RESILIENT SOLAR CASE STUDY: Global Green Solar for Sandy Initiative

PROJECTS UNDER DEVELOPMENT

PROJECT SNAPSHOTS

Location: Far Rockaway, Long Island, Staten Island, Red Hook, and Brooklyn

System Owners: Church of God Christian Academy, MLK Community Center, Red Hook Recreation Center, Rockaway Beach Surf Club

Project Goal: Resiliency and energy savings

Initiative Timeline: 2013 - Present

Equipment: Solar PV, lead acid battery storage, natural gas generator, and/or islandable inverter

Resilience Benefits: Critical loads vary by site, may include: cell phone charging, lighting, heating, cooling, refrigeration, and/or television

Performance Data: Data will be posted on nysolarmap.com once the sites have been fully operational for a year.

By Smart Distributed Generation Hub – Resilient Solar Project[1]
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INTRODUCTION/BACKGROUND

Global Green USA is a non-profit organization focused on building a sustainable future through the development of proof-of-concept projects that support resilient, affordable, and environmentally friendly communities. In response to Hurricane Sandy, Global Green started the 'Solar for Sandy' initiative which will implement six resilient solar projects across New York communities to support the project sites during outages. The projects will serve as a model for enhancing the resilience of first responder locations and critical infrastructure during natural disasters, specifically in areas with the fewest resources available due to regulations that restrict the siting of emergency shelters in flood zones.

The projects are supported by a variety of funders. National Grid supported four of the projects with $1 million in funding while the Red Hook project was supported with funds from IKEA, financial assistance and advisory support from the Schmidt Family Foundation, and facility design assistance from The Parsons School of Design. The projects also utilized a series of incentives for energy conservation and renewables, including energy efficiency incentives from PSEG for a building-wide LED lighting retrofit at the Martin Luther King Community Center site.

The projects employ a variety of technologies and are in various stages of development, as described in greater detail in Table 1 below.

Table 1. Overview of Project Sites

Project Site	Location	Status	Components
Church of God Christian Academy	Far Rockaway, NY	Under Construction	• Solar PV - 15 kW • Natural gas generator - 85 kW
Brooklyn Site 1	Brooklyn, NY	Early Development	• Solar PV - *TBD* • Battery - *TBD*
Martin Luther King Community Center	Long Beach, NY	Under Construction	• Solar PV - 16 kW • Battery - 50 kW (est.)/TBD kWh
Staten Island Site 1	Staten Island, NY	Early Development	• Solar PV - *TBD* • Battery - *TBD*
Red Hook Recreation Center	Red Hook, NY	Completed	• Solar PV - 11.4 kW • Battery - 21 kWh
Rockaway Beach Surf Club	Far Rockaway, NY	Completed	• Solar PV - 5 kW • Sunny Island Inverter - 1.5 kW

[1] The Smart DG Hub was formed by Sustainable CUNY of the City University of New York (CUNY). The DG Hub's Resilient Solar Project is a collaboration between CUNY, the National Renewable Energy Laboratory and Meister Consultants Group, funded by the U.S. Department of Energy and the State of New York.

SELECTION CRITERIA

Global Green developed selection criteria for the projects and consulted with the City of New York to understand their existing shelter sites and emergency procedures. The goal was to identify sites that could serve as first responder "resiliency hubs" for the surrounding communities. National Grid also requested that project locations be geographically dispersed across Staten Island, Brooklyn, Queens, and Long Island. Maps depicting the impacts of flooding and power losses from Hurricane Sandy also informed the final selections.

The six resilient PV projects are located at sites in densely populated neighborhoods in flood zones, where New York City's Office of Emergency Management (OEM) policy restricts emergency shelters from being located due to safety considerations. Therefore the Global Green sites are intended to offer resources to these communities during and immediately following emergency events, as described in more detail in the following section.

Four of the six buildings are public facilities; only the Church of God Christian Academy and Rockaway Beach Surf Club are privately-owned. The site owners will own, operate, and maintain the systems. Each site has 10 kW or greater of solar PV potential, a second floor or mezzanine above the flood plain, and an active role in the local community. Global Green found that projects in the 15-25 kW range for solar PV and 25-55 kWh for battery storage provided the greatest amount of resiliency cost effectively. In addition to meeting feasibility criteria for solar and storage, Global Green also targeted achieving 25% or more in energy savings from energy conservation measures and renewables.

RESILIENCY BENEFITS

The resilient solar systems were sized to power each facility's critical loads indefinitely in the event of a grid outage. All of the sites will open their facilities to first responders following any event that causes loss of power within five miles of the facility and work with emergency response agencies to bring community members resources as fast as possible. During these outage events, Red Cross and site staff will manage the systems at the Church of God Academy and Rockaway Beach Surf Club, while the remaining public facilities will be managed by the City.

To promote awareness and education at each site, Global Green intends to host community preparedness events to inform residents of its availability and educate residents in the area on the opportunities in clean energy and resiliency. Additionally, hands-on workshops have been hosted at the Church of God Academy and MLK Center to compliment STEM curriculum and engage students on the topic of clean energy.

The Red Hook Recreation Center's 11.4 kW solar PV and 21 kWh battery storage project is complete. This system enables cell phone charging, refrigeration, heating, air conditioning, television, and lighting in one of the center's multipurpose rooms when the grid is down. The system is also elevated above historical flood levels from Hurricane Sandy to mitigate the risk of a malfunction during extreme events.

The Rockaway Beach Surf Club, which served as a communal gathering location during Hurricane Sandy, is also complete. The system's resiliency services are provided by an SMA Sunny Island inverter with a wall outlet. If the grid is down, the 5-kW solar system can provide 1.5 kW of power when the sun is shining. This will enable cell phone charging and communications support for disaster relief efforts.

The Church of God Christian Academy completed a series of energy efficiency and weatherization upgrades prior to the installation of a 15-kW solar PV system. The project intended to include an 85 kWh natural gas generator along with a 44-kWh lead acid battery for resiliency use, but due to local regulatory concerns the battery component was withdrawn from the project plans. Once completed, the site will serve as a first responder facility and point of distribution for information and supplies for the community. The natural gas generator will enable cell phone charging, lighting, and refrigeration for medications.

The Martin Luther King (MLK) Community Center has completed lighting retrofits with estimated annual savings of $5,600, along with a 15kW solar PV system with annual savings of $2,900. The 47kWh battery storage system is scheduled to be installed summer 2018. The resilient PV system will allow lighting, minor refrigeration, and plug loads in the gymnasium and a multi-purpose room.

Brooklyn Site 1 and Staten Island Site 1 are under development and completing feasibility assessments. Both sites anticipate installing solar and storage systems.

PERMITTING

The six projects in the Solar for Sandy portfolio are located in and near New York City – one of the first cities in the US to have developed a permitting pathway for solar and storage projects, which was facilitated by the CUNY DG Hub under the Resilient Solar Project and requires project developers to obtain approvals from the NYC Department of Buildings and Fire Department.[2] Two of these projects did not have to undergo the permitting process for energy storage; the Rockaway Beach Surf Club did not utilize battery technology, and the Red Hook Recreation Center was permitted before the formal process existed in NYC.

Two of the projects are currently in the permitting process; one of these (the MLK Center) is located in Long Island and therefore subject to different permitting requirements. The contractor for the MLK Center on Long Island, EmPower Solar, has installed the solar PV and plans to install the battery storage in 2018. EmPower's office is located near Long Beach and it has completed many projects in the area. The organization has developed a close working relationship with the City of Long Beach which has aided the permitting process thus far.

The other site currently in the permitting process is the Church of God Academy. The project contractor for the solar and battery components, UGE, intended to install the battery storage system in the basement of the building. UGE began conversations on permitting with FDNY and DOB in Fall 2016, after which FDNY and DOB provided a list of safety requirements for the site. The solar PV was permitted and constructed shortly thereafter. However, the battery installation would have required further actions specified by FDNY and DOB including fireproofing the room, upgrading fire alarms, verifying compliance of the existing sprinkler system, installing a ventilation system[3], and installation of a hydrogen sensor tied to the fire alarm, and determining the response time of the nearest fire station. Additionally, DOB and FDNY completed a joint inspection of the site and determined that a fire-resistant door needed to be installed at the site as well.

One final component of the permitting approval required UL 1973[4] certification for the battery system.[5] However, due to market constraints, the original battery system selected did not meet this requirement and the alternative would have required a site-specific field test to obtain the certification. Due to the space and testing requirements, Global Green decided not to pursue the battery component of the project as this would have made the installation time- as well as cost-prohibitive.

The remaining two projects (Brooklyn and Staten Island sites) are still in early project development and have not yet begun the permit approval process. The requirements for permitting approval will be different for these two sites as these are dependent upon the technology and site configurations.

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[2] This is described further in the DG Hub permitting guidelines.
[3] This ensures that toxic fumes travel outside of a building instead of within the building during a fire event.
[4] UL 1973 pertains to batteries in stationary and light electric rail applications. The safety standard is not specific to a battery technology or chemistry, but is applicable across stationary battery storage types. It includes construction requirements, safety performance tests, and production tests.
[5] CUNY Smart DG Hub. December 2015. *The Energy Storage Permitting and Interconnection Process Guide for New York City. Page 8, 22. https://nysolarmap.com/media/1450/decdghub_energystoragesystemspermittingandinterconnectionguide.pdf*

LESSONS LEARNED

Global Green USA stated that it would not have changed its processes for the projects it has completed so far. However, expectations for host sites should be set early on to ensure that all parties know the uncertainty and complex nature of these projects in the New York City area. Battery energy storage is a new technology to most communities across the country; facilities pursuing projects should be prepared to be flexible with city staff as they gain additional knowledge about the technology.

For future projects that are similar in nature, especially for projects underway in a young market such as NYC, the process is still being streamlined so it is reasonable to expect obstacles along the way, and Global Green recommends working with contractors that have previous solar and/or battery permit process experience in that given jurisdiction to aid the process. Additionally, fire safety should be considered throughout the process when designing and siting the system. These include, but may not be limited to: fire retardant infrastructure, readily available fire suppressant tools, up to date alert systems, knowledgeable and nearby fire station staff, and proper ventilation.

UGE, the solar and battery contractor on the Church of God Academy project, would recommend pursuing outdoor siting of battery projects since this is a new technology with fairly limited operational data history to draw upon, and indoor siting inherently requires more stringent safety prescriptions than outdoor siting.

Global Green consulted or collaborated with many partners active in New York City including: City officials, utility representatives, building owners, and project developers. By leveraging this collaborative approach alongside their detailed site selection criteria, Global Green is enabling impactful and feasible projects.

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