Resilient Power in Schools, Featuring Florida and New Jersey

March 31, 2015

Hosted by

Todd Olinsky-Paul
Project Director, Clean Energy Group
Housekeeping

All participants are in “Listen-Only” mode. Select “Use Mic & Speakers” to avoid toll charges and use your computer’s VOIP capabilities. Or select “Use Telephone” and enter your PIN onto your phone key pad.

Submit your questions at any time by typing in the Question Box and hitting Send.

This webinar is being recorded.

You will find a recording of this webinar, as well as previous Resilient Power Project webinars, online at:

www.cleanegroup.org/ceg-projects/resilient-power-project/webinars/

and at

vimeo.com/channels/resiliencelpower
Who We Are

RESILIENT POWER
Evolution of a New Clean Energy Strategy to Meet Severe Weather Threats
September 2014

www.resilient-power.org
www.cleanegroup.org
CEG Resilient Power Project

• Goal: significantly increase public/private investment for clean, resilient power systems.
• Support state energy agencies in developing resilient power policy and programs.
• Engage city officials to develop resilient power policies/programs, link to state energy policies.
• Protect low-income and vulnerable communities; focus on affordable housing
• Technical assistance & targeted support for pre-development costs for resilient power projects to help agencies/project developers get deals done.
• See www.resilient-power.org for reports, newsletters, webinar recordings
Today’s Guest Speakers

• John Leeds, Senior Management Analyst, Florida Department of Agriculture and Consumer Services, Office of Energy

• Susan Schleith, Energy Education Coordinator, University of Central Florida, Florida Solar Energy Center

• Avital Szulc, Product Management, A.F. Mensah

We will be joined by Adje Mensah, Peter Mendonez and Drew Adams for the Q&A portion of this webinar.
Office of Energy

Resilient Power in Florida Schools

John Leeds
March 31, 2015
Functions & Responsibilities

• Legislatively designated state energy policy development office within Florida

• Evaluate energy related studies, analyses, and stakeholder input

• Promote and advocate for the development and use of renewable energy resources and energy efficiency technologies

• Use available state and federal funds to develop and manage energy efficiency, renewable energy, and energy education programs

• Produce Annual Energy Report
  • Serve as the state clearinghouse for all energy information
Program Development

• The Florida Office of Energy (OOE) decided to build on the success of the original SunSmart Schools Program and expand the scope of work to include emergency shelters and battery back up.

• Florida PV Buildings Program at Florida Solar energy Center (FSEC)
  – Complemented Federal Million Solar Roofs (1997)
  – PV on Schools 2003 through 2005
    • Coordinated installation of 29 Grid-connected 4 kW PV systems
  – SunSmart Schools 2006 – 2007
    • Coordinated installation of 13 Grid-connected 2 kW PV systems and 2 Larger 10 kW Bi-modal systems
Program Development Con’t

- Decision was made to provide a grant of $10 million in American Recovery and Reinvestment Act funding to FSEC based on performance of previous SunSmart Schools Program
  - Significant time and effort went into compliance with Davis Bacon and Buy American Provisions of the American Recovery and Reinvestment Acts funds.
- Florida Department of Emergency Management
  - The OOE worked with the Florida Department of Emergency Management (FDEM) to identify schools and the needs of the shelters to assist in design of the program.
Reasons

• Saving Schools Money on Energy Costs
  – The average cost of electricity across all sectors in Florida is 10.81 cents. This equates to an annual savings of nearly $200,000 for the entire project or approximately $1,800 per school.

• Emergency Management
  – Each system is outfitted with battery back-up capabilities because each school acts as a shelter during times of emergency.
Reasons Con’t

• Education
  – Over 450 teachers and facilities managers attended educational workshops.
  – Each school was provided energy education kits. An estimated 30,000 kids have benefited from this program.
  – EnergyWhiz webpage house useful real world data.

• Data Acquisition
  – Each system has been fitted with data monitoring capabilities which can be accessed at [http://www.energywhiz.com/](http://www.energywhiz.com/) which can be incorporated into curricula.
  – Research quality data that provides solar production and storage information from across the entire state.

• Jobs
  – Unemployment in Florida was 3.7% in March 2007 and 10.7% by July 2009
  – Unemployment in U.S. was 4.9% in December 2007 and 9.4% in July 2009
    • Florida TaxWatch – Center for Competitive Florida, # 32 August 2009
What we Learned

• Permitting:
  – Every local jurisdiction has different permitting rules and varying degrees of expertise in solar technologies. This project has lead to policy and programmatic discussion about how to alleviate this barrier to solar installations.

• Educating EVERYONE
  – This project had an education component for children, teachers, and facilities managers that was built into it from the start. However, solar technologies are still relatively misunderstood and education should include school officials, district officials, facilities managers, and building inspectors as well.

• Success:
  – Components of this program are still ongoing as utilities have continued to fund Photovoltaic installations and the OOE is developing a problem to distribute educational kits to schools in the state.
What we Learned Con’t

• Significant compliance requirements came along with ARRA funds.
  • Davis Bacon compliance was very difficult and time consuming because of all of the counties that were a part of the program.
  • Buy American compliance was also an issue because it was sometime difficult finding the right components that were made in America.
• Another issue was the badge requirements and schedule requirements for each schools and the difficulty of getting in the school to work.
  • Every school district had different requirements for gaining access to the job site. All required some kind of screening and issuance of a badge.
  • Every school had different time constraint for when the contractor was allowed to access the jobsite.
What we Learned Con’t

• Data Monitoring:
  – The importance of the data produced by identical systems installed across the state was not realized at the onset of the program. It was deemed important to provide data to the EnergyWhiz webpage for student projects but the research aspect of this information evolved over time. Due to this, all SunSmart Schools received AlsoEnergy data loggers to ensure that the proper data points were collected.
Contact Information:

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SunSmart Schools Emergency Shelter (E-Shelter) Program

Susan T. Schleith
K-12 Programs
Florida Solar Energy Center

www.energywhiz.com  or 321-252-9479  or SunSmart@fsec.ucf.edu
Florida Solar Energy Center

• Type I Research Institute – legislated into existence in 1975
• Research Institute of the University of Central Florida
• Research areas:
  – Photovoltaics, Solar Thermal, Hydrogen, Building Efficiency & Alternative Fuel Vehicles
Overview

- Evolution of Sunsmart
- Overview of the E-Shelter Program
- Accomplishments
- Lessons Learned
- Where Do We Go From Here?
Evolution of the SunSmart Schools E-Shelter Program

- 1992: Hurricane Andrew
- 1997: Million Solar Roofs
- 2002: Florida Building Code
- 2003: PV on Schools
- 2004: 4 Hurricanes (Charley, Ivan, Frances & Jeanne)
- 2005: SunSmart Schools
- Now: SunSmart Schools E-Shelter Program
First E-Shelter School - 2007

Middleton High School
Hillsborough County
Overview of Sunsmart Schools Emergency (E)-Shelter Program

Goals

• Generate Clean Electricity from the Sun
• Provide Power to Critical needs to Emergency Shelters
• Educate students and teachers about Clean Energy Technologies and Careers
• Creates jobs in Florida
• Reduce Green House Gas Emissions
Key Players

FDACS/FEO
UCF/FSEC

Contractors

Schools

Utilities

Emergency Organizations
Parameters of the Program

- ARRA funded
  - American made – okay for solar panels but issue with inverters
  - Outback the only American made bimodal inverter
  - Track and document wages
  - Davis Bacon Requirements
Emergency Management Regions

47 School Districts
117 Schools

1 - 11 Schools
2 - 13* Schools
3 - 11 Schools
4 - 33* Schools
5E - 16* Schools
5W - 12* Schools
6 - 10 Schools
7 - 11 Schools

*Includes Utility Provided Systems
School/Shelter Selection

- Online Application Process
- External Review Committee
  - Enhanced Hurricane Protection Area Status
  - Demographics (location, population, etc.)
  - Administrative/school board support
  - Utility support
  - Teacher commitment
Solar Contractor Selection

- Invitation to Bid
- Technical Specifications
- PV System Certified by FSEC Engineers
- Prime Contractor
  - Vergona Bowersox Electric and Engineering
  - Used four solar subcontractors
  - Other contractors
- FSEC coordinated with schools to complete interior wiring of critical loads
Sunsmart E-Shelter PV System

- 10 kW Photovoltaic System
- 25 kWh Battery Back-Up Energy
- 3 Phase Building Electricity
- Utility Grid-Connected
- Net Metering Power
- Data Monitoring
- Ground Mounted Array
- ~1000 Square feet area
Basic Components of a PV System

Energy source – Sun

Energy conversion - Photovoltaics

Power conditioning - Inverter and controllers

Energy storage - Battery

Connecting to the Grid – Critical Load Panel

Electric grid - Utility network

Energy use - critical loads
How it works in the school

* Arrows indicate directions of power flows
Shelter Critical Loads
PV System Details
SunSmart E-Shelter Program Website

www.EnergyWhiz.com

Student & Teacher page
Links to data monitoring for each school
Science Fair Information
Activities, Lessons and Events
The EnergyWhiz Olympics is all about clean energy and creative kids. Each year, on the first Saturday in May, hundreds of students converge at the Florida Solar Energy Center in Cocoa, Florida to participate in renewable energy themed events.

Take a look at our EnergyWhiz videos and see for yourself!
## EnergyWhiz Sites

### EnergyWhiz Schools:

<table>
<thead>
<tr>
<th>Site Name</th>
<th>City</th>
<th>County</th>
<th>Utility</th>
<th>System Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bayridge High School</td>
<td>Palm Bay</td>
<td>Brevard</td>
<td>PPL</td>
<td>10.29 (kW)</td>
</tr>
</tbody>
</table>

### Solar System Performance Data of Florida SunSmart E-Shelter Schools

- Select A School
- Select A County
- Select A Utility

There are 105 sites participating in the various SunSmart programs.

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Bayside High School
1901 Degroodt Rd., SW, Palm Bay, FL 32908, USA
Operating since:

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Chart: Every (Solar) Customer Demographic Prefers Email Communications

Thursday, March 26, 2015 9:39 AM

Whether you’re marketing to solar installers or consumers, you should probably pay attention to this chart, which reveals that every age demographic overwhelmingly prefers to be contacted by email. From 18-year-olds to retirees above 65, they all want you talking to their inbox, and very few want you talking on the phone. Based on this chart, the b

read more...
Accomplishments

Jobs

• 25 Electricians/companies employed
• 5 Solar companies
• Subcontractors – fencing, underground locating, metal work, tree relocating, etc.
• Ex-Kennedy Space Center workers trained through Southeast Solar Training Network helped install several of the E-Shelter systems
SunSmart E-Shelter Program Today

- 117 PV 10 kW with Battery Backup Systems
- 12 Teacher Workshops and 2 Facility Manager Webinars
- Over 450 Teachers & Facilities Managers Educated
- Approximately 30,000 students educated about photovoltaic technology
- Over a Megawatt of capacity
Solar on 117 Florida Shelter/Schools

Collaboration with schools, solar contractors, and electric utilities statewide.
Facility Manager Training

PV System Overview

Facility Manager Webinars

Facility Manager’s Webinars were held in February 2012. Videos of these webinars are available for viewing using Vimeo.

- Introduction
- What does this system do for my school?
- System Installation
- Components Configuration and Operation
- System Demonstration
- Ownership, Reliability and Maintenance
- System Safety
- Data Monitoring

Videos can also be viewed as embedded Quick Time Movies.

- Introduction
- What does this system do for my school?
- System Installation
- Components Configuration and Operation
- System Demonstration
- Ownership, Reliability and Maintenance
- System Safety
- Data Monitoring

Operations Manual and System Overview

This manual is intended for school facility managers and personnel responsible for maintaining the emergency shelter photovoltaic system.

Download manual [7.77MB PDF]
Teacher Workshops
Educational Materials

Middle School Solar Kit
Student Education & Public Outreach

Apollo Elementary Solar Days
Brevard County

EnergyWhiz Olympics
At FSEC
PV System Dedication Ceremonies

Key West High School, Key West

Haines City High School, Polk County
Lessons Learned

• Educating stakeholders and decision-makers should be done before any construction begins

• Effective communication is vital

• Each school may have their own rules
Where Do We Go From Here?

- Complete additional Sunsmart E-Shelter Schools with funding from Duke Energy & TECO
- Refine solar curriculum (Standards)
- Provide more professional development for teachers AND facilities managers
- Develop Sunsmart E-Shelter courses for emergency managers
- Fine tune data collection
Thank you!

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RESILIENT POWER PROJECTS

A.F. Mensah, Inc.
Operation Highlights:

1. Whenever the sun shines, the Solar system generates cheaper and cleaner electricity for the Site. Some of that electricity is stored in the Battery to be sold at higher electricity prices.

1. As electricity prices peak over the course of the day, the battery will discharge to monetize some of the stored solar generation.

1. When there is a power outage, the Battery will work in tandem with the Solar System to provide backup power to the site.

1. The Battery therefore introduces additional revenue streams beyond those traditionally enjoyed by Solar-only systems.
Project Development

Process

- Locate site/customer with need for backup power.
- Work with customer to identify critical loads
- We engineer project and install system at no upfront cost to customer
- We offer power purchase agreement to Customer
- We also enjoy additional revenues for operating the battery in PJM electricity market programs (Energy, Capacity, and Ancillary services). These PJM revenues pay for the incremental cost of the Battery.
- When grid outage occurs solar + battery provide backup power to the Customer
Solar + Storage by the Numbers

- Project Cost for 1 MW Solar + Storage project: $2.5M Net
  - 1 MW solar + storage project costs approximately $3.5M
  - ITC will be $1M

- Project Revenue for 1 MW Solar + Storage project: $675,000/yr
  - $125,000/year through PPA (roughly $0.10/kWh)
  - $200,000 in SREC per year
  - $350,000 in PJM revenues

- ~4 year pay-back period
Host Site Requirements

- Each site location will be unique in its energy requirements but in general;
  - Commercial battery storage systems (30-100kW) could be located inside or outside
  - Battery Duration can vary from 30min to 2 hours.
- All systems will be turnkey “plug and play” systems that will be installed, operated and maintained by us.
- Host sites will be evaluated on a case by case basis to match the characteristics of the various battery storage systems to the energy requirements of the host site.
Case Study

- **New Project (School in Southern New Jersey)**
  - 500kW Solar + 500kW/250kWh Storage
  - Scheduled for Completion in Q4-2015

- **Retrofit Project (School in Central New Jersey)**
  - 6MW Existing Solar PV
  - 1MW/500kWh Battery Storage to be added
  - Scheduled for Completion in Q4-2015
Presenters

- **Avital Szulc; Product Manager**
  - Expertise in thermodynamic modeling, electric trading algorithm design & sustainable practices
  - Prior experience with Demand Response Operations in Deregulated Markets
  - Background in chemical engineering.

- **Drew Adams; Head of Strategy & Partnership**
  - Expertise in regulatory and structured financing of solar, storage, distributed generation, and demand response.
  - Prior experience in solar deployment, and electricity market operations

- **Peter Mendonez, Jr; Head of Engineering**
  - Expertise in smart grid technologies, renewables, storage, energy trading, and utility operations.
  - Prior experience as Subject matter expert and project management for development of National Smart Grid Framework Document and Roadmap
  - Additional Working Experience in Electric Utility Industry
Upcoming Webinars

• Resilient Cities: Clean Energy to Power Critical Public and Private Facilities, Thursday, April 2, 2-3pm ET

• Upgrading Distribution Resilience: A DOE-OE Solicitation, Tuesday, April 7, 1:30-3pm ET
Contact Info & Links

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More information about the Resilient Power Project, its reports, and other information can be found at [www.resilient-power.org](http://www.resilient-power.org).