

# SOLAR SPECTRUM

NEWSLETTER OF THE RESOURCE ASSESSMENT DIVISION

Volume 12, Issue 1 – April 1999

of the American Solar Energy Society®

## SECOND WORKSHOP ON SATELLITES FOR SOLAR ENERGY ASSESSMENT DRAWS INTERNATIONAL COMMUNITY

by David Rennè – National Renewable Energy Laboratory

The 2nd Workshop on Satellites for Solar Energy Assessments was held on 3-4 February, 1999 at the Golden Hotel in Golden, Colorado. This workshop was hosted by NREL, and organized jointly by NREL and SUNY/Albany. The workshop brought together researchers in satellite data analysis and solar energy technology experts to review the current status of techniques and products of solar data derived from weather satellite imagery. Of the more than 40 participants, many were representatives from U.S. government (including the National Aeronautics and Space Administration and the National Oceanic and Atmospheric Administration), research organizations, universities. There were also experts involved in the use of solar energy for building design and concentrating solar power technologies. Besides the U.S., seven other countries (Canada, France, Switzerland, Germany, Mexico, Brazil, and Japan) as well as Puerto Rico, were represented. Many of these foreign visitors were invited to give presentations on the status of research in their country.

Presentations on new techniques for developing climatological estimates of the solar resource at all locations on earth at a resolution of 100 km or less, and of developing estimates at half-hour intervals at resolutions of 10 km or less in specific locations, were made. The users of the data expressed a strong desire for these types of products, and offered additional ideas of their own in which the researchers can provide even more valuable information in the future. A number



*Those attending the workshop gather for a group photo. Besides learning about the latest in the use of satellites for solar resource assessment, the workshop gave everybody a chance to make new friends and renew old acquaintances.*

of specific research topics were identified, including the idea of incorporating other key meteorological information, such as temperature and relative humidity, into the solar radiation data sets.

Although satellite data should still be supplemented by quality ground measurements made at strategic locations, it is clear from this workshop that satellite techniques have become so advanced that

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**Solar Spectrum** is the newsletter from the Resource Assessment Division of the American Solar Energy Society and is published on a semi-annual basis. The purpose of this newsletter is to inform division members of events in the resource assessment field and activities of the division and its members.

**Success of the newsletter depends on your contributions.**

You are encouraged to send comments, letters, or short articles to the Editor:

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I would like to thank Roberta DePasquale, David Renné, and Cecile Warner for their contributions to this newsletter.

Deadline for contributions to the next newsletter is October 1, 1999.

Several pictures in this newsletter were taken from PixSearch at [www.nrel.gov/data/pix/searchpix.html](http://www.nrel.gov/data/pix/searchpix.html). PixSearch is from DOE/NREL. No affiliation with DOE/NREL is to be implied.

Frank Vignola

**Resource Assessment Division  
Officers & Board Members**

Mike Sloan, Chair  
Cecile Warner, Vice Chair  
Gary Vliet, Secretary

Bob Cable  
Roberta DiPasquale  
Dave Kearney  
Bill Marion  
Dave Menicucci  
Richard Perez  
Timothy Townsend



## UPCOMING EVENTS

June 12-16, 1999

**Growing the Market  
SOLAR '99**



Portland, Maine

Information: ASES  
2400 Central, G-1  
Boulder, CO 80301  
Tel 303-443-3130  
Fax 303-443-3212  
<http://www.sni.net/solar/>

August 25-27, 1999

**Sustainable Applications  
for Tropical Island States  
SATIS '99**

<http://ece.uprm.edu/satis99>

San Juan, Puerto Rico

Information: SATIS '99  
University of Puerto Rico-Mayagüez  
Mechanical Engineering Department  
P.O. Box 9045  
Mayagüez, Puerto Rico 00681-9045  
Fax. (787) 265-3817  
Email: [satis99@exodo.uprm.edu](mailto:satis99@exodo.uprm.edu)

### RAD DIVISION ELECTIONS

As stated in the bylaws, this year's Vice Chair, **Cecile Warner** will automatically become chair this year. It was decided at the last general meeting that the transfer of office will take place at the June division meeting.

The results for the other offices and board elections as follows: **Gary Vliet** of the University of Texas at Austin was elected Vice-Chair, and **Roberta DiPasquale** of Analytical

Services & Materials, Inc. was elected secretary.

Filling the vacant board positions are:

**Ray Bahm** of Ray Bahm & Associates, **Dan Greenberg** of Ascension Technology Inc., **Rob Nelson** of Augustyn & Company, and **Bill Marion** of NREL.

### EMAIL ADDRESSES FOR RESOURCE ASSESSMENT DIVISION MEMBERS

In order to open communications between RAD division members, the following members circulated their Email address at the RAD division annual meeting. If you are not on this list and would like to add your name to the list, contact Solar Spectrum's editor and your Email address will be added to the list and published in the next newsletter.  
Augustyn & Company

.....aci@ccnet.com  
Ray Bahm.....r.bahm@ieee.org  
Bruce Bailey.....awssci@delphi.com  
Bill Berg.....n/a at this time  
Roberta DiPasquale.....r.c.dipasquale@larc.nasa.gov  
John Dunlop.....jrdunlop@mcimail.com  
Eppley Laboratory Inc..eplab@mail.bbsnet.com  
Tracy Gardner.....tgardner@nrel.nrel.gov  
Jack Garrison.....jgarriso@sciences.sdsu.edu  
Chris Gueymard.....chris@fsec.ucf.edu  
Bill Marion.....bill\_marion@nrel.gov

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Frank Vignola..... fev@oregon.uoregon.edu  
Gary Vliet..... gvliet@mail.utexas.edu  
Cecile Warner..... cecile@nrel.nrel.gov

## WORLD WIDE SOLAR RESOURCE DATA AVAILABLE SOON

by Roberta DiPasquale

A project entitled, "Development of Surface Solar Energy Data Sets For Commercial Applications", which combines the efforts of Analytical Services and Materials, Inc. and NASA Langley Research Center, is aimed at providing solar resource and meteorology data to the renewable energy industry and agricultural community for remote locations around the world.

The Solar Energy Project is managed by Dr. Ann Carlson, Assistant to the Chief of the Atmospheric Sciences Division of NASA Langley Research Center (NASA/LARC). Dr. Charles Whitlock, former Head of the Surface Radiation Budget (SRB) Project (Atmospheric Sciences Division, NASA/LARC) and Ms. Roberta DiPasquale are Co-Investigators.

As part of the Langley Distributed Active Archive Center, the project provides easily accessible scientific data, via the Internet, at [http://eosweb.larc.nasa.gov/DATDOCS/Surface\\_Solar\\_Energy.html](http://eosweb.larc.nasa.gov/DATDOCS/Surface_Solar_Energy.html). The site averages approximately 100 hits per week. Users can access satellite-derived data about a particular location and produce a 1 page printout. Text files, color plots, and contour plots on a global scale are also available. The



### Surface Solar Energy Data Set

A project at NASA Langley Research Center (LaRC) in conjunction with the National Renewable Energy Laboratory (NREL) has produced a satellite-derived surface solar energy (SSE) data set useful to the Renewable Energy Industry.



Highlights:

- 74 monthly-averaged parameters
- data tables for a particular location
- text files, color plots, and contour plots on a global scale



[Background Information](#)



[Geometry](#)



[Accuracy](#)



[Data Retrieval](#)



[Theoretical Basis](#)



[Related Web Sites](#)



[Additional Projects](#)



[Send Comments, Questions and Register](#)



Pictures courtesy of the DOE/NREL Photographic Information eXchange.

*Sample of NASA web page and information available on the page.*

web master of the project, William Chandler, is currently revising the site based on input from the renewable energy community. The new site will be

released in June 1999.

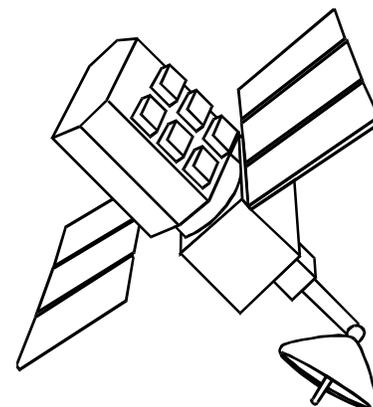
[Ed. More information on this project will be presented at Solar '99.]

### SECOND WORKSHOP ON SATELLITES FOR SOLAR ENERGY ASSESSMENT DRAWS INTERNATIONAL COMMUNITY

*(Continued from page 1)*

they now represent a reasonably-accurate tool for developing large area solar resource assessments, particularly in locations where ground data are limited, and for developing high resolution site/time-specific data that can be used for assessing the performance of

PV technologies.



## ISES WIRE NEWSLETTER



[In March, ISES announced its weekly electronic newsletter as part of its WIRE initiative. The following is the message sent to all ISES members. The Wire news is one way to keep current on the rapid advances in the solar industry.]

Below please find a copy of the most recent weekly newsletter of the WIRE initiative. It is provided for your information. Should you wish to subscribe, or find out more about this initiative, please visit WIRE at <http://wire.ises.org>

All the best,

Rian van Staden

ISES Information Systems

WIRE Newsletter

### New server

There have been a number of changes and additions to WIRE in the last few weeks. A new server is in place to re-route system access. The URL for WIRE is still <http://wire.ises.org>; you will be re-directed to one of the independent WIRE servers from there. The purpose of server independence is that in the long run, the platform can be replicated at multiple locations in different parts of the world, which guarantees quicker access and downloading time.

### Link of the Month

The WIRE link of the month for February is the CLAIR (Center for Library And Information Resources) web site at <http://www.ait.ac.th/clair/> which includes the RERIC (Regional Energy Resource Information Center) at <http://www.ait.ac.th/clair/centers/eric> a good first stop if you are looking for

renewable energy sites related to Asia. RERIC provides an FTP-accessible literature database; besides an catalogue of reference sites and other online databases, it also features an exhaustive list of electronic publications and a voluminous links library.

### Fraunhofer Institute develops new inverters

A truly electrifying development has been made by researchers at the Fraunhofer Institute for Solar Energy Systems ISE in Freiburg: Their new low-voltage DC/DC converter creates output voltages between 12 and 350 V with a high efficiency from input voltages as low as 0.7 V. This opens up completely new application possibilities for energy converters such as fuel cells, thermoelectric converters and solar cells: Up to now, many cells had to be connected in series to produce normal operating voltages. Now, a single cell may suffice. The system can be simpler and new construction forms become feasible.

Read up on this and other new developments in the WIRE Press Kit at <http://wire0.ises.org:8888/wire/Publications/PressKit.nsf/>.

### Featured articles

The German Stock Exchange (Deutsche Boerse AG) has announced plans to set up an energy futures exchange which would permit forward transactions on an international level. It will probably be implemented by the second half of 1999. Traders of energy futures will be able to buy and sell energy at fixed rates and on fixed dates.

Find this and other articles in the Renewable Energy News module at <http://wire0.ises.org:8888/wire/CurrentAffairs/RENews.nsf/H/O?Open&00005E32> or post your own items there.

### Spice up your PR with WIRE

Grasp the opportunity to boost your PR efforts by publishing a Company or Organization Profile in WIRE at <http://wire0.ises.org:8888/wire/independents/Organisations.nsf?OpenDatabase>.

Consult the WIRE Help at <http://wire0.ises.org:8888/wire/Help.nsf/H/O?Open&000021BA> to read instructions on how to submit information to WIRE.

[vanstaden@isesnotes.ises.org](mailto:vanstaden@isesnotes.ises.org)

### RESOURCE ASSESSMENT SESSIONS AT SOLAR '99

#### Resource Assessment Mapping Techniques

Wednesday June 16, 1999  
10:30 am to 12:00 pm

*Recent Advances in Assessing Solar Resources Over Large Areas*, D. Renné  
*An Advanced Web Site of Satellite-Derived Solar Resource Data for the Globe*, R. DiPasquale, S. Cox, C. Whitlock, A. Carlson, P. Stackhouse, D. Brown, W. Chandler, and D. Renné  
*Using GIS To Deploy a Climatological Solar Radiation Model*, E. Brady and D. Buckley

*High-Resolution Maps of Solar Collector Performance Using a Climatological Solar Radiation Model*,

(Continued on page 5)

## RAD DIVISION MEETING

The RAD meeting is scheduled for June 16, 1999 from 12:30-1:30 on Wednesday --room to be decided upon later. There should be box lunches available for purchase, so after the morning session concludes at noon, people can quickly buy lunch and come to the meeting.

Draft Agenda:

12:30 Call to Order  
Report from the outgoing Chair-  
(Sloan)  
Review of the Current meeting-  
All Committee Reports:  
Program (Renne)  
Reviews (Marion)  
Nominating (Augustyn)  
Newsletter (Vignola)  
New Business  
1:30 Adjourn

## Resource Assessment Sessions at Solar '99

(Continued from page 4)

R. George  
*Wind Resource Mapping Using  
Geographic Information Software at  
the National Renewable Energy  
Laboratory*, M. Schwartz.

### Resource Measurement Applications

Wednesday June 16, 1999  
2:00 pm to 3:30 pm

*Comparison of Recent Statewide Solar  
Radiation Measurements in Texas with  
the National Solar Radiation Data-  
base (NSRDB)*, G. Vliet And E.  
Grindle

*Solar Cell Based Pyranometers:  
Evaluation of the Diffuse Response*, F.  
Vignola

*Regional Variations of Days of  
Autonomy for Solar Energy  
Applications*, G. Vliet And E. Grindle  
*Objective Methodology for Selecting  
Photovoltaic Module Standard  
Reporting Conditions*, D. Myers, S.  
Kurtz, C. Whitaker, and A Maish  
*Estimating PV Energy Production*, B.  
Brooks, C. Whitaker, and T.  
Townsend

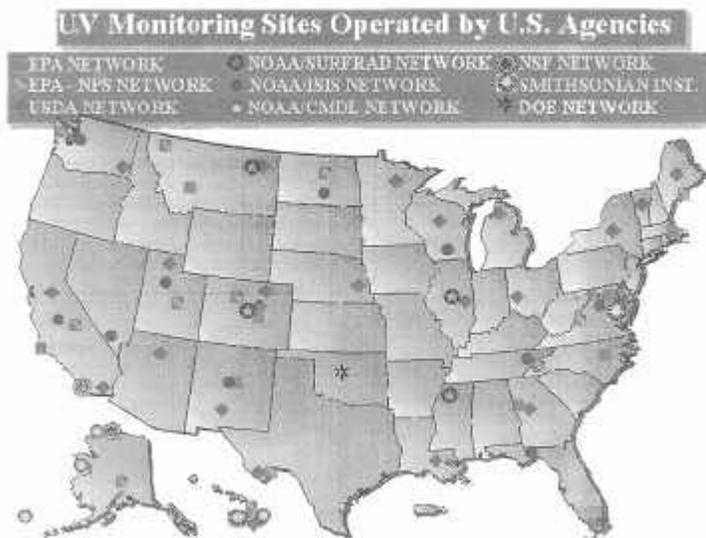


Fig. 1. Map of currently operating UV measuring stations in the United States. (EOS, Transactions, American Geophysical Union, Volume 80, number 10, March 1999.)

## U.S. INTERAGENCY UV MONITORING PROGRAM

[Information taken from the March 9, 1999 issue of EOS, Transactions, American Geophysical Union]

It is instructive to see a national program to monitor the UV irradiance, especially in light of the difficulty that the solar community has been facing trying to set up a national solar radiation monitoring program. The UV network provides quantitative information on the UV irradiance for studies in atmospheric science and studies of the UV effects on human health, agriculture, and ecology.

The U.S. Global Change Research Program (USGCRP) brought together ongoing measurement programs within a number of federal agencies. Involved are the U.S. Department of Agriculture (USDA), the Environmental Protection Agency (EPA), the National Oceanic and Atmospheric Administration (NOAA), the National Science Foundation (NSF), the Department of Energy (DOE), and the Smithsonian Institution (SI).

The network consist of 66

instruments at 55 locations across the United States (See Fig. 1). The instruments range from broadband radiometers, narrowband filter instruments, and highly spectrally resolved spectrophotometers.

The most common broadband instruments have a spectral response function (SRF) that approximates the erythermal action spectrum of the human skin, from 280 to 380 nm. These instruments work through to conversion of UV radiation into the more green part of the spectrum through fluorescence of magnesium tungstate. These broadband instruments have advantages of simplicity, reproducibility, and long-term stability and have been operated in the United States since the 1970s. Just like pyranometers, these instruments need annual calibration to measure any long-term trends.

Among the narrowband instruments are rotating shadowband instruments similar to the multfilter rotating

(Continued on page 8)

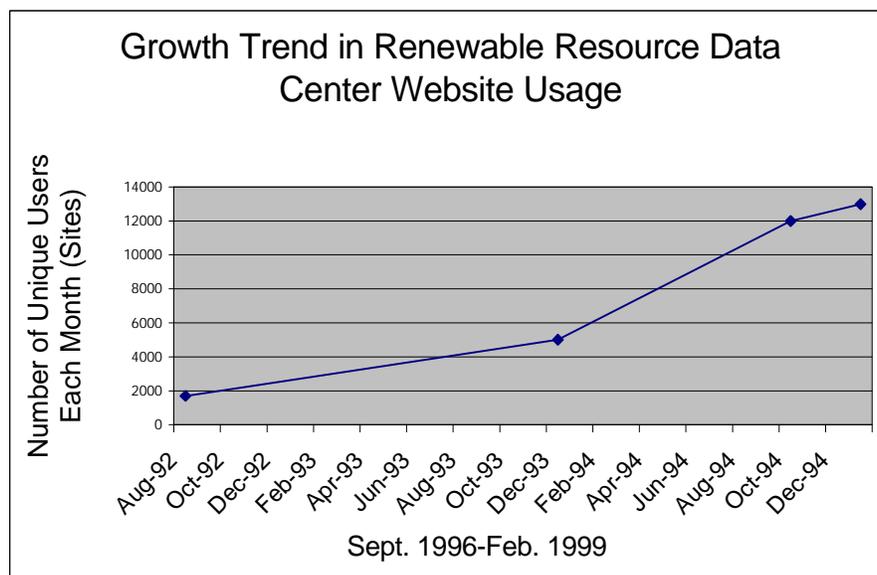
# MAJOR INCREASES ARE SEEN IN USE OF WEB-BASED RESOURCE ASSESSMENT INFORMATION AND DATA

From Cecile Warner



**WEBSITE**  
**Renewable Resource Data Center**  
 (<http://rredc.nrel.gov>)

NREL's "One-Stop Shop" for RA

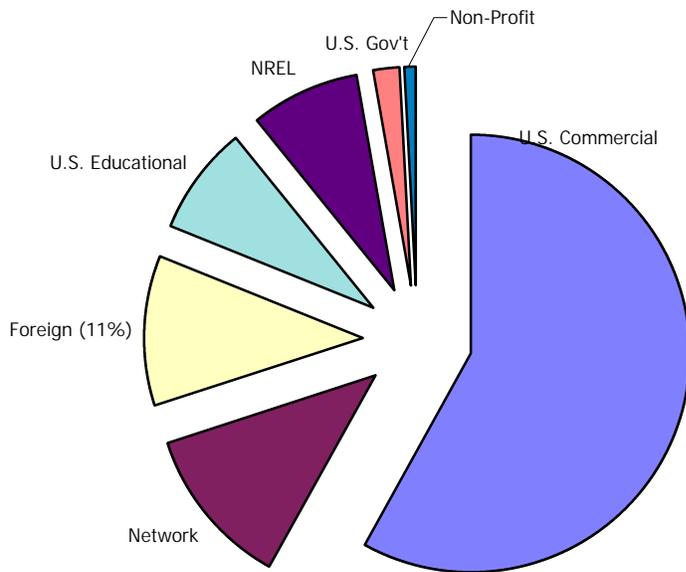


- Contains over 9 terabytes of downloadable data
- Domestic resource maps, global links
- Solar, wind, biomass, and geothermal technologies
- Approximately **13,000 unique users** each month
  - 20% of visitors to NREL homepage
  - 15% of visitors to EREN homepage

# WHO DEPENDS ON RESOURCE ASSESSMENT?

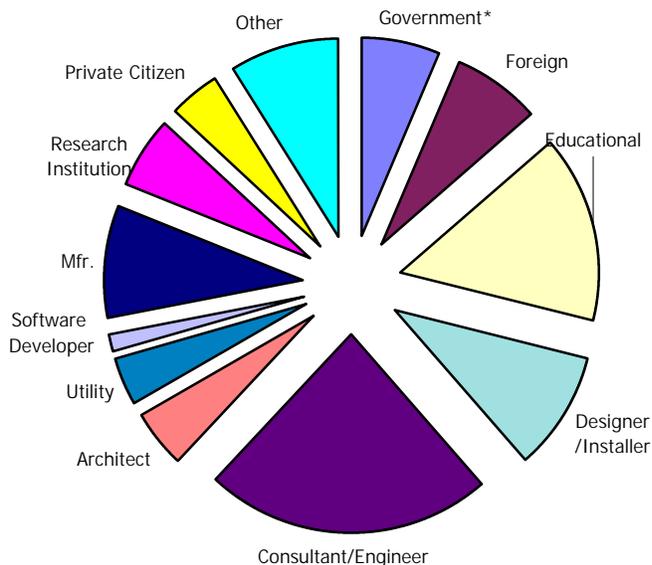
From Cecile Warner

- **Web-based data** is accessed by U.S. commercial, educational, government and foreign users via Renewable Resource Data Center



Total: >13,000 unique sites per month as of 2/99

## Technical Queries and Requests for Documents



*Mailing  
Address  
Goes  
Here*

**In This Issue...**

Second Workshop on Satellites for Solar Energy Assessment, World Wide Solar Resource Data Available Soon

**UV NETWORK**

*(Continued from page 5)*

shadowband radiometers except that they make measurements in the UV region of the spectrum. These instruments are used in the USDA network. Some of the filters in the multifilter UV radiometers have long-term degradation that must be monitored.

Scanning spectroradiometers have come a long way. These instruments make continuous, spectrally resolved measurements across the entire UV spectrum. These instruments generate a considerable amount of data and can be used in a wide variety of scientific studies. Often it requires several minutes to make these measurements, so that temporal variation such as clouds introduce some uncertainty in these measurements. The maintaining an accurate long-term calibration of such a complex instrument is challenging.

Table 1: Web locations for Surface UV Measurements

NOAA/ISIS:	<a href="http://www.atdd.noaa.gov/isis/isis_frame.htm">http://www.atdd.noaa.gov/isis/isis_frame.htm</a>
NOAA/SURFRAD:	<a href="http://titan.srrb.noaa.gov/surfrad/surfpag.htm">http://titan.srrb.noaa.gov/surfrad/surfpag.htm</a>
NOAA/CMDL:	<a href="http://cmdl.noaa.gov">http://cmdl.noaa.gov</a>
USDA:	<a href="http://uvb.nrel.colostate.edu/UVB/home_page.html">http://uvb.nrel.colostate.edu/UVB/home_page.html</a>
EPA:	<a href="http://oz.physast.uga.edu">http://oz.physast.uga.edu</a>
NSF:	<a href="http://www.biospherical.com/nsf/index.html">http://www.biospherical.com/nsf/index.html</a>
SI:	<a href="http://www.serc.si.edu">http://www.serc.si.edu</a>
DOE:	<a href="http://www.arm.gov">http://www.arm.gov</a>

The USGCRP network uses broadband sensors at almost all sites and narrowband and spectrally resolved instruments at an increasing number of locations. The concept being that the simpler instruments be used over the broad range of locations and the more sophisticated expensive instruments be used at a subset of stations where more detail data are desired.

The central UV calibration facility is in Boulder, Colorado and use new UV

standards provided by the National Institute for Standards and Technology to calibrate network instruments. More information on the network can be found on the Internet at the locations given in Table 1.

Many of these stations also monitor broadband and spectral solar irradiance data of interest to the solar community. Maybe the solar community should take note and step up efforts on or pressure for a national coordinated solar network.