

SUMMER 2013

THE MAINE SUN

NEWSLETTER of the Maine Solar Energy Association



The April MESEA PV Course

By Richard Komp

This last April we had the third of our series of week-long courses at our "Solar Center," Richard Komp's home in Jonesport. The program started with a free seminar on Friday the 12th of April, followed by a weekend PV workshop where seven participants made solar cell phone chargers. We encapsulated one of the bigger 20 watt "kiosk" model cell phone chargers in the gas stove oven. The temperature was hard to control so the EVA got a bit over-cooked but the module, which will recharge up to three cell phones at one time, worked perfectly.

Four of the participants stayed on for the solar course the rest of the week. This course also included solar thermal instruction and we rebuilt an older solar oven, double glazing it to increase the efficiency and the maximum cooking temperature. We also went on a field trip to Machias and Jasper Beach to collect jasper stones.



Gluing in the second layer of plastic film to double glaze the older solar oven we rebuilt.

The oven now gets to 300°F and I used it the other day to cook a very nice chicken stew. We also studied solar air and water heaters and solar food driers. (*All in the Maine Solar Primer*) In the second weekend PV workshop we made more small PV solar battery chargers and cell phone chargers. We cooked a second Kiosk model solar cell phone charger on top of my wood stove, where it is actually easier to control the temperature than it was with the gas oven. The second Kiosk module came out perfectly. We also put together a PV system to run an emergency communication radio for one of the students.

Floating Offshore Maine Wind Turbine

By James Montgomery-RenewableEnergyWorld.com

Today marks a milestone for offshore wind energy in the U.S. with the official launch of a prototype floating turbine off the Maine coast, the first grid-connected offshore wind turbine deployed off the coast of North America. The 1/8-scale prototype VolturnUS, a 65-foot-high 20-kW turbine, will spend the summer being "de-risked" off the coast near Castine. Maine Senator Susan M. Collins did the honors, with a (scored) bottle of Madeira

The project, backed the DeepCWind Consortium with the U. of Maine's Advanced Structures and Composites Center and roughly 30 partners from government, academia, and industry, is one of seven offshore wind demonstration projects backed by the Department of Energy, and one of two being pursued in Maine, all exploring different technologies and strategies to lower the costs and complexities involved with offshore wind development. This particular project will focus on a semi-submersible platform, with a concrete hull and lightweight composite materials instead of steel. It also includes a buoy-based floating LIDAR system to measure wind resources and other metocean factors up to 600 ft. above the surface.

Once proven out, this 1:8 pilot-scale turbine (the original plan proposed two 1:3-scale turbine systems) will be scaled up to 6-MW turbine with 423-ft-diameter rotors and deployed in 300-500 foot depths 12 nautical miles offshore near the island of Monhegan. The grand plan is for a 12 MW, \$96 million pilot farm dubbed "Aqua Ventus" with berths for several large-scale turbines, to be grid-connected in 2016.

The DoE's Wind Powering America initiative calculates more than 4,000 GW of offshore wind energy resource potential. Maine has an estimated 156 GW of potential offshore wind capacity and a target of 5 GW of offshore wind deployments by 2030.

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MESEA Website www.mainesolar.org



The Maine Sun

Newsletter of the Maine Solar Energy Association

The Maine Sun is published four times a year by the Maine Solar Energy Association (MeSEA), a non-profit organization (sister chapter to the North East Sustainable Energy Association).

Our Mission:

We are dedicated to promoting the public awareness and use of:

- solar energy
- energy conservation
- other renewable non-polluting energy sources
- environmental and health awareness building practices throughout the state of Maine

Opinions expressed by authors or editors do not necessarily reflect the views of MeSEA. The publisher reserves the right to refuse advertising which is not consistent with the goals of this organization. Acceptance of advertising does not constitute endorsement of the advertiser, its products or services.

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Calendar of Events

MESEA Website WWW.mainesolar.org

Portable PV Trailer Assembly workshop

Jonesport, Maine, 12-14 July, 2013 8:30 AM – 4:30 PM

MESEA will provide a three day assembly workshop, for ASES Chapters, NESEA Chapters and the general public, for the hands-on experience of assembling a *Disaster Ready Portable PV Trailer*, designed to provide electrical power for a limited number of days, for an affected population, after a hurricane, tornado or other natural disaster. MESEA will choose re-cycled, donated and locally available materials and supplies, for this project. The outcome will allow the participants the chance to utilize their experience with other groups in other areas of the country, and assemble duplicate PV trailers, where needed. This project is aimed to get the participants from other ASES chapters around the country involved with the efforts, by making an instructional video, so inexperienced folks will easily accomplish the task.

The solar trailer will be available to rent for outdoor events like fairs and concerts for groups who wish to be as green as possible in their events.

Fee: \$75 per day, \$125 for two days, \$175 for the entire workshop, including lunches. Sleeping space is available for \$30 a day, including breakfast.

Information and Reservations: Rich Komp 207-497-2204, sunwatt@juno.com
Or John Burke 516-674-9090, dadsolar@yahoo.com

PV Workshop in Boston Come learn how to build a Solar Photovoltaic (PV) Module for yourself, your favorite non-profit or other group.

The Green Neighbors Education Committee, Inc. is bringing world renowned solar expert, scientist, inventor and teacher, Dr. Richard Komp to Boston for a two-day solar panel workshop. We will build actual solar panels in this workshop that will be donated to the Urban Agriculture Institute for their Aquaponics project on Lindsey Street in Dorchester.

Dr. Komp, skyheat.org, will teach his, 'How to Assemble a PV Module in the Jungle' workshop. You will receive complete step-by-step instruction in assembling a working solar panel. This will include his innovative technique of encapsulating the panel with EVA using a pizza oven. These are the skills Dr. Komp teaches while helping develop PV cottage industries all over the globe. Skillsets involved include cutting the PV cells with glass cutters; soldering wires with hot soldering irons; testing electricity production with a multimeter.

For our non-profit and other organized friends, feel free to send a DIY type member/supporter if staff cannot attend.

The Green Neighbors will be bringing Dr. Komp to Monrovia, Liberia to teach his month long PV cottage industry program later this year.

Costs: \$100.00 per attendee

Dates: July 23 and 24, 2013, **Time:** 9:30 AM – 4:30 PM

Location: Unity Sports and Cultural Club, 10 Dunbar Avenue, Codman Square, Dorchester

Class size is limited. We expect a lot of interest in this workshop and so must ask that you pay in advance to secure your seat in the workshop. Seating will be on a first come, first served basis.

For further information and to reserve your seat in the workshop, please feel free to contact Owen Toney at otoney@comcast.net or call (617) 427-6293

MESEA Website WWW.mainesolar.org



ASES Chapter Caucus, Solar 2013

By John Burke

The ASES Annual Conference, Solar 2013, in Baltimore, Maryland, was an eye-opener for the Chapter Reps that attended the Chapter Caucus. Only 12 chapters were represented at this year's caucus. The financial aspects of the National ASES organization, was the main focus. The President, Susan Greene communicated the situation that the board has been dealing with the past few years. With a national conference program that had been set up years ago, and reservations for the conference halls and hotel accommodations based on anticipated attendance, which has been disappointing, to say the least, the national organization has just been able to keep its head above water.

This year, was the last of the board arranged conferences that have helped drain the coffers at ASES. As the newest Chapter, MESEA has an interesting seat at the caucus table, with little to say on the finances since our all volunteer organization, with a small number of members, doesn't have the funding base that would allow us more say on the issue. MESEA has a job ahead of us, to get more local members from Maine, and to promote membership in the national ASES organization.

Seth Masia, the interim ASES Executive Director, has a message for ASES members and potential members ... "As a member, and as an influential voice in your own community and profession, you receive regular communication from your ASES colleagues. You get [SOLAR TODAY](#) Magazine, and you may also have signed up to receive our email bulletins, [Solar@Work](#) and [Solar Citizen](#). You have many opportunities to meet with fellow ASES members, through participation in the [National Solar Tour](#) and in our annual [National Solar Conference](#), and in the activities of the ASES [Technical Divisions](#) and [Chapters](#). Together, these publications and meetings provide the information you need to stay abreast of innovations in energy research and policies, plus tools and practices at the deployment/installation level."

"Now, for ASES to continue in that mission, we need your help. Specifically, we need to expand the reach of our Solar Citizen project, and support existing programs and publications so as to assure their continuation beyond 2013. I am writing because I need you to make a tax-deductible donation to ASES *today*, so that ASES can continue to meet the growing demand for its services. Whether you can afford a donation of \$25, \$50, \$100 or more, I need you to send it to ASES -- *today!*"

MESEA is in the market for new members as well as renewing members. We ask all the readers of our Maine Sun newsletter to understand that we need you to become full members in your state chapter, and to join the national ASES organization, please see the MESEA membership form in this issue, and check the [ases.org](#) site for further info. We at MESEA, know there is interest in solar power in Maine, and we need your participation, thank you.

Solar Thrives in Sunny Maine

By Jane Pulaski, IREC

Dana Doran, Director of Energy Programs at Kennebec Valley Community College (ME), found his way to KVCC in 2007 to head up fundraising efforts for the college. A former high school history teacher and basketball coach, Dana felt KVCC was a good fit for his interest in energy and education. His fundraising skills came in handy; a proposal to the U.S. Department of Energy for [KVCC](#) to offer solar training was successful, and by 2009, KVCC was a northeast regional training provider for solar training. Dana has been a strong, successful voice for solar at KVCC ever since. Solar in Maine, you ask? It's not as much of a stretch as you may think. Always gracious, Dana made time to talk about KVCC's solar activities in Maine.

IREC: It was an auspicious move from being a high school history teacher to leading the solar charge at KVCC. Did you expect DOE to award two regional training providers in the northeast?

DD: Back in 2009, KVCC applied to be a Regional Training Provider to do both PV & solar thermal like the other RTPs. DOE thought it was a good idea to split the northeast region into two—one for solar PV (HVCC), and one for solar thermal—KVCC—a solar two-fer for the northeast region.

IREC: Sounds like those fundraising skills came in handy. You spent a couple of years building out a strong solar thermal reputation and facility.

DD: Yes we did. We built and equipped a first-class solar thermal lab to support our solar heating and cooling hands-on installation training—our 40-hour course for solar thermal instructors from seven states in the Northeast region. In all, we trained 60 instructors from community colleges, career and technical education centers, and apprenticeship programs.

IREC: We know what happened: solar thermal wasn't feeling the love at the federal level. The star of the show was PV, nationally and worldwide. It was all PV, all the time. What did that mean to KVCC?

DD: We had a couple of options. We could take what we had built and move on, or we could collaborate with other partners, IREC and DOE, use our existing resources and the institutional knowledge to augment what was happening with solar PV regionally. We began to think about reinventing ourselves and come into the PV family.

IREC: Things happen for a reason, they say. So what looked like an unhappy ending has turned out rather well.

DD: DOE made a good decision to add more solar capacity in the Northeast. There are plenty of opportunities here in the region that DOE felt it warranted having a second solar provider. We looked at HVCC's model – they partner with some 22 institutions, but that leaves a lot of institutions out there that could use some help.

IREC: KVCC already had a good set up in place for solar heating and cooling. How did you convert that infrastructure into solar PV?

DD: We did have a great infrastructure in place—that's absolutely correct. We had rooftops, classrooms, storage facilities, mock training areas—all perfectly suitable for solar PV. We did need to buy some PV-specific equipment—panels, inverters, and DOE wanted us to have a larger mobile training presence.



Complex Work in Nicaragua – Part 2

Continued from the Spring 2013 Maine Sun

The Grupo Fenix' natural food restaurant in Sabana Grande is right along the Pan American Highway branch that goes to Tegucigalpa, Honduras and is now starting to attract international customers as well as local people who come for lunch when they are working nearby. The biogas generator is fed by the only flush toilets in the area and also attracts people, which keep the biogas coming in an example of positive feedback. The restaurant serves beer and can get a good crowd on evenings when they have live music or set up an event with a good disc jockey.



The Solar Women restaurant with the solar cookers in front

The Solar Women of Totogalpa have plans for more buildings on this site and are following the plans laid out in a charette they had years ago moderated by Dulce, an architecture professor at the Universidad Nacional de Ingeniería (UNI) in Managua. The next building in the program will most likely be a workshop where they can build custom photovoltaic (PV) modules for the customers in the area, as well as for their own use. Even though the Chinese PV modules have gotten so inexpensive it is still possible to compete in cost with them on a cost basis when the cost of shipping to Sabana Grande is calculated in the price.

Portable Solar Cookers

Several years ago Nimia Lopez, a Nicaraguan campesina gave a solar cooker workshop in high Andes in Peru. While the workshop was a great success, the heavy, large solar cookers they built were not able to be shipped to two of the remote villages since they had no roads and were only accessible by old llama trails.

Viana Muller, the head of Whole World Botanicals gave the Grupo Fenix in Nicaragua a \$1000 grant to develop a lightweight, portable solar cooker that could be carried to these and other remote places. I had a dream where the details of the cookers showed up and we had a brainstorming session where the Solar Women contributed ideas. There have now been three slightly different prototypes constructed and we are in the middle of testing them. They use a special hinge I had seen in the dream and are able to fold down to a small 6" tall stack of lightweight 17 pound panels to carry on the back of a llama or in a carry bag by a person.



Nimia (second from right) and the campisinos with the three big, heavy solar ovens built in their workshop in the Andes near Huánuco in Peru.

These prototypes were built by different people or groups to try out slightly different ideas and some of them use materials not available in Nicaragua, but which are available in Lima, Peru. So far, the ovens have both reached more than 150° C (300° F). The solar women are discussing manufacturing the portable solar cooker as one of their standard models and are deciding which ideas to incorporate into this model, and what it will cost to the customer.



Nimia and one of the solar women building one of the portable solar cookers in Sabana Grande.



Testing two of the prototype portable lightweight solar cookers next to two conventional cookers



The Cinco Pinos Solar Workshops

On the first Saturday of February I gave the **Sabado Solar** seminar. This series of seminars on the first Saturday of each month (except January) have been given at the UNI by the Grupo Fenix' **Program Fuentes de Alternativas de Eneria (PFAE)** division for the past 15 years. The topic they usually pick for me is "New Developments in Photovoltaics" and this year the well-attended event included Elmer Zelaya Blandon, who runs a non-profit organization in the Leon area of Nicaragua. He talked me into giving a solar workshop in Cinco Pinos, up in the mountains near the Honduran border above Chontales.

He organized a dinner meeting in Leon with the head of the University of Salzburg in Austria and a preliminary seminar in Cinco Pinos for a large group of visiting Austrian students.



The Austrian students working the sweep arms of a very old sugar mill entirely made from wood (no metal parts of any kind in the mill). "Who needs oxen when you have graduate students?"

The students learned how sugar cane is converted to "dulce" a form of raw sugar made by simply cooking down the cane sap to a thick hot liquid and pouring this into wooden molds to make brick shaped loafs of brown sugar. (I always bring a few pounds back with me from Nicaragua for cooking and giving away.) I gave an advanced seminar on the quantum mechanical physics of photovoltaic cells and we planned a second visit where we would build PV modules. We also checked out the facilities of the off-grid facilities to see how to use them to do the PV workshop. In March we came back to Cinco Pinos and had a two day workshop for sixty people: forty five Nicaraguans and fifteen students from Austria. After I gave the initial PowerPoint seminar to everybody, we split the crowd into two groups of thirty people each and I repeated the hands on workshop twice. Although most of the Austrian students spoke English, I did get to practice and revive my very rusty German.

In the workshop we made both solar cell phone chargers and large 65 watt PV modules which will be used to power remote homes that have no electricity. We used a new method of encapsulating the modules using ethylene-vinyl-acetate (EVA) instead of the expensive room temperature curing silicone we have been using, since the cost of the silicone encapsulant is now \$35 for a single module and more than the current cost of the PV cells. However the EVA PV sandwich has to be heated to 120°C (250°F) for at least ½ hour. We used a pizza oven to successfully

lamine seven of the large PV modules as well as five cell phone chargers. As far as I know, this is the first time anybody has used a Pizza oven to cook a PV module



Teaching how to solder Evergreen Solar cells to make a 65 watt PV module.



Putting the EVA-PV module sandwich in the Pizza oven



– And one of the working 65 watt PV modules we made.

For the complete report go to our www.mainesolar.org webpage. Continued on Page 6



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Mini-Hydroelectric Work

John Webster is a hydroelectric expert from Maine who is a good friend of Susan Kinne. He has set up mini-hydroelectric (a megawatt or more) plants in Nicaragua and came down twice while I was working there. I went with him on his trips this time as a translator, guide and to help him with the technical evaluation of several hydroelectric sites.

On the first trip we visited an existing dam that furnished drinking water to the town of San Rafael del Sur. This dam always has water running over the spillway and we evaluated how much power could be generated by installing a power turbine to use this water to generate electric power from this water flow.



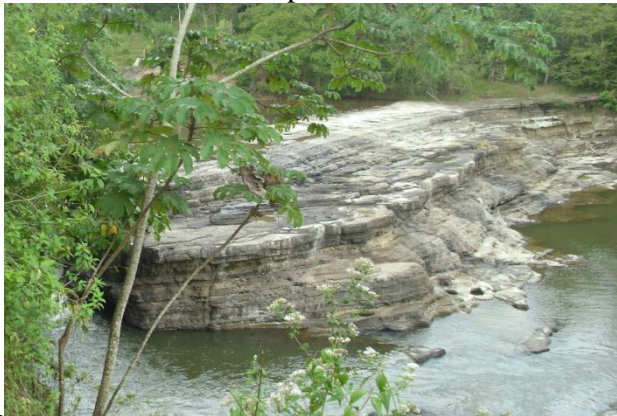
Above the dam and spillway opening



Below the dam, showing the good water flow

John decided that this spot, with a possibility of more than a megawatt of electric power without causing any real change in the local ecology, is a good one to explore for a turbine. We also visited another site on the same first trip but that turned out to be a place where a large irrigation dam from the Somoza Dictatorship era had been washed out by Hurricane Mitch. The area was better off without a dam and the large fields nearby that grew cotton for the US Army, had gone back to forest and were better left alone.

On our second trip in February, we visited a site I had noticed when we went to the area in Chantales near where we installed the PV system for the cell phone tower. We asked around and found out where the mini-hydroelectric plant was located. . It actually didn't have a dam but simply had a diverting weir to take some of the water from the top of a waterfall and run it in a small canal to the power plant



The waterfall with the diverter wall at the top The power plant building with the wall pushed in.

A large deluge had caused the river to overflow its bank and push in the wall and the owners plan to fix it, so John abandoned this site. We also visited a couple of other sites that were possibilities and one of them might be a useful demonstration project in a natural reserve, to power the reserve's buildings..



New PV-Thermal Hybrid Solar Collector

In late April IBM announced a new partnership with Airlight energy, ETH Zurich and Interstate University of Applied Sciences Buchs NTV. The group won a US\$2.4 million grant from the Swiss Commission for Technology and Innovation to develop a low-cost high-concentration photovoltaic thermal (HCPVT) system.

The system uses mirrors to concentrate the sun 2000 times. According to Bruno Michel, manager of advanced thermal packaging at IBM Research in Zurich, the system is built on trackers that are made from low-cost molded concrete for the "lowest base cost possible". A parabolic dish made from mirrors is mounted on the tracking system, which reflects the sun's rays onto several microchannel liquid-cooled receivers that contain hundreds of triple-junction PV cells, which amount to 25 kW of capacity.

Beneath the cells, a liquid composed of antifreeze and corrosion deterrent is piped mere centimetres behind the cells to absorb heat, which is enough to also drive a water desalination process. The coolant maintains the cells at almost the same temperature for a solar concentration of 2000 times, and can keep them at safe temperatures up to a concentration of 5000 times.

"We reach a 25 percent system-level electrical efficiency (and about 30 percent chip level efficiency) with a PV junction temperature of 100-105°C and a coolant temperature of 90°C," explained Michel. "The overall recovery efficiency is 80-85 percent. We lose (less than) 15 percent in the primary optics.

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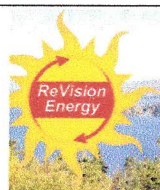
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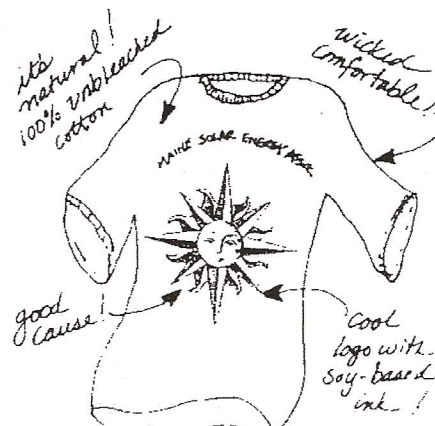
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