

Solar Water Pumping

By Richard Komp, president Maine Solar Energy Association

Right now (February 2009) I am working in Nicaragua with the Grupo Fenix, a Nicaraguan nonprofit group that promotes renewable energy and sustainable living. One of Fenix's activities is manufacturing photovoltaic (PV) modules as a cottage industry. The Solar Women's Cooperative in Totogalpa has their own small factory where they make various sizes of PV modules of up to 60 watts capacity.

We have developed a method of pumping water using PV modules connected directly to the dc water pump with no batteries or controls, except for an on-off switch to use when the tank is full. This method very efficiently uses the solar electricity and saves considerable money, but the PV modules have to be custom designed for the type of pump and the head of water needed between the water level in the well and the top of the storage tank. Storing water is a lot easier and cheaper to do than storing electricity in a battery.

Last week we had a job to install a solar water pump in a deep well at an open-air vegetarian restaurant called Las Casitas. As has been the case lately, the Grupo Fenix has a number of volunteers from all over the world (Germany, England, France, Argentina, New Zealand as well as the US and Canada) so I organized the project into a workshop to teach everybody how to design and install solar water pumps. *The first photo shows us putting the submersible pump into the well with its pipe, support rope and wire.*

The Model SDSQ-135 SunPump we used has a maximum current rating of 6.5 amps and a voltage rating of 30 volts, so we used a set of four custom designed PV modules with 30 Evergreen Solar cells in series in each panel. Since in the tropical temperature conditions, the cells will operate at slightly below $\frac{1}{2}$ volt under load, the 30 cells will produce no more than 14.5 volts at 3.2 amps; so a series-parallel set of 4 modules will drive the pump almost to its maximum rating at noon on a clear, sunny day.

The second photo shows Mauro, the landmine victim who is in charge of the PV module workshop, installing the four modules with the help of Bob from England.

This way of coupling a dc water pump to a PV array is not just limited to tropical countries but is useful anywhere, including rural New England. The total cost of the installation with the pump, tubing, wire, PV modules and other parts came to just about \$2000, including the labor of Mauro and Marco Antonio, the two landmine survivors who now have their own solar businesses. This may be cheaper than the cost of bringing electric power to a remote site and, of course once the system is installed, the electricity to run the pump is free. The system pumps 5 gallons per minute around noon and the owners of the restaurant are very happy with the performance.

