Final Scientific/Technical Report
Submitted to U.S. Department of Energy
July 18, 2011

PROJECT INFORMATION

Award Identification Number: DE -FG36-08GO88162

Recipient: CEC Stuyvesant Cove, Inc. (dba "Solar One")

Project Title: Solar 2 Green Energy, Arts & Education Center

Project Director: Christopher Collins, Executive Director

Consortium/teaming members:

- Kiss&Cathcart, Architects
- Arup, Engineering
- Dome Tech, LEED Commissioning
- Turner Construction, Preconstruction Consulting
- Community Environmental Center, Green Building Technical Assistance
- Main Street Design, Exhibits
- WRT Design, Landscape Architects
- NYC Department of Design and Construction, Construction Management
- HR&A, Planning

AUTHORIZED DISTRIBUTION LIMITATION

This report contains no patentable material or protected data. However, use of project information, images, reports or other submittals is restricted to educational and informational purposes and should not be utilized or made public without the consent of the Recipient.

EXECUTIVE SUMMARY

The Solar 2 Green Energy, Arts and Education Center is a demonstration project that will be constructed to Platinum LEED certification and will be the first carbon-neutral, net-zero energy use public building in New York City, giving it local and national appeal. Employing "green" building features and holistic engineering practices throughout its international award-winning design, Solar 2 will be powered by a 90kW photovoltaic (PV) array in conjunction with a

geothermal heating and cooling system and a high efficient design that seeks to reduce the overall energy load of the building.

Solar 2 will replace our current 500 ft.^{2} prototype facility - known as Solar 1 - as the educational and cultural centerpiece of a five-block public greenway on the East River in Stuyvesant Cove Park, located along two acres of public riverfront on a newly reclaimed, former brownfield in lower Manhattan. Designed as a public-use complex for year-round environmental education exhibits and onsite activities for all ages and backgrounds, Solar 2 will demonstrate energy-efficiency technologies and sustainable environmental practices available now to all urban residents, eco-tourists, teachers, and students alike.

Showcasing one of Solar 2's most striking design elements is the PV roof array with a café and river vistas for miles of New York City's skylines. Capping the building as a solar-powered landmark, and visible from the FDR Drive, the PV array is also designed to provide visitors below a view of the solar roof when standing outside, as well as directly underneath it.

Recognized by an international jury of architects, civil engineers and urban designers by the Swiss-based Holcim Foundation, the Solar 2 design was awarded the prestigious Holcim North American 2008 Gold Award for Sustainable Construction for "innovative, future-oriented and tangible sustainable construction projects," selected from more than 1900 entries.

Funding from the Department of Energy was provided to assist with the ongoing design work of Solar 2, including architecture, engineering and the development of construction specifications. The work performed during the project period brought this process as far along as it could go pending the raising of funds to begin construction of the building. Once those funds are secured, we will finalize any additional details needed before beginning the bidding process and then moving into construction. DOE's funding was extremely valuable in helping Solar One determine the feasibility of a net-zero construction on the site and allowed for the design to project to meet the high standards necessary for LEED Platinum status.

ACTUAL ACCOMPLISMENTS VS. PROJECT OBJECTIVES

PROJECT OBJECTIVES & SCOPE

To finish the design work on a net-zero energy consumption, LEED platinum-rated, Green Energy, Arts and Educational Center, located in New York, NY. This building will be used by Solar One to demonstrate the latest technologies and best practices in energy efficiency, renewable energy and sustainable materials to highlight the ways in which buildings can reduce energy consumption, increase our energy independence within the U.S. and limit pollution and

emissions that can contribute to global warming and other issues. When completed, Solar 2 will be a research and demonstration center that will reach tens of thousands of people per year to demonstrate a message of environmental responsibility and increased building performance.

The Solar 2 Green Energy, Arts and Education Center is planned as an 8,000 ft.^{2} building built on a brownfield along the edge of the East River in Manhattan. It will achieve its energy goals through the installation of photovoltaic (solar) panels, a geothermal heat pump system, and systems designed for maximum efficiency to reduce waste while maintaining comfort.

The building itself will be an instructional tool, using itself as part of the ongoing exhibitions on display. The building will play a large role in Solar One's educational and outreach programs, providing a catalogue of green building possibilities, from a "green screen" to sustainable building materials to low VOC paints. Cutaways and clear walls will allow visitors to see the building systems in action, while interpretive displays help them to better understand how a building works. Each space in the building will contribute to the overall utility, such as the eco-office demonstrating green products and strategies, an outdoor stage that will provide renewable-powered cultural performances, and a multi-purpose space that can accommodate two classes at once for lessons in environmental science or transform into a space for a party or small conference.

TASKS TO BE PERFORMED

1. Architectural Services
2. Mechanical and Engineering Services
3. Landscape Design
4. Civil Engineering
5. Construction Specifications

PROJECT ACCOMPLISHMENTS

As of May 31, 2011 we have completed our design objectives under this DOE Award. Construction Documents have reached 86% completion with all Engineering specs having been 100% completed. The remaining work to be done once funds are secured will mainly consist of small tweaks to design elements and preparing bidding documents. Energy modeling has shown that our goal of net-zero energy use is attainable given the design of the building and its systems

Major elements of the Landscape Design have been completed and will be refined through the end of the Construction Documents phase as bid documents are prepared. Construction

Specifications are well underway and await the additional funding needed for the completion of Construction Drawings. These specs will be used in the competitive bidding for potential contractors that will take place at some point in the coming months. These specs will be vetted by the New York City Department of Design and Construction, submitted to the Department of Buildings for review and used as part of the LEED pre-certification process.

In order to get the building into construction, our main focus over the past year has been raising the additional funds needed to complete construction. With the economy recovering and a growing list of honors, we are gaining significant momentum toward securing those funds during the remainder of 2011 and moving forward with bidding and construction. We have recently received several new pieces of funding totaling over $2M. This recent funding moves us much closer to the start of construction and adds to the growing list of funders supporting the development and construction of Solar 2, including: Mayor Bloomberg/PlaNYC, the New York City Council, the Manhattan Borough President, the U.S. Department of Energy, the Holcim Foundation for Sustainable Construction, the New York State Assembly/New York Dormitory Authority, the Schmidt Family Foundation, ConEdison, the LuEsther T. Mertz Charitable Trust, the Geoff and Sara Gund Foundation, the Kresge Foundation, and the New York State Council on the Arts.

LIST OF ACCOMPLISHMENTS

- Holcim North American 2008 Gold Award for Sustainable Construction
- Engineering “Basis of Design” report in 2009
- Completed preliminary LEED checklist
- Conducted new cost estimates
- Commissioned energy modeling studies for feasibility of net-zero goal
- Completed site investigation to determine geothermal capacity
- NYC Public Design Commission approval
- Granted NYC zoning variance to allow for waterfront construction
- Amended lease with NYC Economic Development Corp. to incorporate design changes
- Completed 100% of Engineering Specifications
- Architectural Construction Documents 86% complete

PROJECT ACTIVITIES

TASK 1. ARCHITECTURAL SERVICES

The final round of Schematic Design was completed in January 2009 followed by a new round of cost estimating. Design Development was finished on schedule at the end of March 2009 and

helped to flesh out the specific materials, equipment and methods that will be used in the building. Our architects worked with the engineers and other consultants to ensure the structure, mechanical, electrical and other systems comply with all necessary building codes and regulations and meet our goals of a net-zero building.

Prior to the Construction Documents phase, we conducted a pre-CD phase that included some value engineering to help bring down the estimated costs of construction to be more in line with our original estimates. The CD phase began in the summer of 2009 and reached 75% completion by the end of September that year and a new round of cost estimated was performed. By the end of 2009, we had reached 86% completion, which was as far as could be reached without full financing for construction in place. The remaining work on CDs will be done once funds are secured to begin bidding and construction. This work mainly consists of small tweaks to design elements and the preparation of bidding documents and will not affect the overall concept or design of the building in any significant way. We remain on track to construct a net-zero, LEED Platinum building.

TASK 2. MECHANICAL AND ENGINEERING SERVICES

As part of the Design Development (DD) submission, our engineers put together a full "Basis of Design Report" in the spring of 2009 that outlines all of the systems in the building, along with calculations and recommendations to maximize performance in order to meet the overall goals of the project. Another round of more detailed energy modeling was also performed to test the design against the desired end results of "net-zero" energy consumption and a LEED Platinum rating.

As of the end of 2009, we have achieved 100% completion of engineering work for the Construction Documents phase. Minor adjustments may be needed to prepare for bidding.

TASK 3. LANDSCAPE DESIGN

WRT Landscape Architects submitted 2 preliminary design ideas as part of the Design Development process. These were presented to the design team for input. The landscape surrounding the Center will reflect and interplay with the sustainable environmental characteristic of the structure itself and will bring added value to the planned outdoor performance space and the open space around the building. As of 2010, major elements of the Landscape Design have been completed and will be refined through the end of the Construction Documents phase as bid documents are prepared.

TASK 4. CIVIL ENGINEERING

As part of its work, Arup drew up plans for an irrigation system, rainwater collection and greywater systems to determine the most economical and sustainable systems. Plans took into account the location of the Center and its situation in a floodplain. The structural scope of work includes the design of foundation and building superstructures and all specs will be drawn up to utilize the most efficient and sustainable products possible. Arup prepared detailed specifications to be used in the competitive bidding that were vetted by the NYC Department of Design and Construction (DDC) and submitted to the Department of Buildings for review. As of the end of 2009, we achieved 100% completion of engineering work for the Construction Documents phase. Minor adjustments may be needed to prepare for bidding.

TASK 5. CONSTRUCTION SPECIFICATIONS

Initial Construction Specifications were developed during each design phase culminating in the Construction Drawings phase in which the architect prepares detailed working drawings and specifications for use in the competitive bidding. These specs also provided the basis for our construction cost estimates. With Engineering Specifications completed, we are now awaiting the completion of Construction Drawings and the associated architectural specifications. These specs will be used for bidding by potential contractors that will take place prior to construction. These final specs will be vetted by DDC prior to bidding.

PRODUCTS & TECHNOLOGY TRANSFERS

a. Publications, conference papers, or other public releases of results

N/A

b. Web site or other Internet sites that reflect the results of this project

http://solar1.org/solar2/
http://kisscathcart.com/solar2/overview.html

c. Networks or collaborations fostered

N/A

d. Technologies/Techniques

N/A

e. Inventions/Patent Applications

N/A

f. Other products

N/A

COMPUTER MODELING

N/A