

SPRING 2015

# THE MAINE SUN

NEWSLETTER of the Maine Solar Energy Association



## Nicaraguan Solar Work

By Richard Komp

### Solar Powered Cell Phone Towers

I have spent the whole winter season in Nicaragua working again with the Grupo Fenix (missing the Maine snow). The first project I worked on was the large contract to install PV power systems to 19 cell phone towers in the Miskito Coast rain forests. Based in the work on the prototype system installed in December 2012 (*see Spring 2013 Maine Sun*), we used the special circuit that has worked perfectly for over two years without the backup diesel generator ever being used. However, the cell phone company, owned by Carlos Slim (*The richest man in the World last year*) wanted Suni Solar to make the PV system with a positive ground, while the rest of the electronics is the normal negative ground. The chief engineer of the inverter company told us that that was impossible to do. That took us an extra two weeks (and several burnt out parts) to work up a new circuit and thoroughly test it out.

Once the circuit was working perfectly in the test rig, Suni Solar started sending large rented trucks and installers to the Caribbean coast to start installing the PV systems.

The impossible just takes a bit longer.



Loading the 250 watt PV modules and other parts onto the truck heading to the Miskito Coast.

With the successful conclusion of this project, Suni Solar is now getting more contracts to install these PV systems on other cell phone towers. *Continued on Page 3.*

Website: [www.mainesolar.org](http://www.mainesolar.org)

## The Luminescent Concentrator

By Richard Komp

And then there was the time when I accidentally dyed my landlady green (*A true story*). Lately I have been receiving Internet links about a “completely transparent” photovoltaic (PV) device that can be used as a window and at the same time be more efficient than the PV modules we now use. When I looked into the idea I discovered it was a luminescent concentrator developed by researchers at Michigan State University. That reminded me of the time I built a similar luminescent concentrator back in 1978, using luminescent organic dyes. One of these was dichlorofluorescein, the Dayglo-green dye that accidentally dyed my long-suffering landlady (*More of that story later*).



Rich Komp demonstrating a working luminescent concentrator at a Skyheat solar workshop in 1980

The idea of the luminescent concentrator is actually quite simple. The crystalline silicon PV cells are most efficient in the near infrared, at about 1 micron wavelength. A luminescent dye absorbs a short wavelength visible or UV photon of light and emits a longer wavelength one with lower energy. The idea is having a transparent flat plate with the dyes in it so that the incoming sunlight is absorbed and most of the emitted photons are trapped by the light pipe effect.

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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

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](http://WWW.mainesolar.org)**  
**Facebook: *Maine Solar Energy Association***

## **The 2015 HOPE Festival**

Is there any hope for the human race? This Earth Day 2015, will bring another **HOPE Festival**, with the Peace & Justice Center of Eastern Maine, April 25, at the University of ME Orono campus ! Details soon, the MESEA and DADS, with SEADS of Truth, again will present a low-tech, do-it-yourself solar approach. This year may include information on a 'tidal turbine' development; a 'new' innovation in solar PV / thermal hybrid collector; as well as the solar PV cell phone charger assembly, all at the MESEA booth !

## **MESEA May Workshops**

The following weekend, Fri, Sat, & Sun, May 1, 2, and 3<sup>rd</sup>, a three day opportunity, at the Solar Home in Jonesport, Maine. MESEA, DADS and SEADS facilitators, will help you get your 'hands-on' experience, with 65 W PV module assembly workshop and another solar PV cell phone charger assembly. You may assemble a cell phone charger for your own phone ! (extra phone charge cable required, I-phone may not work).

These workshop days are available for you to choose which day you would like to participate. \$75. for one day, \$125. for two or \$175. for all three days. Lunch is included., reservations required, so RSVP soon. There will be a minimum number of participants as well as a maximum, thank you. 'We can take control of our lifestyles' !

**For More Information or to Register:** Please call, John, 207-546-1639

## **\$1 per Watt PV Modules Bulk Purchase**

The Maine Solar Energy Association has a new set of 255 watt PV Modules available in our **Bulk Purchase Program**. These new modules are the same size as the previous set but are slightly more efficient and can be used for either a 12 volt or 24 voly system.

We now have more PV modules of different voltages and wattages, including older modules that are designed for direct use in 12 volt systems. These modules will be available for the same \$1 per watt price. In addition we have a few modules with broken glass, but which have been fixed and work perfectly well. I use two of these broken ones on my own home system and they have been working for over a decade after they got broken. These wil cost only 75 cents per watt.

**For More Information or to Purchase:** [sunwatt@juno.com](mailto:sunwatt@juno.com)  
or call: 207-546-1639

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



## Improving the Improved Cookstove

The **Solar Women of Totogalpa**, another part of the **Grupo Fenix**, received a nice grant from the UNDP to install the Improved Cook Stoves in 50 homes in northern Nicaragua. About two years ago I worked with a couple of the volunteers from Europe to add secondary air inputs to the prototype Improved Cookstove at the Montaña Solar we have in Sabana Grande. After several iterations, they came up with a design that lets the extra air into a perforated brick under the firebox.

The Improved Cookstove, developed under the auspices of the **Global Alliance for Clean Cookstoves** is a design that adds a chimney to the usual primitive 3<sup>rd</sup> World Cookstoves found in kitchens all over the world; bringing their design all the way up to the 18<sup>th</sup> Century. We wanted to get the design to the early 19<sup>th</sup> Century at least. When the Grupo Fenix had built and installed several of the Global Alliance designs made from adobe, they asked Proleña to do the scientific measurements of the stoves' efficiencies using the standard methods developed for the Alliance by the **Aprovecho Research Center** in Oregon. Proleña came up with an efficiency of 12.5 to 14.5% for the stoves, starting from a cold firebox.



### Measuring the efficiency of one the Improved Cookers after adding the secondary air intake to the side.

After the secondary air intake was added, the efficiency of one of the same Cookstove increased to 22% from 13%. The solar women built 176 of these Cookstoves in 2014, using the grant money. They learned how to build the Cookstoves much more cheaply with all local materials, as well as making them more efficient. Susan Kinne and I and two of the campesinas are now writing a scientific paper to be given at the **American Solar Energy Society's** annual conference at Penn state next July. Our next job is to add dampers to the chimney and the air intakes to bring the design to the late 19<sup>th</sup> Century.

*From Page 1.*

## Nicaragua Solar Work Cont.

### Solar hot water

Suni Solar also had a contract to install high temperature solar water heaters for three large hospitals. These hospital systems use Chinese made evacuated tube water heaters that can make low pressure steam, even on a cloudy day and were equipped with large storage tanks made right at the Suni headquarters building. In fact, most all the support structures and diesel storage tanks for the solar cell phone towers were also made in our barrio, keeping as much of the money in the local economy.

### Solar Home Electric Power

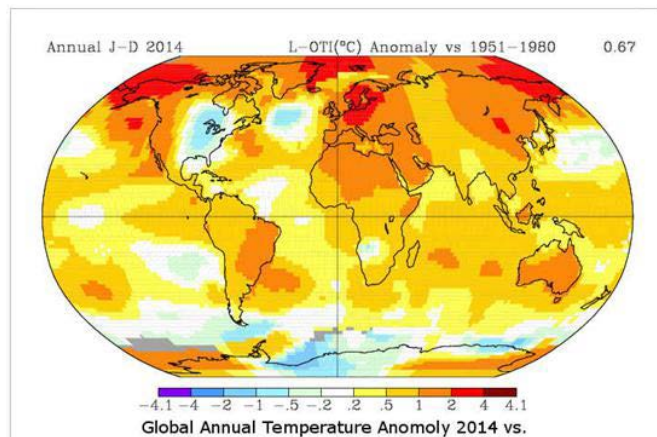
The **Benjamin Linder Foundation** gave Suni Solar a contract to install small photovoltaic (PV) electric systems on 300 casas (small homes) in the Matagalpa area of Nicaragua. While the 50 and 100 watt PV modules were made in China, all the roof brackets and other installation parts were fabricated in Suni's headquarters. The systems are being sold to the campesinos at a subsidized price and will be paid for by microloans, with the monthly payments about equal to what the campesinos were paying for kerosene and candles. This is a way of bringing power to the people at an affordable price.

Other recent projects include powering a special school with PV and several private finca (farm) systems. By now, over the years the Grupo Fenix has powered thousands of homes and more than 1000 schools, as well as over 100 health clinics. Solar energy is working well in sunny Nicaragua.

## Hottest Year Ever

*By Bruce Melton, Truthout /*

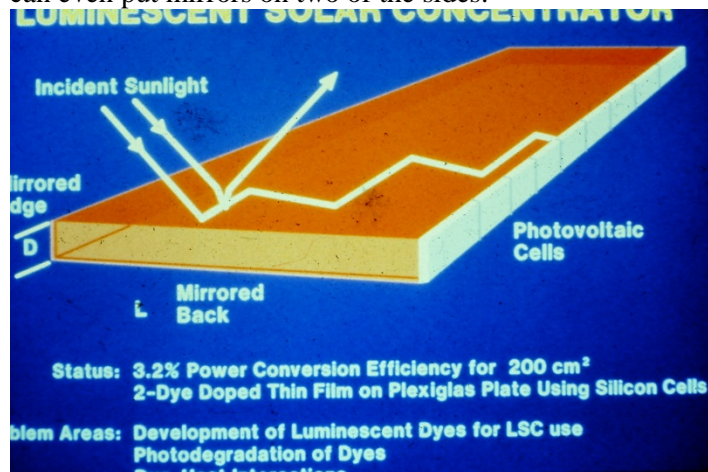
The last time we had this discussion was 2013, remember? Before that it was 2010. Before that it was 2005, and everything started with the Super El Nino in 1998. Statistically, saying that 2014 was the hottest year ever is a very valid thing, and if you understand statistics, I am envious of you.



**Hottest everywhere except the US and Canada Midwest**



**From Page 1.** The longer wave photons bounce back and forth between the two sides of the plate and are delivered to the edge of the plate, where you mount the small PV cells. The concentration ratio can be 50 or more and you can even put mirrors on two of the sides.



**Diagram showing the operation of the concentrator.**

This is not a new idea. Some drafting equipment companies have been making plastic drawing triangles incorporating a red fluorescent dye to light up the edges so you can see the line better when you are drawing lines. I heard about the idea during a solar conference in the late 70s at the U of Michigan where a scientist from Ford's research lab showed his work on the concentrator. I believe people from Michigan State were at the conference (*It seems to have taken them a long time to come up with this variation on the idea*).

When I decided to build one of these devices, I built a wide flat tank out of acrylic plastic so that I could use a liquid with the dyes dissolved. The idea is to be able to circulate the fluid through a heat exchanger to cool the dyes and warm water for a home's domestic hot water system. Since the emitted photons have less energy than the absorbed ones, the excess energy heats up the fluid. In addition, a number of the photons get absorbed without creating the long wave ones and this inefficiency also shows up as heat. It is a shame to waste all that heat so I decided to build a new type of PV-Thermal Hybrid module.

I used a set of three dyes in the prototype. First was the dichlorofluorocine that absorbs UV and blue light and glows in the green part of spectrum. Next was another fluoro-cine dye that absorbs green light and glows red. The third was a blue dye that emits infrared light just above the 1 micron absorption limit of silicon PV cells. The prototype would appear a warm grey color and the depth of the shade of grey (*more than 50 of them are possible*) is determined by the concentration of the dyes. You could have a skylight that let through 20% of the light and used 80% to make electricity and heat, or 10% and 90% or whatever you

wish. If you use a drainback solar water heater system, all the liquid would drain out in the evening when the solar powered circulating pump would stop. The empty flat tank would then become a clear skylight to watch the moon and stars. In cold climates the skylight would have a separate clear glass cover with an airspace for more thermal insulation.

In 1957 when I was a sophomore at Loras College in Iowa, I learned how to make dichlorofluorocine in the organic chemistry lab. At the time I was living off-campus with a roommate who had very regular habits. With his class schedule that year, he had Wednesday afternoon off so he came to the home we shared to take a bath. I took some of the reddish brown compound that was the precursor of the dichlorofluorocine. It is slightly soluble in warm water so I packed it around the drain fitting, where the putty was coming loose.

Unfortunately, when my roommate came home from the college, our landlady was in the bathroom getting ready to take a bath. The precursor reacts with soap to make dichlorofluorocine so when the landlady got in the hot tub and started to soap herself up, her skin started to turn green; and the more she scrubbed with the soap, the greener she got. When she started to scream, I came and told her to pour a tiny bit of Clorox into the water, and get back in which destroys the dye immediately. She wondered what terrible thing happened with the Dubuque water supply and we had a green tint to the water of a few weeks afterwards.

The main problem with the prototype was that the blue dyes that fluoresce in the near infrared are rather fragile molecules that break down after only a couple of weeks in full sunlight. They have things like four member carbon rings with quite a bit of stress in the bonds, and fall apart easily. I did a search for a commercially available, more rugged dye but never found one that held up well. With the dye in solution, you can always add more dye as needed but the idea is to have a device that has very low maintenance for the homeowner...

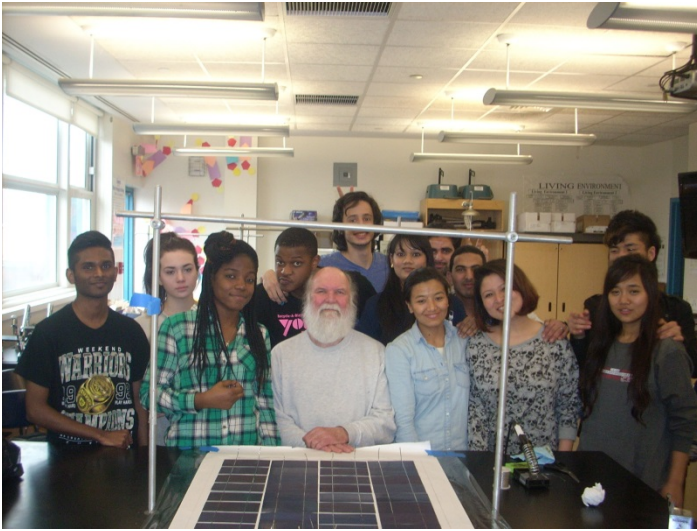
However, with modern chemistry and better dyes, it is probably time to reintroduce the idea of the luminescent concentrator. These could also be built with inorganic phosphors in glass, and the device could then last a long time without fading. You could still have a hybrid design by using a layer of plain glass to form a flat tank and use a clear heat transfer fluid, but the device wouldn't turn clear at night as a skylight.

With the low cost of modern PV cells and modules, the cost advantage of going to such high concentration ratios may not exist. It might be cheaper to simply have a photochromic skylight and separate PV modules, possibly with a heat exchanger on the back like the experimental system described in our Fall 2014 Maine Sun. (*Available at our [www.mainesolar.org](http://www.mainesolar.org) website*)



## MESEA, DADSolar, PV assembly Workshop MCNDHS, New York

This year, (the seventh), at Manhattan Comprehensive Night & Day High School, John Burke, of [dadsolar.com](http://dadsolar.com) and MESEA, held a two day PV assembly workshop, Mar 14 and 21. The 12 students, from around the world, are part of the Environmental Club, and achieved the desired 'hands-on' experience with their science instructor Roy Malinis in attendance.



**John Burke and the Students at the 2015 PV workshop**

The group soldered a string of nine solar cells, and added them to another three strings, that had already been soldered. Then wiring the four strings in series for the 'standard', 65 W PV module. Using the liquid silicon encapsulation method developed in Nicaragua, by Marco Antonio of Grupo Fenix, allowed the club to get the full step by step procedure, the MESEA solar PV workshops present.

*(In the future the group hopes to learn the newest PV module assembly procedure using ethylene-vinyl-acetate [EVA] as the encapsulate. This process normally uses a half-million-dollar laminating machine but we have developed a way to use a pizza oven or a solar oven instead – RK)*

We did cover the complete description of how a solar PV works, and the siting factors to keep in mind when siting a solar PV array. The club members will get the final wiring and framing steps, on the next workshop of the two day series. We hope to have Dr. Rich Komp in attendance for the second workshop.

### Pentecast

Climate change, global warming,  
Whate'r it's called, it is alarming.  
Gloomy eggheads were all scoffed;  
Until the temperature went aloft.

"What's five degrees?" most then did  
smirk.

Now we know, predictions work.  
Still, SUVs the roads do lord  
With only one or two aboard.

Fifty million homes kept cool  
As meat lockers as a rule.  
May often just a ceiling fan  
Do the job? You bet it can.

There're lots of little things to do  
To bring back nature knocked askew.  
Solar, geothermal, hydro, wind,  
Will help atone for how we've sinned.

We have to break the strangle hold  
The carbon brokers have us sold  
And build up energies sustainable  
As oil becomes much less obtainable.

Ostentation is not taste;  
It's often just a sign of waste.  
If we've the will to pay the price  
Much less excess needs suffice.

To make the world the most for all  
Greedy cultures have to fall.  
We've been given all we need  
But from ego must be freed.

**-Mike Holahan - bard of the bay-**



## Talking About Climate Change Banned in Florida?

*By The Daily Take Team, The Thom Hartmann Program*

There's a common rule of thumb in the news business that if you hear a story that sounds too good or too ridiculously weird to be true, it's probably from Florida. This is true of stories about politics, it's true of stories about sports, and it's most definitely true of stories about crime. But it's also true of stories about climate policy. Case in point: **the shocking new report** from the Florida Center for Investigative Reporting (FCIR). According to that report, officials working for the Florida Department of Environmental Protection (DEP), "have been ordered not to use the terms 'climate change' or 'global warming' in any official communications, emails, or reports." That's right - the Florida agency most responsible for fighting climate is banned from talking about climate change!

This insane policy **apparently started in 2011** when Republican Medicaid scam artist Rick Scott took office as governor, and, according to the FCIR, it's had a real impact on the DEP's ability to prepare for the coming climate disaster. Now, while banning environmental officials from talking about the most important environmental issue of our time is bad policy for any state, for Florida, it's downright suicidal. All apologies to LeBron, but in the future no one will take their talents to South Beach because South Beach won't exist.

Florida is ground zero for global warming here in the United States, and if global warming keeps up its current breakneck pace, much of Florida's coastline will simply disappear. This is what the federal government's **top climate scientists think** the Sunshine State will look like under three feet of sea level rise. Scary? You bet, which only goes to show how ridiculous Rick Scott's don't-say-anything policy about global warming really is. His state is facing environmental catastrophe on a level we haven't seen in centuries, and, presumably to keep oil barons like the Koch brothers happy, his administration has decided to ban Florida officials from even talking about it.

This is, in a nutshell, everything that's wrong with the Republican Party. Republicans can try as hard as they want to stop being what Bobby Jindal called the "stupid party," but when it comes to climate policy, they are about as stupid as it gets. Just the other day, for example, Oklahoma Sen. Jim Inhofe - the chair of the Senate Environment Committee, for God's sake - tossed a snowball on the Senate floor to try to prove that global warming is all one big hoax cooked up by greedy scientists looking for grant money (I'm not making this up, by the way, **that's what Jim Inhofe actually believes**).

But here's the thing about Republican stupidity when it comes to climate change: it's calculated stupidity. Sure, there are probably a few boneheads out there who actually believe that emissions standards are the next step towards a UN takeover of US democracy, but in the end, all the nonsense coming from the Rick Scotts and the Jim Inhofes of the world is about one thing and one thing alone: protecting the power of the fossil fuel industry. And that power, of course, stems from the fact that unlike every other industry in the world, Big Oil doesn't have to pay to clean up its own trash. Instead, it passes on the costs of that waste (carbon pollution) to everyone else in the form of what economists call "negative externalities," which include things like the costs of cleaning up from climate-change driven severe weather events, and the costs of pollution-related health problems. Because the fossil fuel industry can dump its waste on the rest of the world without ever having to pay a dime, its business costs are artificially low and its profits are artificially high. This free ride is the payoff the fossil fuel industry gets **from throwing billions and billions of dollars at Republican politicians** every year, and it's the main reason why the industry is so scared of anyone who tries to take action on climate change.

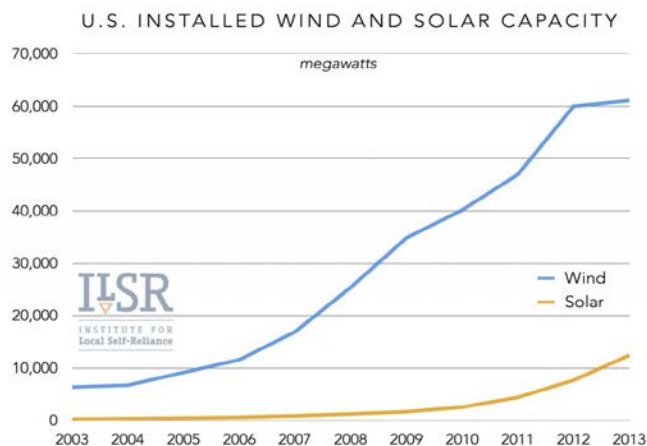
So remember this next time you read a story about some Republican saying something stupid about climate change. This is really all about the money, and as long as they keep raking in the campaign donations from Big Oil, Republican politicians will do everything they can to protect their donors' interests, even that means making giant fools of themselves in the process.



## Energy, Efficiency and Utilities

By John Farrell

While local renewable energy and energy efficiency are both proving to be near-existential threats to electric utilities in the early 21st century, the trends aren't the same. The rapid rise of renewable energy gets the headlines, and it's big news. Total renewable energy capacity has grown 10-fold since 2003 and in certain parts of the country, wind and solar represent more than 20 percent of electricity on the grid.



While renewable energy leads in the news, energy efficiency may be the more persistent threat to electric utilities in the 21st century. The trend of falling electricity consumption is 50 years in the making..

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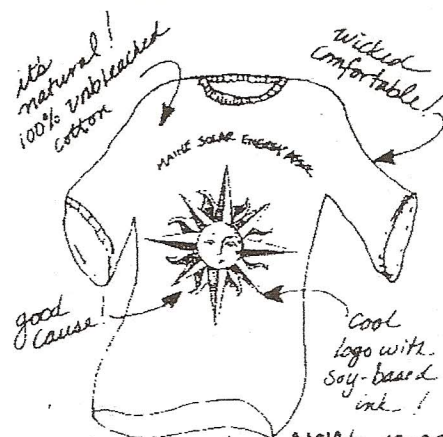
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