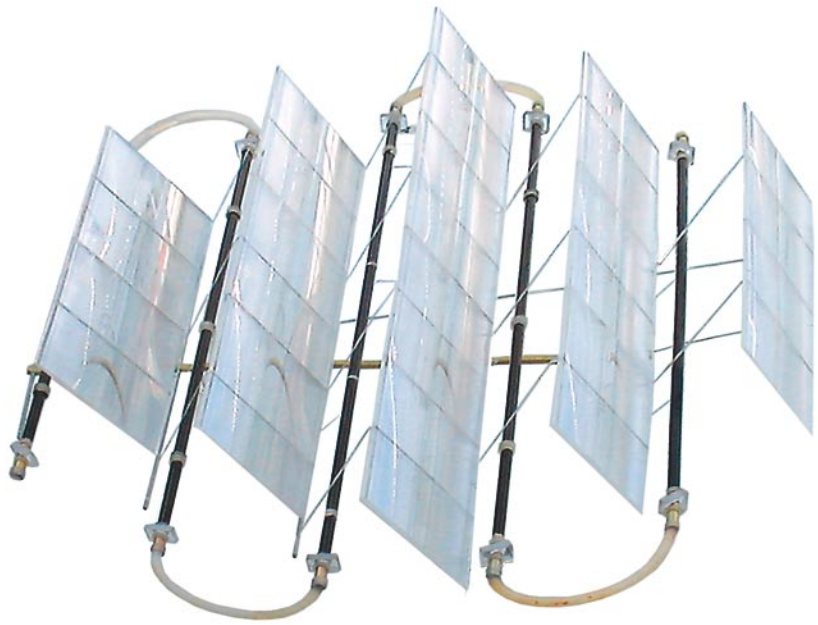
Grassroots Solar Solutions



Leila Dregger reports on new solar technologies that are being tested in a co-operative project.

New Designs For Autonomous Renewable Energy

During a field study in villages in West Africa, Jürgen Kleinwächter noticed the difficulties of the people there and wanted to use his expertise to help. "In the Sahel women walk an average of 40km per day, just to collect wood. Then they crush wheat for one to two hours. At the well, which becomes deeper and deeper each year, they have to pump the water with their own muscle power. Their children become sick due to the bad quality of water and the vegetable gardens suffer from the wind and the heat in this arid climate."

If all these problems remain unsolved, they lead to a rural exodus and so Jürgen decided to develop an alternative which he has called The Solar Village. "Solar cooking reduces deforestation, desertification and erosion," he explains. "This simple technology allows local production to be undertaken anywhere. It is environmentally friendly, has a decentralised energy supply and can be made by regional craft companies, independent of large industry."

Jürgen and his enterprise, Bomin Solar, in Lörrach, Germany have been working on this grassroots vision for decades. Jürgen has developed a solar energy model for an African village with 50 inhabitants. Without the need for photovoltaic panels (which are still relatively expensive and high tech), it produces energy for cooking, pumping water, milling grain and generating electricity.

Jürgen has decided to build the first full scale model of the solar village in Europe at Tamera Ecovillage in Portugal. He says, "A community can guarantee the social and co-operative form of living that is necessary for testing out an autonomous supply of energy."

The Solar Village consists of a combination of various solar technologies which provide the production, storage and use of solar energy.

The Polytunnel

Under the roof of a 30-40m^2 (323-430ft^2) sized polytunnel a row of fresnell lenses are mounted and follow the movement of the sun. Fresnell lenses concentrate the sun's rays in a very specific line or direction, in this case on a focal line. Vegetable oil flows along the focal line in blackened copper tubes that are coated by transparent glass tubes.

Jürgen says, "Vegetable oil is available everywhere in the developing world. Here the oil serves as a carrier of heat. As the oil flows through the concentrated energy zone it heats up easily to 220°C." (*Please note that the size of the greenhouse may need to be increased to generate high temperatures in northern European conditions.*)

The polytunnel membrane is covered by a special layer. This layer allows more parts of the sunlight spectrum (especially UV) to pass through than conventional materials do, supporting the growth of vegetables underneath and making the layer last longer. "The vegetables are also of a very good quality and not to be compared with the usual yields from polytunnels", Jürgen adds. "The temperature in the polytunnel is as comfortable as a day in spring, and salads can be grown, even in the hot summer season." This special membrane is one of the few parts of the Solar Village design that cannot be produced in the region.

From the polytunnel the oil then flows into a heat store.

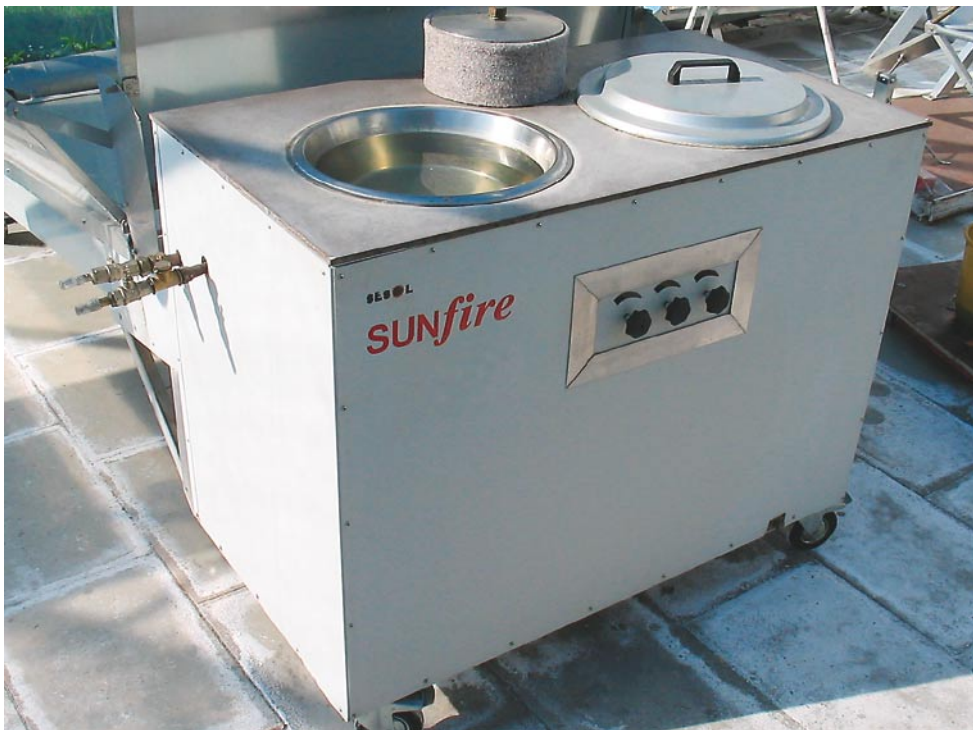
The Heat Store

The hot oil is then stored in a large, well insulated cylinder that can be manufactured locally. The hot oil store ensures that the solar cooker can be used 24 hours a day and avoids the use of expensive and environmentally degrading batteries. It provides autonomous energy for several days.

Above: **The polytunnel.**
Opposite: **Model lenses.**
Below: **Full size lenses.**

The Solar Kitchen

In the Solar Village cooking is done on a specially developed stove. The hot oil flows through double plates that are formed in the shape of cooking pots.



Because the temperature of the oil is 220°C it is possible to fry, cook and bake around the clock. "This is the dream of the African women," says Jürgen happily. "We can regulate the temperature and have the same convenience as an electrical stove." The cooking stove can be produced locally and its manufacture could support the regional economy.

The Stirling Motor

The hot oil also flows into a low temperature stirling motor. This machine uses the temperature difference between the hot oil and cold water in order to move a flywheel. This can be used to either mill grain, pump water or produce electricity. The warm water produced from this process can be used for irrigating the polytunnel. All three possible uses have been built and tested in the laboratory of Bomin Solar. The water pump, called a Sunpulse, has already reached the production stage.

This year in Lörrach, Germany, Bomin Solar, together with technologists from Tamera Ecovillage, built the first model of the Solar Village. "Technically we have demonstrated that the system works," says Jürgen. "What is lacking is a group of people to test out a full scale model for about 50 inhabitants. We need a working situation where the technology is used every day. It also needs to be somewhere that can be visited and studied by people from so called third world countries and provide opportunities for further research and study."

For this reason, Jürgen has decided to site the next phase of The Solar Village at Tamera. "Tamera has a huge amount of experience in co-operative living; this is necessary because energy consumption in single or small family households is too great." In Tamera this will be an interdisciplinary research project where technologists, architects, ecologists, crafts people and village designers can work together to develop a varied, self-sufficient and socially sustainable model village which integrates the pioneering solar technology of Jürgen Kleinwächter

Those who are interested in financially supporting this full scale pilot model are asked to contact Barbara Kovats: b.kovats @tamera.org

***Above*: Sunfire stove; note the built in cooking pots.**

***Right*: Building a test rig at the research project.**

***Below*: A Sterling motor being tested.**