



FLORIDA SOLAR ENERGY CENTER

Creating Energy Independence Since 1975

Solar For Schools & Emergency Shelters

FSEC Policy Advisory Board Meeting

December 11, 2009

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A Research Institute of the University of Central Florida





SunSmart Schools (2003-2009)



Vision

Produce energy literate citizens who make wise energy choices leading to an improved quality of life for all.

Objectives:

- Enhance education through hands-on use of PV (> 1 kW)
- Integrate energy efficiency and renewable energy into the curriculum.
- Expand STEM (science, technology, engineering and mathematics) opportunities
- Public Outreach





SunSmart Schools (2003-2009)



- ❖ State provides ~ 50% funds to install:
- ❖ Utilities traditionally provide other ~50%
(FPL, GRU, Gulf Power, JEA, Lakeland Electric, New Smyrna Beach, OUC, Progress, Tallahassee Elec., Talquin Electric Coop, TECO, Winter Park, Johnson Controls)
- 55+ 1 – 6-kilowatt (kW) demonstration system.
- 4 10-kW emergency shelter PV demonstration system.







10 kW PV provides ~50 kWh per day in Florida



	kWh per day
10 kW Florida PV	50
Average Florida Home AC	48 17 (double this in summer) Needs all the PV and 830 ft ² of roof
Efficient Florida Home	18 Needs 4 kW and 332 ft ² of roof
New Refrigerator	2.5
Old Refrigerator in garage	4
Plasma TV	4
LCD TV	2
10 ac-dc power bricks	1.2
Lighting for home (incandescents)	5.5
Lighting for home (fluorescents)	1.4



SEP: Solar for Schools & Storm Shelters (\$10,600,000) (Dec. 2009 - 2012)

- SUMMARY: Install 10 kW photovoltaic systems on 90 public schools
 - Strategically selected schools that also serve as emergency shelters
 - Battery back-up power on schools/emergency shelters
 - Solar energy educational component
- DOE REVIEW: Approved
- STATUS: Contract has been vetted through EOG Procurement and Legal; negotiations with FSEC continuing



\$10M & \$1M UCF Match for Program



SunSmart Plus (2010-2013)



>10kW PV Grid/Battery Backup
At least 90; >1 per 67 counties

- Teach students
- EnergyWhiz
- Utility Report Card
- Smart Meters
- Real-time School Electric Consumption Data
- Efficiency Savings (real money)



Middleton High



Middleton High Shelter System 10kW PV Grid/Battery Backup



Nine light fixtures. Eight 120V wall plugs.



SunSmart Plus



- ❖ Expand program to include Smart Meters (real-time, web-based building energy use data)
 - A derivative of Utility Report Card
- ❖ Develop classroom activities that use the online building energy use data
- ❖ Involve students in hands-on, real-time “experiments” to evaluate building energy use saving options in their school environment.
- ❖ Save Real Money



West Gadsden High School



- ❖ 2 kW PV array installed Nov, 2009
- ❖ EnergyWhiz data available Nov 9, 2009 – Today
- ❖ Lets look at the data
<http://www.energywhiz.com>







West Gadsden High School

2 kW on sunny and cloudy days



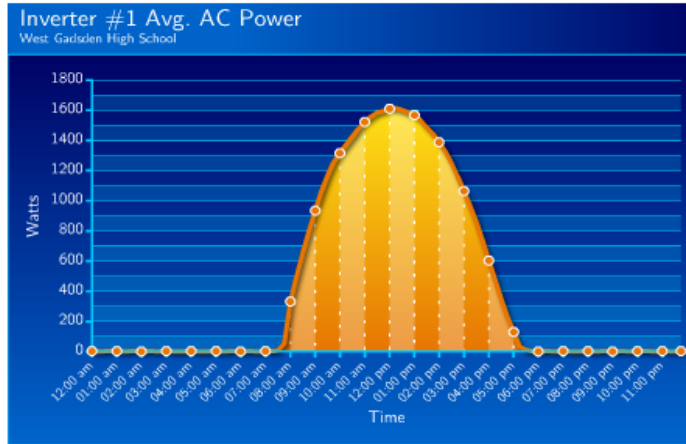
System Performance Data

Nov 26, 2009

- Horizontal Irradiance
- Ambient Temperature
- PV Array #1 Temperature
- PV Array #1 DC Voltage
- PV Array #1 DC Current
- Inverter #1 Avg. AC Power

Flash

Update



10.4 kWh on sunny 11/26/09
Average Temperature 12.1 C
CO₂ Saved versus Coal Burning
Plant (lbs) 19.11

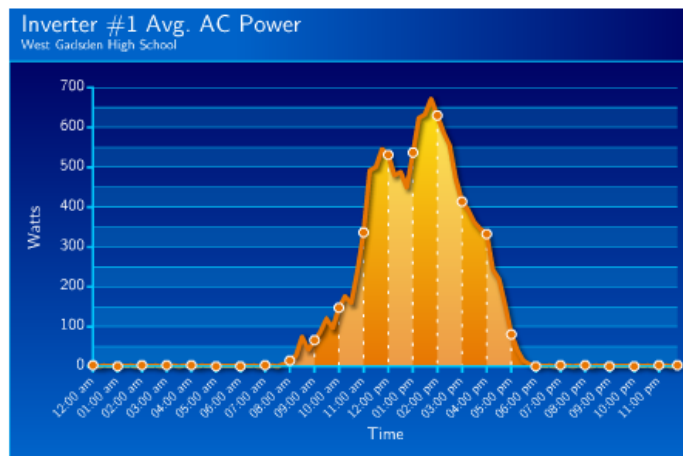
System Performance Data

Nov 25, 2009

- Horizontal Irradiance
- Ambient Temperature
- PV Array #1 Temperature
- PV Array #1 DC Voltage
- PV Array #1 DC Current
- Inverter #1 Avg. AC Power

Flash

Update



3.13 kWh on cloudy 11/25/09
Average Temperature 13.7 C
CO₂ Saved versus Coal Burning
Plant (lbs) 5.72



Utility Report Card



A Tool to Gauge Energy Use in Schools.

About URC

Why URC

Join URC

URC Live

URC Tutorial

Contact Information

Limited Funding Opportunity



Partners

- OCPS
- SCPS
- BCPS
- FSEC
- Progress Energy
- OUC
- FPL
- FEO
- DOE
- Walt Disney World®
- SRC
- FSEC Research

The Utility Report Card (URC) is a web-based energy information system used to report, evaluate and chart utility consumption in schools.

Alachua, Brevard, Indian River, Orange and Seminole County Public Schools
Osceola, and others expected to follow



Utility REPORT CARDS

Utility Report Cards has 5 Districts participating.

District, State	Oct 2009 Usage (kWh/Month)	Oct 2008 Usage (kWh/Month)	Oct 2009 Cost (\$/Month)	Oct 2008 Cost (\$/Month)	Schools	Teachers	Students
Alachua County School District, FL	4,176,694	3,725,044	\$530,060	\$463,399	61	1,639	29,679
Brevard County School District, FL	12,806,689	12,574,119	\$1,433,192	\$1,451,896	109	3,914	71,781
Indian River County School District, FL	4,628,011	6,594,925	\$559,337	\$796,489	27	797	15,423
Orange County School District, FL	22,933,334	15,191,733	\$2,491,861	\$1,450,357	184	8,946	157,433
Seminole County School District, FL	13,125,593	12,838,231	\$1,435,659	\$1,288,928	72	3,394	62,786
Grand Total	57,670,321	50,924,052	\$6,450,109	\$5,451,069	453	18,690	337,102

Select the district to view electric energy use for that district

453 Schools use 0.3 % of Florida's Electricity
 \$6.5M for month of Oct 2009 at 453 Schools
 ~\$50K for Oct 2009 per High School (\$492 K for year)

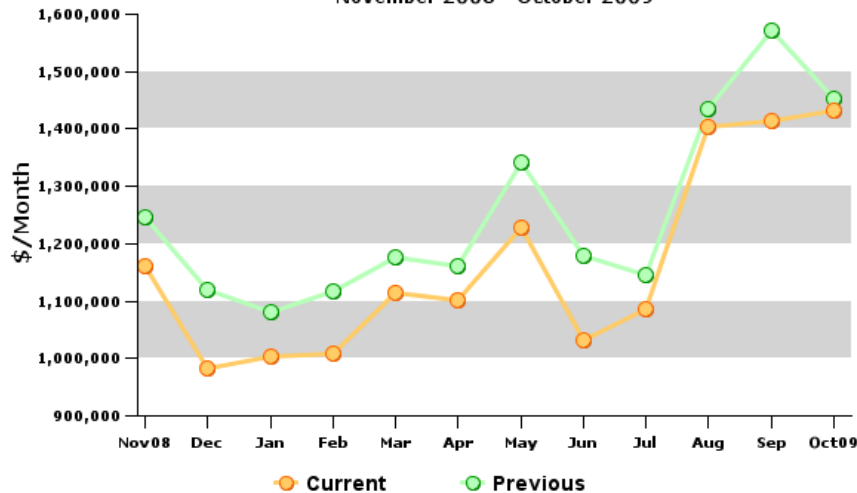


Brevard County School District Cost and Consumption



Brevard County School District - Cost (\$/Month)

November 2008 - October 2009



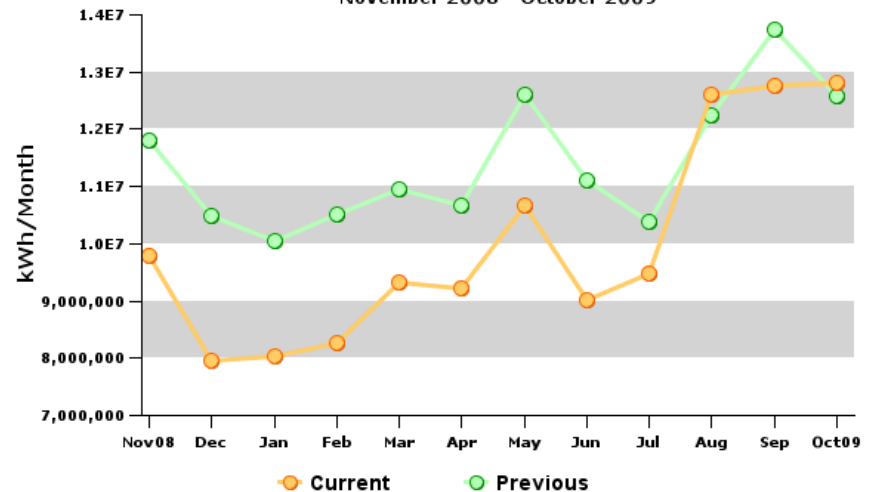
2008 cost \$15.03 M

2009 cost \$13.97 M

Savings \$1.06 M (7%)

Brevard County School District - Consumption (kWh/Month)

November 2008 - October 2009



2008 137 x 10⁶ kWh
2009 119 x 10⁶ kWh
Savings 17 x 10⁶ kWh
(13%)

Why was energy and money saved? Can we save more?



Smart Meters



Real-time School Electric Consumption Data

- ❖ The 90 Solar High Schools
 - Will consume $90 \times \$492\text{K} = \44M per year for electricity
 - Opportunity for real energy savings
- ❖ Document energy savings in real time
- ❖ Modify behavior through incentives
 - Return substantial percentage of savings to school
 - Prizes for the best energy efficiency improvements



LIVE DASHBOARD

HISTORY

GRAPHING

LOAD PROFILE

PRESENT READINGS

November 30 2009 5:23 PM

Days Left In Billing Cycle: 1
Current Rate In Effect: \$0.12000
Plan Type: Flat Rate



REAL-TIME KW USAGE

MTU 1: 0.570 kW
MTU 2: -0.005 kW

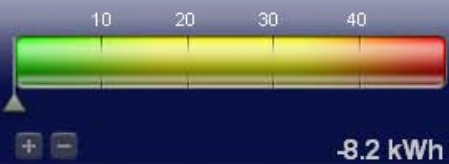


RECORDINGS

Peak kW Today: 3.171 kW @ 12:10 AM
Peak \$ Spent Today: \$0.39 @ 7:03 AM
Low Voltage Today: 119.8 V @ 6:48 AM
High Voltage Today: 122.8 V @ 7:03 AM

Peak kW MTD: 4.477 kW on Nov 8
Peak \$ Spent MTD: \$0.54 on Nov 8
Low Voltage MTD: 112.8 V on Nov 23
High Voltage MTD: 126.6 V on Nov 19

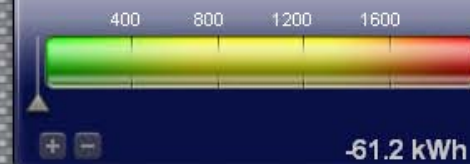
KWH USED SINCE MIDNIGHT



KWH USED THIS MONTH



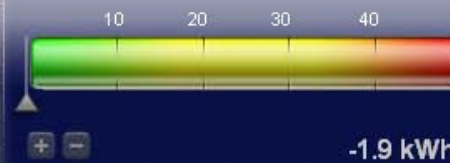
PROJECTED KWH USAGE



PRESENT VOLTAGE



AVERAGE DAILY KWH USAGE



WEATHER
Cocoa Beach, FL



77°

Mostly Cloudy

10-Day Forecast

Wind: W 10mph
Sunrise: 6:57 AM
Sunset: 5:26 PM

Danny Parker's House with 4 kW PV

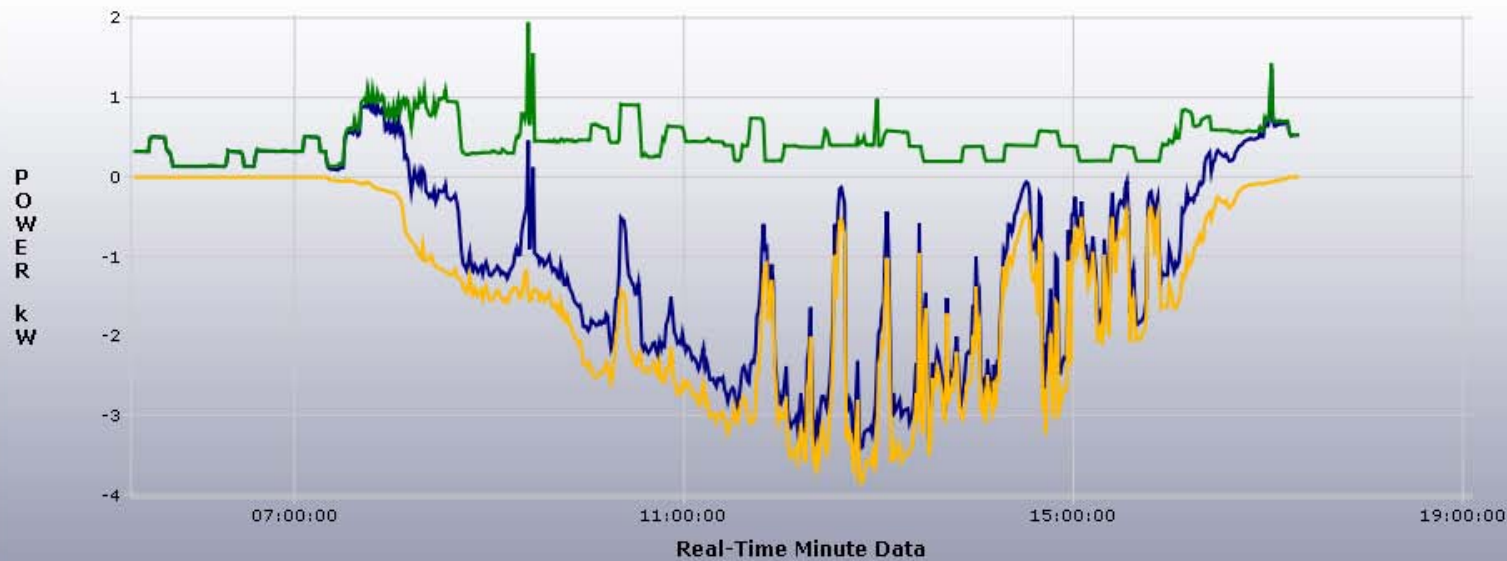


LIVE DASHBOARD

HISTORY

GRAPHING

LOAD PROFILE



HISTORY REPORT SELECTION

Select View Type Minute Live View

Select Sample Size 12 Hours



LIVE DASHBOARD

HISTORY

GRAPHING

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HISTORY REPORT SELECTION

Select View Type: ▾

Select Sample Size: ▾



Possible Questions Asked

That now can be answered



- ❖ Running AC 2 °F warmer at school saves how much?
- ❖ Unplugging TVs and computers saves how much?
- ❖ Unplugging all ac-dc power bricks at school saves how much?
- ❖ Leaving a window in each room open while Air Conditioning costs us how much?
- ❖ What does school lighting or PCs on at night cost?
- ❖ How much money can we really save?
- ❖ What is the wisest way to spend the savings?



Do the Bright Thing! Conserve Energy & Use Solar

