

SOLAR RISING

December 2006

Volume 8, Issue 3

Quarterly Newsletter of the Oregon Solar Energy Industries Association (OSEIA)

OSEIA - Promoting Oregon's largest natural resource since 1981 - solar energy



Sunlight Solar Energy, Inc. Goes Ivy League

by Stephanie Manzo

December 4, 2006

(Bend, OR) Sunlight Solar Energy, Inc. has just installed the largest photovoltaic system in the Ivy League. Mounted atop Fisher Hall, a dormitory within Yale's Divinity School, the 40-kW grid-tied, flat-roof system is estimated to provide approximately two-thirds of the building's peak electricity demand.

Sunlight Solar Energy (SSE), Inc., which operates out of both Milford, CT and Bend, OR, installed the system consisting of 262 Schüco polycrystalline 158-SP photovoltaic modules. A row of solar panels along the roof's edge contributes both a structurally integrated awning and passive solar component for the dorm's top floor. Each PV module is capable of producing 158 watts of peak power. The modules were custom-mounted with Schüco's SolarEZ mounting system to place the panels at a 15-degree pitch. The mounting system did not penetrate the

(Continued on page 4)



groSolar Acquires Energy Outfitters

Venture Makes Solar Company One of Nation's Leading Solar Energy Suppliers

White River Junction, VT. / Grants Pass, OR – groSolar, a national solar energy firm, announced today that it has acquired Energy Outfitters, an Oregon-based solar energy distribution company. The acquisition makes groSolar one of the largest solar distribution and installation firms in the U.S., with additional offices in western and eastern Canada.

“This is a good day for groSolar and even a better day for those dedicated to mitigating global warming,” groSolar CEO Jeff Wolfe said. “The combined assets and expertise of the two companies will enable us to put more solar on more roofs across the U.S. and Canada.”

“We share the same values, mission and goals,” said Bob Maynard, President of Energy Outfitters. “And the strategic fit is great because groSolar has strength in the northeast while Energy Outfitters has strong west coast and Canadian opera-

tions. We are very glad that Energy Outfitters is joining the outstanding groSolar team.”

groSolar, based in White River Junction, Vermont, was founded in 1998, by Jeff and Dorothy Wolfe as Global Resource Options, and is dedicated to fostering energy independence and helping reverse global warming.

Energy Outfitters, of Grants Pass, Oregon; Calgary, Alberta and Barrie, Ontario, was owned by Maynard and Ray Ogden, who will remain actively involved with the business. For over 15 years, En-

(Continued on page 9)

Table of Contents

<i>GroSolar Acquires Energy Outfitters</i>	1
<i>Sunlight Solar Energy, Inc. goes Ivy League</i>	1
<i>OSEIA's Next Membership Meeting</i>	2
<i>BETC Needs an Up-Date</i>	3
<i>OSEIA Year In Review</i>	5
<i>Sweet Life Pâtisserie</i>	6
<i>Market of Choice</i>	7
<i>Affects of Tilt and Orientation</i>	8
<i>Pakistan—FATA Area Solar Pumping Project Implementation Stage</i>	10

SOLAR RISING is the newsletter of the Oregon Solar Energy Industries Association (OSEIA). OSEIA is Oregon's local chapter of the Solar Energy Industries Association. The information presented in this newsletter reflects the opinions of the authors and not necessarily those of OSEIA.

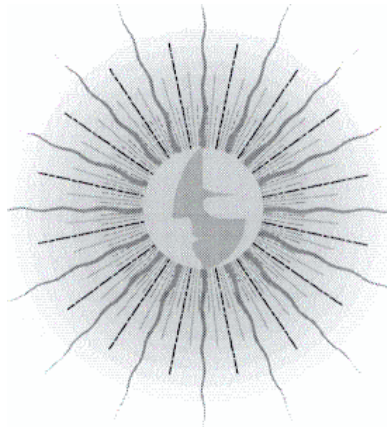
The success of the newsletter depends upon your contributions. This is an opportunity to tell the OSEIA members about your activities and to express your opinions. Photographs or figures to accompany articles are most appreciated. Articles of current and timely interest will be given highest priority. Otherwise, articles will be published on a first come basis as room allows.

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OSEIA's Next Membership Meeting January 16, 2007—EWEB

The next OSEIA membership meeting is January 16 from 12:00 to 4:00 pm. The meeting will be held in Eugene at the EWEB training center. As usual we will elect board members that will set the tone for an extremely important legislative year. Oregon's bi-annual legislative session starts in January 2007 and there will be a packed agenda for the solar industry. From tax credits, to 1% for solar on public buildings, to increased ETO funding, to a renewable portfolio standard (RPS), there will be a host of issues that could dramatically impact your bottom line. We will need to be very active next year.

During the last OSEIA member meeting we discussed many items such as:

- The success of the inaugural NW Solar Expo and the plans to hold it again next year in October.

- The importance of the SEIA solar power conference and the need for members to attend and check out new products (next years conference is Sept 24-27 in Long Beach CA).
- We are working hard on net metering and interconnection issues with the PUC and investor owned utilities. We are nearing a very big breakthrough for Oregon on net metering so stay tuned for more information.
- A change in the method of electing board members: members interested in becoming board members must submit a small paragraph on their intent by December 31st to be eligible for the vote on January 16th. Pros and cons of this change were discussed but the end conclusion

is that if you are not motivated enough to do such a simple thing then you are not motivated enough to be on the board – we need an active board and officers!

- If you are interested in becoming a board member you must send me an email with only a very short reason why. These names and short interest paragraphs will be published to the members for review prior to the January 16th meeting. See the board members up for election below.
- All officers are elected (or re-elected) by the board on an annual basis. There are definitely officers that will not be continuing on so we need volunteers to fill those positions. Several people have ex-

(Continued on page 3)

BETC Needs an UP-Date

by R. Brent Gunderson

With the current resurgence in the sale and installation of non residential solar systems in Oregon, including both solar thermal and PV systems, the Oregon Solar Industry is now experiencing a little understood and once rarely occurring situation regarding the Oregon Business Energy Tax Credit (BETC). The BETC credits have been available to Oregon businesses for more than 25 years and until recently have been limited to a few solar water heating and commercial swimming pool projects. In the late 90's the rules were changed to add the "Pass-Through" option for Renewables that were such a success for Apartment Owners installing weatherization. This one change opened the door to more markets.

Now with higher energy prices, the ETO and Federal Energy Incentives more businesses are looking at Solar as a good business investment. However the BETC administrative rules fine print stands in the way of the

Oregon Solar Industries success. The 35% BETC credit that so many people think exist as an incentive is just a dream after doing the math laid out by the administrative rules.

A "15 year simple payback" caps solar thermal projects and a "30 year simple payback" caps photovoltaic projects. These artificial "payback" caps turn a 35% BETC credit into a 15% +/- real credit for most thermal water heating projects, a 20-25% +/- real credit for PV projects and solar pool heating is the only consistent technology to hit the maximum allowed limit (but not always).

The talk is now of increasing the BETC from 35% to 50% in the next legislative session. If the BETC credit is increased to 50% (but no changes to the CAP) then we will get more BETC credit, just not as much as if we had only a true 35% BETC with no CAP. Difficult system installations and more expensive prevailing wage rules are not effectively

addressed by a 50% BETC w/ CAP.

The Oregon Solar Industry has identified an impediment to the further deployment of solar in Oregon and it is written into the Administrative Rules of the BETC credit. I suggest all members and interested parties read OAR 330-090-0110 (17)(f)(A) and suggest that the ODOE do away with these requirements for both Solar Thermal and Photovoltaic projects. Solar projects now being rejected by building owners may just turn into Solar Installations, Solar savings and Solar jobs.

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OSEIA's Next Membership Meeting

(Continued from page 2)

pressed interest. If you're interested in an officer position you must be willing to put some extra time in – 2007 will be one of our most busy years to date! Remember, the officers are elected by the board so you need to contact myself or other board members if you're interested. We will definitely need a treasurer and secretary so please let me know if you're interested.

Board members up for election in 2007:

- Bob-O Schultze
- David Parker
- Frank Vignola
- John McIntosh
- Tom Scott

Board members elected in 2006 (up for election in 2008):

- Andrew Koyaanisqatsi
- Bob Maynard
- Christopher Dymond
- Dean Abney
- Don Spiek
- Doug Railton

Current OSEIA Officers are:

- President: John McIntosh, Trout Realty Inc.
- VP Zone 1: Andrew Koyaanisqatsi, Solar Energy Solutions
- VP Zone 2: Bob-O Schultze, Electron Connection
- VP Zone 3: Doug Railton, Cascade Sun Works
- Secretary: Christopher Dymond, ODOE
- Treasurer: Diggy Breiling, FPD Solutions

Sunlight Solar Energy, Inc. Goes Ivy League



Protocol. The initiative's goal is to reduce greenhouse gas emissions to 1990 levels by the year 2010 with an additional 10% decrease by 2020. Fisher Hall will serve as the original model of Yale's commitment to innovative green building design on university campuses nationwide.

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(Continued from page 1)

roof at all. Rather, Sunlight Solar combined the system into a uniform grid by utilizing easy-to-install pre-mounted flat roof brackets, mounted on base rails.

In addition, there are four streetlights that line the sidewalk in front of Fisher Hall. Each is equipped with its own Sharp 80-watt polycrystalline solar panel and a battery to run the lights at

night even if there is no sunshine for 3-5 days. The LED streetlamps are holistically energy efficient and help to reduce light pollution on campus.

This project is in response to the Climate Change Action Plan 2005, a Connecticut state initiative modeled after the Kyoto



Federal Tax Credit Extension Passes Congress

by Noah Kaye—SEIA

December 8, 2006, the Senate approved the "Tax Relief and Health Care Act of 2006" (H.R. 6111) by a vote of 79-9, thus clearing the measure for President Bush's signature. This bill contains a 1-year extension of both the residential and commercial solar investment tax credits (through 2008). The President will sign the bill next week. This is a huge victory for SEIA and positions us perfectly for a long term extension and expansion in 2007.

The new bill does not modify the residential solar credit or make

other substantive changes, although it substitutes the term "solar electric" for "photovoltaic" on the residential credit. The bill also includes a one-year extension of the federal R&D tax credit and an additional \$400 million for the Clean Renewable Energy Bonds through 2008. Again, these are the solar provisions:

Residential Solar Tax Credit: Extends a 30-percent tax credit, created in the Energy Policy Act of 2005, for the purchase of residential solar water heating, photovoltaic equipment, and fuel

cell property. Substitutes the term "solar electric" for "photovoltaic." Expires after December 31, 2008.

Business Solar Tax Credit and Fuel Cell Tax Credit: Extends a 30-percent business credit, established in the Energy Policy Act of 2005, for the purchase of fuel cell power plants, solar energy property, and fiber-optic property used to illuminate the inside of a structure. After December 31, 2008, the credit reverts to a permanent 10-percent level.

OSEIA 2006 Year Review

OSEIA Members,

2006 has been a very good year with many unexpected but great results for Oregon's solar industry. When we started the year I expected a relatively easy year spent wrapping up projects and preparing for a busy 2007 legislative session. I was wrong and it reflects the changes seen across the industry worldwide. There will no longer be any 'slow' years for the solar industry. OSEIA needs to recognize this and we need to prepare for the fast paced actions that will be crucial for continued success.

In 2006 we held our first Northwest Solar Expo with very welcome and successful results. Over 2000 people came together to learn about and to see how to implement solar and efficiency measures into their homes and businesses. We received universal positive responses from the event and are busily planning for the 2007 NW Solar Expo. I would like to thank the committee chair, Doug Railton, and all of the committee and OSEIA members for the work they put in to make this event a success. If you're interested in the 2007 expo committee contact me.

A major shift in policy to address an Oregon RPS created additional work. I've attended all of the governors Renewable Energy Working Group meetings and the additional Community Renewables sub-committee to provide input from the solar industry. It has been a long process but the drafts are out for the RPS and accompanying legislation. I encourage you to look at the drafts and offer feedback. We will need a great deal of support from all members in 2007 to make sure we get good legislation passed.

There are several bills that could dramatically impact your bottom line.

Net metering and interconnection standards were initiated by the Oregon PUC for investor owned utilities. We have provided comments at all of these meetings. It looks like we will get positive results for both interconnection and net metering rules. The results will be final in 2007.

OSEIA finished the Solar Construction Safety Manual under a grant from OSHA. The manual is free for download on our Website at: www.oseia.org/solar_safety_training.htm. The manual is intended to be useful to both employers and employees. I encourage you to download the manual and use it for employee training. If you have questions on the manual just let me know.

We also hired a new employee this year. Matt Simmons is the new Renewable Energy Apprenticeship Program Administrator. Matt oversees the RE apprentice programs and has been whipping them into shape. The programs are seeing increased demand and lots of positive changes are on their way. Matt can be reached at: mattsimmons@oseia.org.

There were many other events that occurred for OSEIA in 2006. I've included the highlights below. OSEIA:

- Held the inaugural Northwest Solar Expo in Portland
- Completed the Solar Construction Safety manual under the OSHA grant
- Offered technical training workshops at member meetings and the solar expo
- Provided solar industry input on:
- The Energy Trust of Oregon

Renewable Advisory Committee

- The governors Renewable Energy Working Group
- The OPUC Net metering process
- The OPUC Interconnection standard process
- Hired new administrator for RE apprentice programs
- Received the ETO 2006 Green Future Award in recognition of OSEIA's contribution toward developing Oregon's solar economy
- Moved into a new office space at 833 SE Main ST, Portland
- Increased our marketing, development, and outreach efforts by:
- Attending and speaking at other events:
- Workforce development workshop
- SEIA national conference
- Local conferences
- Updating our OSEIA website (check it out: www.oseia.org)
- Teaming with Get Benefits to offer health care insurance to members

Overall it's been a very busy and good year for OSEIA. I know that all of you have been very busy as well. Oregon's solar hot water industry is growing fast and the PV industry has really taken off. Oregon will have installed around 300 solar hot water and pool heating systems this year and over 700kw of PV. We are seeing more full time jobs opening up and new businesses join OSEIA. Thanks to all of the work you are doing!

I wish all of you the best during the holiday season.

Warm Regards,

Jon



Sweet Life Pâtisserie

by David Parker—Advanced Energy Systems

“Sweet Life Pâtisserie is a pastry shop located at 755 Monroe St. in Eugene, Oregon. We specialize in all that is sweet including morning pastries, cakes and cheese-cakes, pies, wedding cakes, brownies, tartlets, Éclairs, cream puffs, petits fours, cookies, chocolates, gelato and sorbetto. We also have a full organic espresso and tea bar with over 30 tea varieties. We try to tread as lightly as possible on the earth by using as many organic ingredients as possible, recycling and composting, and more recently installing our lovely new solar panels.”
Catherine and Cheryl Reinhart, owners of Sweet Life Pâtisserie

In October 2006 Sweet Life installed 2 Solar Electric and 2 Solar Water Heating systems on their two buildings. Together, the systems comprise 20 KW of PV and 4 KW of Thermal, for a

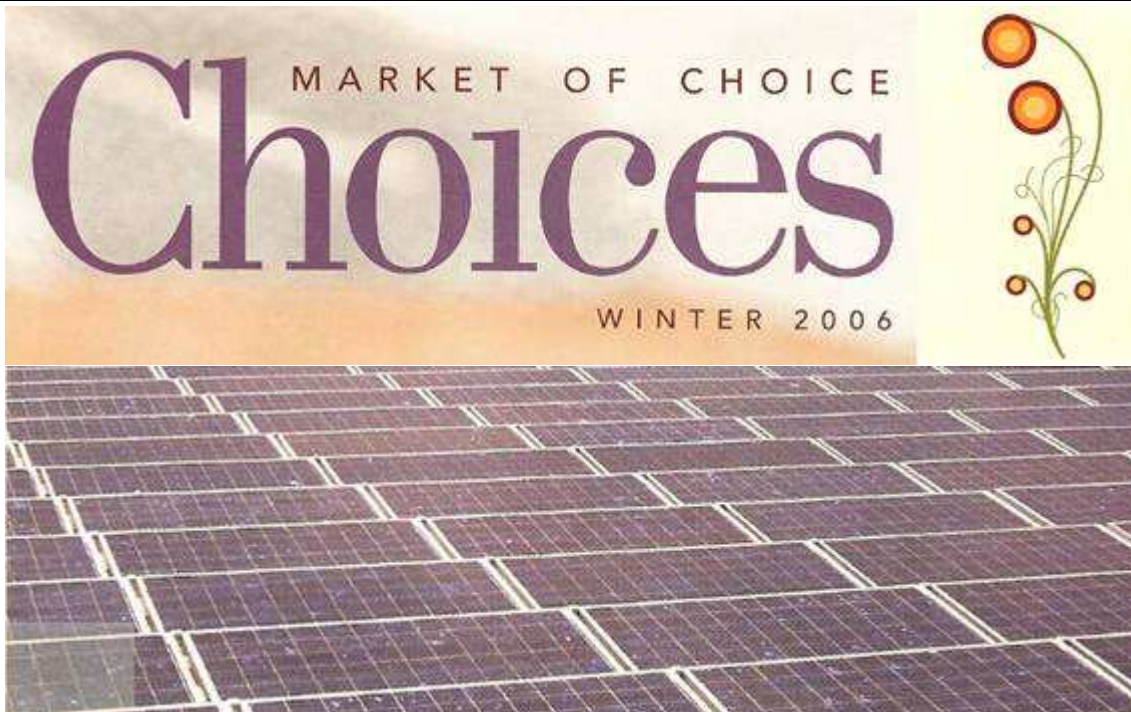
grand total of 24 KW of solar generation.

The Pâtisserie system features the first installation in the Pacific Northwest of roof-integrated Solarsave modules! This 10.8 KW System has (24) SP-450 Watt modules installed on a new single-ply membrane roof. There are three strings of 8 modules each supplying power to three SMA SP-3300 positive ground inverters. The solar water heating system is comprised of 2 Sun Earth EC-32 collectors and a Rheem 80 gallon heat exchanger solar tank. The Solar Water Heater is a closed loop anti-freeze system and supplies pre-heated water for dish washing.

The Bakery system features 9 KW of Sharp 180 watt modules. These modules are installed on Uni-Rac tilt racks @20° facing south. The roof penetrations for

the tilt racks were sealed with foam and booted with single ply membrane material. There are three sub-arrays of PV modules supplying power to three Xantrex GT3.0 inverters. The three inverters are combined in a inverter sub-panel before connecting to EWEB's grid. The solar water heating system is comprised of 2 Sun Earth EC-32 collectors and a Rheem 80 gallon heat exchanger solar tank. The Solar Water Heater is also a closed loop anti-freeze system and supplies pre-heated water to the kitchen.

Both solar electric systems include green tag meters that record the combined amount of power generated. These green tags have been purchased by a Green Tag aggregator.



Market of Choice

by David Parker—Advanced Energy Systems

When the new Market of Choice opens on Willamette in December, the lights will be powered by solar panels on its roof. “We had a huge flat roof, so we decided to tap into the sun’s energy for all the store’s lights,” said Rick Wright, president of Market of Choice.

Custom designed by Eugene’s Advanced Energy System (AES), the 31 Kilowatt photovoltaic system (PV) covers 5,000 square feet and includes 176 Sharp solar modules tilted at 20 degrees to the south. The modules are installed on a non-penetrating rack system above the new TPO membrane roof.

The system’s output data is monitored and stored on a state-of-the-art web-based system with live information provided 24/7. Customers will be able to see how much energy is generated on a flat panel screen at the front of the store.

They can also track the amount of green house gases that were not created as a result of the system.

“Some companies buy Green Tags rather than investing in construction that incorporates environmental features,” Wright said. “We want our building to showcase sustainable practices that minimize environmental

impacts. That visibility also serves to educate people about what’s possible. Just buying credits doesn’t involve us and our customers in observing the impact of our solar collectors on the earth.”

“Solar electric systems today generate a new way of living with clean, renewable energy” said AES President, David Parker. “As a frontrunner with this state-of-the-art technology, Market of Choice is contributing to Oregon’s sustainable future.”



Random Notes: 45% consider Global Warming a “very serious” problem while another 28% say it is “somewhat serious”. Forty-six percent (46%) of American voters believe that Global Warming is caused primarily by human activities. Thirty-five percent (35%) say it is the result of long-term planetary trends. Eight percent (8%) say there is some other cause while 11% are not sure. Thanks Scott Sklar

Affects of Tilt and Orientation

by Frank Vignola

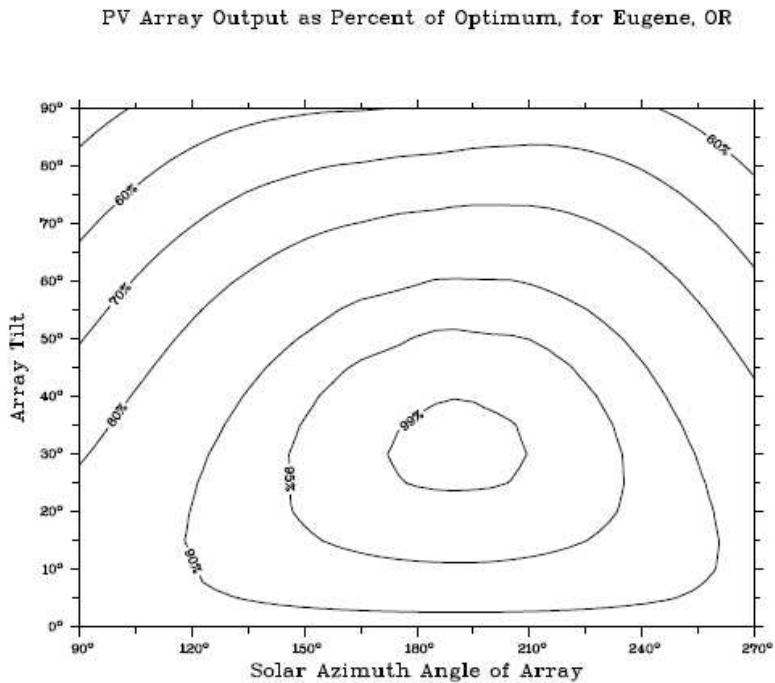


Fig. 1: Contour plots of PV system output verse tilt and orientation are now available on the UO Solar Radiation Monitoring Laboratory's Website at <http://solardata.uoregon.edu/SelectContourPlot.html>. An example of the plots is shown to the left. The horizontal or x-axis is the azimuthal orientation of the array with 180° being due south and 90° facing east. The vertical or y-axis is the tilt of the array. For Eugene, an array that is facing within 40° of due south and tilted between 15° and 45° produces at least 95% of the annual electricity as an optimally tilted array. Note that arrays in Eugene facing slightly west produce slightly more electricity that arrays facing slightly east. This is likely the result of morning fog.

The University of Oregon Solar Radiation Monitoring Laboratory (UO SRML) is beginning to put information developed for the Energy Trust of Oregon on its Website under Photovoltaic Data at <http://solardata.uoregon.edu/Photovoltaics.html>. These files include the shade analysis forms developed for ETO as well as contour plots showing the effects of tilt and orientation on system performance. An example of the plot is shown in the figure above.

These contour plots are available for Astoria, Burns, Eugene, Medford, North Bend, Pendleton, Portland, Redman, and Salem. In general, plots for sites west of the Cascades are similar and plots for sites east of the Cascades are similar. Medford plots tends to fall in between the two areas.

These plots show minimal performance loss when orienting a

photovoltaic system in an esthetic manner instead of trying to obtain the optimal output. Most systems mounted on a roof in a generally southerly direction produce at least 90% of the output of an optimally oriented system. Orienting a system within 30° of due south and having a tilt between 10° and 45° will provide 95% of the optimum system output for Eugene. Of course checking the contour map for the location of interest will give one a better idea of how a will perform compared.

The contour orientation plot shown in Fig. 1 above is sometimes hard to use because some builders think of roof slopes in other terms. Builders generally describe a roof in terms of a vertical rise for a given horizontal distance. For example, a 4/12 roof means that the roof goes up 4

feet for every 12 feet in horizontal distance. Solar installers often think of collector tilts in degrees. Table 1 give a few examples of common roofs and the corresponding angles. For example a 4/12 roof has a slope of 18.5°. Therefore if you are more familiar with the builder terminology, you can use Table 1 to translate the slopes in degrees to the more standard terminology.

Table 1: Roof slope verses roof pitch

Roof pitch	Roof slope
3/12	14°
4/12	18.5°
5/12	22.5°
7/12	30°
12/12	45°

GroSolar Acquires Energy Outfitters



(Continued from page 1)

Energy Outfitters has been dedicated to growing the renewable energy industry.

Wolfe said the cultural fit between the two companies is seamless and should enable combined operations to move ahead without the typical integration delays. With five main points of distribution throughout North America, groSolar is now positioned to

serve all customers in any market quickly and effectively. This wide base of operations makes groSolar the first true North American solar distributor. groSolar distributes solar hot water and solar air heating systems in addition to solar electric systems, providing a wider product base than other distributors.

According to Wolfe, groSolar will continue to use the Energy Outfitters brand in their existing market areas, slowly transitioning to the groSolar brand nationally. "Energy Outfitters customers will see a continuation of the strong service culture, which will grow even stronger as we incorporate groSolar's proven value added distribution expertise," Wolfe said.

About GRO

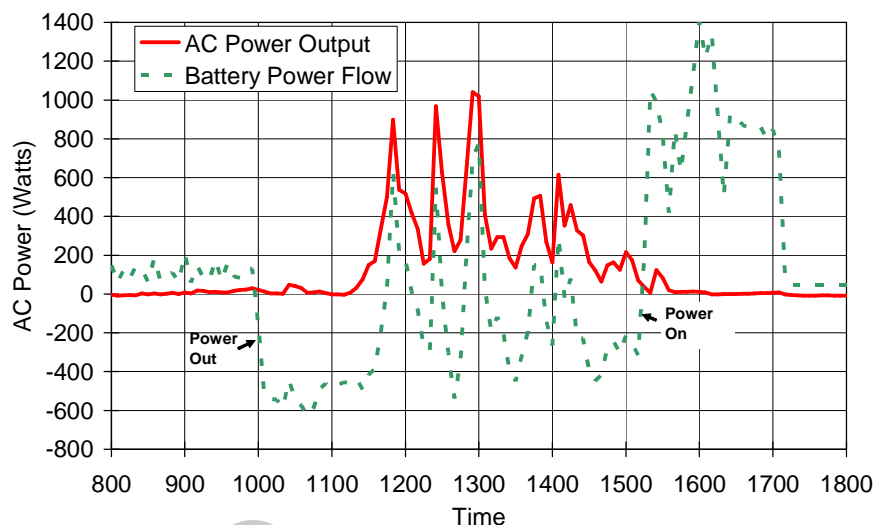
GRO is a national solar inte-

gration firm focused on designing, distributing and installing high quality energy systems. GRO distributes solar electric, solar hot water and air heating systems throughout North America from offices in VT, NJ, NY, MA, CO, OR, Alberta and Ontario. The company recently changed its name from Global Resource Options to GRO. GRO integrates components from leading solar manufacturers including Evergreen Solar, Suntech Power, Heliodyne, Outback, SMA, Magnetek, Gridpoint and UniRac into elegant solar energy systems for its customers that generate clean, reliable energy for decades. groSolar was also recently recognized as one of the best places to work in Vermont by *Vermont Business Magazine*. For information, contact Kevin Ellis 1-800-498-5390 or Sue Lewis at 1-800-374-4494. www.groSolar.com.

Grid-tied with Battery Backup

The plot to the right shows what happens when the power goes out with a grid tied system with battery backup. This system uses an Advance Energy 5000 inverter. The power went out about 10:00 am on December 11 and the battery started supplying power to the house. The sun came out around 11:30 am and the system charged the battery on and off during the day. Power came back after 15:00 and recharged the batteries until they were fully charged around 17:00. Data can be downloaded from <http://solardata.uoregon.edu/SelectArchival.html>.

Cannon Beach, OR -- Power Outage -- December 11, 2006



Pakistan—FATA Area Solar Pumping Project

Implementation Stage

Report by: Walt Ratterman—SunEnergy Power International

In late 2005, Solar Energy International and the National University of Sciences and Technology were jointly awarded a USAID project to provide solar pumping systems for drinking water supplies in 6 villages of the FATA area in the Northwest Frontier Province of Pakistan. (NWFP).

To initiate this project, SEI conducted a training in Photovoltaic Systems and Solar Pumping Systems in April and May of 2006.

NUST then proceeded to finalize the locations of the candidate villages, and to design and procure the equipment required for the systems.

This equipment arrived in Pakistan in October of 2006, and in early November SEI returned to Pakistan to work side by side with NUST on the first two village installations, thus continuing the hands-on portion of the training, on site. This implementation training took place between November 6th and November 20th, 2006.

Work Preliminary to Implementation

After NUST received the primary equipment at their location in Islamabad, they proceeded immediately to test the equipment and then to order all of the required auxiliary equipment. (cables, pipe, fittings, racks, connectors, etc.)

Every panel was tested with its Open Circuit Voltage and Short Circuit Currents being measured and compared to the ratings (adjusted for available sunlight at the time.) The panels were also arranged in strings of five panels, as they would be in the final installation, to test the string voltages and currents.

Each pump was connected to the 1,000 watt array (two strings of 5 – 100 Wp panels) to check that the pump functioned, and that the rotation was correct. Output piping was installed at a height that was able to simulate the TDH at some of the lower elevation sites.

Village Name	Population	TDH (m)	Gallons per Day	Pipe Length (Meters)
Hassan Lagadai, Tehsil Jamrud, Khyber Agency	285	108	1875	300
Toda Cheena, Tehsil Lower Kurram, Kurram Agency	500	61	3553	370
Khurhchai, Tehsil Mamund, Bajaur Agency	630	50	4145	55
Shabana, Tehsil Ghalanay, Mohmand Agency	271	98	2139	219
Ali Masjid, Tehsil Jamrud, Khyber Agency	430	60	3395	450
Midu Tang	320	110	3600	400

No problems were identified with either the panels or the pumps.

The next step, prior to leaving for the villages, was to list and then procure all of the materials required to complete the installation. This includes conduit, wire, connections, piping, fittings, and a large assortment of various hardware and mounting equipment. After SEI and NUST compared notes on the required material items, the crew proceeded to go around to the various markets and procure all of the items, hire a big truck, and deliver the equipment to our partner NGO, CMDO, in Peshawar – the capital of the NWFP.

Scope of Project

There are six village systems included in this project for implementation in 2006. The table below lists the pertinent information for five of these six villages. The sixth village, not listed, is Mirdu Tang.

The joint SEI / NUST implementation stage would take place in two of these villages. NUST and CMDO chose the two villages located in Khyber Agency. This was a consideration made because of their proximity to Peshawar (within 1.5 hours of travel), to facilitate logistics. We had anticipated including Khurchai in the Bajaur Agency, as it is also fairly close to Peshawar, but the recent bombing of the Madrassah there (about 3 km from the village) influenced the decision to focus on the

Khyber Agency villages first.

With two of the villages having Total Dynamic Head calculations of approximately 100 meters (over 300 feet), and total delivery pipe lengths of over 1000 feet, these projects would indeed prove to be challenging solar pumping installations. The rugged terrain between the pumping locations and the tank locations, one of the reasons for doing the project in the first place, was impressive.

Implementation Work

On Monday, November 13, we had completed the testing, and the purchasing of all of the equipment and the truck with the supplies was sent on its way to Peshawar. We got our crew together in two vehicles and headed likewise for Peshawar, arriving there in the afternoon.

We had loaded all of the equipment that we had for all of the villages into 1 big truck. So, we had the truck stop first at CMDO's office, and off-load all of the supplies in a warehouse area that CMDO has set aside for this project. Then, we chose the equipment that would be needed for the two villages in the Khyber Agency, and loaded them back on the truck, which then left that evening for the villages to offload the equipment there. (The villages were close enough, that one staging area was used for both of the two sites..)

On Tuesday morning, we left for the

(Continued on page 11)

Solar Energy International, and Pakistan's National University of Sciences and Technology

(Continued from page 10)

sites to start the actual work. Due to the security in the area, and the fact that I am a foreigner, we were required by tribal regulations to stop every morning at the Khyber Rifle guard post in Peshawar and pick up a guard who had to stay with us at all times. This required a good bit of preliminary planning on the part of CMDO, which they were thankfully able to take care of quite efficiently. The rules were that we always had to be back out of the tribal area by sun-down. (No one really said what time sun-down was, so sometimes sun-down was fairly dark...)

So, on Tuesday, we were able to assure that all of the equipment was at the two sites, and start the installation of the racks that would hold the solar panels. Also on Tuesday, we double checked all of the previous data that had been gathered regarding the depth of the water in the well, and the height of the tank relative to the water depth. That evening, we double and triple checked the calculations and the pump selection, and cable selections to be sure that we were making a proper installation. This checking was used as a training as well.

It took us all day Wednesday to get the excavation work and concrete mixing and pouring done to fix the racks for the 20 panels. This was quite a bit of work, and we expected that this might take two days, so we were fortunate to get it all done on Wednesday. Now we could start the installation of the panels on Thursday.

During Thursday, Friday, and Saturday, we proceeded with the installation in the following order.

- The villagers took the coils of 1.25" PE pipe and rolled it out from the well locations to the tank locations, and proceeded to dig the ditch for the piping (as well as the cabling to the float switch at the tank.)

- The installation crew, comprised of villagers, CMDO, NUST, SEI, and other folks who wanted to chip in, continued with the installation of the solar panels.

- After the solar panels were bolted into the racks, the interconnection wiring could proceed, along with the wiring between the panels and the controller locations.

- Walls had to be built at each of the pump locations to hold the pump controller board and junction boxes. This work was done by the villagers.

It was Saturday when we were ready to make the down-hole assemblies for the piping and the wiring in the wells. This included assembling all of the 1.25" piping along with the safety cable, the power cable, and low water probe cable into one group, making the submersible wiring connections, and lowering the assembly into the hole, fixing it at the top by the drop pipe, and fastening the safety cable as well.

We decided to include a manifold assembly at each location which consisted of two valves, and a "T" fitting. This would allow us to (a) test the pump at the well location without having to climb up the hill or look for waving hands to see if water is coming out, and (b) would provide an auxiliary water point for people who might need water at the well location. This assembly also provides a maintenance factor to be able to turn off the valve directing water up the hill, so if the pump has to be removed, we don't have to remove all of the water in the pipe first.

On Saturday, when we installed the pump, there was very little sun. We didn't expect anything to pump, so we decided to leave the pump controller on, and the valve open at the first site, when we drove over to the second site. As we were climbing into the truck to move over to the second site, we heard a bunch of shouting, and pointing at the ground where we had installed the T. Even with the limited sun (barely enough to cast a shadow) the pump system was pumping water up the 70 feet of drop pipe to the ground level. This was of course quite encouraging, as the force with which the water was pumping with al-

most no sun, was a good sign of what it could do with proper sun.

For the rest of Saturday, we completed the pump installation at the second village. I had to make it all the way back to Islamabad for my flight out to the States, so Saeed and I left the sites at about 2:30 p.m. The others stayed and completed the installations at both sites except for the joining of all of the pipe sections going up the hills to the tank locations. The others remained in Peshawar Saturday night, and returned on Sunday to complete this work.

After taking one week to catch up in the office with other responsibilities, the team is preparing to head back out to FATA to complete the next two installations in the first week of December.

This was a terrific hands-on training, and culmination of the program that started back in April with the classroom training program. By the end of the year, we expect that another couple of thousand residents of FATA will now have access to clean drinking water, at the location of their villages, which was only a dream a few months ago.

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Completed project & class

SolWest 2007

by Jennifer Barker

“Your energy, your food, and your money” is the theme of the ninth annual SolWest Renewable Energy Fair July 27-29, 2007 at the Grant County Fairgrounds in John Day, OR. Admission includes over 50 free workshops on both off-grid and grid-intertied renewable energy (RE) and sustainable living topics. Fifty exhibitors show tools for energy independence and lifestyle self-reliance, including solar, wind and agricultural resources. Keynote speaker Deborah Lindsay emphasizes the connections between community and power. An Electrathon race highlights efficient, lightweight vehicle technology. Cost is \$5 per adult per day, with weekend, youth, and senior discounts, volunteers and children under 12 free. Camping is available (free for volunteers).



For more information contact:

Collogue of exhibits at SolWest

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