



Educational Data Displays

Funding for these displays provided by:



**CONNECTICUT
CLEAN ENERGY FUND**

What is a Heliotronics Data Display?

- ❑ **Educational Tool**
- ❑ Dynamic, Real Time Display
- ❑ **Rich in Content**, More in Depth Than Generic Solar PV Data System
- ❑ Web Database is Sophisticated Yet Easy to Use With Downloadable Data
- ❑ **Standards Based Curriculum**
- ❑ Used in CT, NY, MA & RI

SunViewer.net™ Internet Display is a Superior Educational Tool

- ❑ Flexible Database Queries, Data Sets Starting From the Present or the Past
- ❑ Data Downloads to Spreadsheets
- ❑ Data Graphing *Variety of Graphing Options Available*
- ❑ Agregate Data (*Combine Data From All Sites*)

Data Query Page

- Flexible Date Selection
- Flexible Data Use
 - Plots
 - Tabular Display
 - Download to Spreadsheet
- Real Time Data Updates Approximately Once Per Second

Missouri Department of
Natural Resources
Outreach and Assistance Center

Missouri
Schools
Going Solar

Ameren

College School of Webster Groves

SunViewer.net™ Solar Energy Data

Jun 5 2006

Get Data

Daily Data:

- Power
- Module Temperature
- Ambient Temperature
- Irradiance

Monthly Data:

- Energy by day
- Peak power by day
- Peak Module Temperature by day
- Peak irradiance by day

Annual Data:

- Energy by month
- Incident energy by month
- Avoided CO2
- Avoided SOX
- Avoided NOX

Current Data:

- Current data updated every 15 minutes

Choose Output Format:

- Graph
- Table
- Download Raw Data File (CSV)

Get Data

SunViewer™ Speedometer Display

- Fun and Intuitive
- Familiar, Speed and Distance Similar to Power and Energy
- Real Time, Responds to Changes in the Environment In About 1 Second.



SunViewer™ Real Time Calculator

- Upper Left Box Shows Power Produced By the Array and is Updated Every Second
- Boxes At Right Show The Number of Those Appliances That Could Be Operated With The Available Power
- Switch on Light Bulb Allows Comparison of Incandescent vs CFL

The screenshot shows a web-based calculator interface titled "What Is It Doing?". It features a large input field for "The current solar power..." with a value of "0". Below this, it says "...is enough to run...". To the right, there are four rows of appliance icons and corresponding input fields for the number of units that can be run: "ovens", "air conditioners", "computers", and "60 watt equivalent light bulbs". A "Light Type" section is visible, with "Incandescent" selected and a "Click Me" button. At the bottom, there are "HOME" and "BACK" buttons with globe icons.

SunViewer™ Table Display

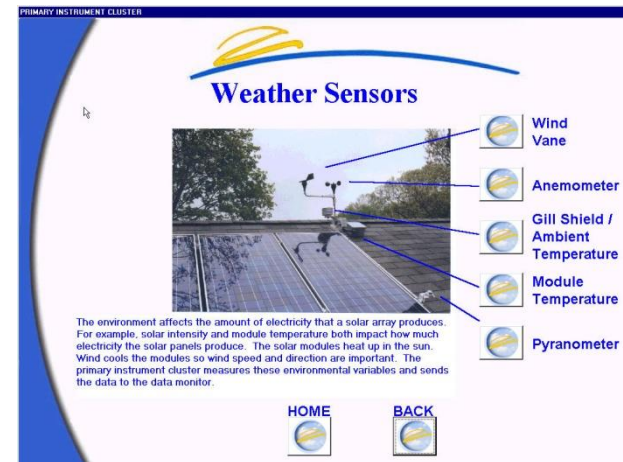
- Paired Columns:
 - One with real time data
 - One Captured If Its Box is Checked
- Enables Manipulation of Correlated Data
- Prevents Decorrelation of Data From Transient Events Such As Clouds Coming Over

The screenshot shows the 'DATA CAPTURE' window in SunViewer. It features a table with two main columns: 'REAL TIME' and 'DATA CAPTURE'. Each parameter has a corresponding input field and a checkbox to enable data capture. The interface also includes navigation buttons like 'HELP', 'HOME', 'BACK', 'Clear', and 'Data Snapshot'.

| | REAL TIME | DATA CAPTURE | | REAL TIME | DATA CAPTURE | | |
|-----------------------------|--------------------|----------------|-------------------------------------|------------------------|---------------|--|--------------------------|
| Date | September/30/2005 | | <input type="checkbox"/> | Solar Array Efficiency | percent | | <input type="checkbox"/> |
| Time | 12:46:00 PM | 12:45:55 PM | <input checked="" type="checkbox"/> | Inverter Efficiency | percent | | <input type="checkbox"/> |
| Ambient Temperature | 23 Celsius | 23 Celsius | <input checked="" type="checkbox"/> | DC Voltage | 0 volts | | <input type="checkbox"/> |
| Solar Intensity | 0 w/m ² | | <input type="checkbox"/> | DC Current | 0 amps | | <input type="checkbox"/> |
| Wind Speed | 0.0 meters/sec | | <input type="checkbox"/> | DC Power | 0.0 kilowatts | | <input type="checkbox"/> |
| System Output Power | 0.0 kilowatts | 0.0 kilowatts | <input checked="" type="checkbox"/> | AC Voltage | 0 volts | | <input type="checkbox"/> |
| System Efficiency (percent) | 0 percent | 0 percent | <input checked="" type="checkbox"/> | AC Current | 0 amps | | <input type="checkbox"/> |
| Incident Solar Power | 00.0 kilowatts | 00.0 kilowatts | <input checked="" type="checkbox"/> | | | | |
| Cumulative System Energy | 00 kilowatt-hours | | <input type="checkbox"/> | | | | |
| Module Temperature | 11 celsius | | <input type="checkbox"/> | | | | |
| Avoided Carbon Dioxide | .0 kilograms | | <input type="checkbox"/> | | | | |
| Avoided Sulfur Oxide | .0 kilograms | | <input type="checkbox"/> | | | | |
| Avoided Nitrogen Oxide | .0 kilograms | | <input type="checkbox"/> | | | | |

Virtual Array Tour

- Enables Students to See Inaccessible System Components.



CCEF's Heliotronics System

<http://www.sunviewer.net/portals/CCEF/>

Systems funded by CCEF have been installed at:

- **Common Ground High School, New Haven, CT**
- **EO Smith High School, Storrs Mansfield, CT**
- **Glastonbury High School, Glastonbury, CT**
- **Wilton High School, Wilton, CT**



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1. Common Ground High School. New Haven, CT.

System Details:

- 2.0 kW Photovoltaics
- Module type: Sanyo HIP-200BA3
- Module power: 200 Watts
- Number of modules: 10
- Inverter: SMA Sunny Boy 2100
- Mounting system:
- Azimuth / Tilt: 172° / 32°
- Lat / Lon: 41°20'16.89"N / 72°57'30.31"W
- Solar Contractor: PV Squared
- Educational Display Type: Heliotronics Feynman™
- Educational Data Display: Internet & Real Time based on Sunviewer™ software



[Monitor site performance...](#)

2. EO Smith High School. Storrs Mansfield, CT.

System Details:

- 3.0 kW Photovoltaics
- Module type: Sanyo HIP-200BA3
- Module power: 200 Watts
- Number of modules: 15
- Inverter: SMA Sunny Boy 3300U
- Mounting system: Direct Power and Water Ballasted Racks.
- Azimuth / Tilt: 150° / 25°
- Lat / Lon: 41°48'16.41"N / 72°14'38.75"W
- Solar Contractor: PV Squared
- Educational Display Type: Heliotronics Feynman™
- Educational Data Display: Internet & Real Time based on Sunviewer™ software



[Monitor site performance...](#)

Main page
displays each
site as shown
here

Common Ground High School

SunViewer.net&trade Solar Energy Data

May 13 2011

Get Data

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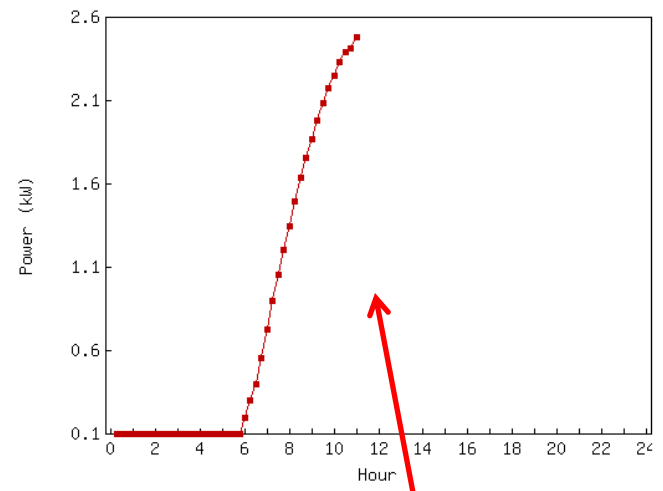
- Graph
- Table
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This is the main screen for the SunViewer data.

By using this page various data types and outputs can be obtained.

Example table: amount of energy generated monthly

15-minute power values for 13-May-2011 for EO Smith High School



please wait while the data is loading...

Example graph: amount of energy generated daily

Monthly generated energy for 2011 for EO Smith High School

| Site Id | Date | Time | Energy (kWh) |
|---------|------------|----------|--------------|
| 154 | 2011-01-01 | 00:00:00 | 51.800 |
| 154 | 2011-02-01 | 00:00:00 | 119.100 |
| 154 | 2011-03-01 | 00:00:00 | 354.100 |
| 154 | 2011-04-01 | 00:00:00 | 321.500 |
| 154 | 2011-05-01 | 00:00:00 | 180.500 |

please wait while the data is loading...

Additional Resources

For additional lessons using the Heliotronics System please visit <http://www.heliotronics.com/educators/teacherzone.html>

Heliotronics and NYSERDA have developed several standards based lessons utilizing various functions of the software.

The screenshot shows the Heliotronics website interface. At the top left is the Heliotronics logo with the tagline "products as reliable as sunrise". To the right are links for "Contact Us" and "Search". A navigation menu includes "System Integrators", "Educators", "Products", "Case Studies", "About Us", and "Related Links". The "Educators" section is active, featuring a photo of a solar panel array and a group of people. Below the photo is the text "Clean Energy in action! Live data from over 100 sites across the USA and Canada... mostly schools." and a link "See an example...". A yellow box highlights a link to "The Educational Research Supporting the Solar Learning Lab(TM) pdf document". The main content area is titled "Welcome to the Teacher Zone..." and lists classroom activities using real data from solar power installations. It includes a link to "NYSERDA Lessons for Use with SunViewer(TM) and SunServer(TM)" for Grades 5 - 12, and four "Virtual Array Tour" lessons (Lesson 1-4) using SunViewer(TM) or SunViewer.net(TM). A section titled "Other Lessons:" lists "Interpreting Solar Power Graphs(PDF)" for Grades 7-10 and "Data Normalization Made Easy(PDF)" for Grades 8-12. At the bottom, there is a call to action for teachers to help develop activities and a link to join a mailing list. On the right side, a "Spotlight" section features an article from "The Science Teacher" journal, dated October 2005, with a link to "Read it here..." and a section for "More FREE resources for educators!" with a link to "Click here...". A "Wind power in the classroom:" section also includes a link to "Click here...".