SUMMER 2014

THE MAINE SUN

NEWSLETTER of the Maine Solar Energy Association

PV Workshops in Maine and New York

By John Burke

PV Assembly Workshop Porter Maine During Ice Storm ! John Burke, MESEA and DADS, went to the southern Maine, Porter Town Hall, to present a 65 W PV assembly workshop, with the Ossipee Towns For Sustainability group, Jan 11, 2014. Due to a condition of nature (ice storm), the roads were impossible to drive over, even the sand / plow truck had to turn back, so the folks re-scheduled the workshop for January 12, which only eight folks could attend.

The Porter Maine group assembling a 65 watt PV module

The group of folks, including a back-to-the-land couple, a business owner, a writer and two retired teachers, were available to participate in the one-day workshop. With the help of the MEEP (Maine Energy Education Program) director, Pete Zack, the workshop went smoothly, despite the weather setback. The group will use the assembled PV module for a local project. They all did get hands-on experience, in every aspect of the assembly process, including the final wiring and framing, after a liquid Si encapsulation, in the style developed by Marco Antonio, of Suni Solar, Nicaragua.

We look forward to another PV workshop with the OTSF, and MEEP in the near future, with a more cooperating weather scenario. Thanks for the hospitality and the understanding of the group.

Manhattan Comprehensive High School, New York

John Burke, MESEA and DADS, presented the 6th 65W PV assembly workshop for the Manhattan Comprehensive HS environmental science class March 14 and 21 with a diverse group of students from Asia, Africa and the NYC area. Working with **Solar1**, the group this year took the time to assemble a module with a special 'transparent' aspect to allow light through for a green/grow space, to be developed . ***Continued on Page 2.***

ASES and MESEA Cooperation

By Richard Komp

In May Brian Allen, from the American Solar Energy Society (ASES) main office in Boulder, Colorado visited Maine as part of his trip visiting all the active Chapters of ASES. We had a number of very good conversations about the situations of the two organizations and how we can work together. Both ASES and MESEA have shrunk financially and in membership. MESEA now has exactly 3 paid-up members; and ASES, which used to have a nice office in a complex in Boulder, now is working out of somebodies home and has all the ASES records stored in a garage. Brian is working out of his laptop computer and cell phone while he is on the road and is very busy for somebody who doesn't really have an office. We had a very good visit together and Brian enjoyed the lobster dinner I threw together, with Soni Biehl, or treasurer and other MESEA members dropping over for the informal meetings we arranged. I drove Brian back to the bus station in Bangor for him to continue his trip around the Northeast states, with many more stops yet planned.

The entire solar energy industry has changed and lots of people feel that our two organizations are no longer relevant. There are large industrial solar companies that don't bother to belong to ASES and there are a number of solar installers and renewable energy groups, including nonprofits, in Maine that don't even bother to contact MESEA when they are having important meetings or events concerning topics like Climate Change.

Both our organizations have a great deal of knowledge and experience that still is very relevant and important and we need to revive our organizations. One important way is to rebuild our membership base. Brian offered to let MESEA join a joint membership plan that ASES is offering for the 60th anniversary of the creation of ASES.

A $60 Joint ASES-MESEA Membership

You can go to page 7 to take advantage of this offer, and you can use your credit card to join on at www.ases.org

Inside

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

The Maine Sun welcomes articles, submissions, photographs, and letters. Please send editorial materials to the following address: MESEA PO. Box 184
Harrington, ME 04643
Phone: 207-497-2204
E-mail**: sunwatt@juno.com or mainesolarenergyassociation @gmail.com**
Website: **www.mainesolar.org**

Receive the Maine Sun by e-mail or at our website to be green.

Printed on recycled paper.

Calendar of Events
MESEA Website WWW.mainesolar.org

MESEA **has no formal workshops scheduled yet for the summer but John Burke will organize a week long solar course for next October.**

intersolar NORTH AMERICA **July 6-10 2014**

Solar Conference and American Solar Energy Society Meeting

This event taking place in San Francisco next month will include the ASES Chapter Caucus. Richard Komp will attend as the Official Chapter Representative for MESEA. He will also give a scientific paper at the conference on a new type of solar-manual hybrid water pump. (*Pages 4 and 5 of this Maine Sun show details of this pump*.)

The Empire Strikes Back
A Pushback on Green Power

By Diane Cardwell MAY 28, 2014

As renewable energy production has surged in recent years, opponents of government policies that have helped spur its growth have pushed to roll back those incentives and mandates in state after state. On Wednesday, they claimed their first victory, when Ohio lawmakers voted to freeze the phasing-in of power that utilities must buy from renewable energy sources.

The bill, which passed the Ohio House of Representatives, 54 to 38, was expected to be signed into law by Gov. John R. Kasich, who helped negotiate its final draft.It stands in marked contrast to the broad consensus behind the original law in 2008, when it was approved with virtually no opposition, and comes after considerable disagreement among lawmakers, energy executives and public interest groups.

Opponents of the mandates argued, in part, that wind and solar power, whose costs have plunged in recent years, should compete on their own with traditional fossil fuels. But the debate has taken on a broader, more political tone as well, analysts say, with disagreements over the role of government, the economic needs of the state and the debate over climate change. Since 2013, more than a dozen states have taken up proposals to weaken or eliminate green energy mandates and incentives, often helped by conservative and libertarian policy or advocacy groups like the Heartland Institute, Americans for Prosperity and the American Legislative Exchange Council.

---

from page1 with the program. David Gibbs and Arlae Castellanos, working with the CDI affiliated school, participated with the students, to accomplish the task at hand, although the extra time needed was taken.
We do look forward to next year and another chance to meet with the class and the teachers interested in furthering their knowledge and experiences dealing with solar PV as well as other solar techniques. There may be interest in a solar oven workshop, with the goal of using the oven to encapsulate a PV module using the EVA sheeting, which is the new method developed by Dr Rich Komp in the developing world programs.

Teaching the Teachers in Liberia and Ghana

By Richard Komp

A group of Liberians living in the Boston area asked me to go to Liberia to give a three part course on solar energy. . This ended up as a two country African Trip where I have been "Teaching the Teachers" I gave the first part of the course at the **Monrovian Vocational Training Center** for the 27 students who will be part of a new solar corporation they are now planning. In the first part of the course, the students made small solar cell phone chargers, then graduated to bigger 15 watt PV modules that can be used to light up small squatter huts and rural grass huts. We ourselves used these modules to recharge a 12 volt deep-cycle battery so we would have continuous power to run our tools, since the Center rarely had electricity.

Assembling the PV cells for a solar cell phone charger

We also purchased a small LED lantern for the equivalent of $8 and rewired it to be able to recharge it from a small 8 volt PV module. In addition to simply teaching the students how to build PV modules, the students also learned how to design PV modules. We put a blocking diode in the LED lamp and brought out a second cord that will recharge a cell phone; but only when the solar battery charger is in the sun and working, so that recharging the cell phone doesn't cut the time the lamp will work at night. I took the lamp home with me and used it for several evenings, it worked perfectly.

Liberia is not as developed as Ghana and we rarely had any electricity, either at the Vocational Center or at the home where I stayed; so we purchased a deep –cycle battery and used it to run the soldering irons. We finished two 15 watt modules before the battery was dead so we could now recharge the battery from the two modules in parallel. From then we had sufficient electricity to continue the hands-on work. I also now had a way to recharge the battery in my laptop computer, since I have a special power supply that works from a 12 volt source, like a car's cigarette lighter.

We spent the second week on solar thermal systems, making a solar box cooker big enough to "cook" the large PV modules we made next.

Assembling the big solar box cooker. We found used aluminum printing plates for the inside box and the reflector for the lid.

Photo showing the large solar cooker and the modules made during the solar course in Liberia

Once we had the solar cooker working properly, we had a way to assemble the big PV modules that use ethylene-vinyl-acetate (EVA) We managed to cook both a 65 watt PV module and a custom 75 watt module for a solar water pump we installed, at the same time in the solar oven (a first for cooking two at once). I had brought a special multimeter that has a thermocouple temperature probe and discovered that the EVA doesn't actually have to get all the way to 120ºC (~250ºF) to start crosslinking, as I had thought. It appears that the process will start slowly at only 100º C (the boiling point of water 212ºF). I keep learning more about making PV modules doing this work in the 3rd World.

The students gave me a special African tribal shirt, which I am wearing in the photo. ***Continued on page 6***

A Hybrid Solar-Hand Cranked Water Pump

This pump could be used in rural Maine and elsewhere.

From a Scientific paper given by Rich Komp et al, San Francisco, July 2014

Details of the pump and well in Nicaragua

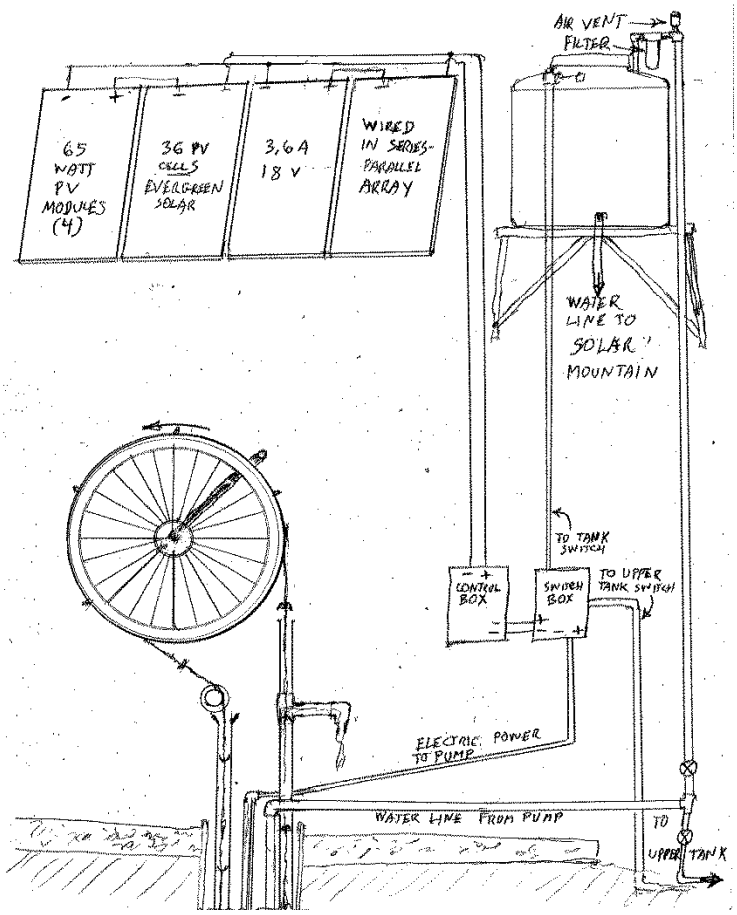

Fig. B Using the hand cranked Rope Pump
Seven families besides the solar mountain use the bomba de mecate (rope pump) daily and others occasionally. Rough calculation of liters per family per day is 100 liters. In Quintin's houshold there are four families, Together, they fill at least 20 five gallon buckets (about 400 liters) every morning. The pimp handle has a lock but it is rarely used since the well capacity is above the current usage.

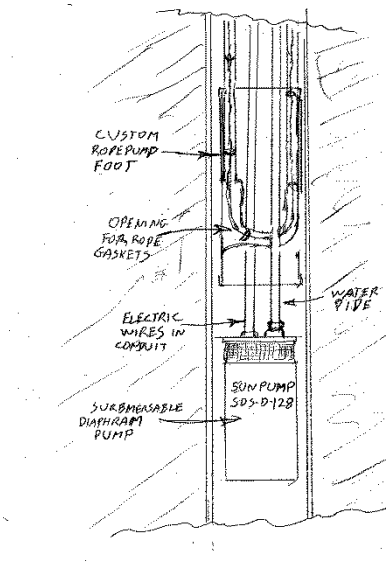

Fig. Aa Cross section diagram of the hybrid solar electric – rope pump. The SunPump is deeper in the well NOT TO SCALE

Fig Ab The special foot for the rope pump

Protecting the Well's Water Table

A great deal of work has been put into repairing damage to the Solar Mountain in Nicaragua. For years the upper part of Solar Mountain was slashed and burned. The upper hills now have only saplings that have grown since the days of burning, This area probably hasn't been burned since Hurricane Mitch in 1998, but there has been no burning since we bought it in 2006. The mountain is now covered by baby trees we have been planting since 2010. They are still thinner than a finger and short. 14,000 trees were planted by ADRA in 2006 , we have planted around 8,000 from 2010 to 2014. This year we are planting 2000 fast growing trees in a section that will be designated for firewood. To slow down the flow of water in the ravines and reduce erosion, we built 90 dykes over the course of three years. 17 of the 33 in the first year were of wood and rotted out or were carried away for firewood and had to be built again the next year by stone. So we now have a total 73 dykes in the gulches between mountains This work has allowed the water to soak into the ground on the slopes and raise the water table in the well all year round.

Details of the Rope Pump

The ***Bomba de Mecata*** (Rope Pump) was developed in Nicaragua decades ago and has been become a standard form of rural water pump. There is a cottage industry in manufacturing these pump using as much recycled scrap material as possible. The basic idea is simple: A loop of rope is fitted with small cup shaped washers of urethane rubber. These cups are made to be an easy slipfit inside a peace of standard PVC (poly-vinyl-chloride) pipe. Knots are tied in the rope about 30 cm apart and each knot has one of these cups slipped down over it before the next knot is tied. The cups are put in with the rounded side facing in the forward direction for easy sliding in the pipes. A special foot piece is made to direct the rope around a molded plastic shape so that the cup slides into the upward pipe, carrying a "slug" of water above it as it travels up to where the outlet pipe is installed at the top of the well. The entire loop is driven by a large wheel at the top of the well. These wheels are usually made by cutting the bead sections of an old tire and clamping them together with clamps on a rim welded together from scrap metal.

The simplest pumps have a hand crank fastened directly to the drive wheel; but many more complex versions are commonly created. Some are clever systems powered by old bicycles. Others are at the base of an eight bladed windmill, and still others use other creative drive systems. There are very large rope pumps driven by horses, mules or oxen walking in a circle. These use 3 or 4 inch (75 or 100mm) PVC sewer pipes with large rubber cups and can pump hundreds of liters per hour. This may be a good technology to transfer to other developing parts of the world.

Bicycle powered rope pump atop a storage tank on a shallow well near Masaya, Nicaragua.

These pumps are mostly made from scrap materials. The big wheels are the bead portion of old tires cut iff about 2" above the bead. The rest of the tire is turned inside-out and used to make planters for raised bed gardens. The spokes and braces are pieces of rebar used to reinforce concrete. There may be several wheels with rope belts connecting them in amazingly complex patterns.

Details of the solar powered pump

Carolina Barreto calculated the expected amount of water per day needed and picked a Submersible SunPump diaphragm pump as the best choice for the expected needs of the people and irrigation requirements of the Solar Mountain. The final selection is shown below: The pump is a **SunPump** brand submersible diaphragm type pump that has worked extremely well in a number of locations where I installed them. The identical (but earlier model) pump we put in the well at the nearby Solar Center of the **Solar Women of Totogalpa** has been running from a custom set of four 55 watt PV modules with no controller for 14 years with no problems at all. The only control is an on-off switch to shut off the pump when the storage tanks are full.

Expected Pump Performance - Pump Model SDS-Q-128

Performance at minimum solar radiation-		
Voltage (V)	15	30
Current (A)	3.95	5.03
Flow liters/min	5.13	.10.26
Minimum Volume Pumped lt/day	770	1,600
Number of People (20 l/person/day)	20	40
Trees irrigated (4liters/plant/day)	96	200
Number. of 65 Watt modules needed for load	2 parallel	4 series /parallel

We have had workshops right here in Maine where we have installed similar pumps, but not necessarily the submersible model.

Putting together a solar pumping system at the Sankofa Farm north of Deblois, Maine

The pump is a FloJet continuous duty diaphram pump used in the lobster boats. It is not submersible so we built a "boat" from a scrap styrofoam box to float on the surface of the water in a shallow well. The 60 watt PV modulke was custom made at a MESEA workshop for this pump and well depth. It is working flawlessly.

From Page 3

The Solar course in Ghana

In Ghana I taught a Green Energy course at another technical university: **The Yeshua Institute of Technology.** In contrast to Liberia where I was teaching at the Monrovia Vocational Training Center, I was teaching college students at the Yeshva University where the students not only learn liberal arts, theory and the science of the world, they will learn practical applications. My course in Solar Energy was the first of these courses and was held in the new electronics laboratory; equipped with electrical instruments like oscilloscopes, power supplies and soldering stations, all donated equipment from supporters in the United States. Ghana is considerably more developed than Liberia and the places where I stayed and worked only had one or two electrical outages a day, instead of the almost never having electricity at any time in Liberia. However, the people in both places are equally very friendly and I always felt a welcomed guest.

Since the scheduled time in Ghana was a few days shorter than the one in Liberia and because we would only be meeting Monday through Friday we didn't do as many different things as we had done there. Therefore I didn't try to build the big wooden solar box cooker we had built in Liberia. Instead we built a smaller cardboard cooker made out of scrap material like cardboard boxes and old newspaper. The cooker worked very well and one morning we cooked rice and other food like stews, which are easy to slow cook at the 90º C temperatures the oven reaches easily.

Assembling the solar oven made from scrap cardboard

The major focus of the course is photovoltaics (PV), making electricity directly from sunlight. Charles AyeAddo, the man who organized this whole project had purched a box of Evergreen Solar PV cells from Skyheat Associates. When Evergreen Solar went bankrupt several years ago, Skyheat Associates bought up tens of thousands of these ribbon grown, polycrystalline silicon cells that Evergreen Solar developed so we have a large supply at a very good price for this work in the 3rd World.

. I was picked up at the airport by Gertrude and Charles' aunt Emily and stayed the whole time of the visit at Emily's house near Accra. We started the classes every day between 9:30 and 10:00 am to avoid the very bad traffic earlier in the morning. We also quit at 4:00 pm to get on the very badly designed expressway (named after George W Bush) before people left from work in the afternoon. Six hours of instruction a day with only a short lunch break is all the students can take without losing concentration, so this worked out well.

We started the course by my teaching the students how to sort and cut the PV cells. Since we would not have the big solar oven needed to heat cure the EVA (ethylene-vinyl-acetate) we use to encapsulate the full size 65 watt PV modules, we would concentrate on smaller PV modules of up to 16 watt capacity like solar cell phone chargers which are very popular and will recharge any cell phone (except the Apple iPhone)

The second style PV module we built was the 32 cell 16 watt PV module I developed on my first trip to Ghana to use for lighting and running tiny bed net fans in a remote village on the mosquito infested coast, to cut down the incidence of malaria. We also rewired a couple of very cheap LED lanterns to be recharged by small custom PV modules we also assembled.

While the first week's lectures were devoted exclusively to photovoltaics, its industry and the physics of PV cells, in the second week I concentrated on solar thermal systems. While the course was intended to be practical with hands-on workshops every afternoon, I devoted the morning lectures to the science of solar energy, including the thermal physics of black body radiation and quantum physics including wave-particle duality

The Students and a professor testing the solar oven

The University arranged for us to be interviewed on the national radio network's morning talk show. Two of the students went with me and we spent about 45 minutes discussing the course and the practical aspects of the work we are doing. It was a very relaxed session and when the moderator asked to purchase the big solar cell phone charger we brought to "show" on the radio, I said we would put him on the list since three people at the station had already asked to buy it. We also talked about Climate Change and its effect on Ghana and other renewables like biofuels and the rules for using them (Never use food and never use land that can grow food).

Solar Energy Comes of Age

By Richard Komp

Solar energy is becoming a mature industry. The prices of the solar installations have gotten so low that photovoltaic (PV) modules have become a commodity with commodity pricing. For example, MESEA still has **Bulk Purchase** where brand new Certified 250 watt PV modules cost $250, or $1 per watt. *(For information on purchasing you own modules at this price, contact Richard Komp 207-497-2204 or sunwatt@juno.com)* Some complete PV installations are costing around $3.50 per watt by the time they are connected to the utility grid. Solar thermal electric and wind systems are similarly inexpensive, making the electricity from these renewable energy systems cheaper than that from coal or gas power plants (Nuclear is way too expensive to compete). These new developments are causing ***The*** Carbon Establishment to quake in their ***Tar incrusted Boots*** *(they are afraid that the free market might actually work)*

So they are **striking back** ***(see page 2).*** We need to do something about this and for MESEA to be more effective, we need more members to help us educate the public, administrators and politicians.

JOIN THE GRAND SOLAR REVIVAL

Fill out the form below or use the ASES website

Coming: The Third Edition

Now 36 pages with new material

The Maine Solar Primer

A compilation of practical information and diagrams from past issues of THE MAINE SUN

The Maine Solar Energy association has published a sourcebook for solar and other renewable energy resources in Maine and New England.
This booklet includes do it yourself plans and basic solar information for everybody.

The Maine Solar Primer is available for $12 inc. postage from MESEA, PO Box 184, Harrington ME 04643

MeSEA Membership Form

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.

Special Joint MESEA – ASES Membership: $60 ***Go to the www.ases.org/join/ website to sign up with a credit card.***

Name(s): _____

Address: _____

_____

Phone: _____

E-mail: _____

Individual MESEA membership - $30.

□ new □ renewal □ upgrading

Family MESEA membership - $50. □

Lifetime MESEA membership - $1000. □

Corporate MESEA membership - $150.□ **

Would you prefer to receive your Maine Sun by e-mail? □ **yes** □ **no** E-mail saves us $4 per year.

**This includes a business card – sized ad in each *Maine Sun*, and promo on our website, as well.

Please make out your check to MeSEA. and mail to: MeSEA, PO Box 184 Harrington ME 04643

THE MAINE SUN
NEWSLETTER of the Maine Solar Energy Association

Maine Solar Energy Association
PO Box 184
Harrington ME 04643