

SPRING 2012

# THE MAINE SUN

NEWSLETTER of the Maine Solar Energy Association



## Workshops Maine and Elsewhere

By John Burke

### MeSEA PV workshop in Manhattan Mar 9 & 16 2012

This is the fourth year of PV workshops with MeSEA and Manhattan Comprehensive High School, NYC. Again, a diverse group of 25 students from Africa, Asia, Central & South America and the Caribbean, met with John Burke, a MeSEA learning facilitator, and assembled two 60W PV modules, using the liquid silicon encapsulation method developed by Marco Antonio, of the Grupo Fenix in Managua, Nicaragua. Earlier they had made a 32 watt module by cutting broken pieces of PV cells, using a diamond cutting wheel. We discussed the new “solar oven” and EVA sheet method now being developed in the developing world, to hold the over-all costs down.

This two day workshop, sponsored by CDI and Solar1, of New York City, will produce the PV modules for use in a greenhouse, for lighting and air movement, in a community supported agriculture project at a NYC area “green space”. We also looked at the “compost tea” aerator, assembled last March with the Manhattan Comprehensive High School student group. We look forward to a continued relationship with the class and instructors. This is the 21<sup>st</sup> year of the High School program at the school.

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Students at a Manhattan Comprehensive PV workshop showing the 32 watt module they made using broken pieces of Evergreen Solar cells.

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## Solar Work in Honduras - 2012

By Richard Komp

It has been twelve years since the last time I had been working in Honduras and Honduras has been through a lot since then but when Jean Arnold of the Falls Brook Centre in Canada asked me to help restart a project they have been working on with the Garifonos people in northern Honduras, I said that I would help. The project is to bring solar electricity to this group of people who live in the Cuero y Salado Reserve right on the Caribbean near La Ceiba, that was on land owned by Dole and is still used by them as a coconut plantation. Actually, Dole seems to own just about everything in the area, including the politicians.

Earlier, in 2011 two Falls Brook interns worked at the reserve and built a 65 watt PV module using the techniques I taught them last June at a solar workshop I taught at the Falls Brook Centre in New Brunswick, Canada. They had installed this one module but got no further in the project before they went back to Canada. While I was in Sabana Grande, Nicaragua giving solar seminars to a semester abroad group of college students from the US, I talked with young Mauro Perez about his coming with me to Honduras to continue this work. He was very excited about the possibility so we arranged to go in late February of this year.

Since I was already in Sabana Grande when it came time to start the trip, Mauro arranged a taxi driver friend to take us in his taxi all the way to the Honduran border at Los Manos, to save time. The taxi driver was going to work in Ocotal anyway so he only charged 300 Cordobas (about \$14 Dollars) for the hour long ride early in the morning. We had no problems at all crossing the border and nobody even asked us what was in our luggage. I had been worried about that since I had a box of 500 Evergreen Solar cells and a gallon bucket of the two part silicone resin, plus lots of other parts and tools but we simply walked across the border, stopping at the immigration windows in Nicaragua and Honduras to fill out simple forms and paying a couple of bucks US for the visa fees.

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## **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

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## **Calendar of Events**

**MeSEA Website [WWW.mainesolar.org](http://WWW.mainesolar.org)**

### **PV Workshops in Jonesport, Maine – April 13-22**

#### **A week at the Solar Home of Dr. Richard Komp, in Jonesport,**

Fri., April 13 thru Sun., April 22, including two weekend PV assembly workshops presented by experienced MeSEA trainers.

**Location** -17 Rockwell Rd, SE, Jonesport, ME 04649

You are invited to attend one day session (Sat or Sun) - **\$75.** Or...

Two day extended session (Sat & Sun)- **\$125.** Or..Full TEN day intensive program - **\$475.** (All noon meals included each day). Limited space is available for overnight stay, or longer, (additional fee required). We plan to keep the number of participants to 12 per day.

**Call to reserve space and arrange for \$50. Dep: 207-546-1639 or 516-669-2442 or 207-497-2204**

***Full workshop fee balance is due upon arrival in April, thanks.***

#### **Solar PV assembly Program: (2-day weekend sessions, Sat & Sun, –**

**April 14 - 15, and April 21 - 22),** This workshop will allow participants to experience the full assembly procedures, used by Dr. Komp in the developing world “PV Cottage Industry” programs using both liquid silicon and the new cottage EVA encapsulation. The first day will focus on the first half of PV assembly and encapsulation, the second will include information on PV systems and new developments in the PV industry.

***The 60W PV modules we assemble will be available for sale to participants, to raise funds for work in developing world!***

**How to start a PV "Cottage Industry",** Free Fri, lecture, Power-point, Apr 13 & 20, 7 – 9 pm. Developing world methods – with hands-on experience for all participants, includes step by step PV assembly process. Presented by Richard Komp.

**Full TEN day program** (Apr 13-22), includes 2 PV assembly sessions, as well as Fri. lectures / power-point sessions and solar thermal rebuild... Plus Earth Day focus!

**How to rebuild a solar Hot-Air collector!** This session, during the week, (Apr 16-19), will allow participants, hands-on experience, with the rebuilding of 2 thermosiphon hot-air collectors built into Rich Komp's solar home, including a seminal on passive solar architecture.

#### **How to combat Climate Change and Global Warming! An Earth Day celebration!**

Sat, April 21, learn how to work with local groups, in your community, to raise awareness of this climate crisis, we can all help to avoid the biggest effects and live with the others.

### **18<sup>th</sup> Annual HOPE Festival U of Maine Orono Sat. April 21**

Held at the Student Recreation and Fitness Center, this annual event will have Bill Mc Kibben as the featured speaker and 40 tables of goodies and information, including an outdoor MeSEA table demonstrating solar ovens and photovoltaic devices.



We had been told that there was an express bus from Los Manos to Tegucigalpa but when we got across to the bus stop we discovered that we had been misinformed. Instead, we took one of the yellow “chicken buses” to a nearby village where we caught an express minibus to Tegucigalpa. We ended up spending all day taking three buses and three taxis to get to La Ceiba, which is a resort town right on the Caribbean beaches. The trip cost \$80.18 total for the two of us. Jean had reserved a room for us at the Grand Hotel Paris, which had 3<sup>rd</sup> World elegance (a nice fancy restaurant and swimming pool but I had to fix the plumbing in our bathroom and the Wi-Fi didn’t work on our floor).

We spent one day in La Ceiba shopping for the tools and parts we didn’t bring with us, which is my usual way of working when I get to a new 3<sup>rd</sup> World country. I design the PV modules to use as much local material as possible. The Falls Brook people had already ordered the glass and aluminum frame materials cut to size, but I had the glass dealer cut six of the pieces of glass cut exactly in half to make twelve 32 watt modules instead of the 65 watt ones they thought were needed. I also showed Mauro and the participants how to cut and bend the frame material so we didn’t waste any of that either because of the change. We bought so many batteries that the pickup truck had to go that afternoon to bring a group of them and the heavy glass to the Reserve.

The next day we left early to go in the pickup truck with rest of the batteries and catch the narrow gauge Dole banana train (which now carries coconuts instead). This train is the only way to get to the Reserve but it has become a bit of a tourist attraction. It used to be steam powered but now they use a homemade looking engine car with a little diesel engine and transmission that I suspect is from a small Japanese pickup truck.



**The narrow gauge train with a load of coconuts behind the “passenger cars”.**

The train trip takes a bit over half an hour on the wobbly track with stops to pick up school kids heading home for lunch and dropping off compesinos and packages for little stores along the way.

The Cuero y Salado Reserve is in wetlands with a large lagoon so after unloading our luggage and solar parts, we took a boat ride on the lagoon to see the turtles and crocodiles and the many kinds of birds that live there. The reserve was a Dole plantation in old fashion antebellum style with a Big house surrounded with two story outbuildings and a row of huts for the workers to live in. We got a tour of the grass huts we will be wiring up for solar electricity and the tiny school which we will also furnish with electric power.

The Garifonos natives have lived in this area for generations and are an interesting mixture of Native Americans, descendents of escaped slaves and pirate crews, and others who somehow ended up on that shore over the centuries; but of course none of them “own” the places their families have lived in for hundreds of years. Dole owned it all, having acquired it the old fashioned way – they stole it in the 19<sup>th</sup> century. Several years ago, Dole turned the land over to the government to be made into the nature preserve but I noticed that Dole still uses the bulk of the land. The Falls Brook Centre has made an arrangement with the NGO that runs the reserve to work with the people and introduce *Analogue Forestry* to the area. They have shown the Garifonos how to plant trees and start gardens so that in just a few short years they will have something analogous to a climax forest. In just a little over one year, the contrast with the dole land is quite remarkable.

Jean Arnold, the head of the Falls Brook Centre (FBC) had promised the compesinos that if they worked hard and fixed up the little patches of land around their grass huts, the work would count towards the payment of their getting solar electricity, as well as give them fresh vegetables from their own gardens, so they have put a lot of labor into these nice gardens.

The first evening we got there I started the course with an introductory PowerPoint on the 3<sup>rd</sup> World solar work in different countries and how we make and install the PV modules as a cottage industry. At 8 the next morning we started the workshop in earnest. I showed the participants how to sort and cut the PV cells; and how to string them together in series with solder joints to make modules for their cottages.

The women, especially, have learned how to cut the PV cells in half for the cottage modules so that in the first day we assembled two big 65 watt modules and a smaller half size 32 watt one. After they had cured overnight, we tested them in the sun and framed them with the aluminum extrusions *Continued on Page 6.*





# Making a Solar Cell Phone Charger

By Richard Komp

When I teach the cottage industry solar workshops in 3<sup>rd</sup> World countries, one of the things everybody wishes to make are solar cell phone chargers. In 2007, the Drivadal tribal people and I in India worked out the details of just how to do this. It turns out to be very simple to do since no special voltage or charge controller is necessary to recharge most brands of cell phones. We found experimentally that a voltage above 5.5 volts is necessary but the voltage can be as high as 6.4 volts with no problems with the cell phone accepting the charge. The current has to be above 0.2 amps and the little PV module can have a short circuit current of up to 1 amp.

This is because the cell phones have their own internal charge controllers that determine exactly what the phone's lithium ion battery needs at the particular point in its charging cycle and delivers just that amount of current and voltage, as long as the power source feeding the phone can deliver above those values. We have discovered that the solar cell phone charger we build with 12 crystalline silicon PV cells in series will work reliably with all brands of cell phones except the Apple iPhones, which require Official Certified Apple cell phone chargers. No cheap home-made electrons allowed in this Special product.



**The nomads in Agadez, Niger west Africa showing some of the solar cell phone chargers they made with wooden frames in my last visit there last November.**

In Niger the nomads made 50 of these solar cell phone chargers, including 24 of our new **Kiosk** design with multiple outlets that can recharge up to 3 or 4 cell phones at the same time. In 3<sup>rd</sup> World places like Niger, Latin America and India, women get a microloan (when available) to buy a cell phone and become a walking phone booth. They have no problems charging their neighbors to use the phone, but they have a big problem recharging the phone's battery in places

where there is no utility power. A lot of these women also have small stands by the side of the road where cell phone users can stop and buy more minutes for their expensive 3<sup>rd</sup> World cell phone contracts. Now these women can offer to recharge the cell phone battery as well. This typically takes two hours and costs 300 West African Francs (about \$0.70). These bigger solar chargers with an output of almost 2 amps at 6 volts have become very popular. Some of the nomads have gone into the business of making and selling both the regular solar charger (for about \$33 each) and the bigger Kiosk chargers.

The solar cell phone charger has not become one of the first things we build in the cottage industry hands-on solar courses I teach.



**Natives putting the glass cover on a solar cell phone charger in Porto de Moz in the Amazon Basin of Brazil. See the white Styrofoam spacers glued on the edges**

Last December in Sarasota, Florida I taught a solar workshop where everybody wanted to build the same kind of solar cell phone charger. The students went to the Dollar Store and bought a batch of \$1 eight by ten inch picture frames. These made perfect cases for the five cell phone chargers we made that day. We did the same thing at the solar workshop I taught in late March at the **New Forest Institute** in Brooks, Maine; but here the picture frames had fancier wooden frames and cost \$3.79 each. They made quite elegant chargers.

The students at Rensselaer Polytech Institute had me bring 15 cell phone charger kits (as well as 15 of the solar battery charger kits we also assemble) but we didn't have time for assembling all the kits in the 2 hours allotted for this work in the all day course so they did the rest as homework. I also taught a week long course at the Universidad Nacional de Ingenieria in Managua, Nicaragua. The students in the course made 14 solar cell phone chargers in one afternoon. I have seen over 100 of these chargers made in different places.



## The Solar Cell Phone Kit Design

I have seen solar cell phone designs on the Internet; and the group of students and faculty from MIT brought a solar cell phone charger they made when they came down to work with the Grupo Fenix in Nicaragua. All these chargers have some sort of electronic circuit that controllers the voltage output of the PV array. These are not needed, the chargers we build work perfectly well without these electronic devices.

Crystalline silicon PV cells put out 0.5 volts under load in full sun. This means that 12 silicon PV cells are needed to make a solar cell phone charger that will work under weaker sunlight as well as full sun. We normally use small cells cut from the broken pieces of full size PV cells we buy at a discount directly from the manufacturers.



**Garifonos people in Honduras sorting and cutting PV cells to make solar battery chargers.**

When we use Evergreen Solar cells we cut the 150 mm x 80 mm cells into quarters, usually by cutting along the copper ribbon that is already attached to the cell. This gives us a piece that will produce 0.8 amps under full sun. (All crystalline silicon cells will produce 0.5 volts under load, independent of the size of the cell). Since these cells are tall and narrow, we solder them in **series** in sets of three and make four sets. Remember to increase voltage, you always put PV cells in series with the front of one cell soldered to the back of the next (just like you put batteries into a flashlight – **Front to back, Front to back**). For some reason, the most common mistake made by all people who assemble these cells into solar cell phone chargers is to not do this step properly.

You might be cutting silicon PV cells from different manufacturers so you might have a different number in the string, depending on size and shape; but you will **always** be wiring the cells in series. Most silicon cells have an aluminum coating on the back, which cannot be soldered to; so the manufacturers put pads of solderable metal on the back as connection points.

After you test the strings to make sure everything is working properly, you are ready to glue the strings down onto the backing material. If this material is thin plywood or cardstock, paint it first on both sides to seal it against moisture

warping the sheet. Use strips of 100% silicone caulk on the back of the cells to glue them down to the backing sheet. Remember to reverse the + and – of every other string so that it will be easy to connect the strings in series. We use strips cut from Styrofoam food trays as the spacers on the sides of the cells, with one in the middle so that the glass can't touch the cells. Fasten short pieces of red and black wire to the ends of the total array and bring them out of the case to make the connection to the cord to the cell phone.



**Finishing a solar cell phone charger in Colombia. Notice how the ribbons connect the strings in series. The + and – wires will come from the lower corners of strings.**

After again checking everything in the sun with a multimeter, glue the glass to the strips with the same silicone caulk.

The hardest job is finding a cord and plug that fits your cell phone. Save old cell phone chargers and cut the cord from one with the proper plug. The red wire in the cord is **positive** + and the other wire is **negative**. Enjoy your new way of charging your cell phone.

### **From Page 1 Joint MeSEA – MRES Solar Workshop**

John Burke was invited to Minneapolis last October to teach a joint MeSEA – Minnesota Renewable Energy Society (MRES) workshop to train trainers who went to Nigeria in March to teach the natives there how to build and install their own PV systems. Using the silicone encapsulation system developed in Nicaragua, John taught them how to build 65 watt power modules and the small solar cell phone chargers.

The MRES volunteers and their Nigerian students are very enthused about the success of MRES's first on-the-ground international project. Four MRES International Committee volunteers introduced solar to Kafanchan, in rural northern Nigeria, in March. The volunteers trained about 15 people to solder and make a solar panel and solar cell phone chargers. As well, they and their enthusiastic students installed a small solar array on the Kafanchan Hospital's pediatric wing to provide lighting; the wing previously had no electricity.





The large building we have for the workshop already has its own PV system but the batteries are old and in bad shape, since nobody knew how to maintain them properly. Jason Juurlink, FBC's renewable energy intern who came down to work with us, took careful measurements of the PV system and batteries and we disconnected three shorted batteries to improve the system.

The next day we installed the first PV system on a cottage using a small 32 watt PV module. Most of the men are fishermen so they are very good with knots and tied the PV module onto the tin roof of the house. We used a roll of rusty bailing wire to fasten the aluminum frame so it wouldn't cut the rope and used twine for everything else.



**Installing the first PV system on a cottage.**

One 12 year old boy named Edwin became Mauro's assistant and has decided that this is what he wants to do in life. I gave him a solar T shirt I had to start him off right. During the five days I was there at the Reserve, we made three 65 watt PV modules, seven 32 watt ones and 6 small solar cell phone chargers. We also installed a second PV system on a cottage and Edwin became a valued member of the installation team, not only climbing on the roof to tie the modules down but also able to wire up the switches and the compact fluorescent lamps. We also taught other members of our course to install, maintain and repair these systems so the project can be self sustaining when the FBC people are not around. I showed them how to collect rain water to use as the distilled water for the batteries and how to clean and maintain the batteries. The women went through two boxes of the PV cells and sorted them out, cutting the marked or damaged PV cells into pieces to make the smaller home PV systems and use the small pieces of cells to make solar cell phone chargers, which turned out to be very popular.

Although I had to leave to come back to Nicaragua to teach a solar course at the National engineering University here in Managua, we arranged for Mauro to stay on for a total of three weeks and the group, under his instruction have installed PV systems on 16 cottages, the tiny local school and the bigger building used as a dormitory for the unmarried men.

Honduras currently has a military dictatorship for a government and the military presence is pretty much everywhere. There is a small group of soldiers living at the Reserve "to protect us" presumably from the Garifonos who are our students. However, the young soldiers got very interested in what we were doing and joined the workshop. On the train trip back from the Reserve, one soldier asked me how he could get to buy one of the solar cell phone chargers.



**Two young soldiers helping to measure strings of PV cells as part of the workshop.**

I went back to Nicaragua by myself. I took 7 buses, 5 taxis, a pickup truck and the narrow gauge train to get here. This took two days, not counting the time I spent in La Ceiba shopping for more tools and materials to be sent back to the Reserve. The trip back cost me more, \$55, not only because I had to come all the way back to Managua, but because I took an Executive class bus from La Ceiba to Tegucigalpa. It had the luxury touch of reclining seats with more leg room but more importantly: a bathroom. Going to La Ceiba, the 7 ½ hour bus trip with no bathroom and only one stop (because the bus broke down and we had to get something fixed in the engine) is a bit hard on me now that I am 73.

Mauro stayed after I left and continued the workshop. He and the Garifonos people made and installed PV systems for 26 cottages, the school and a community center. *The Honduras report is at [www.mainesolar.org](http://www.mainesolar.org)*

**Boost Maine's Renewable Portfolio Standard**

A clean energy coalition in Maine is seeking to boost the state's renewable portfolio standard from 10% by 2017 to 14% by 2017 with incremental increases, ending with 20% by 2020. The initiative also ensures that the Maine Public Utilities Commission identifies and captures energy-efficiency opportunities that are cost-effective. The group - Maine Citizens for Clean Energy - says that doing so would help the state create jobs, lower energy costs and reduce Maine's dependence on imported energy sources.

"Our energy status quo isn't working," says Sargent Corp.'s Herb Sargent. "Every year, Mainers hand over billions of hard-earned dollars to out-of-state and foreign energy companies. The initiative put forward by Maine Citizens for Clean Energy would help to change that. It would create jobs by investing in energy efficiency, which would help lower electric bills, and it would attract new clean energy businesses to our state. It's a practical idea that will help put thousands of Mainers to work."

According to the coalition, the initiative builds off of the success of Maine's existing programs and aims to increase the amount of Maine's electricity supply that will come from new "made-in-Maine" renewable resources - such as wind, solar, hydro and tidal energy - by increasing incrementally the percentage of new renewable resources of electricity sold in Maine.

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Annual membership includes: a subscription to the quarterly MeSEA publication - *The Maine Sun*, 10% discount on workshop fees and MeSEA-sponsored events, networking with other like-minded people in Maine, contribution to the sustainability of our program, and the right to declare your donation to a 501(c)3 on your taxes.

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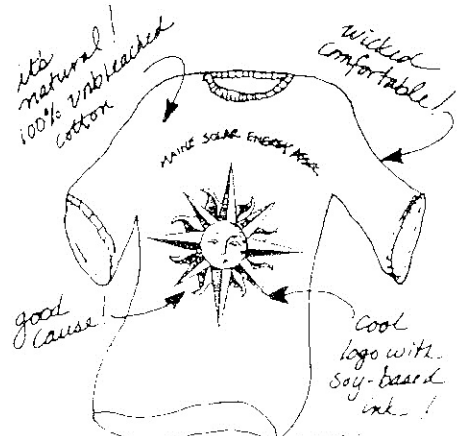
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