CONNECTICUT
GREEN BANK SM

Board of Directors

Meeting Date

December 20, 2019

CONNECTICUT
GREEN BANK

Board of Directors

Lonnie Reed

Chair

Mary Sotos

Senior Policy Advisor of Energy,

DEEP

Binu Chandy

Deputy Director,

DECD

Betsy Crum

Former Executive Director, Women's Housing Institute

Shawn Wooden

Treasurer, State of Connecticut

Thomas M. Flynn

Managing Member, Coral Drive Partners LLC

Matthew Ranelli, Secretary

Partner, Shipman & Goodwin LLP

Eric Brown

Senior Counsel, CT Business & Industry Association

Kevin Walsh

GE Energy Financial Services' Power and Renewable Energy

John Harrity

President, Connecticut State Council of Machinists

845 Brook Street, Rocky Hill, CT 06067
T 860.563.0015
ctgreenbank.com

CONNECTICUT
GREEN BANK

December 13, 2019

Dear Connecticut Green Bank Board of Directors:

We have a regular meeting of the Board of Directors scheduled on **Friday, December 20, 2019 from 9:00 to 11:00 a.m.** in the Colonel Albert Pope Board Room of the Connecticut Green Bank ("Green Bank") at 845 Brook Street, Rocky Hill, CT 06067.

[Note – all those with (*) are agenda items whose materials will be coming by the close of business on Tuesday, December 17th.]

We have a rather short agenda, however, including an update and strategic discussion on our green bond master bond indenture structure. The agenda includes the following:

- **Consent Agenda** – we have a number of items on the consent agenda, including approval of meeting minutes for November 20, 2019 and transactions "Under $500,000" and "No More in Aggregate than $1,000,000. We have also provided a Q1 of FY 2020 update from IPC for your review.

- **Financing Programs** – the staff is bringing a couple of transactions that support our Comprehensive Plan and Budget, and an update on several items including:

    1. **C-PACE Transactions** – several C-PACE transactions, including Brookfield and Simsbury;
    2. **Lead by Example** – an update on the progress we are making support the State of Connecticut with lowering energy costs through a solar PPA RFP; and
    3. **Open RFP Framework** (*) – a discussion about the Open RFP we will be releasing in 2020 to encourage external organizations to apply for investment from the Green Bank for their projects, programs, and products.

- **Green Bonds** (*) – a discussion on Bond Issuance and the Master Bond Indenture in Development.

- **Other Business** – we have included a report called "Solar with Justice" that features the Green bank's "Solar for All" program in partnership with PosiGen.

If you have any questions, comments or concerns, please feel free to contact me at any time.

Until then, enjoy the upcoming weekend!

Sincerely,

Bryan Garcia
President and CEO

AGENDA

Board of Directors of the
Connecticut Green Bank
845 Brook Street
Rocky Hill, CT 06067

Friday, December 20, 2019
9:00-11:00 a.m.

Dial (872) 240-3412
Access Code: 113-744-877

Staff Invited: Mackey Dykes, Brian Farnen, Bryan Garcia, Bert Hunter, Jane Murphy, Selya Price, and Eric Shrago

1. Call to order

2. Public Comments – 5 minutes

3. Consent Agenda – 5 minutes

   a. Meeting Minutes from November 20, 2019
   b. Under $500,000 and No More in Aggregate than $1,000,000
   c. Board of Director Meeting Schedule 2020 (Revision)

4. Financing Programs Recommendations and Updates – 35 minutes

   a. C-PACE Transaction – Brookfield
   b. PosiGen Transaction
   c. Lead by Example – State Solar PPA RFP Update – 5 minutes
   d. Open Request for Proposals ("RFP") Framework

5. Green Bonds US – Discussion on Bond Issuance and Master Bond Indenture in Development – 45 minutes

6. Other Business – 15 minutes

7. Adjourn

Join the meeting online at https://global.gotomeeting.com/join/113744877

Or call in using your telephone:
Dial (872) 240-3412
Access Code: 113-744-877

Next Regular Meeting: Friday, January 24, 2020 from 9:00-11:00 a.m.
Connecticut Green Bank, 845 Brook Street, Rocky Hill, CT

RESOLUTIONS

Board of Directors of the
Connecticut Green Bank
845 Brook Street
Rocky Hill, CT 06067

Friday, December 20, 2019
9:00-11:00 a.m.

Dial (872) 240-3412
Access Code: 113-744-877

Staff Invited: Mackey Dykes, Brian Farnen, Bryan Garcia, Bert Hunter, Jane Murphy, Selya Price, and Eric Shrago

1. Call to order

2. Public Comments – 5 minutes

3. Consent Agenda – 5 minutes

   a. Meeting Minutes from November 20, 2019

Resolution #1

Motion to approve the meeting minutes of the Board of Directors for October 25, 2019

   b. Under $500,000 and No More in Aggregate than $1,000,000

Resolution #2

WHEREAS, on January 18, 2013, the Connecticut Green Bank (the "Green Bank") Board of Directors (the "Board") authorized the Green Bank staff to evaluate and approve funding requests less than $300,000 which are pursuant to an established formal approval process requiring the signature of a Green Bank officer, consistent with the Green Bank Comprehensive Plan, approved within Green Bank's fiscal budget and in an aggregate amount not to exceed $500,000 from the date of the last Deployment Committee meeting, on July 18, 2014 the Board increased the aggregate not to exceed limit to $1,000,000 ("Staff Approval Policy for Projects Under $300,000"), on October 20, 2017 the Board increased the finding requests to less than $500,000 ("Staff Approval Policy for Projects Under $500,000"); and

WHEREAS, Green Bank staff seeks Board review and approval of the funding requests listed in the Memo to the Board dated December 20, 2019 which were approved by Green Bank

staff since the last Deployment Committee meeting and which are consistent with the Staff Approval Policy for Projects Under $500,000;

NOW, therefore be it:

RESOLVED, that the Board approves the funding requests listed in the Memo to the Board dated December 20, 2019 which were approved by Green Bank staff since the last Deployment Committee meeting. The Board authorizes Green Bank staff to approve funding requests in accordance with the Staff Approval Policy for Projects Under $500,000 in an aggregate amount to exceed $1,000,000 from the date of this Board meeting until the next Deployment Committee meeting.

c. Board of Director Meeting Schedule 2020 (Revision)

Resolution #3

Motion to approve the Revised Regular Meeting Schedule for 2020 for the Board of Directors.

4. Financing Programs Recommendations and Updates – 35 minutes

a. C-PACE Transaction – Brookfield

Resolution #4

WHEREAS, pursuant to Section 157 of Public Act No. 12-2 of the June 12, 2012 Special Session of the Connecticut General Assembly and as amended (the "Act"), the Connecticut Green Bank (Green Bank) is directed to, amongst other things, establish a commercial sustainable energy program for Connecticut, known as Commercial Property Assessed Clean Energy ("C-PACE");

WHEREAS, the Green Bank Board of Directors (the "Board") has approved a $40,000,000 C-PACE construction and term loan program;

WHEREAS, the Green Bank seeks to provide a **$549,472** construction and (potentially) term loan under the C-PACE program to 1106 Federal Road, LLC., the building owner of 1106 Federal Road, Brookfield, Connecticut (the "Loan"), to finance the construction of specified clean energy measures in line with the State's Comprehensive Energy Strategy and the Green Bank's Strategic Plan; and

WHEREAS, the Green Bank may also provide a short-term unsecured loan (the "Feasibility Study Loan") from a portion of the Loan amount, to finance the feasibility study or energy audit required by the C-PACE authorizing statute, and such Feasibility Study Loan would become part of the Loan and be repaid to the Green Bank upon the execution of the Loan documents.

NOW, therefore be it:

RESOLVED, that the President of the Green Bank and any other duly authorized officer of the Green Bank is authorized to execute and deliver the Loan and, if applicable, a Feasibility Study Loan in an amount not to be greater than one hundred ten percent of the Loan amount with terms and conditions consistent with the memorandum submitted to the Committee dated

December 17, 2019, and as he or she shall deem to be in the interests of the Green Bank and the ratepayers no later than 120 days from the date of authorization by the Board of Directors;

RESOLVED, that before executing the Loan, the President of the Green Bank and any other duly authorized officer of the Green Bank shall receive confirmation that the C-PACE transaction meets the statutory obligations of the Act, including but not limited to the savings to investment ratio and lender consent requirements; and

RESOLVED, that the proper the Green Bank officers are authorized and empowered to do all other acts and execute and deliver all other documents and instruments as they shall deem necessary and desirable to effect the above-mentioned legal instruments.

b. PosiGen Transaction

Resolution #5

WHEREAS, the Connecticut Green Bank ("Green Bank") has an existing partnership with PosiGen, Inc. (together with its affiliates and subsidiaries, "PosiGen") to support PosiGen in delivering a solar lease and energy efficiency financing offering to LMI households in Connecticut;
WHEREAS, the Green Bank Board of Directors ("Board) previously authorized and approved of a refinancing of the PosiGen financing facilities described in a memorandum to the Board dated November 15, 2019;
WHEREAS, staff desires the Board to confirm its approval of a maturity date for the refinanced facilities to be not later than 3 years from February 15, 2020;
NOW, therefore be it:
RESOLVED, that the Board approves of the maturity date for the PosiGen refinancing facilities be up to three years from the closing date, not to exceed February 15, 2023;
RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and negotiate and deliver all other documents and instruments as they shall deem necessary and desirable to effect the above-mentioned legal instruments.

c. Lead by Example – State Solar PPA RFP Update – 5 minutes
d. Open Request for Proposals ("RFP") Framework

Resolution #6

WHEREAS, the Green Bank Board of Directors (the "Board") and the President and CEO support alternatives for developers and capital providers to gain access to Green Bank resources while affording staff the ability to consider additional investment opportunities;

WHEREAS, the Green Bank President and CEO proposed the introduction of an open and ongoing "Request for Proposals" program to create pathways to access Green Bank support;

WHEREAS, staff has diligence the concept for an open Request for Proposals program (the "Open RFP Program") with other green banks, namely the New York Green Bank and Australia's Clean Energy Finance Corporation, which demonstrated the success and utility of an open and ongoing solicitation program for project proposals;

WHEREAS, the Comprehensive Plan and FY 2020 budget identify the need as well as the capacity to manage an initial Open RFP Program; and

WHEREAS, Green Bank staff recommends that the Board approve the establishment of the Open RFP Program as explained in a memorandum to the Board dated December 17, 2019.

NOW, therefore be it:

RESOLVED, that the Board approves Green Bank to establish the Open RFP Program as explained in a memorandum to the Board dated December 17, 2019;

RESOLVED, that all investments from the Open RFP Program above staff level approval limits, presently over $500,000, will require final authorization and approval from either the Deployment Committee ($2.5 million and below) or the Board;

RESOLVED, that all investments from the Open RFP at or below staff level approval limits, presently under $500,000, will require final authorization and approval from either the Deployment Committee or the Board until the establishment of Board approved program guidelines; and

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and execute and deliver all any documents as they shall deem necessary and desirable to effect the establishment and operation of the Open RFP Program.

5. Green Bonds US – Discussion on Bond Issuance and Master Bond Indenture in Development – 45 minutes

6. Other Business – 15 minutes

7. Adjourn

Join the meeting online at https://global.gotomeeting.com/join/113744877

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Access Code: 113-744-877

Next Regular Meeting: Friday, January 24, 2020 from 9:00-11:00 a.m.
Connecticut Green Bank, 845 Brook Street, Rocky Hill, CT

CONNECTICUT GREEN BANK SM

Board of Directors Meeting

December 20, 2019

Colonel Albert Pope Board Room

Board of Directors

Agenda Item #1

Call to Order

Board of Directors

Agenda Item #2

Public Comments

Board of Directors

Agenda Item #3

Consent Agenda

Consent Agenda
Resolutions 1 through 3

1. **Meeting Minutes** – approve meeting minutes of November 20, 2019

2. **Under $500,000 and No More than $1,000,000** – approve queue of projects each “under $500,000” in size, but no more in aggregate “than $1,000,000” (typically reviewed by Deployment Committee)

3. **Board Meeting Date Revision** – March 25, 2020 Deployment Committee meeting changed to Board of Directors meeting in order to review and approve master green bond indenture

- **IPC Update** – Q1 of FY 2020 update on IPC progress to targets – see Memo (December 11, 2019)

Board of Directors

Agenda Item #4

Financing Program Update and Recommendations

Board of Directors

Agenda Item #4a

C-PACE Transaction (Brookfield)

1106 Federal Rd, Brookfield

Ratepayer Payback

- **$549,472** for a 144kW roof mounted solar PV system & roof
- Projected savings are 12,493 **MMBtu** versus **$549,472** of ratepayer funds at risk.

REDACTED

- Ratepayer funds will be paid back in one of the following ways
  - (a) through a take-out by a private capital provider at the end of construction (project completion);
  - (b) subsequently, when the loan is sold down to a private capital provider; or
  - (c) through receipt of funds from the Town of Brookfield as it collects the C-PACE benefit assessment from the property owner.

1106 Federal Rd, Brookfield

Terms and Conditions

- **$549,472** construction loan at 5% and term loan set at a fixed 5.75% over the 15-year term
- **$549,472** loan against the property
  - Property valued at **REDACTED**
  - Loan-to-value ratio equals **REDACTED**; Lien-to-value ratio equals **REDACTED**
- DSCR > **REDACTED**

1106 Federal Rd, Brookfield

The Five W's

- **What?** Receive approval for a $549,472 construction and (potentially) term loans under the C-PACE program to 1106 Federal Road, LLC to finance the construction of specified energy upgrade
- **When?** Project to commence 2020
- **Why?** Allow Green Bank to finance this C-PACE transaction, continue to build momentum in the market, and potentially provide term financing for this project until Green Bank sells it along with its other loan positions in C-PACE transactions.
- **Who?** 1106 Federal Road, LLC, the property owner of 1106 Federal Road, Brookfield, CT
- **Where?** 1106 Federal Road, Brookfield, CT

1106 Federal Rd, Brookfield

Project Tear Sheet

CONNECTICUT GREEN BANK

REDACTED

1106 Federal Rd, Brookfield

Key Financial Metrics

REDACTED

1106 Federal Rd, Brookfield

Resolutions

- **RESOLVED, that the President of the Green Bank and any other duly authorized officer of the Green Bank is authorized to execute and deliver the Loan and, if applicable, a Feasibility Study Loan in an amount not to be greater than one hundred ten percent of the Loan amount with terms and conditions consistent with the memorandum submitted to the Committee dated December 17, 2019, and as he or she shall deem to be in the interests of the Green Bank and the ratepayers no later than 120 days from the date of authorization by the Board of Directors;**

- **RESOLVED, that before executing the Loan, the President of the Green Bank and any other duly authorized officer of the Green Bank shall receive confirmation that the C-PACE transaction meets the statutory obligations of the Act, including but not limited to the savings to investment ratio and lender consent requirements; and**

- **RESOLVED, that the proper the Green Bank officers are authorized and empowered to do all other acts and execute and deliver all other documents and instruments as they shall deem necessary and desirable to effect the above-mentioned legal instruments.**

Board of Directors

Agenda Item #4b

PosiGen Transaction

PosiGen Transaction

Modification of Maturity Date

- Modification of Approved Maturity Date for Asset Backed Back-Leverage Facility Related to PosiGen Refinancing Plan Approved Nov 15 2019
- Ares Capital Corporation ("Ares") – to replace LibreMax Capital ("LibreMax")
- Ares Facility to mature 3 years *following* closing date
- Green Bank to extend its maturity date under the LibreMax facility (Dec 21) to match the Ares maturity date (Dec 22/Jan 23)
- All other conditions as approved

PosiGen Transaction

Resolutions

- **RESOLVED, that the Board approves of the maturity date for the PosiGen refinancing facilities be up to three years from the closing date, not to exceed February 15, 2023;**

- **RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and negotiate and deliver all other documents and instruments as they shall deem necessary and desirable to effect the above-mentioned legal instruments.**

Board of Directors

Agenda Item #4c

Lead by Example – State Solar PPA RFP Update

Lead by Example

State Solar PPA RFP Update

Due to the confidential nature of the RFP (which is in progress) the briefing will not have slides.

Table 1: Site Information

Project ID	Site Name	Property Address	Exhibit Reference	Project Type	LREC/ZREC Size (kWac)	Delivery Term Start Date
DOC_Cybulski_47	Cybulski	264 Bilton Rd, Somers, CT 06071	A.1	Ground	795.00	4/1/2020
DOC_Enfield_56	Enfield	289 Shaker Road, Enfield CT 06082	A.2	Ground	369.00*	4/1/2020
DOC_MansonYI_99	Manson Youth Institute	176 Jarvis St, Cheshire, CT 06410	A.3	Ground	2,000.00	4/1/2020
DOC_Obsorn_64	Osborn	100 Bilton Rd, Somers, CT 06071	A.4	Ground	2,000.00	4/1/2020
DOC_Robinson_22	Robinson A	289 Shaker Rd, Enfield, CT 06082	A.5	Ground	226.00*	4/1/2020
DOC_Robinson_61	Robinson B	289 Shaker Rd, Enfield, CT 06082	A.6	Ground	249.00	4/1/2020
DOC_Robinson_70	Robinson C	285 Shaker Rd, Enfield, CT 06082	A.7	Ground	1,000.00	4/1/2020
DOC_Robinson_85	Robinson D	285 Shaker Rd, Enfield, CT 06082	A.8	Ground	467.00	4/1/2020
DOC_Willard_50	Willard	391 Shaker Rd, Enfield, CT 06082	A.9	Ground	691.00	4/1/2020
DOC_Cheshire_ Maloney_Webster	Maloney and Webster (Cheshire Correctional)	Jarvis St, Cheshire, CT 06410	A.10	Ground	2,000.00**	TBD
165_Capitol	State Office Building	165 Capitol Ave, Hartford, CT 06106	A.11	Roof	Medium***	TBD
DEEP_Hatchery	Kensington Hatchery	120 Old Hatchery Rd, Kensington, CT 06037	A.12	Ground	100.00****	TBD

* The sites annual consumption is less than ZREC, system size shall not exceed consumption
**A 2MW-AC LREC bid will be submitted into the next auction by the Green Bank.
*** A medium ZREC will be submitted into the next auction by the Green Bank. Maximize roof space
**** A small ZREC will be secured by the CT Green Bank.

CONNECTICUT GREEN BANK

Board of Directors

Agenda Item #4d

Open RFP Framework

Open RFP Framework

Per the Comprehensive Plan of the Green Bank:

- **Increase and accelerate the impact of its model to support the implementation of Connecticut's climate change plan;**
- **Scale up investment and impact in Connecticut;**
- **Draw into the market more investment from private capital sources leveraged by innovative public sector financing; and**
- **Expand our use of green bonds to increase our access to capital beyond our current sources of funding to scale-up its investment activity, while providing more opportunities to engage Connecticut citizens in the state's growing green economy.**

Open RFP Framework (2)

Green Bank proposes an Open RFP to:

- **Receive proposals for Green Bank investment on an open and rolling basis, as received;**
- **Evaluate such proposals in accordance with objective and transparent criteria;**
- **To be "market responsive" and adaptable**
  - **Render preliminary responses to proposals in days and weeks rather than months**
  - **Offer guidance to those proposals that fall short of our criteria where the proposals offer the promise of significant market potential; and**
  - **Have a sufficient budget for investment in order to deliver significant impact quickly.**

Open RFP Framework (3)

Other considerations:

- **Potential for Activity**
- **Based on analysis of peers (NYGB) Connecticut might expect $100 to $125 million in proposals annually**
- **“Actual transactions” worthy of investment – $20 to $25m/yr**
- **Eligible Technologies**
  - **Any technology that is able to help the Green Bank achieve its statutory mandate as voiced through its Comprehensive Plan:**
    - **(a) is either already commercially viable or**
    - **(b) has demonstrated clear potential for commercial viability through, for instance, well-documented feasibility studies and pilot programs where there is clear evidence of a viable business model and a path to substantial impact**

Open RFP Framework (4)

Other considerations (2):

- **Financing Arrangements and Capital Support**
  - **Green Bank not to be prescriptive**
  - **Maximize potential for leverage of Green Bank resources**
  - **Balance the need for risk containment and Green Bank sustainability (i.e., the Green Bank's financial returns vs. the potential for financial losses)**
  - **Usual investments: senior and subordinate loans; construction loans; bridge loans; working capital loans; term loans; loan loss reserves; loan guarantees; other forms of credit enhancement; participation in other lender's loans; equity**
- **All of the above - in accordance with Green Bank operating procedures and its enabling statute.**

Open RFP Framework (5)
Resolutions

- **RESOLVED, that the Board approves Green Bank to establish the Open RFP Program as explained in a memorandum to the Board dated December 17, 2019;**

- **RESOLVED, that all investments from the Open RFP Program above staff level approval limits, presently over $500,000, will require final authorization and approval from either the Deployment Committee ($2.5 million and below) or the Board;**

- **RESOLVED, that all investments from the Open RFP at or below staff level approval limits, presently under $500,000, will require final authorization and approval from either the Deployment Committee or the Board until the establishment of Board approved program guidelines; and**

- **RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and execute and deliver all any documents as they shall deem necessary and desirable to effect the establishment and operation of the Open RFP Program.**

Board of Directors

Agenda Item #5

Green Bonds US

Discussion on Bond Indenture and Master Bond Indenture Development


Yard Goats

Green Bond Team

Connecticut Green Bank

- **Green Bank Team** – Mackey Dykes, Brian Farnen, Bryan Garcia (Facilitator), Bert Hunter (Lead), Eric Shrago, and Mike Yu
- **Board Member Advisor** – Office of the Treasurer (i.e., Bettina Bronisz)
- **Financial Advisor** – Lamont Financial (i.e., Bob Lamb)
- **Legal Advisor** – Shipman & Goodwin (i.e., Bruce Chudwick)
- **Underwriters** – Ramirez (i.e., Al Quintero) and Stifel (i.e., Nate Betnun)
- **Marketing** – GO (i.e., Chad Turner)

Green Bond Team (cont'd)

Connecticut Green Bank

- **Rating Agency** – S&P
- **Green Bond Certifier** – Kestrel Verifiers
- **Climate Action Reserve –** assessment of GHG & public health impacts
- **Trustee** – BoNY, US Bank, competitive process

Master Bond Indenture

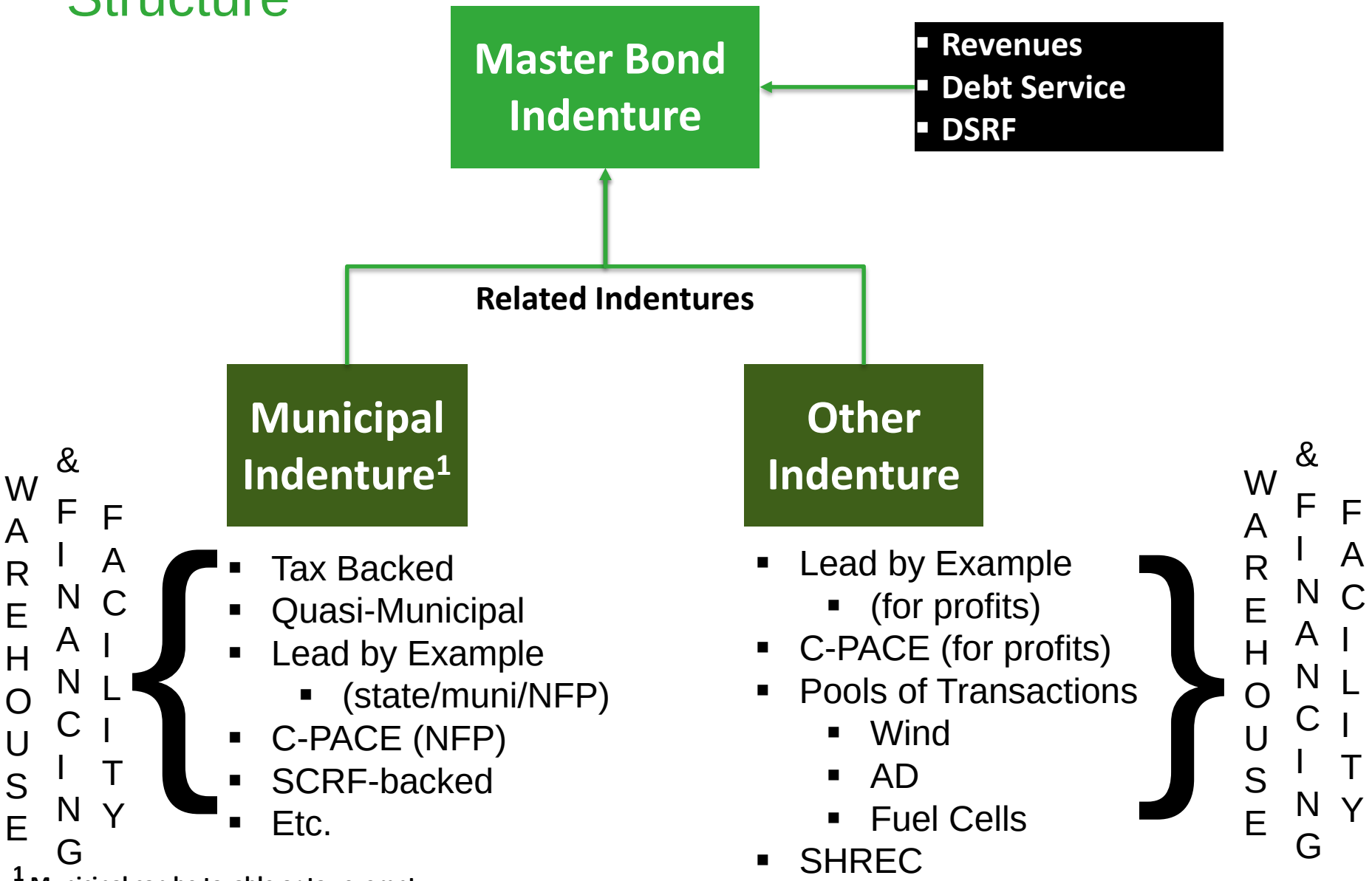
Review of Goals

Scale-Up Investment – **expand deployment** of clean energy project finance and infrastructure development to achieve greater societal benefits, deploy funding beyond SBC and existing revenue sources, and **citizen engagement as retail purchasers**

Defending Funds – **protection** of project revenues and other revenue sources (e.g., CEF, RGGI, etc.) through master indenture, use SCRF as necessary, and **citizen engagement as retail purchasers**

Lower the Cost of Capital – **raise lower cost capital** from institutional investors and **"everyday citizens"** through "green bonds" for clean energy investments

Master Trust Indenture
Structure



[1] Municipal can be taxable or tax exempt

Master Trust Indenture and Related Financing Indentures

CONNECTICUT GREEN BANK

Master Trust Indenture Flow of Funds

Revenue Fund
- *CEF Deposits*
- *Investment Income & Return*
- *Other Funds*

Deposit to Admin Fund
- *Monthly, with two month reserve*

Debt Service Fund for Direct MTI Debt
- *Interest & Principal monthly*

Debt Service Reserve Fund
- *If any, refill as necessary*

Deficiency Reserve Fund
- *Funded as needed if problems in a related indenture*

Excess Revenue Fund
- *Holding acct for future needs*

New Commitment Fund

Surplus Fund

Financing Indenture LBE/Gov't

Revenue Fund

Admin Fund
- Operating acct: monthly
- Financial Services: as needed
- Project Related: as needed

Debt Service Fund
- Interest acct: monthly
- Principal acct: monthly
- Redemption acct: as needed

Debt Service Reserve Fund/SCRF Reserve
- Bond funded at closing
- Refill: as needed

Renewal and Replacement
- As needed, Annual requirement

Surplus Acct
- Coverage revenues/ROI

Key Covenants
- 1x operating, 1.1x DS

Financing Indenture Solar

Revenue Fund

Admin Fund
- O&M acct: monthly
- Financial Services: as needed
- Project Related: as needed

Debt Service Fund
- Interest acct: monthly
- Principal acct: monthly
- Redemption acct: as needed

Debt Service Reserve Fund/SCRF Reserve
- Bond funded at closing
- Refill: as needed

Renewal and Replacement
- As needed, Annual requirement

Surplus Acct
- Coverage revenues/system sales

Key Covenants
- 1.2x DS

Financing Indenture C-PACE

Revenue Fund

Admin Fund
- Operating acct: monthly
- Fin./legal Services: as needed
- Project Related: as needed

Debt Service Fund
- Interest acct: monthly
- Principal acct: monthly
- Redemption acct: as needed

Debt Service Reserve Fund/SCRF Reserve
- Bond funded at closing
- Refill: as needed

Renewal and Replacement
- As needed, Annual requirement

Surplus Acct
- Net revenues/ROI on loans

Key Covenants
- 1.15x DS

SHREC
Taxable Municipal Issuance

- **Taxable municipal bond with retail component**
  - Special Capital Reserve Fund ("SCRF") credit enhancement
    - S&P municipal rating group
    - Allow for serial bonds

- **April execution**
  - Late Jan/early Feb - Independent Engineer report
    - Inform base case energy projections and cash flow model
    - Downside sensitivities
  - Feb – SCRF application
    - Credit analysis & self sufficiency determination
  - Feb/March – S&P ratings process
  - April – 50th Anniversary of Earth Day marketing! (launch)

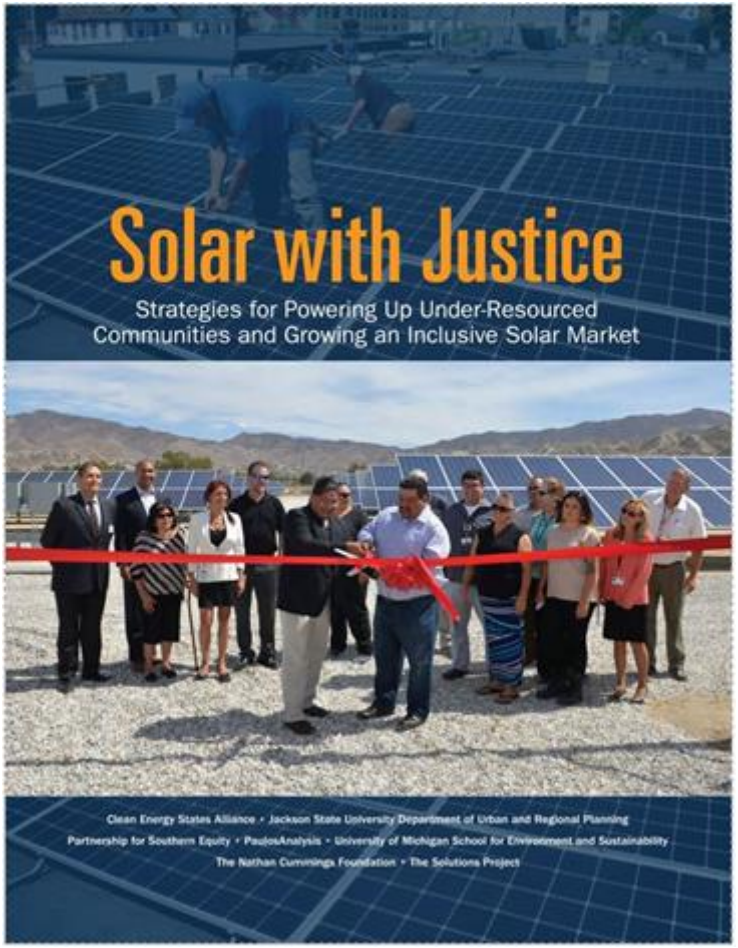
Board of Directors

Agenda Item #6

Other Business

RSIP: Sharing Solar Benefits

LMI & Communities of Color



Methodology:
Categorizing census tracks by race/ethnicity

- Census tracts were categorized as a majority "X" race if more than 50% percent of the population that identified as the same race or ethnicity*
- If less than 50% of the population identified as the same race or ethnicity, census tract labeled "no majority race"
- Predominant minority groups are black and Hispanic; **10.9% of the total population lives in majority Hispanic or majority Black census tract**

	Number of Census Tracts	Total Population	Percent of Population
Majority Hispanic	51	280,795	**7.8%**
Majority Black	24	111,390	**3.1%**
Majority White	558	2,669,635	74.4%
No Majority Race	200	526,750	14.7%
Grand Total	833	3,588,570	100%

*Based on 2016 American Community Survey data

Methodology:
Analyzing owner-occupied homes by race/ethnicity

- Housing distribution was analyzed by racial/ethnic categories

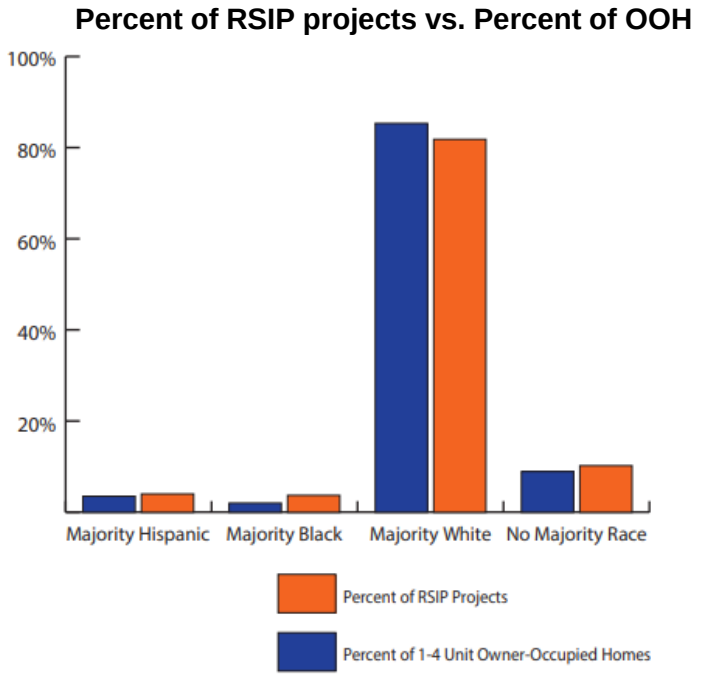
	Number of Owner-Occupied 1-4 Unit Homes	Percent of all Owner-Occupied 1-4 Unit Homes
Majority Hispanic	31,152	**3.6%**
Majority Black	18,163	**2.1%**
Majority White	731,901	85.3%
No Majority Race	76,878	9.0%
Grand Total	858,094	100%

Less than 6% of owner-occupied homes (i.e. homes eligible for RSIP) are in communities of color

Analysis: Homeownership compared to RSIP

- Compared % of RSIP projects in census tracts by race/ethnicity to % of owner-occupied homes
- RSIP Distribution is **on par or exceeds** the distribution of OOH in communities of color

	Percent of 1-4 Unit Owner-Occupied Homes	Percent of RSIP Projects
Majority Hispanic	3.6%	4.1%
Majority Black	2.1%	3.8%
Majority White	85.3%	81.8%
No Majority Race	9.0%	10.3%
Grand Total	100.0%	100%



Communities of Color – Distribution by Income compared to RSIP

- Compared % of RSIP projects in census tracts by race/ethnicity to % of owner-occupied homes in each income band
- Same methodology as Tufts study but used AMI band as a proxy for the same median income
- RSIP Distribution **on par or exceeds** distribution of OOH in communities of color, **inclusive of income**

Census Tract Income Level (AMI Band)	Majority Hispanic		Majority Black		Majority White		No Majority Race	
	% of OO Homes	% of RSIP	% of OO Homes	% of RSIP	% of OO Homes	% of RSIP	% of OO Homes	% of RSIP
<60%	**30.3%**	**24.9%**	**12.8%**	**22.1%**	18.8%	14.6%	**38.0%**	**38.1%**
60%-80%	**10.8%**	**13.0%**	**5.7%**	**7.7%**	62.7%	56.0%	**20.1%**	**23.2%**
80%-100%	1.2%	1.6%	2.9%	4.5%	89.7%	87.9%	6.3%	6.0%
100%-120%	--	--	--	--	95.0%	95.0%	5.0%	5.0%
>120%	--	--	--	--	96.1%	95.1%	3.9%	4.9%
Grand Total	3.6%	4.1%	2.1%	3.8%	85.3%	81.8%	9.0%	10.3%

Solar for All outperforms RSIP

- Using the same methodology, the **Solar for All Program shows even stronger penetration** in communities of color and low-income communities than the RSIP as a whole

Income Band (% of AMI)	Majority Hispanic		Majority Black		Majority White		No Majority Race	
	% of OO Homes	% of Projects	% of OO Homes	% of Projects	% of OO Homes	% of Projects	% of OO Homes	% of Projects
<60%	**30.3%**	**17.0%**	**12.8%**	**32.0%**	18.8%	7.6%	**38.0%**	**43.0%**
60%-80%	**10.8%**	**16.6%**	**5.7%**	**14.13%**	62.7%	44.2%	**20.7%**	**25.2%**
80%-100%	1.2%	1.1%	2.9%	6.27%	89.7%	84.6%	6.3%	8.0%
100%-120%	--	--	--	--	95.0%	89.7%	5.0%	10.3%
>120%	--	--	--	--	96.1%	85.0%	3.9%	15.0%
Grand Total	3.6%	10.24%	2.1%	16.2%	85.3%	47.4%	9.0%	26.2%

RSIP vs *Solar for All*

CONNECTICUT GREEN BANK

	Number of RSIP Installations	Percent of RSIP Installations	Number of Solar for All Installations	Percent of Solar for All Installations
Majority Hispanic	1,265	**4.1%**	207	**10.2%**
Majority Black	1,160	**3.8%**	327	**16.2%**
Majority White	25,184	81.8%	958	47.4%
No Majority Race	3,174	10.3%	530	26.2%
Grand Total	30,783	100%	2,022	100%

The analysis shows that the RSIP and in particular, the *Solar for All* Program, has been effective at reaching communities of color, and in some instances penetration in communities of color outperforms penetration in white neighborhoods.

Solar For All with PosiGen

Case Study: Melvin in Bridgeport, CT

Description	6 kW Solar Lease	System Energized 6/11/2015
Green Bank Incentive	$5,605.63	
Monthly cost	$75 for solar lease	
Terms	20 year lease	
Customer 20-yr Cost	$18,000.00	Lease
Pre-Solar Electric Costs	$50,576.00	(9438 kWh/yr)
Post-Solar Electric Costs	$34,043.00	Including lease
First Year Savings	$595.00	
Net 20-yr Savings	$16,533.00	Not including EE savings

"Everyone said it was crazy to go solar, now they all want it. People don't realize there are savings. Our bill during the winter was $460 and now it is $15."

Melvin

Other Business

Climate Change and Green Banks

- **Governor's Council on Climate Change** – EO1 reconstituted the GC3, including additional state agencies (i.e., Insurance, Public Health, and Housing), energy justice (e.g., Operation Fuel), and others to address mitigation and adaptation-resiliency

- **National Climate Bank** – policy released on December 12 in the House by Congresswoman Debbie Dingell from Michigan, following on similar proposal in the Senate by Senators Markey, Van Hollen, and Blumenthal earlier this year

- **International Green Banks** – international efforts exploring green bank creation from 12 at the start of 2019 to 35 today including African Development Bank, Mongolian Green Finance Corporation, Indian Renewable Energy and Development Agency, Rwandan Catalytic Green Investment Bank, and Inter-American Development Bank

Board of Directors

Agenda Item #7

Adjourn

Board of Directors of the Connecticut Green Bank Special Meeting Minutes

Wednesday, November 20, 2019
2:00 p.m. – 3:00 p.m.

A special meeting of the Board of Directors of the **Connecticut Green Bank (the "Green Bank")** was held on November 20, 2019 at the office of the Connecticut Green Bank, 845 Brook Street, Rocky Hill, CT, in the Colonel Albert Pope Board Room.

1. Call to Order

Lonnie Reed called the meeting to order at 2:04 pm.

Board members participating: Bettina Bronisz (by phone), Eric Brown (by phone), Binu Chandy (by phone), John Harrity (by phone), Michael Li (by phone), and Lonnie Reed

Members Absent: Betsy Crum, Thomas Flynn, Kevin Walsh, Matt Ranelli

Staff Attending: Shawne Cartelli, Bryan Garcia, Brian Farnen (by phone), Bert Hunter, Jane Murphy, Cheryl Samuels, Ariel Schneider, Eric Shrago, Michael Yu (by phone), Nicholas Zuba (by phone)

Others in Attendance: Chris Magalhaes (by phone) and Ben Healey (by phone)

2. Public Comments

- No public in attendance. No public comments.

3. Consent Agenda

a. Meeting Minutes from October 25, 2019

Resolution #1

Motion to approve the meeting minutes of the Board of Directors for October 25, 2019.

Upon a motion made by John Harrity and seconded by Binu Chandry, the Board voted to approve Resolution 1. Motion approved unanimously.

4. Financing Programs Recommendations

a. Posi-Gen – Financing Restructuring

- Bert Hunter introduced Chris Magalhaes from IPC, Chief Investment Officer and Ben Healey from PosiGen, EVP, Finance and Corporate Development.

- Bert summarized PosiGen's PBI Financing Facility background. He stated that the Green Bank has been working with PosiGen since 2014 to reach Low-to-Moderate Income (LMI) households in Connecticut to provide Solar PV and energy efficiency financing. He explained the importance of a disciplined organizational structure to gain the capital structure to succeed, and that without it, processing and administrative requirements can become stressful on an organization. PosiGen has been rationalizing their Capital STAG to make it more efficient and less operationally stressful.
    - Bert emphasized that a stronger capital base is more attractive to investors, especially for presentation in January 2020 (?).

- Bert explained that the Green Bank wants to help expand PosiGen's PBI Financing Facility to benefit their working capital over the next few years. The Green Bank's contribution, even with expansion, is less than $20,000,000 but the intent is to also utilize the Green Bank's credibility and use brand recognition to benefit PosiGen beyond the dollar values.
    - The Green Bank's contributions and PosiGen's system supports about 14,000 homeowners in states beyond Connecticut such as New Jersey and Louisiana.

- Bert stated that the Green Bank would like to expand its contribution to PosiGen's PBI Financing Facility by $3,000,000, but not to exceed $8,000,000. As well, would like to increase the Green Bank's $1,000,000 Participation up to $5,000,000.
    - PosiGen is set to expand further and is looking for more flexibility from IPC participation, hence the need from the Green Bank. The funds from the Green Bank would help deploy projects beyond PosiGen.
    - The Green Bank's additional contributions would be backed by current PBI collateral and the total overall increase would be up to $4,000,000. As well, LibreMax's expanded Back Leverage Facility is set to be taken over by Ares. New Island's Back Leverage Facility would be a separate but similar portfolio.

- Lonnie Reed asked if the change in funding is already set or still being discussed.
    - Bert Hunter stated the Ares Finance Committee met and approved the transaction, but the change is not finalized because the Green Bank Board of Directors still needs to approve it. Even though the funds were previously approved through LibreMax, the lender has changed to Ares and so new approval is needed.

- John Harrity summarized the information, wanting to be clear that he understood.
    - Bert Hunter clarified that Ares is taking the maximum amount of the Back Leverage Financing Facility available and raise it to $75,000,000. As well, Ares will raise its rate from 68% to 72% while lowering the cost of capital from LIBOR+8.25% to LIBOR+6.75%. PosiGen is expanding due to the strain on deployment projects, and the use of Equity Capital is also being discussed.

- Lonnie Reed asked for clarification if PosiGen or LibreMax initiated the divorce between the two companies.
    - Ben Healey stated it was a mutual decision. He explained that LibreMax is a hedge fund and this was its first direct-to-consumer loan. Previously it mostly worked with traders. Over the course of the summer it became clear that the flexibility PosiGen needed was not going to be well met by LibreMax due to the constraints and lack of understanding by its business model. Ben stated that LibreMax would become nervous whenever there was any volatility and would slow down business as a response. As a result, PosiGen switched to Ares, though it felt pushed by LibreMax.

- Lonnie Reed asked if PosiGen has more comfort with Ares, as it didn't look like there were many energy investments.
    - Ben Healey clarified that Ares has done Back Leverage with Sunrun and other companies, and that they are quite familiar with the process.

- Eric Brown stated he had concerns about quintupling of the Green Bank's exposure.
    - Bert Hunter explained that the increase from $1,000,000 to $5,000,000 is backed by solar energy credits, the funds would be paid to PosiGen over 4-6 years, and that the funds are secured by other means.

- John Harrity asked if there was any reason the Green Bank should only be working with PosiGen. He asked if there was any reason it doesn't diversify to deliver programs, questioning if it is more efficient to work with only one outlet.
    - Bert stated that the Green Bank is also working with Inclusive Prosperity Capital to bring forward Momentum Capital. Chris Magalhaes explained that the relationship with PosiGen goes back to 2014, so it has been in the Connecticut market for a while. Over time, the process has been streamlined. He stated about 3-4 months ago, IPC identified a potential new entrant, Momentum Capital. IPC has been working with Momentum Capital to get to a point to structure a Financing Facility that they are comfortable with. The intent is to have a new Financing Facility in place in Connecticut where the Green Bank can participate, and in the long run to provide another option for the Green Bank to use as a provider. Chris stated that looking back, there has only been 2 companies that can maintain this type of Financing Facility officially and safely.
    - Bert Hunter added that in the last few Board meetings there have been discussions about bringing forward an RFP process. The Green Bank has been in contact with other companies (e.g., Clean Energy Finance Corporation of Australia and the New York Green Bank) in last 3 weeks about how their RFPs are structured since they have had success. Bert stated the Green Bank wants to bring that process over by Q1 2020.

- John Harrity stated his confidence in the deal, based on Ben Healey's involvement, position at PosiGen, and prior work at the Green Bank. Bettina Bronisz echoed the statement and is happy with Ben Healey's presence.

Resolution #2

WHEREAS, the Connecticut Green Bank ("Green Bank") has an existing partnership with PosiGen, Inc. (together with its affiliates and subsidiaries, "PosiGen") to support PosiGen in delivering a solar lease and energy efficiency financing offering to LMI households in Connecticut;

WHEREAS, the Green Bank Board of Directors ("Board) previously authorized the Green Bank's participation in a credit facility (the "BL Facility") encompassing all of PosiGen's solar PV system and energy efficiency leases in the United States as part of the company's strategic growth plan, in an amount not to exceed $15 million;

WHEREAS, the Board previously authorized the Green Bank to lend additional funds to PosiGen under the separate PBI-only facility (the "PBI Facility") in addition to the BL Facility, provided that Green Bank capital outstanding between such PBI Facility and the BL Facility would not exceed the previously authorized $15 million total;

WHEREAS, PosiGen is refinancing the existing BL Facility by replacing capital sourced from LibreMax Capital with capital sourced from Ares Capital (the "PosiGen Refinancing") as explained in the memorandum to the Board dated November 15, 2019;

WHEREAS, in order to make efficient use of performance based incentive collateral (the "PBI Collateral"), staff recommends increasing the PBI Facility supported by the PBI Collateral to permit additional advances by Green Bank that can be supported by the PBI Collateral and as explained in the memorandum to the Board dated November 15, 2019.

NOW, therefore be it:

RESOLVED, that the Board approves of the PosiGen Refinancing provided that Green Bank capital outstanding under the BL Facility does not exceed $14 million;

RESOLVED, that the Green Bank Board authorizes the Green Bank to lend additional funds to PosiGen under the PBI Facility provided that Green Bank capital outstanding under the PBI Facility does not exceed $5 million;

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and negotiate and deliver all other documents and instruments as they shall deem necessary and desirable to effect the above-mentioned legal instruments.

Upon a motion made by John Harrity and seconded by Bettina Bronisz, the Board voted to approve Resolution 2. Motion approved unanimously.

5. Incentive Programs Recommendations

a. Energize CT Smart-E Loan – Interest Rate Buydown

- Bryan Garcia stated the Green Bank may be ready for second proposal at the December meeting, and that it wants to put stimulus funds back into Connecticut programs to support its climate change plan. Beyond that statement, this item was not discussed.

Agenda Item 5.a. has been withdrawn from this Board Meeting and was not voted upon.

6. Adjourn

Upon a motion made by John Harrity and seconded by Bettina Bronisz, the meeting was adjourned at 2:37 pm.

Respectfully submitted,

_____

Lonnie Reed, Chairperson

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InclusiveProsperityCapital.org

INCLUSIVE
PROSPERITY CAPITAL

Memo

To: Bryan Garcia and Eric Shrago, Connecticut Green Bank

From: Inclusive Prosperity Capital Staff

Date: December 11, 2019

Re: IPC Quarterly Reporting – Q1 FY20

Progress to targets for Fiscal Year 2020, as of 9/30/2019

Product	Number of Projects	Projects Target	% to goal	Total Financed Amount	Financed Target	% to goal	MW Installed	MW Target	% to goal
Smart-E Loan	169	540	31.3%	$2,274,121	$7,182,000	31.7%	0.2	0.5	40%
Multifamily Pre-Development	3	2	150%	$910,886	$140,000	651%	n/a	n/a	n/a
Multifamily Term	6	9	67%	$2,038,109	$2,500,000	82%	0.0	0.1	0%
Solar PPA	1	34	3%	$242,082	$28,125,000	1%	0.1	12.7	1%
Low income single family (PosiGen)	179	615	29.1%	$4,869,188	$17,202,165	28.3%	1.2	4.2	30%

PSA 5410 – Smart-E Loan

- **New Platform**
  - Program staff managed the transition off the Metis platform and the launch of the National Green Energy Network ("NGEN") platform on July 22, 2019.
    - Nearly 150 eligible contractors participated in trainings before getting access to the new platform.
    - All lenders (active and inactive) were trained on the new platform regarding how to update loan-specific information and upload their monthly loan files

- Connecticut's Smart-E Loan program was the first state energy program to join the NGEN platform; however, Michigan Saves is in the process of customizing NGEN for their energy programs and other states, including Colorado, have already expressed interest in using it.
- All project data was transitioned over from the prior portal to NGEN with minimal to no interruption to existing users; however, IPC and CGB staff continue to work together to address any data integrity issues between NGEN and PowerBI caused by the transition.

- **Volume**
  - Closed loans broken out as 64% HVAC, 12% solar, 7% home performance and 17% other (note: this "other" figure is likely a data error due to the Smart-E platform transition that took place mid-Q1 and will be corrected for the next quarterly report)
- **New Health & Safety Measures Added**
  - IPC program staff brought a request to CGB leadership for the reclassification of asbestos and mold remediation from the "other/related energy measure" category, which limited them to 25% of the total loan amount, to being standalone measures that can be financed in full, up to $25,000.
  - With support from Eversource and United Illuminating Home Energy Solutions ("HES") program staff and active Smart-E contractors, program staff identified (3) paths that the homeowner would be required to follow to create a nexus to energy, ensuring that homeowners go deeper with their energy improvements after addressing the health and safety issues.
  - Program staff supported CGB in making the request for reclassification to CGB's Deployment Committee, which ultimately voted unanimously to approve.
  - Program staff launched the health and safety updates in September 2019 and worked with CGB Marketing to create a website promoting the health & safety measures: https://ctgreenbank.com/smartehealthsafety/. A press release was scheduled for Q2.

Lenders

- CorePlus Credit Union, one of the two original lenders for the Smart-E program, restarted taking applications from all members. They had previously stopped taking applications in early 2019 from all but two of their highest volume contractors because they felt Smart-E's interest rates were too low.
- Program Staff continued conversations with a national credit union about joining as a Smart-E lender in Connecticut, with an expected launch in Q2 or Q3 of Fiscal Year 2020.

PSA 5411 – Multifamily

- The Multifamily team is well on its way to meeting the FY'20 goals, working to fund projects in the pipeline that were projected to close in FY'20. In Q1, 3 pre-development loans closed, exceeding the annual FY'20 target of 2 loans. Six (6) term loans closed using CGB or other funding against an annual FY'20 target of 9 loans. Of note, Seabury Coop, a project we have been working on for about 5 years to help stabilize and preserve as affordable housing, received 2 pre-development and 2 term loans during Q1. These loans included funding from CGB, HDF/MacArthur Foundation, Capital for Change, and the Urban Homesteading Assistance Board (UHAB).

- The bench of multifamily projects in the pipeline is not as strong as previous years. For state and federally funded housing, this is likely attributable to uncertainty and cuts to the state housing budget, making it difficult to advance these projects. For privately owned properties, rates have dipped, and financing has become more available, likely enabling owners to secure more competitive debt from other sources. Given these dynamics, CGB is often a lender of last resort – serving projects with emergency needs that other lenders are unable or unwilling to fund or those that can only be funded with unsecured debt.
- Given the weak bench of projects and the reality that it often takes several years for loans to close, the multifamily team has been working to build pipeline on multiple fronts:
    - Partnering with CHFA and DOH to analyze and reach properties in the State Sponsored Housing Portfolio (SSHP) that need, but have not received, state funding for capital improvements, and may benefit from CGB programs.
    - Continued technical assistance to and market development of the coop sector in partnership with UHAB.
    - Analyzing BenchmarkCT data and municipal grand lists and reaching out to best prospects for energy improvements.
    - Consistently getting the word out using newsletters, press-releases, webinars, trainings – with promotional support from partners/ collaborators including: AHA, C4C, HDF, CHFA, HUD, CONN-NAHRO, CT Apartment Association, Office of the Chief State's Attorney and CT Association of Housing Code Enforcement Officials (CAHCEO), CTGBC, CT Passive House Assn, NESEA, and others.
    - Continued support of the Multifamily Peer-to-Peer network, in partnership with AHA, to build market awareness, capacity and demand for future projects.
- At the end of FY'19, C4C and CGB developed and approved underwriting for the LIME Loan program to serve **ALL** multifamily properties in CT, including market rate properties and those with tenant paid utilities. C4C is in the process of closing on funding from IPC and CGB to capitalize the expanded LIME program as described below. (Soft launch/ announcements in Q2, with a full marketing campaign planned for Q3.)
- Members of the multifamily team from IPC and CGB continue to sit on partner boards including Capital for Change (C4C), Housing Development Fund (HDF), and the Affordable Housing Alliance (AHA). During Q1, we joined the Steering Committee of the Fairfield County Housing Alliance (FCHA) and co-chair the Financial Resources Working Group. These leadership activities enable us to ensure program success and help mainstream energy, health and safety, and resiliency priorities into state housing policy and programs.
- Product development continues on quarterly M&V performance reports being piloted on the LIME loan portfolio and using the WegoWise platform. Development of a cost-effective QA/QC process as well as more customer friendly and transparent processes and materials also continues.

IPC staff met with CGB during Q1 to provide guidance on separately reporting total energy project costs and financing costs (this is in addition to total project costs and financing currently reported by PowerBI). IPC is standing by to review those changes to PowerBI and support in getting this accurately ironed out with CGB.

PSA 5412 – Solar PPA

- On a go-forward basis IPC staff is leading on, with support from Green Bank staff, sourcing tax equity for a new fund that will be managed at IPC and will be capable of supporting

projects originated by the Green Bank in Connecticut and by IPC nationally – such a construct should facilitate greater financing ability and options for Green Bank projects in Connecticut.
- In addition to tax equity, IPC is in the process of sourcing debt capital that can be used for the new fund, which presents the Green Bank an opportunity to participate for financial gains/targets in Connecticut-based solar PPA projects. IPC continued discussions with Green Bank for the level of debt they might provide.
- In coordination with Green Bank, IPC executed a $5M commercial solar PPA construction facility for new Connecticut commercial solar PPA projects.
- IPC supported Green Bank staff in the evaluation of PPA pricing and recommended adjustments.
- In coordination with Green Bank, IPC staff has finalized PACE-secured and non-PACE solar PPA documentation for use.
- Development of a Salesforce-based project origination platform for the Solar PPA product suite was launched. Green Bank and IPC staff are jointly working to finalize a developer and partner portal where developers will be able to log-in and provide updated documentation directly to the project in Salesforce, creating workflow efficiencies for both IPC and the Connecticut Green Bank.

PSA 5413 – Investment Management (LMI Solar and Green and Healthy Homes)

PosiGen Solar for All Program Management

- The PosiGen Solar for All partnership has started out strong this fiscal year, with an additional 179 installations the first quarter.
- 93% of projects include weatherization and efficiency provided by HES or HES-IE and 66% of customers all time have received deeper measures through PosiGen's energy efficiency agreement (as of May 2019, all PosiGen customers will have deeper energy efficiency work wrapped into their lease).
- The Solar for All program has seen a decline in at the program's ability to reach the LMI market segment this quarter with only 50% of new homes verified as low income.

Green and Healthy Homes Project

- The CT-specific Medicaid ROI analysis for the Green and Healthy Homes project has received Department of Social Services (DSS) approval for the Trips and Falls data. Once lead and asthma data analysis is approved, the pilot design based on feedback from the working groups that met over the course of summer 2019 can begin.
- A funding gap of $25,000 remains with a grant application submitted to Robert Wood Johnson Foundation.

Investment Management

IPC staff supported Green Bank staff on the following financings:

- PosiGen:
    - Ongoing portfolio monitoring, payment verification and processing, and diligence/analysis on a refinancing with a 3rd party capital source on Green Bank

collateral which will result in additional 3rd party capital being driven into PosiGen investment structures (expected to close the 4th calendar quarter of 2019).
    - IPC continues to monitor, administer, and support the Green Bank's investment position in PosiGen through IPC's non-controlling participation in the Green Bank financing facility.

- Residential SL2:
    - IPC Staff continued to manage all aspects of the residential CT Solar Lease portfolio, under the guidance of CGB's Accounting, Finance, Legal and Statutory and Infrastructure teams.
        - Ongoing management includes: management of program partnerships with Assurant (warranty management), Renew Financial (servicing) and co-management of monitoring and technical support partners, Locus-SunSystem Technology, with CGB's S&I team. Specific tasks include weekly, sometimes daily, processing of UCC-1 subordination agreements, managing the pipeline of lease transfers, and steady flow of customer service issues from homeowners, contractors, and other stakeholders.
    - IPC Staff continued to work with CGB staff on transitioning the SL2 management fully to CGB; however, Staff struggled to find qualified candidates for the position. A qualified candidate was eventually identified and a start date of Q2-FY20 was targeted.

Use of DEEP Proceeds

Energize CT Health & Safety Revolving Loan Fund

- Funds for pilot asbestos remediation of 5 Success Village Association buildings were drawn equaling $95,307.60 of an authorized $165,000. Success Village has indicated that the remediation for these 5 buildings is complete and IPC has converted the loan to amortizing.
- No new closed loans or approvals were given during Q1.

$5M Capital Grant

- IPC's Board approved a $1.2M investment in Capital for Change to provide liquidity under its successful LIME Loan program offered in partnership with the Connecticut Green Bank. The transaction is expected to close in Q2 under a master facility construct with CGB where CGB will also invest additional capital into the program.

General Updates

Below are updates for the first fiscal quarter of FY20:

- Capital raising:
    - Continued diligence process with New York Green Bank for first credit facility that will access the Kresge Guarantee, target close of 2nd fiscal quarter.
    - Approved of the assumption and assignment of a $3M solar + storage PRI from the Green Bank to IPC, since the CT market for storage is economically challenging and IPC can source deals outside CT.

    - Continued conversations with the next set of capital providers, including impact investors and foundations.
- Business Development of interest to Connecticut:
    - Applied for and was turned down for a national LLR/guarantee facility from the new national "guarantee bank," the Community Investment Guarantee Program ("CIGP"), a collective of 10 foundations led by Kresge. We applied with Michigan Saves and were turned down despite our leverage ratio being 3-5x higher than desired due to the fact that the model is not exclusively focused on LMI. While the CIGP acknowledged the superior leverage ratio and the sustainable business model of mixing market rate with LMI customers in one platform, they unfortunately do not have the flexibility to fund this type of application, given the foundations participating in the CIGP and their desire to back LMI-only initiatives.
    - Continued conversations with Colorado Energy Office to be the first client of NGEN for the Smart-E program model. Expected to contract in Q2.
    - Continued to work with a number of green banks, local governments, etc. on leveraging IPC's products and financing strategies. Conducted a finance training with Philadelphia Energy Authority, working with Montgomery County Green Bank, Rhode Island Infrastructure Bank, and CGC on a variety of opportunities.
- Administrative:
    - Kim Stevenson joined IPC from the Green Bank in August, and we began recruiting for a new financial analyst position.
    - Shopped out Cyber and Tech E&O insurance, since we can no longer come under Green Bank's Cyber policy. The Tech E&O policy is needed to cover licensing of the NGEN platform for the Smart-E program to other organizations (including Green Bank).
    - Selected Blum Shapiro to conduct our first audit, which will commence in Q2.

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CONNECTICUT GREEN BANK

Memo

To: Board of Directors of the Connecticut Green Bank – Deployment Committee of the Connecticut Green Bank

From: Bryan Garcia (President and CEO)

Date: December 20, 2019

Re: Approval of Funding Requests below $500,000 and No More in Aggregate than $1,000,000 – Update

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At the October 20, 2017 Board of Directors (BOD) meeting of the Connecticut Green Bank ("Green Bank") it was resolved that the BOD approves the authorization of Green Bank staff to evaluate and approve funding requests less than $500,000 which are pursuant to an established formal approval process requiring the signature of a Green Bank officer, consistent with the Comprehensive Plan, approved within Green Bank's fiscal budget and in an aggregate amount not to exceed $1,000,000 from the date of the last Deployment Committee meeting. This memo provides an update on funding requests below $500,000 that were evaluated and approved. During this period, 5 projects were evaluated and approved for funding in an aggregate amount of approximately $967,000. If members of the board or committee would be interested in the internal documentation of the review and approval process Green Bank staff and officers go through, then please request it.

Project Name:	**Amodex (Gemini X2, LLC) - 1354 State Street, Bridgeport CT 06605**
Amount:	**$80,163**
Comprehensive Plan:	**C-PACE**

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Project Name: **200 Main Street Properties, LLC - 199-201 Main Street, Danbury, CT 06810**

Amount: **$285,019**

Comprehensive Plan: **CPACE**

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Project Name: **Bausch Advanced Technologies, Inc - 115 Nod Road, Clinton**

Amount: **$316,761**

Comprehensive Plan: **CPACE**

[redacted]

[redacted]

- [redacted]

- [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Project Name: **Cafolla-DiMare, LLC, 0 Hope Street, Stamford CT 06907**

Amount: **$246,129**

Comprehensive Plan: **CPACE**

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Amount: **$39,140**

Comprehensive Plan: **CPACE**

[redacted]

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[redacted]

Resolution

WHEREAS, on January 18, 2013, the Connecticut Green Bank (the "Green Bank") Board of Directors (the "Board") authorized the Green Bank staff to evaluate and approve funding requests less than $300,000 which are pursuant to an established formal approval process requiring the signature of a Green Bank officer, consistent with the Green Bank Comprehensive Plan, approved within Green Bank's fiscal budget and in an aggregate amount not to exceed $500,000 from the date of the last Deployment Committee meeting, on July 18, 2014 the Board increased the aggregate not to exceed limit to $1,000,000 ("Staff Approval Policy for Projects Under $300,000"), on October 20, 2017 the Board increased the finding requests to less than $500,000 ("Staff Approval Policy for Projects Under $500,000"); and

WHEREAS, Green Bank staff seeks Board review and approval of the funding requests listed in the Memo to the Board dated December 20, 2019 which were approved by Green Bank staff since the last Deployment Committee meeting and which are consistent with the Staff Approval Policy for Projects Under $500,000;

[redacted]

NOW, therefore be it:

RESOLVED, that the Board approves the funding requests listed in the Memo to the Board dated December 20, 2019 which were approved by Green Bank staff since the last Deployment Committee meeting. The Board authorizes Green Bank staff to approve funding requests in accordance with the Staff Approval Policy for Projects Under $500,000 in an aggregate amount to exceed $1,000,000 from the date of this Board meeting until the next Deployment Committee meeting.

BOARD OF DIRECTORS

REGULAR MEETING SCHEDULE FOR 2020

The following is a list of dates and times for **regular meetings** of the Connecticut Green Bank Board of Directors through 2020.

- Friday, January 24, 2020 – Regular Meeting from 9:00 to 11:00 a.m.
- March 25, 2020 – Regular Meeting from 2:00 to 3:00 p.m.
- Friday, April 24, 2020 – Regular Meeting from 9:00 to 11:00 a.m.
- Friday, June 26, 2020 – Regular Meeting from 9:00 to 11:00 a.m.
- Friday, July 24, 2020 – Regular Meeting from 9:00 to 11:00 a.m.
- Friday, October 23, 2020 – Regular Meeting from 9:00 to 11:00 a.m.
- Friday, December 18, 2020 – Regular Meeting from 9:00 to 11:00 a.m.

Should a **special meeting** need to be convened for the Connecticut Green Bank board of Directors to review staff proposals or to address other issues that arise, a meeting will be scheduled accordingly.

All regular and special meetings will take place at the:

Connecticut Green Bank
845 Brook Street, Building #2
Albert Pope Board Room
Rocky Hill, CT 06067

1106 Federal Road: A C-PACE Project in Brookfield, CT

Address	1106 Federal Road, Brookfield, CT 06804			
Owner	1106 Federal Road, LLC			
Proposed Assessment	$549,472			
Term (*years*)	15			
Term Remaining (*months*)	Pending construction completion			
Annual Interest Rate[1]	5.75%			
Annual C-PACE Assessment	$55,165			
Savings-to-Investment Ratio	1.11			
Average DSCR	[redacted]			
Lien-to-Value	[redacted]			
Loan-to-Value	[redacted]			
Projected Energy Savings (mmBTU)		EE	RE	Total
	Per year		669	669
	Over EUL		12,493	12,493
Estimated Cost Savings (incl. ZRECs and tax benefits)	Per year		$51,993	$51,993
	Over EUL		$779,902	$779,902
Objective Function	22.74 kBTU / ratepayer dollar at risk			
Location	Brookfield			
Type of Building	Commercial Warehouse – Tile & Stone Retail			
Year of Build	1978			
Building Size (*sf*)	19,800			
Year Acquired by Owner	2017			
As-Complete Appraised Value[2]	[redacted]			
Mortgage Lender Consent	[redacted]			
Proposed Project Description	144 kW Solar PV and roof replacement			
Est. Date of Construction Completion	Pending closing			
Current Status	Awaiting Board of Directors Approval			
Energy Contractor	[redacted]			
Notes				

[redacted]

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C-PACE TECHNICAL REVIEW REPORT

TO: Alysse Lembo-Buzzelli, CT Green Bank

FROM: Satyen Moray – ERS

CC: Mackey Dykes, Nicholas Zuba, CT Green Bank

RE: 1106 Federal Road C-PACE Project Technical Review Report

Report Date	12/16/2019
Customer Name	La Pietra Thinstone Veneer of Monroe
Address	1106 Federal Road, Brookfield, CT 06804
Property Type	Tile and Stone Retail
Property Size (sq. ft.)	N/A
Contractor(s)	Efficient Lighting Consultants

EXECUTIVE SUMMARY

This report provides a summary of the technical review conducted by Satyen Moray of ERS for the solar PV project that will be located at 1106 Federal Road in Brookfield, CT. The CT Green Bank provided ERS with the required project documentation for review. The project scope includes upgrading the roof, upgrading the interior lighting that will be financed through EnergizeCT Small Business Energy Advantage (SBEA) program's on bill financing and the installation of one PV array with a capacity of 144.0-kW (DC).

ERS was provided historical electric usage data for the site which contained the required rate structure information and 12 months of consumption data. Based on the data for the most-recent 12 months, the annual kWh consumption across all electric accounts is 205,680 kWh. Based on the contractor's solar PV analysis conducted using Folsom Labs software (confirmed to be reasonable when compared with PV Watts), the solar PV system is expected to produce 183,031 kWh in the first year. The lighting energy efficiency project results in annual energy savings of 12,963 kWh which does not increase the risk of the solar PV system generating excess energy on an annualized basis. An annual energy escalation rate of 2.99% was applied to the utility rate. One ZREC contract has been approved for this system and the contract offers $100.0 per ZREC with a capacity of 168 maximum annual ZRECs. ERS included the ZREC income in the SIR calculations. ERS also included the cost savings from the lighting energy efficiency

project. The contractor agreed to provide a 20-year warranty on the inverters for this project. We applied a 26% investment tax credit rate in our analysis.

Table 1 lists the project level financial summary. Based on a 15-year finance term and a 20-year EUL, this project has an overall SIR of 1.11.

Table 1. Project Financial Summary

Savings to Investment Ratio (SIR)	1.11
Project cost	$587,156
Amount financed	$549,471
Gross total cost savings over EUL	$916,403
Total PACE + O&M payments over EUL	$827,477
% financed	96%
SBEA financed amount (not included in CPACE financing)	$22,084
Interest rate	5.750%
Finance term, years	15

PROJECT ENERGY SAVINGS AND TAX CREDITS/INCENTIVES SUMMARY

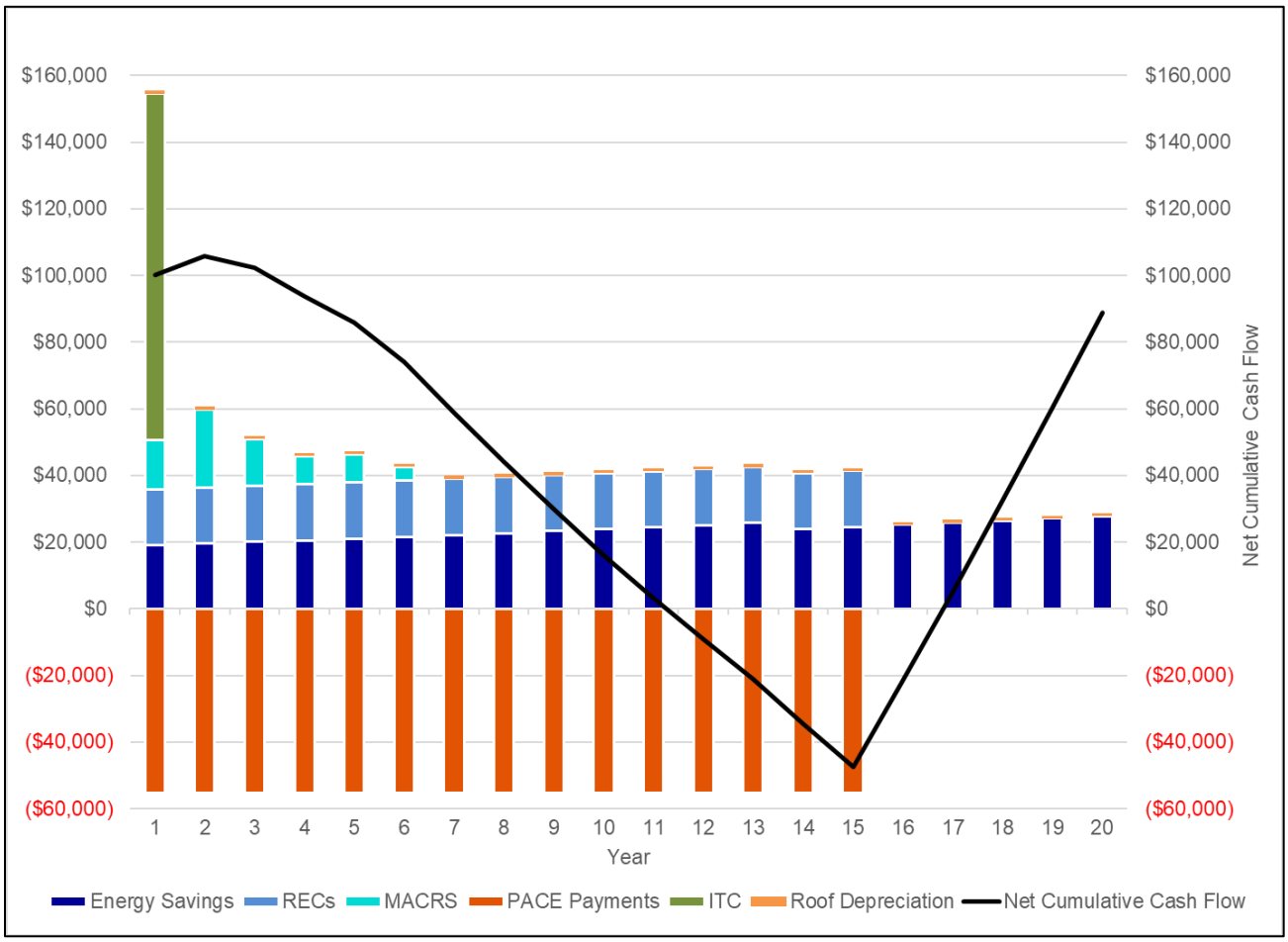
The project scope financed through the PACE program includes upgrading the roof and the installation of a solar PV system with a capacity of 144.0-kW (DC). Concurrently, this project also involves upgrading the lighting system that will be financed separately that will result in energy savings of 12,963 kWh, demand savings of 1.6 kW and estimated first year cost savings of $1,268 (with an EUL of 13 years). The overall project level energy and cost savings, Energy on the Line grant (EOL), and tax credits summary is presented in Table 2.

Table 2. Measure Energy Savings Summary

Effective useful life – EUL (years)	20
Gross project cost ($)	$587,156
Closing cost ($)	$16,627
Appraisal fees ($)	$5,000
Energy on the Line Grant (EOL) ($)	$37,227
Financed amount (including closing costs and EOL) ($)	$549,471
First year electric energy savings (kWh/yr)	195,994
First year electric energy savings (MMBtu/yr)	669
Total electric savings over EUL (kWh)	3,660,367
Total electric savings over EUL (MMBtu)	12,493
First year energy cost savings ($/yr)	$19,060
EUL energy cost savings ($)	$469,470
Federal ITC	$104,060
MACRS for Solar (total over 6 years)	$73,122
Roof depreciation (total over 25 years) ($)	$22,190
ZRECs (total over 15 years) ($)	$252,000

Figure 1 shows the plot of cash flows over the life of this project.

Figure 1. Project Lifetime Cash Flow Plot



TECHNICAL REVIEW SUMMARY

Below is the project summary checklist that ERS staff referenced to confirm that the C-PACE program guidelines are met for this project.

Project Checklist

☒ Energy assessment included – **Analysis included.**

☒ Renewable energy feasibility study conducted – **The project involves installing a new roof. The submitted project documents did not include structural drawings.**

☒ Minimum 12 months of utility data used to establish baseline – **12 months of usage information available in the electric bill provided.**

☒ Copy of utility bills included – **ERS was provided with an Eversource electric bill representing usage for one month. This bill also showed the electric consumption for the previous 12 months.**

- ☒ No major renovation took place in baseline period – **N/A**
- ☒ Baseline building energy use consistent with ASTM BEPA E2797-15, per ICP protocol – **N/A**
- ☒ Measure life is within industry practice – **20 years**
- ☒ Measure life exceeds finance term – **Measure life is greater than finance term**
- ☒ Local weather data used for normalization – **Brookfield, CT (appropriate)**
- ☒ Energy production for renewable energy system is reasonable – **Energy production provided by the contractor analysis was accurate.**
- ☒ Project cost estimate is reasonable – **$2.78 per watt is reasonable.**
- ☒ Projected energy cost escalation is reasonable – **2.99% per year**
- ☒ Projected annual performance degradation is reasonable – **0.5% per year**
- ☒ Commissioning plan has been addressed – **Not provided.**
- ☒ M&V plan has been addressed – **Not provided.**
- ☒ Projected SIR > 1 – **SIR is greater than 1.**

The following sections discuss the measure specific findings from the technical review.

Solar Photovoltaic System

The LaPietra Thinstone Veneer of Monroe facility is proposed to have a new solar PV system with a 144.0-kW (DC) capacity. The solar PV project specifications are listed in Table 3 and Table 4. The project involves two arrays. The panels face roughly due-south and the azimuth angles were verified using Google Maps. The azimuth angles were stated and confirmed to be 177° the two arrays. The tilt angles are proposed to be 7° and 12° and would be best verified during the commissioning verification visit. ERS used PV Watts to verify the contractor's analysis and found the contractor's analysis to be accurate within a less than 2% margin. The PV module power warranty is 25 years, and the contractor indicated that the project cost included the cost of a 20-year inverter warranty. The contractor has applied for and received one ZREC contract, with a 15-year term. The ZREC value is $100.0 per MWh and that value has been included in the SIR calculations.

Photo 1 shows the overhead view of the facility with the proposed solar panel alignment.

Photo 1. Overhead View (Provided in Proposal)

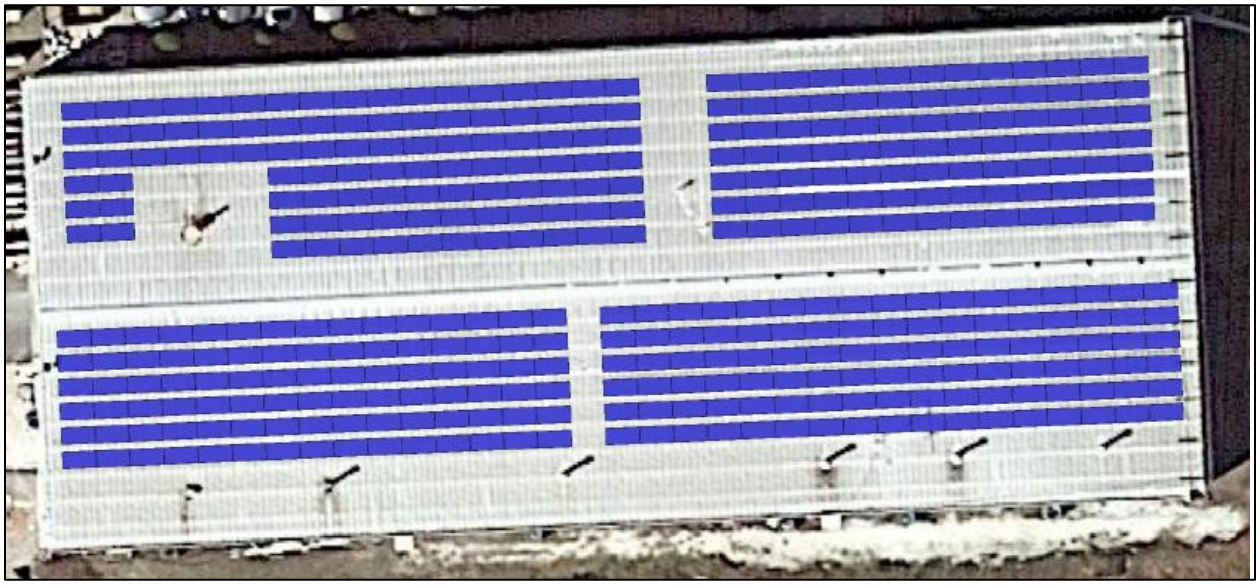


Table 3. Solar PV Specifications

Item	System specifications
Total PV system capacity (kW DC)	144.0
No. of modules	384
Location	Roof
PV module model	GCL-M6/72H 375, 375W Panels
Module efficiency	19.3%
Inverter model	(2) CPS SCA50KTL-DO/US-480 (2 x 50 kW)
Inverter efficiency	98.5%
Tilt angle	7° (72 kW) and 12° (72 kW)

Table 4. Solar PV Specifications by Array

	Array 1	Array 2	Total
Azimuth	177.5°	177.5°	N/A
Tilt	7°	12°	N/A
System size (kW-DC)	72	72	144
Inverter size (kW-AC)	50	50	100
DC to AC sizing ratio	1.44	1.44	1.44
Production (kWh/yr)			183,031

Lighting Energy Efficiency Project

In addition to the roof upgrade and the solar PV installation, the LaPietra Thinstone Veneer of Monroe facility is also proposing upgrading its lighting which is being processed through the EnergizeCT programs. This effort is currently being represented as owner equity in this project as this portion of the project is not being financed through the PACE programs. We were

supplied with the lighting analysis for this project which indicated annual energy savings of 12,963 kWh (representing approximately 6% of the site energy use) and monthly demand savings of 1.6 kW. We applied an EUL of 13 years for this measure.

Potential Savings Impacts

Based on our review of the system specifications, the installation of the proposed solar PV system is expected to meet the predicted electrical generation. The following factors could affect the electric generation from the PV system and the predicted SIR:

- Shading: During the commissioning site visit, potential shading issues will be inspected. If there is shading, the PV generation would be affected.
- Angle of tilt: The angle of tilt, if modified, could change the energy generation form the PV system. This will be verified during the commissioning site visit.
- Inverter and PV module make and model: The calculations for this measure are based on the efficiency of the proposed PV modules and inverters. If the PV module or inverter makes and models change, the generation would need to be recalculated.
- Savings from the lighting project.

Utility Rates Summary

The site is on Eversource rate 30. The details of the tariffs are listed in Table 4.

Table 4. Utility Rate Tariff Summary

Electric Rates	
Electric utility	Eversource
Electric rate	30
Electric energy rate ($/kWh)	$0.09517
Electric peak demand rate ($/kW)	$21.86

Note: In the SIR analysis, we did not include the peak demand charges in the solar PV cost savings when calculating the SIR because solar PV production is highly weather dependent. As a result, there is a chance during any billing cycle that the solar PV panels may not produce power during any one of the on-peak hours, thereby negating the peak demand savings that would be associated with avoiding the electric demand related charges. We however did include the demand cost savings for the lighting energy efficiency project.

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CONNECTICUT GREEN BANK

Investment Modification Memo

To: Connecticut Green Bank Board of Directors

CC: Bryan Garcia, President and CEO; Jane Murphy, Vice President of Accounting and Financial Reporting; Brian Farnen, General Counsel and CLO; Eric Shrago, Managing Director of Operations

From: Bert Hunter, EVP and CIO

Date: December 17, 2019

Re: Modification of Approved Maturity Date for Asset Backed Back-Leverage Facility Related to PosiGen Refinancing Plan

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Background

At the Special Meeting of the Green Bank Board of Directors (the "Board") held on November 20, 2019, the Board approved of the adjustment to certain Green Bank financing facilities described in the memorandum dated November 15, 2019.

Staff did not make clear in that memorandum that with the replacement of LibreMax Capital ("LibreMax") with PosiGen's new financing partner – Ares Capital Corporation ("Ares") – to replace LibreMax as the "first lien" (i.e., senior) lender with Green Bank remaining as "second lien" (i.e., subordinate) lender under this new financing arrangement, that the maturity of the Ares facility would be 3 years from the closing date (expected to occur between late December 2019 and early January 2020).

Consequently, to avoid any issues with approvals needed to close the refinancing transaction, staff requests that the Board pass a simple resolution to confirm its agreement with a maturity date for the refinanced facilities to 3 years from the closing date of the refinanced facilities, not to exceed 3 years from February 15, 2020.

All other conditions remain unchanged.

Resolutions

WHEREAS, the Connecticut Green Bank ("Green Bank") has an existing partnership with PosiGen, Inc. (together with its affiliates and subsidiaries, "PosiGen") to support PosiGen in delivering a solar lease and energy efficiency financing offering to LMI households in Connecticut;

WHEREAS, the Green Bank Board of Directors ("Board) previously authorized and approved of a refinancing of the PosiGen financing facilities described in a memorandum to the Board dated November 15, 2019;

WHEREAS, staff desires the Board to confirm its approval of a maturity date for the refinanced facilities to be not later than 3 years from February 15, 2020;

NOW, therefore be it:

RESOLVED, that the Board approves of the maturity date for the PosiGen refinancing facilities be up to three years from the closing date, not to exceed February 15, 2023;

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and negotiate and deliver all other documents and instruments as they shall deem necessary and desirable to effect the above-mentioned legal instruments.

Submitted by: Bert Hunter, EVP and CIO

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CONNECTICUT
GREEN BANK

Memo

To: Connecticut Green Bank Board of Directors

From: Bert Hunter, EVP and CIO

CC: Bryan Garcia, President & CEO; Brian Farnen, General Counsel & CLO; Selya Price, Director, Statutory & Infrastructure Programs; Mackey Dykes, VP, Commercial, Industrial & Institutional Programs; Jane Murphy, Finance and Administration

Date: December 17, 2019

Re: Clean Energy Financing Requests For Proposals (General Solicitations)

Background & Purpose

Per the Comprehensive Plan of the Connecticut Green Bank ("Green Bank"), considerable investment is needed in our state in order to continue progress toward reducing carbon emissions and pursuing sustainable development while confronting climate change. To achieve this overall objective, the Green Bank must:

- Increase and accelerate the impact of its model to support the implementation of Connecticut's climate change plan;
- Scale up investment and impact in Connecticut;
- Draw into the market more investment from private capital sources leveraged by innovative public sector financing; and
- Expand our use of green bonds to increase our access to capital beyond our current sources of funding to scale-up its investment activity, while providing more opportunities to engage Connecticut citizens in the state's growing green economy.

The Green Bank has been recognized for its leadership in financial innovation, leverage of private capital with its limited public resources, as well as positive impact on our environment, public health, jobs and economic development. Programs such as Solar Lease 2 which provided access to capital for contractors to deploy solar PV at scale for commercial and industrial properties across the state changed the way such solar projects are underwritten and financed. Our award-winning commercial PACE program has deployed more than $150 million over 300 projects across the state – and continues to expand. Green Bank's "Solar for All" program has resulted in "solar parity" where low-to-moderate income families now demand solar PV at rates greater than their more affluent counterparts and "beyond parity" when it comes to race (i.e., Black and Hispanic households). Our multifamily programs are bringing the benefits of solar PV and energy efficiency to those families that rent or those that live in common ownership communities.

At the same time, we need to increase our efforts to achieve more impact. Following a discussion with the Green Bank Board of Directors (the "Board") on alternatives for developers and capital providers to gain access to Green Bank resources while affording staff the ability to consider additional investment opportunities, the President and CEO proposed the introduction of an open and ongoing "Request for Proposals" program. In the meantime, staff has reached out to fellow green banks in New York ("NYGB") and Australia (Clean Energy Finance Corporation or "CEFC") to gauge the success and utility of open and ongoing solicitations for project proposals that they have managed for the past 5 plus years.

Following this outreach, staff returns to the Board to seek approval at a broad level to introduce an open and ongoing "Request for Proposals" program (the "Open RFP") in early 2020. This Open RFP will support a variety of developers and capital providers – from emerging developers of commercially established technologies, to well-established manufacturers of emerging technologies and lenders and investors of all types. It is important to note that the Open RFP is not intended to be a venture capital program nor will it seek to assume risks that are more appropriate for other elements of a project's or business's capital stack. At its core, the Green Bank is a special purpose financial institution, with a responsibility to be good stewards of funds committed to it by statute to promote the clean energy and resiliency goals of the state.

The Financing Opportunity

The Open RFP is intended to provide access by project developers and capital providers / investors to Green Bank capital that will catalyze investment which – but for the Green Bank's participation – would either not happen or be realized at a much slower pace or with less impact. Since inception, the Green Bank has demonstrated its ability to work with a variety of developers and capital providers to accelerate investment in clean energy, including energy efficiency as well as commonly known renewable technologies like solar PV, on-shore wind, run-of-the-river hydroelectric power, fuel cells and anaerobic digesters. The Green Bank proposes to commence a process through the Open RFP to:

- Receive proposals for Green Bank investment on an open and rolling basis, as received;
- Evaluate such proposals in accordance with objective and transparent criteria;
- To be "market responsive" and adaptable – meaning that the Green Bank will endeavor to render preliminary responses to proposals in days and weeks rather than months and to offer guidance to those proposals that fall short of our criteria where the proposals offer the promise of significant market potential; and
- To have a sufficient budget for investment in order to deliver significant impact quickly.

Potential for Activity

In discussions with NYGB and CEFC, representatives expressed a positive view of their RFP process. In terms of volume, NYGB has considered approximately $3.5 billion in proposals. While it was not entirely clear whether CEFC track aggregate volume of proposals over time, it is a multiple of the NYGB – with transactions via this process under consideration as of June 30, 2019 totaling requests for A$4 billion (US$2.7 billion) across 80 projects. Clearly, by any measure, the RFP process successfully attracts transactions to these two Green Banks and suggests that the Connecticut Green Bank could expect similar success on a scale more commensurate with the relative size of Connecticut's economy. For example,

New York's economy is roughly 5x the size of Connecticut. With about $600 million in proposals on average over 6 years for NYGB, Connecticut might expect $100 to $125 million in proposals annually. While it is not possible to anticipate how many proposals may result in actual transactions worthy of investment – NYGB has committed approximately 20% (or circa $700 million) towards these projects. A similar "yield" for our Green Bank would suggest an annual pace of about $20 to $25 million – well within our financing capacity.

Eligible Technologies

In order to not limit access to promising technologies, some of which may be on the verge of becoming commercially established, staff recommends that the Open RFP be available to any technology that is able to help the Green Bank achieve its statutory mandate as voiced through its Comprehensive Plan which staff reasonably determines: (a) is either already commercially viable (based on success in markets other than Connecticut or even other than the United States) or (b) has demonstrated clear potential for commercial viability through, for instance, well-documented feasibility studies and pilot programs where there is clear evidence of a viable business model and a path to substantial impact.

Financing Arrangements and Capital Support

Staff does not intend for the role of the Green Bank to be prescriptive, but to be determined in a manner that maximizes the potential for leverage of Green Bank resources while balancing the need for risk containment and Green Bank sustainability (i.e., the Green Bank's financial returns vs. the potential for financial losses). As such, staff expects Green Bank investments to take the usual forms, such as:

- Senior and Subordinate loans
    - Construction loans
    - Bridge loans
    - Working Capital loans
    - Term loans
- Loan loss reserves
- Loan guarantees
- Other forms of credit enhancement
- Participation in other lender's loans
- Equity (including participation as a member of a limited liability company, holder of preferred stock or other instruments that could be a hybrid of debt and equity, debt with conversion rights, debt with warrants for equity, etc.)

All of the above, of course, would be considered in accordance with Green Bank operating procedures and its enabling statute.

Eligible Proposers

The Open RFP would accept proposals from:

1) Private sector financial institutions or other third-party capital providers that finance, or intend to finance, clean energy technologies in State of Connecticut (although proposals that are part of a "multi-state" concept will also be welcomed and encouraged); and/or
2) Industry participants including project developers, energy service companies ("ESCOs"), building and facility owner/operators, equipment manufacturers, or others that provide equipment, materials and/or services related to eligible technologies where the object of the activity being proposed is entirely or meaningfully related to the State of Connecticut.

Proposers can apply on a standalone basis or as part of a team, such as a developer/sponsor, lead equipment provider, lead equity and/or debt provider.

Regardless of whether the proposal comes from a standalone entity or as part of a team, proposers must have directly relevant experience in the transaction/project type being submitted, and the relevant technologies.

Requirement for Clean Energy and Financial Impact

Of considerable importance to the program will be achieving leverage of private capital with its limited public resources as the Green Bank seeks to act in furtherance of the Connecticut's ambitious environmental / GHG and CO2 reduction goals, Green Bank clean energy deployment objectives, and in support of public health outcomes, jobs and economic development.

The most successful proposals to this Open RFP will demonstrate the ability to make significant impact across all of these desired outcomes and the ability to measure and track such performance over time.

Green Bank Capital Commitment

As noted above, if the success of NYGB can be analogous to our condition, the Green Bank may (ultimately) expect upwards of $20 to $25 million in capital requirements for submitted proposals which could annually top $100 million. This capital requirement is quite manageable in the context of both anticipated revenues from the system benefit charge, RGGI revenues, portfolio income and financing capacity (including recently executed lines of credit with commercial banks and the Green Bonds US campaign). Staff proposes for the current fiscal year allocation of up to $5 million in Green Bank capital resources which could come from an existing capital set aside (hence no additional request for FY20). For FY21 and beyond, and depending upon the success of the program, staff will make budgetary requests (e.g., including additional revenues from green bonds issued) commensurate with the Open RFP program's progress and expected timing of investment needs.

Recommendation

Since the establishment of the finance and program teams, Green Bank has been responsible for the deployment of more than $1.8 billion in capital toward clean energy projects in Connecticut. At the same time, as explained herein, not only does more need to be done, but other Green Banks have demonstrated the success of open and ongoing RFPs to solicit investment proposals. Given the potential for success in Connecticut and our current financial capacity to meet anticipated proposal demands, staff recommends:

A. Board approval for the Open RFP process and the requested $5 million capital allocation for FY20 from existing budgetary authority, with the process eligible for release to the market as soon as possible in calendar 2020; conditioned upon
B. Approval of each transaction under the RFP in accordance with Green Bank operating procedures.

Strategic Plan

Is the program proposed, consistent with the Board approved Comprehensive Plan and Budget for the fiscal year?

Yes – the proposed Open RFP operates in support of Green Bank's Comprehensive Plan for Fiscal Year 2020 & Beyond and FY20 budget allocation of $7,500,000 (approximately $2,500,000 of which has been allocated to date to other investments).

Ratepayer Payback

How much clean energy is being produced (i.e. kWh over the projects lifetime) from the program versus the dollars of ratepayer funds at risk?

To be determined based upon transactions submitted to the Open RFP.

Terms and Conditions

What are the terms and conditions of ratepayer payback, if any?

To be determined based upon transactions submitted to the Open RFP.

Capital Expended

How much of the ratepayer and other capital that Green Bank manages is being expended on the project?

For FY2020, from the overall budget allocation of $7,500,000 (approximately $2,500,000 of which has been allocated to date to other investments), an allocation of $5,000,000 of Green Bank capital is requested.

Risk

What is the maximum risk exposure of ratepayer funds for the program?

The maximum risk exposure is $5,000,000 for FY20 resources once committed with the annual program being estimated to result in $20 to $25 million of investments annually.

Financial Statements

How is the program investment accounted for on the balance sheet and profit and loss statements?

To be determined based upon transactions submitted to the Open RFP.

Target Market

Who are the end-users of the engagement?

Multiple end-users throughout the State of Connecticut to be determined based upon transactions submitted to the Open RFP.

Green Bank Role, Financial Assistance & Selection/Award Process

The Green Bank will award the capital pursuant to an RFP evaluation process TBD.

Program Partners

To be determined based upon transactions submitted to the Open RFP.

Risks and Mitigation Strategies

To be determined based upon transactions submitted to the Open RFP.

Resolutions

WHEREAS, the Green Bank Board of Directors (the "Board") and the President and CEO support alternatives for developers and capital providers to gain access to Green Bank resources while affording staff the ability to consider additional investment opportunities;

WHEREAS, the Green Bank President and CEO proposed the introduction of an open and ongoing "Request for Proposals" program to create pathways to access Green Bank support;

WHEREAS, staff has diligence the concept for an open Request for Proposals program (the "Open RFP Program") with other green banks, namely the New York Green Bank and Australia's Clean Energy Finance Corporation, which demonstrated the success and utility of an open and ongoing solicitation program for project proposals;

WHEREAS, the Comprehensive Plan and FY 2020 budget identify the need as well as the capacity to manage an initial Open RFP Program; and

WHEREAS, Green Bank staff recommends that the Board approve the establishment of the Open RFP Program as explained in a memorandum to the Board dated December 17, 2019.

NOW, therefore be it:

RESOLVED, that the Board approves Green Bank to establish the Open RFP Program as explained in a memorandum to the Board dated December 17, 2019;

RESOLVED, that all investments from the Open RFP Program above staff level approval limits, presently over $500,000, will require final authorization and approval from either the Deployment Committee ($2.5 million and below) or the Board;

Resolved, that all investments from the Open RFP at or below staff level approval limits, presently under $500,000, will require final authorization and approval from either the Deployment Committee or the Board until the establishment of Board approved program guidelines;

and

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and execute and deliver all any documents as they shall deem necessary and desirable to effect the establishment and operation of the Open RFP Program.

Submitted by: Bert Hunter EVP & CIO and Bryan Garcia, President & CEO

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CONNECTICUT GREEN BANK

Memo

To: Connecticut Green Bank Board of Directors

From: Bert Hunter, EVP and CIO, Mike Yu, Director, Clean Energy Finance, Barbara Walters, Associate Director of Marketing

CC: Bryan Garcia, President and CEO; Brian Farnen, General Counsel and CLO; Dale Hedman, Consultant (Retiree); Eric Shrago, Managing Director of Operations, Jane Murphy, Vice President of Accounting and Financial Reporting; Selya Price, Director of Incentive Programs

Date: December 20, 2019

Re: Green Bond Update

The Connecticut Green Bank's (the "Green Bank") Green Bond initiative consists of three distinct but related endeavors:

- A green bond marketing campaign, ***Green Bonds US***, to raise awareness of the Green Bank and our bonds;
- Setting up a Master Trust Indenture ("MTI") to enable the Green Bank to issue bonds under an umbrella structure; and
- Monetization of the third tranche ("Tranche 3") of Solar Home Renewable Energy Credits ("SHREC") as the first assets under the MTI

Each of these initiatives is discussed below.

Green Bonds US

Green Bonds US is the theme for a multi-phased, brand awareness marketing campaign promoting the Green Bank and benefits of green energy through a simple but critically important message: green brings us together, green bonds us. The campaign encourages people to go to our website and sign up for more information on our products.

The first phase of the campaign launched in November 2019, with a focus on driving awareness of the Green Bank and our mission. This run was centered on a 30-second video aired on NBC broadcast television with over 516,000 viewers and across streaming devices, such as ROKU and Apple TV reaching approximately 190,000 online viewers. It also used digital display banner ads and retargeting to drive traffic to the www.greenbonds.us website, where visitors could enter their contact information.

Phase 2 will begin in early 2020, and will feature revised messaging across similar distribution channels.

The campaign will lead into the direct marketing of the bond sale as we approach and enter April 2020. Tactics to target potential bond buyers will include an email campaign for existing Green Bank customers and stakeholders, presence at green energy-themed events, and partnerships with like-minded organizations in the state, such as Sustainable CT.

Master Trust Indenture

The size of investment required and long-term revenue streams associated with clean energy projects lend themselves well to bond structures. Issuing green bonds can provide the Green Bank a lower cost, longer-term source of capital, enabling the Green Bank to further leverage state and federal funds to increase its impact in Connecticut by attracting and mobilizing private investment in the state's green economy. While green bonds can be issued on a project-by-project or asset-by-asset level, the Green Bank will benefit greater by encapsulating its assets under a Master Trust Indenture.

MTIs have historically been implemented as a way to pool the credit of multiple entities and projects and create a "master trust" consisting of the pledged revenues or other assets under the MTI. These sub-groups can be a wide array of project and asset types including system benefit charges, C-PACE assessments, SHREC bonds, and large infrastructure projects. The benefits to having these assets under an MTI include simplification of collateral pools and flexibility in future borrowings. By pooling credit and collateral, the credit strength of the MTI can exceed that of its individual components. And the master indenture structure can accommodate the full range of debt financing options and provides flexibility for the future. Bonds can be issued at a sub-indenture level (e.g., SHREC Tranche 3) or at the general corporate level. In addition, the MTI will allow for retail mini-bonds, which will boost citizen engagement in clean energy investing.

Staff last provided an update to the Green Bank Board on its MTI initiative during its July 2019 meeting. Since then, a preliminary indenture has been drafted and circulated, and an "all hands" meeting consisting of Green Bank Staff, financial advisors, Treasury representative, and outside counsel was convened to walk through the mechanics of the MTI. Substantive progress has been made, and Staff is targeting the following timeline through the first half of 2020:

- December – Bond Team prepares a draft of the Master Trust Indenture and presents to Board for review and comment along with update on the project list.
- January – Finalization of Master Trust Indenture and presentation to Board for review. Update on project list.
- March – Possible special Board meeting (swapped with existing Deployment Committee meeting) to review and approve bond issuance materials related to SHREC – Tranche 3, Board approves Master Trust Indenture, including a possible Debt Reserve Fund, the form of the bond, and terms & conditions of the bond issuance.
- April – First projects/assets (SHREC – Tranche 3, discussed in next section) included under Master Indenture.

SHRECs (Tranche 3)

In a memorandum to the Green Bank Board of Directors dated September 5th 2019, staff provided an update on its SHREC monetization efforts of the third tranche of SHREC systems. Based on an assessment made by the SHREC Team of the various RFP proposals from three financial institutions, a taxable municipal bond proposal was determined to offer the best value for the Green Bank's needs for (a) an efficient structure and low cost transaction with (b) high advance rates and low cost of capital that (c) appeals to a broad array of environmental, social, and governance-focused investors, both retail and institutional. In particular, reaching retail investors with this issuance would further the Green Bank's mission to spread clean energy investment opportunities as well as deepen our internal expertise in both municipal and mini-bonds.

The Green Bank received taxable municipal bond proposals from both Stifel, Nicolaus & Company, Inc. ("Stifel") and Ramirez & Co. ("Ramirez", together with Stifel, the "Underwriters"). Based on meetings with both Ramirez and Stifel that included Green Bank financial advisors and senior staff, Staff selected both firms as co-managers, with Ramirez to lead on this transaction. Utilization of the co-manager structure is common in municipal bond underwritings and allows issuers to (a) promote continued competition and transparency over multiple issuances and (b) take advantage of individual firm's strengths (e.g., Stifel's retail presence in Connecticut).

Initially the target monetization date was Q4 2019, but as discussed further below, Staff recommends April 2020 as the optimal execution month (which would also coincide with the 50th anniversary of Earth Day (April 22nd)). In clarifying securitization objectives with the Underwriters and the importance of reaching retail investors, they advised that in order to access the retail market, an 'A' rating from S&P, and not just Kroll, is required. This is because S&P is a far more widely recognized rating agency for retail investors. Moreover, if SHRECs are securitized as an unenhanced municipal ABS structure, the transaction would be rated by the asset backed ratings groups at the rating agencies. Especially at S&P, this increases the risk that the S&P stress scenarios required for an 'A' rating will potentially be more onerous and (a) reduce the advance rate and (b) reduce or eliminate the ability to sell serial bonds, thus stifling efforts to sell to retail investors.

A stand-alone Kroll rating could ameliorate timing, cost, and structuring challenges, but Kroll alone would not be enough to ensure any success in generating retail demand. For example, the NYSERDA transaction placed earlier this year used Kroll alone because, at the NYSERDA board's instruction, the target investors for its solar municipal ABS issue were exclusively institutional.

As enabling retail access to clean energy investment opportunities is a "must have" for this tranche of SHRECs, Staff recommends utilizing credit enhancement in a municipal structure via the use of the State's Special Capital Reserve Fund ("SCRF"). This would allow for higher additional proceeds and a greater proportion of retail friendly serial bonds. With the support of the SCRF, the bonds could be rated at or within a "notch" of the credit rating of State of Connecticut General Obligation bonds by the Public Finance Group at S&P. Ratings through the municipal analysts at the rating agencies can be secured very quickly and will be much less costly than when secured through the ABS group. Ramirez expects an 'A' rating from S&P will be very attractive to retail investors. Given ABS characteristics and Connecticut credit strength, a broad institutional investor base will likely coalesce to produce strong demand.

Interest Rate Assumptions						
		Benchmark US Treasury				
Maturity	Par	Bench	Maturity	Yield	Spread	Yields
11/01/20	1,490,000	T2	2021	1.650%	+ 50 bps	***2.150%***
11/01/21	1,380,000	T2	2021	1.650%	+ 60 bps	***2.250%***
11/01/22	1,365,000	T3	2022	1.660%	+ 70 bps	***2.360%***
11/01/23	1,345,000	T5	2024	1.690%	+ 80 bps	***2.490%***
11/01/24	1,335,000	T5	2024	1.690%	+ 90 bps	***2.590%***
11/01/25	1,320,000	T7	2026	1.790%	+ 90 bps	***2.690%***
11/01/26	1,310,000	T7	2026	1.790%	+100 bps	***2.790%***
11/01/27	1,300,000	T10	2029	1.850%	+105 bps	***2.900%***
11/01/28	1,300,000	T10	2029	1.850%	+115 bps	***3.000%***
11/01/29	1,290,000	T10	2029	1.850%	+125 bps	***3.100%***
11/01/34	6,830,000	T10	2029	1.850%	+175 bps	***3.600%***

Pursuing a SCRF credit enhancement requires that the Green Bank prove “self-sufficiency”, that revenues from Tranche 3 are sufficient to pay the principal of and interest on the bonds issued against it. Proving self-sufficiency, in turn, requires a technical evaluation by an Independent Engineer (“IE”) that validates energy production forecasts and revenue generation. The IE is currently examining Tranche 3 performance and expects to have its report complete in late January. Given the timing of the IE report and subsequent SCRF and rating agency processes, Staff recommends targeting Earth Day in April 2020 for its green bond securitization (see Appendix A for preliminary timeline).

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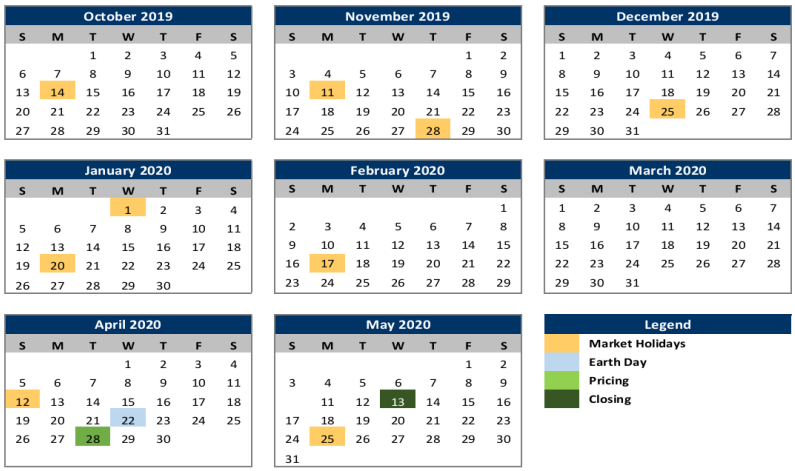
Connecticut Green Bank

Solar Home Renewable Energy Credit Green Revenue Bonds, Series 2020

Preliminary Schedule as of November 19, 2019



Transaction Schedule

Date	Description	Participant
Week of November 4		
	▪ Connecticut Green Bank 2.0 Call	CGB / Ramirez / Stifel
Week of November 11		
November 11	▪ *Veteran's Day*	
November 14	▪ 4pm - Marketing Call	CGB / Ramirez
Week of November 18		
November 18	▪ 11:30am - Working Group Meeting/Call *845 Brook Street, Rocky Hill, CT 06067* *800-220-9875 / 3571-6666#*	All
	▪ Circulate first draft of master bond indenture	S&G
Week of November 25		
November 28	▪ *Thanksgiving*	
Week of December 2		
Week of December 9		
	▪ Circulate first draft of SHREC financing indenture	S&G
Week of December 16		
Week of December 23		
December 25	▪ *Christmas*	

Transaction Schedule		
Week of December 30		
January 1	▪ *New Year's Day*	
	▪ Working Group Call *800-220-9875 / 3571-6666#*	All
	▪ Circulate first draft of Preliminary Official Statement	Kutak
Week of January 6		
	▪ Circulate second draft of legal documents	S&G / Kutak
Week of January 13		
	▪ Circulate first draft of cashflow model	
Week of January 20		
January 20	▪ *Martin Luther King Jr. Day*	
	▪ Working Group Call *800-220-9875 / 3571-6666#*	All
Week of January 27		
	▪ Circulate first draft of Rating Agency Presentation	CGB/Ramirez
	▪ Initial filing for CBI certification	CGB/Ramirez
	▪ Select verifier for CBI certification	CGB/Ramirez
Week of February 3		
	▪ Working Group Call *800-220-9875 / 3571-6666#*	All
Week of February 10		
	▪ Circulate second draft of Rating Agency Presentation	CGB/Ramirez
		CGB/Ramirez
Week of February 17		
February 17	▪ *President's Day*	
	▪ Circulate initial draft of Investor Presentation	Ramirez
Week of February 24		
	▪ Circulate draft Advertising Plan	Ramirez

Transaction Schedule		
Week of March 2		
	▪ Working Group Call *800-220-9875 / 3571-6666#*	All
	▪ Finalize Ratings Presentation	CGB/Lamont/Ramirez
Week of March 9		
	▪ Package to S&P	CGB
	▪ Circulate second draft of Investor Presentation	Ramirez
Week of March 16		
	▪ Working Group Call *800-220-9875 / 3571-6666#*	All
	▪ Call with S&P	
Week of March 23		
	▪ Receive Ratings	CGB
	▪ Receive Climate Bond certification	CGB
Week of March 30		
	▪ Working Group Call *800-220-9875 / 3571-6666#*	All
	▪ Finalize Investor Presentation	All
	▪ Finalize Marketing/Advertising Plan	All
Week of April 6		
	▪ Due Diligence	All
	▪ Working Group Call - POS Sign-Off *800-220-9875 / 3571-6666#*	All
April 9	▪ Post POS / Investor Presentation	Kutak
Week of April 13		
	▪ Marketing	Ramirez / Stifel
	▪ Retail Advertising Campaign	Ramirez / Stifel
Week of April 20		
April 22	▪ *Earth Day*	
	▪ Marketing	Ramirez / Stifel
	▪ Retail Advertising Campaign	Ramirez / Stifel
April 24	▪ Market Update Call *800-220-9875 / 3571-6666#*	CGB/Lamont/Ramirez/Stifel

Transaction Schedule		
Week of April 27		
April 27	▪ Pre-Pricing Call	CGB/Lamont/Ramirez
April 28	▪ **Pricing**	**CGB/Lamont/Ramirez**
April 29	▪ Sign Bond Purchase Agreement	CGB/Ramirez
May 1	▪ Circulate draft OS	Kutak
Week of May 4		
	▪ Post Final OS	Kutak
Week of May 13		
May 12	▪ Pre-Closing	All
May 13	▪ **Closing**	**All**

Key Participants:

Issuer:	Connecticut Green Bank
Financial Advisor:	Lamont
Bond Counsel:	Shipman & Goodwin
Senior Manager:	Ramirez & Co.
Co-Manager:	Stifel
Underwriters' Counsel:	Kutak Rock

MASTER TRUST INDENTURE

between

CONNECTICUT GREEN BANK

and

_____,
as Master Trustee

Dated as of _____, 2020

MASTER TRUST INDENTURE

THIS MASTER TRUST INDENTURE (the "Master Indenture"), dated as of _____, 2020 between CONNECTICUT GREEN BANK ("Green Bank") and _____, a national banking association organized and existing under the laws of the United States of America, being qualified to accept and administer the trusts hereby created as master Trustee (the "Master Trustee").

W I T N E S S E T H:

WHEREAS, pursuant to Sections 16-245n and 16-245kk through 16-245mm of the Connecticut General Statutes (the "Act"), Green Bank is established and created as a body politic and corporate constituting a public instrumentality and political subdivision of the State of Connecticut (the "State"); and

WHEREAS, Green Bank is authorized to support financing or other expenditures that promote investment in clean energy sources in accordance with a comprehensive plan developed by Green Bank; and

WHEREAS, Green Bank may pledge its revenues to secure any borrowing for the purpose of developing, acquiring, constructing, refinancing, rehabilitating or improving its assets or supporting its programs, provided that each such borrowing, unless otherwise provided by its Board of Directors, shall be a special obligation of Green Bank, payable solely from the assets, revenues and other resources of Green Bank; and

WHEREAS, Green Bank is authorized from time to time to issue negotiable Obligations for any corporate purpose, as shall be authorized by resolution its Board of Directors; which resolution may contain provisions, which shall be part of the contract with holders of the Obligations to be authorized, for Green Bank to pledge all or any part of the revenues of a project or any revenue-producing contract or contracts made by Green Bank or any other property, revenues, funds or legally available moneys to secure the payment of the Obligations or of any particular issue of Obligations; and

WHEREAS, at the discretion of Green Bank, any Obligations may be secured by a trust agreement by and between Green Bank and a corporate Trustee or Trustees, which trust agreement may secure such Obligations by a pledge or assignment of any revenues to be received, any contract or proceeds of any contract, or any other property, revenues, moneys or funds available to Green Bank for such purpose; any such pledge shall be valid and binding from the time when the pledge is made; and the lien of any such pledge shall be valid and binding as against all parties having claims of any kind in tort, contract or otherwise against Green Bank, irrespective of whether the parties have notice of the claims; and

WHEREAS, Green Bank expects to issue Obligations for its various programs that promote investment in clean energy sources (the "Obligations") and desires to obtain low cost capital to support the financing of those programs by entering into this Master Indenture; and

WHEREAS, all acts and things necessary to constitute this Master Indenture a valid indenture and agreement according to its terms have been done and performed and Green Bank has duly authorized the execution and delivery of this Master Indenture; and

WHEREAS, the Master Trustee agrees to accept and administer the trusts created hereby in accordance with the terms and conditions hereof;

NOW, THEREFORE, THIS MASTER INDENTURE WITNESSETH, that to secure the payment of Required Payments and all other amounts due from time to time under this Master Indenture, including those due to the Master Trustee, to secure the performance and observance of all of the covenants, agreements, obligations and conditions contained in the Obligations and in this Master Indenture, and to declare the terms and conditions upon and subject to which the Obligations are and are intended to be issued, held, secured and enforced and in consideration of the premises and the acceptance by the Master Trustee of the trusts created herein and of the purchase and acceptance of the Obligations by the Holders and for other good and valuable consideration, the receipt of which is acknowledged, Green Bank has executed and delivered this Master Trust Indenture and absolutely and irrevocably grants, bargains, sells, conveys, releases, pledges and assigns to the Master Trustee and to its successors in trust, on the basis set forth herein, and its and their assigns, all right, title and interest of Green Bank in and to the following (collectively, the "Trust Estate"):

(1) The Revenue Fund (except for the Administrative Account within the Revenue Fund), the Debt Service Fund, the Debt Service Reserve Fund, the Deficiency Reserve Fund, the Excess Revenue Fund, the Surplus Fund and the New Commitments Fund, together with any and all receipts, funds or moneys, investments and other property of every kind and nature from time to time hereafter on deposit in or payable to such funds and accounts thereof;

(2) All of the Green Bank's right, title and interest in the Revenues, as hereinafter defined, and all other agreements and property that may in the future be delivered, or by writing of any kind, conveyed, pledged, assigned or transferred to Green Bank as additional security hereunder for the Obligations; and

(3) Subject to any Related Supplement authorizing surplus revenues as revenues pledged to the Master Trustee, Surplus Revenues including the right of the Master Trustee to require the application of any Surplus Revenues, together with any and all receipts, funds or moneys of every kind and nature from time to time hereafter available under this Master Indenture.

TO HAVE AND TO HOLD all in singular the Trust Estate, whether now owned or hereafter acquired, unto the Master Trustee and its successors and assigns forever, SUBJECT, HOWEVER, IN ALL CASES to the application thereof for the purposes and on the terms and conditions hereafter set forth in this Master Indenture;

IN TRUST, NEVERTHELESS, under and subject to the terms and conditions as hereinafter set forth for:

(a) the equal and proportionate benefit, security and protection of all present and future Holders from time to time issued and to be issued under and secured by this Master Indenture without privilege, priority or distinction as to the lien or otherwise of any

Obligation over any other Obligations equally secured, and for enforcement of the payment of the Obligations in accordance with their terms, and all other sums payable hereunder, on or in connection with the Obligations and for the performance of and compliance with the obligations, covenants and conditions of and subject to the provisions of this Master Indenture, permitting the application and investment thereof for the purposes and on the terms and conditions set forth herein;

(b) the enforcement of the payment of the principal of, redemption premium, if any, and interest on the Obligations, and all other amounts due from time to time under this Master Indenture, including those due to the Master Trustee, when payable, according to the true intent and meaning thereof and of this Master Indenture, and

(c) security for the performance and observance of and compliance with the covenants, agreements, obligations, terms and conditions of this Master Indenture in connection with the issuance of the Obligations,

in each case, without preference, priority or distinction, as to lien or otherwise except as provided herein, of any one Obligation over any other by reason of designation, number, date of the Obligations or of authorization, issuance, sale, execution, authentication, delivery or maturity thereof, or otherwise, so that each Obligation and all Obligations shall have the same right, lien and privilege under this Master Indenture and shall be secured equally and proportionately by this Master Indenture, it being intended that the lien and security of this Master Indenture shall take effect from the date hereof, without regard to the date of the actual issue, sale or disposition of the Obligations, as though upon that date all of the Obligations were actually issued, sold and delivered to purchasers for value.

PROVIDED, HOWEVER, that upon satisfaction of and in accordance with the provisions of Article IX hereof, the rights assigned hereby shall cease, terminate and be void to the extent described therein, otherwise such rights shall be and remain in full force and effect; and

It is declared that the Obligations to be issued under and secured by this Master Indenture are to be issued, authenticated and delivered, and that all Revenues assigned or pledged hereby are to be dealt with and disposed of under, upon and subject to, the terms, conditions, stipulations, covenants, agreements, obligations, trusts, uses and purposes provided in this Master Indenture; and Green Bank has agreed and covenanted, and agrees and covenants with the Master Trustee and with each and all holders of Obligations, as follows:

ARTICLE I

DEFINITIONS AND INTERPRETATION

Section 1.01. Definitions. Unless the context otherwise requires, the terms defined in this Section shall for all purposes of this Master Indenture and of any supplemental indenture issued hereafter and of any certificate, opinion or other document herein mentioned, have the meanings herein specified, equally applicable to both singular and plural forms of any of the terms herein defined.

"Account" means one of the accounts created and established pursuant to this Master Indenture.

"Accountant" means any firm of independent certified public accountants selected by Green Bank.

"Act" means Sections 16-245n and 16-245kk through 16-245mm of the Connecticut General Statutes, as amended.

"Additional Indebtedness" means any Indebtedness (including all Obligations) incurred subsequent to the execution and delivery of this Master Indenture.

"Administrative Fees" means the items of expense to be paid or reimbursed by Green Bank related to this Master Indenture and any Related Obligations Indenture, which items of expense shall include, but not be limited to, fees and charges for the authorization, issuance, execution, delivery, transportation and safekeeping of Obligations and Related Obligations, fees and charges of the Master Trustee and any trustee of any Related Obligations Indenture, legal fees and charges, professional consultant fees, costs of credit ratings, loan origination and loan servicing fees, debt obligation underwriting and debt obligation issuance fees, and other costs, charges and fees in connection with the foregoing or as otherwise identified in a written direction of Green Bank delivered to the Master Trustee pursuant to Section 4.03 hereof.

"Authorized Representative" means with respect to Green Bank, the President or any other person designated as an Authorized Representative of Green Bank by resolution of its Board of Directors.

"Balloon Indebtedness" means Long-Term Indebtedness 25% or more of the principal of which becomes due (either by maturity or mandatory redemption) during any period of twelve (12) consecutive months, which portion of the principal is not required by the documents governing such Indebtedness to be amortized by redemption prior to such date.

"Bond Counsel" means counsel of recognized national standing in the field of law relating to municipal Obligations, appointed by Green Bank.

"Bond Proceeds" means the proceeds of the sale of Related Obligations.

"Business Day" means any day other than a Saturday, a Sunday, or a day on which banking institutions in the State of New York are authorized or obligated by law or executive order to be closed.

"Certificate," "Statement," "Request," "Consent" or "Order" of Green Bank or the Master Trustee means, respectively, a written certificate, statement, request, consent or order signed in the name of Green Bank by its Authorized Representative or in the name of the Master Trustee by its Responsible Officer. Any such instrument and supporting opinions or certificates, if any, may, but need not, be combined in a single instrument with any other instrument, opinion or certificate and the two or more so combined shall be read and construed as a single instrument. If and to the extent required by Section 1.04 hereof, each such instrument shall include the statements provided for in Section 1.04.

"Code" means the Internal Revenue Code of 1986, as amended.

"Contribution Account" means the account by that name established pursuant to Section 3.01 hereof.

"Contributions" means gifts, grants, bequests, donations and contributions made to or for the benefit of Green Bank and specifically restricted by the donor for the purposes for which amounts on deposit in the Program Fund may be applied, which amounts shall be designated as such in an Officer's Certificate upon the delivery thereof to the Master Trustee.

"Costs of Issuance" means the items of expense related to the authorization, sale and issuance of any Related Obligations and the investment of the proceeds of such Related Obligations, which items of expense shall include, but not be limited to, printing costs, costs of reproducing documents, filing and recording fees, initial fees and charges of any bond Trustee, legal fees and charges, professional consultants' fees, costs of credit ratings, fees and charges for execution, transportation and safekeeping of Related Obligations, costs and expenses of refunding Related Obligations, and other costs, charges and fees in connection with the foregoing.

"Costs of Issuance Fund" means the fund by that name established pursuant to Section 4.13 hereof.

"Credit Enhancement Fees" means any fees or costs payable by Green Bank to stabilizing or improve the rating provided by a Rating Agency on Outstanding Long-term Indebtedness of Green Bank.

"Credit Facility" means a line of credit, letter of credit or other similar financial instrument, including any fees or costs related thereto.

"Credit Rating Report" means an internal credit rating assigned by Green Bank, ranging from one (1) to five (5) stars, based on Green Bank's credit rating methodology and the underlying report prepared by Green Bank describing the credit analysis performed to render such rating.

"Debt Service Coverage Ratio" means the fraction calculated by dividing (i) the total amount of Revenues received during the most recent Fiscal Year, as shown on the audited financial statements of Green Bank for such Fiscal Year, by (ii) the total amount of Required Payments payable during such Fiscal Year.

"Debt Service Requirement" means, for any Fiscal Year for which such determination is made, the aggregate of the scheduled payments to be made with respect to principal (or mandatory sinking fund or installment purchase price or lease rental or similar payments) and interest on Outstanding Long-Term Indebtedness of Green Bank during such period, taking into account, at the option of Green Bank, the following:

(a) With respect to Indebtedness represented by a Guaranty of obligations of a Person, as long as any such Guaranty is a contingent liability under generally accepted accounting principles, the principal and interest deemed payable with respect to such Guaranty shall be deemed to be the lowest percentage of debt service requirements set forth immediately following this paragraph (determined after giving effect to any other

paragraph of this definition at the election of Green Bank), if the debt service coverage ratio (determined in a manner as nearly as practicable to the determination of the Debt Service Requirement hereunder) of the Person primarily obligated on the obligations effectively guaranteed by such Guaranty for the immediately preceding Fiscal Year (the "Accommodated Person"), or any other 12-month period ending within 180 days prior to the date of calculation, shall be greater than the amount specified opposite such percentage below; provided, Green Bank may revise such percentage to give effect to additional credit support or collateral provided for the obligations of such Accommodated Person:

Debt Service Coverage Ratio of Accommodated Person	Percentage of Debt Service Requirements
Over 1.35X	20%
1.15X to 1.35X	25%
Less than 1.15X	35%

If any such Guaranty becomes a non-contingent liability but thereafter becomes a contingent liability, during the period such Guaranty is a non-contingent liability and for two years after such Guaranty becomes a contingent liability, 100% of the annual debt service on the indebtedness being guaranteed shall be added to the computation of the Debt Service Requirement.

(b) With respect to Balloon Indebtedness, the amount of principal and interest deemed payable during such period shall be determined as if such Balloon Indebtedness were being repaid in substantially equal annual installments of principal and interest over a term over which Green Bank could reasonably be expected to borrow, not to exceed thirty-five (35) years from the date of incurrence of such Balloon Indebtedness, and bearing interest at an interest rate (determined as of the date of calculation of the Debt Service Requirement) equal to the rate at which Green Bank could reasonably be expected to borrow for such term, by issuing Indebtedness, all as set forth in an Officer's Certificate dated as of the date of incurrence of such Balloon Indebtedness accompanied by a letter of a banking or investment banking institution knowledgeable in matters of renewable energy facility finance, confirming that the borrowing term and interest rate assumptions set forth in such statement comply with the requirements of this subsection.

(c) With respect to Variable Rate Indebtedness, if the actual interest rate on such Variable Rate Indebtedness cannot be determined for the period for which the Debt Service Requirement is being calculated and there is no hedging instrument in place to manage such Variable Rate Indebtedness exposure, the amount of interest deemed payable during such period on such Variable Rate Indebtedness shall be assumed to be equal to the average interest rate per annum which was in effect for any twelve (12) consecutive calendar months specified in an Officer's Certificate during the eighteen (18) calendar months immediately preceding the date of calculation of the Debt Service Requirement (or,

if such Variable Rate Indebtedness was not Outstanding during such eighteen-month period, the average interest rate per annum which would have been in effect).

(d) With respect to Indebtedness payable from an Irrevocable Deposit, the amount of principal or interest taken into account during such period shall be assumed to equal only the principal or interest not payable from such Irrevocable Deposit and the investment income from such funds.

(e) With respect to Long-Term Indebtedness incurred to finance or refinance the construction of capital improvements, principal and interest with respect to such Long-Term Indebtedness shall be excluded from the determination of the Debt Service Requirement but only in proportion to the amount of principal and interest on such Long-Term Indebtedness which is payable in the then current Fiscal Year from the proceeds of such Long-Term Indebtedness.

(f) With respect to Long-Term Indebtedness with respect to which a Financial Products Agreement has been entered into by Green Bank, interest on such Long-Term Indebtedness shall be included in the determination of the Debt Service Requirement by including for each Fiscal Year an amount equal to the amount of interest payable on such Long-Term Indebtedness in such Fiscal Year at the rate or rates stated in such Long-Term Indebtedness plus any Financial Product Payments payable in such Fiscal Year minus any Financial Products Receipts receivable in such Fiscal Year; provided that in no event shall any calculation made pursuant to this subsection result in an amount less than zero being included in the determination of the Debt Service Requirement; and provided, further, that if the actual interest rate on such Long-Term Indebtedness or the actual amount of Financial Product Payments or Financial Products Receipts cannot be determined for the period for which the Debt Service Requirement is being calculated, then the amount of interest deemed payable during such period on such Long-Term Indebtedness shall be determined by applying the average interest rate per annum which was in effect or the average Financial Product Payments which would have been paid, or the average Financial Products Receipts which would have been received, as the case may be, for any twelve (12) consecutive calendar months specified in an Officer's Certificate during the eighteen (18) calendar months immediately preceding the date of calculation of the Debt Service Requirement (or, if such Long-Term Indebtedness was not Outstanding during such eighteen month period, the average rate which would have been in effect).

(g) With respect to Credit Enhancement Fees, any such fees for any twelve (12) consecutive calendar months specified in an Officer's Certificate.

"Debt Service Reserve Fund" means the fund by that name established pursuant to Sections 4.05 hereof.

"Debt Service Reserve Fund Requirement" means as of any date of calculation, an amount equal to the maximum amount of Required Payments becoming due in the calendar year in which such computation is made or in any succeeding calendar year, on Obligations issued directly under this Master Indenture.

"Defeasance Obligations" means any obligations authorized under applicable State law and the related financing documents to be deposited in escrow for the defeasance of any Obligations.

"Deficiency Reserve Fund" means the fund by that name established pursuant to Section 4.06 hereof.

"Deficiency Reserve Fund Requirement" means, as of any date of calculation, the aggregate of all Related Deficiency Reserve Fund Requirements; provided, however, that any decrease thereto or elimination thereof shall be accompanied by a Sufficiency Certificate delivered to the Master Trustee.

"Donor Program" means any program funded by Contributions.

"Event of Default" means any of the events specified in Section 9.01 hereof.

"Excess Revenue Fund" means the fund by that name established pursuant to Section 4.07 hereof.

"Excess Revenue Requirement" means, initially, zero dollars ($0), as such amount may be increased or decreased, each as set forth in a Related Supplement; provided, however, that any decrease thereto shall be accompanied by a Sufficiency Certificate delivered to the Master Trustee.

"Financial Products Agreement" means a Credit Facility, interest rate swap, cap, collar, option, floor, forward or other hedging agreement or arrangement identified to the Master Trustee in a Related Supplement or otherwise in an Officer's Certificate as having been entered into by or assigned to Green Bank with a Qualified Provider not for speculative or investment purposes but for the purpose of (1) reducing or otherwise managing Green Bank's risk of interest rate changes or (2) effectively converting Green Bank's interest rate exposure, in whole or in part, from a fixed rate exposure to a variable rate exposure, or from a variable rate exposure to a fixed rate exposure.

"Financial Products Payments" means payments required to be paid to a counterparty by Green Bank pursuant to a Financial Products Agreement, as the same may be further identified in a Related Supplement.

"Financial Products Receipts" means amounts required to be paid to Green Bank by a counterparty pursuant to a Financial Products Agreement, as the same may be further identified in a Related Supplement.

"Fiscal Year" means that period adopted by Green Bank as its annual accounting period. The Fiscal Year is initially the twelve month period commencing on July 1 and ending on June 30 in each year.

"Fitch" means Fitch Ratings, a corporation duly organized and existing under and by virtue of the laws of the State of Delaware, and its successors and assigns or, if such corporation shall be dissolved or liquidated or shall no longer perform the functions of a securities rating agency, any other nationally recognized securities rating agency designated by Green Bank.

"Fund" means any fund established pursuant to Section 4.02 of this Master Indenture.

"Government Obligations" means direct obligations of, or obligations unconditionally guaranteed by, the United States and certificates of deposit or time deposits secured by direct obligations of, or obligations unconditionally guaranteed by, the United States, or obligations of a state, a territory, or a possession of the United States, or any political subdivision of any of the foregoing, within the meaning of Section 103(a) of the Code, the full and timely payment of the principal of and interest on which are secured by an irrevocable deposit of direct obligations of the United States which, if the Outstanding Obligations are then rated by a nationally recognized rating agency, are rated in the highest rating category by such rating agency, maturing at such time or times as shall be appropriate to assure the prompt payment, as to principal, interest and redemption premium, if any, of the Outstanding Obligations to be refunded.

"Governmental Issuer" means any municipal corporation, political subdivision, state, territory or possession of the United States, or any constituted authority or agency or instrumentality of any of the foregoing empowered to issue obligations on behalf thereof, which obligations constitute Related Obligations.

"Green Bank Program" means any program funded by Green Bank.

"Green Bank Programs Fund" or "Program Fund" means the fund by that name established pursuant to Section 3.01 hereof.

"Guaranty" means all loan commitments and all obligations of Green Bank guaranteeing in any manner whatever, whether directly or indirectly, any obligation of any other Person that would, if such other Person were Green Bank, constitute Indebtedness.

"Holder" means the registered owner of any Obligation in registered form or the bearer of any Obligation in coupon form that is not registered or is registered to bearer.

"Indebtedness" means all obligations for borrowed money, installment sales and capitalized lease obligations, incurred or assumed by Green Bank including Guaranties, Long-Term Indebtedness, Short-Term Indebtedness or any other obligation for payments of principal and interest with respect to money borrowed.

"Independent Consultant" means a Person that (1) does not have any direct financial interest or any material indirect financial interest in Green Bank and (2) is not connected with an officer, employee, promoter, Trustee, partner, director or Person performing similar functions, and designated by Green Bank, qualified to pass upon questions relating to the financial affairs of Green Bank and having a favorable reputation for skill and experience.

"Irrevocable Deposit" means the irrevocable deposit in trust with any Trustee or escrow agent authorized to act in such capacity of cash in an amount or Government Obligations the principal of and interest on which will be an amount, and under the terms sufficient to pay all or a portion of the principal of and/or premium, if any, and interest on, as the same shall become due, any Indebtedness which would otherwise be considered Outstanding. The Trustee of such deposit may be the Master Trustee or any other Trustee authorized to act in such capacity.

"Issuer Indemnified Party" means any Person that Green Bank has indemnified for any damages, monetary or otherwise, incurred by the Person under an agreement between Green Bank and the Person.

"Loan" or "Loans" means funds provided by a Person to or for the benefit of Green Bank on the basis that all or any portion of such funds would be repaid to the Person, and specifically restricted by the Person for the purposes for which amounts on deposit in the Program Fund may be applied, which amounts shall be designated as such in an Officer's Certificate upon the delivery thereof to the Master Trustee.

"Long-Term Indebtedness" means Indebtedness having an original maturity greater than one year or renewable at the option of Green Bank for a period greater than one year from the date of original incurrence or issuance thereof.

"Master Indenture" means this instrument as originally executed and as it may from time to time be supplemented, modified or amended in accordance with the terms hereof.

"Master Trustee" means _____, a national banking association organized and existing under and by virtue of the laws of the United States of America and, subject to the limitations contained in Section _____ hereof, any other corporation or association which may be co-Trustee with _____ and any successor or successors to said Trustee or co-Trustee in the trusts created hereunder.

"Moody's" means Moody's Investors Service, Inc., a corporation organized and existing under the laws of the State of Delaware, its successors and their assigns, or, if such corporation shall be dissolved or liquidated or shall no longer perform the functions of a securities rating agency, any other nationally recognized securities rating agency designated by Green Bank.

"New Commitments Fund" means the fund by that name established pursuant to Section 4.08 hereof.

"Obligation" means any obligation of Green Bank issued hereunder, which shall be in the form set forth in a Related Supplement, including, but not limited to, Obligations, notes, obligations, debentures, reimbursement agreements, Financial Products Agreements, Credit Facilities, loan agreements, leases or lease purchase agreements. Reference to a Series of Obligations or to Obligations of a Series means Obligations or Series of Obligations issued pursuant to a single Related Supplement, unless otherwise specified in the Related Supplement.

"Officer's Certificate" means a Certificate signed by the Authorized Representative of Green Bank.

"Operating Expenses" means all reasonable and necessary current costs and expenses of Green Bank to function as a quasi-public entity in accordance with State law, including all employee wages, salaries and benefits, as provided in its approved budget. Operating Expenses do not include principal of or interest on any Obligations or the costs for or related to Credit Facilities.

"Opinion of Bond Counsel" means a written opinion signed by an attorney or firm of attorneys experienced in the field of public finance whose opinions are generally accepted by purchasers of Obligations issued by or on behalf of a Governmental Issuer.

"Opinion of Counsel" means a written opinion signed by an attorney or firm of attorneys who may be counsel for Green Bank.

"Outstanding," when used with reference to Indebtedness or Obligations, means, as of any date of determination, all Indebtedness or Obligations theretofore issued or incurred and not paid and discharged other than (a) Obligations theretofore cancelled by the Master Trustee or delivered to the Master Trustee for cancellation, (b) Obligations in lieu of which other Obligations have been authenticated and delivered or have been paid pursuant to the provisions of a Related Supplement regarding mutilated, destroyed, lost or stolen Obligations unless proof satisfactory to the Master Trustee has been received that any such Obligation is held by a protected purchaser, (c) any Obligation held by Green Bank, and (d) Indebtedness deemed paid and no longer outstanding pursuant to the terms thereof; provided, however, that if two or more obligations which constitute Indebtedness represent the same underlying obligation (as when an Obligation secures an issue of Related Obligations and another Obligation secures repayment obligations to a bank under a letter of credit which secures such Related Obligations) for purposes of the various financial covenants contained herein, but only for such purposes, only one of such Obligations shall be deemed Outstanding and the Obligation so deemed to be Outstanding shall be that Obligation which produces the greater amount of Pledged Payments to be included in the calculation of such covenants.

"Permitted Investments" shall mean, unless otherwise provided in a Related Supplement, negotiable instruments or securities represented by instruments in bearer or registered or in book-entry form which evidence (i) obligations fully guaranteed by the United States of America; (ii) obligations of any agency of the United States of America; and (iii) any other instruments or securities in which Green Bank may lawfully invest.

"Person" means an individual, corporation, limited liability company, firm, association, partnership, trust, or other legal entity or group of entities, including a governmental entity or any agency or political subdivision thereof.

"Prior Bond Indentures" means (i) the Indenture of Trust between the Connecticut Green Bank and U.S. Bank National Association as Trustee for $2,957,971.35 Clean Renewable Energy Bonds (CGB Meriden Hydro LLC Project) dated as of February 2, 2017, and (ii) the Base Indenture, as supplemented by the Series 2019-1 Indenture Supplement, for the SHREC ABS 1 LLC Series 2019-1 SHREC Collateralized Notes ($36,800,000 Series 2019-1 Notes, Class A and $1,800,000 Series 2019-1 Notes, Class B) dated as of April 2, 2019.

"Prior Lease/Purchase Agreement" means the $9,101,729.15 Equipment Lease/Purchase Agreement (Taxable Direct Pay New Clean Renewable Energy Bond) Connecticut State Colleges and University System dated December 29, 2017, as amended October 25, 2018.

"Projected Debt Service Coverage Ratio" means, for any future period, the projected Debt Service Coverage Ratio; provided, however, that for purposes of the issuance of Indebtedness,

Green Bank may consider all expected revenues from the issuance of such Indebtedness including at the time of issuance and any and all moneys held in the funds or accounts of this Master Indenture, except moneys held in the Program Fund or any other account excluded from the pledge of this Master Indenture pursuant to a Related Supplement.

"Principal Amount" means, with respect to an Obligation, the principal amount of such Obligation; provided that, for any Obligation issued in connection with a Financial Products Agreement, the net amount payable (if any) following the designation of an early termination date thereunder and the determination of the early termination or unwind amount in accordance with such Financial Products Agreement.

"Qualified Provider" means any major financial institution or insurance company domiciled in the United States or having a branch or office in the United States and which is a counterparty to a Financial Products Agreement if the unsecured long-term debt obligations of such financial institution or insurance company (or of the parent or a subsidiary of such financial institution or insurance company if such parent or subsidiary guarantees the performance of such financial institution or insurance company under such Financial Products Agreement), or obligations secured or supported by a letter of credit, contract, guarantee, agreement, insurance policy or surety bond issued by such financial institution or insurance company (or such guarantor parent or subsidiary), are rated in one of the three highest Rating Categories of a national rating agency at the time of the execution and delivery of the Financial Products Agreement (and if in the third highest rating category, that it have two such ratings from each of S&P, Moody's or Fitch).

"Rating Agency" means, as at any time, any nationally recognized rating agency including Fitch, Moody's, or S&P, then rating Related Obligations at the request of Green Bank.

"Rebate Fund" means the fund by that name established pursuant to Section 4.12 hereof.

"Reimbursement Account" means the account by that name established pursuant to Section 3.01 hereof.

"Related Bond Indenture" means any indenture, trust agreement, bond resolution or other comparable instrument pursuant to which a series of Related Obligations are issued.

"Related Obligations" means the revenue Obligations or other obligations issued by Green Bank or any Governmental Issuer or financial institution, pursuant to a single Related Bond Indenture, the proceeds of which are made available to Green Bank in consideration of the execution, authentication and delivery of an Obligation or Obligations to or for the order of such Governmental Issuer, excluding any Obligations or other obligations for which Green Bank does not provide any credit support or receive any excess loan or other revenues or funds for the use by Green Bank at its discretion.

"Related Deficiency Reserve Fund Requirement" means, as of any date of calculation, the Deficiency Reserve Fund Requirement of any Obligations as provided in a Related Supplement entered into in connection with said Obligations.

"Related Supplement" means an indenture supplemental to, and authorized and executed pursuant to the terms of, this Master Indenture.

"Required Payment" means any payment required to be made by Green Bank under this Master Indenture, any Related Supplement or any Obligation, including (i) any payment of principal or interest, whether regularly scheduled or due at maturity, by acceleration, upon proceeding for redemption or otherwise, (ii) net scheduled and partial or full early termination or unwind payments due under any Financial Products Agreement, (iii) the purchase price of Related Obligations tendered or deemed tendered for purchase pursuant to the terms of a Related Bond Indenture, and (iv) any payments to an Issuer Indemnified Party or an Issuer Judgement Lien Party not otherwise satisfied by revenues from a project or projects subject to a Related Bond Indenture.

"Responsible Officer" means, with respect to the Master Trustee, any person who at the time and from time to time may be designated, by written certificate, as a person authorized to act on behalf of the Master Trustee. Such certificate shall contain the specimen signature of such person(s) and shall be signed on behalf of the Master Trustee by any officer of the Master Trustee and may designate an alternate or alternates.

"Revenue Fund" means the fund by that name established pursuant to Section 4.03 hereof.

"Revenues" means all revenues, income, receipts and money received by Green Bank from all lawfully available sources, including (a) the assessed charge to each end use customer of electric services in the State as authorized by the Act, as the same may be amended from time to time; (b) the regional greenhouse gas initiative revenues authorized by the Connecticut General Statutes, as the same may be amended from time to time; (c) amounts in the form of returned or reimbursed Contributions and repayment of Loans, and any investment earnings thereon; (d) gifts, grants, bequests, donations and contributions, exclusive of any gifts, grants, bequests, donations and contributions to the extent specifically restricted by the donor thereof to a particular purpose inconsistent with their use for the payment of Required Payments; and (e) investment earnings on and other income from amounts held in the Revenue Fund; provided, however, that Revenues shall not include (1) revenues from a project or projects pledged under a Related Bond Indenture pursuant to a Related Supplement; (2) revenues, and all funds and accounts, pledged by Green Bank under the Prior Bond Indentures and the Prior Lease/Purchase Agreement; (3) income derived from Defeasance Obligations that are irrevocably deposited in escrow to pay the principal of or interest on any defeased Obligations; (4) any gains or losses resulting from the sale, exchange or other disposition of property not in the ordinary course of business, or the reappraisal, reevaluation or write-up of assets, or any other extraordinary gains or losses; (5) net unrealized gain (losses) on investments and Financial Products Agreements; (6) proceeds of borrowings, and (6) net amounts received in connection with the termination or unwinding of Financial Products Agreements.

"S&P" means S&P Global Ratings, its successors and assigns, or, if such corporation shall be dissolved or liquidated or shall no longer perform the functions of a securities rating agency, any other nationally recognized securities rating agency designated by Green Bank.

"Short-Term Indebtedness" means all Indebtedness having an original maturity less than or equal to one year and not renewable at the option of Green Bank for a term greater than one

year from the date of original incurrence or issuance unless, by the terms of such Indebtedness, no Indebtedness is permitted to be outstanding thereunder for a period of at least twenty (20) consecutive days during each Fiscal Year.

"Subordinated Indebtedness" means any Indebtedness that is subordinate in priority of payment, and secured on a junior basis, to any Obligation, and the provisions with respect to which are set forth in a Related Supplement.

"Sufficiency Certificate" means, with respect to a proposed action requiring the delivery of the same to the Master Trustee, a Certificate of an Authorized Representative of Green Bank stating that, after giving effect to such action the Projected Debt Service Coverage Ratio will not be less than _____:_____.

"Supplemental Indenture" means a supplement to the Master Indenture as described in Article VII.

"Surplus Fund" means the fund by that name established pursuant to Section 4.09 hereof.

"Tax-Exempt Obligations" means any Related Obligations interest on which is excluded from gross income for federal income tax purposes under Section 103 of the Code.

"Variable Rate Indebtedness" means Indebtedness the interest on which is payable pursuant to a variable interest rate formula or other determination method rather than at a fixed rate of interest per annum to maturity.

Section 1.02. Interpretation.

(a) Any reference herein to any officer of Green Bank shall include those succeeding to his or her functions, duties or responsibilities pursuant to or by operation of law or who are lawfully performing his or her functions.

(b) Unless the context otherwise indicates, words of the masculine gender shall be deemed and construed to include correlative words of the feminine and neuter genders. The singular shall include the plural and vice versa.

(c) All accounting terms not specifically defined herein shall be construed in accordance with generally accepted accounting principles consistently applied, except as otherwise stated herein. If any change in accounting principles from those used in the preparation of the financial statements of Green Bank results from the promulgation of rules, regulations, pronouncements and opinions by or required by the Governmental Accounting Standards Board, American Institute of Certified Public Accountants, or other authoritative bodies that determine generally accepted accounting principles (or successors thereto or agencies with similar functions) and such change results in a change in the accounting terms used in this Master Indenture, the accounting terms used herein shall be modified to reflect such change in accounting principles so that the criteria for evaluating Green Bank's financial condition shall be the same after such change as if such change had not been made. Any such modification shall be described in an Officer's Certificate filed with the Master Trustee, which shall contain a certification to the effect that (i)

such modifications are occasioned by such a change in accounting principles and (ii) such modifications will not have a material adverse effect on Green Bank's financial condition.

(d) Headings of Articles and Sections herein and the table of contents hereto are solely for convenience of reference, and do not constitute a part hereof and shall not affect the meaning, construction or effect hereof.

Section 1.03. References to Master Indenture. The terms "hereby," "hereof," "hereto," "herein," "hereunder," and any similar terms, used in this Master Indenture refer to this Master Indenture.

Section 1.04. Contents of Certificates and Opinions. Every Certificate or opinion provided for herein by Green Bank with respect to compliance with any provision hereof shall include: (i) a statement that the Person making or giving such certificate or opinion has read such provision and the definitions herein relating thereto; (ii) a brief statement as to the nature and the scope of the examination or investigation upon which the certificate or opinion is based; (iii) a statement that, in the opinion of such Person, he or she has made, or caused to be made, such examination or investigation as is necessary to enable him or her to express an informed opinion with respect to the subject matter referred to in the instrument to which his or her signature is affixed; and (iv) a statement as to whether, in the opinion of such Person, such provision has been complied with.

Any such Certificate or opinion made or given by an officer of Green Bank or the Master Trustee may be based, insofar as it relates to legal, accounting or school management matters, upon a Certificate or opinion or representation of counsel, an Accountant or Independent Consultant unless such officer knows, or in the exercise of reasonable care should have known, that the Certificate, opinion or representation with respect to the matters upon which such Certificate or opinion may be based, as aforesaid, is erroneous. Any such Certificate, opinion or representation made or given by counsel, an Accountant, or an Independent Consultant, may be based, insofar as it relates to factual matters (with respect to which information is in the possession of Green Bank), upon the Certificate or opinion of, or representation by an officer of Green Bank unless such counsel, Accountant or Independent Consultant knows, or in the exercise or reasonable care should have known, that the Certificate, opinion of or representation by such officer, with respect to the factual matters upon which such Person's Certificate or opinion may be based, as aforesaid, is erroneous. The same officer of Green Bank or the same counsel or Accountant or Independent Consultant, as the case may be, need not certify as to all the matters required to be certified under any provision hereof, but different officers, counsel, Accountants or Independent Consultants may certify as to different matters, respectively.

ARTICLE II

AUTHORIZATION, ISSUANCE AND FORM OF OBLIGATIONS

Section 2.01. Authorization of Obligations. Green Bank hereby authorizes to be issued from time to time Obligations or Series of Obligations, without limitation as to amount, except as

provided herein or as may be limited by law, and subject to the terms, conditions and limitations established herein and in any Related Supplement.

Section 2.02. Authorization for Issuance of Obligations in Series. From time to time when authorized by this Master Indenture and subject to the terms, conditions and limitations established in this Master Indenture, Green Bank may authorize the issuance of an Obligation or a Series of Obligations by entering into a Related Supplement. The Obligation or the Obligations of any such Series may be issued and delivered to the Master Trustee for authentication upon compliance with the provisions hereof and of any Related Supplement.

Each Related Supplement authorizing the issuance of an Obligation or a Series of Obligations shall specify and determine the Principal Amount of such Obligation or Series of Obligations, the purposes for which such Obligation or Series of Obligations are being issued, the form, title, designation, and the manner of numbering or denominations, if applicable, of such Obligations, the date or dates of maturity or other final expiration of the term of such Obligations, the date of issuance of such Obligations, and any other provisions deemed advisable or necessary by Green Bank.

Section 2.03. Execution and Authentication of Obligations.

(a) All Obligations shall be executed by the Authorized Representative of Green Bank as provided in the Related Supplement authorizing such Obligation. The signature of such officer may be mechanically or photographically reproduced on the Obligations. If any officer whose signature appears on any Obligation ceases to be such officer before delivery thereof, such signature shall remain valid and sufficient for all purposes as if such officer had remained in office until such delivery. Each Obligation shall be manually authenticated by a Responsible Officer of the Master Trustee, without which authentication no Obligation shall be entitled to the benefits hereof.

(b) The form of Certificate of Authentication to be printed on each Obligation and manually executed by a Responsible Officer of the Master Trustee shall be as follows:

[FORM OF MASTER TRUSTEE'S CERTIFICATE OF AUTHENTICATION]

The undersigned Master Trustee hereby certifies that this Obligation No. ____ is one of the Obligations described in the within-mentioned Master Indenture.

Dated: _____

_____,
as Master Trustee

By _____
Responsible Officer

Section 2.04. Conditions to the Issuance of Obligations. The issuance, authentication and delivery of any Obligation or Series of Obligations shall be subject to the following specific conditions:

(a) Green Bank and the Master Trustee shall have entered into a Related Supplement providing for the terms and conditions of such Obligation and the repayment thereof.

(b) The Master Trustee shall have received an Officer's Certificate to the effect that Green Bank shall be in full compliance with all warranties, covenants and agreements set forth in this Master Indenture and in any Related Supplement.

(c) The Master Trustee shall have received an Officer's Certificate to the effect that neither an Event of Default nor any event which with the passage of time or the giving of notice or both would become an Event of Default has occurred and is then outstanding or would occur upon issuance of such Obligation or is continuing under this Master Indenture or any Related Supplement.

(d) The Master Trustee shall have received an Officer's Certificate to the effect that all requirements and conditions to the issuance of such Obligation set forth herein and in the Related Supplement shall have been complied with and satisfied.

(e) The Master Trustee shall have received an Opinion of Counsel to the effect that: (1) such Obligation and Related Supplement have been duly authorized, executed and delivered by Green Bank and constitute valid and binding obligations of Green Bank, enforceable in accordance with their terms; and (2) such Obligation is not subject to registration under the Securities Act of 1933, as, amended, and such Related Supplement is not subject to registration under the Trust Indenture Act of 1939, as amended (or that such registration, if required has occurred).

(f) The Master Trustee shall have received a Sufficiency Certificate.

ARTICLE III

GREEN BANK PROGRAMS FUND

Section 3.01. Green Bank Programs Fund.

(a) The Master Trustee shall establish, maintain and hold in trust a separate fund designated as the Program Fund, and within said fund separate accounts designated as the Contribution Account, the Loan Account and the Reimbursement Account, and any other separate accounts as directed by Green Bank from time to time. The Master Trustee shall administer said fund and accounts as set forth in this Section 3.01.

(b) All amounts at any time deposited in the Program Fund or any account therein shall be held by the Master Trustee in trust for the benefit of the applicable Donor Program or Green Bank Program.

(c) The Master Trustee shall deposit into the Contribution Account of the Program Fund, as and when such amounts are received, (i) all Contributions, (ii) all amounts delivered by or at the direction of Green Bank to the Master Trustee for deposit therein, and (iii) any other amounts required to be deposited therein pursuant to this Master Indenture and any Related Supplement.

(d) The Master Trustee shall deposit into the Loan Account of the Program Fund, as and when such amounts are received, (i) all Loans, (ii) all amounts delivered by or at the direction of Green Bank to the Master Trustee for deposit therein, and (iii) any other amounts required to be deposited therein pursuant to this Master Indenture and any Related Supplement.

(e) The Master Trustee shall deposit into the Reimbursement Account of the Program Fund, as and when such amounts are received, (i) all Bond Proceeds delivered by or at the direction of Green Bank to the Master Trustee for deposit therein and (ii) any other amounts required to be deposited therein pursuant to this Master Indenture and any Related Supplement.

(f) Investment earnings on amounts on deposit in any account within the Program Fund shall be retained in such account.

(g) At the written direction of Green Bank, the Master Trustee shall transfer from the account within the Program Fund set forth in such written direction the amount set forth in such written direction (i) to the Debt Service Reserve Fund, (ii) with respect to amounts allocable to a Contribution or a Loan, to the Person or Persons set forth in such written direction for any other purpose permitted under the agreement governing such Contribution or Loan and set forth in such written direction, or (iii) from the Reimbursement Account only, to the Revenue Fund, to make Required Payments as such payments become due (whether by maturity, redemption, acceleration or otherwise), and, if such amounts shall not be sufficient to pay in full all such payments due on any date, then to the payment of Required Payments ratably without any discrimination or preference.

ARTICLE IV

PLEDGE; ESTABLISHMENT OF FUNDS AND ACCOUNTS; INVESTMENTS

Section 4.01. Pledge. Pursuant to the Granting Clauses set forth herein, Green Bank has pledged the Trust Estate as security for the payment of the Obligations and the performance of any other obligation of Green Bank under this Master Indenture, in accordance with the terms and the provisions of this Master Indenture, subject only to the provisions of this Master Indenture permitting the application thereof for or to the purposes and on the terms and conditions herein set forth. This pledge shall be valid and binding from the time when the pledge is made. The lien of this pledge shall be valid and binding as against all parties having claims of any kind in tort, contract or otherwise against Green Bank, irrespective of whether the parties have notice of the claims. Notwithstanding any provision of the Uniform Commercial Code, no instrument by which such pledge is created need to be recorded or filed except in the records of Green Bank. Any revenues, contract or proceeds of any contract, or other property, revenues, moneys or funds so pledged and thereafter received by Green Bank shall be subject immediately to the lien of the

pledge without any physical delivery thereof or further act, and such lien shall have priority over all other liens.

Section 4.02 Establishment of Funds and Accounts.

(a) The following Funds and Accounts are hereby established:

(1) Revenue Fund

(a) Administrative Account

(2) Debt Service Fund

(3) Debt Service Reserve Fund

(4) Deficiency Reserve Fund

(5) Excess Revenue Fund

(6) Surplus Fund

(7) Loan Repayment Fund

(8) New Commitments Fund

(9) Redemption Fund

(10) Subordinated Indebtedness Fund

(11) Rebate Fund

(12) Costs of Issuance Fund

(b) In addition to the Accounts established in subsection (a) above, the Master Trustee shall, at the written request of Green Bank, establish within any Fund such Accounts as shall be designated in the written instructions of an Authorized Representative of Green Bank and shall in like manner establish within any Account such subaccounts for the purposes of such Accounts as shall be so designated.

(c) Unless otherwise expressly provided in this Master Indenture, all of the Funds and Accounts, except the Administrative Account, shall be held by the Master Trustee.

Section 4.03 Revenue Fund.

(a) The Master Trustee shall establish, maintain and hold in trust a separate fund designated as the "Revenue Fund," and within said fund one or more separate accounts as directed by Green Bank from time to time, and administer said fund and such accounts as set forth in this Section 4.03. The Master Trustee shall deposit into the Revenue Fund, as and when such amounts are received, (i) all Revenues, (ii) all amounts delivered by or at

the direction of Green Bank to the Master Trustee for deposit therein, and (iii) any other amounts required to be deposited therein pursuant to this Master Indenture and any Related Supplement.

(b) The Master Trustee shall use and withdraw amounts in the Revenue Fund from time to time and apply such amounts as follows:

FIRST: on the second Business Day immediately preceding the first day of each calendar month, to the Administrative Account, the amount necessary to provide for (taking into account amounts on deposit therein and expenses incurred and unpaid for the current month) the payment of the next two (2) succeeding months' Operating Expenses;

SECOND: at the written direction of Green Bank, to the Person or Persons set forth in such written direction for the purpose of paying any Administrative Fees set forth in such written direction;

THIRD: to the Debt Service Fund to make Required Payments as such payments become due (whether by maturity, redemption, acceleration or otherwise), and, if such amounts shall not be sufficient to pay in full all such payments due on any date, then to the payment of Required Payments ratably without any priority or preference;

FOURTH: to the Debt Service Reserve Fund, (a) the greater of (i) the amount designated for deposit thereto in a written direction of Green Bank, and (ii) the aggregate amount of each prior withdrawal from the Debt Service Reserve Fund for the purpose of making up a deficiency in said fund (until deposits on account of such withdrawals are sufficient to fully restore the amount withdrawn), provided that no deposit need be made into the Debt Service Reserve Fund if the balance in said fund is at least equal to the Debt Service Reserve Fund Requirement, and (b) in the event the balance in the Debt Service Reserve Fund shall be less than the Debt Service Reserve Fund Requirement due to the valuation of the Permitted Investments deposited therein in accordance with Section 4.05, the amount necessary to increase the balance in said fund to an amount at least equal to the Debt Service Reserve Fund Requirement (until deposits on account of such valuation deficiency are sufficient to increase the balance in said fund to said amount);

FIFTH: to the Deficiency Reserve Fund, the greater of (i) the amount designated for deposit thereto in a written direction of Green Bank, and (ii) the aggregate amount of each prior withdrawal from the Deficiency Reserve Fund for the purpose of making up a deficiency in said fund (until deposits on account of such withdrawals are sufficient to fully restore the amount withdrawn), provided that no deposit need be made into the Deficiency Reserve Fund if the balance in said fund is at least equal to the Deficiency Reserve Fund Requirement;

SIXTH: to the Excess Revenue Fund, the amount designated for deposit thereto in a written direction of Green Bank;

SEVENTH: to the New Commitments Fund, the amount designated for deposit thereto in a written direction of Green Bank; and

EIGHTH: to the Surplus Fund, the balance.

Section 4.04 Debt Service Fund.

(a) The Master Trustee shall establish, maintain and hold in trust a separate fund designated as the "Debt Service Fund," and within said fund one or more separate accounts as directed by Green Bank from time to time, and administer said fund and such accounts as set forth in this Section 4.04.

(b) The Master Trustee shall deposit into the Debt Service Fund, as and when such amounts are received, (i) all amounts delivered by or at the direction of Green Bank to the Master Trustee for deposit therein, and (ii) any other amounts required to be deposited therein pursuant to this Master Indenture and any Related Supplement.

(c) Investment earnings on amounts on deposit in the Debt Service Fund shall be retained therein.

(d) At the written direction of Green Bank, the Master Trustee shall transfer from the Debt Service Fund the amount set forth in such written direction to the Person or Persons set forth in such written direction to make Required Payments as such payments become due (whether by maturity, redemption, acceleration or otherwise) on Obligations issued by Green Bank pursuant to this Master Indenture, ratably without any priority or preference.

Section 4.05 Debt Service Reserve Fund.

(a) The Master Trustee shall establish, maintain and hold in trust a separate fund designated as the "Debt Service Reserve Fund," and within said fund one or more separate accounts as directed by Green Bank from time to time, and administer said fund and any such accounts as set forth in this Section 4.05.

(b) The Master Trustee shall deposit into the Debt Service Reserve Fund, as and when such amounts are received, (i) all amounts delivered by or at the direction of Green Bank to the Master Trustee for deposit therein, and (ii) any other amounts required to be deposited therein pursuant to this Master Indenture and any Related Supplement.

(c) Investment earnings on amounts on deposit in the Debt Service Reserve Fund shall be retained therein.

(d) Amounts on deposit in the Debt Service Reserve Fund shall be valued by the Master Trustee at their fair market value on the last Business Day of each month, and the Master Trustee shall notify Green Bank of the results of such valuation. If the amount on deposit in the Debt Service Reserve Fund on the first Business Day following such valuation is less than 100% of the Reserve Account Requirement, then the Master Trustee shall make the transfer to the Debt Service Reserve Fund required by Section 4.03(b). If the amount on deposit in the Debt Service Reserve Fund on the first Business Day following such valuation is greater than the Reserve Account Requirement, any such excess may be transferred to the Revenue Fund.

(e) All amounts in the Debt Service Reserve Fund shall be used and withdrawn by the Master Trustee solely for the purposes of making up any deficiency in the Revenue Fund or (together with other moneys available therefor) for the payment or redemption of all Obligations

of Green Bank under this Master Indenture. On the Business Day immediately preceding the first day of each calendar month, the Master Trustee shall withdraw from the Debt Service Reserve Fund and transfer to the Revenue Fund an amount equal to the difference between the amount on deposit in the Revenue Fund (taking into account any amounts transferred from the Excess Revenue Fund to the Revenue Fund pursuant to Section 4.07(d), any amounts transferred from the New Commitments Fund to the Revenue Fund pursuant to Section 4.08(d), any amounts transferred from the Surplus Fund to the Revenue Fund pursuant to Section 4.09(d) and any amounts transferred from the Reimbursement Account of the Program Fund to the Revenue Fund pursuant to Section 3.01(g)) and the amount of all payments to be made therefrom described in Section 4.03 coming due during such calendar month. Notwithstanding the foregoing, amounts in the Debt Service Reserve Fund shall be used and withdrawn by the Master Trustee, at the written direction of Green Bank, for the payment or redemption of Related Obligations identified in such written direction as necessary to maintain the tax-exempt status of Related Obligations in connection with any the refunding of Related Obligations; provided however that any such use or withdrawal by the Master Trustee shall not, unless otherwise permitted by this Master Indenture, cause a reduction in the Debt Service Reserve Fund Requirement.

(f) The Master Trustee shall notify Green Bank immediately of (i) any withdrawal from the Debt Service Reserve Fund for the purpose of making up a deficiency in the Revenue Fund for the purposes of making up any deficiency in the Revenue Fund or (together with other moneys available therefor) for the payment or redemption of all Obligations of Green Bank under this Master Indenture, which notice shall specify the amount of such withdrawal, and (ii) the final maturity, earlier redemption in full of the Related Obligations or the date on which no Obligations are Outstanding.

Section 4.06 Deficiency Reserve Fund.

(a) The Master Trustee shall establish, maintain and hold in trust a separate fund designated as the "Deficiency Reserve Fund," and within said fund one or more separate accounts as directed by Green Bank from time to time, and administer said fund and such accounts as set forth in this Section 4.06.

(b) The Master Trustee shall deposit into the Deficiency Reserve Fund, as and when such amounts are received, (i) all amounts delivered by or at the direction of Green Bank to the Master Trustee for deposit therein, and (ii) any other amounts required to be deposited therein pursuant to this Master Indenture and any Related Supplement.

(c) Investment earnings on amounts on deposit in the Deficiency Reserve Fund shall be retained therein.

(d) At the written direction of Green Bank, the Master Trustee shall transfer from the Deficiency Reserve Fund the amount set forth in such written direction to the Person or Persons set forth in such written direction to make Required Payments as such payments become due (whether by maturity, redemption, acceleration or otherwise) on Obligations issued by Green Bank pursuant to a Related Supplement, ratably without any priority or preference.

Section 4.07 Excess Revenue Fund.

(a) The Master Trustee shall establish, maintain and hold in trust a separate fund designated as the "Excess Revenue Fund," and within said fund one or more separate accounts as directed by Green Bank from time to time, and administer said fund and any such accounts as set forth in this Section 4.07.

(b) The Master Trustee shall deposit into the Excess Revenue Fund, as and when such amounts are received, (i) all amounts delivered by or at the direction of Green Bank to the Master Trustee for deposit therein, and (ii) any other amounts required to be deposited therein pursuant to this Master Indenture and any Related Supplement.

(c) Investment earnings on amounts on deposit in the Excess Revenue Fund shall be retained therein.

(d) On the second Business Day immediately preceding the first day of each calendar month, the Master Trustee shall withdraw from the Excess Revenue Fund and transfer to the Revenue Fund an amount equal to the difference between the amount on deposit in the Revenue Fund and the amount of all payments to be made therefrom described in Section 4.03 coming due during such calendar month; provided that the Master Trustee shall transfer such additional amounts to the Revenue Fund as indicated pursuant to the written direction of Green Bank.

(e) On each January 1 and July 1, provided that the applicable transfers to the Revenue Fund required pursuant to Sections 4.05(d), 4.08(d), 4.09(d) and 3.01(g) have been made, the Master Trustee shall transfer all amounts on deposit in the Excess Revenue Fund in excess of the Excess Revenue Requirement to the New Commitments Fund or the Surplus Fund as indicated pursuant to the written direction of Green Bank; provided that, the Master Trustee shall retain such additional amounts in the Excess Revenue Fund as indicated pursuant to the written direction of Green Bank.

Section 4.08 New Commitments Fund.

(a) The Master Trustee shall establish, maintain and hold in trust a separate fund designated as the "New Commitments Fund," and within said fund one or more separate accounts as directed by Green Bank from time to time, and administer said fund and such accounts as set forth in this Section 4.08.

(b) The Master Trustee shall deposit into the New Commitments Fund, as and when such amounts are received, (i) all amounts delivered by or at the direction of Green Bank to the Master Trustee for deposit therein, and (ii) any other amounts required to be deposited therein pursuant to this Master Indenture and any Related Supplement.

(c) Investment earnings on amounts on deposit in the New Commitments Fund shall be retained therein.

(d) At the written direction of Green Bank, the Master Trustee shall transfer from the New Commitments Fund the amount set forth in such written direction (i) to the Person or Persons set forth in such written direction for the purpose of funding all or a portion of a Green Bank program funding commitment, or (ii) to the Revenue Fund an amount equal to the difference between the amount on deposit in the Revenue Fund and the amount of all payments to be made

therefrom described in Section 4.03 coming due during such calendar month; provided that the Master Trustee shall transfer such additional amounts to the Revenue Fund as indicated pursuant to the written direction of Green Bank.

Section 4.09 Surplus Fund.

(a) The Master Trustee shall establish, maintain and hold in trust a separate fund designated as the "Surplus Fund," and within said fund one or more separate accounts as directed by Green Bank from time to time, and administer said fund and such accounts as set forth in this Section 4.09.

(b) The Master Trustee shall deposit into the Surplus Fund, as and when such amounts are received, (i) all amounts delivered by or at the direction of Green Bank to the Master Trustee for deposit therein, and (ii) any other amounts required to be deposited therein pursuant to this Master Indenture and any Related Supplement.

(c) Investment earnings on amounts on deposit in the Surplus Fund shall be retained therein.

(d) On the second Business Day immediately preceding the first day of each calendar month, to the extent there are insufficient funds on deposit in the Excess Revenue Fund to make any transfer required pursuant to Section 4.07(d) hereof, the Master Trustee shall withdraw from the Surplus Fund and transfer to the Revenue Fund an amount equal to the difference between the amount required to be transferred to the Revenue Fund pursuant to Section 4.07(d) hereof and the amount, if any, actually transferred to the Revenue Fund pursuant to Section 4.07(d).

(e) At the written direction of Green Bank, the Master Trustee shall transfer from the Surplus Fund the amount set forth in such written direction (i) to the fund or account hereunder, including the New Commitments Fund, set forth in such written direction, or (ii) to Green Bank free and clear of the lien of this Master Indenture to be used for any lawful and proper corporate purposes of Green Bank.

Section 4.10 Loan Repayment Fund.

(a) The Master Trustee shall establish, maintain and hold in trust a separate fund designated as the "Loan Repayment Fund," and within said fund one or more separate accounts as directed by Green Bank from time to time, and administer said fund and such accounts as set forth in this Section 4.10.

(b) The Master Trustee shall deposit into the Loan Repayments Fund, as and when such amounts are received, (i) all amounts delivered by or at the direction of Green Bank to the Master Trustee for deposit therein, and (ii) any other amounts required to be deposited therein pursuant to this Master Indenture and any Related Supplement.

(c) Investment earnings on amounts on deposit in the Loan Repayment Fund shall be retained therein.

(d) At the written direction of Green Bank, the Master Trustee shall transfer from the Loan Repayment Fund the amount set forth in such written direction (i) to the Person or Persons set forth in such written direction for the purpose of paying the principal of or interest on any Loan or Loans, or (ii) to the Revenue Fund to make Required Payments as such payments become due (whether by maturity, redemption, acceleration or otherwise), and, if such amounts shall not be sufficient to pay in full all such payments due on any date, then to the payment of Required Payments ratably without any priority or preference.

Section 4.11. Redemption Fund

(a) The Master Trustee shall establish, maintain and hold in trust a separate fund designated as the "Redemption Fund," and within said fund one or more separate accounts as directed by Green Bank from time to time, and administer said fund and such accounts as set forth in this Section 4.11.

(b) The Master Trustee shall deposit into the Redemption Fund, as and when such amounts are received, (i) all amounts delivered by or at the direction of Green Bank to the Master Trustee for deposit therein, and (ii) any other amounts required to be deposited therein pursuant to this Master Indenture and any Related Supplement.

(c) Investment earnings on amounts on deposit in the Redemption Fund shall be retained therein.

(d) At the written direction of Green Bank, the Master Trustee shall transfer from the Redemption Fund the amount set forth in such written direction to the purchase of Obligations at prices not exceeding the redemption price thereof applicable on the next redemption date plus accrued interest to such next redemption date (such redemption date shall be the earliest date upon which Obligation are subject to redemption from such amounts) or to the redemption of Obligations pursuant to Article V hereof.

Section 4.12 Subordinated Indebtedness Fund [More detail to follow]

(a) The Master Trustee shall establish, maintain and hold in trust a separate fund designated as the "Subordinated Indebtedness Fund," and within said fund one or more separate accounts as directed by Green Bank from time to time, and administer said fund and such accounts as set forth in this Section 4.12.

(b) The Master Trustee shall deposit into the Subordinated Indebtedness Fund, as and when such amounts are received, (i) all amounts delivered by or at the direction of Green Bank to the Master Trustee for deposit therein, (ii) all amounts delivered for a Donor Program to the Master Trustee for deposit therein, and (iii) any other amounts required to be deposited therein pursuant to this Master Indenture and any Related Supplement.

(c) Investment earnings on amounts on deposit in the Subordinate Indebtedness Fund shall be retained therein.

(d) At the written direction of Green Bank, the Master Trustee shall transfer from the Subordinate Indebtedness Fund the amount set forth in such written direction for Loans to the

Person or Persons set forth in such written direction for any other purpose permitted under the agreement governing such Loans.

Section 4.13 Rebate Fund

(a) With respect to the Obligations sold under this Master Indenture, the Master Trustee shall, as provided in a Certificate of an Authorized Representative, deposit to the Rebate Fund any moneys (i) held by it under any funds or accounts pursuant to this Master Indenture, (ii) delivered to it by any qualified person for deposit in the Rebate Fund, or (iii) transferred or paid to it by Green Bank in accordance with the provisions of this Section 4.13 for deposit therein. An Authorized Representative of Green Bank shall make such deposit to the Rebate Fund and at such times and in such amounts as shall be set forth in a written determination by an Authorized Representative as necessary to comply with the Code with respect to the Obligations. Green Bank, by written direction to the Master Trustee, shall cause to be transferred at such times such amounts from any legally available funds of Green Bank as an Authorized Representative of Green Bank shall determine to be necessary to comply with the Code with the respect to such Obligations.

(b) Moneys on deposit in the Rebate Fund shall, as provided in a Certificate of an Authorized Representative, be applied to pay Rebate Amounts to the Department of the Treasury of the United States of America at such times as may be set forth in the Certificate of an Authorized Representative. At any time and from time to time, moneys which Green Bank determines to be in excess of the amount required to be so paid shall, as provided in a Certificate of an Authorized Representative, be deposited to any fund or account held pursuant to this Master Indenture or paid to Green Bank, in accordance with the directions of such Authorized Representative of Green Bank.

Section 4.14 Costs of Issuance Fund.

(a) The Master Trustee shall establish, maintain and hold in trust a separate fund designated as the "Costs of Issuance Fund," and within said fund one or more separate accounts as directed by Green Bank from time to time, and administer said fund and any such accounts as set forth in this Section 4.14.

(b) The Master Trustee shall deposit into the Costs of Issuance Fund, as and when such amounts are received, (i) all amounts delivered by or at the direction of Green Bank to the Master Trustee for deposit therein, and (ii) any other amounts required to be deposited therein pursuant to a Related Supplement.

(c) Amounts on deposit in the Costs of Issuance Fund or any subaccount therein may be invested as permitted under Section 4.15. Investment earnings on amounts on deposit in the Costs of Issuance Fund or any subaccount therein shall be retained therein.

(d) At the written direction of Green Bank, the Master Trustee shall transfer from the Costs of Issuance Fund the amount set forth in such written direction to the Person or Persons set forth in such written direction.

Section 4.15 Investment of Moneys.

(a) Except as otherwise provided in a Related Supplement, all moneys in any of the funds and accounts established pursuant to this Master Indenture and held by the Master Trustee shall be invested by the Master Trustee at the written direction of Green Bank solely in Permitted Investments maturing not later than the date on which it is estimated that such moneys will be required for the purposes specified in this Master Indenture. Permitted Investments purchased under any investment agreement may be deemed to mature on the date or dates on which the Master Trustee may redeem such Permitted Investments under such agreement.

(b) The Master Trustee may sell at the best price obtainable, or present for redemption, any Permitted Investments so purchased whenever it shall be necessary to provide moneys to meet any required payment, transfer, withdrawal or disbursement from the fund or account to which such Investment Security is credited, and, subject to the provisions of this Master Indenture, the Master Trustee shall not be liable or responsible for any loss resulting from any investment made in accordance with provisions of this Master Indenture.

(c) Any Permitted Investments that are registrable securities shall be registered in the name of the Master Trustee.

(d) If the Master Trustee has not received written investment directions from Green Bank with respect to any moneys, such moneys shall be deposited in the Master Trustee's money market deposit account, provided that such qualifies as a Permitted Investment. All income earned on investments of moneys in the funds and accounts shall be treated as income of Green Bank for federal income tax purposes.

ARTICLE V

REDEMPTION OF OBLIGATIONS

The provisions contained in the following Sections of this Article V are applicable to the Obligations issued pursuant to this Master Indenture.

Section 5.01 Privilege of Redemption and Redemption Price. Obligations subject to redemption prior to maturity shall be redeemable, upon notice as provided in this Article, at such times, at such redemption prices and upon such terms as may be specified in this Master Indenture.

Section 5.02 Redemption at the Election of Green Bank. In the case of any redemption of Obligations otherwise than as provided in Section 5.03 or the Obligations, Green Bank shall, as provided in a Certificate of an Authorized Representative, give written notice to the Master Trustee of the election so to redeem, of the redemption date, of the principal amounts of the Obligations to be redeemed (principal amounts thereof to be redeemed shall be determined by Green Bank in its sole discretion) and whether such notice and such redemption are unconditional or conditional on funds being available on the redemption date to pay the redemption price. Such notice shall be given to the Master Trustee at least thirty (30) days prior to the redemption date.

Section 5.03 Redemption Other Than at Green Bank Election. Whenever by the terms of this Master Indenture Obligations are required to be redeemed otherwise than at the election of Green Bank, the Master Trustee shall select the Obligations to be redeemed, in any manner which the Master Trustee may determine, give the notice of redemption and apply the moneys available

therefor to redeem on the redemption date at the redemption price therefor, together with accrued interest to the redemption date, of the Obligations to be redeemed.

Section 5.04 Notice of Redemption. The Master Trustee shall give notice, in the name of Green Bank, of the redemption of such Obligations, which notice shall specify the Obligations to be redeemed, the redemption date and the place or places where amounts due upon such redemption will be payable and, if less than all of the Obligations are to be redeemed, the numbers or other distinguishing marks of such Obligations so to be redeemed. Such notice shall further state whether the notice and the redemption are unconditional or conditional; if unconditional, that on such date there shall become due and payable upon each Obligation to be redeemed the redemption price thereof, together with interest accrued to the redemption date; if conditional, that on such date that, if there shall be sufficient funds available to effect such redemption on the redemption date, there shall become due and payable upon each Obligation to be redeemed the redemption price thereof, together with interest accrued to the redemption date, and, in either case, that if there shall be sufficient funds available to effect such redemption on the redemption date, then from and after such date interest thereon shall cease to accrue and be payable. The Master Trustee shall mail a copy of such notice by first class mail, postage prepaid, not less than twenty (20) days before the redemption date, to the owners of the Obligations which are to be redeemed, at their last addresses appearing upon the registry books.

Section 5.05 Payment of Redeemed Obligations. Notice having been given in the manner provided in Section 5.04, if there shall be sufficient funds available to effect such redemption on the redemption date, the Obligations so called for redemption shall become due and payable on the redemption date so designated at the redemption price, plus interest accrued and unpaid to the redemption date, and, upon presentation and surrender thereof at the office specified in such notice such Obligations shall be paid at the redemption price plus interest accrued and unpaid to the redemption date. If, on the redemption date, moneys for the redemption of all the Obligations and maturity to be redeemed together with interest to the redemption date, shall be held by the Master Trustee as to be available therefor on said date and if notice of redemption shall have been given as aforesaid, then, from and after the redemption date interest on the Obligations so called for redemption shall cease to accrue and become payable. If said moneys shall not be so available on the redemption date, such Obligations or portions thereof shall continue to bear interest until paid at the same rate as they would have borne had they not been called for redemption.

ARTICLE VI

REPRESENTATIONS AND COVENANTS OF GREEN BANK

Green Bank represents, covenants and agrees with the Master Trustee and the holders of the Obligations as follows:

Section 6.01 Payment of Obligations. Green Bank shall duly and punctually pay or cause to be paid, solely from the Trust Estate pledged hereunder for such payments, the Required

Payments or redemption price of every Obligation, at the dates and places and in the manner stated in the Obligations.

Section 6.02 Offices for Servicing Obligations. Green Bank shall at all times maintain an office or agency where Obligations may be presented for registration, transfer or exchange, and where notices, presentations and demands upon Green Bank in respect of the Obligations or of this Master Indenture may be served. Green Bank hereby appoints the Master Trustee as its agent to maintain such office or agency for the registration, transfer or exchange of Obligations and for the service of such notices, presentations and demands upon Green Bank.

Section 6.03 Further Assurance. At any and all times, Green Bank shall, so far as each may be authorized by law, pass, make, do, execute, acknowledge and deliver, all and every such further resolutions, acts, deeds, conveyances, assignments, transfers and assurances as may be necessary or desirable for the better assuring, conveying, granting, pledging, assigning and confirming all and singular, the rights, assets, revenues and other moneys, securities, funds and property hereby pledged or assigned, or intended so to be, or which Green Bank, may become bound to pledge or assign.

Section 6.04 Power to Issue Obligations and Pledge Revenues. Green Bank is duly authorized under the Act and all applicable laws to authorize and issue and deliver the Obligations. Green Bank is duly authorized to execute and enter into this Master Indenture and to pledge the Revenues and assets purported to be pledged and assigned hereby in the manner and to the extent herein provided. Except to the extent permitted under this Master Indenture, the Revenues and assets so pledged and assigned are and will be free and clear of any pledge, lien, charge or encumbrance thereon or with respect thereto prior to, or of equal rank with, the pledge created hereby and all corporate or other action on the part of Green Bank to that end has been and will be duly and validly taken. The Obligations are and will be the valid and legally enforceable obligations of Green Bank in accordance with their terms and the terms of this Master Indenture. Green Bank shall at all times, to the extent permitted by law, defend, preserve and protect the pledge of the Revenues and other assets, including rights herein pledged and assigned under this Master Indenture and all the rights of the Holders under this Master Indenture against all claims and demands of all persons whomsoever. Green Bank shall not take any action or permit any action to be taken (unless taken by the State), to dissolve Green Bank.

Section 6.05 Tax Covenants.

(a) Green Bank shall not permit at any time or times any of the proceeds of the Obligations the interest on which is excluded from gross income for federal income tax purposes under Section 103 of the Code, or any other funds of Green Bank to be used directly or indirectly to acquire any securities or obligations the acquisition of which would cause any Obligation to be an "arbitrage bond" as defined in Section 148 of the Code.

(b) Green Bank shall not permit at any time or times any proceeds of the Obligations the interest on which is excluded from gross income for federal income tax purposes under Section 103 of the Code, or any other funds of Green Bank to be used, directly or indirectly, in a manner which would result in the loss of the exemption of interest from gross income of the Holders thereof.

Section 6.06 Accounts and Periodical Reports and Certificates. Green Bank shall keep or cause to be kept proper books of record and account (separate from all other records and accounts) in which complete and correct entries shall be made of its transactions under this Master Indenture and which, together with all other books and papers of Green Bank, shall at all reasonable times be subject to the inspection of the Master Trustee, the State or the representative, duly authorized in writing, of the Holder or Holders of not less than 25% in principal amount of the Obligations then Outstanding.

Section 6.07 Indebtedness and Liens. Green Bank shall not issue any Obligations, notes or other evidences of indebtedness, other than the Obligations, secured by a pledge of or other lien or charge on the Revenues and shall not create or cause to be created any lien or charge on such Revenues or on any amounts held by the Master Trustee under this Master Indenture; but this Section shall not prevent Green Bank from issuing notes payable from the proceeds of Obligations or notes or other obligations for the corporate purposes of Green Bank payable out of, or secured by a pledge of, Revenues to be derived on and after such date if the pledge of the Revenues provided in this Master Indenture shall be discharged and satisfied as provided in Article XI.

Section 6.08 General. Green Bank shall do and perform or cause to be done and performed all acts and things required to be done or performed by or on behalf of them under the provisions of the Act and this Master Indenture in accordance with the terms of such provisions.

Section 6.09 Agreement of Green Bank. Green Bank agrees that it will not in any way impair the rights and remedies of Holders until the Obligations, together with the interest thereon, and all costs and expenses in connection with any action or proceeding by or on behalf of such holders, are fully met and discharged.

Section 6.10 State Not to Impair Obligations of Green Bank. Pursuant to the Act, the State has pledged to and agreed with the Holders of Obligations issued under this Master Indenture pursuant to the Act, and with those parties who may enter into contracts with Green Bank or its successor agency pursuant to the Act, that the State will not limit or alter the rights vested in Green Bank until such Obligations, together with the interest thereon, are fully met and discharged and such contracts are fully performed on the part of Green Bank, provided nothing contained in this Section shall preclude such limitation or alteration if and when adequate provisions shall be made by law for the protection of the Holders described in this Section or those entering into such contracts with Green Bank.

ARTICLE VII

AMENDMENTS

Section 7.01 Supplemental Indentures Without Affirmative Consent of Holders. Notwithstanding any other provisions of this Article VII, Green Bank and the Master Trustee may at any time or from time to time, upon giving not less than 30 days' notice to the Holders that, if not disapproved by all the Holders within ten days, shall be deemed approved, enter into any

Supplemental Indenture so as to modify or amend this Master Indenture for one or more of the following purposes:

To add to the covenants and agreements of Green Bank contained in this Master Indenture, other covenants and agreements thereafter to be observed relative to the application, custody, use and disposition of the proceeds of the Obligations; or

To confirm, as further assurance, any pledge under and the subjection to any lien on or pledge of the Revenues created or to be created by this Master Indenture; or

To cure any ambiguity, supply any omission, or cure or correct any defect or inconsistent provision in this Master Indenture, unless such modification would result in a material reduction of the rights or interests of the Holder under this Master Indenture; or

To grant to or confer on the Master Trustee for the benefit of the Holders any additional rights, remedies, powers, or security that Green Bank may lawfully be granted or conferred and which are not contrary to or inconsistent with this Master Indenture as theretofore in effect; or

To amend any provisions of this Master Indenture if, prior to the execution of any such amendment there shall be delivered to the Master Trustee a Bond Counsel's Opinion to the effect that such amendment will not have a material adverse effect on the security, remedies or rights of the Holders.

Section 7.02 Supplemental Indentures With Consent of Holders.

(a) At any time or from time to time but subject to the conditions or restrictions contained in this Master Indenture, a Supplemental Indenture may be entered into by Green Bank and the Master Trustee amending or supplementing this Master Indenture or releasing Green Bank from any of the obligations, covenants, agreements, limitations, conditions or restrictions therein contained. However, except as set forth in Section 7.01, no such Supplemental Indenture shall be effective unless such Supplemental Indenture is approved or consented to by the Holders, obtained as provided in this Article VII, of not less than a majority of the principal amount of all Outstanding Obligations affected thereby. In computing any such required percentage there shall be excluded from such consent, and from such Outstanding Obligations, any such Outstanding Obligations owned or held by or for the account of the Green Bank.

(b) Notwithstanding the provisions of paragraph (a) of this Section, except as provided in Section 7.03, no such modification changing any terms of redemption of Obligations, due date of principal of or interest on Obligations or making any reduction in principal or redemption price of and interest on any Obligations shall be made without the consent of the affected Holder.

(c) Notwithstanding any other provisions of this Section, no Supplemental Indenture shall be entered into by Green Bank and the Master Trustee, except as provided in Section 7.03, reducing the percentage of consent of Holders required for any modification of this Indenture or diminishing the pledge of the Revenues securing the Obligations.

Section 7.03 Supplemental Indentures By Unanimous Action. Notwithstanding anything contained in the foregoing provisions of this Article VII, the rights and obligations of Green Bank and of the owners of the Obligations and the terms and provisions of this Master Indenture, any Supplemental Indenture or the Obligations may be modified or amended in any respect upon the execution and delivery of a Supplemental Indenture by Green Bank and the Master Trustee with the consent of the holders of all the Outstanding Obligations affected by such modification or amendment, such consent to be given as provided in this Article VII.

Section 7.04 General Provisions.

(a) This Master Indenture shall not be modified or amended in any respect except as provided herein. Nothing in this Article VII shall affect or limit the right or obligation of Green Bank to make, do, execute, acknowledge or deliver any Master Indenture, act or other instrument pursuant to the provisions of this Article VII or the right or obligation of Green Bank to execute and deliver to any Master Trustee any instrument which elsewhere in this Master Indenture it is provided shall be delivered to said Master Trustee.

(b) Any Supplemental Indenture referred to and permitted or authorized by Sections 7.01 may be executed and delivered by Green Bank and the Master Trustee without the consent of any of the Holders, but shall become effective only on the conditions, to the extent and at the time provided in said Section. The copy of every Supplemental Indenture filed with the Master Trustee shall be accompanied by a Bond Counsel's Opinion stating that such Supplemental Indenture has been duly and lawfully delivered in accordance with the provisions of this Master Indenture, is authorized or permitted by this Master Indenture, is valid and binding upon Green Bank and if the interest on any Obligations issued hereunder are excluded from gross income for federal income tax purposes under Section 103 of the Code, such Supplemental Indenture shall not result in the loss of the exemption of interest from gross income of the Holders thereof.

(c) The Master Trustee is hereby authorized to enter into any Supplemental Indenture referred to and permitted or authorized by Section 7.01, 7.02 and 7.03 and to make all further agreements and stipulations which may be therein contained, and the Master Trustee, in taking such action, shall be fully protected in conclusively relying on an opinion of counsel (which may be a Bond Counsel's Opinion) that such Supplemental Indenture is authorized or permitted by the provisions of this Master Indenture.

(d) No Supplemental Indenture shall change or modify any of the rights or obligations of any Master Trustee without its written consent thereto.

ARTICLE VIII

CONSENTS

Section 8.01 Consent of Holders. When Green Bank and the Master Trustee enter into a Supplemental Indenture making a modification or amendment permitted by and requiring the consent of the Holders pursuant to the provisions of Section 7.03, such Supplemental Indenture shall take effect when and as provided in this Section. Upon the execution of such Supplemental

Indenture, a copy thereof, certified by an Authorized Officer of the Green Bank, shall be filed with the Master Trustee for the inspection of the Holders affected. A copy of such Supplemental Indenture (or summary thereof) together with a request to such Holders for their consent thereto, shall be mailed or caused to be mailed by Green Bank to such Holders. Such Supplemental Indenture shall not be effective unless and until there shall have been filed with the Master Trustee the written consents of the percentages of owners of Outstanding Obligations in accordance with Section 7.03. Each such consent shall be effective only if accompanied by proof of ownership of the Obligations for which such consent is given. A certificate or certificates by the Master Trustee, which shall be placed on file, that it examined such proof and that such proof is sufficient, shall be conclusive evidence that the consents have been given by the owners of the Obligations described in such certificate or certificates of the Master Trustee. Any consent shall be binding upon the owner of the Obligations giving such consent and on any subsequent owner of such Obligations (whether or not such owner has notice thereof) unless such consent is revoked in writing by the owner of such Obligations giving such consent or a subsequent owner by filing revocation with the Master Trustee prior to the date when the notice hereinafter in this Section provided for is first given. The fact that consent has not been revoked may likewise be proved by a certificate of the Master Trustee which shall be placed on file. At any time after the owners of the required percentage of Obligations shall have filed their consent to any Supplemental Indenture a notice shall be given or caused to be given to such Holders by Green Bank by mailing such notice to such Holders (but failure to mail such notice shall not prevent such Supplemental Indenture from becoming effective and binding as herein provided). Green Bank shall file with the Master Trustee proof of giving such notice. Such notice shall state in substance that any Supplemental Indenture (which may be referred to as an indenture executed by and between Green Bank and the Master Trustee on a stated date, a copy of which is on file with the Master Trustee) has been consented to by the owners of the required percentage of Obligations and shall be effective as provided in this Section. A record, consisting of the papers required or permitted by this Section to be filed with the Master Trustee, shall be proof of the matters therein stated. Upon such notice, such Supplemental Indenture making such amendment or modification shall become effective and conclusively binding upon Green Bank, the Master Trustee, and the owners of all Obligations. Any papers, documents and instruments required under this Article VIII may be delivered electronically [… more detail to follow].

Section 8.02 Exclusion of Obligations. Obligations owned or held by or for the account of Green Bank shall not be deemed Outstanding Obligations for the purpose of any consent or other action or any calculation of Outstanding Obligations provided for in this Article VIII, and shall not be entitled to consent or take any other action provided for in this Article VIII. At the time of any consent or other action taken under Article VII, Green Bank shall furnish the Master Trustee a certificate signed by an Authorized Officer, upon which the Master Trustee may conclusively rely, describing all Obligations so to be excluded.

Section 8.03 Notation on Obligations. Obligations authenticated and delivered after the effective date of any action taken as in this Article VIII shall bear a notation by endorsement or otherwise in form approved by Green Bank as to such action, and in that case upon demand of the holder of any Obligation Outstanding at such effective date and presentation of such holder's Obligation for the purpose at the designated office of the Master Trustee or upon any registration of transfer or exchange of any Obligation Outstanding at such effective date, suitable notation shall be made on such Obligation or upon any Obligation issued upon any such registration of transfer

or exchange by the Master Trustee as to any such action. If Green Bank shall so determine, new Obligations so modified as in the opinion of Green Bank to conform to such action shall be prepared, authenticated and delivered, and upon demand of the holder of any Obligation then Outstanding shall be exchanged for Obligations of the same maturity then Outstanding, upon surrender of such Obligations with all unpaid coupons, if any, appertaining thereto.

ARTICLE IX

DEFAULTS; REMEDIES ON DEFAULT

Section 9.01 Events of Default. If one or more of the following events (in this Master Indenture called "Events of Default") shall occur:

(1) a default in the due and punctual payment of any Required Payment or the redemption price of any Obligation when and as the same shall become due and payable, whether at maturity or upon call for redemption, or otherwise; or

(2) default by Green Bank in the performance or observance of any other of its covenants, agreements or conditions in this Master Indenture, and such default shall continue for a period of thirty (30) days after the giving of written notice thereof stating that such notice is a "Notice of Default" to Green Bank by the Master Trustee, or to Green Bank and to the Master Trustee by the Holders of not less than a majority in principal amount of the Obligations Outstanding,

then, upon the happening and continuance of any Event of Default, the Master Trustee may, and upon the written request of the Holders of not less than a majority in principal amount of the Obligations Outstanding, the Master Trustee shall, in any such case, subject to Section 9.04 hereof, proceed, in its own name, to protect and enforce the rights of the Holders by such of the following remedies, as the Master Trustee, being advised by counsel, shall deem most effectual to protect and enforce such rights:

(1) by mandamus or other suit, action or proceeding at law or in equity, to enforce all rights of the Holders, including the right to require Green Bank to receive and collect revenues, including the Revenues, adequate to carry out the covenants and agreements as to, and the pledge of, such Revenues, and to require Green Bank to carry out any other covenants or agreements with Holders and to perform its duties under the Act;

(2) by bringing suit upon the Obligations;

(3) by action or suit in equity, to require Green Bank to account as if it were the Master Trustee of an express trust for the Holders; and

(4) by action or suit in equity, to enjoin any acts or things which may be unlawful or in violation of the rights of the Holders.

Section 9.02 Accounting and Examination of Records After Default.

(a) Green Bank covenants that if an Event of Default shall have happened and shall not have been remedied, the books of record and account of Green Bank shall at all times be subject to the inspection and use of the Master Trustee and of its agents and attorneys.

(b) Green Bank covenants that if an Event of Default shall happen and shall not have been remedied, Green Bank, upon demand of the Master Trustee, will account, as if they were the Master Trustee of an express trust, for all Revenues and other moneys, securities and funds pledged or held under this Master Indenture for such period as shall be stated in such demand.

Section 9.03 Application of Revenues and Other Moneys After Default.

(a) Green Bank covenants that if an Event of Default shall occur and shall not have been remedied, Green Bank, upon demand of the Master Trustee, shall pay over or cause to be paid over to the Master Trustee (i) forthwith, any moneys, securities and funds then held by Green Bank in any Fund or Account established under this Master Indenture (other than the Rebate Fund and the Administrative Account within the Revenue Fund) and (ii) as promptly as practicable after receipt thereof, the Revenues.

(b) During the continuance of an Event of Default, unless otherwise directed by the owners of a majority in principal amount of the Obligations at the time Outstanding, the Master Trustee shall apply such Revenues and the income therefrom as follows and in the following order:

(1) to the payment of the reasonable and proper charges and expenses of the Master Trustee and its counsel;

(2) to the payment of the Required Payments or redemption price then due on the Obligations, as follows:

(i) unless the principal of all of the Obligations shall be due and payable,

First: To the payment to the persons entitled thereto of all installments of interest then due in the order of the maturity of such installments, and, if the amount available shall not be sufficient to pay in full any installment or installments maturing on the same date, then to the payment thereof ratably, according to the amounts due thereon, to the persons entitled thereto, without any discrimination or preference; and

Second: To the payment to the persons entitled thereto of the unpaid principal or redemption price of any Obligations which shall have become due, whether at maturity or by call for redemption, in the order of their due dates, and, if the amount available shall not be sufficient to pay in full all the Obligations due on any date, then to the payment thereof ratably, according to the amounts of principal or redemption price due on such date, to the persons entitled thereto, without any discrimination or preference.

(ii) If the principal of all of the Obligations shall be due and payable, to the payment of the principal and interest then due and unpaid upon the Obligations without preference or priority of principal over interest or of interest over principal, or of any installment of interest over any other installment of interest, or of any Obligation over any other Obligation, ratably, according to the amounts due respectively for principal, interest and net interest on notional amounts, to the persons entitled thereto, without any discrimination or preference.

(c) if and when all overdue installments of interest on all Obligations, together with the reasonable and proper charges and expenses of the Master Trustee and its counsel, and all other sums payable by Green Bank under this Master Indenture, including the principal and redemption price of and accrued unpaid interest on all Obligations which shall then be payable by declaration or otherwise, shall either be paid by or for the account of Green Bank, and all defaults under this Master Indenture or the Obligations shall be made good or secured, the Master Trustee shall pay over to Green Bank all such Revenues then remaining unexpended in the hands of the Master Trustee (except Revenues deposited or pledged, or required by the terms of this Master Indenture to be deposited or pledged, with the Master Trustee), and thereupon Green Bank and the Master Trustee shall be restored, respectively, to their former positions and rights under this Master Indenture, and all Revenues shall thereafter be applied as provided in Article IV. No such payment over to Green Bank by the Master Trustee or resumption of the application of Revenues as provided in Article IV shall extend to or affect any subsequent default under this Master Indenture or impair any right consequent thereon.

Section 9.04 Proceedings Brought by Master Trustee.

(a) If an Event of Default shall occur and shall not have been remedied, then and in every such case, the Master Trustee, by its agents and attorneys, may proceed to protect and enforce its rights and the rights of the Holders of the Obligations under this Master Indenture forthwith by a suit or suits in equity or at law, whether for the specific performance of any covenant herein contained, or in aid of the execution of any power herein granted, or for an accounting against Green Bank as if it were the Master Trustee of an express trust, or in the enforcement of any other legal or equitable right as the Master Trustee, being advised by counsel, shall deem most effectual to enforce any of its rights or to perform any of its duties under this Indenture.

(b) All rights of action under this Master Indenture may be enforced by the Master Trustee without the possession of any of the Obligations or the production thereof at the trial or other proceedings, and any such suit or proceedings instituted by the Master Trustee shall be brought in its name.

(c) The Holders of a majority in principal amount of the Obligations at the time Outstanding, may direct by instrument in writing the time, method and place of conducting any proceeding for any remedy available to the Master Trustee, or exercising any trust or power conferred upon the Master Trustee, provided that the Master Trustee shall have the right to decline to follow any such direction if the Master Trustee shall be advised by counsel that the action or proceeding so directed may not lawfully be taken, or if the Master Trustee in good faith shall determine that the action or proceeding so directed would subject the Master Trustee to personal liability or be unjustly prejudicial to the Holders not parties to such direction.

(d) Upon commencing a suit in equity or upon other commencement of judicial proceedings by the Master Trustee to enforce any right under this Master Indenture, the Master Trustee shall be entitled to exercise any and all rights and powers conferred in this Indenture and provided to be exercised by the Master Trustee upon the occurrence of an Event of Default; and, as a matter of right against Green Bank, without notice or demand and without regard to the adequacy of the security for the Obligations, the Master Trustee shall, to the extent permitted by law, be entitled to the appointment of a receiver of the moneys, securities and funds then held by Green Bank in any Fund or Account established under this Master Indenture (other than the Rebate Fund and the Administrative Account within the Revenue Fund) and, subject to application of the Revenues, with all such powers as the court or courts making such appointment shall confer; but notwithstanding the appointment of any receiver, the Master Trustee shall be entitled to retain possession and control of and to collect and receive income from, any moneys, securities and funds deposited or pledged with it under this Master Indenture or agreed or provided to be delivered or pledged with it under this Master Indenture.

(e) Regardless of the happening of an Event of Default, the Master Trustee shall have the power to, but (unless requested in writing by the Holders of a majority in principal amount of the Obligations then Outstanding, and furnished with security and indemnity satisfactory to it) shall be under no obligation to, institute and maintain such suits and proceedings as it may be advised shall be necessary or expedient to prevent any impairment of the security under this Master Indenture by any acts which may be unlawful or in violation of this Master Indenture, and such

suits and proceedings as the Master Trustee may be advised shall be necessary or expedient to preserve or protect its interests and the interests of the Holders.

Section 9.05 Restriction on Holders' Action.

(a) No holder of any Obligation shall have any right to institute any suit, action or proceeding at law or in equity for the enforcement of any provision of this Master Indenture or the execution of any trust under this Master Indenture or for any remedy under this Master Indenture, unless such holder shall have previously given to the Master Trustee written notice of the happening of an Event of Default, as provided in this Article, and the holders of at least a majority in principal amount of the Obligations then Outstanding shall have filed a written request with the Master Trustee, and shall have offered it reasonable opportunity, either to exercise the powers granted in this Section or to institute such action, suit or proceeding in its own name, and unless such holders shall have offered to the Master Trustee adequate security and indemnity against the costs, expenses and liabilities to be incurred therein or thereby, and the Master Trustee shall have refused to comply with such request within a reasonable time; it being understood and intended that no one or more holders of Obligations shall have any right in any manner whatever by his/her or their action to affect, disturb or prejudice the pledge created by this Indenture, or to enforce any right under this Master Indenture, except in the manner therein provided; and that all proceedings at law or in equity to enforce any provision of this Master Indenture shall be instituted, had and maintained in the manner provided in this Master Indenture and for the equal benefit of all holders of the Outstanding Obligations.

(b) Nothing in this Master Indenture or in the Obligations contained shall affect or impair the obligation of Green Bank, which is absolute and unconditional, to pay at the respective dates of maturity and places therein expressed the principal of and interest on the Obligations to the respective holders thereof from the Trust Estate, or affect or impair the right of action, which is also absolute and unconditional, of any holder to enforce such payment of an Obligation. Notwithstanding the preceding sentence and anything in this Master Indenture or in the Obligations contained, Green Bank shall not be required to advance any moneys derived from any source other than the Revenues and assets pledged under this Master Indenture for any of the purposes in this Master Indenture mentioned whether for the payment of the principal of or the redemption price, if any, or interest on the Obligations or for any other purpose of this Master Indenture.

Section 9.06 Remedies Not Exclusive. No remedy by the terms of this Master Indenture conferred upon or reserved to the Master Trustee or the Holders is intended to be exclusive of any other remedy, but each and every such remedy shall be cumulative and shall be in addition to every other remedy given under this Master Indenture or existing at law or in equity or by statute on or after the date of adoption of this Master Indenture.

Section 9.07 Effect of Waiver and Other Circumstances.

(a) No delay or omission of the Master Trustee or of any Holder to exercise any right or power arising upon the happening of an Event of Default shall impair any right or power or shall be construed to be a waiver of any such default or to be an acquiescence therein; and every power and remedy given by this Article to the Master Trustee or to the Holders may be exercised

from time to time and as often as may be deemed expedient by the Master Trustee or by the Holders.

(b) The holders of a majority in principal amount of the Obligations at the time Outstanding, or their attorneys-in-fact duly authorized, may on behalf of the holders of all of the Obligations waive any past default under this Master Indenture and its consequences, except a default in the payment of interest on or principal or redemption price of the Obligations. No such waiver shall extend to any subsequent or other default or impair any right consequent thereon.

ARTICLE X

THE MASTER TRUSTEE

Section 10.01 Concerning the Master Trustee; Acceptance of Master Trustee. The Master Trustee hereby accepts and agrees to execute the trusts imposed upon it by this Master Indenture, but only upon the terms and conditions set forth in this Article and subject to the provisions of this Master Indenture, to all of which the parties hereto and the respective owners of the Obligations agree.

Section 10.02 Obligation of Master Trustee. The Master Trustee shall be under no obligation to institute any suit, or to take any action or proceeding under this Master Indenture or to enter any appearance or in any way defend in any suit in which it may be made defendant, or to take any steps in the execution of the trusts hereby created or in the enforcement of any rights and powers hereunder, including, without limitation, pursuant to the direction of, or on behalf of, any of the Holders, until it shall be paid or reimbursed or indemnified to its satisfaction against any and all reasonable costs and expenses, outlays, liabilities, damages and counsel fees and expenses and other reasonable disbursements. The Master Trustee may nevertheless begin suit, or appear in and defend suit, or do anything else in its judgment proper to be done by it as the Master Trustee, and in such case Green Bank shall reimburse the Master Trustee for all costs and expenses, outlays, liabilities, damages and counsel fees and expenses and other reasonable disbursements properly incurred in connection therewith. If Green Bank shall fail to make such reimbursement, the Master Trustee may reimburse itself from any moneys in its possession under the provisions of this Master Indenture (other than money on deposit in the Rebate Fund, or any money on deposit in any irrevocable trust or escrow fund established with respect to any defeased Obligations) upon notice to Green Bank of its intention to reimburse itself and the Master Trustee shall be entitled to a preference therefor over any of the Obligations Outstanding hereunder.

Section 10.03 Responsibilities of Master Trustee. (1) The recitals contained in this Master Indenture, any Supplemental Indenture and in the Obligations shall be taken as the statements of Green Bank and the Master Trustee assumes no responsibility for the correctness of the same. The Master Trustee makes no representations as to the validity or sufficiency of this Master Indenture, any Related Supplement or of the Obligations or in respect of the security afforded by this Master Indenture or any Related Supplement and the Master Trustee shall incur no responsibility in respect thereof. The Master Trustee shall be under no responsibility or duty with respect to: (i) the issuance of the Obligations for value; or (ii) the application of the proceeds

thereof except to the extent that such proceeds are received by it in its capacity as Master Trustee; or (iii) the application of any moneys paid to Green Bank or others in accordance with this Master Indenture except as to the application of any moneys paid to it in its capacity as Master Trustee; or (iv) the recording or rerecording, registration or reregistration, filing or refiling of this Master Indenture or any security documents contemplated thereby, provided, however, the Master Trustee shall be responsible for the filing of Uniform Commercial Code continuation statements; or (v) the validity of the execution by Green Bank of this Master Indenture; or (vi) compliance by Green Bank with the terms of this Master Indenture. The Master Trustee may require of the Green Bank full information and advice regarding the performance of the covenants, conditions and agreements contained in this Master Indenture. The Master Trustee shall not be liable in connection with the performance of its duties hereunder except for its own negligence, misconduct, or failure to comply with the provisions of this Master Indenture.

(b) Except as otherwise provided in this Master Indenture, the Master Trustee shall not be bound to recognize any person as a holder of any Obligation or to take action at such person's request, unless such person shall be the Holder of such Obligation. Any action duly taken by the Master Trustee pursuant to this Master Indenture upon the request, authority or consent of any person who at the time of making such request or giving such authority or consent is the Holder of any Obligation secured hereby shall be conclusive and binding upon all future Holders of such Obligation.

(c) The duties and obligations of the Master Trustee shall be determined by the express provisions of this Master Indenture, and the Master Trustee shall not be liable except for the performance of such duties and obligations as are specifically set forth in this Master Indenture. In the case of an event of default specified in Article ____ hereof, which event of default has not been cured or waived and of which the Master Trustee is deemed to have knowledge, the Master Trustee shall exercise such of the rights and powers vested in it by this Master Indenture and shall use the same degree of care and skill in its exercise thereof as a prudent person would exercise or use under the circumstances in the conduct of his or her own affairs.

(d) The Master Trustee shall not be charged with knowledge of any event hereunder unless an officer or administrator in the Master Trustee's corporate trust department has actual knowledge of such event.

(e) The Master Trustee, upon receipt of documents furnished to it by or on behalf of Green Bank pursuant to this Master Indenture, shall examine the same to determine whether or not such documents conform to the requirements of this Master Indenture.

(f) Except as otherwise expressly provided by the provisions of this Master Indenture, the Master Trustee shall not be obligated and may not be required to give or furnish any notice, demand, report, request, reply, statement, advice or opinion to the Holder of any Obligation and the Master Trustee shall not incur any liability for its failure or refusal to give or furnish the same unless obligated or required to do so by an express provision hereof. The Master Trustee shall not be liable for any action taken or omitted by it in good faith and believed by it to be authorized or within the discretion or rights or powers conferred upon it by this Master Indenture. The Master Trustee shall incur no liability in respect of any action taken or omitted by it in good faith without negligence in accordance with the direction of the Holder of the percentage of the Obligations

specified herein relating to the time, method and place of conducting any proceeding for any remedy available to the Master Trustee or exercising any trust or power conferred upon the Master Trustee under this Master Indenture.

(g) In the event the Master Trustee shall receive inconsistent or conflicting requests and indemnity from two or more groups of Holders, each representing less than a majority of the principal amount of the Obligations then Outstanding, the Master Trustee, in its sole discretion, may determine what action, if any, shall be taken.

(h) The Master Trustee shall not be liable for interest on any funds deposited with it hereunder, except as provided herein or as the Master Trustee may otherwise specifically agree in writing.

Section 10.04 Property Held in Trust. All moneys and securities held by the Master Trustee at any time pursuant to the terms of this Master Indenture shall be and hereby are assigned, transferred and set over unto the Master Trustee in trust for the purposes and under the terms and conditions of this Master Indenture.

Section 10.05 Evidence on Which Master Trustee May Act. The Master Trustee shall be protected in acting upon any notice, resolution, request, consent, order, certificate, report, opinion, bond or other paper or document believed by it to be genuine, and to have been signed or presented by the proper party or parties. The Master Trustee may consult with counsel of its selection, who may or may not be counsel to Green Bank, and may rely on an opinion of such counsel. Any such opinion of counsel shall be full and complete authorization and protection in respect of any action taken or suffered, or any action not taken, by it in good faith and in accordance therewith, and the Master Trustee shall not be liable for any action taken or omitted in good faith in reliance on such opinion of counsel. Whenever the Master Trustee shall deem it necessary or desirable that a matter be proved or established prior to taking or suffering or not taking any action under this Master Indenture, such matter (unless other evidence in respect thereof be hereby specifically prescribed) may be deemed to be conclusively proved and established by a certificate signed by an Authorized Representative of Green Bank. Such certificate shall be full warrant for any action taken or suffered, or any action not taken, in good faith under the provisions hereof, but the Master Trustee may (but shall not be required to) in addition thereto or in lieu thereof require or accept other evidence of such fact or matter or may require such further or additional evidence as it may deem reasonable. Except as otherwise expressly provided herein, any request, order, notice or other direction required or permitted to be furnished pursuant to any provision hereof by Green Bank to the Master Trustee shall be sufficiently executed if executed in the name of Green Bank by an Authorized Representative.

Section 10.06 Compensation and Indemnification. Unless otherwise provided by contract with the Master Trustee, Green Bank shall pay or cause to be paid to the Master Trustee after reasonable notice to Green Bank in light of the compensation sought to be received, reasonable compensation for all services rendered by it hereunder, including, if applicable, its services as registrar, paying agent and transfer agent, and also all its reasonable expenses, charges, counsel fees, expenses and other disbursements and those of its attorneys, agents, and employees, incurred in and about the performance of its powers and duties hereunder. Green Bank shall indemnify and save the Master Trustee harmless against any expenses and liabilities which it may incur in the

exercise and performance of its powers and duties hereunder which are not due to its negligence, misconduct or failure to comply with the provisions of this Master Indenture. None of the provisions contained in this Indenture shall require the Master Trustee to expend or risk its own funds or otherwise incur financial liability in the performance of any of its duties or in the exercise of any of its rights or powers. The obligations of Green Bank under this Section to compensate the Master Trustee, to pay or reimburse the Master Trustee for expenses, disbursements, charges and counsel fees and to indemnify and hold harmless the Master Trustee shall survive the satisfaction and discharge of this Master Indenture. The Master Trustee may, upon written notice to Green Bank, reimburse itself from any moneys in its possession under the provisions of this Master Indenture (other than monies on deposit in the Rebate Fund or any money on deposit in any irrevocable trust or escrow fund established with respect to any defeased Obligations) and shall be entitled to a preference therefor over any of the Obligations Outstanding hereunder.

Section 10.07 Permitted Acts. The Master Trustee may become the owner of or may deal in Obligations or may deal with Green Bank as fully and with the same rights as if it were not the Master Trustee. The Master Trustee may act as depository for, and permit any of its officers or directors to act as a member of, or in any other capacity with respect to, Green Bank or any committee formed to protect the rights of Holders or to effect or aid in any reorganization growing out of the enforcement of the Obligations or this Master Indenture, whether or not such committee shall represent the owners of a majority in principal amount of the Outstanding Obligations in respect of which any such action is taken.

Section 10.08 Resignation of Master Trustee. The Master Trustee, or any successor thereof, may at any time resign and be discharged of its duties and obligations hereunder by giving not less than thirty (30) days' written notice to Green Bank and the Holders, specifying the date when such resignation shall take effect, provided such resignation shall not take effect until a successor shall have been appointed by Green Bank or a court of competent jurisdiction as provided in Section 10.10 and shall have accepted such appointment.

Section 10.09 Removal of Master Trustee. The Master Trustee, or any successor thereof, may be removed with or without cause at any time by Green Bank, if no Event of Default under this Master Indenture shall have occurred and be continuing, or upon an Event of Default under this Master Indenture by the owners of a majority in principal amount of Outstanding Obligations, excluding any Obligations held by or for the account of Green Bank, by an instrument or concurrent instruments in writing signed and acknowledged by such Holders or by their attorneys-in-fact duly authorized and delivered to Green Bank, provided that such removal shall not take effect until a successor is appointed. Such removal shall take effect upon the date a successor shall have been appointed by Green Bank or a court of competent jurisdiction as provided in Section 10.10 and shall have accepted such appointment. Copies of each instrument providing for any such removal shall be delivered by Green Bank to the Master Trustee and any successor thereof.

Section 10.10 Successor Master Trustee. (a) In case the Master Trustee, or any successor thereof, shall resign or shall be removed or shall become incapable of acting, or shall be adjudged a bankrupt or insolvent, or if a receiver, liquidator or conservator of the Master Trustee or of its property shall be appointed, or if any public officer shall take charge of control of the Master Trustee, or of its property or affairs, Green Bank shall forthwith appoint a Master Trustee to act.

Notice of any such appointment shall be delivered by Green Bank to the Master Trustee so appointed and the predecessor Master Trustee. Green Bank shall give or cause to be given written notice of any such appointment to the Holders.

(b) If in a proper case no appointment of a successor shall be made within forty-five (45) days after the giving of written notice in accordance with Section 10.8 or after the occurrence of any other event requiring or authorizing such appointment, the Master Trustee or any Holder may apply to any court of competent jurisdiction for the appointment of such a successor, and such court may thereupon, after such notice, if any, as such court may deem proper, appoint such successor.

(c) Any successor appointed under the provisions of this Section shall be a bank or trust company or national banking association which is able to accept the appointment on reasonable and customary terms and authorized by law to perform all the duties required by this Master Indenture, which is approved by Green Bank (unless an event of default under Section 9.01 exists, in which case a successor shall be appointed by the owners of a majority in principal amount of Outstanding Obligations or by a court pursuant to the above paragraph, or unless a successor is appointed by a court pursuant to the above paragraph) and which has a combined capital and surplus aggregating at least $50,000,000 (or such other financial resources acceptable to Green Bank in its sole discretion), if there be such a bank or trust company or national banking association willing to serve as Master Trustee hereunder.

Section 10.11 Transfer of Rights and Property to Successor Master Trustee. Any successor Master Trustee appointed under the provisions of Section 10.10 shall execute, acknowledge and deliver to its predecessor, and also to Green Bank, an instrument accepting such appointment, and thereupon such successor, without any further act, deed or conveyance shall become fully vested with all moneys, estates, properties, rights, powers, duties and obligations of its predecessor hereunder, with like effect as if originally appointed as Master Trustee. However, the Master Trustee then ceasing to act shall nevertheless, on request by Green Bank or of such successor, execute, acknowledge and deliver such instruments of conveyance and further assurance and do such other things as may reasonably be required for more fully and certainly vesting and confirming in such successor all the right, title and interest of such Master Trustee in and to any property held by it hereunder, and upon payment of its fees and expenses shall pay over, assign and deliver to such successor any moneys or other properties subject to the trusts and conditions herein set forth and subject to any indemnification rights of the Master Trustee hereunder. Should any deed, conveyance or instrument in writing from Green Bank be required by such successor for more fully and certainly vesting in and confirming to it any such moneys, estates, properties, rights, powers, duties or obligations, any and all such deeds, conveyances and instruments in writing shall, on request, and so far as may be authorized by law, be executed, acknowledged and delivered by Green Bank.

Section 10.12 Merger or Consolidation of the Master Trustee. Any company into which the Master Trustee may be merged or with which it may be consolidated or any company resulting from any merger or consolidation to which it shall be a party or any company to which such Master Trustee may sell or transfer all or substantially all of its corporate trust business, provided such company shall be a bank or trust company or national banking association qualified to be a successor to such Master Trustee under the provisions of Section 10.10 (except that the approval

of Green Bank shall not be required), shall be the successor to such Master Trustee, without any further act, deed or conveyance.

Section 10.13 Several Capacities. Anything in this Master Indenture to the contrary notwithstanding, the same entity may serve hereunder as the Master Trustee and in any other capacities, to the extent permitted by law. The Master Trustee is hereby appointed to serve initially in the capacity of Master Trustee.

Section 10.14 Co-Master Trustees.

(a) With the consent of Green Bank, for the purpose of meeting the legal requirements of any applicable jurisdiction, the Master Trustee shall have power to appoint one or more persons to act as co-Master Trustee under this Master Indenture, with such powers as may be provided in the instrument of appointment, and to vest in such person or persons any property, title, right or power deemed necessary or desirable, subject to the remaining provisions of this Section.

(b) Each co-Master Trustee shall, to the extent permitted by applicable law, be appointed subject to the following terms:

(i) The rights, powers, duties and obligations conferred or imposed upon any such Master Trustee shall not be greater than those conferred or imposed upon the Master Trustee, and such rights and powers shall be exercisable only jointly with the Master Trustee, except to the extent that, under any law of any jurisdiction in which any particular act or acts are to be performed, the Master Trustee shall be incompetent or unqualified to perform such act or acts, in which event such rights and powers shall be exercised by such co-Master Trustee subject to the provisions of subsection (b)(iv) of this Section.

(ii) The Master Trustee may at any time, by an instrument in writing executed by it and with written notice to Green Bank, accept the resignation of or remove any co-Master Trustee appointed under this Section.

(iii) No co-Master Trustee under this Master Indenture shall be liable by reason of any act or omission of any other co-Master Trustee appointed under this Master Indenture.

(iv) No power given to such co-Master Trustee shall be separately exercised hereunder by such co-Trustee except with the consent in writing of the Master Trustee, anything herein contained to the contrary notwithstanding.

Section 10.15 Master Trustee May Fix Record Date. The Master Trustee may, but shall not be obligated to, fix a record date for the purpose of determining the Holders entitled to give their consent or take any other action pursuant to this Master Indenture. If a record date is fixed, then at such record date only those persons (or their duly designated proxies), shall be entitled to give such consent or to revoke any consent previously given or to take any such action, whether or not such persons continue to be Holders after such record date. No such consent shall be valid or effective for more than 120 days after such record date.

Section 10.16. When Obligations Disregarded. In determining whether the Holders of the required principal amount of Obligations have concurred in any direction, waiver or consent, Obligations owned by Green Bank or by any entity directly or indirectly controlling or controlled by or under direct or indirect common control with Green Bank shall be disregarded and deemed not to be Outstanding, except that, for the purpose of determining whether the Master Trustee shall be protected in relying on any such direction, waiver or consent, only Obligations which the Master Trustee knows are so owned shall be so disregarded. Also, subject to the foregoing, only Obligations Outstanding at the time shall be considered in any such determination.

Section 10.17. Compliance with CGS Section 4a-60 and 4a-60a.

(a) CGS Section 4a-60. In accordance with Connecticut General Statutes Section 4a-60(a), as amended, and to the extent required by Connecticut law, the Master Trustee agrees and warrants as follows: (1) in the performance of this Master Indenture it will not discriminate or permit discrimination against any person or group of persons on the grounds of race, color, religious creed, age, marital status, national origin, ancestry, sex, gender identity or expression, intellectual disability, mental disability or physical disability, including, but not limited to, blindness, unless it is shown by the Master Trustee that such disability prevents performance of the work involved, in any manner prohibited by the laws of the United States or of the State of Connecticut and further to take affirmative action to insure that applicants with job-related qualifications are employed and that employees are treated when employed without regard to their race, color, religious creed, age, marital status, national origin, ancestry, sex, gender identity or expression, intellectual disability, mental disability or physical disability, including, but not limited to, blindness, unless it is shown by the Trustee that such disability prevents performance of the work involved; (2) in all solicitations or advertisements for employees placed by or on behalf of the Master Trustee, to state that it is an "affirmative action-equal opportunity employer" in accordance with regulations adopted by the Commission on Human Rights and Opportunities (the "CHRO"); (3) to provide each labor union or representative of workers with which the Master Trustee has a collective bargaining agreement or other contract or understanding and each vendor with which the Master Trustee has a contract or understanding, a notice to be provided by the CHRO advising the labor union or workers' representative of the Master Trustee's commitments under Connecticut General Statutes Section 4a-60, and to post copies of the notice in conspicuous places available to employees and applicants for employment; (4) to comply with each provision of Connecticut General Statutes Sections 4a-60, 46a-68e and 46a-68f and with each regulation or relevant order issued by the CHRO pursuant to Connecticut General Statutes Sections 46a-56, 46a-68e, 46a-68f and 46a-86; (5) to provide the CHRO with such information requested by the CHRO, and permit access to pertinent books, records and accounts, concerning the employment practices and procedures of the Master Trustee as relate to the provisions of Connecticut General Statutes Sections 4a-60a and 46a-56; and (6) to include provisions (1) through (5) of this section in every subcontract or purchase order entered into by the Master Trustee in order to fulfill any obligation of this Master Indenture, and such provisions shall be binding on a subcontractor, vendor or manufacturer unless exempted by regulations or order of the CHRO and take such action with respect to any such subcontract or purchase order as the CHRO may direct as a means of enforcing such provisions in accordance with Connecticut General Statutes Section 4a-60.

(b) CGS Section 4a-60a. In accordance with Connecticut General Statutes Section 4a-60a(a), as amended, and to the extent required by Connecticut law, the Master Trustee agrees and

warrants as follows: (1) that in the performance of this Master Indenture, the Master Trustee will not discriminate or permit discrimination against any person or group of persons on the grounds of sexual orientation, in any manner prohibited by the laws of the United States or of the State of Connecticut, and that employees are treated when employed without regard to their sexual orientation; (2) to provide each labor union or representative of workers with which the Master Trustee has a collective bargaining agreement or other contract or understanding and each vendor with which the Trustee has a contract or understanding, a notice to be provided by the CHRO advising the labor union or workers' representative of the Master Trustee's commitments under Connecticut General Statutes Section 4a-60a, and to post copies of the notice in conspicuous places available to employees and applicants for employment; (3) to comply with each provision of Connecticut General Statutes Section 4a-60a and with each regulation or relevant order issued by the CHRO pursuant to Connecticut General Statutes Section 46a-56; (4) to provide the CHRO with such information requested by the CHRO, and permit access to pertinent books, records and accounts, concerning the employment practices and procedures of the Master Trustee which relate to the provisions of Connecticut General Statutes Sections 4a-60a and 46a-56; and (5) to include provisions (1) through (4) of this section in every subcontract or purchase order entered into by the Master Trustee in order to fulfill any obligation of this Indenture, and such provisions shall be binding on a subcontractor, vendor or manufacturer unless exempted by regulations or orders of the CHRO and take such action with respect to any such subcontract or purchase order as the CHRO may direct as a means of enforcing such provisions in accordance with Connecticut General Statutes Section 4a-60a.

(c) Required Submissions. The Master Trustee agrees and warrants that (1) it has delivered to Green Bank an affidavit signed under penalty of false statement by a chief executive officer, president, chairperson, member, or other corporate officer duly authorized to adopt corporate or company policy in the form as required under the Connecticut General Statutes; (2) if there is a change in the information contained in the most recently filed affidavit, the Master Trustee will submit an updated affidavit not later than the earlier of the execution of a new contract with the State or a political subdivision of the State or thirty days after the effective date of such change; and (3) the Master Trustee will deliver an affidavit to Green Bank annually, not later than fourteen days after the twelve-month anniversary of the most recently filed affidavit, stating that the affidavit on file with Green Bank is current and accurate.

Section 10.18. Compliance with CGS Section 9-612(g)(2). For all State contracts as defined in Public Act 07-1 having a value in a calendar year of $50,000 or more or a combination or series of such agreements or contracts having a value of $100,000 or more, the Master Trustee's authorized signatory to this Master Indenture expressly acknowledges receipt of the State Elections Enforcement Commission's notice advising State contractors of State campaign contribution and solicitation prohibitions, and will inform its principals of the contents of the notice.

ARTICLE XI

SATISFACTION AND DISCHARGE OF MASTER INDENTURE

Section 11.01 Payment of Obligations; Defeasance. (a) If Green Bank shall deposit monies with the Master Trustee, or pay or cause to be paid to the holders of all Obligations then Outstanding, the principal installments and interest and redemption price, if any, to become due thereon, at the times and in the manner stipulated therein and in this Master Indenture, and all amounts due to the Master Trustee have been paid, then at the option of Green Bank, expressed in an instrument in writing signed by an Authorized Representative of Green Bank and delivered to the Master Trustee, the covenants, agreements and other obligations of Green Bank to the Holders shall be discharged and satisfied. In such event, the Master Trustee shall, upon the request of Green Bank, execute and deliver to Green Bank all such instruments as may be desirable to evidence such discharge and satisfaction and the Master Trustee shall pay over or deliver to Green Bank all moneys, securities and funds held by it pursuant to this Master Indenture which are not required for the payment or redemption of Obligations not theretofore surrendered for such payment or redemption.

(b) Obligations for the payment or redemption of which moneys shall have been set aside and shall be held in trust by the Master Trustee (through deposit by Green Bank of funds for such payment or redemption or otherwise) at the maturity or redemption date thereof shall be deemed to have been paid within the meaning and with the effect expressed in subsection (a) of this Section. Subject to the provisions of subsection (c) of this Section, all Outstanding Obligations shall, prior to the maturity or redemption date thereof, be deemed to have been paid within the meaning and with the effect expressed in subsection (a) of this Section if (i) in case any of said Obligations are to be redeemed on any date prior to their maturity, Green Bank shall have given to the Master Trustee irrevocable instructions accepted in writing by the Master Trustee to provide notice as provided in Article V, (ii) there shall have been deposited with the Master Trustee either moneys in an amount which shall be sufficient, or Defeasance Obligations the principal installments of and/or the interest on which when due, without reinvestment, will provide moneys which, together with the moneys, if any, deposited with the Master Trustee at the same time, shall be sufficient, in the opinion of a nationally recognized firm of independent certified public accountants, to pay when due the principal installments or redemption price, if applicable, and interest due and to become due on said Obligations or prior to the redemption date or maturity date thereof, as the case may be, and (iii) in the event said Obligations are not to be redeemed within the next succeeding 60 days, Green Bank shall have given the Master Trustee in form satisfactory to it irrevocable instructions to provide notice to the holders of such Obligations that the deposit required by (ii) above has been made with the Master Trustee and that said Obligations are deemed to have been paid in accordance with this Section 11.01 and stating such maturity or redemption date upon which moneys are to be available for the payment of the principal installments or redemption price, if applicable, on said Obligations (other than Obligations which have been purchased by the Master Trustee at the direction of Green Bank as hereinafter provided prior to the provision of the notice of redemption referred to in clause (i) hereof). The Master Trustee shall, as and to the extent necessary, apply moneys held by it pursuant to this Section 11.01 to the retirement of said Obligations in the manner provided in this Master Indenture. The Master Trustee shall, if so directed by Green Bank (x) prior to the maturity date of Obligations deemed to have been paid in accordance with this Section 11.01 which are not to be redeemed prior to their

maturity date or (y) prior to the provision of the notice of redemption referred to in clause (i) above with respect to any Obligations deemed to have been paid in accordance with this Section 11.01 which are to be redeemed on any date prior to their maturity, apply moneys deposited with the Master Trustee in respect of such Obligations and redeem or sell Defeasance Obligations so deposited with the Master Trustee and apply the proceeds thereof to the purchase of such Obligations and the Master Trustee shall immediately thereafter cancel all such Obligations so purchased; provided, however that the Master Trustee shall receive an Accountant's Certificate showing that the moneys and Defeasance Obligations remaining on deposit with the Master Trustee after the purchase and cancellation of such Obligations shall be sufficient to pay when due the principal installment or redemption price, if applicable, and interest due or to become due on all Obligations, in respect of which such moneys and Defeasance Obligations are being held by the Master Trustee on or prior to the redemption date or maturity date thereof, as the case may be and an opinion of Bond Counsel to the effect that such redemption or sale of such Defeasance Obligations will not result in the loss of the exemption of interest from gross income of the Holders thereof if such Obligations are issued by Green Bank on a tax-exempt basis and that such redemption or sale otherwise complies with the provisions of this Master Indenture. The directions given by Green Bank to the Master Trustee referred to in the preceding sentence shall also specify the portion, if any, of such Obligations so purchased and cancelled to be applied against the obligation of the Master Trustee to pay Obligations deemed paid in accordance with this Section 11.01 upon their maturity date or dates and the portion, if any, of such Obligations so purchased and cancelled to be applied against the obligation of the Master Trustee to redeem Obligations deemed paid in accordance with this Section 11.01 on any date or dates prior to their maturity. In the event that on any date as a result of any purchases and cancellations of Obligations as provided in this Section 11.01 the total amount of moneys and Defeasance Obligations remaining on deposit with the Master Trustee under this Section 11.01 is in excess of the total mount which would be required to be deposited with the Master Trustee on such date in respect of the remaining Obligations in order to satisfy clause (ii) of this subsection (b) of Section 11.01, the Master Trustee shall, if requested by Green Bank, pay the amount of such excess to Green Bank free and clear of any lien or pledge securing said Obligations or otherwise existing under this Master Indenture. Except as otherwise provided in this subsection (b) of Section 11.01 and subsection (c) of this Section 11.01, neither Defeasance Obligations nor moneys deposited with the Master Trustee pursuant to this Section nor principal or interest payments on any such Defeasance Obligations shall be withdrawn or used for any purpose other than, and shall be held in trust for, the payment of the principal or redemption price, if applicable, and interest on said Obligations; provided that any cash received from such principal or interest payments on such Defeasance Oblations deposited with the Master Trustee, (A) to the extent such cash will not be required at any time for such purpose, shall be paid over to Green Bank as received by the Master Trustee, free and clear of any trust, lien or pledge securing said Obligations or otherwise existing under this Master Indenture, and (B) to the extent such cash will be required for such purpose at a later date, shall, to the extent practicable, be reinvested at the written direction of an Authorized Representative of Green Bank in Defeasance Obligations maturing at times and in amounts sufficient to pay when due the principal or redemption price, if applicable, and interest to become due on said Obligations on or prior to such redemption date or maturity date thereof, as the case may be, and interest earned from such reinvestments shall be paid over to Green Bank, as received by the Master Trustee, free and clear of any lien or pledge securing said Obligations or otherwise existing under this Master Indenture.

(c) Anything in this Master Indenture to the contrary notwithstanding, any moneys held by the Master Trustee in trust for the payment and discharge of any of the Obligations which remain unclaimed for two years after the date when such Obligations have become due and payable, either at their stated maturity dates or by call for earlier redemption, if such moneys were held by the Master Trustee at such date, or for two years after the date of deposit of such moneys if deposited with the Master Trustee after the said date when such Obligations become due and payable, shall, at the written request of Green Bank, be repaid by the Master Trustee to Green Bank, as its absolute property and free from trust, and the Master Trustee shall thereupon be released and discharged with respect thereto and the Holders shall look only to Green Bank for the payment of such Obligations.

ARTICLE XII

MISCELLANEOUS PROVISIONS

Section 12.01 Evidence of Signatures of Holders and Ownership of Obligations.

(a) Any request, consent, revocation of consent or other instrument which this Master Indenture may require or permit to be signed and executed by the Holders may be in one or more instruments of similar tenor, and shall be signed or executed by such Holders in person or by their attorneys-in-fact appointed in writing. Proof of the execution of any such instrument, or of an instrument appointing any such attorneys, shall be sufficient for any purpose of this Master Indenture (except as otherwise therein expressly provided) if made in any manner satisfactory to the Master Trustee. Proof of the holding of Obligations on any date shall be provided by the registration books of Green Bank maintained by the Master Trustee.

(b) Any request or consent by the owner of any Obligation shall bind all future owners of such Obligation and any Obligation issued in exchange therefor in respect of anything done or suffered to be done by Green Bank of any Master Trustee in accordance therewith.

Section 12.02 Moneys Held for Particular Obligations. Except a set forth in Section 11.01(c) hereof, the amounts held by any Master Trustee for the payment due on any date with respect to particular Obligations shall, on and after such date and pending such payment, be set aside on its books and held in trust by it for the holders of the Obligations entitled thereto.

Section 12.03 Preservation and Inspection of Documents. All documents received by any Master Trustee under the provisions of this Master Indenture shall be retained in its possession and shall be subject at all reasonable time to the inspection of Green Bank, any other Master Trustee, and any Holder and their agents and their representative, any of whom may make copies thereof.

Section 12.04 Parties Interested Herein. Nothing in this Master Indenture expressed or implied is intended or shall be construed to confer upon, or to give to, any person or corporation, other than Green Bank, the Master Trustee, and the holders of the Obligations, any right, remedy or claim under or by reason of this Indenture of any covenant, condition or stipulation thereof; and all covenants, stipulations, promises and agreements in this Master Indenture contained by and on behalf of Green Bank shall be for the sole and exclusive benefit of Green Bank, the Master Trustee, and the holders of the Obligations.

Section 12.05 No Recourse on the Obligations. No recourse shall be had for the payment of the principal of or interest on the Obligations or for any claim based thereon or on this Master Indenture against any member or officer of Green Bank or any person executing the Obligations, or any employee or agent of the foregoing.

Section 12.06 Successors and Assigns. Whenever in this Master Indenture Green Bank is named or referred to, it shall be deemed to include its successors and assigns and all the covenants and agreements in this Master Indenture contained by or on behalf of Green Bank shall bind and inure to the benefit of their respective successors and assigns whether so expressed or not.

Section 12.07 Severability of Invalid Provisions. If any one or more of the covenants or agreements provided in this Master Indenture on the part of Green Bank or any Master Trustee to be performed should be contrary to law, then such covenant or covenants, agreement or agreements, shall be deemed severable from the remaining covenants and agreements, and shall in no way affect the validity of the other provisions of this Master Indenture.

Section 12.08 Payments on Saturdays, Sundays and Holidays. In any case where the date of any payment required to be made under this Master Indenture shall be a Saturday or a Sunday or shall be, at the place designated for such payment a legal holiday or a day on which banking institutions are required by law to close, then such payment shall not be made on such date but shall be made on the next succeeding business day not a Saturday, Sunday or a legal holiday or a day upon which banking institutions are authorized by law to close with the same effect as if made on such prior date.

Section 12.09 Effective Date This Master Indenture shall take effect upon its execution by the Authorized Representative of Green Bank.

Section 12.10 Notice All notices required by this Master Indenture shall be sent to Green Bank and the Master Trustee at the addresses below. Such addresses may be amended from time to time without any amendment to this Master Indenture by delivery of a notice to the other parties listed in this Section.

If to the Green Bank:

Connecticut Green Bank
845 Brook Street
Rocky Hill, CT 06067
Attn: President

If to the Master Trustee:

_____
_____
_____
Attn: _____

CONNECTICUT GREEN BANK

By: _____
Name: _____
Title: _____

_____
as Master Trustee

By: _____
Name:
Title:

Doc. 8143543v4

Solar with Justice

Strategies for Powering Up Under-Resourced Communities and Growing an Inclusive Solar Market

Clean Energy States Alliance • Jackson State University Department of Urban and Regional Planning
Partnership for Southern Equity • PaulosAnalysis • University of Michigan School for Environment and Sustainability
The Nathan Cummings Foundation • The Solutions Project

Acknowledgments

Many people and organizations helped produce this report. The project was a team effort by the 11 authors with the help of their respective organizations.

The idea for this report emerged as a recommendation from grantee partners who attended a 2018 convening on community-owned and community-determined solar that The Nathan Cummings Foundation and The Solutions Project co-hosted. The concept for the convening originated from Sharon Alpert, president of The Nathan Cummings Foundation, and Sarah Shanley Hope, executive director of The Solutions Project.

The authors are grateful to the 82 people who participated in general research interviews for this report. Their names and organizations are listed in Appendix C. We particularly wanted to gather and learn from the perspectives of leaders of frontline community organizations focused on energy equity. We included many of these community leaders in our interviews and in a kickoff workshop in January 2019, which helped set the research agenda for the project. The workshop participants are listed in Appendix D.

We very much thank the approximately 20 people who provided us with information for the report's case studies through interviews and correspondence. We hope they will feel that we portrayed their admirable projects accurately and appropriately, but only the authors are responsible for any errors or misrepresentations.

JC Burton of Woodline Solutions helped pull the project team together and helped set the stage for its work. Anthony Giancatarino of the Movement Strategy Innovation Center, Seth Mullendore of Clean Energy Group, Summer Sandoval of UPROSE, and Elaine Ulrich of the US Department of Energy read a draft of some or all of the report and provided us with useful comments that improved the final product. Refugio Mata and Cat Lazaroff of Resource Media gave us sound advice on how to structure and present the report so that it would reach its intended audiences. Valerie Bouchard, Mandy Van Deven, and Candice Wynter of The Nathan Cummings Foundation provided valuable input and connected us with stakeholders who informed the final report.

Maria Blais Costello, manager of program administration for the Clean Energy States Alliance, was responsible for report production, including copyediting the report, working with the graphic designer, and coordinating all the myriad details that go into producing a document of this size and scope. Diana Chace assisted with proofreading the report. David Gerratt of DG Communications designed the final product.

We very especially thank The Nathan Cummings Foundation for making this report possible.

Disclaimer

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For More Information

Information about this project is available on the website of the Clean Energy States Alliance (CESA) at *www.cesa.org/projects/low-income-clean-energy/solar-with-justice*. To reach the project team, contact:

Clean Energy States Alliance
50 State Street, Suite 1
Montpelier, VT 05602
802.223.2554
www.cesa.org
cesa@cleanegroup.org

On the Cover Photo

A one-megawatt solar project by and for the Soboba Band of Luiseño Indians in Riverside County, California. The project serves the 1,320 members of the tribal community, most of whom live on the Soboba Reservation.

Solar with Justice

Strategies for Powering Up Under-Resourced Communities and Growing an Inclusive Solar Market

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December 2019

To access this report online, please visit
https://cesa.org/resource-library/resource/solar-with-justice.

Contents

RE-volv

EXECUTIVE SUMMARY

Under-resourced communities face a disproportionate share of societal burdens and lack access to many of the benefits other communities enjoy. Participation in the solar economy can help ease these burdens and provide low- and middle-income (LMI) households with economic relief. In addition to the obvious benefit of helping to reduce consumers' electricity costs, solar can also reduce electricity shutoffs from non-payment, provide jobs in under-resourced communities, reduce residents' exposure to pollution, diminish the use of potentially dangerous heating sources, and make critical community facilities less vulnerable to power outages from extreme weather events and other electricity disruptions.

The supply and quality of affordable housing can be improved by including solar and allowing roof repairs as part of the rooftop solar installation process, and by creating savings for affordable housing providers that can be leveraged toward preserving and expanding affordable housing. Solar on buildings that house nonprofits can provide utility bill savings that can be redirected to programs and mission-related activities. Solar on single-family homes can increase the home's value. Solar can also make decision-making more democratic by giving residents of under-resourced communities more control over their energy choices.

The goal for the *Solar with Justice* report is to accelerate the implementation of solar in under-resourced communities* in ways that provide meaningful, long-lasting benefits to those communities. The recommendations in the report set a path forward for increasing solar deployments that result in significant economic, equity, and health improvements.

* This report defines "under-resourced communities" as ones that have high proportions of LMI residents and generally receive below average services and financial resources from government. Many, but not all, comprise an above average number of people of color and immigrants.

Building Equity into Solar Development

Representatives of frontline organizations want solar development to be a vehicle for strengthening community-based organizations and building community wealth. But their prior experiences—on a range of issues other than solar—have made them wary of outsiders coming into the community and making decisions for them. For solar to meet the needs of under-resourced communities and to be perceived as beneficial, the community must feel that solar development is something being done *by them* rather than *to them*.

Community empowerment is the process of building leadership capacity within a community to increase community-led decision-making. It is not enough to turn decision-making over to community organizations and residents if they do not have the resources and subject-matter knowledge to deal with a technically complicated subject like solar development, or if legal and financial barriers prevent them from being positioned as solar project beneficiaries. The elements of creating community empowerment can include the following:

1. Establishing trust
2. Educating the community
3. Building organizational capacity and developing leadership
4. Addressing barriers and biases
5. Involving relevant stakeholders in constructive engagement
6. Increasing community wealth
7. Mobilizing resources for program sustainability

Obstacles to Solar for Under-Resourced Communities

There are significant obstacles to deploying solar in a manner that results in the tangible benefits accruing to under-resourced communities. The most obvious barrier for low-income customers is that they have low incomes, which can make it difficult to build financial wealth. Although solar can provide savings on utility bills, and thus reduce energy burdens, LMI households generally need assistance to overcome the initial up-front cost hurdle of going solar. Efforts to enable low-income customers to benefit from solar must also consider a larger set of barriers, including policy, finance, and regulatory obstacles. This report examines ten obstacles and market challenges that must be addressed to successfully deploy solar in under-resourced communities:

1. The solar market is still developing in many places
2. Lack of solar marketer interest and customer awareness in under-resourced communities
3. Financial barriers for community institutions
4. Competition between solar and existing LMI energy programs
5. Policy barriers
6. Utility opposition
7. Competing priorities for advocates and service groups

8. Housing policies
9. Finance policies
10. Vestiges of discriminatory practices and residential segregation

Recommendations

Solar with Justice offers a series of recommendations for advancing solar for under-resourced communities, including the context behind each recommendation and advice on how to implement it. The recommendations from each chapter are listed below for easy reference, though in some cases, it may be necessary to read the explanations in the report to fully understand the reason for, or implications of, the recommendation.

The general findings and recommendations presented in Chapter 4 apply to a range of participants in the solar market. At the top of the list: partnerships with trusted community organizations are central to successful solar development for under-resourced communities.

Top Ten General Findings and Recommendations (Chapter 4)

1. Partnerships involving trusted community organizations are essential
2. It's still the experimental phase for LMI solar
3. Installations for community institutions deserve special consideration
4. Resilience should be a component of LMI solar
5. Financial risk needs to be minimized for LMI households and community organizations

DOE/Chris Collins

6. Strong consumer protection is crucial
7. Shared solar projects can play a useful role, but they are not a panacea
8. Training and workforce development should remain a priority
9. Solar education is important
10. Increasing the availability of financing for solar projects in under-resourced communities is essential

Most of the report's recommendations are targeted at specific key stakeholder groups: state governments, community organizations, philanthropic foundations, the solar industry, municipalities, investors. The aim is to help each group channel its efforts in productive ways.

Recommendations for State Governments (Chapter 5)

1. Measure progress towards energy equity
2. Make sure pro-solar state policies are in place
3. Adopt special incentives and policies
4. Leverage private capital
5. Work with and help community organizations
6. Bring LMI issues into public utility commission proceedings
7. Design solar programs for specific market segments
8. Ensure financial benefits reach LMI households
9. Impose high consumer protection standards

Recommendations for Philanthropic Foundations (Chapter 6)

1. Incorporate input from community groups
2. Support frontline organizations with unrestricted multi-year grants
3. Invest in projects with a strategic focus
4. Leverage financing and program-related investments to de-risk projects
5. Provide funding to determine the most viable community empowerment models for solar
6. Lean in to challenging locations to accelerate equity in solar access
7. Leverage strategic new channels to teach LMI households

Recommendations for Community Organizations (Chapter 7)

1. Insist on the involvement of community organizations
2. Develop an internal education plan
3. Engage the community in dialogue on solar

Sunwealth

4. Control the decision-making process and make careful decisions about project ownership
5. Push for community benefit agreements
6. Identify key institutions and help them adopt solar
7. Take part in shaping policy

Recommendations for Other Stakeholders (Chapter 8)

1. Solar businesses should seek local partners
2. Solar businesses should have a plan for workforce development
3. The solar industry should self-police
4. Local governments can support solar that benefits LMI communities and residents
5. Communities with municipal utilities and electric coops have special opportunities
6. Large electricity users can help shared-solar projects work for LMI households

Recommendations for Expanding and Improving Project Financing (Chapter 9)

1. Build capacity so that community-led development teams and financing institutions can successfully implement projects
2. Present credible solar information in familiar formats
3. De-risk project finance for financial institutions and borrowers

4. Use alternatives to FICO credit scores
5. Negotiate project ownership and distribution of benefits

At the end of most of the chapters, we provide brief descriptions of promising initiatives that others can learn from and emulate. Additionally, we have included extended case studies in several chapters to showcase some of the most inventive approaches that organizations have taken to advance solar for under-resourced communities. Key take-aways from each of the case studies are noted, as well as the types of groups and organizations that could replicate the model presented in the case study.

Case Studies

1. Connecticut Green Bank brings solar to LMI homeowners
2. Energy Trust of Oregon engages community groups to create replicable solar development models
3. The Kresge Foundation provides credit enhancements to finance resilient power projects
4. LaGrange Housing Authority project catalyzes ongoing solar development by an innovative community organization
5. PUSH Buffalo incorporates solar into a mixed-use project with community asset ownership
6. UPROSE's Sunset Park Solar creates New York's first cooperatively owned shared solar project
7. Native Renewables builds energy independence
8. Denver Housing Authority applies shared solar to benefit affordable housing
9. Fellowship Energy arranges for solar energy for faith-based communities
10. RE-volv provides opportunities for nonprofits serving under-resourced communities to install solar energy
11. Investment firm Sunwealth delivers tangible social impact along with strong investor returns

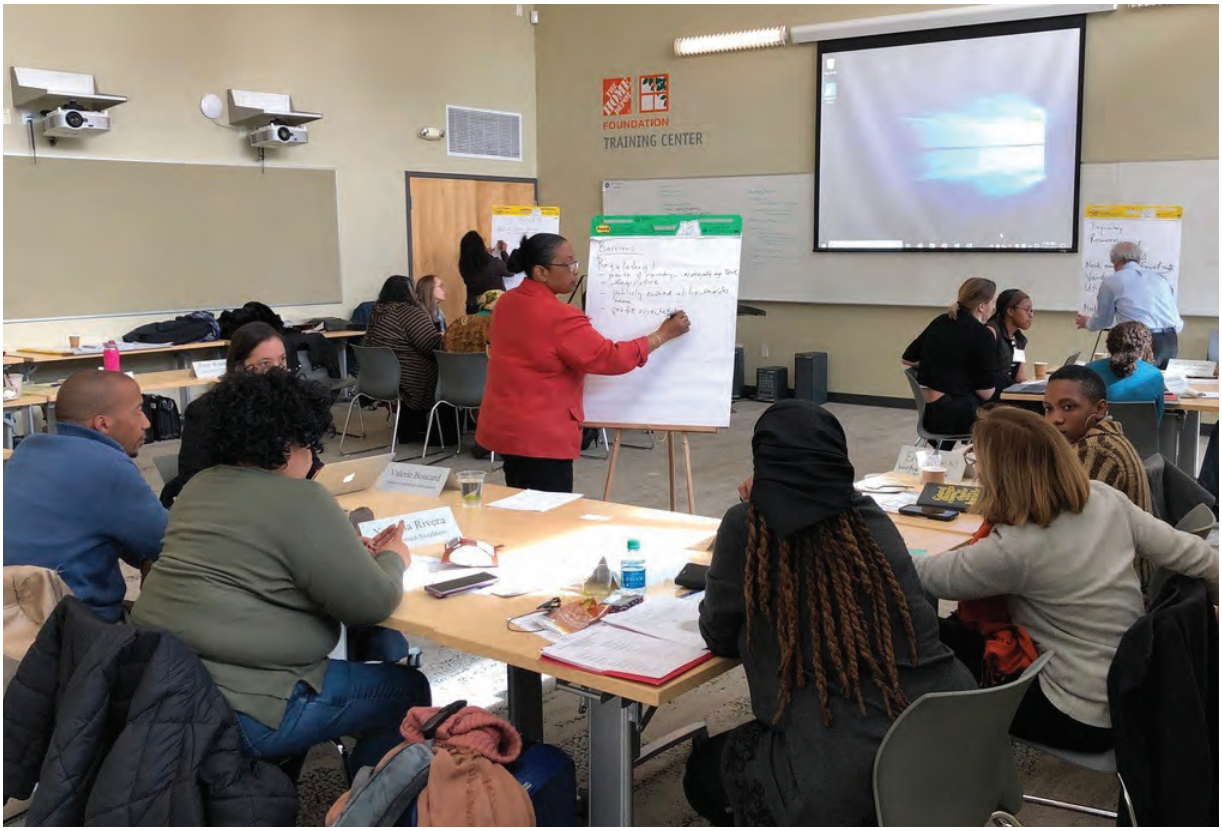
The Report's Origins and Distinguishing Features

The *Solar with Justice* report's meetings, research, writing, and production were funded by The Nathan Cummings Foundation. The need for the project emerged from an early-2018 workshop of its grantees, partners, and thought leaders that was co-convened by the Foundation and The Solutions Project on the topic of community-owned and community-determined solar. Attendees at the workshop identified a strong need for information and recommendations on solar best practices for under-resourced communities.

Although other useful reports have been published on the topic of solar for LMI households and communities, our report has four key distinguishing features:

- ***A diverse team worked together to explore solar in under-resourced communities in a comprehensive, integrated manner.*** The project team not only examined solar technologies, solar policies, and solar market trends, but we also considered the needs and perspectives of residents of under-resourced communities. We put together a project team with deep and varied experience working on solar policy, energy equity, community development, and project financing.

- ***The report gathered the viewpoints of many experts from across the country***. In addition to desktop research, the project team conducted 76 interviews with 82 leaders and experts from across the country. We spoke with leading solar project developers, investors, community leaders, advocates, and representatives of national NGOs, the federal government, state governments, financial institutions, and solar companies. More than 10 additional interviews were conducted as part of the research for the report's case studies.
- ***The views of leaders of community organizations were given special attention.*** We especially wanted to hear and understand the perspectives of leaders of frontline community-based organizations working for energy equity and climate justice. Those voices are frequently missing from reports prepared by national organizations working on energy issues. We kicked off the project with a full-day workshop in Atlanta in January 2019 with 14 representatives of frontline community-based organizations. Later interviews and a video conference on draft recommendations ensured that the perspectives of community group leaders continued to be heard.
- ***The report makes clear recommendations***. Rather than simply describe the solar market and present dozens of possible program options without evaluating them, this report presents very clear recommendations aimed at the most important stakeholder groups that can shape the future of solar for under-resourced communities.



Clean Energy States Alliance

Dennis Schroeder/NREL

INTRODUCTION

To optimize the benefits of solar energy, access to solar photovoltaics (referred to as "solar" or "PV" in this report) by under-resourced communities needs to happen now. Solar costs have fallen dramatically over the past decade and the PV industry has experienced an average annual growth rate of 50 percent, making it cost-effective in many locations. Solar energy provides health, environmental, job creation, and economic development benefits, while saving consumers money. And no one stands to benefit from reduced energy costs more than low- and moderate-income (LMI) consumers.

With the right market conditions, finance tools, and policy frameworks, solar can generate additional wealth for under-resourced communities. It can help transfer control over energy decisions to the residents of those communities. It can be integrated into housing and community facilities to reduce energy costs, increase resilience, and improve equity. Anti-poverty programs can gain additional funding for their primary mission by saving on their energy bills. Low-cost solar can be an entry point for developing programs that deliver inclusive wealth-building opportunities for under-resourced communities.[1]

But there are significant obstacles to deploying solar so that its tangible benefits are provided to under-resourced communities. Among other factors:

- LMI renters can have difficulty benefiting financially from solar.

1 For this report, we define "under-resourced communities" as ones that have high proportions of LMI residents and generally receive below average services and financial resources from government. Many, but not all, of them comprise an above average number of people of color and immigrants. We are using the term "under-resourced communities" prominently in this report, because it centers equity in the context of access to prosperity and building community wealth. People earn lower incomes due to many factors, but they often have been negatively impacted by social and economic marginalization. Some communities have been intentionally disenfranchised by decades of redlining and the associated economic disinvestment that limits access to resources and services, devalues physical assets, and weakens community anchor institutions. Combined, these conditions create what we refer to as under-resourced communities. Under-resourced is an accurate way to frame the compounding issues communities face as well as the reason that the conditions exist in the first place.

- LMI homeowners with below-average credit scores or problematic roofs are often unable to qualify for programs to install PV
- Most LMI households do not have sufficient tax liability to take advantage of the federal residential tax credit for solar.
- Federal housing assistance programs can limit LMI households' ability to benefit financially when solar is installed.
- LMI households could be harmed by long-term solar contracts that pose financial risks if utility solar programs or electricity rates change.

This report seeks to accelerate the implementation of solar in under-resourced communities in ways that provide meaningful, long-lasting benefits to those communities. In recent years, many useful publications on the topic of LMI solar have appeared, some of which are included in the annotated bibliography in Appendix A. We hope the perspectives and recommendations contained in this report can make a noteworthy contribution and help set a path forward for increasing solar deployments that result in significant economic, equity, and health benefits.

The report's meetings, research, writing, and production were funded by The Nathan Cummings Foundation. The need for the project emerged from an early-2018 workshop of its grantees, partners, and thought leaders that was co-convened by the Foundation and The Solutions Project on the topic of community-owned and community-determined solar. Attendees at the workshop identified a strong need for information and recommendations on solar best practices for under-resourced communities.

What Makes This Report Different?

The research method and development of recommendations used for this report have four key features:

1. ***A diverse team worked together to explore solar in under-resourced communities in a comprehensive, integrated manner.*** The project team not only examined solar technologies, solar policies, and solar market trends, but also the needs and perspectives of residents of under-resourced communities. We put together a project team with deep and varied experience working on solar policy, energy equity, community development, and project financing.

   To ensure that team members' experiences and different viewpoints would shape the final report, we worked collaboratively to define the research scope, vet the recommendations, and review all aspects of the report. It was a collective enterprise that led us to different and better recommendations than any single team member would have been able to arrive at individually.

   The project team members are described in Appendix E and represent the following diverse organizations: the Clean Energy States Alliance, the Jackson State University Department of Urban and Regional Planning, the Partnership for Southern Equity/Advancing Equity and Opportunity Collaborative, the University of Michigan School for Environment and Sustainability, PaulosAnalysis, The Nathan Cummings Foundation, and The Solutions Project.

2. ***The report gathered the viewpoints of many experts from across the country.*** In addition to desktop research, the project team conducted 76 interviews with 82 leaders and experts from across the country. We spoke with leading project developers, investors, community leaders, advocates, and representatives of national NGOs, the federal government, state governments, financial institutions, and solar companies. A list of interviewees is included in Appendix C. More than 10 additional interviews were conducted as part of the research for the case studies.

Clean Energy States Alliance

3. ***The views of leaders of community organizations were given special attention.*** In preparing this report, we especially wanted to hear and understand the perspectives of leaders of frontline community-based organizations working for energy equity[2] and climate justice. Those voices are frequently missing from reports prepared by national organizations working on energy issues. We kicked off the project with a full-day workshop in Atlanta in January 2019 with 14 representatives of frontline community-based organizations. That workshop helped set the project's research agenda and gave us many intriguing ideas to explore. We then conducted more than 20 interviews with community-based organizations from different parts of the country. After we developed an initial set of recommendations, we held a video conference with the community representatives so they could give us feedback on our draft ideas and recommendations.

4. ***The report makes clear recommendations***. Rather than simply describing the market for solar in under-resourced communities and presenting dozens of possible program options without evaluating them, this report presents very clear recommendations aimed at the most important stakeholder groups that can shape the future of solar for under-resourced communities. For each group—state governments, community organizations, philanthropic foundations, the solar industry, municipalities, investors—we present findings and recommendations aimed specifically at that group. In addition, Chapter 4 offers some general overarching recommendations.

   We want to help each stakeholder group focus on a few most important things to accomplish over the next several years. We ended up with a larger list of recommendations than we initially envisioned, but ultimately realized that LMI solar is complicated, and there are many things that need to be done to ensure rapid progress. The lists of recommendations should help stakeholder groups to channel their efforts in productive ways.

2 Organizations focused on energy equity sometimes frame their work in terms of "energy democracy." For a discussion of that topic, see Denise Fairchild and Al Weinrub, *Energy Democracy: Advancing Equity in Clean Energy Solutions* (Island Press, October 2017).

Although we believe that the report significantly advances the understanding of how best to implement solar in under-resourced communities, it is by no means the last word on this topic. Those of us on the project team will continue to work to ensure that under-resourced communities receive meaningful benefits by going solar. We very much want to hear your reactions, suggestions, and additional ideas.

Finally, we want to make clear that this report represents the conclusions and recommendations of the report authors alone. Although we received extremely valuable input and feedback from our interviewees and reviewers, they were not asked to approve and are not responsible for the final product. This report also does not necessarily represent the views of The Nathan Cummings Foundation, which is not responsible for the content of this report.

Clearing Up Confusion over Community Solar: "Community Solar" vs. "Shared Solar" vs. "Locally Controlled Solar"

In conducting research for this report and interviewing a wide range of stakeholders, it became clear that considerable confusion was caused by different groups' very different definitions of the term "community solar."

When the solar industry and utilities use the term "community solar," they generally refer to a large shared solar installation in which customers can purchase subscriptions or ownership of part of the array. The installation does not necessarily have to be in the same community as the subscribers and can often be located elsewhere in an electric utility's service territory. The subscribers do not all need to come from the same town or city. The subscribers receive credit on their electricity bills for their share of the electricity generated by the solar installation. Not all states allow these types of projects. Depending upon the rules and practices in a state, such shared solar installations can be developed by private developers, utilities, nonprofit organizations, or groups of residents. Participation in a large shared solar project can be especially appealing for households and organizations without suitable roofs for their own onsite solar installation.[3]

Community groups in under-resourced communities and environmental justice organizations mean something very different when they talk about "community solar." They seek to advance solar projects that are located in the community, are shaped by the community, and provide tangible benefits to the community, including *local wealth building*. The projects do not necessarily have to involve subscriptions for individual customers, and they can also be located at and provide electricity for community institutions, such as schools, churches, and social service organizations. Some community representatives link projects that are locally owned to their definition of community solar.

To avoid, or at least reduce, confusion and miscommunication in this report, we will not use the term "community solar." When we discuss a group subscription-based solar project that provides electricity bill credits to subscribers, we will use the term "shared solar." We are using this term rather than "community solar" in the interest of clarity and not as a value judgment. There can be desirable and undesirable shared solar projects.

When we discuss a project that is designed to benefit the community in which it is located, we will use the term "locally controlled solar." When there is a project that both uses a group subscription-based model and is designed to benefit the community in which it is based, we will use the term "locally controlled shared solar."

3 For more information about shared solar projects (i.e., what the solar industry calls "community solar"), see US Department of Energy, *A Guide to Community Shared Solar: Utility, Private, and Non-Profit Project Development* (US Department of Energy, revised edition, 2012), https://www.nrel.gov/docs/fy12osti/54570.pdf, and EnergySage, "Community Solar: What Is It?" web page, accessed May 22, 2019, https://www.energysage.com/solar/community-solar/community-solar-power-explained.

Bright Power

CHAPTER 1
Challenges Under-Resourced Communities Face and How Solar Can Help

Under-resourced communities face a disproportionate share of societal burdens[4] and lack access to many of the benefits other communities enjoy. Participation in the solar economy can ease these burdens. This chapter explores some of the energy-related challenges that under-resourced communities face and illustrates how solar can provide measures of relief.

Relieving Energy Burdens

Many of the urgent challenges under-resourced communities face are economic. Households with lower incomes[5] tend to dwell in less energy-efficient properties. As a result, they often have high home energy bills. They pay more for utilities per square foot than average.[6] They also pay more for their household energy needs on a percentage of income basis. The percentage of income that a household spends

4 See, e.g., Ihab Mikati, Adam F. Benson, Thomas J. Luben, Jason D. Sacks, and Jennifer Richmond-Bryant, *Disparities in Distribution of Particulate Matter Emission Sources by Race and Poverty Status* (American Journal of Public Health, April 2018), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5844406.

5 There are different operative definitions for low-income and for low-and moderate-income. According to the US Department of Housing and Urban Development, very low-income families are households whose income do not exceed 50 percent of the median family income for the area. Low-income families are households whose income is above 50 percent but less than 80 percent of the median family income for the area. Other definitions group low- and moderate-income families as all those below 80 percent of the median family income for the area. Others still define low-income families as households whose income is 80 percent of the median family income for the area or lower and moderate-income as those whose income is over 80 percent but not more than 100 percent of the median family income for the area.

6 Ariel Drehobl and Lauren Ross, *Lifting the High Energy Burden in America's Largest Cities* (ACEEE, 2015), https://aceee.org/sites/default/files/publications/researchreports/u1602.pdf. African-American and Latino households, regardless of income, paid even more per square foot than the average.

on its energy needs is sometimes referred to as "energy burden."[7] On one level, it is no surprise that low-income households carry a higher energy burden—having less income means that a larger portion of it goes to energy costs—but the relative spending on home energy costs can be staggering for low-income households. According to one analysis, in several parts of the country, a majority of the households below 50 percent of the federal poverty line spent more than half of their income on home energy.[8] Another survey found that one out of every five US households had reduced or abstained from necessities, such as buying food or medications, to pay an energy bill.[9]

Solar energy can provide low and moderate-income (LMI) customers with economic relief. The most common way to compensate residential solar generation in the US is through net metering. Net-metered customers receive bill credits equal to the retail cost of electricity for their PV system's generation that is exported to the grid. Through net metering, customers who adopt solar can see bill savings, and they may be able to take advantage of other financial incentives. These savings can go a long way for low-income customers who spend a large portion of their income on energy.

"Relieving the energy burden of under-resourced households not only makes their financial existence less precarious but it reduces stress in their lives."

— DeAndrea Salavador, Renewable Energy Transition Inititive

DeAndrea Salvador, founder of the Renewable Energy Transition Initiative, notes: "Relieving the energy burden of under-resourced households not only makes their financial existence less precarious but it reduces stress in their lives."

Reducing Electricity Shutoffs

A household's failure to pay its electricity bill can result in its electricity service being shut off,[10] the consequences of which can be devastating for low-income households. High electricity costs for air conditioning and heating, exacerbated by extreme temperatures, can increase the possibility of shutoffs. Although many states have policies preventing utilities from disconnecting service above or below certain temperature thresholds or during certain times of the year, some customers who experience electricity shutoff never get reconnected.[11] A 2018 National Energy Assistance Study found that 15 percent of

7 US Department of Energy, Office of Energy Efficiency & Renewable Energy, *Low-Income Household Energy Burden Varies Among States—Efficiency Can Help in All of Them*. (December 2018), *https://www.energy.gov/sites/prod/files/2019/01/f58/WIP-Energy-Burden_final.pdf.*

8 Dan Boyce and Jordan Wirfs-Brock, *High Utility Costs Force Hard Decisions for The Poor* (Inside Energy, May 2016), *http://insideenergy.org/2016/05/08/high-utility-costs-force-hard-decisions-for-the-poor.*

9 US Energy Information Administration, *Today in Energy* (US EIA, September 2018), *https://www.eia.gov/todayinenergy/detail.php?id=37072.*

10 The frequency of electrical shutoffs may be growing in the US. According to Financial Advisor, *In Great American Blackout, Millions Go Dark Due to Unpaid Bills* (October 2017): "Not all states track electricity shut-offs, but in those that do, numbers are rising." *https://www.fa-mag.com/news/in-great-american-blackout–millions-go-dark-due-to-unpaid-bills-35201.html?section=3&page=2* A study of California investor-owned electric customers conducted by The Utility Reform Network (TURN) found that 886,000 California households had their electricity service shut off in 2017, an increase of over 50 percent from seven years before. Gabriela Sandoval, Mark Toney, *Living Without Power* (TURN, 2017), *http://www.turn.org/wp-content/uploads/2018/05/2018_TURN_Shut-Off-Report_FINAL.pdf.*

11 US Department of Health and Human Services, *State Disconnection Policies* (2019), *https://liheapch.acf.hhs.gov/Disconnect/disconnect.htm.* A study conducted by The Utility Reform Network (TURN) found that of every ten investor-owned utility customers in California who has their electricity shut off, more than one never regain electrical service. Gabriela Sandoval, Mark Toney, *Living Without Power* (TURN, 2017), *http://www.turn.org/wp-content/uploads/2018/05/2018_TURN_Shut-Off-Report_FINAL.pdf.*

The Broader Toll of Delinquent Accounts

Delinquencies in bill payment not only present a liability for late-paying customers, but also for utilities. In some cases, utility accounts in arrears may be assigned to collection agencies or deemed uncollectible. According to one source, the cost of uncollectible electrical accounts exceeds $1.3 billion annually in the US—losses which may ultimately be borne by other ratepayers.[15] By generating customer savings and reducing account arrearages, solar power can reduce the probability of nonpayment of electricity bills and mitigate the need for a utility to pursue resource-intensive collection remedies.

Low-Income Home Energy Assistance Program (LIHEAP) recipients had their electric or natural gas service shut off in the previous year due to utility bill nonpayment.[12]

Disconnection can be life threatening for utility customers who are dependent on electricity for home medical devices.[13] Additionally, the lack of electrical service could support justifications for tenant eviction or the removal of children from a home.[14] Savings from solar can offer relief and can alleviate the threat of electricity shutoff.

Providing Employment Opportunities

Residents of under-resourced communities may lack access to well-paying jobs and pathways to prosperity. Low-income communities in the US had an average unemployment rate of 13 percent from 2011 through 2015, whereas moderate and high-income communities averaged 7.3 percent over the same period. Unemployment was even higher for majority-minority communities, averaging 14.3 percent.[16] The unemployment rate in the US has declined since 2015, but disparities in employment rates remain between low-income communities and their higher-income counterparts.[17]

The employment issue is not simply that under-resourced communities experience more joblessness; it is also that residents of these communities have less access to employment opportunities. Out-of-pocket expenses such as job training, licensing fees, and transportation expenses can present cost barriers to low-income employment. Even looking at job access purely as a function of distance to work, studies have found greater job declines within a typical commuting distance of high-poverty and majority-minority communities.[18]

12 National Energy Assistance Directors' Association, *2018 National Energy Assistance Survey Final Report* (December 2018), *http://box2085.temp.domains/~neadaorg//wp-content/uploads/2015/03/liheapsurvey2018.pdf.*

13 Jennifer Bosco, *Protecting Older Adults from Utility Disconnection* (National Consumer Law Center, December 2018), *https://ncler.acl.gov/Files/Protecting-Older-Adults-from-Utility-Disconnection.aspx.*

14 Financial Advisor, *In Great American Blackout, Millions Go Dark Due To Unpaid Bills* (October 2017), *https://www.fa-mag.com/news/in-great-american-blackout–millions-go-dark-due-to-unpaid-bills-35201.html?section=3&page=2.*

15 Jim Polson, "More Americans are Getting Their Electricity Cut Off" (Bloomberg, October 13. 2017), *https://www.bloomberg.com/news/articles/2017-10-13/in-great-american-blackout-millions-go-dark-due-to-unpaid-bills*.

16 Janet Yellen, *Addressing Workforce Development Challenges in Low-Income Communities* (Federal Reserve, March 2017), *https://www.federalreserve.gov/newsevents/speech/files/yellen20170328a.pdf.* Poverty correlates with majority-minority communities. For example, a study of the US's largest metro areas found that 72 percent of high-poverty communities (census tracts with poverty rates above 20%) were also majority-minority at the end of 2009. Fifty-five percent of majority-minority communities were high poverty, according to: Elizabeth Kneebone and Natalie Holmes, *The Growing Distance Between People and Jobs in Metropolitan America* (Metropolitan Policy Program, Brookings Institute, March 2015), *https://www.brookings.edu/wp-content/uploads/2016/07/Srvy_JobsProximity.pdf.*

17 Bureau of Labor Statistics, *A Profile of The Working Poor, 2017* (2019), *https://www.bls.gov/opub/reports/working-poor/2017/home.htm.*

18 Elizabeth Kneebone and Natalie Holmes, *The Growing Distance Between People and Jobs in Metropolitan America* (Metropolitan Policy Program, Brookings Institute, March 2015), *https://www.brookings.edu/wp-content/uploads/2016/07/Srvy_JobsProximity.pdf.*

The solar industry can offer skills training and livable-wage jobs that provide pathways into careers and advancement up the career ladder. Solar job training that includes electrical and construction skills can be leveraged into opportunities outside the solar industry. Some jurisdictions have adopted low-income solar programs with requirements for job training opportunities in under-resourced communities.[19] According to the 2018 National Solar Jobs Census, the solar industry in the US employs over 242,000 people with entry-level wages that are considerably above the national median wage.[20] In 2018, Latino or Hispanic workers comprised 16.9 percent of the solar workforce, Asian workers represented 8.5 percent, and black or African American workers represented 7.6 percent.[21]

As a long-term investment in community infrastructure, the adoption of solar can function as a community development tool.[22] Solar investment can induce more investment in a neighborhood. As money earned directly through solar energy job wages or indirectly through solar savings on utility bills cycles through a local economy, it can create economic ripple effects. For example, savings from solar that reduce operating expenses can enable business growth, increase sales, and expand hiring in local neighborhoods.[23] These solar investments increase an area's labor productivity, which helps attract additional investment and grows the local economy. In addition to offering employment prospects, solar can broadly help build wealth and create educational opportunities in under-resourced communities.[24]

Expanding the Solar Market's Reach

Solar installations in under-resourced communities not only benefit residents of those communities, but they are also important for the long-term sustainability of the solar industry. If solar is not deployed in ways that benefit all segments of society, or it is perceived as an inequitable technology, it stands to lose public support. Beyond that, if under-resourced communities are not able to access the benefits of solar, it limits the solar market's potential. A recent study by the National Renewable Energy Laboratory found that 42 percent of the technical potential for rooftop solar exists on buildings owned or rented by low- or moderate-income households, a demographic segment that makes up 43 percent of the US population.[25] To sustain market growth, the solar industry will need to reach this substantial, and in many cases untapped, market segment. Particularly in jurisdictions seeking to meet ambitious renewable energy targets, the LMI market segment will need to be part of those efforts.

19 See, e.g., Illinois Solar For All, Job Training web page, *https://www.illinoissfa.com/job-training*

20 The Solar Foundation, *National Solar Jobs Census* (2018), *https://www.thesolarfoundation.org/national*

21 Solar Foundation, *National Solar Jobs Census.*

22 Robert Sanders and Lewis Milford, *Clean Energy for Resilient Communities* (Clean Energy Group, 2014), *https://www.cleanegroup.org/wp-content/uploads/Clean-Energy-for-Resilient-Communities-Report-Feb2014.pdf*

23 Joey James, Evan Hansen, and Alan Collins, *Capturing the Sun's Rays: An Economic Impact Assessment of Solar Development in Southwest Virginia* (Solar Workgroup of Southern Virginia, September 2017), *https://www.downstreamstrategies.com/documents/reports_publication/solar-workgroup_final-report_9-6-17.pdf.*

24 Brownfield Listings, *Select Solar Developers are Focusing on Community Development and Sharing Benefits* (October 2018), *https://brownfieldlistings.com/blog/post/select-solar-developers-are-focusing-on-community-development-and-sharing-benefits.*

25 Benjamin Sigrin and Meghan Mooney, *Rooftop Solar Technical Potential for Low-to-Moderate Income Household in the United States* (NREL, April 2018), *https://www.nrel.gov/solar/solar-potential-low-to-moderate-income-households.html.*

Reducing Pollution Exposure

Under-resourced communities incur disproportionate health impacts from traditional sources of electricity generation. Coal-fired power plants are often located in under-resourced communities. One analysis found that the average per capita income of US residents living within three miles of coal-fired generation plants was approximately $3,000 less than average.[26] Living closer to the coal power plants creates greater exposure to the pollutants.[27] Estimates vary, but one study indicates that over 3,000 deaths are attributable to fine particle pollution from US power plants annually.[28] Within the power sector, 83 percent of fine particulate emissions comes from coal-fired plants.[29]

Solar installations contribute to the displacement of fossil fuels in the electricity sector. When PV and other clean energy resources make up a greater portion of the electricity portfolio, they can supplant coal and other fossil fuel-powered generation. Over time, by advancing the retirement of fossil fuel-powered generating plants, solar helps give rise to a cleaner energy mix and contributes to reduced pollution exposure.

Safer Home Heating through Building Electrification

Energy-related home health issues crop up with greater frequency in under-resourced communities. In those communities, homes tend to be less energy efficient, particularly in urban areas with older housing stock.[30] As noted above, heating these homes can be a financial challenge. A 2018 National Energy Assistance Study found that prior to receiving a federal subsidy, 30 percent of LIHEAP recipients were unable to use their main source of heat at some point in the previous year because their fuel was shut off, they could not afford fuel delivery, or they could not afford to fix their broken heating system.[31] When residents are unable to use their main source of heat, they often turn to potentially dangerous heat sources to stay warm. Thirty percent of LIHEAP recipients resorted to using a kitchen stove or oven for heat in the past year,[32] which could result in carbon monoxide poisoning.[33]

PV systems paired with electric air source heat pumps offer a clean heating alternative, which can eliminate the need for residents to use unsafe or inefficient devices. Within the building sector, there is increased momentum to find alternatives to fossil fuels for heating, particularly in under-resourced communities where energy efficiency is lacking, and safety issues are rife. Since fossil fuel-based heating systems produce harmful emissions, electrifying heating systems can help reduce local air pollution. Electrifying water heaters and heating systems within buildings can also increase energy efficiency, provide cost-savings, and improve safety.

26 NAACP, *Coal Blooded* (2001), *https://www.naacp.org/wp-content/uploads/2016/04/Coal_Blooded_Executive_Summary_Update.pdf.*

27 Clean Air Task Force, *The Toll From Coal* (September 2010), *http://www.catf.us/wp-content/uploads/2010/09/CATF_Pub_TheTollFromCoal.pdf.*

28 Clean Air Task Force, *Raising Awareness of the Health Impacts of Coal Plant Pollution* (2018), *https://www.catf.us/educational/coal-plant-pollution.*

29 Emanuele Massetti et al., *Environmental Quality and the U.S. Power Sector: Air Quality, Water Quality, Land Use and Environmental Justice* (Oak Ridge National Laboratory, US Department of Energy, January 2017), *https://energy.gov/epsa/downloads/environment-baseline-vol-2-environmental-quality-and-us-power-sector-air-quality.*

30 Diana Hernandez and Stephen Bird, *Energy Burden and the Need for Integrated Low-Income Housing and Energy Policy* (Poverty & Public Policy, August 2012), *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4819257.*

31 National Energy Assistance Directors' Association, *2018 National Energy Assistance Survey Final Report*, *http://box2085.temp.domains/~neadaorg//wp-content/uploads/2015/03/liheapsurvey2018.pdf.*

32 National Energy Assistance Directors' Association, *2018 National Energy Assistance Survey Final Report*, *http://box2085.temp.domains/~neadaorg//wp-content/uploads/2015/03/liheapsurvey2018.pdf.*

33 EPA, *Indoor Air Quality* (2017), *https://www.epa.gov/indoor-air-quality-iaq/emergencies-and-iaq.*

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Increasing Energy Resilience

Under-resourced communities face disproportionate impacts from extreme weather events. The Fourth National Climate Assessment, released in 2018, notes, "Across all climate risks, children, older adults, low-income communities, some communities of color, and those experiencing discrimination are disproportionately affected by extreme weather and climate events, partially because they are often excluded in planning processes."[34] Under-resourced communities tend to have less durable infrastructure and less access to information and resources to prepare for and avoid the health risks of extreme weather events.[35] They also have fewer economic resources to respond to and recover from extreme events.[36] Low-income communities may be first in line to have their power curtailed during times of peak electricity demand, such as during heatwaves,[37] they may experience more frequent and longer-lasting power outages,[38] and they may endure longer wait times for emergency services.[39] Moreover, low-income

34 US Global Change Research Program, *Fourth National Climate Assessment* (2018), *https://nca2018.globalchange.gov/downloads/NCA4_2018_FullReport.pdf.*

35 Maya Earls, "Climate Change Exacerbates the Affordable Housing Shortage," (*E&E News,* August 7, 2019), *https://www.scientificamerican.com/article/climate-change-exacerbates-the-affordable-housing-shortage.*

36 US Global Change Research Program, *Climate and Health Assessment: Extreme Events* (2016), *https://health2016.globalchange.gov/extreme-events.*

37 Justine Calma, *During Deadly Heat Wave, New York Utility Cut Power to High-Risk Neighborhoods* (Grist, July 2019), *https://grist.org/article/during-deadly-heat-wave-new-york-utility-cut-power-to-high-risk-neighborhoods.*

38 Emma King, *Power Outages in NOLA: The Problem, Implications, Solutions, and Moving Forward* (Alliance for Affordable Energy, June 2019), *https://www.all4energy.org/uploads/1/0/5/6/105637723/power_outages_in_nola__the_problem_implications_solutions_and_moving_forward.pdf.*

39 Elizabeth Fernandez, *Ambulance Response Times are Worse for Low-income People* (University of California San Francisco, November 2018), *https://www.ucsf.edu/news/2018/11/412421/ambulance-response-times-are-worse-low-income-people.*

Sunwealth

homeowners or renters are less likely to have flood and earthquake insurance to cover losses incurred from extreme weather events, such as floods and hurricanes.[40]

Pairing solar with battery storage systems in an "islandable" configuration, allowing the systems to work independent from the utility grid, can provide reliable power for a range of critical facilities and essential building service loads during power outages. It can help protect vulnerable communities and increase survivability during extreme weather events. Resilient solar plus battery storage deployments can enable multifamily housing residents to safely shelter in place during extreme events by providing back-up power for medical devices, refrigeration, lighting, telecommunications, fire alarms and security cameras, and climate controls.

Providing Social Benefits

Solar can supply a range of social benefits too. Some examples include the following:

1. ***Tax Revenue***. Even where solar projects do not provide direct benefits to LMI residents, large-scale solar development can be a source of public tax revenue, which can be put toward services that benefit under-resourced communities. The tax treatment of solar projects varies, but in some states, solar development can be a significant source of tax revenue, particularly in rural areas. A report looking at solar development in 50 North Carolina counties found that properties that developed solar projects paid nearly $10.6 million in property taxes in the year after the projects were developed compared to $513,000 in the prior year.[41]

40 SAMHSA, *Greater Impact: How Disasters Affect People of Low Socioeconomic Status* (July 2017), *https://www.samhsa.gov/sites/default/files/dtac/srb-low-ses_2.pdf.*

41 Claire Carson, Daniel Brookshire, Jerry Carey, and Daniel Parker, *Increased North Carolina County Tax Revenue from Solar Development* (NC Sustainable Energy Association, July 2019), *https://energync.org/wp-content/uploads/2019/07/Small_Increased-NC-County-Tax-Revenue-from-Solar-Developmentv3.pdf?*

2. ***Affordable Housing***. The US faces a shortage of 7.2 million affordable and available rental homes for low-income households.[42] Solar on affordable multifamily housing properties can help preserve affordable housing. Solar can do this directly as a long-term infrastructure investment, and indirectly by creating savings for affordable housing providers that can be leveraged toward preserving and expanding affordable housing.[43]

3. ***Structural Instability.*** Low-income housing stock may suffer from roof leaks or structural instability. Some LMI solar incentive programs explicitly allow program funds to be used for roof repairs.[44] Through the rooftop solar installation process, roofs can be shored up, fixed, and replaced.

4. ***Nonprofit Savings.*** Solar installed on buildings that house nonprofits can provide financial savings that can be redirected to programs and mission-related activities.

5. ***Brownfield Repurposing.*** Previously contaminated industrial sites that have fallen into disuse are more likely to be located in low-income or majority–minority neighborhoods.[45] Re-purposing brownfields for community solar installations offers a way to remediate these sites and to make beneficial use of them.[46] The US Environmental Protection Agency has a RE-Powering America's Land Initiative that provides tools, information, and outreach resources to encourage solar and renewable energy development on brownfield sites. As of January 2019, the program had catalogued 282 solar projects on contaminated lands, landfills, and mining sites, representing over 900 MW of installed capacity.[47]

6. ***Energy Democracy.*** Solar can make energy decision-making more democratic by giving residents of under-resourced communities more control over their energy choices.

42 NLIHC, *The Gap: A Shortage of Affordable Homes* (March 2018), *https://reports.nlihc.org/sites/default/files/gap/Gap-Report_2018.pdf.*

43 Stefen Samarripas and Dan York, *Our Powers Combined: Energy Efficiency and Solar in Affordable Multifamily Buildings* (ACEEE, May 2018), *https://aceee.org/sites/default/files/publications/researchreports/u1804.pdf.*

44 Government of the District of Columbia, Department of Energy and the Environment, *Solar for All Implementation Plan* (2017), *https://doee.dc.gov/sites/default/files/dc/sites/ddoe/service_content/attachments/DOEE-%20Report-%20Solar%20for%20All%20Implementation-%20Final%20for%20Transmittal.pdf.*

45 Kriston Capps, *How Much Cleaning Up Brownfields Is Really Worth (*CityLab, July 2014), *https://www.citylab.com/solutions/2014/07/how-much-cleaning-up-brownfields-is-really-worth/375234.*

46 EPA, *Community Solar: An Opportunity to Enhance Sustainable Development on Landfills and Other Contaminated Sites* (December 2018), *https://www.epa.gov/sites/production/files/2016-12/documents/epa_repowering_community_solar_discussion_paper_final_120716_508.pdf.*

47 EPA, *RE-Powering America's Land Initiative: Tracking Completed Projects on Contaminated Lands, Landfills, and Mine Sites* (January 2019), *https://www.epa.gov/sites/production/files/2019-02/documents/re_tracking_matrix_508_final_013119a.pdf.*

Clean Energy Group

CHAPTER 2
Obstacles to Solar for Under-Resourced Communities

The most obvious barrier for low-income customers to go solar is that they have low incomes, which can make it difficult to build financial wealth. Although solar can save them money on their utility bills, and thus reduce their energy burden, they are generally unable to overcome the hurdle of paying the initial cost of a PV system without assistance. Efforts to enable low-income customers to benefit from solar must also consider a larger set of barriers, including policy, finance, and regulatory obstacles.

Below we provide an explanation of 10 important obstacles to advancing solar in under-resourced communities.

1. The Solar Market Is Still Developing in Many Places

Low-cost solar is a recent phenomenon, and solar is just now approaching mainstream acceptance in many places. The solar ecosystem—marketing, supply chain, a pool of qualified installers, and customer awareness—is still developing and has not reached all customers.

In the past, the high cost of PV systems limited the market to those states with higher electricity prices and strongly favorable solar policies. California was the key early adopter and is still responsible for half of the two million distributed solar installations in the US. But in the past decade installed residential solar prices have fallen from $8.00 to $3.70 per watt, making solar competitive with retail electric rates in many states.[48]

The maturation of the solar market for homes and other buildings is being helped by rapid growth in the larger utility-scale solar market. Large-scale solar has exploded in recent years, rising from

48 Galen Barbose and Naim Darghouth, *Tracking the Sun 2019* (Lawrence Berkeley National Laboratory, September 2019), https://trackingthesun.lbl.gov.

380 megawatts in 2009 to over 23,000 megawatts last year, with six states installing more than 1,000 megawatts.[49] This growth helps to drive down manufacturing costs, while expanding the solar supply chain and labor pool.

Nevertheless, there is not a robust market for small-scale or residential solar projects in all states. Only five states accounted for more than 80 percent of the installations of systems smaller than five megawatts through 2018.[50] Without a healthy solar market, building an LMI solar market will be difficult.

2. Lack of Solar Marketer Interest and Customer Awareness in Under-Resourced Communities

In the same way that the solar industry has expanded beyond states with high electricity costs into other regions, solar marketers are beginning to expand beyond higher-income early adopters into broader demographic sectors. As the price for PV has fallen, solar marketing has especially begun targeting middle-class homeowners.

Research by Lawrence Berkeley National Laboratory has shown that the median household income (MHI) of solar adopters was $100,000 in 2010, decreasing to $87,000 in 2016, which is only slightly above the MHI of all homeowners in the states studied, at $79,000.[51] (Non-homeowners have a lower median income of $60,000.)

In 2016, 43 percent of solar adopters were in the lower 60 percent of income levels, while 15 percent were below 200 percent of the federal poverty line, a common benchmark used in low-income programs. However, it is possible that some low-*income* solar buyers were not necessarily low-*wealth*, such as retirees.

But without policy incentives, solar marketers may not find low-income customers attractive. Low-income customers pose several obstacles to marketers. Only 40 percent of low-income households are homeowners, according to Berkeley Lab, while the majority are tenants in multifamily apartment buildings. Those who are homeowners may require roof repairs or electric panel upgrades before installation. About 29 percent of people living below the poverty line speak a language other than English at home, and about one-fifth of those speak English less than "Very Well."[52] They may not have sufficient cash on hand to buy systems outright, and due to low credit scores or low equity in their homes, some homeowners may require special financing strategies that can raise costs and risks.[53] And finally, low-income customers who get discounted utility rates have less incentive to save money with solar.

Because of these circumstances, marketers are unlikely to focus limited advertising budgets or tailor their marketing to reach low-income customers. As a result, low-income customers may have less awareness of the benefits of solar power and less trust of marketers pushing unfamiliar technology. This lack of customer awareness about solar in turn makes them less attractive to marketers and drives a negative feedback loop.

49 Mark Bolinger and Joachim Seel, *Utility-Scale Solar 2018* (Lawrence Berkeley National Laboratory, 2018), *https://utilityscalesolar.lbl.gov*.

50 Data from the *Tracking the Sun* data set (Lawrence Berkeley National Laboratory, September 2019). The top states are, in order, California, Arizona, Massachusetts, New York, and Colorado.

51 Galen L Barbose, Naïm R Darghouth, Ben Hoen, and Ryan H Wiser, *Income Trends of Residential PV Adopters: An analysis of household-level income estimates* (Lawrence Berkeley National Laboratory, April 2018), *https://emp.lbl.gov/publications/income-trends-residential-pv-adopters*.

52 US Census Bureau, American Community Survey, "Characteristics of People by Language Spoken at Home," 2018: ACS 1-Year Estimates Subject Tables, TableID: S1603, *http://data.census.gov*.

53 Research by the Connecticut Green Bank has shown that homeowners—even low-income homeowners—have higher credit scores than non-homeowners. See Chapter 9 for alternatives to conventional consumer credit ratings.

3. Financial Barriers for Community Institutions

Community institutions that serve LMI communities may be more financially suited to go solar than their clients. Food banks, shelters, health facilities, and others can redirect savings from their energy bills into their primary mission. However, they have their own hurdles to going solar. Notably, many institutions are nonprofits or government entities that are unable to take advantage of federal solar tax credits.

The commercial-sector solar market is rapidly expanding, and about 20 percent of such customers are tax-exempt nonprofits, schools, or government sector entities. Because the federal investment tax credit (ITC) for solar is structured as a credit against active income, nonprofit organizations—which do not pay federal income taxes—cannot directly benefit from the ITC. Those that do go solar either forego the 30 percent incentive or they must find a third-party "tax equity partner" that invests in the project in order to claim the tax credits and receive a fee or stake in the project. Such a partnership can facilitate the deal, but it can reduce the portion of the savings that go to the nonprofit. About 40 percent of tax-exempt customers who have gone solar have used third-party ownership arrangements rather than direct ownership, compared to 14 percent of installations at commercial customer sites.[54]

DOE/Greg Johnstone

54 Galen Barbose and Naim Darghouth, *Tracking the Sun 2019* (Lawrence Berkeley National Laboratory, September 2019), *https://trackingthesun.lbl.gov*.

Tax equity partners often require higher rates of return than a more conventional financing strategy, such as a bank loan. And such deals are more complicated to structure, leading to higher transaction costs and a longer approval process. These all have the effect of reducing the total benefit to the nonprofit customer.

Lastly, while solar may generate savings for mission-driven organizations that serve low-income communities, those organizations may have other priorities and better ways to invest financial and human capital—and they may face barriers to solar adoption if they do not own their buildings.

4. Competition between Solar and Existing LMI Energy Programs

Policies to assist low-income consumers with energy have traditionally focused on bill payment assistance, such as the federal Low Income Home Energy Assistance Program (LIHEAP), and demand reduction through energy efficiency, such as the federal Weatherization Assistance Program (WAP), and comparable state programs.

"The lowest income customers already have the opportunity to save on their electric bills through utility assistance programs, making it hard for a monthly solar payment to be lower than their current monthly bill. We therefore targeted households above 150 percent of federal poverty level with our solar program."

— Laura Rigell,
Philadelphia Energy Authority

Bill payment or rate discount programs provide direct subsidies to qualifying low-income households, undercutting the opportunity for solar to reduce those energy bills. In its low-income solar program, the Philadelphia Energy Authority found, "The lowest income customers already have the opportunity to save on their electric bills through utility assistance programs, making it hard for a monthly solar payment to be lower than their current monthly bill," according to the Authority's Laura Rigell. "We therefore targeted households above 150 percent of federal poverty level with our solar program to ensure that participants would see savings by going solar."

Annual LIHEAP appropriations from Congress cover only about 20 percent of those eligible for support. Also, LIHEAP caps the number of years that a recipient can get support, creating the potential for gaps in coverage. Assistance program models based on solar can be structured to deliver steady savings to customers over the full 20- to 30-year life of the solar installation.

Solar power was not an eligible technology under WAP until *The 2005 Energy Policy Act*, and it still had to meet cost effectiveness tests before being accepted in a state's implementation plan. With the declining cost of solar, the Colorado Energy Office applied for permission from the US Department of Energy to incorporate PV in the WAP, which was granted in 2016. Colorado is using some WAP funds for solar, as well as shifting 15 percent of LIHEAP funds to support weatherization projects, including solar. The Colorado Energy Office conducted a pilot program on four homes before expanding it to 300 homes to be installed by the end of 2019. In all cases, solar is combined with all cost-effective weatherization measures.[55]

55 Jeffrey J. Cook and Monisha Shah, *Reducing Energy Burden with Solar: Colorado's Strategy and Roadmap for States* (National Renewable Energy Laboratory, March 2018), *https://www.nrel.gov/docs/fy18osti/70965.pdf.*

Although solar power may be less cost effective than some other efficiency measures, such as insulation or lighting changes, it can provide bigger bill savings; and it can be an effective measure after simpler changes have been implemented. In the Colorado pilot project, solar was always combined with efficiency measures, but it was solar that provided the largest single source of bill savings—at about 40 percent.

5. Policy Barriers

Government and utility policies on solar energy are rarely tailored for low-income customers and communities. More commonly, their primary goals are technology development, cost reduction, and mass deployment. As a result, solar policies often fail to serve the needs of low-income customers and under-resourced communities.

The most common failure is that policies often seek financial leverage by requiring substantial funds to be contributed by customers. The federal investment tax credit, for example, offers a 30 percent credit to leverage a 70 percent investment by end users. Low-income customers are less able to provide such a response and may not have a large enough tax liability to be able to use the tax credit.

Conversely, programs that do not require leverage—that cover all or most of the cost of going solar for low-income households—can quickly run out of money after reaching only a few eligible customers.

Local government policies can also be an impediment or can increase the cost of going solar. Cities and towns can have high permitting fees and a slow, unpredictable permitting process. High transaction costs contribute to the unaffordability of solar for LMI households.

TABLE 1: Solar Policy Rankings and Levels of Poverty

	Percentage of People in Poverty	Rating of Policies for Distributed Solar
Louisiana	19.8	F
Mississippi	19.8	F
New Mexico	18.7	B
West Virginia	17.2	D
Alabama	16.0	F
Arkansas	15.5	F
Kentucky	15.3	F
District of Columbia	14.9	A
Georgia	14.7	F
Arizona	14.4	C
North Carolina	14.1	C
South Carolina	14.1	C
Oklahoma	14.0	F

Sources: US Census Bureau and Solar Power Rocks

Another structural impediment to low-income solar is that many of the states with the largest percentage of low-income residents are those least likely to have pro-solar policies. Of the states with more than 14 percent of people living in poverty, the most common grade for solar policies, as rated by the Solar Power Rocks *2019 State Solar Power Rankings Report*, was "F" (see Table 1).[56]

In short, solar policies tend to be the weakest in places with the most low-income customers. And in states where solar policies are stronger, the policies are often not designed with input from frontline communities, LMI programs are under-funded, and they often ignore unique issues with low-income customers. Finally, while higher-income customers may invest the time and money needed to overcome policy shortcomings, lower-income customers are likely to be the most discouraged from going solar.

56 US Census Bureau, *Percentage of People in Poverty by State Using 2- and 3-Year Averages: 2015-2016 and 2017-2018*, https://www.census.gov/data/tables/2019/demo/income-poverty/p60-266.html and Solar Power Rocks, *2019 State Solar Power Rankings Report* (accessed September 2019), https://www.solarpowerrocks.com/state-solar-power-rankings.

6. Utility Opposition

Utilities in some states are actively discouraging customers from going solar, such as by increasing fixed charges or changing net metering rules. This has a disproportionate impact on low-income customers, especially those who want to go solar or reduce their energy use.

Residential electricity bills typically have three parts: a charge for electricity consumed (kilowatt-hours), a fixed service charge, and various taxes and fees. Rate structures with high fixed charges often have lower electricity charges. This reduces the value of a kilowatt-hour saved or self-generated, directly reducing the incentive that customers have to invest in energy efficiency or solar power. Fixed charges tend to increase bills for low-usage customers while decreasing them for high-use customers. Because low-income households generally consume less electricity than other residential customers with larger homes and more appliances and electronic equipment, higher fixed charges increase utility bills most for those who can least afford the increase.[57]

Utilities have also proposed changes that would undermine how solar power is valued for customers, by changing rules around net metering. While traditional net metering in effect values solar generation at the retail rate for electricity, some utilities have proposed instead compensating customers based on the utilities' wholesale cost of generation, for either the surplus generation produced by the customer each month or for every kilowatt-hour generated by the customer.

Some utilities have proposed rate changes that would affect existing solar customers, potentially undermining the financial case for investments already made. While this creates a regulatory risk for all customers, the consequences are much more dire for low-income customers.

While many of the most solar-hostile proposals for higher fixed charges and net metering have been rejected, some have been approved. The Louisiana Public Service Commission recently approved a change that would lower compensation for onsite solar generation from 10¢ to 4¢ per kilowatt-hour and allow the utility to be reimbursed for the value of lost sales, creating a new subsidy for shareholders at the expense of customers.[58] As indicated in Table 1 on page 28, Louisiana has one of the highest rates of poverty.

7. Competing Priorities for Advocates and Service Groups

Frontline advocates and service organizations often face pressing community challenges on a wide range of issues. Solar energy and energy efficiency may not be at the top of their priorities. Social and equity issues like housing, food security, transportation, and voter disenfranchisement may rightly be prioritized over solar. Community groups' bandwidth to add on additional work, even if beneficial for their communities, may be limited, especially if they are underfunded or not resourced to advance solar.

Engaging frontline community groups as equal stakeholders continues to be a challenge for renewable energy and environmental partners. However, the opportunity to fully engage those organizations on the potential of solar energy can provide a better understanding of the long-term community benefits, as well as develop a stronger foundation for trust and partnerships.

Places that have seen significant activity by frontline groups typically have strong state policies, an active solar market, and significant philanthropic support for this work. Most often, low-income solar

57 Melissa Whited, Tim Woolf, and Joseph Daniel, *Caught in a Fix: The Problem with Fixed Charges for Electricity* (Consumers Union, February 2016), *https://advocacy.consumerreports.org/wp-content/uploads/2016/02/Caught-in-a-Fix-FINAL-REPORT-20160208-2.pdf*.

58 Catherine Morehouse, *Louisiana utilities to pay less for rooftop solar power under new net metering rules* (Utility Dive, September 13, 2019), *https://www.utilitydive.com/news/louisiana-utilities-to-pay-less-for-rooftop-solar-power-under-new-net-meter/562834*.

deployment has been led by groups created solely for that purpose, such as New York Energy Democracy Alliance, GRID Alternatives, Native Renewables, Solar United Neighbors, Groundswell, Solstice, Rural Renewable Energy Alliance, or by energy services groups that have added solar to their work, such as Rising Sun Center for Opportunity.

The roles and opportunities for frontline organizations are discussed in more detail in Chapter 7.

8. Housing Policies

Because a significant number of LMI households live in rental housing, the landlord-tenant relationship can be a significant barrier to solar power adoption. "It can be hard to get the benefits to flow onto tenants' bills," says Charlie Harak of the National Consumer Law Center.

The landlord-tenant relationship can be a significant barrier to solar power adoption. "It can be hard to get the benefits to flow onto tenants' bills."

— Charlie Harak,
National Consumer Law Center

Tenants who live in housing supported by the US Department of Housing and Urban Development (HUD) are subject to HUD rules on housing assistance payments. One HUD rule in particular, on "utility allowances," can undermine the realization of benefits from solar or energy efficiency.

Under HUD rules, tenants pay no more than 30 percent of their income for both rent and utilities. If a solar improvement saves money on utility bills, the tenant's rent payment responsibility may be raised to bring the combined total back to 30 percent. As a result, tenants' utility savings resulting from a solar improvement in an affordable housing project are often essentially captured by HUD, rather than passed on to the tenants. (To understand the circumstances in which this does and does not happen, see the sidebar on HUD utility allowances on page 31.)

Fortunately, a recent HUD ruling may provide a pathway around this barrier. California's Solar on Multi-Family Affordable Housing (SOMAH) program provides credits from shared solar projects to eligible low-income tenants in multifamily housing, through "virtual net metering." HUD ruled that since the electricity generated by the SOMAH solar systems is exported straight to the utility grid, it does not directly offset resident electricity consumption. The SOMAH credits, meanwhile, are merely an accounting transaction by the utility. Because there is no connection between actual electricity consumption and the solar credits generated through the program, HUD has ruled that the credits should be ignored when calculating utility allowances.[59]

The ruling, however, applies only to California's SOMAH program. Other programs will have to apply for HUD permission, unless HUD promulgates a blanket rule.

Even without HUD rules, the landlord-tenant relationship suffers from a classic economics problem known as "split incentives." Landlords typically make the decisions about capital improvements like solar power for their properties, but the tenants often pay the utility bills and could benefit most from the savings.

59 Seth Mullendore, *Housing Department Decision Will Bring Solar Benefits to Low-Income Households in California* (Clean Energy Group, August 16, 2019), *https://www.cleanegroup.org/housing-department-decision-will-bring-solar-benefits-to-low-income-households-in-california*.

HUD Utility Allowances

At first glance, HUD's utility allowance rules seem straight forward, as does their impact on residents of HUD-supported housing: tenants are to pay no more than 30 percent of their income for a combination of rent and utilities. If solar reduces tenants' utility bills, their rent liability may be raised to bring the combined payment total back to 30 percent. That means that tenants receive no direct financial benefit from solar.

In reality, administration of the rules is more complicated and there are still opportunities for households to save money from solar. For one thing, there are three different streams of HUD subsidies, and the 30 percent rule is implemented differently in each case. It is important for all stakeholders with an interest in solar for under-resourced communities to understand the differences so that they can know when and how households can benefit financially from solar.

HOUSING CHOICE VOUCHERS (SECTION 8)

This assistance is tied to the household, rather than to a particular building. As HUD describes it, "The housing choice voucher program is the federal government's major program for assisting very low-income families, the elderly, and the disabled to afford decent, safe, and sanitary housing in the private market. Since housing assistance is provided on behalf of the family or individual, participants are able to find their own housing, including single-family homes, townhouses and apartments." Currently, about 2.7 million households are eligible for vouchers.

The voucher program is administered by the local public housing agency (PHA) or another locally designated administrator. The allowance for utility bills is set by the PHA based on the average energy cost for the city, county, or metropolitan area. The PHA works with the local utility to determine average energy costs based on the number of people in a household and the size of the rental unit. The averages are then applied to households as the energy allowance. If a household spends less than that on energy, either because of energy efficiency measures or participation in a shared solar project, the HUD subsidy is not reduced. The household would realize financial savings from solar or energy efficiency, because the PHA does not looks at an individual household's energy bills.

PUBLIC HOUSING

About one million households live in public housing nationwide. The process of determining utility allowances for public housing tenants varies by state. In a common methodology, if utility rates go up or down by more than 10 percent, the utility allowance is recalculated. But there is no standard methodology. Before proceeding with a solar project for public housing or enrolling tenants in shared solar projects, solar stakeholders should first find out how utility allowances for public housing are calculated in that state or city.

SECTION 8 CONTRACTS ASSIGNED TO A BUILDING

HUD provides subsidies to holders of some HUD-insured and HUD-held mortgages to keep the projects viable and rents affordable by low-income households. About 1.5 million units fall into this category. As of 2014, the utility allowance was determined based on actual utility bills from building residents. As a condition of receiving HUD assistance, renters are required to provide access to their utility bills. For smaller buildings and housing projects, all building residents must submit their bills, while larger buildings/developments can use a sampling methodology. The utility allowance is calculated based on an average for either the building or for a multi-building development. If one or a few households participate in a shared solar project, it would not meaningfully alter the average utility subsidy for that building, so the shared solar project would save money for participants. However, if a large share of the residents were to participate, the average subsidy could be affected. As a further complication, some buildings and cities may still be using the pre-2014 methodology, which based allowances on a city-wide average, as in the Housing Choice Vouchers category described above.

9. Finance Policies

Many solar policies are based on tax incentives. Because low-income customers, nonprofit groups, and public agencies pay little or no income tax, they are often unable to monetize the incentives by themselves.

A large number of work-around strategies have been developed, including third-party ownership and tax equity partnerships. But the complexity of these finance tools can result in high transaction costs, leading to higher project costs and fewer benefits going to end-use customers.

When solar is incorporated into public housing finance, which has its own regulations and tax incentives, the result can be even more complicated. "Most people don't understand and appreciate all the restrictions, approvals, and requirements affordable housing developers must comply with when agreeing to a 20-year energy services agreement," says Adam Boucher of Promise Energy. "Unlike the standard process for commercial and industrial solar projects, it's a very resource-intensive and educational process that requires getting approval from all interested parties."

"Most people don't understand and appreciate all the restrictions, approvals, and requirements affordable housing developers must comply with when agreeing to a 20-year energy services agreement…. [I]t's a very resource-intensive and educational process that requires getting approval from all interested parties."

— Adam Boucher, Promise Energy

10. Vestiges of Discriminatory Practices and Residential Segregation

Discriminatory practices and attitudes have served as impediments to upward mobility, home ownership, and educational opportunities for communities of color. A 2018 paper from The Hamilton Project, *The Historical Role of Race and Policy for Regional Inequality*, highlighted the negative social and economic effects of residential segregation on low-income communities and showed how these geographic disparities continue.[60]

With this in mind, it is essential that efforts to expand the benefits of solar do so with the realization that historical patterns and practices of racism are difficult to expunge, and special attention must be given to make sure that solar policies that target under-resourced communities are implemented with care and inclusiveness.

Conclusion

This chapter has outlined barriers to distributed solar in general, and to the low-income market specifically.

Many of the barriers to solar access for under-resourced communities stem from the conventional approaches that were taken to build up a nascent market, where the solar industry pursued the most financially attractive customers first. As prices for solar fall, and as a more marketers seek a larger pool of customers, there will be more attention paid to attracting moderate and even lower income

60 Bradley Hardy et al., *The Historical Role of Race and Policy for Regional Inequality* (The Hamilton Project, September 2018), *https://www.hamiltonproject.org/papers/the_historical_role_of_race_and_policy_for_regional_inequality.*

DOE/Timothy Peshek

households to this market. As the solar industry develops these new markets, greater public awareness of the benefits of solar power will result, and thus greater participation by all customer classes in the solar economy.

But some of the barriers will not be addressed automatically by the market, because they can be quite complex and require significant attention from policymakers, regulators, the industry, and advocates. Some of the barriers are accidental, since the goal of many solar policies has been to provide financial incentives to entice early adopters, who are primarily wealthier solar customers, rather than to expand solar as broadly as possible. This strategy has achieved its aim. Over the past two decades the solar market expanded, costs declined, and solar is now more affordable. Solar policies can now be adapted for more equitable success, and policies can be refocused to benefit low-income customers and disadvantaged communities, while simply facilitating the market for more affluent customers.

But other barriers to low-income solar access are not accidental at all: they are the result of entrenched interests seeking to slow the growth of customer-owned generation, or companies seeking policies that favor their business model at the expense of others. In such cases, public interest groups must actively seek to break down the barriers through legislative and regulatory changes.

While the barriers facing under-resourced communities may seem daunting, they can be solved; and when they are solved the market can grow very quickly. States that have created conducive policies have enabled millions of customers to benefit from solar, and the industry is still growing.

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CHAPTER 3
The Importance of Community Empowerment

In 2018, The Nathan Cummings Foundation and The Solutions Project organized convenings of environmental justice advocates and community groups to discuss energy strategies. At those meetings, the representative of frontline organizations in under-resourced communities strongly emphasized that those communities wanted solar development to be a vehicle for strengthening community-based organizations and building community wealth. Their prior experiences on a range of issues other than solar have made them wary of outsiders coming into the community and making decisions for them.

Solar development is often regarded within the context of these prior experiences. As Sandra Upchurch of the Southern Alliance for Clean Energy said, "When companies come into under-resourced communities, these communities often receive no benefits. The communities feel robbed and used. Solar companies need to be different and consciously work to ensure equity." Environmental justice advocates and community representatives start with the strong belief that communities must be at the center of the decision-making that directly impacts them.

The interviews we conducted for this report reinforced the sense that community-centered decision-making and community wealth-building are essential. We asked all the interviewees: "When designing solar initiatives for under-resourced communities, which of the following

"When companies come into under-resourced communities, these communities often receive no benefits. The communities feel robbed and used. Solar companies need to be different and consciously work to ensure equity."

— Sandra Upchurch, Southern Alliance for Clean Energy

do you think is most important: (1) Significantly increase the amount of solar energy; (2) Reduce residents' and organizations' energy bills; or (3) Build community wealth through activities such as stipulations about hiring from within the community, job training, ownership models that benefit the LMI community beyond bill savings, and installations on the buildings of community institutions."

Although the 76 interviews yielded a range of different answers, including indicating that all three goals are important, the responses of representatives of community groups were especially striking and differed from those of the other respondents. Of the 20 interviewees who represented frontline organizations active in LMI communities, 12 of them (60 percent) said that building community wealth was most important. Five of them (25 percent) thought that bill savings were most important. Of the remaining three, two thought that bill savings and community wealth building were equally important, while one felt all three had the same importance. No one thought the primary goal should be maximizing the amount of solar energy in LMI communities.

Even respondents who did not rank community wealth building first still prized it highly. As one person who rated it equally with bill savings said, "Reduced energy bills should be the short-term goal, while wealth building should be the long-term goal." An interviewee who ranked bill savings first, said she did that, because "unless you reduce community members' energy costs, you can't build community wealth and power."

What Is Community Empowerment?

For solar to meet the needs of under-resourced communities and to be perceived as beneficial to community residents, the community must feel that solar development is something being done *by them* rather than *to them*. In other words, there needs to be a process of community empowerment that gives community residents and their representatives a degree of self-determination and control over their lives. Through empowerment, the community will feel and become stronger, more confident, and more in control of the decisions that affect members of the community.

Elements of Community Empowerment

We refer to community empowerment as a process, because it is not sufficient to turn decision-making over to community organizations and residents if they do not have the resources and subject-matter

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knowledge to deal with a technically complicated subject like solar development, or if legal and financial barriers remain that would prevent them from being positioned as solar project beneficiaries.

Community empowerment is the process of building leadership capacity to increase community-led decision-making. It implies community action; that people are their own assets. It is a critical factor to addressing the social, cultural, political, and economic determinants that underpin community health and well-being.

Figure 1 below shows key elements we have identified for achieving authentic community empowerment related to solar in under-resourced communities. The figure was inspired by a diagram by the United Nations Development Programme and other international agencies on a different topic[61] and it includes insights from *EPA's Environmental Justice Community Problem-Solving Model*.[62]

When all the elements in the figure are achieved, more equitable outcomes related to solar development are truly advanced. That does not mean that a solar installation company, housing developer, or municipal agency needs to go through a years-long community empowerment process every time it wishes to install solar on an individual building, but there should be an assessment of whether or not solar

FIGURE 1
Elements of Community Empowerment

61 United National Development Programme et al., *Implementing Comprehensive HIV and STI Programmes with Transgender People: Practical Guidance for Collaborative Interventions* (2016), https://www.unfpa.org/sites/default/files/pub-pdf/TRANSIT_report_UNFPA.pdf.

62 Charles Lee et al., EPA's Environmental Justice Collaborative Problem-Solving Model (US Environmental Protection Agency, June 2008), https://www.epa.gov/sites/production/files/2015-04/documents/ejproblemcollaborativesolvingmodel.pdf.

development in a particular community is leading to greater community empowerment. And there should always be some decision-making role for the community, whether it is an individual homeowner, tenants of multifamily housing, a building owner, a community institution, or community group.

Many of the recommendations in the subsequent chapters of this report seek to explicitly advance community empowerment or have community empowerment components. Below, we briefly describe the various elements of community empowerment.

1. ***Establishing trust.*** Community organizations and residents need to feel that they can trust outsiders who seek to develop solar in their community. There needs to be a conscious effort to build that trust. This can often involve forging partnerships between the outside entity and organizations within the community that are already trusted by local residents.

2. ***Educating the community***. There should be strategies for ensuring the community members have the knowledge and training that they will need for making sound decisions about solar projects. These strategies include not just energy literacy initiatives, but also authentic community engagement and leadership development that value the lived experience of community members as expertise.

3. ***Building organizational capacity and developing leadership.*** Key organizations and institutions in under-resourced communities frequently have small staffs, low budgets, and myriad responsibilities. Financial assistance or other support will often be needed to build their organizational capacity so that they can play an active role in solar development. There should be special efforts made to develop the abilities of individuals in those organizations to play leadership roles. This can help to support the long-term success of community energy initiatives.

4. ***Addressing barriers and biases***. There are many daunting obstacles to overcome to implement LMI solar, especially in ways that provide tangible benefits to the local community. There should be some assessment of which barriers are most significant for a particular community, and which strategies should be developed to overcome those obstacles. Special attention should be given to the ways in which biases and prejudices have disadvantaged LMI communities.

5. ***Involving relevant stakeholders in constructive engagement***. Ongoing involvement by relevant stakeholders and discussions about needs, overall goals, strategies, tactics, and outreach are keys to success.

6. ***Increasing community wealth***. There should be conscious consideration of how solar development specifically will lead to a stronger, more self-directed community and to benefits beyond bill savings accruing to the community.

7. ***Mobilizing resources for program sustainability***. Ideally, solar development in under-resourced communities should be ongoing, self-sustaining, and increasing. Initial solar initiatives and projects should lead to local organizations and institutions having greater capacity, including financial and human resources, over time.

Solar energy presents a significant opportunity to increase options for LMI populations in under-resourced communities by providing them with increased capacity to cope with a changing socio-ecological environment—to adapt and to become more self-reliant.

Clean Energy States Alliance

CHAPTER 4
Top Ten General Findings and Recommendations

Top Ten General Findings and Recommendations

1. Partnerships involving trusted community organizations are essential
2. It's still the experimental phase for LMI solar
3. Installations for community institutions deserve special consideration
4. Resilience should be a component of LMI solar
5. Financial risk needs to be minimized for LMI households and community organizations
6. Strong consumer protection is crucial
7. Shared solar projects can play a useful role but they are not a panacea
8. Training and workforce development should remain a priority
9. Solar education is important
10. Increasing the availability of financing for solar projects in under-resourced communities is essential

Most of the recommendations in this report are aimed at specific stakeholder groups and are presented in subsequent chapters. However, there are ten general findings and recommendations that are relevant to all stakeholder groups. They are presented in this chapter.

1. Partnerships Involving Trusted Community Organizations Are Essential

Community organizations are well placed to know how to most effectively engage and communicate with local residents. The other stakeholders and entities involved with LMI solar—from government agencies and philanthropic foundations to investors, solar advocates, utilities, and the solar industry—should seek out partnerships with trusted community groups. This will help those different entities design programs that are responsive to the needs of under-resourced communities, and it will help overcome some of the distrust that many of the residents of those communities feel towards utilities, energy companies, and the solar industry. It will also make it more likely that community empowerment will be a meaningful component of the resulting programs.

As Dr. Mildred McClain, Executive Director of Harambee House points out, "In order to be a truly collaborative project with a goal of community benefit, you have to bring the community in from the beginning. This is because the community benefits from the process of engagement as much as from the project outcomes."

Although it takes time and financial resources for community organizations and other players in the solar market to work in partnership, it ultimately leads to greater efficiency and a reduced chance of project failure. Grassroots outreach with trusted partners can be more effective than advertising. And in the program design phase, partnerships involving community organizations can help avoid "one size fits all" approaches that miss creating place-specific unique solutions.

As Mary Rottman of Rottman Associates observes, "Each community has unique strengths and resources, and the best local approaches will be customized by the involved parties given their specific needs and community resources."

2. It's Still the Experimental Phase for LMI Solar

Although the solar industry has extensive experience from installing over two million solar projects across the country, including some for low-income customers, it is not yet clear which types of installations, financing mechanisms, business structures, and outreach strategies will ultimately be most successful and widely applicable to under-resourced communities. For one thing, those communities have been under-represented in the solar roll-out up to now, so there is less experience to draw on than there is in more established markets. Moreover, because there are many obstacles to successful implementation of LMI solar, the best approaches are not always obvious, especially if the goal is to provide community empowerment along with electricity.

There have certainly been successful solar projects and initiatives in under-represented communities, as will become apparent in subsequent chapters of this report, but what works in one region of the country or type of community will not necessarily work elsewhere. Because the LMI population is so varied in its housing and its needs, and because state and local policies vary, many different solutions will be needed to reach all the many segments of this population.

To figure out the best solutions for the long term and to help under-resourced communities catch up to the rest of the solar market, it is important to get many projects under development and installed in the near term. There then needs to be continuing evaluation of those projects and of the implementation strategies that they represent. Systematic project assessment and dissemination of results are

"In order to be a truly collaborative project with a goal of community benefit, you have to bring the community in from the beginning. This is because the community benefits from the process of engagement as much as from the project outcomes."

— Mildred McClain, Harambee House

"Each community has unique strengths and resources, and the best local approaches will be customized by the involved parties given their specific needs and community resources."

— Mary Rottman, Rottman Associates

key to making progress during this experimental phase. Data collection and analysis of what worked and what did not, and why, will be key to inform policy, finance, and consumer decisions about solar.

3. Installations for Community Institutions Deserve Special Consideration

Supporters of LMI solar should consider giving attention to installations for community institutions and not just for residences. As Alana Mathews, Public Adviser for the California Energy Commission points out, "A good way to build support for solar is to think about which places are meaningful to people and involve those places in the solar economy." This can include faith institutions, businesses (e.g., grocery stores, barbershops), community service organizations, and public buildings.

There are many advantages to solar projects for community institutions. Because the projects are often highly visible, a large number of people learn about them, thereby serving an important educational function. That makes it easier to develop additional projects. In addition, such projects create a sense of participation in the solar economy. When a church with 300 congregants installs solar panels on its roof, all 300 people can benefit from it and feel that they are helping their community move towards clean energy.

By reducing the energy costs for community institutions that serve large numbers of people, solar can provide valuable economic assistance to the community. As Djuan Coleon of PURE in Brunswick, Georgia notes, "The budget for utilities is one of the few areas where schools, boys and girls club facilities, recreation centers, and other community institutions can trim their costs without negatively affecting the user experience." The money saved on energy bills can be redirected toward program delivery.

Given some of the challenges to developing residential installations that provide financial benefits to renters and residents of HUD-supported housing, solar projects for community institutions can be a more assured way to ensure that cost savings from solar remain in the community. However, nonprofit organizations have their own challenges for going solar, such as an inability to directly take advantage of federal tax credits, special financing needs, and competing priorities. Policies and programs should be tailored to overcome these hurdles.

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— Alana Mathews,
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"The budget for utilities is one of the few areas where schools, boys and girls club facilities, recreation centers, and other community institutions can trim their costs without negatively affecting the user experience."

— Djuan Coleon, PURE

4. Resilience Should Be a Component of LMI Solar

Residents and support organizations in under-resourced communities have often suffered when storms or other factors cause power outages and other damage, because they have few financial resources for dealing with those problems. Solar incorporated into a microgrid project, or into a simpler installation combined with battery storage, can help under-resourced communities withstand power disruptions. A move towards this type of energy resiliency was spurred by the disastrous impacts of Hurricane Sandy in 2012, and its need was highlighted more recently by Hurricane Maria in Puerto Rico in 2017 and the 2019 planned power outages in Pacific Gas and Electric's service territory in California to help prevent wildfires. Solar plus battery storage can help protect the operations of fire stations, community shelters, hospitals, and other community institutions.

5. Financial Risk Needs to Be Minimized for LMI Households and Community Organizations

By definition, LMI households have limited financial resources. They are less able to withstand financial setbacks than wealthier households. Even a small unexpected financial reversal can be catastrophic. For LMI households, a solar project would be undesirable if it involves a long-term financial obligation with a small chance of losing money, even if the project has a much larger chance of saving participants money. Many of the typical solar deals offered by solar companies will therefore not work well in under-resourced communities.

Emphasis should be placed on arrangements that will either provide guaranteed savings to the customer or that allow customers to easily withdraw from the arrangement at any time if changes in policies or the electricity market mean that the customer is no longer saving money. Of course, it is more expensive and less profitable for companies to offer products with such features, suggesting that special incentives from state or local governments or utilities are necessary.

Similarly, community organizations and institutions in under-resourced communities should limit their financial risk if they do not have a cushion for absorbing financial losses. Project participants, including funders and community groups, should consider financial risk when deciding about the best ownership structure for a specific solar project. The topic of project ownership is discussed at greater length in Chapter 7 on Community Organizations.

6. Strong Consumer Protection Is Crucial

Most people who have installed solar over the past two decades have been very pleased with their decision to do so. But that does not mean that stronger consumer protection measures are not needed in many locations to protect consumers from entering into solar arrangements that they will regret.

The need for consumer education and protection is especially acute in under-resourced communities, because consumers there have fewer resources to fall back on if they enter into an unfavorable contract; and because previous predatory practices by businesses could amplify actions by even a small number of bad actors in the solar industry, which could reinforce negative feelings and sour LMI residents on solar.

In Illinois, for example, deceptive marketing by competitive electricity suppliers in the past has resulted in some customers having higher than expected electricity rates, thereby creating distrust of companies selling electricity products. To distinguish solar from these past bad experiences, the Illinois Power Agency has insisted on especially strong consumer protections in its solar programs.

Sunwealth

There are other reasons to focus on consumer education and consumer protection beyond thwarting marketers that may not have the best interests of consumers in mind. Well-meaning solar companies and first-time solar consumers may not always understand when a solar deal involves too much financial risk for a consumer with a low ability to absorb a financial loss.

Many of the players in the solar space have a role to play in educating and protecting consumers in under-resourced communities. If a state does not already require appropriate solar contract disclosures (i.e., provisions, statements, or information that must be included in all executed solar contracts) or does not give consumers a grace period for withdrawing from a contract, it can impose such consumer protection measures. The solar industry can more actively police and ostracize bad actors, and it can support rather than resist consumer protection regulations by state governments. Community groups and utilities, as well as state governments and the solar industry, can all do more consumer education, especially to help potential consumers evaluate their solar options and avoid taking on excessive risk. We will discuss consumer protection further in subsequent chapters of this report.

7. Shared Solar Projects Can Play a Useful Role but They Are Not a Panacea

Some solar advocates have argued that large shared solar projects are the ideal way for LMI households to participate in the solar economy. Under a shared solar approach, customers purchase subscriptions or partial ownership of a solar array that is located away from their homes. This can allow renters and others without suitable roofs for solar to benefit financially from solar without having to install solar panels. Subscribers receive credits on their bill that reflect the output of their portion of the energy generated by the group solar array. (Note that these projects are frequently called "community solar projects" by the solar industry and solar advocates, but we are refraining from using that term to avoid confusion. See the sidebar on page 15 for a discussion of the term "community solar.")

Shared solar is indeed a good partial solution for how to bring solar to under-represented communities; however, it has several limitations. For one thing, some states do not allow these sorts of group solar

subscription projects. Where shared solar is allowed, LMI participation is often low. Some project developers have little interest in recruiting LMI subscribers, who they perceive as more difficult to recruit and less likely to maintain steady payments. Low credit scores can be a real or perceived barrier to marketing solar to low-income households.

Several organizations and developers, such as Cooperative Energy Futures and Rural Renewable Energy Alliance, have taken the initiative to develop shared solar projects that include a high proportion of LMI subscribers, and those projects should be replicated. One promising strategy is to involve an anchor tenant (i.e., a financially robust entity that contracts for a significant share of the electricity from the shared solar project). The anchor tenant enables participation by LMI subscribers by accepting slightly lower cost savings on its share of the project and/or by agreeing to vary the amount of electricity it gets from the project as LMI customers join or withdraw. The anchor tenant thereby provides the project developer with stable revenue and a sufficient rate of return to want to market to LMI customers, while the LMI subscribers achieve bill savings and can withdraw from participation as needed. These anchor customers have included private companies, churches, housing authorities, and government agencies.

The best shared solar projects for under-resourced communities will have most or all of the following elements: 1) they provide significant guaranteed bill savings for the LMI subscribers, 2) they are nearly risk free because the LMI subscribers can withdraw without penalty at any time, 3) they are located within the subscribers' community, and 4) organizations and residents within that community have an active role in deciding on project siting and development.

Nevertheless, it is unlikely that such voluntary efforts alone can be scaled up sufficiently to reach a statistically significant share of the nation's LMI population. To achieve large enrollment by LMI consumers requires either a state requirement that shared solar projects include a certain minimum LMI participation or special financial incentives from the state or utility.

Even then, there are limitations to the impact of shared solar projects for under-resourced communities. Some projects give participants the satisfaction of helping to transition the nation to clean energy but provide meager financial benefits. Unless there are good consumer protection measures in place, the LMI households can be locked into long-term contracts that can be hard to exit if market or policy changes were to make the solar electricity more expensive than conventional electricity from the local utility.[63]

Some shared solar projects provide little in the way of community empowerment. A project that relies on a PV system installed in a distant location means that the solar is not seen by community residents, the subscribers have little influence over how it is developed or managed, and it does not create jobs in the LMI community. If the project is remotely sited, the subscribers' relationship to it can be abstract and passive.

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63 For a list of questions that should be answered before a consumer or organization concludes that a shared solar project is financially desirable, see "What Consumers Need to Know" in Diana Chace and Nate Hausman, *Consumer Protection for Community Solar: A Guide for States* (Clean Energy States Alliance, June 2017), p. 15, *https://www.cesa.org/assets/2017-Files/Consumer-Protection-for-Community-Solar.pdf*.

Finally, shared solar projects can benefit LMI households that serve as hosts for solar arrays and not just as subscribers for the electricity they produce. For example, in the South, there are African-American farmers whose farms struggle to maintain economic viability. A shared solar project installed at the farm would become an important source of rental income. Project developers and utilities can work with community groups to find such locations for projects.

The US Department of Energy is ramping up a National Community Solar Partnership that has resource materials related to shared solar. The Partnership may also be able to provide some technical assistance to groups interested in developing shared solar projects.[64]

8. Training and Workforce Development Should Remain a Priority

An important strategy for using solar development to build wealth in under-resourced communities is to emphasize training and workforce development so that jobs are created in those communities. Of course, it takes time and money to incorporate job training into solar initiatives, but there will be practical benefits for the solar industry beyond the wealth-building benefits for the community. Solar companies will ultimately have more sales if potential customers see people from the community working in the industry; there can also be increased community support for solar. Unfortunately, not all project budgets can accommodate the cost of job training and skills development, so difficult choices may need to be made or coordination with other workforce initiatives may be necessary.

Elevate Energy in Illinois and GRID Alternatives in several states have done a good job of emphasizing job training in solar initiatives.[65] Such efforts can be extended to other locations. GRID Alternatives

Elevate Energy

64 See National Community Solar Partnership web page, *https://www.energy.gov/eere/solar/national-community-solar-partnership.*

65 See Elevate Energy, Clean Energy Jobs Accelerator web page, *https://www.elevateenergy.org/programs/solar-energy/clean-energy-jobs-accelerator* and GRID Alternatives, Get Training web page, *https://gridalternatives.org/get-training.*

can be a good partner on workforce development for a variety of participants in the solar market, including utilities, affordable housing developers, local governments, and community-based job training organizations.

There also needs to be more attention given to ensure that there will be ongoing jobs for those who receive the solar training. One way is for various parties who play a role in solar project development (i.e., investors, community groups, sites that host projects) to insist that a certain share of the jobs on those projects go to members of the community. State agencies can do something similar when they craft incentives and job training programs.

9. Education Is Important

Earlier in this chapter, we mentioned the need for more education to help potential solar customers make sound decisions. Those individuals need easily accessible and digestible information that focuses on the specific issues they will need to consider when deciding whether to go solar.

Other types of education are also important. When the project team for this report convened its workshop for frontline organizations in January 2019, those groups ranked solar education highest when discussing their needs. Community leaders can play an important intermediary role with local residents, but they first need to learn about the benefits of solar and decide if it will deliver benefits substantial enough to warrant attention. If they decide to pursue it, they will need to know how to communicate the importance of solar. For community organizations to successfully pursue community empowerment, their leaders need to understand options related to developing and financing solar projects. Education can place them in a stronger position as they negotiate with solar companies and decide how best to pursue solar development for their community. Ideally, members of community groups will receive enough training so that they can educate and provide technical assistance to residents.

A very different type of education is needed for project developers and solar installation companies, so that they understand the specific needs and perspectives of residents of under-resourced communities. Solar companies and financial institutions will be more likely to focus on appropriate solar projects and solutions when they are aware of the structure of LMI households' energy payments, the specific financial risks that LMI households face related to energy, and communities' desires for community empowerment.

10. Increasing the Availability of Financing for Solar Projects in Under-Resourced Communities Is Essential

Reliable, broad access to financing for locally controlled solar projects remains a key issue to be solved if under-resourced communities are to realize the benefits of solar energy. Despite many efforts that have been made to address this financing challenge, it is still difficult for worthy projects to secure the financial resources necessary to move forward. Many different groups—state governments, philanthropic foundations, investors, lenders, project developers, and community organizations—can play a role in increasing the private sector's supply of financing for projects and in ensuring that investors and lenders support projects that provide meaningful benefits for under-resourced communities and their residents. Because this is a complicated topic, this report includes a special chapter focused on financing (see Chapter 9: Expanding and Improving Project Financing to Support a Larger Pipeline of Successful Projects).

Clean Energy States Alliance

CHAPTER 5

State Governments: Recommendations and Case Studies

Recommendations for State Governments

1. Measure progress towards energy equity
2. Make sure pro-solar state policies are in place
3. Adopt special incentives and policies
4. Leverage private capital
5. Work with and help community organizations
6. Bring LMI issues into public utility commission proceedings
7. Design programs for specific market segments
8. Ensure financial benefits reach LMI households
9. Impose high consumer protection standards
10. State initiatives to replicate

Although the federal government and the private sector have played important roles in advancing clean energy, states have been essential to the growth of solar and other clean energy technologies, especially in their role as primary regulator of the electricity industry. Because the federal government has not dictated a national approach, some states have been able to innovate and experiment, creating policies and programs to meet the specific needs of their populations, economies, and geographies. From that experimentation, effective and replicable ideas have spread to other states.

As with other aspects of clean energy, this has been true for LMI solar. For progress to continue and accelerate, the states will need to implement targeted policies and specially designed programs to create a favorable climate in which solar can flourish in under-resourced communities. To reflect different resources and needs, policies and programs will vary among states interested in LMI solar, although there are some general approaches they all can take.

Below we detail recommendations for state government leaders interested in advancing solar in under-resourced communities.

1. Measure Progress towards Energy Equity

States can better design and target their programs when they have good data on the scope and nature of the problem they seek to address. This is especially the case when it comes to solar equity. "Policymakers and program administrators need to have a clear sense of who they are designing their programs for—what the population of under-resourced households actually looks like and what specific market segments they are trying to reach," notes Ben Passer, Director of Energy Access and Equity at Fresh Energy.

"Policymakers and program administrators need to have a clear sense of who they are designing their programs for—what the population of under-resourced households actually looks like and what specific market segments they are trying to reach,"

— Ben Passer, Fresh Energy

It is useful for states to collect quantifiable data aimed at understanding 1) how solar installations are currently spread among different population groups and 2) if progress is being made in bringing all segments of the population into the solar economy. This information can help various stakeholders know where and how to target their efforts.

With this in mind, states can produce a report on solar equity, or on energy equity more broadly, and then update it annually or at some other regular interval. The California Energy Commission has taken an expansive approach to this task and produces an annual Energy Equity Indicators report that it makes widely available on its website.[66] An interactive map focuses on disadvantaged communities and those locations with less than 60 percent of mean household income. It shows solar capacity per capita, energy efficiency investments, clean vehicle rebates, asthma emergency room visits, and older housing stock.

Smaller states without the California Energy Commission's research budget can start by collecting state-specific information that has been compiled by other research organizations—such as Lawrence Berkeley National Laboratory's Income Trends of Residential PV Adopters, the US. Department of Energy's Low-Income Energy Affordability Data (LEAD) tool, the National Renewable Energy Laboratory's Solar for All map, the Stanford University DeepSolar Project, and the Solar Foundation's National Solar Jobs Census—and then supplement it with narrowly focused additional research.[67] A state can also start with findings from a national study, such as the 2019 article on "Disparities in Rooftop Photovoltaics Deployment in the United States by Race and Ethnicity," and then gather state-specific data to see how the state compares to the national trend.[68]

Measuring and evaluating solar equity progress need not be costly, but it is a vital first step towards formulating effective policies and programs.

66 California Energy Commission, Energy Equity Indicators web page, *https://ww2.energy.ca.gov/sb350/barriers_report/equity-indicators.html.*

67 Galen Barbose et al., *Income Trends of Residential PV Adopters: An Analysis of Household-Level Income Estimates* (Lawrence Berkeley National Laboratory, April 2018), *https://emp.lbl.gov/news/new-berkeley-lab-study-offers-insights-income*; US Department of Energy, Low-Income Energy Affordability Date (LEAD) Tool web page, *https://openei.org/doe-opendata/dataset/celica-data*; National Renewable Energy Laboratory, Solar for All Map web page, *https://maps.nrel.gov/solar-for-all/?aL=6m-d90%255Bv%255D%3Dt&bL=clight&cE=0&lR=0&mC=38.870832155646326%2C-98.34521484375001&zL=5*; Stanford Engineering, The DeepSolar Project web page, *http://web.stanford.edu/group/deepsolar/home.html*; The Solar Foundation, *National Solar Jobs Census 2018* (The Solar Foundation, 2018), *https://www.thesolarfoundation.org/national*.

68 Deborah A. Sunter et al., *Disparities in Rooftop Photovoltaics Deployment in the United States by Race and Ethnicity* (Nature Sustainability, January 10, 2019), pp. 71–76, *https://www.nature.com/articles/s41893-018-0204-z*.

2. Make Sure Pro-Solar State Policies Are in Place

For LMI solar to thrive, it needs a policy environment that is conducive to general solar development. If a state does not have policies in place that make it easy for solar projects to flourish, it is not going to be possible to install significant solar in under-resourced communities. Even though policies alone will not create a thriving market for LMI solar, they are a prerequisite to establishing such a market.

Without attempting to list all the possible state solar-supporting policies, here are some of the types of policy goals that can be favorable to solar development:

- Ensuring that there are ***favorable solar compensation policies***. This may involve preserving net metering, which credits solar customers for the electricity they add to the electricity grid beyond the amount they consume immediately, allowing the customer to benefit at the full retail rate for all the energy produced by the solar array. Or it can be accomplished by implementing a value-of-solar tariff, which is an electricity rate design that compensates customers with solar panels for the electricity they generate at a specific price.
- ***Preventing high monthly fixed charges*** on electricity bills that make it uneconomical to install solar and preventing high demand charges targeted specifically at solar customers.
- Creating ***property and/or sales tax exemptions*** for solar installations.
- Allowing for ***property-assessed clean energy*** (PACE), making it possible for consumers to pay for solar installations over time through their property tax bills, or requiring utilities to allow for ***on-bill financing***, enabling customers to pay for the cost of an energy upgrade over time via charges on monthly electricity bills.
- Establishing ***quick and easy permitting*** for solar systems.
- Offering ***rebates or grants*** from the state or utilities for solar installations.
- Enacting a ***renewable portfolio standard*** (RPS), especially one with a solar carve-out, that gives solar installations the possibility of revenue from the sale of renewable energy certificates (RECs).
- Enabling output from ***shared solar installations*** to be valued using "virtual" net metering or as on-bill credits.
- Implementing ***statewide interconnection standards*** that make it easy to hook up new solar installations to the electricity grid.
- Sanctioning ***third-party ownership*** through leases and power purchase agreements (PPAs), making it possible for consumers to get an installation with few upfront costs.[69]

Although no single policy is mandatory or a silver bullet, the most successful states have adopted an overall suite of policies that collectively create a favorable environment for solar. Policy consistency over time is also important.

69 In 2016, Environment America surveyed state solar policies. See Gideon Weissman et al., *Lighting the Way IV: The Top States that Helped Drive America's Solar Energy Boom in 2015* (Environment America, July 2016), *https://environmentamerica.org/sites/environment/files/reports/AME%20LightingTheWay%20Jul16%201.3.pdf.*

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3. Adopt Special Incentives and Policies

Having a positive policy environment for solar development is necessary but does not ensure robust solar growth in under-resourced communities. Some special incentives and/or policies are needed to overcome the obstacles identified in Chapter 2 of this report.

Those incentives and policies can take many different forms, but state governments must adopt some targeted efforts if they want solar development to reach all economic and social groups in their state. Possible approaches that states can take to support LMI solar goals include:

- Targeted grant or loan programs.
- Higher rebates or lower interest rates for LMI program participants.
- Incentives to attract solar companies, investors, or lenders to become active in under-resourced communities.

The case studies and other programs discussed in the rest of this chapter all include some form of special incentive or policy aimed specifically at the LMI market.

4. Leverage Private Capital

Although special financial incentives will be necessary to jump-start solar in under-resourced communities, states should generally avoid fully funding solar systems for LMI households. Most states do not have enough financial resources to reach a large share of the LMI population if the only source of capital is public funding. Loan-loss reserve funds, green banks, and other financial partnerships can help to leverage private capital and enable solar projects. Some of the advice on financing in Chapter 9 is relevant to state agencies.

5. Work with and Help Community Organizations

As highlighted in this report's general recommendations in Chapter 4, partnerships with community organizations are important. There are several ways that state governments can work with and support frontline organizations in under-resourced communities. For one thing, states can bring representatives of those communities into the program design process when developing solar programs for under-resourced communities.

"It's important to get multiple voices to the table and listen to their expertise," says Betsy Kauffman of Energy Trust of Oregon. "It might involve working differently, maybe holding evening meetings or providing stipends. But the learning and relationships are worth the effort." Such outreach can involve working with community groups one-on-one or include the creation of an advisory committee or working group.

States can also provide community groups with training and funding to help them put together plans for solar projects. The state can then provide some of the funding for the resulting projects. Energy Trust of Oregon has done this very successfully (see Case Study 2).

And while partnerships with community groups are key, they need to be linked to outreach and education for other stakeholders. As Daniel White of the Distrit of Columbia's Department of Energy and Environment observes, "Great incentives alone won't achieve equitable clean energy goals if the community isn't on board and the industry isn't on board. You need to build trust in the community and have everyone at the table."

6. Bring LMI Issues into Public Utility Commission Proceedings

Utilities should be encouraged to focus on solar equity as part of their general social obligation.[70] States have considerable leverage over utilities through the regulatory activities of state public utility commissions (PUCs). LMI solar has not been a major topic for most PUCs, but there are many ways in which this could be approached by state regulators and policymakers:

- Require PUCs to integrate equity considerations into their proceedings or to include special LMI provisions and programs as part of utilities' integrated resource planning (IRP) processes. The California Public Utilities Commission has adopted a plan that provides enhanced opportunities for under-resourced communities to participate in the Commission's decision-making processes, and it requires equity to be considered in all of its proceedings.

"It's important to get multiple voices to the table and listen to their expertise. It might involve working differently but the learning and relationships are worth the effort."

— Betsy Kauffman, Energy Trust of Oregon

"Great incentives alone won't achieve equitable clean energy goals if the community isn't on board and the industry isn't on board. You need to build trust in the community and have everyone at the table."

— Daniel White, DC Department of Energy and Environment

70 See Jim Lazar et al, *Electricity Regulation in the US: A Guide* (The Regulatory Assistance Project, second ed., June 2016), *https://www.raponline.org/wp-content/uploads/2016/07/rap-lazar-electricity-regulation-US-june-2016.pdf*.

- Consider opportunities within rate design to support LMI solar adoption. For example, if a state undertakes net metering reform that will reduce solar compensation, perhaps LMI customers can have a longer "grandfathered" period and be allowed to continue with traditional net metering longer than other customers.
- Analyze the current electricity rate structures that LMI households face and determine whether those rate structures should be altered in ways that make solar adoption more advantageous.
- Scrutinize utilities' claims that changing their billing software or serving low-income households more aggressively would be too costly or require too much administrative change. PUCs can investigate to determine if such claims are true. If so, state regulators can help find the resources to address the problem. If not, they should not let the utilities use a false claim as an excuse for inaction.
- Work with utilities to identify creative ways that they can build solar installations that have LMI community benefits.
- Integrate solar into existing utility rate discount programs for low-income customers or other low-income bill assistance programs. The CleanCARE proposal from the Interstate Renewable Energy Council (IREC) is one such proposal.[71]

7. Design Programs for Specific Market Segments

The LMI market is diverse, and a single program will not reach or impact all segments of that market in the same way. A solar program is unlikely to be able to serve both LMI homeowners and renters equally, or benefit community institutions and individual households to the same degree.

State solar programs will generally be most successful if they explicitly target specific market segment(s) and are tailored to the needs of that particular audience. For example, the Connecticut Green Bank examined the makeup of the LMI population in Connecticut and concluded that LMI homeowners were one appropriate market segment to target. The program they established has been successful precisely because it was designed specifically for that audience (see Case Study 1). The Green Bank went further by funding a study that looked at subgroups within the LMI homeowners market segment to see which subgroups had the greatest potential to be solar customers and which marketing approaches would reach them.[72]

A clear understanding of the demographics and housing stock of the LMI population in the state can help a state agency figure out which market segments to target. For most states, multifamily housing is an especially important market segment to target with special programs, in part because a high percentage of the LMI population lives in such housing, but also because most residential solar installation companies have more experience with single-family homes and there are complicated financial and administrative issues with incorporating solar into multifamily affordable housing developments.

71 Interstate Renewable Energy Council, *IREC's Proposal for a Pilot CleanCARE Program* (submission to California Public Utilities Commission, May 29, 2013), *http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M065/K714/65714610.PDF.*

72 See C+C, *CT Solar Customer Segmentation Study* (September 2017), *https://www.ctgreenbank.com/wp-content/uploads/2018/05/595_CTGB_Customer_Segmentation_CT_FINAL_public.pdf.*

Barb Odell/Cornerstones

8. Ensure Financial Benefits Reach LMI Households

Some programs and projects that could increase the amount of solar in under-resourced communities do not provide meaningful financial benefits to residents, either because they entail excessive financial risk or because the benefits accrue primarily to the project developer, building owner, financier, or to the federal government. When designing any program for the LMI market, states should carefully assess to whom the financial benefits will flow. Specific questions to ask, include:

- Are there mechanisms in place to ensure that LMI households or community institutions are not taking on unreasonable financial risks?
- Will the reduction in electricity bills represent a meaningful financial benefit to the LMI households?
- Are there other benefits that can be conferred to LMI households through solar adoption, such as energy resilience achieved through systems that include battery storage?
- For projects done in conjunction with affordable housing developments, what will be the direct, tangible benefits for tenants?
- For projects involving households that receive HUD housing assistance, will savings on tenants' electricity bills require them to pay more for rent? Similarly, will households' support through LIHEAP be reduced? (See Chapter 2.)

It is better to have less solar development in under-resourced communities than to put state funds into projects that give the illusion of benefitting those communities but do not actually address energy equity. Among the strategies that states can adopt to ensure that benefits reach LMI households are the following:

- Require solar companies to guarantee financial benefits to LMI households if they want to participate in a program that includes special LMI incentives.
- Require affordable housing developments to provide tangible benefits to tenants as a condition for receiving state solar incentives.
- Avoid designing programs that reduce households' HUD housing subsidies.

9. Impose High Consumer Protection Standards

As mentioned in the last chapter, states can create regulations related to solar contracts to protect consumers who are considering whether to go solar. Some states require certain performance guarantees, warranties, service statements, or other consumer protection information be included in all executed solar contracts. The Clean Energy States Alliance has produced a report on *State Solar Contract Disclosure Requirements* that surveys what different states have done in this area. It includes solar contract disclosure forms from six states.[73]

States can also allow consumers to have a grace period for withdrawing from a solar contract, and they can make sure that there are clear, well-publicized avenues for consumers to report problems they are having with a solar contractor. Strong consumer protection benefits all solar customers, but it is especially important for LMI consumers who have limited ability to absorb an unexpected financial loss.

The Illinois Power Agency has incorporated comprehensive and effective consumer protection into its solar programs. For the general Illinois Shines initiative, only projects with approved vendors receive the initiative's generous financial incentives. Those vendors are required to give customers a consumer protection brochure and to use a standard disclosure form so that customers will be able to easily compare offers from different companies and know how much they will need to pay over time. To prevent misleading sales practices, approved vendors need to follow guidelines for their marketing materials and marketing behavior. A special page on the Illinois Shines website makes it easy for consumers to register concerns and complaints about solar marketers or installers.[74] As is noted in the next section on Initiatives to Replicate, the Illinois Power Agency's program for low-income customers, Solar for All, has additional consumer protections.

10. State Initiatives to Replicate

In addition to the Connecticut Green Bank and Energy Trust of Oregon programs described at length in the state case studies below, some promising program models that can be implemented by states are listed here:

- ***California's Solar on Multifamily Affordable Housing (SOMAH) program.*** SOMAH provides upfront, capacity-based financial incentives for installing solar systems on multifamily affordable housing properties. Eligible solar projects under the program are required to achieve direct economic benefits for low-income tenants. Over half of a project's electric output must directly offset tenant load and be provided to tenants in the form of virtual net metering bill credits. The program also offers various no-cost services to participating property owners, including project technical assistance. The program includes job training and local hiring requirements for contractors.[75]

73 Nate Hausman et al., *State Solar Contract Disclosure Requirements* (Clean Energy States Alliance, August 2018), *https://www.cesa.org/assets/2018-Files/State-Solar-Contract-Disclosure-Requirements.pdf.*

74 Information about Illinois Shines, including brochures for consumers (in both English and Spanish), marketing guidelines, disclosure forms, and vendor requirements, is available on the Illinois Shines website, *http://illinoisshines.com*.

75 For more information, see the Solar on Multifamily Affordable Housing (SOMAH) program web page, *https://www.calsomah.org.*

- ***Colorado's inclusion of rooftop solar as an eligible measure for its Weatherization Assistance Program (WAP).*** In 2015, Colorado became the first state to receive approval from the US Department of Energy to integrate rooftop solar into WAP, which provides no-cost energy efficiency upgrades to eligible low-income families. Colorado had to demonstrate that solar was likely to be a cost-effective measure.[76] As part of a 2016 settlement, Colorado's largest electricity provider, Xcel Energy, agreed to use WAP funds to offer both an upfront and a per kilowatt-hour solar incentive for up to 300 low-income households.[77] Although the Colorado example demonstrates that leveraging programs like WAP can make solar more accessible for low-income households, states should be careful not to undermine the purpose and function of existing anti-poverty programs, particularly when such programs are designed to provide urgent relief to low-income customers.

- ***Hawaii's Green Energy Money $aver (GEM$) program.*** GEM$ is an on-bill financing program that expands the accessibility and affordability of solar and energy efficiency upgrades to renters, LMI homeowners, and nonprofits. Clean energy investments are repaid over time through a line item on a customer's monthly electric bill. This means that participants can save money from the start, since the program does not require upfront participant costs and only finances investments where the average monthly savings exceed the cost of a participant's monthly bill repayments. Program eligibility is conditioned upon a participant's history of bill repayment (rather than a traditional credit score), and repayment is tied to the electric meter so it can be transferred from one tenant to another.[78]

- ***Illinois' Solar for All program.*** The Illinois Power Agency's Solar for All program helps make solar more affordable for low-income customers and communities. Incentives are offered through approved vendors who agree to all the consumer protection standards in the state's general Illinois Shines solar initiative, as well as special measures that guarantee benefits and reduce risks for participating LMI customers. The program ensures that there are no upfront costs for participants and any ongoing costs or fees will not exceed more than half the value of the energy produced. Customers have seven days after signing a contract to cancel. The program also offers solar job training and connects graduates of the training with approved vendors, who are required to use qualified trainees on a percentage of their projects. [79]

- ***Maryland's Resiliency Hubs program.*** The Maryland Energy Administration's Resiliency Hubs program provides grants to microgrid developers to offset costs for projects in high-density, LMI communities. The program considers a resiliency hub to be a facility within short walking distance from economically disadvantaged populations and that, in an emergency, can provide refrigeration for medications, allow for the charging of small personal devices, and serve as a heating, cooling, and lighting center. The program ranks applications based upon the ratio of LMI residents served and is open to local government agencies, nonprofits, and businesses.[80]

76 For more information, see Jeffrey J. Cook and Monisha Shah, *Reducing Energy Burden with Solar: Colorado's Strategy and Roadmap for States* (National Renewable Energy Laboratory, March 2018), *https://www.nrel.gov/docs/fy18osti/70965.pdf*; and the Colorado Energy Office Rooftop Solar Photovoltaic Program web page, *https://www.colorado.gov/pacific/energyoffice/rooftop-solar-pv.*

77 Colorado has used Low Income Home Energy Assistance Program (LIHEAP) funds for low-income solar too. Federally administered by the US Department of Health and Human Services, LIHEAP helps pay heating and electricity bills for low-income customers. Although many states have used a portion of their LIHEAP funds for weatherization, solar was first included as a weatherization measure in Colorado's LIHEAP plan in 2017.

78 For more information, see the Hawaii Green Infrastructure Authority GEM$ Financing Program web page, *https://gems.hawaii.gov/participate-now/for-homeowners.*

79 Information about Illinois Solar for All is available on the program's website at *https://www.illinoissfa.com*; see especially the program's "Consumer Protections" web page, *https://www.illinoissfa.com/consumer-protections.*

80 Information about the Maryland Resiliency Hubs program is available on the program web page, *https://energy.maryland.gov/Pages/Resiliency-Hub.aspx.*

- ***Massachusetts' Solar Loan program.*** The Mass Solar Loan program connects homeowners interested in installing solar systems with financing opportunities through low-interest loans. It offers loan support in three ways: 1) an interest rate buy-down, which reduces the interest rate paid by customers as compared to a traditional market-rate loan; 2) a loan loss reserve, which serves as a guarantee against default and encourages lenders to loan to less creditworthy customers; and 3) an additional income-sensitive incentive, which is applied directly to the loan principal to reduce an LMI customer's overall repayment obligation.[81]

- ***New Hampshire's Low and Moderate Income Community Solar Grant program.*** The New Hampshire Public Utilities Commission, which administers the state's Renewable Fund, is required by law to allocate 15 percent or more of the fund annually to benefit LMI residential customers, including "financing or leveraging of financing for low-moderate income community solar projects in manufactured housing communities or in multifamily rental housing." Stemming from this requirement, New Hampshire offers grants for shared solar projects that provide direct benefits to LMI residents. Applicants must use the grant funding for shared solar projects that will result in a direct benefit to at least five residential customers and a majority of them must be LMI customers. These benefits must flow to the LMI customers for 20 years or until the end of the solar project's operational life, whichever is earlier.[82]

- ***New York's Solar for All program.*** Administered by the New York State Energy Research and Development Authority (NYSERDA), New York's Solar for All program offers low-income households the opportunity to subscribe to a shared solar project at no cost. Enrollment in the program operates like a utility bill assistance program with monthly credits being applied directly to participating customers' electricity bills. NYSERDA provides funding for the shared solar arrays to be built, manages the subscription process, matches income-qualified customers with shared solar projects, and works with project developers and electricity providers to ensure subscribers are credited for their subscription in a project. Low-income households subscribe for free, pay no fees to participate, and typically save between $5–$15 a month by participating in the program. Subscription does not impact LIHEAP or other benefit programs.[83]

81 Information about the Mass Solar Loan program is available on the program web page, *https://www.masssolarloan.com*.

82 New Hampshire Public Utilities Commission, *Request for Proposal-Renewable Energy Fund Low and Moderate Income Community Solar Grants* (February 6, 2019), *https://www.puc.nh.gov/Home/RFPs/2019-001/20190206-PUC-RFP-2019-001-REF-LMI-Community-Solar-Grants.pdf*.

83 NY-Sun Solar for All program web page, accessed November 14, 2019, *https://www.nyserda.ny.gov/All%20Programs/Programs/NY%20Sun/Solar%20for%20Your%20Home/Community%20Solar/Solar%20for%20All*.

CASE STUDY 1

Connecticut Green Bank Brings Solar to LMI Homeowners

Steve Adams Photography

Summary

Key Organizations: Connecticut Green Bank, an agency established by the state, and PosiGen, a solar installation company

Program Location: Connecticut

Solar Developed: More than 2,500 solar installations on single-family homes in Connecticut

Who Can Replicate this Program: Other states and municipalities can establish similar programs for LMI single-family homeowners; solar companies can use the Connecticut experience to learn how to market to LMI single-family homeowners; advocates can encourage states and municipalities to establish similar programs.

Key Take-Aways

1. The Connecticut Green Bank, in partnership with PosiGen Solar, has developed a successful solar model for LMI single-family homeowners.
2. The average PosiGen customer in Connecticut receives a net annual financial benefit of $450.
3. PosiGen has installed more than 2,500 solar projects on single-family homes in Connecticut, with about 60 percent qualifying for special LMI incentives.

Program Overview

One state that has successfully served a segment of the LMI population with solar is Connecticut. The Connecticut Green Bank, an agency established by the Connecticut General Assembly, has analyzed the barriers and developed special tools for bringing cost-effective solar, combined with energy efficiency, to LMI homeowners.

CASE STUDY 1: **Connecticut Green Bank Brings Solar to LMI Homeowners** (CONTINUED)

Although Connecticut's standard solar incentive program for homeowners, the Residential Solar Incentive Program (RSIP), has been successful in stimulating residential solar development, it initially served few low-income customers. Barriers to solar for LMI homeowners can include access to financing, perceived and real credit issues, inability to take advantage of tax credits, and contractors' customer acquisition strategies. Furthermore, many LMI homeowners do not know anyone in their communities who has solar and are unlikely to even think of solar as a possibility. The Green Bank board and staff realized that they would need to implement extra measures if LMI homeowners were going to be able to install solar in large numbers.

The Green Bank's Incentive for LMI Homeowners

In 2014, the Green Bank created a new incentive for LMI homeowners that was originally three times the standard incentive. Customers who earn less than 100 percent of Area Median Income (AMI) are eligible for the LMI incentive. Because the Green Bank did not want the homeowners to be responsible for large upfront payments and wanted to ensure that the LMI homeowners would benefit from the federal solar tax credit, at least indirectly, only third-party-owned systems are eligible for the LMI incentive. The Green Bank's incentive is paid to the solar company, which owns the system and is then able to offer a reduced price to the customer.

To qualify for the LMI RSIP, contractors must submit their proposed product pricing, marketing strategy, and qualifications, and agree to abide by program rules.[84] These additional program requirements ensure that Green Bank-supported solar projects for LMI homeowners have a positive economic benefit for the homeowners and include strong consumer protection. For instance, price escalators, which increase the price customers pay over time, are not permitted with the LMI program. After completing the paperwork, contractors go through a negotiation and discussion process with the Green Bank before they are approved.

Helping Solar Companies Enter the LMI Market

The Green Bank recognized that contractors may be hesitant to enter the LMI solar market because of its unique challenges. The Green Bank therefore issued a solar financing RFP to help solar PV system providers to establish solar businesses in Connecticut that focused on serving LMI customers. A review process for solar contractors who responded to the RFP assessed whether they would be successful in reaching underserved markets.

PosiGen Solar was the first company to be approved both for the LMI RSIP and for the additional solar financing opportunity. Since 2015, PosiGen, in partnership with the Connecticut Green Bank, has been providing solar and energy efficiency to Connecticut residents through a program known as Solar for All. Any homeowner can participate, but PosiGen specifically targets LMI homeowners. PosiGen's model also includes an alternative underwriting approach other than using credit scores to qualify customers and community-based marketing. These two key program elements have proven essential to reaching the low-income market. Additionally, an energy efficiency audit is required of all participating customers.

84 See the RFP for the LMI RSIP at *https://www.ctgreenbank.com/wp-content/uploads/2015/12/LMI-Incentive-Contractor-RFQ-0807151.pdf.*

CASE STUDY 1: **Connecticut Green Bank Brings Solar to LMI Homeowners** (CONTINUED)

Prior to 2019, PosiGen offered an optional energy savings agreement that allowed customers to undertake deeper energy efficiency upgrades. PosiGen has now made this a standard part of its service, and all of its customers receive the deep energy efficiency measures. In order to make this change, PosiGen expanded its list of energy efficiency offerings to ensure every customer receives value and the cost of the additional energy improvements is rolled into the customer's lease price.

In addition to the financial support that the Connecticut Green Bank provides to PosiGen, the Green Bank helps to identify community organizations and local governments that are interested in partnering with PosiGen. These community partners are a key part of PosiGen's marketing strategy.

How the Finances Work

All incentives under the RSIP are paid by the Green Bank to the system owner. The LMI RSIP is a production-based incentive (PBI) and is paid to the third-party owner for six years. Its value has declined from $0.11/kilowatt-hour (for systems up to 10 kilowatts) in 2015 to $0.09/kilowatt-hour in 2019.[85] For a 5-kilowatt PV system, which would generate roughly 6,360 kilowatt-hours/year,[86] the current value of the LMI RSIP is ($0.09)(6,360)(6) = $3,434.40 over six years.

The non-LMI RSIP, in contrast, is available as either a PBI (for third-party-owned systems) or an upfront incentive (for customer-owned systems). The current value of the non-LMI PBI is $0.035/kilowatt-hour, which means that for a third-party-owned 5-kilowatt PV system the value of the non-LMI RSIP is ($0.035)(6,360)(6) = $1,335.60 over six years.

The Connecticut Green Bank takes ownership of the Renewable Energy Credits (RECs) for all solar systems that receive the RSIP incentive. Through the sale of RECs, the Green Bank makes some of the money back that it spends on the RSIP.

Customers who lease their systems do not receive a direct incentive from the Green Bank, but they benefit financially when the reduction in their electric bills exceeds the cost of their solar leases. Additionally, all PosiGen customers receive efficiency upgrades, leading to further savings. The average PosiGen customer in Connecticut receives a net annual financial benefit of $450.

Since 2015, PosiGen has deployed more than 2,500 residential solar systems in Connecticut. Sixty percent of these systems have been eligible for the LMI RSIP, while the others were installed at homes that did not qualify for the special LMI incentives and received the standard RSIP instead.

PosiGen has recently opened a second Connecticut office in Hartford. Isabelle Hazlewood of the Green Bank says that the Solar for All program has "cracked the nut" for how LMI homeowners can go solar, and tremendous potential exists for more LMI homeowners to be served by this model, both in Connecticut and elsewhere.

85 Connecticut Green Bank, *RSIP Transition Webinar,* (January 2019), *https://ctgreenbank.com/wp-content/uploads/2019/01/RSIP-Transition-Webinar_011519.pdf*.

86 National Renewable Energy Laboratory, PVWatts program website, *pvwatts.nrel.gov*.

CASE STUDY 1: **Connecticut Green Bank Brings Solar to LMI Homeowners** (CONTINUED)

Through a US Department of Energy award, the Clean Energy States Alliance is currently working with the Green Bank, PosiGen, and others to further evaluate and promote this model for bringing solar to LMI single-family homes. State agencies from across the country will be given the opportunity to join a working group where they will receive technical assistance and other support to consider adopting similar programs for their states.

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CASE STUDY 2

Energy Trust of Oregon Engages Community Groups to Create Replicable Solar Development Models

Summary

Key Organizations: Energy Trust of Oregon, a nonprofit organization established through state legislation, and numerous community organizations in Oregon

Program Location: Oregon

Solar Developed: Nine community groups have received grants to develop projects

Who Can Replicate this Program: Other states and municipalities can learn from and emulate Energy Trust's approach to outreach and to working with community groups; advocates can encourage states and municipalities to establish programs.

Energy Trust of Oregon

Key Take-Aways

1. Energy Trust of Oregon has developed a successful seed-funding model to support LMI solar projects across Oregon.
2. Energy Trust and its organizational partners conducted extensive outreach, including dozens of public meetings, and developed LMI working groups as well as partnerships with community-based organizations.
3. Nine community-based projects received grants from Energy Trust, with participants in one funded project expected to save $300–$400 annually and participants in another project expected to save 25 percent on their energy bills.

CASE STUDY 2: **Energy Trust of Oregon Engages Community Groups to Create Replicable Solar Development Models** (CONTINUED)

Program Overview

Energy Trust of Oregon implemented a multi-stage initiative for engaging community-based organizations and other stakeholders to expand opportunities for LMI residents to access solar energy. The effort involved learning from and building capacity in community groups, and ultimately awarding innovation grants to help those groups develop their own programs for deploying solar for the benefit of LMI families. The initiative will provide a portfolio of options for other nonprofits, government entities, and community groups to use as a resource for creative LMI community-focused solar projects.

Energy Trust's Mission

Energy Trust of Oregon is a nonprofit organization dedicated to helping utility customers benefit from saving energy and generating renewable power. Located in Portland, Energy Trust provides services, cash incentives, and expertise to help residents and businesses invest in energy efficiency and renewable energy.

Community Engagement

In 2016, Energy Trust and the Oregon Department of Energy received funding from the US Department of Energy via an award to the Clean Energy States Alliance for creating programs to address barriers to LMI participation in solar projects. They concluded that, before finalizing any new programs, it was important to better understand the perspectives of stakeholders, especially those representing LMI communities.

Energy Trust, the Oregon Department of Energy, the Oregon Public Utilities Commission, and leading local energy nonprofits undertook a public outreach roadshow in 2017 that consisted of four regional meetings where over 140 people attended, including local residents, representatives from utilities, municipal agencies, environmental and energy groups, community-based organizations, and affordable housing developers. The events focused on meaningful engagement that allowed organizations to hear community representatives' views and the stakeholders to learn about solar project development. The process set the stage for strong partnerships between Energy Trust and local community organizations. Key outcomes from the initial outreach efforts included a need to better define costs, interest in locally sited projects, a need for additional outreach and education, and the development of a common understanding of LMI community values and needs.

Energy Trust then convened a working group of interested stakeholders and community groups that, over the course of about nine months, helped develop a set of draft strategies for deploying solar to benefit LMI families.

Energy Trust conducted 30+ additional meetings in nine communities with local residents and community-based organizations to review and refine the draft strategies and to create a deeper community network. Energy Trust staff discussed the best ways to help community groups learn about and develop solar projects. As a result of the extensive outreach campaign, Energy Trust and its organizational partners developed partnerships with community-based organizations and with an LMI working group

CASE STUDY 2: **Energy Trust of Oregon Engages Community Groups to Create Replicable Solar Development Models** (CONTINUED)

comprised of a wide range of stakeholders. This group met regularly, helping to implement final strategies focused on capacity building, development of replicable LMI solar project funding models, and opportunities for Energy Trust to support existing local programs to overcome LMI participation barriers. Some community groups received funding that allowed them to participate in recognition of the time required to participate and of the fact that renewable energy was outside of the organizations' core missions.

Based on this community feedback, Energy Trust launched innovation grants in 2018 to inspire community-based approaches to more equitable solar energy deployment. A solicitation was issued to identify pioneering solar program proposals that showed direct benefits to community members. Applicants were local community organizations with direct ties to LMI residents. Energy Trust awarded nine grants for a total of $81,600.

Community-Based Projects

Three of the nine projects have already made substantial progress in achieving the goals of their Innovation Grants; they are described below.

Neighbor Works Umpqua

Based in Southern Oregon, NeighborWorks Umpqua is a nonprofit community development corporation focused on economic, social, and environmental equity. It owns Newton Creek Manor, a manufactured home park community, serving mostly LMI households. Community members rent land from NeighborWorks but own their manufactured homes and pay their own energy bills. NeighborWorks Umpqua used the innovation grant funding to create a 12-kilowatt, on-site, rooftop solar installation on the shared Newton Creek Manor community building. The funding from the Energy Trust innovation grant is part of a pool of funding and resources that includes municipal, utility, and nonprofit resources. The energy savings are shared with 10 percent of the tenants (five tenants total). NeighborWorks used a need-based matrix to identify the tenants with the highest energy burden. The chosen tenants receive an average of 25 percent savings on their energy bills. This program is paired with existing energy efficiency programs that provide education, resources, monitoring, consultation, and upgrades to the site, community buildings, and homes.

Benton and Albany Area Habitat for Humanity, Seeds for the Sol, and Oregon Clean Energy Cooperative

The Benton and Albany Area Habitat for Humanity organizations, Seeds for the Sol, and Oregon Clean Energy Cooperative collaborated to create and implement a model to finance the installation of solar arrays on single-family homes for LMI homeowners who do not have a federal tax liability and therefore cannot take advantage of the federal solar tax credit. The project secured financing for 10 homes to be fitted with three-kilowatt arrays each. These were aggregated into one 30-kilowatt solar project connected to a federal tax investor. Incentives, donations and zero-interest loans from Seeds for the Sol provided financing. Habitat for Humanity guaranteed the loans. Homeowners are projected to save an average of $300–$400 per year over the warrantied 25 years.

CASE STUDY 2: Energy Trust of Oregon Engages Community Groups to Create Replicable Solar Development Models (CONTINUED)

Wallowa Resources Community Solutions, Inc.

Wallowa Resources Community Solutions, Inc. (WRCSI) specializes in services for renewable energy businesses. It is partnering with Fleet Development which manages 116 affordable housing properties located throughout Oregon, Washington and Idaho. Together, WRCSI and Fleet developed a third-party-owned, 66-kilowatt aggregated, net-metered solar project for Park Street Apartments, a low-income multifamily building in Wallowa County. This project pulls together several funding mechanisms, including the Federal Investment Tax Credit, a USDA Rural Energy for America Grant, Energy Trust incentives, renewable energy development grant funds, and project partner equity. Working with the third-party entity, Fleet will receive the direct savings from the project and pass on the benefits to the tenants by staving off rent increases. In approximately seven to eight years, the loan will be paid off, Fleet will pass on additional savings to the tenants through discounts and building improvement projects.

Next Steps

As the Innovation Grant Program progresses, Energy Trust of Oregon anticipates this initiative will produce a collection of novel LMI solar projects that can be used as a toolbox of ideas, strategies, plans, models, and guidelines for similar projects in Oregon and other states, leading to greater access to solar energy benefits for LMI residents who historically have been excluded from accessing renewable energy.

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CHAPTER 6

Philanthropic Foundations: Recommendations and Case Studies

Recommendations for Philanthropic Foundations

1. Incorporate input from community groups
2. Support frontline organizations with unrestricted multi-year grants
3. Invest in projects with a strategic focus
4. Leverage financing and program-related investments to de-risk projects
5. Provide funding to determine the most viable community empowerment models for solar
6. Lean in to challenging locations to accelerate equity in solar access
7. Leverage strategic new channels to teach LMI households
8. Philanthropy-supported solar initiatives to replicate

Philanthropic foundations have played an important role in advancing solar energy nationwide by encouraging innovation, funding environmental advocacy organizations, supporting pilot projects, and aiding policy development. In recent years, more foundations have recognized the importance of ensuring that solar development also advances energy equity. Those foundations have funded a range of innovative and impactful activities to bring solar to under-resourced communities.

This chapter uses the experiences of those foundations, along with insights gained from our project's interviews and research, to identify best practices and recommendations for foundations to consider as they support solar in under-resourced communities over the next few years. We acknowledge upfront that, even though some foundations have considerable financial resources, their funding is ultimately limited. They are not able to fund most solar installations in under-resourced communities. But they can fund organizations to work on policies that will catalyze public financing and they can strengthen frontline organizations so that they can be more effective participants in the solar market. In these and other ways, foundations can jump-start larger efforts that can ultimately be self-sustaining without grant funding.

Below we provide recommendations for philanthropic organizations interested in advancing solar in under-resourced communities.

"Rather than come into a community with fully-baked solutions, foundations should first have conversations with the affected under-resourced communities and learn what those communities think the solutions should be."

— Jennifer Somers, Energy Foundation

1. Incorporate Input from Community Groups

Getting the views of community groups is vital to program success and foundations should consider those perspectives when deciding how to target their philanthropic efforts. As Jennifer Somers of the Energy Foundation points out, "Rather than come into a community with fully-baked solutions, foundations should first have conversations with the affected under-resourced communities and learn what those communities think the solutions should be."

Ideally, foundation staff would spend time on the ground with frontline organizations. Of course, if a foundation gives grants that impact multiple communities, it is usually not possible to spend time in all of them, but even establishing contacts in a few places can lead to more successful programs.

By engaging frontline organizations and the environmental justice community in dialogue, there is also an opportunity for a foundation to educate community members about the constraints under which it may operate. Frontline organizations may not be aware of the foundation's capabilities, narrow grantmaking focuses, overall budget constraints, pre-existing commitments, and geographic targets.

Foundations can also ask grantees that are not frontline organizations to engage with those organizations. National or regional environmental organizations that seek to promote solar in under-resourced communities should be asked to initiate dialogues and work in partnerships with community groups, if they are not already doing so.

2. Support Frontline Organizations with Unrestricted Multi-Year Grants

Community organizations in under-resourced communities are themselves under resourced. They can have difficulty moving solar forward in their communities, given small staffs and budgets. Foundations should seek to strengthen some of these organizations even though it will never be possible for all the worthy community organizations in under-resourced communities to receive foundation funding.

As many foundations are aware, some of the frontline groups feel disregarded because foundations disproportionately favor large, national environmental organizations, which are considered to have greater capacity for project implementation. Here are some strategies that foundations can use to address this perception and to best help community organizations advance solar:

- Provide unrestricted grants and general operating support to grantees to fund overhead and allow experimentation in the field.
- Rather than one-year grants for specific projects, emphasize multi-year grants that include organizational support and capacity building, so that small community organizations have time to produce results and do not need to focus as much on short-term fundraising.

- Encourage and support statewide and regional coalitions of frontline groups. Give those coalitions funding so that they can build capacity and expertise in energy issues and help the local organizations in their coalitions.
- Support training, education, and networking opportunities for leaders and members of community organizations, including opportunities to engage with other solar stakeholders at regional and national conferences. Because frontline organizations have limited resources, funding should cover the participants' travel expenses and time.
- Foundations that are focused on policy development and policy advocacy should fund efforts to connect community members to larger policy organizations and to educate those individuals on the policy debates that can affect solar development in under-resourced communities. The foundations can create the expectation that the representatives of frontline organizations will be active players in state-based advocacy campaigns. Frontline organizations can bring their own political clout to policy debates, with relationships to policymakers who are not reached by traditional environmental groups.
- Foundations should diversify their funding awards. Rev. Mariama White-Hammond, a grassroots environmental leader in Boston, encourages foundations to think in terms of a portfolio of projects that vary in their goals and risks: "Funders need to have an investment portfolio that reflects the diversity of approaches and solutions that we need. Don't just fund one type of group or community. Invest some in early start-up community groups, invest some in groups that are a little further along, and some in groups that are well-established. The foundations should then create opportunities for dialogue where early-stage groups can learn from the experiences of the more established and more established groups can embrace the innovations of newer groups."
- Foundations should amplify the efforts of the organizations they fund. As Jean-Ann James of the Turner Foundation points out, "In addition to providing funding and convening, foundations can share relevant work with funding and grantee partners, and they can act as cheerleaders to boost their grantees."

"Funders need to have an investment portfolio that reflects the diversity of approaches and solutions that we need. Don't just fund one type of group or community. Invest some in early start-up community groups, invest some in groups that are a little further along, and some in groups that are well-established."

— Rev. Mariama White-Hammond, New Roots AME Church

3. Invest In Projects with a Strategic Focus

Foundation grants for specific solar projects were essential to some of the initial installations in under-resourced communities. Because many solar projects have now been developed, there is little need for foundations to continue to fund demonstration projects whose main point is to show that LMI solar is possible.

Instead, any foundation funding for solar projects should have additional purposes. Perhaps a foundation with a targeted geographic focus wants to help a particular organization or community reduce its energy costs. Or a foundation might want to help a community organization to develop some projects to

strengthen the organization and give it visibility as a solar developer. A foundation might also consider funding a solar installation that is essential to a job training or workforce development initiative.

Another way to use foundation funding is to attract other types of capital, both public and private, into a project. Foundations should consider if their funds can leverage other investments in solar projects. In some cases, a modest foundation grant to a community partner can make it possible to access much larger public funding.

4. Leverage Financing and Program-Related Investments to De-Risk Projects

Rather than focus on individual solar projects, foundations can take actions that will make project development less risky and will make financing easier for many projects. In 2017, Clean Energy Group published *A Resilient Power Capital Scan: How Foundations Could Use Grants and Investments to Advance Solar and Storage in Low-Income Communities*, funded by The Kresge Foundation and others. Although it was focused specifically on solar-plus-storage projects, most of its more than 50 proposed interventions by foundations are applicable to other types of solar projects as well. Many of the ideas aim at expanding the available financing for projects and reducing project risk.[87]

"PRIs can play a critical role in leveraging new capital for projects benefitting low-income communities. We have paired PRIs—including below-market loans and loan guarantees—with traditional grant dollars to speed the adoption of solar power in underserved communities."

— Lois DeBacker,
The Kresge Foundation

Foundations can deploy program-related investments (PRIs), which involve investing funds from their capital endowments. PRIs can provide credit enhancements that address project performance risk. Credit enhancements, such as loan guarantees and loan loss reserves, can reimburse lenders for monetary losses if expected economic returns from projects do not materialize. Case Study 3 describes a credit enhancement model that The Kresge Foundation is launching soon. Chapter 9 discusses financing strategies more generally, including PRIs and impact investing.

Lori DeBacker, Managing Director of the Environment Program at The Kresge Foundation point out that: "PRIs can play a critical role in leveraging new capital for projects benefitting low-income communities. We have paired PRIs—including below-market loans and loan guarantees—with traditional grant dollars to speed the adoption of solar power in underserved communities."

5. Provide Funding to Determine the Most Viable Community Empowerment Models for Solar

As discussed earlier in this report, there is great interest in using solar to build wealth in under-resourced communities and to give community members greater control of their destiny, but successful models are lacking. New project development and financing strategies that achieve community empowerment

87 Robert G. Sanders and Lewis Milford, *A Resilient Power Capital Scan: How Foundations Could Use Grants and Investments to Advance Solar and Storage in Low-Income Communities* (Clean Energy Group, February 2017), https://www.cleanegroup.org/ceg-resources/resource/resilient-power-capital-scan.

are needed. Although technology demonstration projects are no longer needed, foundations could give grants to prove the viability of models that promise community empowerment, such as community ownership of solar projects.

Foundations should support technical assistance for the analysis of community empowerment financial models and include money in grants for project evaluation and wide dissemination of results.

6. Lean in to Challenging Locations to Accelerate Equity in Solar Access

Most solar initiatives for under-resourced communities have focused on the Northeast, the Pacific Coast, and a handful of other states, such as Colorado and Minnesota. In part, this is because public policies have created a more favorable environment in those locations and large foundations are most active there.

But as solar power becomes more financially attractive, its geographic reach is expanding. The South, for example, is seeing rapid growth in utility-owned solar, though the region still suffers from unfavorable policies for customer-owned solar. The South also suffers from greater poverty and higher energy burdens than other regions, making low-income solar an especially attractive option for cutting energy bills—if policy and finance barriers can be addressed.

A strategy for the South may look different than for other regions. Foundations may want to devote more resources to strengthening community organizations with capacity-building and education. Opening up distributed solar markets, such as by legalizing third-party ownership arrangements, is a greater priority in the South than in other regions.[88] Foundations can also look for niche market situations

Clean Energy States Alliance

88 Marie Donahue, *States Agree: Third-Party Ownership Enables Distributed Solar, But What's Next?* (Institute for Local Self-Reliance, March 23, 2018), *https://ilsr.org/states-agree-third-party-ownership-enables-distributed-solar-but-whats-next.*

where solar already makes financial sense. For example, a report by Clean Energy Group assessing the economic benefits of solar+storage projects for commercial buildings and some public facilities found that such projects had favorable economics in Wilmington, North Carolina and Charleston, South Carolina, but they would not work well financially in Miami, Florida and New Orleans, Louisiana.[89]

7. Leverage Strategic New Channels to Teach LMI Households

The traditional model for solar deployment has been to leverage public money by matching it with private investment by customers. A 30 percent federal solar tax credit, for example, leverages 70 percent in private funding from the customer. In the early days of solar, due to the high cost of the technology, the private funding came from wealthier early adopters. As the cost of systems fell, middle class customers entered the market. But now many states have phased out direct financial incentives for solar deployment so that solar is transitioning to a largely unsubsidized future.

A foundation's greatest leverage traditionally has come from supporting advocacy efforts to create public investment in solar through policy development, legislation, or regulatory decisions. As solar becomes more viable for LMI households, foundations need to find leverage tailored to that end goal. Since LMI customers themselves are less able to take tax breaks or provide funds for up-front costs, leverage funding for solar projects needs to be found elsewhere, which is a more complex task but still feasible. Existing government anti-poverty programs are one source, such as housing and energy bill assistance. Utility energy programs can evolve beyond early adopters and middle-class homeowners to gain a focus on LMI customers, so solar incentive programs can be redirected. And strategies can be used to continue driving down the cost of deployment, so that even low-income households can afford to go solar, such as through bulk purchasing, job training, and volunteer labor programs.

8. Philanthropy-Supported Solar Initiatives to Replicate

In addition to the Kresge Foundation and the LaGrange Housing Authority case studies presented in detail below, other promising initiatives that have benefitted from financial support by philanthropic foundations include:

- ***McKnight Lane Affordable Housing Project.*** This project in Waltham, VT repurposed a defunct mobile home park with the first examples of resilient, zero-energy, modular housing in a rural community. Solar+storage systems at each home provide tenants with backup power and zero energy costs. The all-electric, net-zero homes demonstrate how energy efficiency, PV, and battery storage systems together can bring economic and energy security benefits to tenants while also providing grid benefits to the local utility. This project received essential funding from the Vermont Community Foundation–Sustainable Future Fund and the High Meadows Fund. Without that foundation support, the project would not now be able to serve as an example of how solar+storage can provide rural low-income housing with health, safety, and economic benefits.[90]
- ***North End Woodward Community Coalition*** (NEWCC) started as a coalition of bus riders and their supporters in Detroit's North End neighborhoods, but in 2010, it began raising money for solar streetlights when the City of Detroit decided to turn off and remove grid-tied streetlights in a

89 Seth Mullendore et al., *Resilient Southeast: Exploring Opportunities for Solar+Storage in Five Southeastern Cities* (Clean Energy Group, April 2019), *https://www.cleanegroup.org/wp-content/uploads/Resilient-Southeast-Series-Overview.pdf.*

90 For more information about the McKnight Lane project, see a case study: Samantha Donalds, et al., *McKnight Lane Redevelopment Project* (Clean Energy Group, June 2018), *https://www.cleanegroup.org/ceg-projects/resilient-power-project/featured-installations/mcknight-lane.nonprofit-grant-programs/good-use.*

money-saving move. After NEWCC purchased 15 homes at risk of foreclosure and placed them in a community land trust to keep the residents in their homes, the Honnold Foundation partnered with NEWCC to fund solar installations on ten of the homes, thereby "placing solar panels directly in the hands of low-income Detroiters living in one of the most polluted zip codes in the United States."[91]

- ***GoodUse*** is an initiative in greater Atlanta that supports solar and other energy efficiency measures for nonprofits to help those organizations reduce their operating costs and their environmental footprint. The Kendeda Fund provides essential financing support for this initiative, which is managed by the Southface Institute and builds on a partnership with the Community Foundation of Greater Atlanta. Among the many projects have been a 35-kilowatt installation at the Atlanta Neighborhood Charter School and a 20-kilowatt installation at the Salvation Army Metro Atlanta Red Shield Services Emergency and Transitional Housing Facility. There are three funding opportunities annually for nonprofits to apply to participate in the program.[92]
- ***Whitney M. Slater Shared Solar Facility.*** This Duke Energy and Pine Gate Renewables project was driven in part from the community by New Alpha Community Development Corporation in the Pee Dee region of South Carolina, specifically serving the Dillon County area where 52 percent of the population is at or below the Federal poverty level. The Solutions Project seeded New Alpha's work over a three-year period with $50,000 per year in grants plus media support to position the community group and its executive director, Reverend Leo Woodberry, to help overcome policy, regulatory, and implementation barriers in the state for such projects. The project offers a shared solar subscription model with carve-outs for low-income utility customers with a minimum savings of $100 per year based on a 2-kilowatt subscription with waivers for start-up fees.
- ***The Regenerative Community Development.*** In the Pine Ridge Indian Reservation of South Dakota, at least half of the approximately 30,000 Oglala Lakota indigenous people live below the Federal poverty level. Thunder Valley Community Development Corporation (TVCDC) is working to serve the population through a system-change approach that may lead to a more regenerative economy. It is building a 34-acre community adhering to stringent sustainability and land stewardship objectives and rooted in indigenous Lakota values. The project is constructing energy and water-efficient buildings, including single-family homes, a twelve-unit mixed-income apartment building, and a community center. The project includes 14 3.7-kilowatt installations, one 61.6-kilowatt installation, and one 24-kilowatt installation that includes battery storage. The project has been financed in part through in-kind donations, grants, and other types of finance. It has received important institutional funder support and apartment financing from the South Dakota Development Housing Authority. The Solutions Project has recently supported TVCDC both with grant dollars and introductions to untapped funders.

91 Honnold Foundation web page about the North End Woodward Community Coalition, *http://www.honnoldfoundation.org/newccpartner.*

92 For more information about GoodUse, see its web page on the Southface Institute website, *https://www.southface.org/programs.*

93 For more information about the project, see Naeem McFadden, "Solar Farm in Dillon County Renamed to Honor Whitney M. Slater," *AP* (August 29, 2018), *https://apnews.com/e066041bb3b349dd937cf0f87e821bcb.*

94 For more information about the project, see a web page by GenPro Energy Solutions, which is partnering on the project, *https://www.genproenergy.com/project/thunder-valley-solar.*

CASE STUDY 3

The Kresge Foundation Provides Credit Enhancements to Finance Resilient Power Projects

New Partners Community Solar

Summary

Key Organizations: Kresge Foundation, a philanthropic foundation based in Michigan, and Clean Energy Group, a national nonprofit based in Vermont

Program Location: Nationwide

Solar Developed: The Kresge Foundation's loan guarantee program is in its early stages and will ultimately support many solar+storage projects at multifamily affordable housing in various locations.

Who Can Replicate this Program: Other foundations can receive technical assistance from CEG to set up loan guarantee programs or to make capacity-building and pre-development grants; lenders and affordable housing developers can qualify for loan guarantees.

Key Take-Aways

1. The Kresge Foundation, with the assistance of Clean Energy Group (CEG), has developed a $10.3 million solar+storage loan guarantee program for LMI projects.
2. The program offers an innovative alternative to traditional loan guarantee programs by providing a payment guarantee mechanism that helps keep loan payments current and from falling into default, as well as capacity-building grants and pre-development grants.
3. The US Department of Energy has awarded a three-year grant to the Clean Energy States Alliance/CEG to promote expansion of the Kresge loan guarantee model to other philanthropies interested in clean energy and social equity.

Program Overview

The Kresge Foundation's Financing Resilient Power Program is a significant new philanthropic effort—a $10.3 million social justice initiative to accelerate the market development of solar PV plus battery storage (solar+storage) technologies in vulnerable and

CASE STUDY 3: **The Kresge Foundation Provides Credit Enhancements to Finance Resilient Power Projects** (CONTINUED)

disadvantaged communities. Solar+storage systems provide energy resilience, reduce electric bills, and provide a powerful means of integrating more clean renewable energy into the electric grid.

The program, developed with the nonprofit Clean Energy Group (CEG), represents the first time a US foundation has committed to use both its grantmaking and endowment resources in a comprehensive clean energy and social equity strategy to bring new clean energy technologies to affordable housing and critical community facilities.

The program is a model for how foundations in the environment and climate space can realign their grant and investment portfolios to support social justice and equity in clean energy project development.

Program Elements

The innovative financing partnership consists of three program elements:

1. A $10 million loan guarantee program to reduce credit risk for solar and storage project investments. The guarantee facility is booked as a reserve on the foundation's endowment until such time as a demand for payment is made under a specific guaranteed loan transaction, which then takes the form of a program-related investment (PRI);
2. $210,000 in capacity grants to nonprofit participating lenders to accelerate their ability to finance solar+storage projects, build project pipelines, and actively engage in information sharing (the first participating lender is NYCEEC); and
3. $120,000 in technical assistance grants to enable eligible project owners and developers to assess the technical and financial aspects of new solar and storage projects.

The program elements above are expected to: (1) lead to increased investments in solar+storage projects in challenging low-income markets, (2) help build multiple project pipelines of solar and storage projects that expand existing loan portfolios of low-income project lenders, and (3) provide technical assistance and capacity building support to ensure solar+storage system installations and developers' clean energy projects are successful.

Roots of the Kresge Program

The Financing Resilient Power Program is an outgrowth of a study of market barriers to deploying solar+storage technologies in low-income communities that The Kresge Foundation and Surdna Foundation (with additional support of The JPB Foundation) commissioned CEG to conduct. In February 2017, CEG published *A Resilient Power Capital Scan: How Foundations Could Use Grants and Investments to Advance Solar and Storage in Low-Income Communities.*[95] The report identified more than 50 grant and

95 Robert G. Sanders and Lewis Milford, *A Resilient Power Capital Scan: How Foundations Could Use Grants and Investments to Advance Solar and Storage in Low-Income Communities* (Clean Energy Group, February 2017), https://www.cleanegroup.org/wp-content/uploads/Capital-Scan-Feb2017.pdf.

CASE STUDY 3: The Kresge Foundation Provides Credit Enhancements to Finance Resilient Power Projects (CONTINUED)

investment opportunities, including loan guarantees and capacity grants, that foundations and other socially minded investors can use to target the market barriers.

In 2018, CEG collaborated with lenders, foundations, and owner/developers to design a loan guarantee model and draft term sheet, which became the initial blueprint for the Resilient Power Loan Guarantee Program. The Resilient Power Loan Guarantee Program is expected to officially launch in the winter of 2019–2020. It will initially be available to support solar+storage projects in the Northeast US, with the intention of expanding nationally over time. CEG will monitor the progress of the program and issue a report on its results. Learn more at *www.resilient-power.org*.

Key Loan Guarantee Program Terms

The $10 million Kresge Foundation loan guarantee program is unprecedented in several ways:

- It provides approved participating lenders with a 50 percent payment guarantee for loans made to solar+storage projects. If the project cannot cover its portion of a borrower's debt service, then the guarantor foundation pays up to 50 percent of the project debt service to keep the borrower's loan payments current, substantially reducing the risk of a payment default to the lender's investor who provided capital for the loan. The cumulative payments made by the guarantor will not exceed 50 percent of the original amount of the solar+storage portion of the project loan. The guarantor foundation assumes first loss position for these loans.
- The Loan Guarantee Facility appears as a reserve liability against the guarantor foundation's endowment, but no funds are transferred until such time as a demand for payment is made under the guarantee, which then takes the form of a PRI. The foundation endowment continues to earn market rate returns on the reserved funds until demand for payment is made under a specific guaranteed loan transaction.
- The term of the Loan Guarantee Facility is 14 years, which includes an initial four-year origination period. There is no minimum or maximum guaranteed loan amount.
- The Loan Guarantee Program has been designed to be responsive to a wide range of loan types and ownership structures. It is available for construction and permanent financing when originated by an approved participating lender for LMI solar+storage projects for multifamily affordable housing, elderly and other supportive housing, unsubsidized workforce rental housing, commercial and mixed-use projects, and community facilities.

Types of ownership that can be accommodated under the loan guaranty program include:

- Direct immediate ownership
- Third-party ownership
- Special purpose entities
- For-profit and nonprofit ownership
- Cooperative and community ownership

CASE STUDY 3: **The Kresge Foundation Provides Credit Enhancements to Finance Resilient Power Projects** (CONTINUED)

Capacity Grants and Technical Assistance Awards

Recognizing that credit enhancement alone will be insufficient to change behavior in this nascent market, the Financing Resilient Power Program includes two important new grant resources:

- First, participating lenders will have access to new capacity grants to help them build additional in-house capacity to finance solar+storage projects, strengthen project pipelines, and share information.
- Second, the program will offer new technical assistance grants to help project developers and community groups to size solar+storage systems to verify that the resilience goals and financial benefits of the project are technically and economically feasible.

The Loan Guarantee Program's technical assistance grants are limited to supporting those projects that are likely to be financed by approved participating lenders.

Opportunities for Other Foundations

Although this is an important and groundbreaking initiative by The Kresge Foundation, it alone will not move the market in all low-income communities. It is hoped that the loan guarantee program will encourage other philanthropies interested in clean energy and equity to expand or adapt this model. To this end, the Clean Energy States Alliance has received a three-year award from the US Department of Energy to work with CEG and promote the expansion of the Kresge loan guarantee model.[96] It is expected that this will bring new grant support to the capacity and technical assistance programs, as well as direct other endowment investments to expand the existing loan guarantee beyond the current $10.3 million committed by The Kresge Foundation.

For more information, contact:
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96 Learn more about this DOE-funded project and how to access technical assistance at the project web page, *Scaling Up Solar for Under-Resourced Communities*, *https://www.cesa.org/projects/low-income-clean-energy/scaling-up-lmi-solar.*

CASE STUDY 4

LaGrange Housing Authority Project Catalyzes Ongoing Solar Development by an Innovative Community Organization

Becca Eiland

Summary

Key Organizations: LaGrange Housing Authority, a municipal nonprofit corporation; Groundswell, a national nonprofit solar developer; and The Solutions Project, a national funder of innovative projects by frontline organizations

Program Location: LaGrange, Georgia

Solar Developed: A 2.5-kilowatt ground-mounted installation with a tracking system provides power equivalent to a 3-kilowatt to 4-kilowatt stationary system.

Who Can Replicate This Project: Institutional funders can seed projects to catalyze solar development in communities with few solar projects; community groups can emulate the LaGrange approach of placing an initial solar project in a high-visibility location and combining it with education to leverage the project for further development.

Key Take-Aways

1. Funders should not disregard small projects, because small-scale projects in new markets can position communities to access capital, build wealth, and advance equity.
2. A small PV system still provides some financial benefits and can be an accessible first step for organizations that are at the beginning stages of including renewable energy initiatives in their work.
3. Public-private philanthropic partnerships are key to developing new solar markets.

Program Overview

The LaGrange Housing Authority has found novel ways to advance renewable initiatives forward in a state that does not offer the kinds of support, programs, or incentives for renewable energy offered in many other places. The Housing Authority's approach to building interest in solar through a small-scale solar project provides a useful model for other

CASE STUDY 4: **LaGrange Housing Authority Project Catalyzes Ongoing Solar Development by an Innovative Community Organization** (CONTINUED)

communities that lack significant front-end capital and state-level policy support but desire to move a just energy transition forward in their communities.

Partnership Development

The LaGrange Housing Authority in LaGrange, Georgia was created in 1953. Under the leadership of Director Zsa Zsa Heard, it focuses on addressing the deficit of safe and affordable housing in LaGrange. It provides 400 units of housing to the community and offers many community-focused programs.

In 2017, Groundswell (a national nonprofit that develops and supports shared solar projects) and The Solutions Project (a national intermediary funder of innovative renewable energy projects in support of a just transition) had been assessing project opportunities. Groundswell had existing relationships in Georgia and began exploring a partnership with the LaGrange Housing Authority. The Solutions Project developed a series of rapid response grants ($10,000–$25,000) to support community-led efforts to develop local, small-scale solar energy initiatives. It prioritizes projects in in disadvantaged communities that do not have strong state policy support and that may be well-positioned to leverage a small project to move future project expansion forward. While this can be a risky investment strategy, The Solutions Project believes that supporting frontline communities in areas like the American South, where there are limited streams of financing for renewable energy projects, could help catalyze policy action and expand solar in new markets, while proving that there is great capacity and community support throughout the US to expand solar with justice.

Groundswell played a key role in connecting The Solutions Project with the LaGrange Housing Authority. Groundswell Marketing Director Becca Eiland lives in LaGrange and had been following the Housing Authority's innovative community programs. From after-school programs to homeownership classes and connecting talented high school students to college opportunities, the Housing Authority looks to improve the lives of residents and position them for independence and success. The LaGrange Housing Authority had the flexibility provided by being in the service territory of a municipally owned utility and its existing community outreach model could be adapted to fold renewables into its mission.

Groundswell applied for The Solutions Project grant and $15,000 in funds were awarded for a small-scale solar project. The Solutions Project trusted community partners to best understand what the project should be and gave them the flexibility to design, adapt, and implement the project. Groundswell provided support to the LaGrange team as it explored different ideas. The team considered a rooftop solar project on a single-family home but they were concerned that this would not benefit enough residents or stimulate the level of community involvement that they wanted. They decided to install a SmartFlower unit, a ground-mounted all-in-one solar system fitted with a tracker that follows the sun's movement.

Gathering Community Support

Groundswell served as project manger and the LaGrange team provided leadership and made all the decisions regarding the project, in partnership with community members. The team selected the area between the LaGrange Housing Authority offices and their community center to install a 2.5-kilowatt

CASE STUDY 4: LaGrange Housing Authority Project Catalyzes Ongoing Solar Development by an Innovative Community Organization (CONTINUED)

SmartFlower. This location allowed for community members to regularly see the SmartFlower. The team partnered with local businesses and willing volunteers to store and transport the unit. The local businesses also assisted with pouring the concrete and some technical support, though the Facilities Director at the LaGrange Housing Authority, Earnest Pickett, was able to do much of the installation and maintenance work with his staff. Mr. Pickett envisions this as a first step in engaging the community in a long-term plan to achieve net-zero energy housing for all residents in Housing Authority properties.

The SmartFlower is currently powering the La Grange Housing Authority Offices, resulting in an average monthly savings of approximately $50. The savings are being used for additional after-school enrichment programs. And school-aged students are learning about the SmartFlower and the benefits of renewable energy. Mr. Pickett stops the SmartFlower so the youth can interact with it and learn how it works. Some of the students have already expressed an interest in renewable energy careers.

In the summer of 2019, the LaGrange Housing Authority, Groundswell, The Solutions Project and the City of LaGrange had a ribbon-cutting event to celebrate the installation of the SmartFlower. Over 100 residents, LaGrange municipal staff, and the Regional Director of the US Department of Housing and Urban Development gathered to see the SmartFlower in action and to congratulate the community on this important first step. To commemorate the event, students participating in the program created a mural representing the SmartFlower and what it means to their community. They included visuals and messages about a clean environment and a sustainable future.

Ms. Heard and Mr. Pickett, along with their team, are working toward expanding their environmental efforts including tankless water heaters, energy-efficient appliances, and rainwater collections systems. They are also developing additional clean energy projects, including pilot homes with four-kilowatt roof-mounted solar PV systems. The broader goal is the renewable energy and efficiency development of all 27 lots managed by the Housing Authority servicing low-income families and seniors. Projected household savings are estimated be at least $300 per month, which is significant for LaGrange household incomes. The high visibility of the project has provided opportunities to apply for HUD and State of Georgia grants to advance this project.

The LaGrange Housing Authority's SmartFlower project demonstrates the leverage that can be gained from a small-scale project to create a large impact through community engagement, local business partnerships, and philanthropic support. Currently, Groundswell and The Solutions Project are working with LaGrange on a possible second-phase project.

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CHAPTER 7
Community Organizations: Recommendations and Case Studies

Recommendations for Community Organizations

1. Insist on the involvement of community organizations
2. Develop an internal education plan
3. Engage the community in dialogue on solar
4. Control the decision-making process and make careful decisions about project ownership
5. Push for community benefit agreements
6. Identify key institutions and help them adopt solar
7. Take part in shaping policy
8. Community organization initiatives to replicate

In other chapters of this report, we emphasize the importance of state governments, foundations, investors, and solar companies working with and forging partnerships with trusted community organizations. This chapter focuses on the ways in which those community organizations can approach partnerships and how they can ensure that the residents of their communities benefit from solar.

In presenting these recommendations, we do not intend to make unrealistic requests of small organizations with limited resources. We understand that most groups will not have the staff or funding to implement all these recommendations. We present the recommendations as a menu for groups to choose from as their resources and needs allow.

Below we provide recommendations for community organizations interested in advancing solar in under-resourced communities.

1. Insist on the Involvement of Community Organizations

There is an increasing awareness that solar will succeed best in under-resourced communities if community organizations and community representatives are involved in the decision-making process and are active partners in project implementation. Solar should be something that happens *with* the community, not *to* the community.

Although the solar development process is moving in a direction that engages community voices, that does not mean that those voices will always be included. Community-based organizations focused on energy equity should continue to speak out forcefully and repeatedly to insist that community representatives and community organizations be included in planning and implementing all projects. Community organizations were essential parts of coalition efforts in California and Illinois that led to nation-leading solar programs. If a solar company begins to market its products and services within a community without involving community representatives, it should be approached by community leaders and told that it needs to alter its marketing strategy.

2. Develop an Internal Education Plan

To prepare to play a leadership role on solar in the community and to serve an intermediary role with local residents, community organizations should prepare themselves with information on energy issues and solar development. As noted in the general recommendations in Chapter 4, community organizations will be better able to pursue community empowerment if their leaders understand the options for developing and financing solar projects. They will be in a stronger position to push for policy changes, negotiate with solar companies, and develop plans for solar development.

With this in mind, community organizations can develop an internal education plan. They should start by determining the roles they want to play in relationship to solar. For example, will they develop solar projects or only provide information to others about solar options? Will they be the main source of information about solar for community residents or will they work to support another educational organization that will play the lead role? The roles a community organization intends to play will determine what types of knowledge and training its staff needs. Once the roles have been determined, the organization can develop an internal education strategy for gaining the necessary information.

Unfortunately, it is not always easy to find objective information and effective educational materials. A report that the Clean Energy States Alliance produced for states, *Solar Information for Consumers,* includes models and resources that may be applicable to the needs of community organizations.[97]

"Communities are experts in their struggles. Therefore, listening sessions where community residents can tell their stories are essential to effective long-lasting change. Grassroots community organizations can explain what impacted communities need and illustrate how solar can meet those needs."

— Rev. Michael Malcolm,
The People's Justice Council

3. Engage the Community in Dialogue on Solar

Frontline organizations are, by definition, already embedded in their communities and have close ties to community residents. They can consciously engage residents in focused discussions of solar to heighten interest, to reveal the issues that need to be addressed before solar projects can move forward, and to make sure that residents have the information they need to make sound decisions.

97 See sections 4 and 5 on models and resources in Warren Leon, *Solar Information for Consumers: A Guide for States* (Clean Energy States Alliance, November 2016), *https://www.cesa.org/assets/2016-Files/solar-information-for-consumers.pdf*.

"Communities are experts in their struggles. Therefore, listening sessions where community residents can tell their stories are essential to effective long-lasting change," observes Rev. Michael Malcom of The People's Justice Council. "Grassroots community organizations can become a medium for amplifying those stories. They can explain what impacted communities need and illustrate how solar can meet those needs."

4. Control the Decision-making Process and Make Careful Decisions about a Project's Ownership

Community organizations should work to ensure that solar development happens in ways that empower the local community and its residents. This means that the community has the ability to shape decisions and to make sure that there are adequate community benefits, both in terms of short-term financial savings and long-term control of community assets, so that current residents cannot be easily ignored or displaced.

The community, rather than outside businesses, should determine which solar projects get developed and how. Sometimes community wealth building can best be achieved by owning the solar project. As the PUSH Buffalo case study below shows, local ownership can work well in certain situations. Community organizations should do an honest self-assessment to determine if they have the appetite and expertise to be a solar project developer, as well as the resources to withstand the unexpected financial losses that can come from owning a project.

If an organization concludes that solar project development is too difficult to navigate on its own and ownership might be too risky, it does not mean that the organization needs to feel defeated or give up control. Trenton Allen, CEO of Sustainable Capital Advisors, suggests: "Well-structured contractual agreements (e.g., power purchase agreements or rental agreements) that favor community organizations could realize many economic benefits for community organizations without the risks of ownership."

A community organization that owns a building can initiate, control, and make the decisions about a solar installation on its roof, but still partner with a third-party entity that would own the system and take responsibility for maintaining it. Such an arrangement can also increase the financial benefits of the project because the for-profit, third-party owner can qualify for the federal solar tax credit.

Working with a partner that will own the project can have other financial advantages. As Jeffrey Cramer of the Coalition for Solar Community Access points out, "Specialized businesses exist to make these processes more efficient. And because business can do things more efficiently, they can often generate more savings."

"Well-structured contractual agreements (e.g., power purchase agreements or rental agreements) that favor community organizations could realize many economic benefits for community organizations without the risks of ownership."

— Trenton Allen,
Sustainable Capital Advisors

"Specialized businesses exist to make these processes more efficient. And because business can do things more efficiently, they can often generate more savings."

— Jeffrey Cramer, Coalition
for Community Solar Access

There is a hybrid approach that retains many of the benefits of ownership but still takes advantage of federal tax credits. This model brings in a partner with solar development experience to use tax equity investors who will initially own most or all of the project. The tax equity investors will withdraw after a period of years when they have received their tax benefits. The UPROSE case study on page 98 describes a successful application of this approach. It can result in low risk and leads to wealth building through ownership. On the other hand, it can delay when the community organization receives maximum financial benefits from the project, which may or may not be a good tradeoff in a specific instance.

According to Melanie Santiago-Mosier of Vote Solar: "The various stakeholders should try to create a process where communities know their options and can choose the one that is right for them. Ownership may or may not be right for them; it shouldn't be excluded or be the only route to empowerment. Ultimately, communities on the front lines should be in the driver's seat when it comes to making these types of decisions."

5. Push for Community Benefit Agreements

Community organizations can play an important role by making community benefit agreements the norm for locally controlled solar projects. For any solar project, there should be a written explanation of how the community will benefit, what guarantees are in place to ensure that those benefits materialize, and what happens if the project falls short of achieving its benefit goals.

The types of benefits that could appear in such an agreement include decision-making roles for community members, bill savings targets, job training requirements, stipulations about hiring within the community, and guarantees that electricity costs will not exceed the price of standard power from the local utility. For projects on properties with private-sector landlords, there could be assurances that current tenants will not be displaced or have their rents increased, and that gentrification will be avoided.

These sorts of agreements will only become standard practice if frontline community organizations insist on them. In supporting the community benefit agreement concept, Adam Flint of New York Energy Democracy Alliance and the Binghamton Regional Sustainability Coalition notes: "There should be a counterparty that looks out for the community and works with a private company that is developing solar."

"Stakeholders should try to create a process where communities know their options and can choose the one that is right for them. Ownership may or may not be right for them; it shouldn't be excluded or be the only route to empowerment. Communities on the front lines should be in the driver's seat when it comes to making these types of decisions."

— Melanie Santiago-Mosier, Vote Solar

"There should be a counterparty that looks out for the community and works with a private company that is developing solar."

— Adam Flint, NY Energy Democracy Alliance and Binghamton Regional Sustainability Coalition

6. Identify Key Institutions and Help them Adopt Solar

As discussed previously, helping community institutions go solar can be especially desirable. They can provide educational, cost-saving, wealth-building, and resiliency benefits.

Community organizations focused on energy equity can help direct solar development towards those particular institutional buildings that would provide the greatest community benefits. The frontline organizations can consider which institutions would benefit most from installing solar and which installations would most help the rest of the community. The organizations can then encourage the institutions to pursue solar and can link them up with developers and investors who can make an installation happen.

An energy equity organization can also link up a local institution with an entity with good credit, thereby reducing financing costs and speeding project development. The Fellowship Energy case study in Chapter 9 shows how this can work.

7. Help the Community Avoid Consumer Protection Problems

One of the best ways for community organizations to advance solar while helping the community is to reduce the number of consumer protection concerns related to solar. Organizations' education and outreach activities can give local residents the information they need to make sound decisions and to avoid taking on undesirable financial risks. One good starting point is to find out if the state or municipality has produced a consumer guide to solar, as DC, Maryland, Mississippi, and other states have.[98] A community group can help disseminate some or all of the guide to local residents.

Many of the consumer protection issues related to solar have to do with the financing of systems. Some states, such as Massachusetts or New Mexico, have produced state-specific guides about the differences between leases, loans, and power purchase agreements in that state. Or a community group can turn to CESA's generic *A Homeowner's Guide to Solar Financing: Leases, Loans, and PPAs.*[99] In all these guides, look especially at the lists of questions to ask when deciding on solar financing. Even though the advice in these guides is directly primarily to homeowners, some of it is also relevant to renters and to organizations that seek to install solar on their buildings.

Community organizations can also try to educate solar companies that enter the local area so that those companies understand the specific needs of the local community and the need for LMI households to minimize their financial risks.

Education will not always be enough, however, because unscrupulous companies and contractors sometime try to prey on under-resourced communities. When that appears to be the case, it is important for community organizations to confront the company directly to see if it will change its practices. If it does not, community organizations can widely publicize the company's bad behavior so that residents are warned, and the company pays a price. Community organizations can also bring the problem to the attention of relevant state or municipal government agencies and urge them to take action.

98 See DC Office of People's Counsel, *A DC Consumer's Guide to Going Solar* (April 2018), *http://www.opc-dc.gov/images/pdf/brochure/cesa-rptDCguide2.pdf*; and Diana Chace and David L. Comis, *A Maryland Consumer's Guide to Solar* (Maryland Energy Administration, January 2018), *https://energy.maryland.gov/Reports/A%20Maryland%20Consumers%20Guide%20to%20Solar.pdf*; and Mississippi Attorney General's Office, *A Consumer's Guide to Solar Power in Mississippi* (2017), *http://www.ago.state.ms.us/wp-content/uploads/2017/04/SolarPower_MSConsumerGuide-digital-version.pdf*.

99 Nate Hausman, *A Homeowner's Guide to Solar Financing: Leases, Loans, and PPAs* (Clean Energy States Alliance, rev. ed., August 2018), *https://www.cesa.org/assets/2015-Files/Homeowners-Guide-to-Solar-Financing.pdf*.

8. Take Part in Shaping Policy

Frontline community organizations should have a seat at the table when states and municipalities decide on solar policies that impact the community. This can be difficult, both because community groups are often left out and because those groups generally have few paid staff members, small budgets, and many competing demands on their time. Nevertheless, frontline organizations should insist that they be included.

If resources are limited, a community organization can join a state coalition of similar organizations or can help to start such a coalition. A group can also approach a larger state or national organization that works on solar policy in its region and request to be kept informed of solar policy developments. It can also ask to be told when its input into policy could make a difference in the outcome of a decision.

Even occasional phone calls and letters can remind national/regional environmental organizations and state/municipal policymakers that they need to take the views and interests of frontline energy equity organizations into consideration.

Resonant Energy

Policy advocacy can often be easier for a community organization at the municipal than the state level. It can be especially appealing and impactful to promote municipal solar policy when the community is served by a municipal utility or rural electric cooperative. The work of the Los Angeles Alliance for a New Economy described in the next section shows a good example of this.

9. Community Organization Initiatives to Replicate

Religious institutions in many states have installed solar in ways that provide economic benefits while promoting solar and educating the community. Examples of successful projects with LMI congregations include Dupont Park Seventh Day Adventist Church in Washington, DC; Faith Baptist Church in East

Oakland, CA; Faith Community Church in Greensboro, NC; and Second Church in Dorchester, MA.[100] Fellowship Energy works exclusively on solar projects for faith-based communities and its activities are described in a case study in Chapter 9. Interfaith Power & Light, a nonprofit organization that encourages faith communities to take action on climate change, keeps a directory of churches and other houses of worship across the country that have gone solar. Although most are in middle- and upper-income communities, some are in under-resourced communities.[101] Catholic Energies, a program of the Catholic Climate Covenant, assists Catholic churches and other Catholic organizations in embracing solar energy. It helped develop the largest solar array in the District of Columbia, with 5,000 solar panels offsetting nearly 100 percent of the conventional electricity used by Catholic Charities of the Archdiocese of Washington.[102]

Solarize campaigns have been a proven method for accelerating solar deployment in a community. Solarize is a general term for a community-focused marketing campaign that combines four main components: pre-negotiated group buying discounts, community-driven outreach, competitively selected installers, and a limited time offer that motivates consumers to act quickly. This approach has been tried successfully in several states, often with funding or some other support from a state agency. It is well-matched to a community group that wants to play a lead role in promoting solar to LMI homeowners, but it can also be led by a municipal government. For example, when Hamden, Connecticut conducted a Solarize campaign led by town officials, 71 families signed solar contracts, 48 percent of them LMI households. Solar United Neighbors and its Community Power Network has successfully conducted Solarize campaigns for under-resourced communities in several states.[103] A team from Yale University, Connecticut Green Bank, SmartPower, and Duke University has written *Solarize Your Community: An Evidence-Based Guide for Accelerating the Adoption of Residential Solar* to give step-by-step advice on how to mount a Solarize campaign or other community-based residential solar marketing campaign.[104] The guide is not specifically focused on under-resourced communities, but it still provides useful information for these communities.

Los Angeles Alliance for a New Economy (LAANE) has worked to prompt the Los Angeles Department of Water and Power to address energy equity. Because the utility is municipally owned, all ratepayers have a voice in it and can make sure that the utility serves the needs of all residents. In 2016, LAANE pushed the utility to adopt a resolution that requires periodic reports on equity metrics, including the geographic and demographic distribution of consumer rebates, power outages, and home energy improvement participation. There is also information on demographics related to hiring and promotions. LAANE closely monitors the reports to see if progress is being made.[105]

100 Read about these church projects in Catherine Plume, *Community Solar: Ward 7's Dupont Park Seventh Day Adventist Church Gives Back*, (East of the River, June 12, 2019), *https://eastoftheriverdcnews.com/2019/06/12/community-solar*; Kelsey Misbrener, *RE-volv Crowdfunding Campaign Makes Solar Possible for East Oakland Church*, (Solar Power World, March 22, 2018), *https://www.solarpowerworldonline.com/2018/03/re-volv-crowdfunds-solar-east-oakland-faith-baptist-church*; John David Baldwin, *Solar 'David' Takes on a Utility 'Goliath' in North Carolina*, Solar United Neighbors website, *https://www.solarunitedneighbors.org/news/solar-david-takes-utility-goliath-north-carolina*; Sami Grover, "Church Solar Project Inspires Solar for Neighborhood," Resonant Energy website (March 2, 2017), *http://www.resonant.energy/newsroom/2018/8/16/church-solar-project-inspires-solar-for-neighborhood*.

101 Interfaith Power & Light, Congregational Solar Directory web page, accessed October 7, 2019, *https://www.interfaithpowerandlight.org/congregational-solar-directory*.

102 For information about Catholic Energies, see its website, *https://www.catholicenergies.org*.

103 For information about Solar United Neighbors, see its website, *https://www.solarunitedneighbors.org*.

104 Kenneth Gillingham et al., *Solarize Your Community: An Evidence-Based Guide for Accelerating the Adoption of Residential Solar* (Yale School of Forestry & Environmental Studies, 2017), *https://cbey.yale.edu/sites/default/files/2019-09/Solarize%20Your%20Community%20Rev1%20Dig.pdf*.

105 The resolution passed by the Los Angeles Department of Water and Power is available at *https://www.ladwp.com/cs/idcplg?IdcService=GET_FILE&dDocName=OPLADWPCCB527015&RevisionSelectionMethod=LatestReleased*. The most recent semi-annual report is available at *https://www.ladwp.com/cs/idcplg?IdcService=GET_FILE&dDocName=OPLADWPCCB690288&RevisionSelectionMethod=LatestReleased*.

CASE STUDY 5

PUSH Buffalo Incorporates Solar into a Mixed-Use Project with Community Asset Ownership

PUSH Buffalo

Summary

Key Organization: PUSH Buffalo (People United for Sustainable Housing), a nonprofit Community Development Corporation in West Buffalo, New York

Project Location: Buffalo, New York

Solar Developed: A 64-kilowatt solar array was incorporated into a major project that redeveloped an abandoned school for housing, offices, and community facilities

Who Can Replicate this Project: Community organizations that seek to develop a project that involves serving as developer and owning the PV system can use this as a model; funders can support similar projects elsewhere.

Key Take-Aways

1. PUSH Buffalo has created a successful redevelopment project including a rooftop solar array that has led to jobs, affordable housing and energy savings for its community.
2. PUSH leveraged a large number of funding streams to finance a large-scale community project. This effort serves as a model for similar projects.
3. PUSH's community engagement approach, which led to deep community involvement in large-scale projects, has yielded many positive outcomes for residents and is a useful model for other organizations.

Program Overview

PUSH Buffalo (People United for Sustainable Housing) is a non-profit organization in West Buffalo, New York. It is dedicated to addressing housing, jobs, economic equity, and environmental justice through community-led and project-focused initiatives. Its School 77 project included solar as an important component of

CASE STUDY 5: **PUSH Buffalo Incorporates Solar into a Mixed-Use Project with Community Asset Ownership** (CONTINUED)

a comprehensive plan to turn an abandoned property into a multi-use facility with valuable economic, environmental, and community empowerment benefits.

PUSH Buffalo Serves the Community

Founded in 2005, PUSH Buffalo now has an operating budget of just over $4 million and a staff of roughly 50 employees. It has renovated dozens of vacant homes and lots, turning them into affordable green infrastructure sites, homes, and community gardens. PUSH conducts dozens of job and community development programs and trainings yearly. It also organizes a Hiring Hall program to connect residents with employers.

PUSH was formed as a Community Development Corporation (CDC), which allows it to purchase properties with the aim of improving the quantity and quality of affordable housing in West Buffalo. PUSH works closely with residents by engaging them in ongoing dialogues to understand their needs and hopes for the neighborhood. PUSH reflects these ideas back to the community members through meetings, phone calls, and door-to-door campaigns.

School 77 Emerges as a Focus of PUSH's Redevelopment Activities

A PUSH interactive process with over 800 West Buffalo residents identified a strong desire to create affordable housing by redeveloping the School 77 building, an abandoned historical property that once served as a school for many of the community members. Affordable housing was an obvious need, given the city's nearly 11 percent unemployment rate and the high burden rent places on households, especially those of people of color. Nearly 62 percent of Latinx renters pay more than 30 percent of their income on housing, as do 60 percent of black renters, compared to 45 percent of white renters.

A key goal of the School 77 PUSH project was to gain control of community resources, including land, housing, and energy. Going into this effort, PUSH and the residents wanted to experience and learn from controlling a renewable energy asset and to pass on to the community the savings and wealth opportunities that owning assets provides. They also wanted to provide a clear path for developers to get involved in additional low-income, community-centered projects.

A 64-kilowatt solar array was a small part of the very large redevelopment project and represented about two percent of the total budget. PUSH's finance office gathered the $14.8 million needed for the entire building redevelopment project through a major financing effort that tapped a wide range of funding sources, including:

- Low Income Housing Tax Credits, allocated by New York's state affordable housing agency, Homes and Community Renewal (HCR). This generated $6.4 million in tax credit equity.
- A $1.66 million loan from HCR
- A $1.75 million loan from HCR's Urban and Rural Community Investment Fund
- A $1.6 million loan from the Empire State Development Corporation's Better Buffalo Fund

CASE STUDY 5: **PUSH Buffalo Incorporates Solar into a Mixed-Use Project with Community Asset Ownership** (CONTINUED)

- $3 million in equity generated by Federal Historic Tax Credits
- $2 million in equity generated by Historic Tax Credits administered by the New York State Office of Parks, Recreation and Historic Preservation
- $125,700 in solar project support from the New York State Energy Research and Development Authority (NYSERDA)
- $38,135 in Solar Tax Credits
- $90,000 in NYSERDA Grant Funding for Cleaner Greener Communities funding
- $37,000 in ITC Tax Credits bought by the LIHTC Tax-Equity Partner at about $0.93 on the dollar
- $3,000 in NY-Sun NYSERDA Incentives
- Additional support from PUSH operating funds and smaller grants

Carrying Out the Project

In 2013, PUSH acquired the abandoned 80,600 square-foot school. They reached out to partners with experience developing similar projects, including UPROSE, NYCEJA, and Groundwork. They worked with these partners to gather technical knowledge, resources, and ideas for the School 77 project. PUSH leveraged these resources, in partnership with the local residents, to identify engineers, architects, planners and developers who would be the best fit for the project and reflected PUSH's values. The process of identifying the right development team relied heavily on a defined values filter that included a search for companies and organizations that were led by women and people of color, with strong records of success in low-income communities. PUSH sought out developers that offered robust training programs and would work well with PUSH's Hiring Hall program. For example, the chosen solar developer had hired and trained residents for other solar projects for well over a year.

In order to best position community members for decision-making throughout the project development process, PUSH offered trainings such as an Energy 101 course, that focused on jargon clearing and included topics ranging from understanding utility bills to land use planning in the context of renewable energy.

Completed in 2018, the School 77 project includes rain gardens, sustainable landscaping, PUSH Buffalo's headquarters, 30 energy-efficient units of affordable senior housing, a 64-kilowatt solar array on the roof of the building, a community gymnasium, meeting spaces, and a community theater. The building is now fully occupied, and residents are receiving deeply discounted energy bills.

PUSH had to structure and manage the solar project carefully to maximize the financial benefits for the building's residents. They chose a shared solar system, with each of the households having a subscription for a share of the output. A behind-the-meter system linked to individual apartments was not possible because of historic preservation architectural restrictions. Neither would a true co-op system have worked, because residents' income-qualifying housing benefits could have been impacted.

CASE STUDY 5: PUSH Buffalo Incorporates Solar into a Mixed-Use Project with Community Asset Ownership (CONTINUED)

PUSH staff is initially handling subscription management of the solar array in order to create a transparent and user-friendly process. Later, residents will be able to lead and manage the process when control of subscription management is transferred to them. Selling energy credits at half the cost of the utility, or $0.055 per kilowatt-hour, results in projected revenue of $3,520, which can cover half to three-quarters of 15–20 subscriber's utility bills. This makes people stronger tenants, builds a stronger local economy, and makes the people most burdened by the current energy economy direct investors and owners in the regenerative energy economy of the future. In addition, PUSH Buffalo hopes for profits of $4,000–$4,500 per year. By year five, the goal is for the array to be owned through a community based-ownership model.

Because the cost of solar has come down and panel output has gone up since this project, PUSH is confident in their ability to build more and better systems with deeper savings for tenants and building operators, and better returns on investment. For example, this year PUSH is installing a 20-kilowatt array on a nine-unit affordable housing complex and is planning a scattered site project with a projected production of 250 kilowatts across 11 sites.

A Model for a Multi-Faceted Community Project

School 77 provides a powerful template for mobilizing a community to address many complex, deeply rooted injustices. The project offers short and longer-term opportunities for job creation, just housing, climate change mitigation, and community cohesion. This effort provides a fount of ideas for other organizations.

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CASE STUDY 6

UPROSE's Sunset Park Solar Creates New York's First Cooperatively Owned Shared Solar Project

UPROSE

Summary

Key Organizations: UPROSE, a community-based organization in Brooklyn, NY, in partnership with solar companies and an energy cooperative

Project Location: Brooklyn, NY

Solar Developed: A 685-kilowatt shared solar array on the roof of a decommissioned Army building

Who Can Replicate this Project: Community organizations that seek to work with partners to develop a community-controlled, shared solar array that provides multiple community benefits can use this as a model; funders can support similar projects elsewhere.

Key Take-Aways

1. UPROSE created a first-of-its-kind solar project in New York State that offers a framework for future locally controlled solar projects.
2. Sunset Park Solar will produce 19.6 million kilowatt-hours of solar electricity over a period of 25 years and will offer $888,000 in utility bill savings.
3. The Sunset Park Solar model provides a pathway to community-owned solar while offering various ownership alternatives within one project over time.

Program Overview

In late 2019, UPROSE and its partners will complete the development of New York State's first cooperatively owned shared solar system. Sunset Park Solar is a 685-kilowatt system located on the roof of the Brooklyn Army Terminal building in Sunset Park, Brooklyn. This innovative project, at its core, is a frontline, community-led effort for a regenerative economy rooted in energy democracy and a just transition.

CASE STUDY 6: UPROSE's Sunset Park Solar Creates New York's First Cooperatively Owned Shared Solar Project (CONTINUED)

UPROSE: An Environmental Justice Leader

UPROSE, established in 1966, is Brooklyn's oldest Latino community-based organization. It is now recognized internationally as a leader in the environmental and justice movements. It is an intergenerational, multi-racial, woman-of-color-led organization focused on promoting sustainability and resiliency in Sunset Park. This includes an emphasis on preventing loss of social cohesion and persevering and supporting the cultural integrity of the waterfront, working-class community in the Sunset Park neighborhood, where 31 percent of residents live below the poverty line. UPROSE's many projects include:

- developing local urban forest endeavors
- fighting power plant siting
- creating climate justice leadership engagement with youth
- promoting transportation justice
- supporting industrial and small business resiliency building.

Their most recent project, Sunset Park Solar, continues their trailblazing work and demonstrates a pathway to energy and environmental justice applicable to comparable communities.

Partnerships

UPROSE has been organizing around renewable energy for many years. In 2016, UPROSE initiated efforts for a locally controlled solar project in response to clear messages from on-going community meetings (including post-Hurricane Sandy community workshops) and resident discussions. Residents identified local renewable energy development as a community priority in the Sunset Park Community Action Plan for Climate Resiliency, a report that UPROSE produced through community workshops and engagement. The anticipated benefits included job and training opportunities for residents, utility bill savings, and carbon emission reductions. In 2018, the New York City Economic Development Corporation (NYCEDC) issued an RFP for a solar project and awarded the project to a team comprised of UPROSE and several partners: Co-op Power, Solar One, 770 Electric Corp., and Resonant Energy.

- ***Co-op Power***—A consumer-owned, sustainable-energy cooperative with extensive experience in the Northeast developing and owning renewable energy projects and creating/managing community energy cooperatives.
- ***Solar One***—A local nonprofit assisting community organizations with the development of solar projects, green workforce training, and energy education.
- ***770 Electric Corp***—A solar installation company that has a history of integrating trainees into its workforce and developing solar projects with affordable housing providers, nonprofits and municipalities.
- ***Resonant Energy***—A solar provider with extensive experience in the Northeast offering financial modeling and solar project management, with an emphasis on work within LMI communities.

CASE STUDY 6: UPROSE's Sunset Park Solar Creates New York's First Cooperatively Owned Shared Solar Project (CONTINUED)

UPROSE and its partners proposed a cooperatively-owned, locally controlled shared solar project that would provide a 15–20 percent energy discount to approximately 200 Sunset Park residents and small businesses who will subscribe to receive power from the project. NYCEDC, which owns and manages the building, developed a rent credit lease on the Brooklyn Army Terminal rooftop. Management will be shared between UPROSE and Co-op Power.

Sunset Park Solar will be a part of the New York City Community Energy Co-op (NYC CEC). NYC CEC is one out of many energy co-ops in the Northeast, which take part in Co-op Power's community ownership model. This will allow subscribers the ability to attend board meetings, join committees, and vote on the co-op's decisions.

Financing Model

The $2 million Sunset Park Solar project is utilizing a tax equity flip model, also known as a partnership flip model. This model includes the following financing streams:

- ***Tax equity investor*** — 41 percent
- ***Debt*** *(loans for capital cost)* — 58 percent acquired by Co-op Power
- ***Sponsor equity*** — one percent by Co-op Power

In this model, Co-op Power will finance, own, and operate the rooftop solar array. The tax equity investor will be able to make use of the federal tax credit (30 percent for 2019) and accelerated bonus depreciation.

Over the lifetime of the project, there will be two main flips of ownership. At the start of the project, the investor owns 99 percent of the project as a limited partner and Co-op Power owns one percent as the managing member. The first flip will occur sometime between years five and seven. At that point, the tax investor will have received the total tax credits available and will switch to five percent ownership. Co-op Power then will own 95 percent of the project.

One year after the first flip, Co-op Power will give UPROSE 10 percent project equity. The second flip will be when UPROSE has the option to buy more of the project from Co-op Power at the end of year 15. UPROSE will also have the opportunity to buy the tax investor's remaining five percent.

Jobs and Subscriptions

Solar One will provide a two-week, intensive technical skills course that will train 10–12 Sunset Park residents to be involved in the installation and maintenance of the solar project. These residents will be chosen through a selection process led by UPROSE. Recruiting will be done through local outreach.

CASE STUDY 6: UPROSE's Sunset Park Solar Creates New York's First Cooperatively Owned Shared Solar Project (CONTINUED)

UPROSE has undertaken an extensive outreach campaign for community participation. They are visiting local businesses, conducting residential door-to-door outreach, and presenting in various local meetings and community events to create awareness of the project. They are in regular conversation with community members, gathering feedback on project plans and subscription contracts. They conduct outreach and generate materials in English, Spanish, and Chinese, including contracts, project information, and a community disclaimer. They focus on addressing concerns through a series of ongoing community meetings and discussions that help inform materials, access to information, and processes. Education and subscriber engagement events, including customer agreement signing workshops, are planned for the coming months, ensuring that Sunset Park residents are engaged and informed.

The Sunset Park Solar Project is positioned to generate 19.6 million kilowatt hours of solar electricity and offer $880,000 in total customer savings over the life of the project's 25 years. Sunset Park Solar is on track to be fully subscribed (approximately 200 customers) by the end of 2019.

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CASE STUDY 7

Native Renewables Builds Energy Independence

Native Renewables

Summary

Key Organization: Native Renewables, a nonprofit based in the Navajo Nation

Program Location: The Navajo Nation

Solar Developed: Several homes have received solar installations; many more projects are in the planning stage

Who Can Replicate this Program: Organizations can use this as a model for programs for other Native American nations and for other off-grid homes and rural locations; funders can support similar projects elsewhere.

Key Take-Aways

1. Homes in the Navajo Nation that switch from diesel or gas generators to off-the-grid solar arrays can save approximately 70 percent on energy costs.
2. Native Renewables brings an equitable renewable energy model to the Navajo Nation, based on the regenerative way of life, long held in their traditions.
3. Electrification provides in-home refrigeration, leading to better health outcomes as a result of access to fresh foods versus a reliance on canned foods.

Program Overview

Three-quarters of the homes in the US without access to grid-tied electricity are located in the Navajo Nation. This area spans four states (New Mexico, Nevada, Arizona and Colorado) and is roughly the size of West Virginia. This wide geographic region, in combination with the high cost of power-line expansion at an average of $27,000 per mile, poses challenges for Native Utilities, the major energy supplier for the Navajo Nation, to cover this expansive rural area.

CASE STUDY 7: **Native Renewables Builds Energy Independence** (CONTINUED)

The Native Renewables Approach

Native Renewables is a nonprofit organization located in the Navajo Nation that is focused on creating access to renewable electricity for over 15,000 homes and providing education to build long-term energy independence within an equitable framework. Founded in 2016, Native Renewables works within the Navajo Nation and partner Nations to advance community education on renewables, green workforce training, low-cost residential solar projects, and low-cost solar array support and maintenance. Native Renewables was formed and is led by indigenous women. This resonates with local families as the Navajo societal structure is matriarchal, and women are often heads-of-household who make family decisions regarding energy.

Native Renewables' framework is based on the regenerative way of life long-held in Navajo ancient wisdom, prayers, songs, and ceremonies. Transparency, honesty, true partnerships, equity, independence, and an understanding of traditions and values are central to their work. Native Renewables focuses on lifting up local knowledge and talent, including working with indigenous partners on solar technology and community outreach. In addition, they educate outside partners on their values, best practices, and expectations in order to prevent partnerships based solely on profits, and to avoid partnerships that use projects to gather media attention for marketing purposes.

Benefits of Solar for Off-Grid Homes

Off-grid homes often use diesel or gas generators for electricity. This is a costly, heavily polluting, and potentially dangerous source. Without a consistent supply of energy, many residents do not have reliable access to refrigeration, computers, or evening lights.

Native Renewables installs off-grid ground and roof-mounted solar systems ranging in size from 750 watts to 3 kilowatts. These systems have an expected life of 20 years. Native Renewables includes additional batteries with all their installs in order to extend the functionaliy of the system when the sun isn't shining. Evening lighting allows homeowners to work and study for longer hours leading to more wealth growing opportunities. Homeowners have access to keeping fresh food in the home for longer periods of time, reducing their reliance on less healthy packaged and canned foods.

The Innovation of the Native Renewables Model

Native Renewables did not have many models on which to base their work. Off-the-grid projects for first-time electricity users are uncommon in the US. Further, the large size and rural nature of the Navajo Nation presents an unusual setting in which to advance solar. It is difficult to connect with peer circles to discuss issues such as translating financing concepts or maintenance processes. As a result, Native Renewables' peer networks are in India and Africa, where similar projects have been advanced. Ultimately, they are designing a unique residential solar model that is properly customized to whom they are serving.

More than 20 years ago, federal programs provided approximately 1,000 free solar arrays to local residents. However, these programs relied on outside solar providers, and they did not include the education, training, or community infrastructure growth needed to support maintenance and expansion of residential solar. Native Renewables provides support for these systems as part of their initiative.

CASE STUDY 7: **Native Renewables Builds Energy Independence** (CONTINUED)

Community Outreach, Education, and Training

Community education has already been conducted in six Navajo Chapters. This outreach included an introduction to solar and energy basics, how to calculate energy loads, energy-efficient appliances, and designing an off-the-grid system. Native Renewables provides partial and day-long training sessions and large training events on the technical aspects of PV systems. They also engage young people on this topic in schools and museums as part of a STEM education program. The Native Renewables team breaks down the cost and shows how their residential solar program can save homeowners 70 percent in energy costs over 10 to 20 years when compared to generators relying on fossil fuels.

Building this vision for technical training and workforce capacity building, Native Renewables is training 10 residents through an 8- to 10-week intensive program, with a plan to eventually train 50 installers who will have specific expertise in working in expansive rural areas.

Residential Projects and Support

Native Renewables has already completed three residential projects and is planning two more in 2019. The current systems lease for approximately $125 per month for five to 10 years.

Before starting an installation project, Native Renewables meets with homeowners to discuss their energy needs and to help them understand energy load, available financing options, limitations of the system, installation and electrical wiring requirements, and system maintenance. Once the project is underway, the homeowner is responsible for digging the trenches needed for installation. Native Renewables builds and transports the pre-fabricated system to the home. Native Renewables installs the system as well as conducts ongoing project monitoring to assess the quality of the systems and to identify any potential issues related to use or damage to the systems in order to provide proper support as soon as problems arise.

Native Renewables also wants to help households that have older PV systems from the initial federal installations. Some of those systems require upgrades, in part because of the age of the batteries. Native Renewables is offering to assess those older PV systems and provide homeowners with detailed assessment reports, technical assistance, and financing for replacement batteries.

Native Renewables has created a renewable energy model that addresses the greatest energy needs in a challenging geographic scenario. Their model can serve as a template for addressing some of the most difficult challenges faced by communities when moving toward an equitable transition to a renewable energy economy.

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DOE/Kate Costa

CHAPTER 8
Other Stakeholders: Recommendations and Case Studies

Recommendations for Other Stakeholders

1. Solar businesses should seek local partners
2. Solar businesses should have a plan for workforce development
3. The solar industry should self-police
4. Local governments can support solar that benefits LMI communities and residents
5. There are special opportunities in communities with municipal utilities and electric coops
6. Large electricity users can help shared solar projects work for LMI households

Although this report devotes special chapters to state governments, foundations, and community organizations, we know that other actors have important roles to play in advancing solar in under-resourced communities. The general recommendations in Chapter 4 and the recommendations related to expanding financing in Chapter 9 apply to a broad range of players in the solar market.

In this chapter, we first offer several recommendations for the solar industry, followed by a few recommendations for municipalities and large electricity users.

1. Solar Businesses Should Seek Local Partners

Solar companies that wish to do business in an under-resourced community should cultivate a relationship with a local partner, either a trusted nonprofit community group or the local government. Ben Underwood of Resonant Energy, a solar provider that focuses on nonprofits and LMI communities in the Northeast, recommends that solar companies work to understand the neighborhoods they wish to serve by listening to longtime residents and community organizations. "This is a key initial step but is often missed when a solar company has a prescribed business model."

It takes time to build trust and solar companies should be prepared to invest that time. Not only will this help the business know how best to market its services, but it will help ensure that those services will meet the community's needs. It will also reduce the chances that the company will be criticized by the community or will be caught flat-footed if there is criticism. As Vito Greco of Elevate Energy, an Illinois nonprofit focused on energy solutions for low-income communities, points out, "For many reasons, community groups can sometimes have an institutional distrust of programs meant to help them. It is important to have a relationship with the community before an issue arises, rather than after."

2. Solar Businesses Should Have a Plan for Workforce Development

Before marketing solar products or services in under-resourced communities, it is in a business's self-interest to hire workers from within that community. Beth Galante of PosiGen, a solar and energy efficiency service provider focused on LMI communities, points out that: "It is critical to business success to hire people who are representative of the population the business wants to serve."

Beyond that, to ensure that the community benefits from solar projects, businesses should take steps to hire locally and support job training to help residents enter the industry. Job training programs can backfire, however, if the graduates cannot get a job at the conclusion of their training. Solar businesses should therefore consciously develop a clear plan for hiring and workforce development, and make sure that it is designed to leave residents with appealing long-term jobs.

3. The Solar Industry Should Self-Police

Jacqueline Patterson, Director of the NAACP Environmental and Climate Justice Program, observes: "The predatory practices of some solar companies are a significant problem." These companies not only harm financially vulnerable households but can undercut community support for solar development. As a result, "it's making it an uphill battle to overcome the negative experiences," Patterson notes.

The NAACP, in its recommendations on *Advancing Equity, Inclusion, and Leadership in the Solar Industry*, states: "The industry must aggressively uphold practices that are rooted in consumer protection, non-predatory practices, full disclosure of risks to customers, etc."[106]

Solar companies should work to understand the neighborhoods they wish to serve by listening to longtime residents and community organizations. "This is a key initial step but is often missed when a solar company has a prescribed business model."

— Ben Underwood, Resonant Energy

"For many reasons, community groups can sometimes have an institutional distrust of programs meant to help them. It is important to have a relationship with the community before an issue arises, rather than after."

— Vito Greco, Elevate Energy

106 NAACP, *Advancing Equity, Inclusion, and Leadership in the Solar Industry* (NAACP, n.d.), accessed September 5, 2019, *http://www.solarpowerworldonline.com/wp-content/uploads/2017/05/Advancing-Equity-Inclusion-and-Leadership-In-the-Solar-Industry.pdf*.

The Solar Energy Industries Association has taken useful steps by establishing strong codes of business conduct for its members,[107] but the association can and should do even more. It can aggressively educate its members on the perspectives of under-resourced communities and the danger of placing low-income residents at financial risk. It should also welcome and encourage states to implement strong consumer protection measures.

There is a special need for the solar industry to identify and call out bad behavior in under-resourced communities by individual businesses and ostracize those businesses if they do not reform.

4. Local Governments Can Support Solar that Benefits LMI Communities and Residents

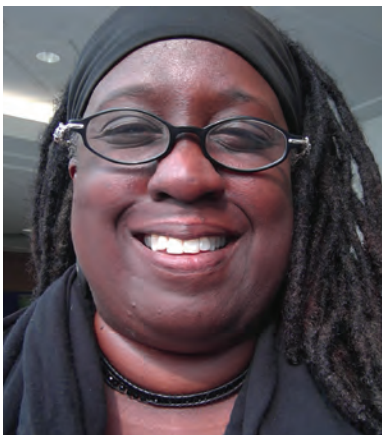
Cities and towns can take a range of steps to help advance solar that benefits LMI communities—everything from streamlining permitting to convening collaborations among stakeholders to installing solar plus battery storage systems on municipal buildings that can serve as shelters in LMI neighborhoods if there are power outages. When they solicit solar projects for municipal properties, cities and towns can include stipulations giving preferences for local minority or female-headed companies. They can require hiring from within the community. Municipal governments can also partner with local groups to do outreach, education, and program delivery. A few municipalities, including Charlottesville and Milwaukee, have established municipal solar loan programs.

On the policy front, municipalities should do a scan of the currently applicable state policies. Especially in locations where state policies do not adequately encourage and support solar development, municipalities can determine if any actions at the municipal level can overcome those state policy weaknesses. For example, the municipality can take steps to ease solar permitting or can offer grants for projects. In locations where state policies are supportive, municipalities can build on those policies. For example, if property-assessed clean energy (PACE) is allowed, a municipality can implement it at the local level.

Solarize initiatives have proven to be very successful at expanding solar market penetration at a reduced cost (see Chapter 7, page 84.) Municipalities with large LMI populations can seek to participate in a Solarize campaign launched by a state agency or can start their own campaign. If a Solarize initiative is launched within the

"It is critical to business success to hire people who are representative of the population the business wants to serve."

— Beth Galante, PosiGen



"The predatory practices of some solar companies are a significant problem." These companies not only harm financially vulnerable households but can undercut community support for solar development. As a result, "it's making it an uphill battle to overcome the negative experiences."

— Jacqueline Patterson, NAACP Environmental and Climate Justice Program

107 The Solar Energy Industries Association has developed various solar consumer protection resources, including a Solar Business Code and voluntary residential solar contract disclosure forms (for solar purchases, leases, and power purchase agreement transactions). See *https://www.seia.org/initiatives/consumer-protection-industry-resource-portal*.

RE-volv

municipality, the local government can take steps to make sure that it includes LMI neighborhoods and incorporates special provisions for LMI residents.

The SolSmart program can be useful to municipalities that want to act to advance solar within their borders. SolSmart is "a national designation program designed to recognize communities that have taken key steps to address local barriers to solar energy and foster the growth of mature local solar markets." It is funded by the US DOE Solar Energy Technologies Office and managed by ICMA and The Solar Foundation. Once a city, town, or county achieves SolSmart designation, it is eligible for free technical assistance through the program to help implement pro-solar programs and policies. More than 300 local jurisdictions are participating in the program.[106]

5. There are Special Opportunities in Communities with Municipal Utilities and Electric Coops

Municipal utilities and electric cooperatives frequently have a mission of serving local residents that goes beyond simply providing reliable power. They can be better placed to design community-specific programs than larger investor-owned utilities that span multiple communities. Governments in cities and towns with municipal utilities and electric coops can work with those utilities to design and implement programs aimed at helping LMI residents adopt solar and related energy services. For example, they may want to consider implementing on-bill financing that allows residents to pay for a solar installation over time through a monthly payment on the customer's electricity bill (see Chapter 5, page 54 for information about a statewide on-bill financing program in Hawaii, GEM$).

Municipal utilities and coops can also directly pursue beneficial solar development. In Holyoke, Massachusetts, a city with a primarily LMI population, the municipal utility partnered with a large-scale solar developer to develop a large shared solar project and offer its output to residential customers who chose to participate. Participants receive savings on their electricity bills.

106 For information on SolSmart, see its website, *https://www.solsmart.org*.

PUSH Buffalo

6. Large Electricity Users Can Help Shared Solar Projects Work for LMI Households

As noted in Chapter 4, for shared solar projects to work well for LMI households, subscribers should be able to withdraw without penalty when changes in the electricity market make the solar electricity from the shared array more expensive than conventional power from the local utility. Large electricity users—businesses, city governments, institutions—can make this possible by agreeing to a flexible subscription in the shared solar project and serving as an anchor tenant and backup subscriber. The backup subscriber would agree to allow the amount of solar electricity it purchases to fluctuate and to increase the amount temporarily to account for households that drop out or default.

CASE STUDY 8

Denver Housing Authority Applies Shared Solar to Benefit Affordable Housing

Denver Housing Authority

Summary

Key Organizations: The Housing Authority of the City and County of Denver (DHA), a quasi-municipal corporation that provides affordable housing to over 10,000 LMI families in Denver; Enterprise Community Loan Fund; Monarch Private Capital; National Housing Trust; Aurora Housing Authority; Mercy Housing; GRID Alternatives; and Solar TAC, Namaste Solar, and Ensight Energy

Program Location: Denver Metro, Colorado

Solar Developed: A two-megawatt shared solar array about 30 miles northeast of Denver

Who Can Replicate this Program: Housing authorities in jurisdictions that have shared solar programs.

Key Take-Aways

1. DHA's Clean Affordable Renewable Energy (CARE) project, a two-megawatt shared solar array, generates electricity bill savings of 15–20 percent for the affordable housing properties that it serves.
2. DHA Manages subscriptions for the CARE project and guarantees to subscribe 100 percent of the solar array.
3. DHA's CARE project was awarded the grand prize in the US Department of Energy's *Solar in Your Community Challenge*.

Program Overview

The Housing Authority of the City and County of Denver's (DHA's) Clean Affordable Renewable Energy (CARE) project provides solar benefits to affordable housing properties in the Denver Metro area. The core of the project is a ground-mounted two-megawatt shared solar array located at the Solar Technology Acceleration Center (SolarTAC), about 30 miles northeast of Denver. DHA manages and serves as the financial guarantor

CASE STUDY 8: Denver Housing Authority Applies Shared Solar to Benefit Affordable Housing (CONTINUED)

for the project. DHA apportions the credits for the electricity produced by the array across several multifamily affordable housing providers and individual LMI households in the greater Denver Metro area. The project generates electricity bill savings of 15–20 percent for the affordable housing properties that it serves—properties that collectively house 500-plus households. The project has several notable features:

Financing

DHA financed most of the project's cost through partnerships with the Enterprise Community Loan Fund, and Monarch Private Capital. These partnerships enabled the realization of the 30 percent investment tax credit as part of project's financing package. DHA owns a one percent share of the project and serves as its managing partner. The project's tax equity investor owns 99 percent of the project and serves as its limited partner. After six years, the tax equity investor will discontinue its ownership interest in the project, and DHA will become the majority partner.

By participating in the electric utility Xcel's Solar*Rewards Community, DHA is able to achieve bill crediting at a rate that accounts for the value of the Renewable Energy Credits (RECs) generated by the CARE project.

Subscription Management

DHA guarantees to subscribe the entirety of the shared solar array and manages all the project's subscriptions. Individual residents subscribe to the project with the majority of subscriptions apportioned between three affordable housing providers operating in the area: Aurora Housing Authority, DHA, and Mercy Housing. In addition, DHA apportions five percent of the project's subscriptions to individual low-income households in the Denver Metro area.

Many of DHA's affordable housing facilities, and well as those of Aurora Housing Authority and Mercy Housing, are master-metered, meaning that there is only one meter that records the electricity usage of each property. Since the affordable housing providers pay the electricity bill on behalf of their residents in these cases, they are unable to directly apportion bill credits to individual units within their buildings. Instead, under the CARE project, the housing providers will reinvest their savings from the project—15–20 percent of their properties' electric bills—in tenant services, property management, and building improvements that enhance the quality of life for their residents.

Job Training

DHA partnered with GRID Alternatives to develop and provide work force training and job opportunities. This program provided DHA residents and other individuals from under-served communities in the Denver Metro area with hands-on and classroom-based solar job training. The program has provided solar training to over 50 low-income individuals, some of whom helped to install the CARE array.

CASE STUDY 8: Denver Housing Authority Applies Shared Solar to Benefit Affordable Housing (CONTINUED)

DHA's CARE project offers a model that can be replicated by other housing authorities in jurisdictions with shared solar programs. In May 2019, DHA's CARE project received the $500,000 grand prize in the *Solar in Your Community Challenge*, a US Department of Energy-sponsored prize competition to incentivize the creation of innovative models to improve solar access for LMI communities. DHA continues to plan new solar projects to enable its affordable housing residents to benefit from solar.

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Efficiency Vermont

CHAPTER 9

Expanding and Improving Project Financing to Support a Larger Pipeline of Successful Projects

Recommendations for Expanding and Improving Project Financing

1. Build capacity so that community-led development teams and financing institutions can successfully implement projects
2. Present credible solar information in familiar formats
3. De-risk project finance for financial institutions and borrowers
4. Use alternatives to FICO credit scores
5. Negotiate project ownership and distribution of benefits
6. Financing initiatives to replicate

Solar projects in under-resourced communities face many obstacles in obtaining financing. For one thing, many locally controlled solar projects have limited capacity to support debt. In addition, few community organizations have sufficient financial resources and technical capacity to develop a clean energy project, although that capacity can be developed internally over time or provided externally.

Solar developers and the community organizations they serve often pursue financing from sources that apply fairly narrow credit requirements and financing terms that fit easily within investors' comfort zone. Lenders that focus on "where the easy money is" inevitably miss many viable financing opportunities. Solar financing for community facilities in LMI communities rarely qualifies for credit ratings from agencies such as Moody's or Standard & Poor's, and conventional consumer credit ratings of LMI residents often produce low FICO credit scores.

Community development financial institutions (CDFIs) have strong track records of building loan portfolios involving real estate transactions in LMI communities, but relatively few CDFIs have extensive experience financing clean energy technologies, such as solar-alone and solar plus battery storage systems (solar+storage).

And fewer yet have partnered with clean energy financing entities or green banks to underwrite and participate in the financing of solar in LMI communities.

This chapter looks broadly at the development and financing of solar projects in under-resourced communities. It sets out recommendations for attracting lenders and investors to invest in LMI communities. A range of players in the solar market have a role to play in implementing the recommendations below and replicating successful financial models.[109]

Below we list recommendations for providing more extensive and more effective financing for solar in under-resourced communities.

1. Build Capacity so that Community-Led Development Teams and Financing Institutions Can Successfully Implement Projects

The issue of capacity building is of key importance to many community-led development efforts. Many community-based organizations—whether they are nonprofit service institutions, associations of community residents, or housing owners—have limited existing capacity to take on the challenges of implementing new technology applications. For example, because affordable housing owners/developers are revenue- and development fee-driven, they have real concerns regarding the costs of predevelopment delays and ongoing property management costs that could be associated with new technologies.

Lack of experience in obtaining necessary building permits, fire department sign-offs, and utility interconnection issues (including where solar can be installed and the scheduling of needed upgrades) can result in costly solar development bottlenecks. Additional funding and technical assistance are needed to address the opportunity costs and investment of time needed to fully evaluate, plan, and implement new clean energy technologies. Grants from foundations, states, or municipalities to fund the technical and economic feasibility of solar and solar+storage projects are needed. If not funded with grants, these and other predevelopment expenses for community-based projects could be funded with zero-interest predevelopment loans that are refinanced at time of project financing and recycled for future projects.

Successful locally controlled solar projects can be developed in ways that emphasize a transfer of skills from technical service providers and development partners to the community organization (i.e., internal capacity-building over time). They can also be developed by relying primarily on third-party entities to develop and manage projects on behalf of community organizations. Community organizations will need to secure funding to pay for external expertise, and they should clarify what level of additional capacity can reasonably be expected to accrue to the organization.

2. Present Credible Solar Financial Information in Familiar Formats

Even community development organizations and lenders that have extensive experience with real estate projects may not understand how a solar project fits into the larger building development. They may not have a clear understanding of how the solar project pro forma operations roll up into the larger real estate pro forma financial statements and projections. They may not know whether projected solar income and cost savings projections are realistic and by what amount they may need to be discounted.

109 For an overview of financing options for a range of affordable housing types, see Jeffrey J. Cook and Lori Bird, *Unlocking Solar for Low-and Moderate-Income Residents: A Matrix of Financing Options by Resident, Provider, and Housing Type* (National Renewable Energy Laboratory, January 2018), https://www.nrel.gov/docs/fy18osti/70477.pdf.

It is important to the real estate development committees of community development organizations—and to the credit committees of their lenders—to have access to expert independent advice when reviewing solar project economics and financial pro forma statements. The advisor should not have a financial stake in whether the project proceeds. Information needs to be presented in a familiar format that addresses the concerns of community-based development organizations and the underwriting requirements of their lenders.

3. De-Risk Project Finance for Financial Institutions and Borrowers

Although solar and solar+storage systems have had a strong record of being successfully deployed in commercial markets, there is a lack of development experience and performance data regarding the deployment of systems in under-resourced communities. For instance, there are relatively few solar+storage systems that currently operate in multifamily affordable housing properties, much less that have provided operating and financial performance data throughout the expected economic life of these systems.[110]

Credit enhancement is an important means of addressing both the credit risks and cost of financing that lenders and borrowers face in LMI markets. A reduction in credit risk can result in a lender being able to reduce the cost of financing for the borrower. Sources of credit enhancement include foundations, impact and social investors, and federal, state and local agencies.

Courtesy of L+M Development Partners Inc.

110 Clean Energy Group has written about market barriers to deploying solar+storage technologies in low-income markets. In its report, *A Resilient Power Capital Scan: How Foundations Could Use Grants and Investments to Advance Solar and Storage in Low-Income Communities,* more than 50 grant and investment opportunities are identified that socially minded investors can use to target those barriers. See *https://www.cleanegroup.org/wp-content/uploads/Capital-Scan-Feb2017.pdf*.

Some common methods of credit enhancement are loan guarantees, subordinated debt, and debt service and loan loss reserves. Loan guarantees provide a payment backstop for lenders; the third-party guarantor assumes the debt obligation in the event borrowers default on their loan. Subordinated debt refers to a debt owed to a lender who has agreed to be paid in the event of a liquidation only after the claims of a senior lender have been met. Debt service and loan loss reserves are cash accounts that are established to ensure full and timely payments to a lender or to cover potential losses in a lender's loan portfolio.

However, credit enhancement is not a universal remedy for successfully deploying solar projects. As our interviewees pointed out, credit enhancement cannot prop up weak, uneconomical projects that lenders believe cannot support financing. Care is needed in structuring loan guarantees and other credit enhancement that will actually be used by lenders and project developers in financing solar technologies in LMI communities.

Although credit enhancement is important for reducing credit risk, foundations and impact investors should not automatically assume loan guarantees and other concessionary capital are necessary for solar project financing in under-resourced communities. Foundations should start with the premise that, in the great majority of cases, LMI residents pay their electric bills, and that financing models can be designed and right-sized in ways that acknowledge that capacity to pay.

Continuing this line of thought, large anchor institutions located in under-resourced communities such as hospitals, universities, and large private social service agencies do not necessarily require concessionary terms to access financing for solar projects benefiting those communities. Concessionary terms should be saved for when projects require a longer loan term, for new technologies such as solar+storage, or as a means of de-risking and supporting a lower cost of financing for new solar technologies. For instance, foundations or government agencies could fund loan loss reserves or provide a guarantee that backstops payments to investors, thereby ensuring a specific interest rate return is paid. A loan guarantee facility could be used to de-risk solar+storage transactions that are part of a larger portfolio of solar projects; or foundations and impact investors could simply place more flexible, low-interest capital with lenders.

This last point was a recurring theme in our interviews. Lenders interested in financing solar projects in under-resourced communities would like additional low-interest, flexible loan capital to deploy, including investments structured in the form of equity-equivalent loan capital.[111] Both equity-equivalent investments and balance sheet guarantees can help lenders attract and deploy additional capital.

4. Use Alternatives to Traditional FICO Credit Scores

Many first-time borrowers are unable to access financing because they have no or limited reported credit history that meets the underwriting requirements that most lenders use to determine creditworthiness. Being unable to meet minimum FICO credit scores has excluded many consumers from securing a mortgage or other financial services on affordable terms.

111 An equity-equivalent investment is an alternative to making a grant of loan capital to a nonprofit lender. Sometimes used by foundations and social investors, it is a deeply subordinated, long-term loan from an investor to a lender with features that make it function like equity. It is carried as an interest-bearing investment on the investor's balance sheet. It is a general obligation of the lender that is not secured by any of the lender's assets. It is fully subordinated to the right of repayment of all the lender's other creditors. It has a rolling term and consequently an indeterminate maturity. It has been used by foundations and social investors when a key goal is to strengthen the balance sheet of a nonprofit lender to attract additional capital and increase lending. At the same time, it provides an interest rate return on the investment, which otherwise might have been structured as a simple grant of loan capital.

DOE/Kate Costa

Traditional credit bureaus do not collect and report all the available forms of data that would represent a complete profile of the individual's history of making payments over time. Additional forms of data can include utility, phone/telecom and rent payments. Including this data in credit bureau reports and in loan underwriting decisions would especially benefit consumers who are underrepresented in traditional credit reports and scores—first time borrowers, young consumers, and minorities.[112]

Lenders and companies in the solar market have begun to respond to this problem and have developed business plans to address this large underserved market. Some of the companies that have done so are Clean Energy Works (Oregon), Inclusive Prosperity Capital, PosiGen, and Solstice. They have developed alternatives to relying only on FICO credit scores for LMI solar projects, which include basing their underwriting decisions on additional data such as utility, telecom and rent payment history. This trend was recently reinforced when the Federal Housing Finance Agency issued a rule requiring Fannie Mae and Freddie Mac, two mortgage-finance firms that back nearly half of US mortgages, to also consider credit-score alternatives to FICO scores when determining a mortgage applicant's creditworthiness.[113]

Including additional forms of data to create more complete credit profiles to underwrite residential projects not only qualifies more households for financing but it acts to de-risk the loans for lenders and investors.

112 Karan Kaul and Laurie Goodman, *The FHFA's Evaluation of Credit Scores Misses the Mark* (Urban Institute, March 2018), *https://www.urban.org/sites/default/files/publication/97086/the_fhfas_evaluation_of_credit_scores_misses_the_mark.pdf.*

113 Andrew Ackerman, *Fannie, Freddie to Consider Alternatives to FICO Scores* (Wall Street Journal, August 13, 2019), *https://www.wsj.com/articles/fannie-freddie-to-consider-alternatives-to-fico-scores-under-new-rule-11565719353.*

5. Negotiate Project Ownership and Distribution of Benefits

"More important than who owns the system is who is getting the financial benefit from it."

— Jonathan Abe, Sunwealth

For many good reasons, some community advocates focus on creating ways for low-income residents and their organizations to own solar energy systems and to secure solar benefits through the ownership of those systems. The historical lack of ownership of community assets by communities of color makes a strong case that future control and ownership remain in the under-resourced communities, so they can directly benefit from and participate in solar and solar+storage systems' various value streams, which range from utility bill savings, to potential revenue from grid services, to back-up power during grid disruptions.

As important as ownership is as a key equity issue for LMI advocates, it is also important to consider the challenges of immediate direct ownership of solar systems and to explore the range of options for local communities to share in the benefits of the clean energy economy. Our interviews confirmed this concern. Several interviewees emphasized the importance of limiting financial risk to under-resourced communities and their organizations. As Jonathan Abe, CEO of Sunwealth, emphasized, "More important than who owns the system is who is getting the financial benefit from it."

Community organizations may not have the desire, resources, or capacity to manage, operate, and reserve funds for replacement of inverters and other key system maintenance. The community group may not be able to absorb unexpected expenses or revenue shortfalls. In these and other instances, it may be preferable to identify a third party "platform" or entity that can absorb economic risk across multiple projects.

One such model is the National Housing Trust/Enterprise Community Partners (NHT/Enterprise) model. This model has created a solar development and financing platform, where NHT is the solar project developer on behalf of other housing developers and owners. NHT owns the solar assets and earns a development fee and asset management fee paid through a PPA. Ultimate ownership of the solar assets can be negotiated. Ownership flip structures are available, where ownership flips from NHT to the housing owner or another entity after five to six years.

Clean Energy Group has published a report on the interrelated issues of solar+storage project ownership options, the equitable distribution of energy benefits, and financing options. *Owning the Benefits of Solar+Storage: New Ownership and Investment Models for Affordable Housing and Community Facilities* describes emerging finance models for addressing the energy equity challenge and for leveling the financing playing field. The paper explores additional ownership and financing options for solar+storage projects in low-income communities beyond direct ownership and conventional leasing models. It describes five ownership and investment models and makes the point that there are ownership and financing strategies that can provide many of the economic and other benefits of direct ownership, while overcoming some of the risks and barriers that direct ownership may entail for many project developers.[112]

114 Robert G. Sanders and Lewis Milford, *Owning the Benefits of Solar+Storage: New Ownership and Investment Models for Affordable Housing and Community Facilities* (Clean Energy Group, February 2018), https://www.cleanegroup.org/ceg-resources/resource/owning-the-benefits-of-solar-storage.

By transferring ownership of solar assets to a community organization once the project's operations have stabilized and the federal investment tax credit compliance period has expired, development and operating risk is mitigated for the community organization. That notwithstanding, it may not be a good idea to saddle the community group with ownership that flips after five to six years if the underlying debt financing is for a term of 10 to 15 years, given the possible regulatory and technology changes over time and the need to reserve funds for equipment replacement.

Instead, it may be preferable to give the community as much economic benefit as possible up front, and not after the tax equity investors have been taken out. This could be done through well-structured contractual agreements (e.g., community solar aggregation strategies, power purchase agreements with reduced and capped electricity costs, or rooftop rental agreements) that allow community organizations to realize many economic benefits without the risks of ownership.

One foundation impact investor suggests that the challenge is to ensure that community residents are the principal beneficiaries of solar projects that receive foundation support and other technical resources.

6. Financing Initiatives to Replicate

Several projects and programs focused on expanding financing are featured in case studies in this report. The Connecticut Green Bank/PosiGen program for LMI single-family homeowners and The Kresge Foundation's Financial Resilient Power Program are included in previous chapters. The financing models of Fellowship Energy, RE-volv, and Sunwealth are described in Case Studies 9 through 11 below.

In addition, as mentioned in the section above, the NHT/Enterprise model refers to a useful solar development and finance platform where NHT is the owner/developer of the solar assets and the economic benefits of the project are negotiated and shared with the community housing organization. Enterprise also seeks out "non-traditional" energy lenders to participate in the financing of their solar projects. Enterprise and many other CDFIs view themselves as primarily real estate lenders. CDFIs are not as comfortable with energy lending. For energy projects, Enterprise likes to participate with energy lenders (e.g., NY Green Bank, NYCEEC, Inclusive Prosperity Capital) when possible. In those instances, Enterprise underwrites and funds the multifamily affordable housing real estate portion of the financing transaction; the energy lender underwrites and funds the solar portion of the loan transaction.

CASE STUDY 9

Fellowship Energy Arranges for Solar Energy for Faith-Based Communities

Fellowship Energy

Summary

Key Organizations: Fellowship Energy, a clean energy finance organization based in California, and faith-based communities nationwide

Program Location: Nationwide

Solar Developed: Solar has been installed at numerous churches and other buildings of faith-based communities

Who Can Replicate this Program: Faith-based communities can work with Fellowship Energy to secure financing for a solar project; other nonprofits in under-resourced communities can take a similar approach involving third-party ownership and relationships with creditworthy entities.

Key Take-Aways

1. Fellowship Energy has developed a financing model that helps houses of worship and other religious organizations obtain financing for solar installations.
2. Because churches and other nonprofits are unable to take advantage of the federal Investment Tax Credit (ITC), third-party investors that can monetize the tax credit are included in the solar projects.
3. Fellowship Energy received the award for the "Best Nonprofit Program" in the US Department of Energy's "Solar in Your Community Challenge."

Program Overview

Fellowship Energy is a California-based organization that helps houses of worship, parochial schools, and other nonprofits adopt solar energy. It offers a financing model that allows these tax-exempt organizations to install solar energy systems with no up-front costs while immediately reducing their electricity bills.

CASE STUDY 9: Fellowship Energy Arranges for Solar Energy for Faith-Based Communities (CONTINUED)

As nonprofits, churches and other faith-based communities have traditionally had difficulty taking advantage of the federal Investment Tax Credit (ITC), an incentive that currently allows customers with sufficient tax liability to deduct 30 percent of the cost of installing a solar energy system from their federal taxes. Because nonprofits are not taxable entities, they cannot directly claim the federal ITC. The Fellowship Energy model enables faith-based organizations to enter into power purchase agreements (PPAs) with third-party investors who can realize the federal tax benefits of installing the system. The PPAs are long-term contracts through which the faith communities agree to buy solar generation from the PV system sited on their property.

The Fellowship Energy model also addresses the risk that individual congregations and religious organizations in under-resourced communities may not be deemed to be creditworthy by third-party investors. To provide security to those investors, Fellowship Energy relies on denominational authorities, creditworthy entities within the hierarchical framework of a worship community, to assume the risk if the congregation is unable to fulfill its part of the PPA. In addition, when a religious denomination has a church extension fund, which provides loans for capital projects for houses of worship, Fellowship Energy has leveraged the fund to provide capital for solar installations for houses of worship and faith-based organizations.

Two Solar Projects in Richmond, Virginia Use the Fellowship Energy Model

Fellowship Energy applied this financial model to two solar projects in Richmond, Virginia: a 50-kilowatt rooftop solar system on St. Stephens Episcopal Church and a 379-kilowatt rooftop solar system at Trinity Episcopal School. Both projects were supported by the Episcopal Church Building Fund (ECBF), a church extension fund established to provide low-interest loans to Episcopal institutions to finance capital projects.

For St. Stephens Episcopal Church, rather than rely on traditional fundraising initiatives that ask members to donate funds for building improvements, the ECBF provided a low-interest loan for the church to purchase the solar system at a reduced cost once the third-party owner was able to exit the project following the 60-month Internal Revenue Service compliance period for tax credits.

Similar to other solar PPAs, Fellowship Energy's financial model allowed St. Stephens Episcopal Church and Trinity Episcopal School to install solar energy with no up-front costs. By connecting a third-party investor through a PPA secured by a church's denomination authority, Fellowship Energy has created a financial model that addresses what has been a significant barrier for faith-based communities to access solar. This model creates a financially accessible method for enabling congregations across the US to install solar, reducing their electricity bills and allowing them to contribute to the clean energy economy.

Fellowship Energy Wins National Awards

In May 2019, Fellowship Energy was awarded the "Best Nonprofit Program" in the *Solar in Your Community Challenge*, a prize competition the US Department of Energy's Solar Energy Technologies Office sponsored for innovative and replicable financial models to improve solar energy access.

CASE STUDY 9: **Fellowship Energy Arranges for Solar Energy for Faith-Based Communities** (CONTINUED)

Fellowship Energy's future plans include applying its financial model to at least 14 additional nonprofits supplying over three megawatts of solar energy. In September 2019, Fellowship Energy was awarded the 3iAward from the Interstate Renewable Energy Council (IREC) for "Best Community Shared Renewables Project" and for the innovative financing model that allows faith-based properties to participate in solar energy installations.

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CASE STUDY 10

RE-volv Provides Opportunities for Nonprofits Serving Under-Resourced Communities to Install Solar Energy

RE-volv

Summary

Key Organizations: Re-volv, a nonprofit based in California, and community organizations across the country

Program Location: Nationwide

Solar Developed: Many nonprofit organizations, some in under-resourced communities, have worked with Re-volv to install solar at their buildings

Who Can Replicate this Program: Nonprofits in under-resourced communities can work with RE-volv on a project for their building or can pursue a similar approach using crowdfunding; advocates can promote crowd-funding for solar projects in under-resourced communities.

Key Take-Aways

1. Re-volv has developed a model that provides solar financing assistance to nonprofit organizations, including those in under-resourced communities.
2. Crowdfunding helps raise some of the funds the nonprofit organizations need for the upfront costs of a PV system
3. A Solar Ambassadors Program uses student volunteers to assist with crowdfunding and help educate community members.

Program Overview

RE-volv, a small nonprofit organization headquartered in San Francisco, provides solar financing assistance for small- and medium-sized nonprofits, which often do not have the funds to cover the upfront cost of a PV system. Three key elements to RE-volv's model enable it to serve the nonprofit market: 1) RE-volv uses crowd-funding to help raise the upfront costs for a nonprofit organization to install a PV system, 2) RE-volv puts a portion of the solar payments a nonprofit makes into a revolving fund that helps pay for solar

CASE STUDY 10: **RE-volv Provides Opportunities for Nonprofits Serving Under-Resourced Communities to Install Solar Energy** (CONTINUED)

projects for other nonprofits, and 3) RE-volv leverages student volunteers who assist with its crowd-funding and solar education campaigns.

Crowdfunding Model

Crowdfunding is the practice of raising money from many people, typically in small amounts, through online donations. RE-volv offers a nonprofit beneficiary a crowdfunding platform for raising funds to cover the cost of adopting solar. The crowdfunding platform gives prospective donors a two-fold basis for contributing to a campaign: to support the nonprofit beneficiary organization and to support the clean energy economy through a solar investment. Since solar can provide electricity bill savings, it can enable more of a nonprofit's funds to be directed toward its mission-related work. By contributing to a solar crowdfunding campaign, donors committed to an organization can help advance the nonprofit's core mission.

Other donors, who may not have a connection to the nonprofit beneficiary organization, may be motivated to support the environmental attributes of solar.

While RE-volv supplies the crowdfunding platform, ultimately, it is the nonprofit beneficiary's job to raise the funds to cover the cost of adopting solar. According to RE-volv, the nonprofit beneficiary should aim to raise one-third of the total cost of adopting solar— within the first two weeks of the crowdfunding campaign—from their core donor list and network of friends and family. If this threshold is met, it becomes significantly more likely that the ultimate fundraising goal will be achieved. Then, RE-volv's crowdfunding platform can help the nonprofit beneficiary reach beyond its existing donor base for the remaining crowd-funded donations. The likelihood of a successful campaign can be increased by preparing outreach materials that can be released on the first day to build rapid momentum for the project.

Solar Revolving Fund

The nonprofit beneficiary pays RE-volv for its solar installation over time through a lease or power purchase agreement (PPA) financing arrangement. As the nonprofit makes its financing payments, RE-volv reinvests money into a fund that helps offset the cost of additional solar projects for other nonprofits. This revolving fund, called the Solar Feed Fund, is a pay-it-forward model for solar energy that is designed to continually perpetuate itself to help pay for new solar projects.

Solar Ambassadors Program

RE-volv created the Solar Ambassador Program, which enlists college students to help raise funds for RE-volv's solar campaigns and to increase solar awareness in the community where the nonprofit beneficiary organization is located. Under RE-volv's Solar Ambassador Program, students are trained in crowdfunding, solar policy, community engagement, and project management.

CASE STUDY 10: **RE-volv Provides Opportunities for Nonprofits Serving Under-Resourced Communities to Install Solar Energy** (CONTINUED)

How the Financing Model Works

RE-volv offers its nonprofit beneficiary organizations two different solar financing options. Under its traditional model, RE-volv owns the solar array located on a nonprofit's property and leases it to the nonprofit beneficiary organization for a term typically of 20 years. This saves the beneficiary organization approximately 15 percent on its electricity costs over the lease period. Since RE-volv itself is a nonprofit, it is unable to monetize the federal tax credit under this model.

In July 2019, RE-volv partnered with Trisolaris LLC, a multi-million-dollar investment firm, to offer its nonprofit beneficiary organizations a power purchase agreement (PPA) financing option with a locked-in payment schedule. Under this model, Trisolaris, which serves as the solar system owner, is able to take advantage of the federal tax credit. This allows for larger solar projects and requires less reliance on crowdfunding. As such, under its PPA model, RE-volv's Solar Ambassadors are able to shift much of their focus from crowdfunding towards community education, engagement, and advocacy.

RE-volv has completed 25 solar projects since 2013, but with its partnership with Trisolaris, it envisions completing 100 projects over the next three years. In particular states where PPAs are not authorized, RE-volv will continue to rely on its lease model.

Whether the system is financed through a PPA or lease, it is third-party owned (i.e., not owned by the nonprofit beneficiary organization) so the nonprofit initially does not have to worry about managing the installation process or maintenance of the solar system. At the end of the nonprofit beneficiary's financing term, RE-volv transfers the system's ownership to the nonprofit at no cost. At that point, the nonprofit beneficiary organization receives continued electricity generation without any financing payments.

To be eligible to be a nonprofit beneficiary, organizations must have a strong presence in and demonstrated commitment to the communities. They must also have an established track record in their current locations for at least five years and be on firm financial footing. Ideally, the nonprofit beneficiary owns the building that will host the solar array, but situations with a solid, long-term lease arrangement between the nonprofit beneficiary and its landlord can be workable.

Although not all of RE-volv's nonprofit beneficiaries serve LMI communities, many do. Example include two projects in East Dayton, Ohio: 1) the Mission of Mary Cooperative, which provides urban farming opportunities, and 2) the East End Community Services, which helps move local residents out of poverty. Project Home in Madison, Wisconsin, which provides energy efficiency services for LMI households, has also installed a solar project.

CASE STUDY 10: RE-volv Provides Opportunities for Nonprofits Serving Under-Resourced Communities to Install Solar Energy (CONTINUED)

Replicability of the RE-volv Model

In May 2019, the US Department of Energy recognized RE-volv as one of 17 winners of the *Solar in Your Community Challenge*. DOE noted that during the 18-month challenge, RE-volv trained over 250 student solar ambassadors, raised $330,000, and saved participating nonprofits approximately 25 percent on their electricity bills.

Nonprofit organizations in under-resourced communities can work with RE-volv or take a similar approach on their own to use crowdfunding for solar projects.

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CASE STUDY 11

Investment Firm Sunwealth Delivers Tangible Social Impact along with Strong Investor Returns

Sunwealth

Summary

Key Organizations: Sunwealth, an investment firm based in Massachusetts, in partnership with investors and solar projects across the country

Program Location: Nationwide

Solar Developed: Solar has been installed at a variety of buildings and institutions in under-resourced communities

Who Can Replicate this Program: Community organizations can seek project financing from Sunwealth; investors can make investments that advance solar in under-resourced communities; a range of participants in the solar market can emulate the project pool concept.

Key Take-Aways

1. To attract financing for solar projects, especially those in under-resourced communities, Sunwealth combines a group of diversified solar projects into a project pool.
2. Projects that might have been perceived as risky on their own are able to receive financing at favorable rates by being part of a project pool.
3. Investors can either participate in tax equity ownership or purchase fixed-income investment bonds.

Program Overview

Sunwealth, a clean energy investment firm, offers a financing vehicle that works with non-traditional solar investors to invest in solar projects with an "economic inclusion lens," focused on ensuring that LMI communities participate in and economically benefit from solar energy. This is accomplished through a pooled-risk financial model that combines conventional creditworthy projects with projects perceived to have "weaker" or unrated credit.

CASE STUDY 11: Investment Firm Sunwealth Delivers Tangible Social Impact along with Strong Investor Returns

Pooled-Risk Investments

Through its Solar Impact Fund, Sunwealth combines a group of diversified solar projects into a project pool. Each pool contains an assortment of solar projects that vary in size (installed capacity), the markets they serve (for example, nonprofit organizations, small and medium businesses, or LMI communities), and the type of building where a project is located (for example, multifamily housing, schools, commercial buildings, faith organizations, government properties, and community facilities). As of May 2019, 43 percent of Sunwealth's solar projects were located in low-income communities.

Partnering with local installers, Sunwealth develops, owns, and manages the projects. By minimizing transaction costs and bundling a variety of solar projects into a single investment vehicle, Sunwealth's Solar Impact Fund enables investors to achieve an attractive return on their investment with greater social impact. Sunwealth provides transparency to investors so they know which specific projects they are financing and have access to measurable social and environmental impacts such as the reduction of carbon emissions, energy saved, and jobs created through the development of the projects.

Projects in LMI communities that might have been perceived as risky on their own are able to receive financing at favorable rates by being part of a diversified project pool anchored by creditworthy projects. Sunwealth's proprietary underwriting process assesses risk while striving to deliver competitively priced financing. This underwriting process is founded on ensuring clear financial benefits by providing predictable electricity savings or compensation to the project host from a site lease, PPA, or net-metering credit agreement. The project pool concept addresses the lack of financing options for LMI projects compared to those in more affluent communities.

Sunwealth offers two ways to invest through the Solar Impact Fund. Investment in tax equity ownership allows investors to participate in the ownership of a pool of solar projects for a term of 5.25 years. The financial returns include tax credits and deductions, as well as cash returns. Alternatively, investment bonds provide fixed-income returns for accredited investors with quarterly distributions of interest for a term of five years.

Sample Sunwealth Projects

As of September 2019, Sunwealth had financed over 100 projects by more than 175 investors.

A recent example of a solar project developed by Sunwealth is one in Massachusetts on the roof of New Bedford VFW Post 3260. This 58-kilowatt installation will provide the VFW with close to $4,000 in annual energy savings, or $107,000 in lifetime savings. Sunwealth partnered with Framingham solar installer Team Solar to develop and install the system at no cost to the Post. Sunwealth leases the roof from the VFW, providing payment in the form of energy savings.

Another recent example is Sunwealth's solar project on the roof of Mustard Seed Catholic Worker House in Worcester, Massachusetts. For nearly 50 years, the volunteer-run nonprofit organization has brought together a diverse community of volunteers to provide meals and support to Worcester residents in need. The organization operates a soup kitchen serving 80-200 meals a night and a food pantry providing food for individuals and families. The 11-kilowatt solar installation on the roof of

CASE STUDY 11: Investment Firm Sunwealth Delivers Tangible Social Impact along with Strong Investor Returns

the building will provide the organization with close to $16,000 in energy savings over the system's lifetime. Sunwealth partnered with developer Resonant Energy and Marlborough-based installer Endless Energy to install the system. Other key partners included Renewable Energy Worcester and Co-op Power.

Sunwealth's work partnering with institutional investors has included a $3 million loan in 2018 from The Reinvestment Fund, a social enterprise lending organization with experience helping to fund clean energy projects in low-income neighborhoods. This loan is being combined with a $3 million tax-equity investment from private investors. This investment package will provide funds for the installation of over 2.5 megawatts of rooftop solar capacity for nonprofits, small businesses, and residences in communities that have often lacked opportunities for accessing the benefits of solar. Through this investment package, Sunwealth is strengthening local resiliency, building the capacity of local solar developers, and contributing to energy savings for residences, businesses, and nonprofit groups.

In the past five years, Sunwealth has installed approximately $35 million in solar systems. According to Sunwealth CEO Jonathan Abe, for every $1.00 invested, there has been $0.60 in electricity cost savings for the project hosts.

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APPENDIX A

Summary Tables to the Report's Case Studies

The following two tables summarize the key points about each case study in the report and the key take-aways from each case study.

TABLE 2: Summaries of Case Studies

Case Study Title	Key Organizations	Location	Solar Developed	Who Can Replicate Project
Connecticut Green Bank Brings Solar to LMI Homeowners	Connecticut Green Bank, an agency established by the state, and PosiGen, a solar installation company	Connecticut	More than 2,500 solar installations on single-family homes in Connecticut	Other states and municipalities can establish programs for LMI single-family home; solar companies can use the CT experience to learn how to market to LMI single-family homes; advocates can encourage states and municipalities to establish programs
Energy Trust of Oregon Engages Community Groups to Create Replicable Solar Development Models	Energy Trust of Oregon, a nonprofit established by the state, and numerous Oregon community organizations	Oregon	Nine community groups have received grants to develop projects	Other states and municipalities can learn from and emulate Energy Trust's approach to outreach and working with community groups; advocates can encourage states and municipalities to establish programs
The Kresge Foundation Provides Credit Enhancements to Finance Resilient Power Projects	Kresge Foundation, a philanthropy in Michigan, and Clean Energy Group, a national nonprofit based in Vermont	Nationwide program	The loan guarantee program will ultimately support many solar+storage projects at multifamily affordable housing	Other foundations can receive technical assistance from Clean Energy Group to set up loan guarantee programs or make capacity-building and pre-development grants; lenders and affordable housing developers can qualify for loan guarantees
LaGrange Housing Authority Project Catalyzes Ongoing Solar Development by an Innovative Community Organization	LaGrange Housing Authority; Groundswell, a national solar developer; and The Solutions Project, a national funder	LaGrange, Georgia	A 2.5-kilowatt ground-mounted installation with a tracking system	Foundations and other funders can use similar projects to catalyze solar development in communities with few solar projects; community groups can emulate the LaGrange approach
PUSH Buffalo Incorporates Solar into a Mixed-Use Project with Community Asset Ownership	PUSH Buffalo, a nonprofit Community Development Corporation in West Buffalo, NY	Buffalo, NY	A 64-kilowatt solar array was included in a major project that redeveloped an abandoned school for housing, offices, and community facilities	Community organizations that seek to develop a project that involves serving as developer and owning the PV system can use this as a model; funders can support similar projects elsewhere
UPROSE's Sunset Park Solar Creates New York State's First Cooperatively Owned Shared Solar Project	UPROSE, a community-based organization, in partnership with solar companies and an energy cooperative	Brooklyn, NY	A 685-kilowatt project on the roof of a decommissioned Army building	Community organizations that seek to work with partners to develop a community-controlled shared solar array that provides multiple community benefits can use this as a model; funders can support similar projects elsewhere
Native Renewables Builds Energy Independence	Native Renewables, a nonprofit based in the Navajo Nation	Navajo Nation	Several homes have received solar installations; many more projects are in the planning stage	Organizations can use this as a model for programs for other Native-American nations and for other off-grid homes and rural locations; funders can support similar projects elsewhere
Denver Housing Authority Applies Shared Solar to Benefit Affordable Housing	Housing Authority of the City and County of Denver plus other housing agencies, funders, and solar companies	Denver Metro, CO	A two-megawatt shared solar array about 30 miles northeast of Denver	Housing authorities in jurisdictions that have shared solar programs
Fellowship Energy Arranges for Solar Energy for Faith-Based Communities	Fellowship Energy, a clean energy finance organization in California, and faith-based communities nationwide	Nationwide	Solar has been installed at numerous churches and other buildings of faith-based communities	Faith-based communities can work with Fellowship Energy to secure financing for a solar project; other nonprofits in under-resourced communities can take a similar approach involving third-party ownership and relationships with creditworthy entities
RE-volv Provides Opportunities for Nonprofits Serving Under-Resourced Communities to Install Solar Energy	Re-volv, a nonprofit based in California, and community organizations across the country	Nationwide	Many nonprofit organizations, some in LMI communities, have worked with Re-volv to install solar at their buildings	Nonprofits in under-resourced communities can work with RE-volv on a project for their building or can pursue a similar approach using crowdfunding; advocates can promote crowdfunding for solar projects in under-resourced communities
Investment Firm Sunwealth Delivers Tangible Social Impact along with Strong Investor Returns	Sunwealth, an investment firm based in Massachusetts, in partnership with investors and solar projects nationwide	Nationwide	Solar has been installed at a variety of buildings and institutions in under-resourced communities	Community organizations can seek financing from Sunwealth; investors can make investments that advance solar in under-resourced communities; a range of participants in the solar market can emulate the project pool concept

TABLE 3: Key Take-Aways from Case Studies

Case Study Title	Take Away 1	Take Away 2	Take Away 3
Connecticut Green Bank Brings Solar to LMI Homeowners	The Connecticut Green Bank, in partnership with PosiGen Solar, has developed a successful solar model for LMI single-family homeowners	The average PosiGen customer in Connecticut receives a net annual financial benefit of $450	PosiGen has installed more than 2,500 solar projects on single-family homes in Connecticut, with about 60 percent qualifying for special LMI incentives
Energy Trust of Oregon Engages Community Groups to Create Replicable Solar Development Models	Energy Trust of Oregon has developed a successful seed-funding model to support LMI solar projects across Oregon	Energy Trust and partners conducted extensive outreach, including dozens of public meetings, and developed LMI working groups as well as partnerships with community-based organizations	Nine community-based projects received grants, with participants in one project expected to save $300-$400 annually and participants in another expected to save 25 percent on their energy bills
The Kresge Foundation Provides Credit Enhancements to Finance Resilient Power Projects	The Kresge Foundation, with the assistance of Clean Energy Group (CEG), has developed a $10.3 million solar+storage loan guarantee program for LMI projects	The program offers a payment guarantee mechanism that helps keep payments current and from falling into default, as well as capacity-building and pre-development grants	US DOE has awarded a three-year grant to CESA/CEG to promote expansion of the Kresge loan guarantee model to other philanthropies interested in clean energy and social equity
LaGrange Housing Authority Project Catalyzes Ongoing Solar Development by an Innovative Community Organization	Small-scale projects in new markets can position communities to access capital, build wealth, and advance equity	A small PV system can be an accessible first step for organizations that are including renewable energy initiatives in their work	Public-private partnerships are key in developing new solar markets
PUSH Buffalo Incorporates Solar into a Mixed-Use Project with Community Asset Ownership	PUSH Buffalo has created a successful redevelopment project including a roof-top solar array that has led to jobs, affordable housing and energy savings for its community	PUSH leveraged many funding streams to finance a large-scale community project. This effort serves as a model for similar projects	The community engagement approach, which led to deep community involvement in large-scale projects, yielded positive outcomes for residents and is a useful model for other organizations
UPROSE's Sunset Park Solar Creates New York's First Cooperatively Owned Shared Solar Project	UPROSE created a first-of-its-kind solar project in New York State that offers a framework for future locally controlled solar projects	Sunset Park Solar will produce 19.6 million kilowatt hours of solar electricity over a period of 25 years and offer $1.3 million in utility electricity bill savings	The Sunset Park Solar model provides a pathway to community-owned solar while offering various ownership alternatives within one project over time
Native Renewables Builds Energy Independence	Homes in the Navajo Nation that switch from diesel or gas generators to off-the-grid solar arrays can save approximately 70 percent on energy costs	Native Renewables brings an equitable renewable energy model to the Navajo Nation, based on the regenerative way of life, long held in their traditions	Electrification provides in-home refrigeration, leading to better health outcomes as a result of access to fresh foods versus a reliance on canned foods
Denver Housing Authority Applies Shared Solar to Benefit Affordable Housing	DHA's CARE project, a two-megawatt shared solar array, generates electricity bill savings of 15–20 percent for the affordable housing properties that it serves	DHA manages subscriptions for the CARE project and guarantees to subscribe 100 percent of the solar array	DHA's CARE project was awarded the grand prize in the US Department of Energy's Solar in Your Community Challenge
Fellowship Energy Arranges for Solar Energy for Faith-Based Communities	Fellowship Energy has developed a financing model that helps houses of worship and other religious organization obtain financing for solar installations	Because nonprofits are unable to take advantage of the federal Investment Tax Credit, third-party investors that can monetize the tax credit are included in the solar projects	Fellowship Energy received the award for the "Best Nonprofit Program" in the US Department of Energy's "Solar in Your Community Challenge"
RE-volv Provides Opportunities for Nonprofits Serving Under-Resourced Communities to Install Solar Energy	Re-volv has developed a model that provides solar financing assistance to nonprofit organizations, including those in under-resourced communities	Crowdfunding helps raise some of the funds the nonprofit organizations need for the upfront costs of a PV system	A Solar Ambassadors Program uses student volunteers to assist with crowdfunding and help educate community members
Investment Firm Sunwealth Delivers Tangible Social Impact along with Strong Investor Returns	To attract financing for solar projects, especially those in under-resourced communities, Sunwealth combines a group of diversified solar projects into a project pool	Projects that might have been perceived as risky on their own are able to receive financing at favorable rates by being part of a project pool	Investors can either participate in tax equity ownership or purchase fixed-income investment bonds

APPENDIX B
Useful Publications

A Guidebook on Equitable Clean Energy Program Design for Local Governments and Partners, by the Cadmus Group for the Urban Sustainability Directors' Network (2018). This guide helps local governments and their partners to design programs that enable current and emerging clean energy technologies, including rooftop solar PV, solar+storage, air-source heat pumps, and electric vehicles, to be accessed equitably. It includes discussion of how to involve low-income residents in program design and create programs that prioritize making clean energy technologies accessible and beneficial to LMI households. *http://www.revermont.org/wp-content/uploads/Equitable-Clean-Energy-Guidebook-Final-9-2018.pdf*

A Resilient Power Capital Scan: How Foundations Could Use Grants and Investments to Advance Solar and Storage in Low-Income Communities, by Lew Milford and Rob Sanders (Clean Energy Group, 2017). This report identifies market barriers to deploying solar+storage in LMI markets and proposes more than 50 grant and investment opportunities that socially minded investors can use to target those barriers, including: supporting new tax credit aggregation entities, providing credit enhancement for performance risk, providing working capital, providing long-term capital, funding leadership awards to owners, investing for LMI expansion, and funding LMI advocates. *https://www.cleanegroup.org/wp-content/uploads/Capital-Scan-Feb2017.pdf*

Affordable Access to Clean and Efficient Energy: Final Working Group Report, by the Massachusetts Affordable Access to Clean and Efficient Energy Working Group (April 2017). A Massachusetts stakeholder process offers recommendations for overcoming barriers that prevent LMI consumers from accessing solar, energy efficiency, and other clean energy technologies. This Massachusetts-focused report discusses subsidized housing and housing finance agencies, technical assistance and marketing, and low-income-focused program design. *https://www.mass.gov/files/documents/2017/09/12/aacee-report.pdf*

Barriers to Low-Income Energy Efficiency and Renewables, California Public Utility Commission (2016). This California study, mandated by the state's legislature, reviews barriers for low-income customers to access energy efficiency and renewable energy, including customers in disadvantaged communities, and gives recommendations on how to increase access to energy efficiency and renewable energy investments for low-income customers. It is California-specific. *https://ww2.energy.ca.gov/sb350/barriers_report*

Breaking Ground: New Models that Deliver Energy Solutions to Low-Income Customers, by Coreina Chan et al. (Rocky Mountain Institute, 2016). This report describes several business models for serving LMI customers with solar, including models for shared solar and for multifamily housing. It contains charts portraying the flow of value between the many different parties involved in these kinds of models. *https://rmi.org/wp-content/uploads/2017/04/eLabLeap_Breaking-Ground-report-2016.pdf*

Bringing the Benefits of Solar Energy to Low-Income Consumers, by Bentham Paulos (Clean Energy States Alliance, 2017). This guide is primarily for policymakers interested in bringing the benefits of solar to LMI consumers and communities. It outlines the obstacles that LMI households face in accessing solar power and provides a detailed overview of strategies that policymakers and government agencies can use to encourage LMI solar adoption. *https://www.cesa.org/assets/2017-Files/Bringing-the-Benefits-of-Solar-to-Low-Income-Consumers.pdf*

Clean Energy for Low-Income Communities Accelerator Toolkit, US Department of Energy Better Buildings (2019). This toolkit released by the US Department of Energy's Clean Energy for Low-Income Communities Accelerator (CELICA), a two-year, voluntary federal partnership with state and local governments to lower energy bills for low-income communities, offers case studies, templates, and other materials produced through the Accelerator to help stakeholders plan and implement programs to reduce energy burdens for low-income communities. The CELICA toolkit includes a customizable version of the Low-Income Energy Affordability Data (LEAD) tool, which provides information on the low-income housing and energy characteristics of specific geographic areas in the US. *https://betterbuildingsinitiative.energy.gov/CELICA-Toolkit*

Collaborating for Bold Possibilities: The Ecosystem of Networks Advancing a Just Energy Transition, by the Climate Justice Alliance (2018). This report provides a snapshot of collaborations, networks, or alliances around the country that are approaching climate change in ways that ultimately lead to energy transition, reflecting the belief that the process of transition should be just, centering race, gender, and class. *https://climatejusticealliance.org/wp-content/uploads/2018/10/Collaborating-for-Bold-Possibilities_FINAL_830_TO-PRINT_SPREAD.pdf*

Community Solar Opportunities for Low to Moderate Income Households in the Southeast, by Anne Tazewell and Achyut Shrestha (North Carolina Clean Energy Technology Center, 2018). This report reviews the shared solar landscape in the Southeastern United States, discusses ways to reduce upfront costs for shared solar projects in order to enable more LMI participation, and considers possible additional funding sources. *https://nccleantech.ncsu.edu/wp-content/uploads/2018/05/Community-Solar-LMI-Report-3_27_18.pdf*

Directory of State Clean Energy Programs and Policies for Low- and Moderate-Income Residents, by Clean Energy States Alliance (2018). This directory includes a broad sample of publicly funded clean energy programs for LMI residents in 14 states and the District of Columbia. The programs mostly focus on electricity generation but also include some energy efficiency and solar thermal opportunities. *https://www.cesa.org/assets/Uploads/State-Low-Income-Programs.pdf*

Disparities in Rooftop Photovoltaics Deployment in the United States by Race and Ethnicity, by Deborah A. Sunter et al. (Nature Sustainability, 2019). This study by researchers from Tufts University and the University of California, Berkeley finds racial and ethnic inequities in rooftop solar participation among US households. Analyzing rooftop solar data from Google's Project Sunroof and demographic data from the American Community Survey, the researchers found that black- and Hispanic-majority census tracts show significantly less installed rooftop solar even after accounting for differences in household income and home ownership. *https://www.nature.com/articles/s41893-018-0204-z*

Energy Democracy: Advancing Equity in Clean Energy Solutions, by Denise Fairchild and Al Weinrub (Island Press, 2017). This collection of articles by energy and environmental justice experts links the environmental and climate movements with broader movements for social and economic change. It discusses the struggle of working people, low income communities, and communities of color to take control of energy resources from the energy establishment and to use those resources to empower their communities. *https://islandpress.org/books/energy-democracy*

Expanding Solar Access: Pathways for Multifamily Housing, by the Interstate Renewable Energy Council (2018). This report outlines two paths to enable greater access to solar for multifamily residents—1) on-site solar, and 2) off-site shared solar—and reviews the needs and considerations under each path. *https://irecusa.org/expanding-solar-access-pathways-for-multifamily-housing*

Inclusive Solar Finance Framework, by Sustainable Capital Advisors (Vote Solar, 2018). This report identifies 12 ways to access/pay for solar, barriers to participation for low-income, low-credit, and low-income/low-credit customers, and possible solutions such as refundable tax credits and credit enhancements. *https://votesolar.org/files/1215/3394/2652/Inclusive_Solar_Finance_Framework_Report.pdf*

Insights from the Colorado Energy Office Low-Income Community Solar Demonstration Project, by Lotus Engineering (Colorado Energy Office, 2017). This report evaluates the results from the Low-Income Community Solar Demonstration Project, a portfolio of eight shared solar arrays collectively serving over 300 low-income Colorado households. The report assesses the structure, cost effectiveness, and impact of the project. *https://www.colorado.gov/pacific/sites/default/files/Insights%20from%20the%20CEO%20Low-Income%20Community%20Solar%20Demonstration%20Project.pdf*

Low-Income Solar Policy Guide, by Vote Solar, GRID Alternatives, and the Center for Social Inclusion (originally published in 2016 but updated in subsequent years). This guide, which is available both as a pdf and as an online tool, examines many program models and case studies for expanding LMI access to solar power. The guide highlights LMI solar efforts on topics related to single-family, multifamily, community solar, and workforce development. It also notes that policy tools including solar compensation mechanisms, incentives, and financing, can be harnessed to support LMI solar access. *https://www.lowincomesolar.org*

Owning the Benefits of Solar+Storage: New Ownership and Investment Models for Affordable Housing and Community Facilities, by Lew Milford and Rob Sanders (Clean Energy Group, 2018). This paper goes beyond direct ownership and conventional leasing models to explore additional ownership and financing options for solar+storage projects in under-resourced communities. *https://www.cleanegroup.org/wp-content/uploads/Owning-the-Benefits-of-Solar-Storage.pdf*

Reversing Energy System Inequity: Urgency and Opportunity During the Clean Energy Transition, by John Howat et al. (National Consumer Law Center, 2019). The paper highlights three ways to make energy system decision-making more equitable: 1) collecting and distributing residential customer data, with separate categories for LMI and vulnerable ratepayers, 2) establishing an inclusive regulatory process that considers equity impacts, and 3) developing and widely sharing programs and best practices to address economic inequities for low-income consumers. *https://www.nclc.org/images/pdf/special_projects/climate_change/report-reversing-energy-system-inequity.pdf*

Shared Renewable Energy for Low- to Moderate-Income Consumers: Policy Guidelines and Model Provisions, by Interstate Renewable Energy Council (2016). This report addresses how to define "LMI customers," offers an overview of the major barriers to LMI participation in shared solar projects, discusses various financing tools and other mechanisms to address LMI financial barriers, and provides model provisions for LMI shared renewable energy programs. *https://irecusa.org/publications/shared-renewable-energy-for-low-to-moderate-income-consumers-policy-guidelines-and-model-provisions*

Solarize Your Community: An Evidence-Based Guide for Accelerating the Adoption of Residential Solar by Kenneth Gillingham et al. (Yale School of Forestry & Environmental Studies, 2017). A team from Yale University, Connecticut Green Bank, SmartPower, and Duke University give step-by-step advice on how to mount a Solarize campaign or other community-based residential solar marketing campaign. The guide is not specifically focused on under-resourced communities, but it still provides useful information for these communities. *https://cbey.yale.edu/sites/default/files/2019-09/Solarize%20Your%20Community%20Rev1%20Dig.pdf*

The Vision for U.S. Community Solar: A Roadmap for 2030, by GTM Research (Vote Solar, 2018). See especially Section 4, Realizing the Low-and Moderate-Income Opportunity. This report envisions a market where shared solar is a mainstream option for consumers to choose and control their own energy generation, especially for those lacking access to traditional solar options, such as renters and the LMI community. It outlines the benefits of shared solar and subscriber preferences, addresses key bottlenecks to the expansion of shared solar, and provides strategies to enhance inclusion of LMI populations in shared solar. *https://votesolar.org/policy/policy-guides/shared-renewables-policy/csvisionstudy*

Unlocking Solar for Low-and Moderate-Income Residents: A Matrix of Financing Options by Resident, Provider, and Housing Type, by Jeffrey J. Cook and Lori Bird (National Renewable Energy Laboratory, 2018). The intent of this report is to identify the most promising strategies state policymakers might consider using to finance PV for LMI customers across three housing types: single-family, multifamily, and manufactured housing. The report examines 13 financing options that could be used to serve LMI residents. In general, the variables that influence which of these financing options may be most preferable for certain LMI residents are housing type, ownership status, and whether the resident receives federal housing assistance. *https://www.cesa.org/assets/2018-Files/NREL-LMI-Solar-Matrix.pdf*

Up to the Challenge: Communities Deploy Solar in Underserved Markets, by Jeffrey J. Cook, Sydney Forrester, Bryn Grunwald, Jenny Heeter, Clark Henry, and Monisha Shah (National Renewable Energy Laboratory, 2019). This report provides a summary of the Solar in Your Community Challenge, a US Department of Energy-sponsored prize competition designed to encourage the development of new approaches to increase the affordability of electricity and expand solar adoption. The report includes key takeaways from the Solar in Your Community Challenge and profiles ten Challenge teams with innovative models for expanding solar access. *https://www.nrel.gov/docs/fy19osti/72575.pdf*

APPENDIX C
People Interviewed

During the research for this report, the project team conducted 76 interviews. In a few cases, more than one person from an organization were interviewed at the same time. The authors of this report thanks each of the interviewees for her/his time and insights.

- **Jonathan Abe**, CEO, Sunwealth
- **Zelalem Adefris**, Resilience Director, Catalyst Miami
- **Trenton Allen**, Managing Director and CEO, Sustainable Capital Advisors
- **Galen Barbose**, Research Scientist, Electricity Markets & Policy Group, Lawrence Berkeley National Laboratory
- **Shauna Beland**, Chief, Program Development, Rhode Island Office of Energy Resources
- **Crystal Bergemann**, Affordable Housing Preservation Market Lead, Multifamily Affordable Initiative, Fannie Mae
- **Lori Bird, Director**, US Energy Programs, World Resources Institute
- **Sara Birmingham**, Senior Director for State Affairs, Solar Energy Industries Association
- **Adam Boucher**, CEO, Promise Energy
- **Matt Brennan**, Vice President of Operations, CollectiveSun
- **Jessica Brooks**, Chief Development Officer, Sunwealth
- **David Castro**, Electrical Engineering Associate, Community Solar Program, Los Angeles Department of Water and Power
- **Coreina Chan**, Principal, Rocky Mountain Institute
- **Djuan Coleon**, Executive Director, PURE
- **Beverly Craig**, Senior Program Manager, Low & Moderate-Income Programs, Massachusetts Clean Energy Center
- **Jeff Cramer**, Executive Director, Coalition for Community Solar Access
- **Julie Curti**, Associate, Cadmus
- **Luis Davila**, Director, Campaigns and Advocacy, Sunrun
- **Naomi Davis**, Founder, BIG: Blacks in Green
- **Kim Dempsey**, Deputy Director, Social Investment Practice, The Kresge Foundation
- **Timothy Den-Herder Thomas**, General Manager, Cooperative Energy Futures
- **Michael DiRamio**, Manager of Strategic & Interagency Initiatives, Weatherization and Intergovernmental Programs, Office of Energy Efficiency and Renewable Energy, US Department of Energy
- **Asali DeVan Ecclesiastes**, Director, Strategic Neighborhood Development, New Orleans Business Alliance
- **Jason Edens**, Director, RREAL
- **Katherine Egland**, Chair, Environmental and Climate Justice Committee, NAACP
- **Adam Flint**, Director of Clean Energy Programs (also Community Owned Shared Renewables Working Group Coordinator), Binghamton Regional Sustainability Coalition (also NY Energy Democracy Alliance)
- **Michael Freedberg**, Senior Advisor for Energy Efficiency and Climate Change, Office of Economic Resilience, US Department of Housing and Urban Development
- **Beth Galante**, Vice President of Business Development and Government Relations, PosiGen Solar
- **Jairo Garcia**, Chief Executive Director, Urban Climate Nexus
- **Anthony Giancatarino**, Fellow, Movement Strategy Innovation Center (formerly with the Center for Social Inclusion)

- **Noah Ginsburg**, Director of Here Comes Solar, Solar One
- **Michelle Gransee**, Manager, Minnesota Energy Office/Department of Commerce
- **Vito Greco**, Senior Manager, Solar Program, Elevate Energy
- **Zach Greene**, Program Director, Solar Foundation
- **Charlie Harak**, Attorney, National Consumer Law Center
- **Isabelle Hazlewood**, Associate Manager, Statutory and Infrastructure Programs, Connecticut Green Bank
- **Mari Hernandez**, Assistant Director, Regulatory Program, Interstate Renewable Energy Council
- **Ken Hughes**, Clean Energy Specialist, New Mexico Energy, Minerals, and Natural Resources Department
- **Elise Hunter**, Policy and Regulatory Affairs Director, GRID Alternatives
- **Jean-Ann James**, Senior Program Associate, Turner Foundation
- **Max Joel**, NY-Sun Team Lead, NYSERDA
- **Andy Johnson**, Director, Winneshiek Energy District
- **Ellie Kahn**, Policy Advisor, New York City Mayor's Office of Sustainability
- **Andreas Karelas**, Executive Director, RE-volv
- **Betsy Kauffman**, Director, Renewable Energy Department, Energy Trust of Oregon
- **Kerry Klemm**, Customer Choice & Renewable Programs Manager, Xcel Energy
- **Thomas Koch Blank**, Principal, Rocky Mountain Institute
- **Rev. Michael Malcolm**, Executive Director, Alabama Interfaith Power & Light
- **Justin Marquez**, Community Affairs Coordinator, MCE Clean Energy
- **Alana Mathews**, Public Adviser, California Energy Commission
- **Cara Merriman**, Manager, Business Development, Sunrun
- **Andrea Nyamekye**, Campaign and Policy Director, Neighbor to Neighbor Massachusetts
- **Kerry O'Neill**, CEO, Inclusive Prosperity Capital
- **Katie Chiles Ottenweller**, Southeast Director, Vote Solar
- **Ben Passer**, Director of Energy Access and Equity, Fresh Energy
- **Nick Patane**, Energy Policy Advisor, New York City Mayor's Office of Sustainability
- **Jacqueline Patterson**, Senior Director, Environmental and Climate Justice Program, NAACP
- **Joseph Pereira**, Regulatory Director, Citizens Utility Board of Minnesota
- **Laura Rigell**, Solar Manager, Philadelphia Energy Authority
- **Yesenia Rivera**, DC Program Director, Solar United Neighbors – DC
- **Kelly Roache**, Director of Inclusion, Solstice
- **Mary Rottman**, Owner/Principal, Rottman Associates
- **DeAndrea Salvador**, Founder, Renewable Energy Transition Initiative (RETI)
- **Deidre Sanders**, Director, Government and Community Affairs, East Bay Community Energy
- **Melanie Santiago-Mosier,** Program Director, Low-Income Solar Access, Vote Solar
- **Molly Simpson**, Manager of Multifamily Green Business, Fannie Mae
- **Nicole Sitaraman**, Senior Manager of Public Policy, Sunrun
- **Jennifer Somers**, Program Director for Energy Efficiency for All, Energy Foundation
- **Maria Thomas**, Outreach and Organizing Coordinator, Soulardarity
- **Patrick Thompson**, Senior Renewable Energy Utility Scale Consultant, Trust Energy Limited (and Cobb EMC energy equity hub member)
- **Esther Toporovsky**, Senior Program Director, Green Communities, Enterprise Community Partners

- **Roxana Tynan**, Executive Director, Los Angeles Alliance for a New Economy
- **Elaine Ulrich**, Acting Senior Advisor, US Department of Energy
- **Ben Underwood**, President of Operations, Resonant Energy
- **Sandra Upchurch**, Energy Justice Manager, Southern Alliance for Clean Energy (SACE)
- **Jaimes Valdez**, Policy Manager, Spark Northwest
- **Stephanie Wang**, Policy Director, California Housing Partnership (CHPC)
- **Gibran Washington**, Energy Educator & EEA Technician, EcoWorks
- **Daniel White**, Energy Program Specialist, DC Department of Energy and Environment
- **Rev. Mariama White-Hammond**, Pastor, New Roots AME Church
- **Kathryn Wright**, Senior Associate, Cadmus

APPENDIX D

Attendees at 2018 New York Convening & 2019 Atlanta Workshop

Attendees at New York Convening on Community-Determined and Community-Owned Clean Energy, March 7, 2018

- **Angela Adrar,** Climate Justice Alliance
- **Nwamaka Agbo,** Movement Strategy Center
- **Trenton Allen,** Sustainable Capital Advisors
- **Kartik Amarnath,** New York City Environmental Justice Alliance
- **Donnel Baird,** BlocPower
- **Eddie Bautista,** New York City Environmental Justice Alliance
- **Thomas Koch Blank,** Rocky Mountain Institute
- **Christine Cordero,** Center for Story-based Strategy
- **Jim Doyle,** Business Forward
- **Jordan Estevao,** People's Action
- **Adam Flint,** Southern Tier Solar Works
- **Ivan Frishberg,** Amalgamated Bank
- **Rahwa Ghirmatzion,** PUSH Buffalo
- **Clarke Gocker,** PUSH Buffalo
- **Wahleah Johns,** Native Renewables
- **Andy Johnson,** Winneshiek Energy District
- **Leslie Lindo,** Common Future
- **Dwayne Patterson,** Partnership for Southern Equity
- **Jacqui Patterson,** NAACP
- **Nathaniel Smith,** Partnership for Southern Equity
- **Aaron Tanaka,** Center for Economic Democracy
- **Matt Wasson,** Appalachian Voices
- **Liz Welch,** Thunder Valley

Attendees at Atlanta Kickoff Workshop, January 31, 2019

- **Valerie Boucard**, The Nathan Cummings Foundation
- **Djuan Coleon**, PURE
- **Naomi Davis**, BIG: Blacks in Green
- **Danielle Deane-Ryan**, The Nathan Cummings Foundation
- **Asali DeVan Ecclesiastes**, New Orleans Business Alliance
- **Katherine Egland**, NAACP
- **Chandra Farley**, Partnership for Southern Equity
- **Sage Green**, PUSH Buffalo
- **Berneece Herbert**, Jackson State University
- **Erica Holloman-Hill**, West Atlanta Watershed Alliance
- **Warren Leon**, Clean Energy States Alliance
- **Mildred McClain**, Harambee House, Inc.
- **Rev. Michael Malcolm**, Alabama Interfaith Power & Light
- **Katie Chiles Ottenweller**, Vote Solar
- **Tony Reames**, University of Michigan School for Environment and Sustainability
- **Yesenia Rivera**, Solar United Neighbors – DC
- **DeAndrea Salvador**, Renewable Energy Transition Initiative
- **Maria Thomas**, Soulardarity
- **Roxana Tynan**, LAANE
- **Sandra Upchurch**, Southern Alliance for Clean Energy

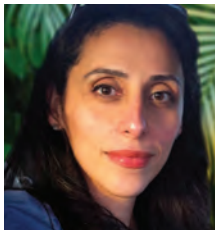
APPENDIX E
The Project Team

Warren Leon is the Executive Director of the Clean Energy States Alliance (CESA). He oversees the organization's day-to-day operations and leads strategy development. He has produced many reports for CESA, including *Returning Champions: State Clean Energy Leadership Since 2015*. Prior to working for CESA, he was Director of the Massachusetts Renewable Energy Trust, Executive Director of the Northeast Sustainable Energy Association, and Deputy Director for Programs at the Union of Concerned Scientists. He holds a PhD from Harvard University.

Chandra Farley is Director of the Just Energy Program for the Partnership for Southern Equity. She provides leadership, strategy, and coaching to ensure the program achieves its energy equity goals and optimizes its impact in the community. She works in partnership with environmental and equity organizations throughout the American South to engage diverse communities around issues of energy inequity, democracy, and climate justice. She was previously a Program Manager for Southface Energy Institute.

Nate Hausman is a CESA Project Director. He manages the "Scaling Up Solar for Under-Resourced Communities Project," an initiative funded by the US Department of Energy to advance three distinct subsets of the LMI solar market: single-family homes, manufactured homes, and multifamily affordable housing. In 2018, he was named to Renewable Energy World's Solar 40 Under 40 list, which recognizes solar energy leaders under the age of 40. He holds a JD with a certificate in Environmental & Natural Resources Law. He is licensed to practice law in Vermont.

Berneece Herbert is Chair of the Department of Urban and Regional Planning at Jackson State University in Jackson, Mississippi. She previously was Interim Chair and Program Coordinator for the Department of Community & Regional Planning at Alabama A&M University. Before joining the university, she worked for a consulting firm and was a Senior Urban Planner and Director of the Department of Statistics and Economic Planning for the Nevis Island government. She holds a PhD in Natural Resources and Environmental Sciences.



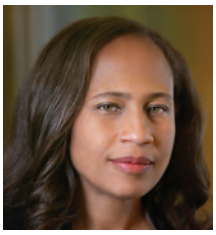
Nicole Hernandez Hammer is a CESA Project Director working on solar for under-resourced communities. She is a sea-level researcher, climate change expert, and environmental justice advocate. A Guatemalan immigrant, she works to address the disproportionate impacts of climate change on communities across the US. She previously was an advocate at the Union of Concerned Scientists, Florida field manager for Moms Clean Air Force, an environmental blogger for Latina Lista, and assistant director of the Florida Center for Environmental Studies at Florida Atlantic University.

Bentham Paulos is the principal of PaulosAnalysis, consulting and writing on clean energy policy, technology, and trends, for non-profit, media, industry, research, and philanthropic clients. He is an affiliate at Lawrence Berkeley National Lab, sits on the board of CESA, and serves on the Berkeley Energy Commission. He was a program director with the Energy Foundation from 2000 to 2013. For CESA, he wrote *Bringing the Benefits of Solar to Low-Income Consumers: A Guide for States and Municipalities*.

Tony Reames is Assistant Professor at University of Michigan's School for Environment & Sustainability. His research focuses on energy justice, exploring disparities in residential energy generation, consumption, and affordability. Among his many publications are "*Targeting Energy Justice*" and *"A Community-Based Approach to Low-Income Residential Energy Efficiency Participation Barriers."* He has a PhD in Public Administration and an MS in Engineering Management.

Robert Sanders is Senior Finance Director for CESA and *Clean Energy Group*. With over 25 years of experience in community development and energy-related commercial finance, he has deep expertise in designing, implementing, and evaluating financing programs, financial products, and related services in the areas of clean energy and sustainable community development. He was formerly Managing Director of Energy Finance for The Reinvestment Fund, a leading innovator in the financing of neighborhood and economic revitalization.

Laura Schieb is a Program Associate for CESA, where she works on initiatives to make solar more accessible to low- and moderate-income communities. Laura was previously a Global Energy Fellow at Vermont Law School where she worked in the Institute for Energy and the Environment as a team leader in identifying strategies to overcome barriers to low-income solar ownership in Vermont. Laura received an LLM in Energy Law and a JD from Vermont Law School.



Danielle Deane-Ryan is Director of the Inclusive Clean Economy Program at The Nathan Cummings Foundation. She served in the Obama Administration as Senior Advisor for External Affairs and Acting Director for Stakeholder Engagement at the US Department of Energy's Office of Energy Efficiency & Renewable Energy. Prior, she held roles at The Raben Group, serving as Green 2.0's founding executive director; the Hewlett Foundation; and served on the National Academies of Sciences Gulf Research Program's Advisory Board. She holds a MS in Environment and Development from the London School of Economics and Political Science.

Rudi Navarra serves as Director of Investments at The Solutions Project, managing grantmaking strategies to advance 100 percent clean energy for 100 percent of the people. Rudi also leads a national effort to organize philanthropy and increase investments in rural electric cooperatives. He also serves as a steering committee member at the 100% Network. Follow him on social media on Twitter @LatinoSublime.

Maria Blais Costello is the Manager of Program Administration for CESA, where she is responsible for managing grants and communications for CESA projects. Maria directs CESA's State Leadership in Clean Energy awards program and coordinates development activities and special events. She manages communications, report production, and editing. She also serves as CESA's corporate secretary.

Solar with Justice

Strategies for Powering Up Under-Resourced Communities and Growing an Inclusive Solar Market

The Clean Energy States Alliance (CESA) is a national, nonprofit coalition of public agencies and organizations working together to advance clean energy. CESA members—mostly state agencies—include many of the most innovative, successful, and influential public funders of clean energy initiatives in the country. CESA facilitates information sharing, provides technical assistance, coordinates multi-state collaborative projects, and communicates the views and achievements of its members. *www.cesa.org*

Jackson State University (JSU) is a historically Black, research-intensive public institution of higher education in Mississippi. JSU's mission is built upon three pillars of success—student centeredness, teamwork, and the pursuit of excellence. The Department of Urban and Regional Planning at JSU offers the only accredited Urban Planning programs in the state, producing highly knowledgeable, skilled graduates who can significantly contribute to building healthy and sustainable communities. *www.jsums.edu*

The Partnership for Southern Equity (PSE) is an Atlanta-based nonprofit that advances policies and institutional actions that promote racial equity and shared prosperity in metropolitan Atlanta, the state of Georgia, and the American South through an ecosystem-based model for multi-demographic engagement. Focusing on four key areas—energy, growth, health, and opportunity—PSE has developed strong partnerships, which result in successful policy initiatives that elevate the communities it serves. *www.psequity.org*

PaulosAnalysis provides research and consulting on clean energy policy, technology, and trends, for non-profit, media, industry, research, and philanthropic clients. *www.paulosanalysis.com*

The School for Environment and Sustainability's overarching objective is to contribute to the protection of the Earth's resources and the achievement of a sustainable society. Faculty, staff, and students are devoted to generating knowledge and developing policies, techniques, and skills to help practitioners manage and conserve natural and environmental resources to meet the full range of human needs on a sustainable basis. *www.seas.umich.edu*

The Nathan Cummings Foundation is a multigenerational family foundation, rooted in the Jewish tradition of social justice, working to create a more just, vibrant, sustainable, and democratic society. We partner with social movements, organizations and individuals who have creative and catalytic solutions to climate change and inequality. *www.nathancummings.org*

The Solutions Project accelerates the transition to 100% clean energy for 100% of the people, and does so by working with grassroots organizations to build an inclusive, celebratory, and collaborative culture. It invests in frontline women and leaders of color positioned for impact—helping to amplify their stories and scale their clean energy solutions. It recently committed to invest 95% of its philanthropy in people of color and women-led organizations. *www.thesolutionsproject.org*

To access this report online, please visit
https://cesa.org/resource-library/resource/solar-with-justice.

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