

RESILIENTPOWER

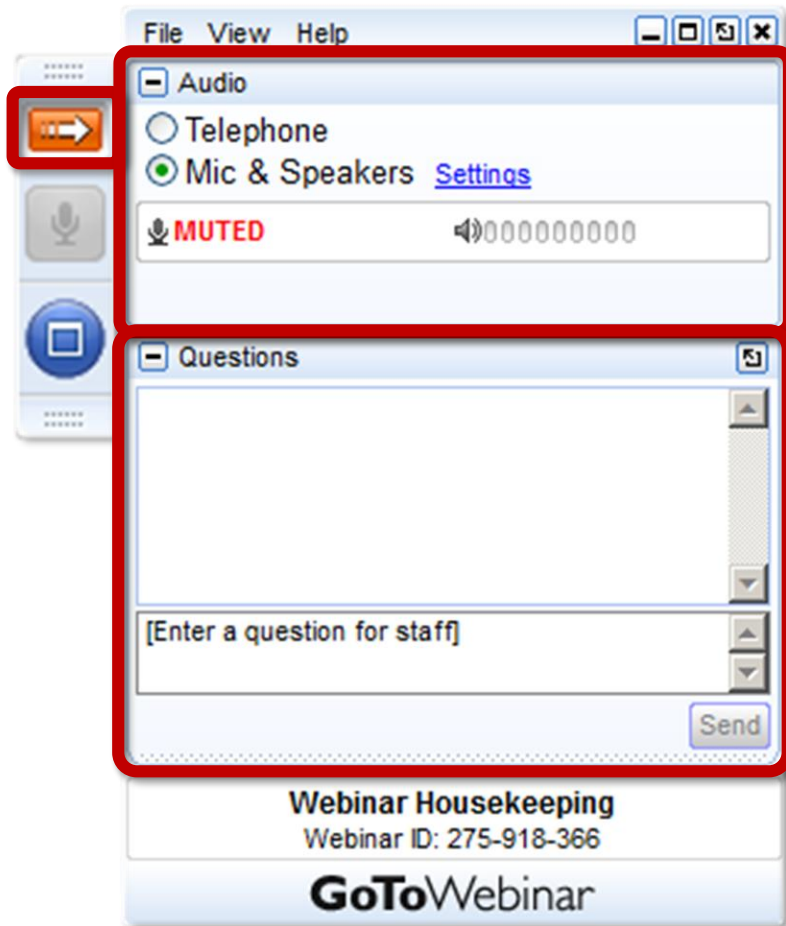


Is Energy Storage Right for Our Community-Based Solar Project? A Solar+Storage 101 Webinar

May 12, 2017



Housekeeping



Use the red arrow to open and close your control panel

Join audio:

- Choose Mic & Speakers to use VoIP
- Choose Telephone and dial using the information provided

Submit questions and comments via the Questions panel

This webinar is being recorded. We will email you a webinar recording within 48 hours. Clean Energy Group's webinars are archived at

www.cleanegroup.org/webinars

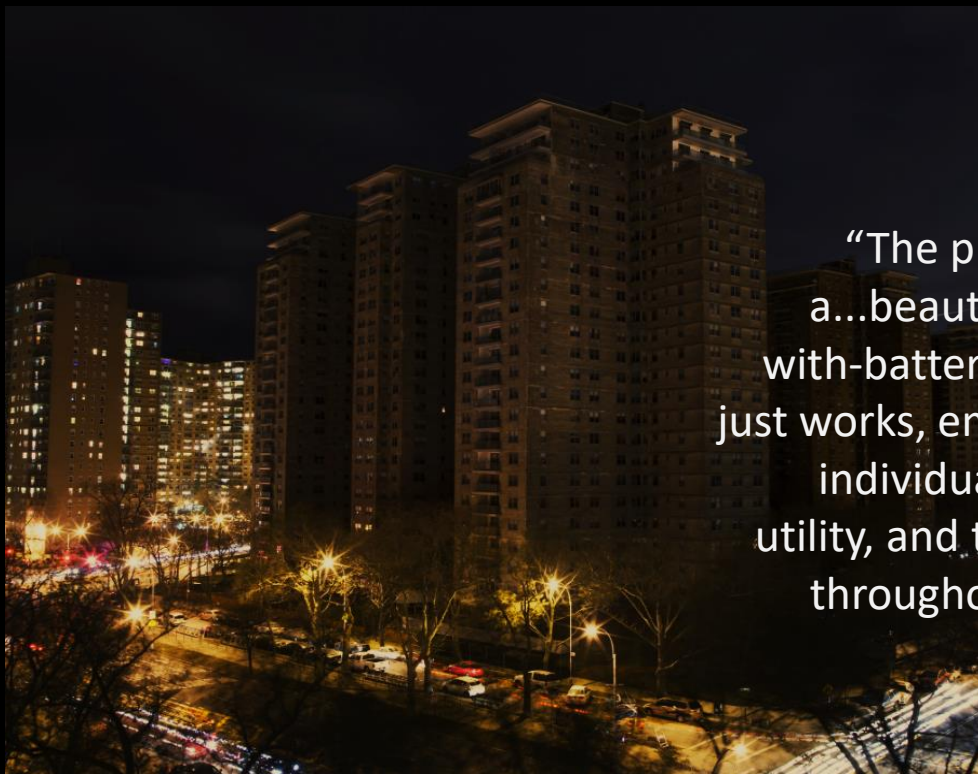
Who We Are



JANE'S TRUST

Bridging the Resilient Power Divide

“Electricity was not fully restored...until three weeks after Sandy landed.” -Urban Health

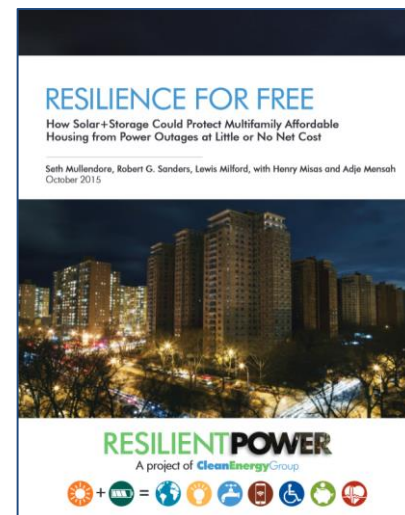
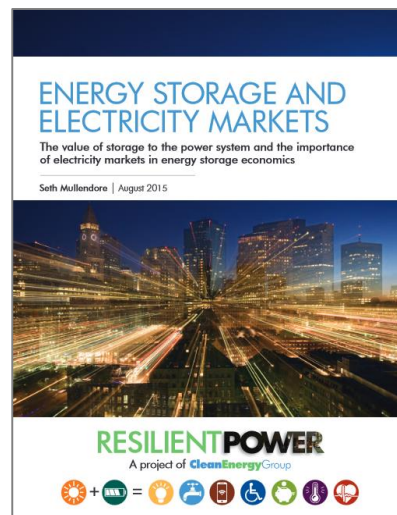
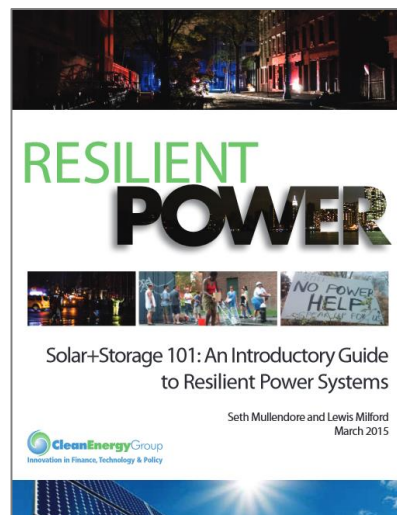
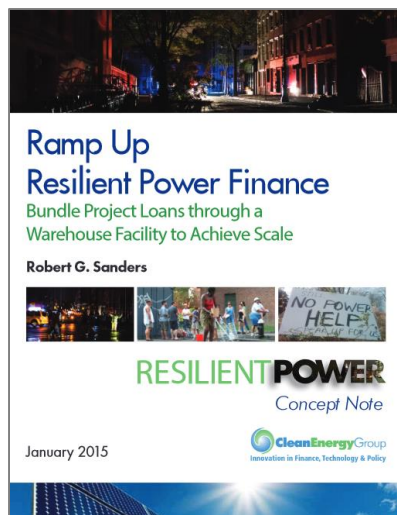


“The plan is to create a...beautiful solar-roof-with-battery product that just works, empowering the individual as their own utility, and then scale that throughout the world.”
-Elon Musk

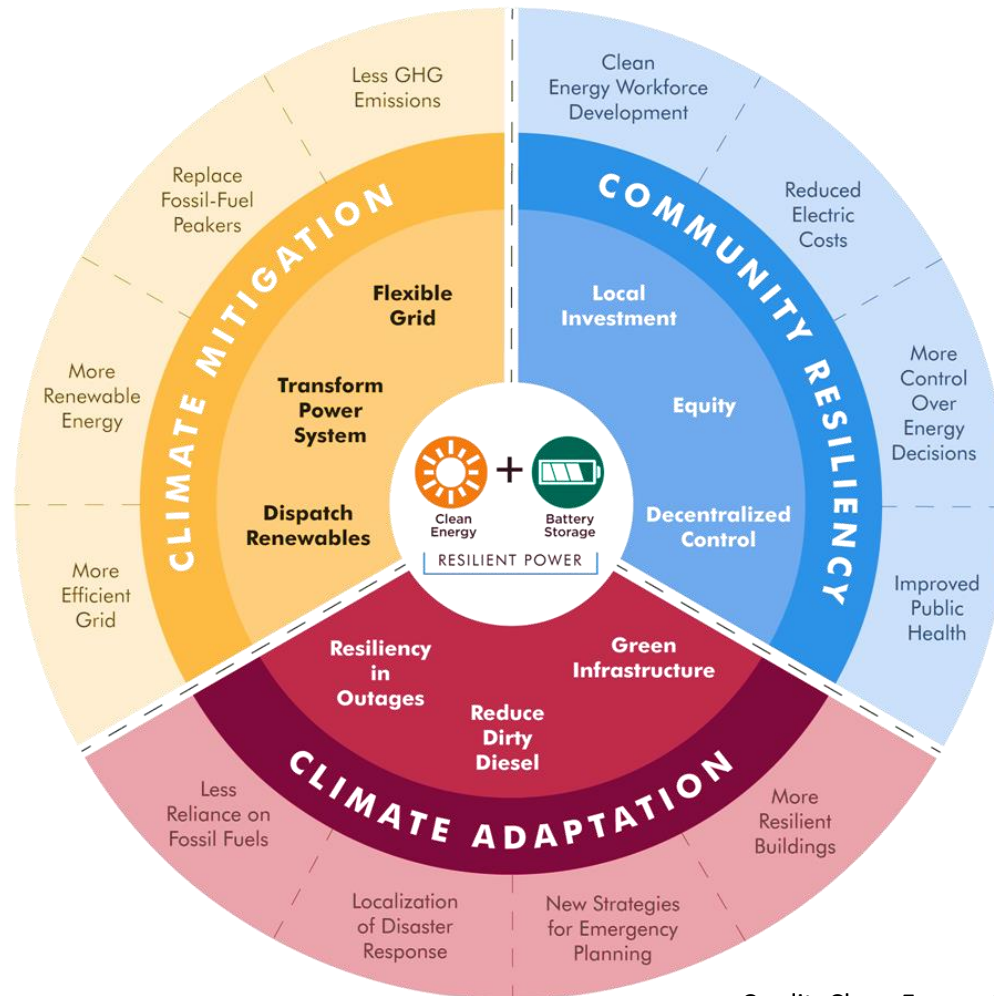


www.resilient-power.org

- Increase public/private investment in clean, resilient power systems
- Engage city officials to develop resilient power policies/programs
- Protect low-income and vulnerable communities
- Focus on affordable housing and critical public facilities
- Advocate for state and federal supportive policies and programs
- Technical assistance for pre-development costs to help agencies/project developers get deals done
- See www.resilient-power.org for reports, newsletters, webinar recordings



Solar+Storage: Driver of Multiple Transitions



Credit: Clean Energy Group

Resilient Power Equity Divide



High-End Markets

- Thousands of projects built
- Mainly to reduce electric bills
- Will grow exponentially like solar
- New financing options emerging
- Will become status quo offering



LMI Markets

- Few projects built
- Greater need for technology
- Unequal incentives distribution
- Difficult to finance under traditional models
- Few targeted LMI strategies

Panelists

- **Low Milford**, President, Clean Energy Group
- **Alison Corwin**, Program Officer for Sustainable Environments, The Surdna Foundation
- **Shamar Bibbins**, Program Officer – Environment, The Kresge Foundation
- **Aaron Bartley**, Executive Director, PUSH Buffalo
- **Seth Mullendore**, Project Director, Clean Energy Group
- **Rob Sanders**, Senior Finance Director, Clean Energy Group



School 77 – Buffalo Neighborhood Stabilization Company and PUSH Buffalo





PROJECT SITE

Google

School 77 Community Planning

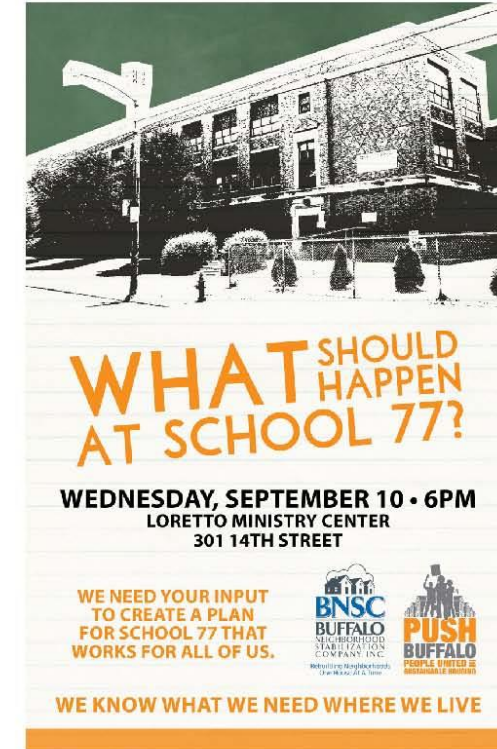
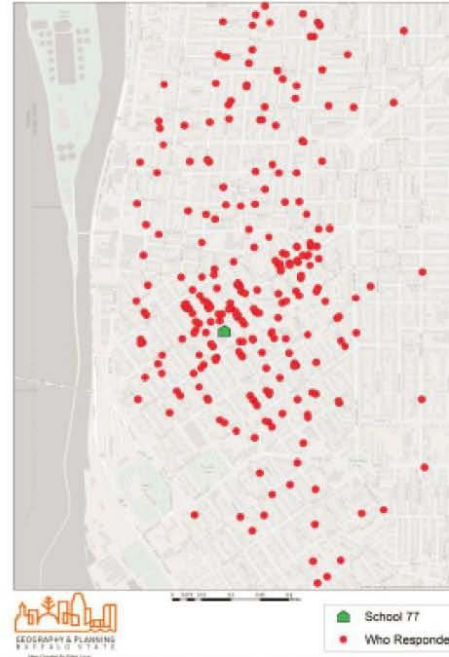


☐ I support PUSH Buffalo's plan to keep the School #77 building open as a community space

I would like to see that space as: _____

NAME: _____
ADDRESS: _____
PHONE: _____
Signed: _____ Date: _____

PUSH BUFFALO
PEOPLE UNITED IN SUPPORTABLE HOUSING



WHAT SHOULD HAPPEN AT SCHOOL 77?

WEDNESDAY, SEPTEMBER 10 • 6PM
LORETTO MINISTRY CENTER
301 14TH STREET

WE NEED YOUR INPUT TO CREATE A PLAN FOR SCHOOL 77 THAT WORKS FOR ALL OF US.

WE KNOW WHAT WE NEED WHERE WE LIVE

BNSC
BUFFALO MULTIBENEFIT STABILIZATION COMPANY INC.
Rebuilding Neighborhoods One Block at a Time

PUSH BUFFALO
PEOPLE UNITED IN SUPPORTABLE HOUSING

Major Themes for School 77 that have been identified were **Affordable Housing**, **Community Center**, **Culture**, **Education**, and **Recreation + Youth**

Affordable Housing



We can build 30 units of
Senior
Housing



School 77 Cross Section

-  Community or Commercial Spaces
-  Residential Spaces

Community Facilities



Affordable Housing and Critical Facilities



Resilient Power Toolkits

You are here: [Home](#) / [Projects](#) / [Resilient Power Project](#) / [Resilient Power Toolkits](#)

[Overview](#) | [Toolkits](#) | [Publications](#) | [Webinars](#) | [Blog](#) | [Newsletters](#) | [FAQs](#) | [Project Map](#) | [Featured Installations](#)

Resilient Power Toolkits

Resilient power, supplied by clean, renewable technologies, can help strengthen communities by delivering resiliency, economic, and health benefits. The [community services](#) and [affordable housing](#) toolkits listed below are designed to provide the tools and background information to gain a better understanding of resilient power systems and how to approach the planning and development of a resilient power installation. Resources include descriptions and links to key reports, guides, and webinars produced by Clean Energy Group and other organizations.

Community Services

Resources for developing resilient power projects in shelters, first response, and other critical community facilities.

Affordable Housing

Resources for developing resilient power projects in single family and multifamily affordable housing developments.



Resilient Power Toolkits

[Return to Toolkits Main Page](#)

Community Services Toolkit

Are there critical facilities (emergency shelters, first response, healthcare centers) in your community that could benefit from clean, reliable power? The information and resources listed below will help you explore how the social and economic benefits of resilient power can help strengthen your community. Resources include descriptions and links to key reports, guides, and webinars produced by the Resilient Power Project and other organizations.

If you have any questions or would like to learn more about resilient power for community services, please contact us at resilient-power@cleangroup.org.

Information specific to resilient power for affordable housing is available [here](#).



Read more about these resilient community projects on the [Featured Installations page](#).

Background on Resilient Power Technologies

Resilient power is the ability to provide a facility with continuous, reliable power even when the electric grid goes down. Truly resilient power should be clean, renewable, and have the ability to provide benefits throughout the year, not just during natural disasters and other power emergencies. The resources listed below provide a more in-depth look at the components of a resilient solar+storage system, including an introduction for those new to solar+storage technologies ([Solar+Storage 101](#)) and considerations for projects interested in adding storage to an existing solar system ([Resilient PV Retrofit and Storage Ready Guidelines](#)).

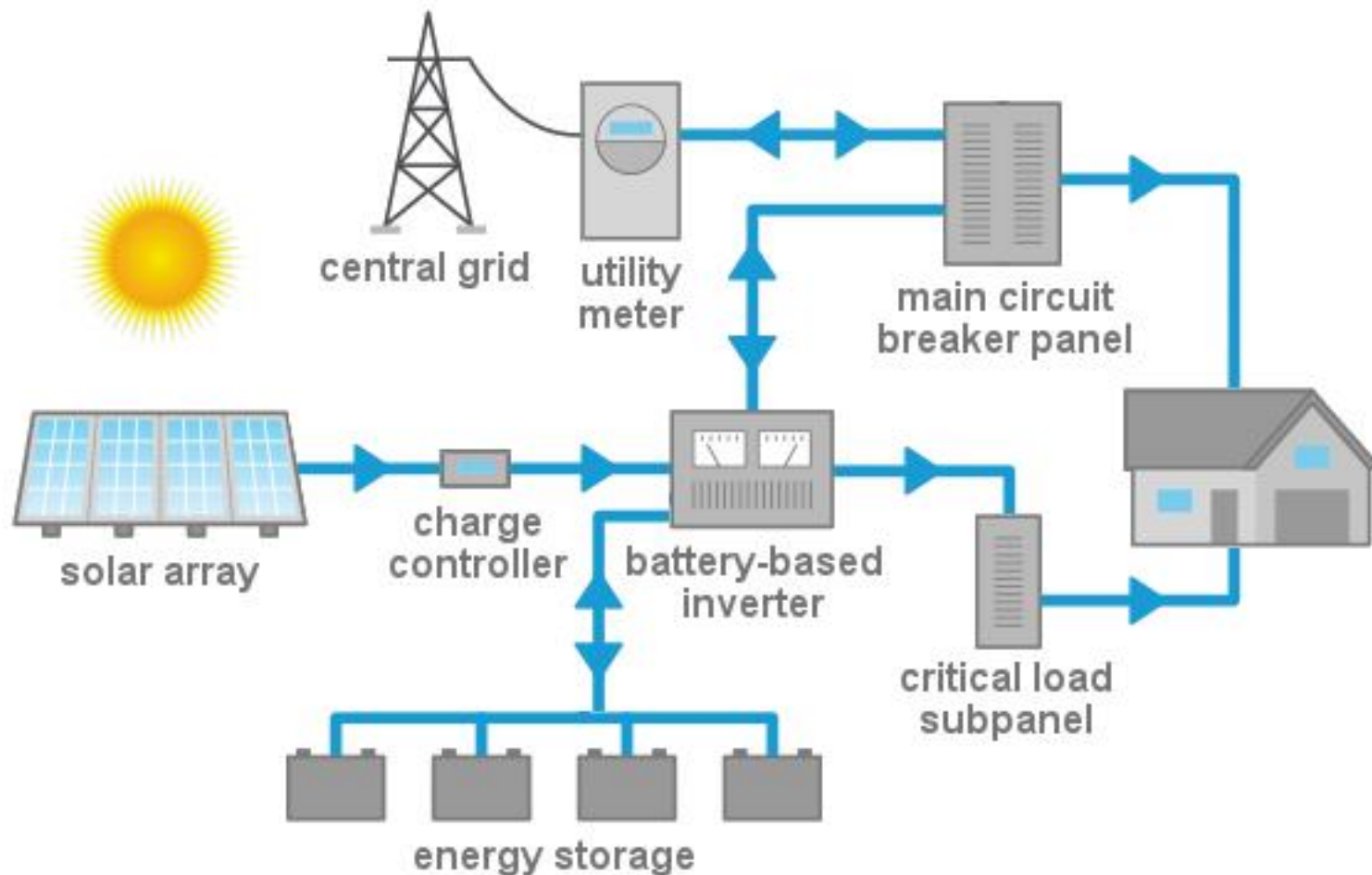
[View All Resources](#)

Resilient Power Toolkits

Six Toolkit Focus Areas:

- 1) Background on Resilient Power Technologies
- 2) Resilient Power Economics
- 3) Financing Resilient Power Projects
- 4) Developing a Resilient Power Project
- 5) Resilient Power Policies
- 6) Additional Resources

Solar+Storage 101



The Economics of Battery Storage

The Value of Storage

Energy storage technologies have the capacity to benefit each segment of the power system.



Increase renewable integration



Reduce dependence on fossil-fuel peaker plants



Reduce operating expenses



Balance electricity supply and demand



Improve power quality and reliability



Avoid costly system upgrades



Keep critical equipment online during power disruptions



Reduce utility bills and generate revenue

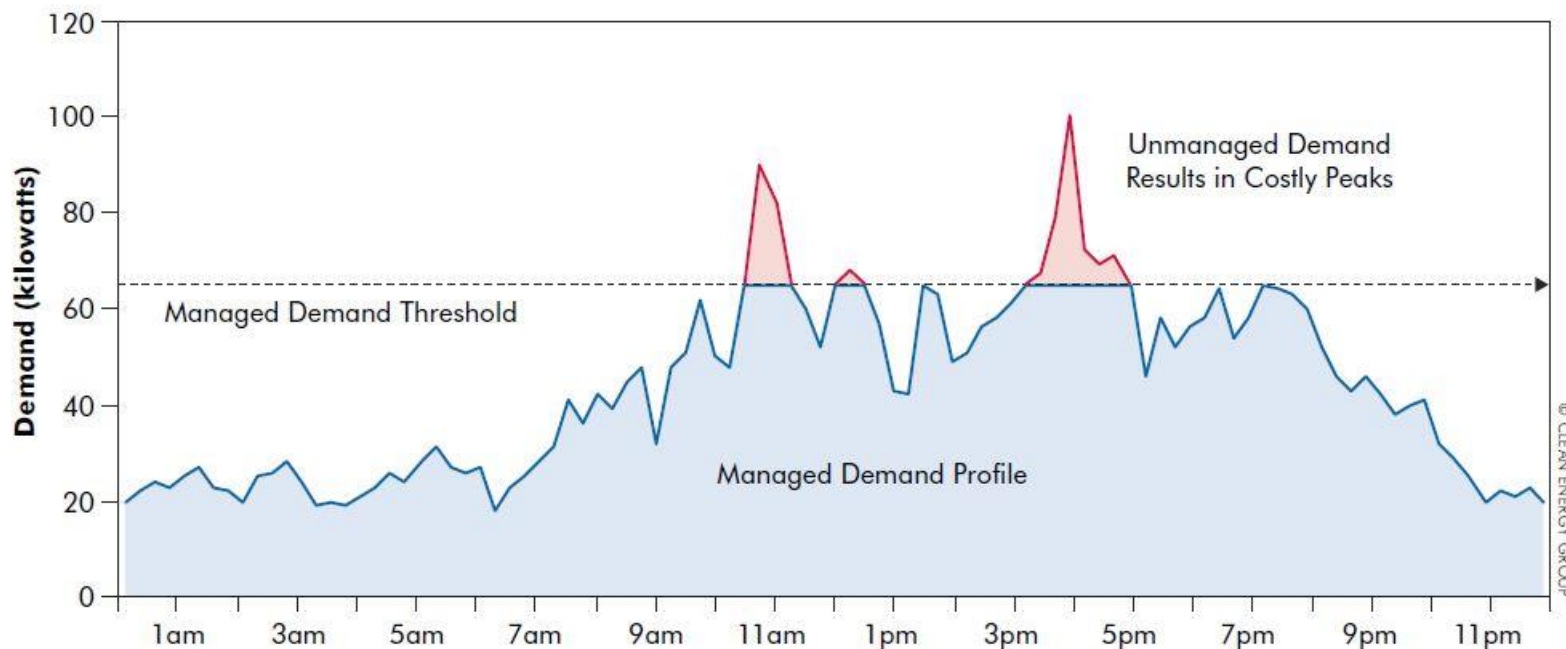


Reliable backup power during severe weather and other blackouts



Reduce utility bills and generate revenue

Demand Management



Peak reduced from 100 kW to 65kW = **35 kW reduction**

@ \$10/kW = **\$4,200 annual savings**

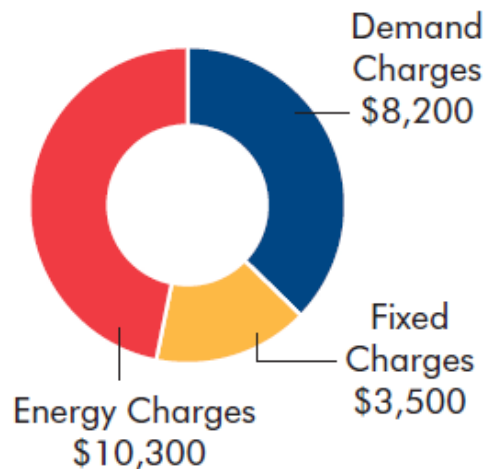
@ \$20/kW = **\$8,400 annual savings**

Closing the CA Clean Energy Divide

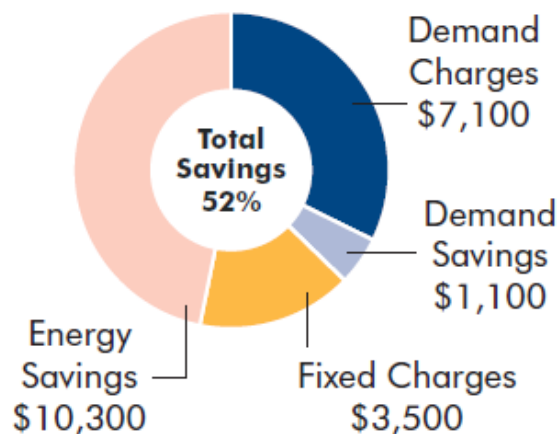
Affordable Housing in California:

Example of Impacts from the Addition of Solar and Solar+Storage on Electricity Bills

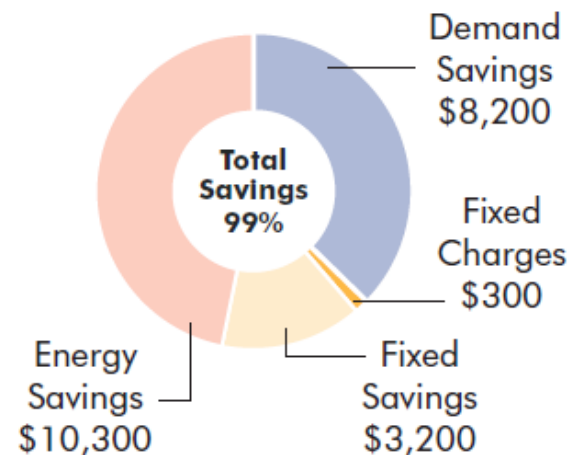
Original Electric Bill
\$22,000



Bill with Solar
\$10,700

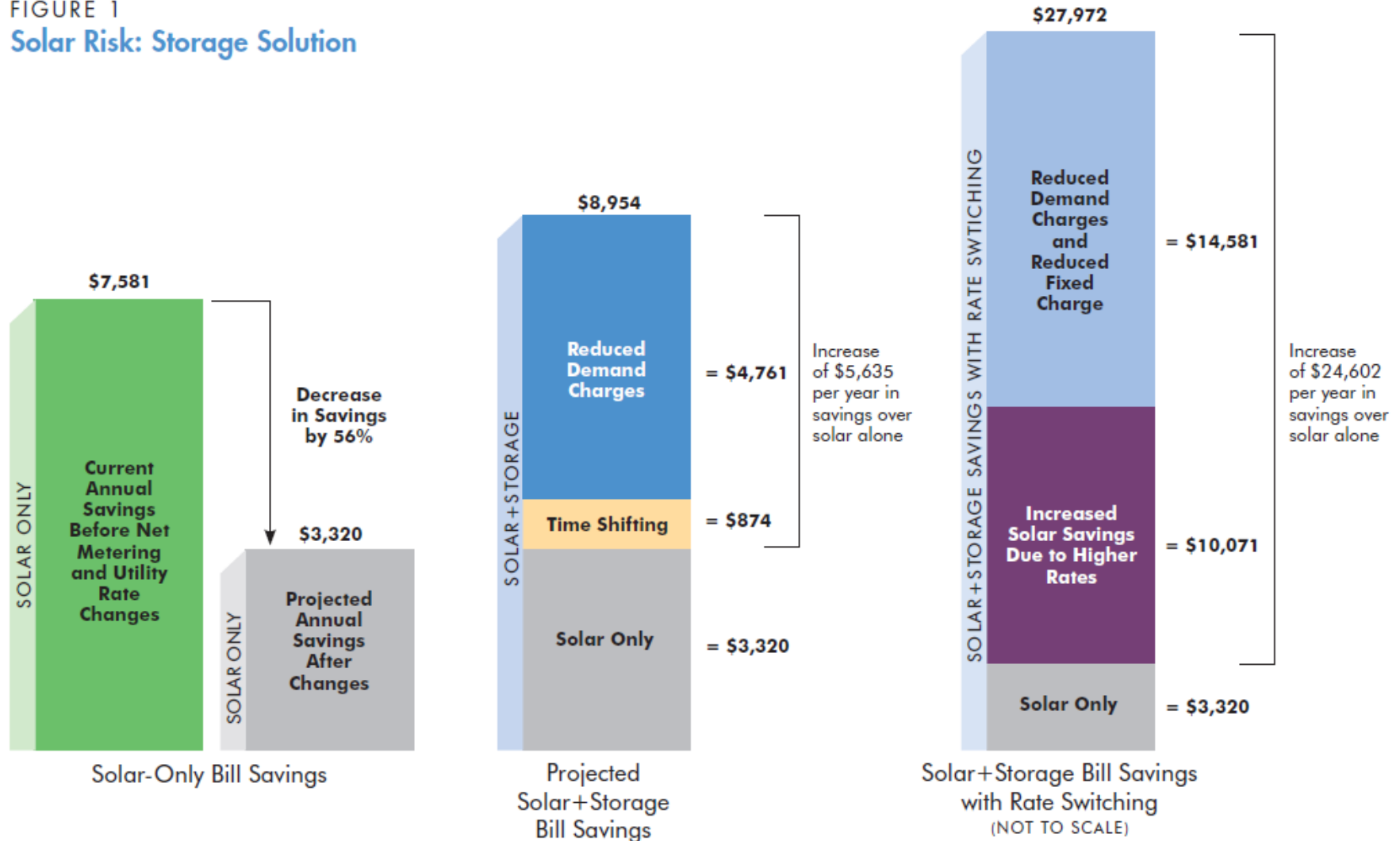


Bill with Solar+Storage
\$300



Hedging Solar Risk with Storage

FIGURE 1
Solar Risk: Storage Solution



Energy Storage and Electricity Markets

Utility Demand Management

Demand response	Discharging stored energy to supply on-site electricity demand in response to utility signals for demand response, which occur at times when power system demand is approaching available supply.
Peak capacity	Generation capacity deployed when electricity demand is higher than available supply of normal capacity resources, often provided by natural gas-fired combined cycle power plants.

Grid Balancing

Ancillary services	Ensuring the quality and reliability of electricity production, transmission, and distribution. See Table 1 (p. 6) for a detailed description of the most common ancillary services.
Power quality	Energy storage can insulate downstream loads from power quality disruptions, such as voltage spikes or dips, frequency imbalances, or a low power factor.
Ramping	Charging or discharging energy over a sustained period in response to rapid increases or decreases in supply and demand. This function is particularly beneficial in areas of high solar penetration when solar production ramps up in the morning and down in the evening.

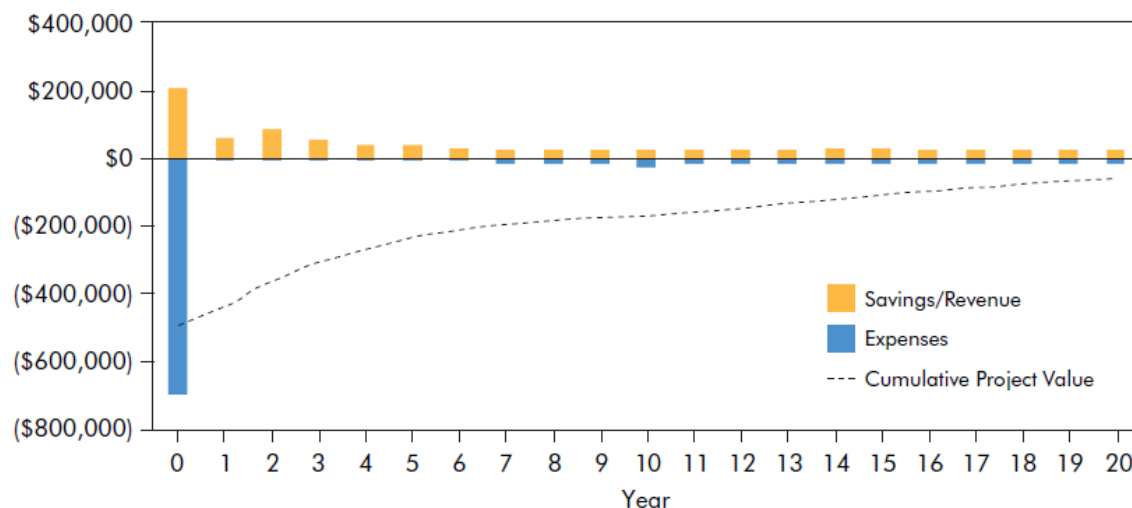
Energy Transmission & Distribution

Transmission system support	Improving the performance of transmission and delivery systems by correcting for voltage and resonance issues.
Transmission system congestion relief	Discharging energy downstream of points of high demand during peak periods when transmission systems can become overloaded and congested or charging to relieve periods of excess supply.
Transmission & distribution upgrade deferral	Similar to congestion relief, by deploying energy storage downstream from regions of congested transmission, the need for more costly transmission and distribution system upgrades can be delayed or entirely eliminated.
Utility substation power	Providing power to substation control equipment, switching components, and communications systems when grid power is unavailable.

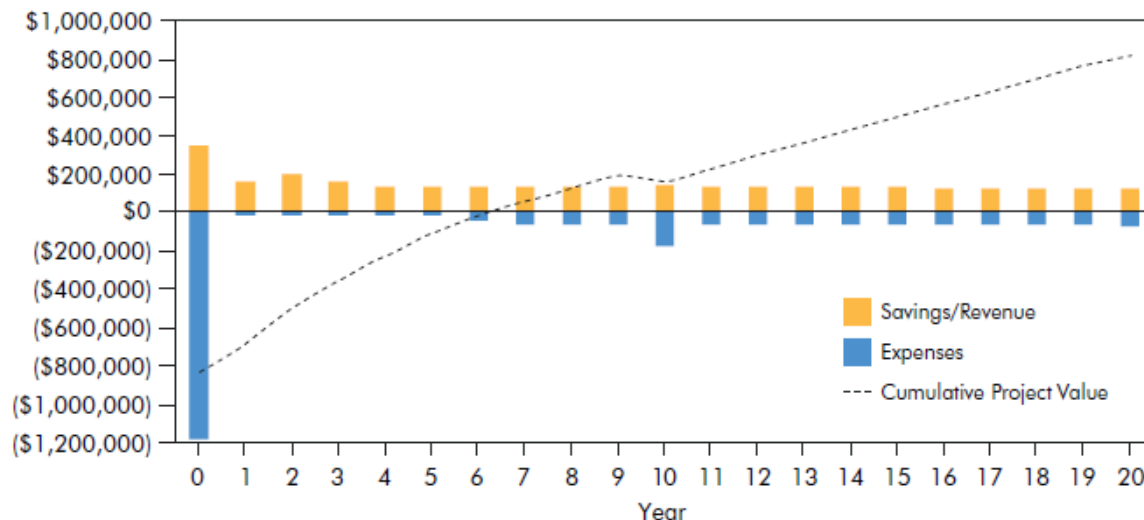
Resilience for Free

Affordable Housing: Chicago

Solar-only
20+ year payback



Solar+Storage
6.2 year payback



Solar+Storage Project Checklist



Get to know your utility bill

Becoming more familiar with your building's energy needs and utility rate structure is a good first step in thinking about a solar+storage system. Your electric utility may be able to assist you in answering the following questions.

QUESTIONS TO CONSIDER

- ☐ What is your monthly/annual energy use (kWh)?
- ☐ Are you subject to demand charges? If so, how much are they (\$/kW)?
- ☐ Are you on a time-of-use rate structure that may reward you for shifting loads to off-peak periods? If not, does your utility offer a time-of-use rate option?



Seek out expert advice

There are a lot of steps involved and things to consider when planning a solar+storage system. Connect with professionals who have experience and technical expertise in solar+storage to help you evaluate your options and examine potential solutions. A bit of guidance can help your project move forward and ensure you'll benefit from the experience of others.

Clean Energy Group may be able help get you on the right track. Contact resilient-power@cleangroup.org if you are working on an affordable housing or community-based solar+storage project and could use some assistance.

QUESTIONS TO CONSIDER

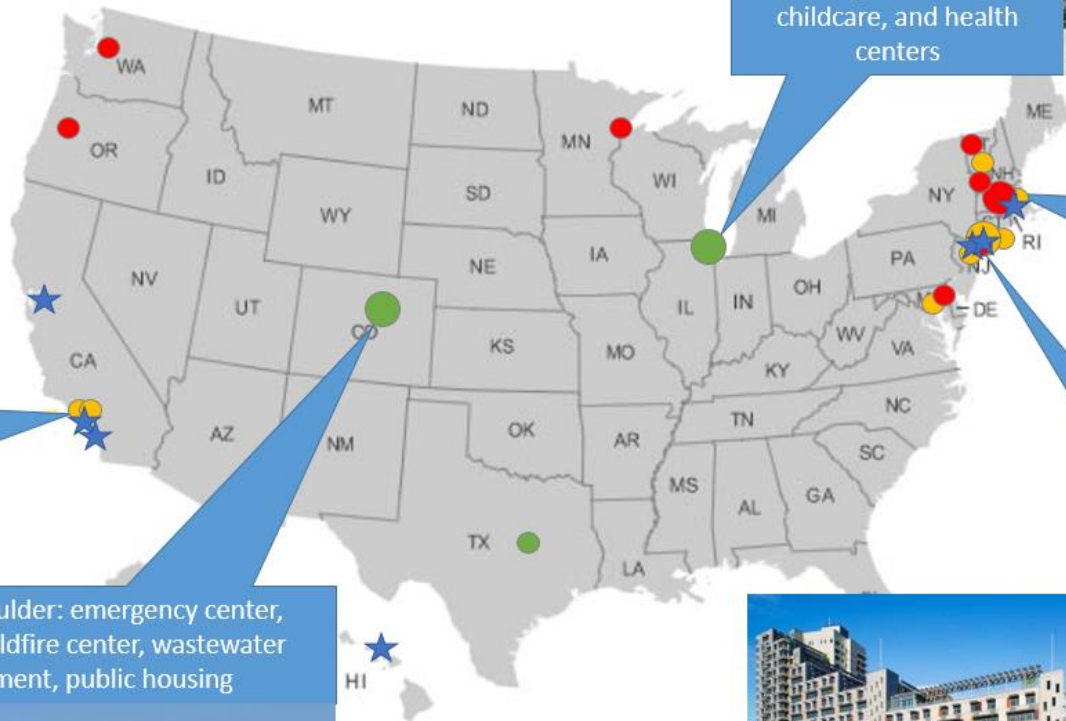
- ☐ Does your organization have internal energy analysis and technical planning expertise?
- ☐ Do you have a strong understanding of the economics of solar+storage systems?

Supporting 50+ Projects Across U.S.

- ★ Leadership Awardee
- Affordable Housing
- Critical Facilities
- Both



California Multifamily Affordable Housing: AB 693 150,000 units



City of Boulder: emergency center, shelter, wildfire center, wastewater treatment, public housing



Chicago Housing Authority: 1,900 public housing units; senior, childcare, and health centers



Massachusetts Community Clean Energy Resiliency Initiative: 11 communities, 28 projects



New York/New Jersey: 9 multifamily affordable housing projects, community shelter



Hartley Nature Center



Hartley Nature Center: Solar

Solar:

11.3 kW rooftop array

1.8 kW ground mount dual-axis tracker

Installed in 2003



Original inverters began to fail in 2016

Explored storage along with inverter replacement

Hartley Nature Center: Storage

Storage:

6 kW / 14.2 kWh lithium-ion (Sunverge)

6 kW of rooftop array DC coupled with storage

Remaining rooftop capacity grid-tied through SPS inverter



*First resilient
solar+storage system in
state of Minnesota*

Hartley Nature Center: Resiliency

Resiliency:

Community Shelter

City Emergency Base of Operations

Backup strategies:

short-term operations, long-term community disaster



Extreme flooding (2012)

*Severe summer storm
resulted in 6-day
outage, ending 2 hours
before battery delivery*

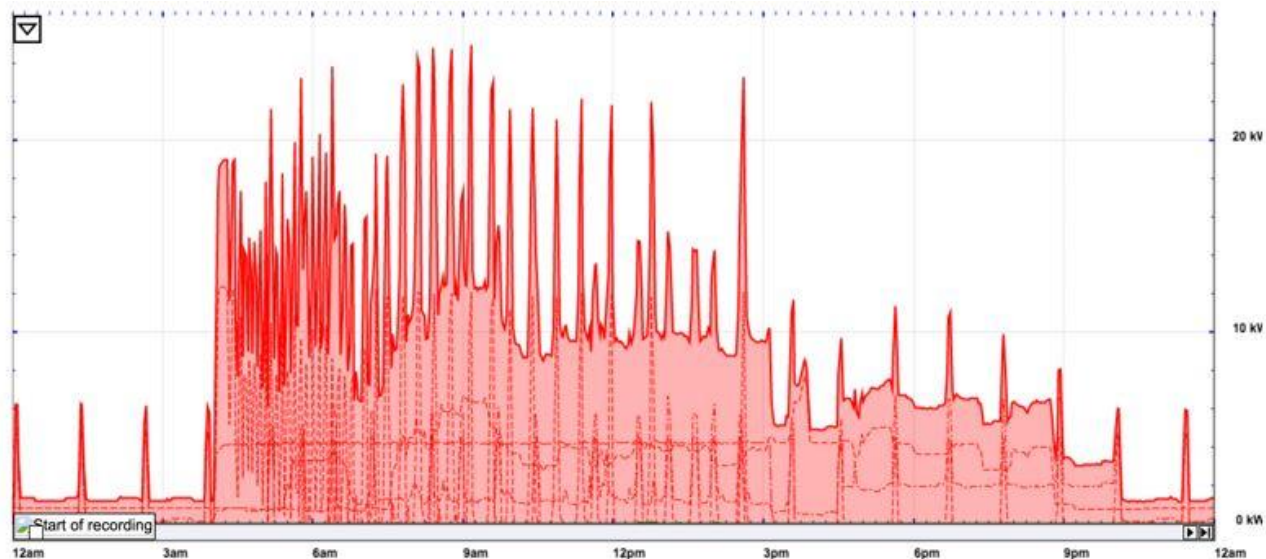
Hartley Nature Center: Economics

Economic Value:

City-owned property, interested in reducing operating expenses

Manage demand spikes due to ground-source heat pump

Hartley Nature Center Daily Load Profile



Technical Assistance Fund

- An essential market development tool - funded by foundations
- Grants pay for technical services to determine project feasibility
 - To date: A dozen elderly, family & supportive affordable housing projects in NYC, Chicago, DC and Newark NJ
- Require sharing of deal & financing docs, reporting of project performance for 2 years



TAF Guidelines

- *Geographic focus* - Located in low-income communities, also to provide critical services to LMI / other vulnerable populations
- *Project focus* - Distributed clean generation to support critical building loads independent of grid during power outage
- *Types of support* - 3rd-party technical services, predevelopment costs, program / project assistance to municipal officials
- *Grant amount* - Typical grant: \$5,000 to \$7,500, larger grants under special circumstances



Outreach to Community Advocates



- Have reached 10,000 stakeholders this past year through webinars, presentations, reports, newsletters, articles.
- Need to do more to engage community advocates
- Connect energy resilience with environmental justice, health & economic equity work through leadership grants
- Have identified more than 70 community advocate networks already thinking about this who we would like to engage in community energy resilience
- **Resilient Power Toolkits**
 - For community services, affordable housing

Resilient Power Leadership Grants

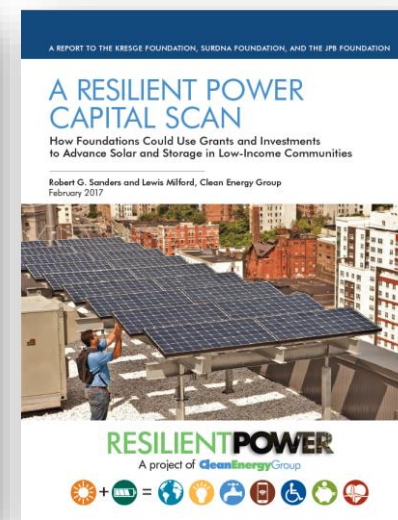
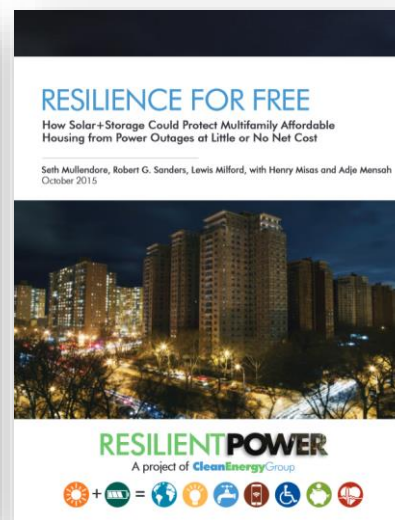
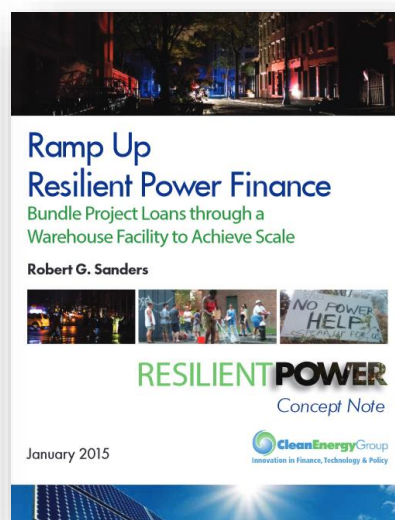
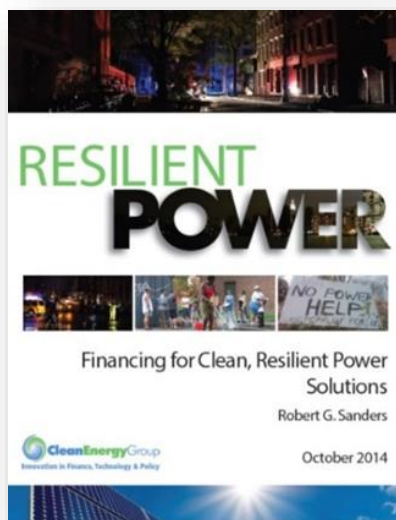


- Community-led programs that further advance energy equity & environmental justice
- To develop resilient power awareness & implementation strategies in low-income communities
 - CA Environmental Justice Alliance (**CEJA**) (Oakland & Huntington Park, CA)
 - The **Greenlining Institute** (Oakland, CA)
 - **LINC Housing** Corporation (Long Beach, CA)
 - Preservation of Affordable Housing (**POAH**) (Boston, MA)
 - **Sustainable Molokai** (Kaunakakai, HI)
 - **THE POINT** Community Development Corp (Bronx, NY)
 - **WE ACT** for Environmental Justice (NYC)

Marcus Garvey Apartments



- **Location:** East Brooklyn, NYC – 625 units
- **Solar:** 400kW
- **Storage:** 300kW/1.2MWh lithium-ion batteries
- **Project Partners:** L+M Development Partners, New York Energy Efficiency Corporation, Demand Energy, Con Edison
- Cuts electricity costs, improves grid reliability, provides backup power during extended outages.
- Shared savings model
 - Owner, developer use energy savings to pay off loan
 - Share revenue from Con Edison payments
 - Capacity payments
 - Performance payments for each demand response event



RESILIENTPOWER

A Project of Clean Energy Group and Meridian Institute



RESILIENT POWER

PROTECTING COMMUNITIES IN NEED

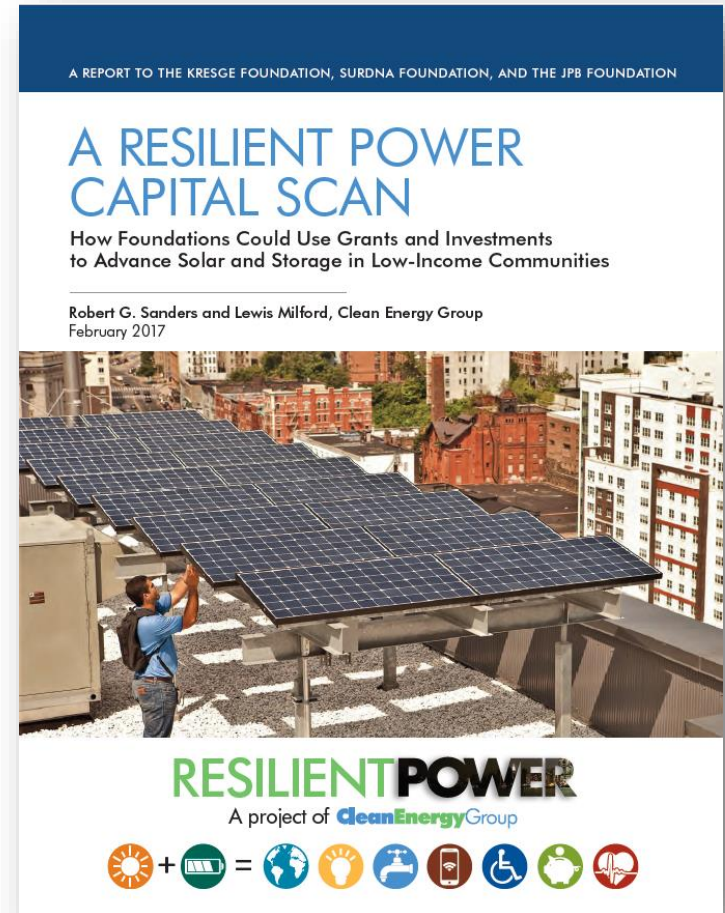
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How Solar+Storage Projects are Financed Today

- *Utilities* - direct ownership or contract for services (3rd party owned)
- *Large energy services companies* - access to capital markets (MUSH)
- *New solar+storage companies* - using project finance funds, venture capital & private equity
- *Non-recourse project finance* (Macquarie/CIT finance facility)
- *State incentives* for demonstration projects (MA DOER, MD Energy Administration)
- *Federal tax credits* (ITCs, LIHTCs)
- *Bond financing* for municipal projects, schools, large nonprofit institutions

A Resilient Power Capital Scan

In May 2016, The Kresge Foundation and Surdna Foundation and The JPB Foundation commissioned Clean Energy Group to conduct a “capital scan” of grant, PRI, and MRI investment opportunities in the resilient power solar and storage space.



Owning the Benefits of Solar+Storage

- *“Owning the Benefits of Solar+Storage: New Ownership and Investment Models for Affordable Housing”*
 - Immediate direct ownership
 - Third-party ownership flips
 - CivicPACE with third-party ownership
 - Third-party ownership under a utility-contracted payment for services agreement



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