sun connect

rural electrification with photovoltaics

Harald Schützeichel

Is rural electrification facing a crucial decision?

In many regions throughout the world, solar energy offers the only chance for economic development. Its expansion allows for growth independent of fossil fuels in the world's poorest regions. Nonetheless, required is more than the seemingly endless range of continually new small solar lamps.

In order to set sustainable development in motion, assistance cannot be limited to mere replacement of kerosene lamps. People in rural regions need and demand more than a short-term improvement of living conditions. They want to know what opportunities solar energy offers for permanent economic and social development. Are there already existing concepts? Are there partners on location? Since such conditions are rarely available, people help themselves and buy diesel generators to run televisions, refrigerators, and ventilators. The message implied by that is just as devastating as it is clear: solar energy suffices for the first step only, namely, to replace kerosene lamps. Further development, however, requires a diesel generator. This is a dangerous development for solar energy!

Producers would be well advised to stop producing ever more small solar lamps and instead, concentrate on the development of other products, such as solar refrigerators, ventilators, radios, and televisions. And they should develop concepts together with those affected for shaping a sustainable post-kerosene lamp era. This type of comprehensive approach demands time and money and does not fit with the need to announce short-term successes. Yet for those who claim to work for the permanent alleviation of poverty through rural electrification, it is unavoidable.

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What is good light?

Artificial light has developed steadily since the first lamps burning animal fat circa 40,000 years ago. Nonetheless, there is still no simple patent recipe for good light even today. The right mixture of daylight and artificial light, direct and indirect lighting, must, in any case, be adjusted to each context and the needs of the user, and is additionally subject to different culturally shaped perceptions.

Ambient light à l'Ethiopienne: newspaper plastered walls reflect the light beams and create a bright atmosphere.

It defines our lives in a way that almost no other element does. And yet we often first notice it when it is missing: light is one of the most important elixirs, and not only for people, but also flora and fauna. Light determines our sense of time, separates day from night. Light lends objects shape and form and controls our sense of color. The quality of light also influences our mood. On dreary, cloudy winter days a lot of people in northern countries suffer from a phenomenon known as seasonal depression and are often treated by means of light therapy.

In today's western world illuminated by artificial light, one can barely imagine the sensation caused by the stone lamps run on animal fat and the accompanying change in daily routine 40,000 years ago. Further essential innovations—the Romans' lamps burning with beeswax, oil lamps, the first gas lanterns at the beginning of the nineteenth century, and especially Edison's light bulbs in1879—followed in increasingly shorter intervals. Along with advancing development, artificial light became not only lighter, but also safer, more emission-free, and quieter. Edison's invention brought an end to the latent danger of fire and steadily present odor of gas in broad parts of the world. The crackling of a fire became a quietly gasping flame and in the end an almost silent click of a hand on a light switch. The LCD lamps used since the 1920s and the LED lamps used in even greater dimensions since the 1960s, require, in addition, less energy and are more durable: the latest generation of LED lamps lasts up to twenty-five years and uses roughly ten times less electricity than light bulbs.

Their light quality is, however, disputed, as shown, for example, by the case of the Christmas lights on Zurich's Bahnhofstrasse (2005–2009). The rod-shaped LED lights, which conjured up a light play on the elegant street by means of software programming, were not very well received by the population despite their frugal and futuristic technology. Too garish, not warm enough, not Christmasy enough were the scathing criticisms. Developers reacted to such criticism: meanwhile, LEDs with a warmer light are also on the market.

The American light pioneer, Richard Kelly (1910–1977), who among other things, lit up Mies van der Rohe's Seagram Building, differentiated three basic functions of artificial light: ambient light illuminates the surroundings and a space and enables the perception of people and objects; light to follow (focal glow) attempts to arrange the hierarchy of perception in a space by means of the distribution of light within a wealth of information; and light to look at (play of brilliance), a light source that itself becomes information, for example, the flame of a candle or the sparkling of a chandelier to mediate a particular mood. Previously a stage illuminator, Kelly approached a space to be illuminated as he would a stage in order to evoke a certain mood and set accents by means of the staging of light. Inside, light does much more than make perception possible. It is meant to create an atmosphere, make spaces seem larger or smaller, border or link areas, and highlight details.

Light planners can calculate the physical qualities of a lighting situation quite easily nowadays. Decisive for a consistent lighting situation are, in the end, the extremely complex process of vision and subjective perception of each individual. For that reason, light planning must take into consideration not only technical aspects, but also human awareness and knowledge from the psychology of perception. Another important principle is the phenomenon of perceptual constancy, which says that the recognition of brightness, color, material qualities, form, and spatial dimensions is not influenced by changing environmental factors, such as differences in lighting, changing light colors, or distance. A black object in direct sunlight has a significantly higher light density than a white object in the shade. Nonetheless, the white object is recognized as white and the black as black. Due to the constancy of degree of reflection, perception is not dependent on light density so that the true shapes of the objects are recognized. People's perception of color is also amazingly constant under changing lighting situations. As

long as no comparison is possible (for example, via light sources with better color reproduction), astonishingly, people perceive colors as authentic.

Also important is the fact that light is valued differently in different cultures. In southern countries, neutral white to daylight white light colors are preferred, which suggest "coolness" on hot days. In northern countries, the reverse trend can be found: warm, also often indirect light that lends the space a comfy atmosphere. While Chinese culture prefers what appears for Western perception to be a kitschy artificial light in as many different colors as possible, Japan, which can refer back to a centuries-old and deeply traditional lighting culture, uses artificial lighting rather sparingly. Shadowing, thus has a particularly important status in Japanese culture.

All of this thereby makes obvious that the question of good light cannot be answered clearly, but instead, produces different answers depending on the context and cultural background. *me*

Check list solar lamps: overview of the minimum technical standards for solar lamps

A seemingly endless amount of solar lamps are available on the market. And new models are introduced almost daily. For those who want to realize a solar project, it is often not easy to find an adequate solar lamp in this flood of products.

Distinction of lamp types

A) Mini reading lamps

Most of the mini reading lamps available on the market are only of minimal brightness and are not suitable for replacing kerosene lamps.

B) Flashlights

Flashlights have high intensity focused light. They can also be helpful in particular workplaces in which lighting is required in a small space.

C) Portable room lights

As a type of mini solar home system, these lamps unite various qualities: they are capable of lighting a space and can also be used as a mobile flashlight. Their mobility also has advantages within a space. In contrast to standard solar home systems, they can be employed flexibly.

A and B are not suitable for replacing kerosene lamps due to their construction and lack of brightness. Therefore, they will not be considered in the following.

Brightness

Decisive for a lamp's usability is the brightness it emits (measured in lumen) with as little electricity consumption as possible (measured in watt).

A solar lamp intended as replacement for a kerosene lamp should have at least 60 lumen, while 100 lumen are recommended.

LED lamps can achieve a brightness of 100 lumen with an electricity consumption of only one watt. This high energy yield makes them interesting for solar products since LED lamps demand relatively small batteries and modules.

Burn time

Two things are to be differentiated in the burn time of a lamp:

a) Daily burn time: refers to normal daily use. By maintaining this time, the battery can be recharged completely. Minimum specification here: 4h / day

b) Autonomous time: refers to the maximum lighting time of a fully charged battery. Since a battery may be not fully charged in one day (for example, due to weather), professional systems have a battery storage surpassing normal use. Minimum specification: 2 x minimum burn time = 8 h

Battery

Unfortunately, there is no perfect battery type for solar lamps. Every type in use today has its particular advantages and disadvantages. These include, along with specific technical characteristics, also various levels of user friendliness.

Good quality NiMeH, Li Ion, and also GEL lead acid batteries can be used. Until now, NiMeH and GEL lead acid batteries have proven themselves most useful in practice. NiCd batteries are not recommended due to their memory effects and environmental burden.

Hopes are that battery research will soon find an optimal solution for energy storage.

Charge controller

To protect the battery against overcharging and deep-discharging, a charge controller is recommended.

Solar module

Integration or not?—Some solar lamps have an integrated solar module. This solution is not recommended for various reasons:

– as a rule, the module is not large enough to reliably charge the battery;
– the solar lamp has to be set out in the sun to charge, which is, harmful, in the first place, for the battery;

– dust or rain could also considerably damage the lamps; and
– charging outside of a closed space opens the way to theft.

Size

Savings are often made in the size of modules to reduce system costs. However, one should actually not calculate module size too closely. Module size should be oriented on the duration of sunshine during the rainy period. A region's annual average is thereby not appropriate for determining module size. As standard, one could say that for a battery with 2.8 Ah, the module should be no smaller than 1.5 Wp.

User information

The following features are recommended for designing user-friendly solar lamps:
– battery charge status indicator;
– indicator showing the charging of the lamp;
– at least two levels of brightness; and
– remote switch, to turn the lamp on and off conveniently should it be installed on the ceiling.

Robustness

Since the lamps can be used as both permanently installed units and mobile flashlights, robustness is an important aspect. Minimum standards are as follows:
– drop test: the lamp must survive undamaged from a one-meter fall;
– water and dust protection: minimum is IP41 standard; and
– the module must additionally be equipped with a stable frame to prevent damages from bumps.

Guarantee (minimum standards)

Module:
2 year product guarantee
20 year service guarantee
Lamps, including batteries:
1 year minimum
When purchasing a lamp, it is crucial to make sure that the supplier is capable of fulfilling the manufacturer's guarantee services. This applies especially to the availability of replacement parts and the possibility to install them on location. This requirement should be listed explicitly in the purchase contract.

Solar TV: product overview

In rural areas, radio and television usually offer the only possibility to receive trans-regional news. They thus embody a quasi link to the world. Most firms and organizations find that soon after installation of solar lighting comes the request for solar operated television. However, suitable products are difficult to find. A solar operated device should use as little electricity as possible to minimize the costs of the solar power collector.

Company	SunTransfer	Phocos
Model	TV-1560	TV 15
Power		
Power consumption	12 – 15 W	15 – 18 W
Features		
Screen size	15.6"	15"
Aspect ratio	16:9	4:3
Resolution	1366 x 768	1024 x 768
Pixel pitch	250 cd / m2	250 cd / m2
Brightness	600:1	500:1
Viewing angel	H: 160 / V: 160	n. a.
Response time	8 ms	8 ms
TV system	PAL / NTSC or PAL / SECAM	PAL, SECAM, NTSC
DVD player integrated	–	–
Connectors		
Cable / antenna Input	+	+
CVBS input	+	–
CVBS / S-Video L / R Audio	+	–
S-Video input	+	+
HDMI input	+	–
VGA Input	+	+
Integrated DVB T tuner	–	–
SCART	–	–
USB slot	+	–
Cardslot	–	–
Headphone	+	+
Speaker	2 x 3 W	+
Webpage	www.suntransfer.com	www.phocos.de

\+ existent
– nonexistent
n.a. data not available

Televisions available on the local market are frequently less expensive, but their high electricity consumption makes it impossible to purchase an appropriate solar collector. sun connect has tested out the market and offers an overview of televisions suitable for combination with a solar collector.

Criteria:

- 12 V operation
- Screen size of at least 15"
- Electricity consumption < 50 W

Odys	Sundaya	Grundig	Odys	Sundaya	Odys
LCD-TV 15-Fino	NT1702	Vision 2	LCD TV 15-Imagine	NT2001	LCD-TV 17"
< 24 W	31.2 W	35 W	< 36 W	43.2 W	< 48 W
15.6"	17"	18.5"	15.6"	20"	17"
16:9	4:3	16:9	16:9	4:3	4:3 and 16:9
1366 x 768	1310 x 720	1366 x 786	1366 x 768	640 x 480	1024 x 768
220 cd / m2	300 cd / m2	250 cd / m2	220 cd / m2	450 cd / m2	450 cd / m2
500:1	500:1	1000:1	500:1	500:1	500:1
H: 90 / V: 50	H: 170 / V: 170	H: 160 / V: 160	H: 90 / V: 50	H: 160 / V: 140	H: 150 / V: 130
8 ms	25 ms	5 ms	8 ms	16 ms	25 ms
PAL, SECAM	PAL, NTSC, SECAM	n. a.	PAL, SECAM	PAL, NTSC, SECAM	PAL, NTSC3, NTSC4, SECAM
–	n. a.	+	+	–	+
+	+	+	+	+	+
–	+	–	–	+	–
–	+	–	–	+	–
+	+	+	+	+	+
+	–	+	+	–	–
+	–	+	+	–	+
–	–	+	+	–	–
+	–	–	+	optional	+
+	–	+	optional	–	+
–	–	–	–	–	SD, MMC, MS
+	+	+	optional	n. a.	+
2 x 3 W	2 x 3 W	+	2 x 3 W	3 (R) + 3 (L) optional	2 x 2 W
www.odys.de	www.sundaya.com	www.grundig.de	www.odys.de	www.sundaya.com	www.odys.de

Will the demand for mobile phones initiate a solar boom?

Prospects for a rapidly growing solar market look good. For one, because 1.5 billion people in rural regions live without access to electricity, and for another, cell phone networks are spreading rapidly throughout the world. Mobile phones do not require any cross country cables and broadcast towers can be built quickly. But mobile phones must be charged regularly.

In developing countries, money transfers, medical care, and weather forecasts via mobile phone have become a daily occurence.

The United Nations calls it a "mobile phone revolution" with effects on trade, health, and social life. Of all continents, Africa has the greatest growth areas. Over 300 million cell phone contracts were signed between 2003 and 2008 alone. Kenya's monopoly supplier, Safaricom, estimates that it will have 12 million contract customers in 2010. Roughly one third of all Africans telephone, trade, and transfer money via mobile phones. In southern Africa, cell phone density is nearly 100 percent. In northern Africa it is around 65 percent.

The cell phone market is also developing rapidly in Asia. A study published in Sri Lanka by Lirneasia revealed that the rapid increase of cell phones can be traced back mainly to the poor population groups. Of those surveyed, 90 percent reported that they had telephoned within the past three months, 75 percent that they have access to a telephone within ten minutes.

The Grameen Telecom Corporation (GTC) in Bangladesh deals with the urban-rural gap by helping women in rural regions start their own businesses with so-called "Grameenphones." Women buy mobile phones on credit and offer telephone services in their home villages. Nearly 400,000 "phone ladies" make their living through the sale of telephone minutes in Bangladesh, linking even the most remote villages with the rest of the world.

Cell phones must be charged. And the more services offered (weather, market prices, medical care, money transfers), the more indispensable they become. This is evident, for example, in Kenya where the number of money transfers made with the cell phone is nearly equal to the number of those made with credit cards and cell phone rates are sometimes more important than the price of a loaf of bread. Along with a dense network, required for the reliable use of the small mobile devices is, mainly, a stable electrical supply. Mobile phones with integrated solar cells are only an emergency solution. Practice has shown that use behavior renders the charging cycles too short and the rechargeable batteries quickly lose their capacity. Replacement batteries are expensive and difficult to buy.

Here is where solar power systems come into play. Such systems have long delivered more than just light, and have become multi-power providers. They have run refrigerators, radios, and televisions, and for some time now, have charged mobile phones. Those who use mobile phones in rural areas and want to avoid the bothersome journey to a far-away charging station soon recognize the advantage of having their own solar power system. It is almost a certainty that the demand for solar home systems in non-networked areas will increase greatly and that solar trade will develop along the route of broadcasting towers. *yd*

Exemplary facts:

In Uganda, there are meanwhile more contracts for mobile phones than landlines. Additionally, mobile phones are offered at the marketplace with access on a per-call basis. Car owners transform their vehicles into mobile charging stations.

Electrical networks and mobile phone networks: whereas more than 90 percent of the people in the countryside have no electrical network, nearly 50 percent have broadcasting towers.

Solar technicians on their way to install solar light in the Dera region, Ethiopia.

Ethiopia

Inauguration Solar Valley Ethiopia: Solar power station with research aspirations

The first solar power research station in Ethiopia was inaugurated in November 2010. The Ethiopian Solar Energy Foundation conducted the planning and installation. The German Energy Agency financed the project in the context of its umbrella solar program together with the German Federal Ministry of Economics and Technology (BMWi).
The solar power station will deliver important data for the generation of solar power in Ethiopia. Various types of modules and inverters will provide information about what solar technology functions best under given conditions. The facility is on the roof of the "International Solar Energy School" and offers local solar technology students as well as technology suppliers from Germany information about advantages and disadvantages, durability, yields, and montage. www.stiftung-solarenergie.org
www.dena.de

Bangladesh

Dipal Barua founds his own foundation

Dipal Barua, co-founder of Grameen Shakti and Managing Director of the Grameen Bank, for which he worked as Deputy Managing Director for 34 years, has left Grameen to set up a new company, Bright Green Energy Foundation, based in Dhaka. Dipal Barua is also a new Network Partner in Hystra.
www.greenenergybd.com
www.hystra.com

EPIA – European Photovoltaic Industry Association

Study: Unlocking the sunbelt potential of photovoltaics

According to an EPIA study from September 2010, the sunbelt countries (between 35 degrees north and south of the equator) currently represent around 75 percent of the world's population and 40 percent of global electricity demand. Expectations are that this share will rise steeply in the next twenty years. The study attests to a unique potential for solar energy in this region; the photovoltaic potential of the sunbelt, depending on the scenario, is between 60 and 250 GW by 2020, and even between 260 and 1100 GW by 2030. The study analyzes the 66 most heavily populated countries of the 148 in the sunbelt. Despite the high insolation, these countries currently have available only nine percent of the world's installed photovoltaic capacity.
www.epia.org

European Union

Green energy for 100 million Africans

The Africa-EU Energy Partnership launched in Vienna will have an initial capital of 6.5 million US dollars, which will go toward 10,000 MW of hydropower, 5,000 MW of wind turbines, and 500 MW of solar power.

India

Off-Grid Lighting Stakeholder Association

The International Off-Grid Lighting Stakeholder Association (IOGLSA), which is currently in the formation process, will hold a kick off meeting on 14 December 2010 in Mumbai. The Association will become a respected global leader in the implementation of a harmonized set of best practices, enabling the sustainable development of clean off-grid lighting solutions for developing countries. IOGLSA is an ongoing platform to accelerate the availability of quality, affordable clean technology products and promotes internationally the use of clean, sustainable, quality, affordable off-grid lighting products. The Association is self-governed and funded through membership dues, with initial contributions coming from Lighting Africa.

Ethiopia

World Bank and Ministry of Energy sign MoU to build a testing facility

The World Bank initiative "Lighting Africa" began working toward its goal of providing up to 250 million people in sub-Saharan Africa with lighting powered by alternative energy by 2030, with its latest plans to venture into Ethiopia. The Ethiopian Ministry of Water and Energy (MoWE) signed a MoU with the World Bank and IFC on October 26 to build a local testing facility in Addis Ababa that will assess the quality of lighting products. The MoU was signed by Alemayehu Tegenu, Minister of Water and Energy, and Ken Ohashi, director of the World Bank for Ethiopia and Sudan, during the third Lighting Africa workshop.

Rural Solar Energy Index: 4.4 (1 = poorest, 10 = best performance)

Geography / demography / education

Location (continent): Northern Africa
Form of government: Republic
Surface: 163,610 sq km
Population: 10,486,339
Population density: 64 / sq km
GDP per-capita: US$ 8254
Life expectancy: 75.78 years
Urbanization: 67 %
Literacy rates (of population 15 +): 74.3 %
Religions: Muslim (98 %), Christian (1 %), Jewish and other (1 %)
Human Development Index (HDI): 0.769

Economy

Gross national income (PPP): US$ 86,35 billion
Economic growth: 3 %
Share of agriculture: 11 %
Inflation rate (CP): 3.7 %
***Economic transformation index (Bertelsmann):** 4.98
***Corruption index (Transparency International):** 4.4
***International Property Rights Index (IPRI):** 5.9

Electricity

Electricity consumption: 11.9 GWh
Electricity production: 11.08 GWh
Electricity export: 130 million kWh
Electricity import: 145 million kWh
***Share of PV in electricity production:** 0 %
Percent of the overall population with access to electricity: 99.5 %
***Percent of the rural population with access to electricity:** 99 %

Photovoltaic (PV)

Daily sun-hours: 8.2 hours per day
***Tax exemptions / incentives for Photovoltaic:** yes (tax exemption or direct subsidy of 20 % for environmentally friendly investments; 50 % of the investments may be financed with a soft loan)
***Market introduction programs for PV, general:** n. a
***Market introduction programs, special for off grid:** n. a
Jobs in solar energy: n. a
Amount of installed PV capacity: n. a

*included for calculation of Rural Solar Energy Index (n.a. = data not available)

Sources: Bertelsmann Transformation Index 2009 / 10, CIA, Climatetemp.info, Human Development Report 2007 / 08, IMF, International Energy Agency, International Property Rights Index 2009, Transparency Interna-tional 2009, Rural Poverty Portal, Société Tunisienne de l'Electricité et du Gaz (STEG), Unctad, Unido, World Bank.

Tunisia

Date market in Douze, Tunisia © Franca Pedrazzetti/EPA/Keystone

Christian Schmidt

Clean water – a human right

At the beginning of the twenty-first century, every seventh person throughout the world must continue to live without sanitary drinking water. Affected are mainly the peripheral areas in developing countries. At the same time, an entire series of technologies are available to allow these people, too, access to clean water.

Since spring 2010, the dwellers of the village Rema have access to disinfected water.

The UN Secretary Generals agree. In 2006, Kofi Annan said: "Access to clean water is a central human need and thereby a human right," and his successor Ban Ki-moon doubled that in 2010: "Clean drinking water is decisive for people's survival, health, and dignity." The urgency of this verdict is well founded: 1.8 million people die from diarrhea every year; the majority is children in developing countries.

The UN is therefore determined to cut in half the number of people without access to drinking water by 2015. According to prognoses, however, mainly urban settlements—thanks to connections to mains networks—will profit, whereby many rural areas will continue to be cut off from clean water in the future.

Yet that does not have to be the case. Research and industry have meanwhile developed an entire palette of water sterilization technologies that are especially qualified for use in remote regions. Common to all these facilities is that they have low running costs, can be maintained without a great deal of effort, and are simple to operate. The greatest differences between the individual solutions are in the principles used for sterilization and capacity.

UV rays

The simplest technique for disinfecting water was developed by the Swiss Federal Institute of Technology Zurich. The Sodis Method (Solar Water Disinfection) requires only a plastic PET bottle, heat, and sunlight as resources. The bottle is filled with contaminated water and set outside in the sun for six hours. In this time, the UV rays in combination with the high temperatures reached inside the bottles kill 99.9 percent of the pathogens. Recommended by WHO, Unicef, and IKRK, the method has already been employed in numerous developing countries. The advantage: Sodis costs nothing, works without installation or additional technology, requires no electrical energy, and can be employed as needed without limits. Disadvantages: due to the low capacity, Sodis can supply only the needs of individuals. During the rainy period the method does not work or only with limitations. (www.sodis.ch)

The water disinfection method developed by Osram likewise works with UV rays. However, free sunlight is not at the base of the procedure, but a disinfection radiator operated with 12 or 230 volts that is put into tanks with polluted water. The UV light emitted by the radiator kills the germs and delivers eighty liters of clean water per hour. Advantage: an easily transportable and simple to use system. Disadvantage: the disinfection radiator is reliant on an electrical network to charge the batteries or must be run on electricity. (www.osram.ch/_global/pdf/osram_de/produkte/leuchten/leuchten/sonderleuchten/puritec_de.pdf)

A third technique based on UV comes from Naiade. The company has developed a compact device with an ultraviolet lamp inside that disinfects contaminated water. The necessary energy comes from an integrated solar panel. The Naiade system has been tested by the internationally active certification company Kiwa and the Unesco Institute for Water Education, and is em-

Sodis method: within 6 hours, UV rays and heat kill 99.9 percent of all pathogens, Lombok/Indonesia.

ployed in numerous developing countries. It, too, delivers eighty liters of clean water per hour. Advantage: simple maintenance and independence from the electricity network together with its performance render the device suitable for use in small settlements and schools. (www.safe-drinkingwater.com)

Filter

The firm Trunz Water Systems builds both stationary and mobile water preparation facilities with a capacity of 900 liters per hour. The technology is thereby suitable for entire villages. The basis for disinfection is a three-part filter that in a first step removes larger dirt particles, and in the following steps, kills viruses and bacteria (by means of so-called reverse osmosis). The facility draws its energy from solar panels or windmills, whereby a battery guarantees independent operation for up to twenty-four hours. Advantage: qualitatively high-class building components promise longevity and low maintenance costs. In contrast to all of the other techniques, the Trunz facilities are also capable of removing inorganic particles from the water. Disadvantage: comparably high initial investment costs. (www.trunz.ch)

Cell Membrane Electrolysis

The method of water sterilization developed by the firm LVPG is based on so-called Cell Membrane Electrolysis (CME). Contaminated water is mixed with salt while adding electricity at the same time. The resulting chemical reaction produces acid. This acid has strong disinfectant qualities and kills all of the disease-causing germs. After successful disinfection, it returns to its initial components—water and salt. LVPG's facilities meet WHO standards and are suitable for use in industrial areas, for example, the Frankfurt Airport, as well as in developing areas, for example, Ethiopia (see box). Advantage: CME technology delivers disinfected water within seconds. There are no detrimental secondary or end products. Disadvantage: relatively complicated technology. (www.lvpg-international.de/)

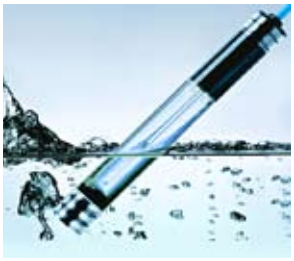
Christian Schmidt is a scientific journalist in Zurich.

Rema, a village in a remote area of Ethiopia, has been one of the most important working areas of the Solar Energy Foundation since 2005. While at first the main concern was to supply electricity to the 4500 inhabitants, the foundation soon added the task of supplying the people with clean water. This goal has now been realized. In spring 2010, the firm LVPG brought one of its facilities and installed it in Rema. Village dwellers have since had access to clean water. The water is stored in a central tank and then pumped to individual collection stations. The facility has a capacity of up to 100,000 liters in 24 hours. "For the village dwellers, the clean water signifies a clear improvement in their quality of life," says Harald Schützeichel, founder and CEO of the Solar Energy Foundation.

The Trunz Water Systems cleans 900 liters per hour and draws its energy from solar panels or windmills.

With Cell Membrane Electrolysis a chemically generated acid kills all disease-causing germs.

Nedap Naiade water purifier with integrated solar panel, here in Brazil.



Electrically generated disinfectant rays by Osram deliver up to 80 liters of clean drinking water per hour.

Battery recycling

Mass production without recycling leads to a massive problem. That is also true of solar products. According to business figures from various producers, hundreds of thousands, even millions of solar lamps are distributed in Africa alone. There are currently no arrangements for dealing with used solar products.

Solar home systems (SHS) and solar products comprise, basically, a module, electronics, and a battery for energy storage. Since batteries are the most short-lived component of the solar product, regardless of whether they contain lead, quick silver, lithium, nickel, or cadmium, a recycling solution is necessary: none of these heavy metals should end up in the environment.

Lead batteries are the most common energy storage devices because they are compatible with use behavior (no memory effect). As lead-acid batteries, they are used in automobiles, buses, trucks, and railways, among other places. Lead-gel batteries are suitable for solar systems. Their advantage is that they are lighter, service-free, and do not have to be mounted level. After four to five years, they, too, have to be exchanged. Recycling facilities for lead-acid batteries can be found in northern Africa (Morocco, Algeria, Tunisia), in western Africa (Senegal, Ghana, and Nigeria), in central Africa (Cameroon), in southern Africa (South Africa, Zambia, Zimbabwe, Mozambique, and Swaziland) and in eastern Africa (Kenya, Ethiopia). However, these facilities are concerned mainly with the recovery of the lead (ca. 70 percent of the total battery) as a valuable raw material. Plastic casing, separators, connections, and mainly the sulfuric acid are not reintroduced into the recycling cycle.

Lead is one of the most toxic heavy metals. Emissions present the major problem in recycling lead. Workers at the recycling facilities are, as a rule, not trained or protected against poisoning. Among other things, the International Lead Management Center (ILMC) demands that an inventory of the presence of lead batteries be made and mandates an examination of the existing recycling facilities. In addition, the public must be informed about the dangers of handling used energy storage devices. Already in 2001, the ILMC demanded a legal framework for regulating the collection, transport, and recycling to avoid endangering people and the environment.

Recycling must be an integral component in the distributions concept for the operation of solar products in rural regions of Africa, Asia, and Latin America. This not only benefits people and the environment, but also offers an opportunity to gain new economic perspectives through the processing and extraction of raw materials. That would then be a benefit all around. *yd*

A recycling solution is necessary for the most short-lived component of most products: the battery

Recycling facilities can be found in these African countries.

Christopher Neidl

MFIs and energy lending: 3 tips on common motivations, initial concerns, and lessons learned

A growing number of microfinance institutions (MFIs) have been successful in reaching new customers through service and portfolio diversification, making clean energy lending more and more common. What motivates MFIs to engage in energy lending in the first place? What common concerns prevent or postpone energy portfolios from going forward, and what decisions are crucial to early success? Interview surveys of four established microfinance institutions[1] currently engaged in energy lending yielded the following insights:

1. Triggering influences and long-term goals

An initial commitment to energy lending is influenced by factors that are specific to the MFI and the context within which it operates. However, a few common drivers can be identified. Each of the survey respondents indicated that early interest arose principally from interactions with customers: either existing clients requested loans for energy products, or market research and staff observations brought the scope of the opportunity and potential impact into clear focus. Motivation is, however, also fostered at higher organizational levels as a response to global trends, often reflecting a new embrace of "triple bottom line" values by the MFI and also, importantly, governments and major sponsors. Indeed, as new funding sources for the support of clean energy emerge, MFIs will continue to reevaluate energy as a potential opportunity. Interest in energy lending can be predicated on different long-term objectives, resulting in distinct business approaches. For instance, some survey respondents seek to grow permanent energy sales forces within their organizations, and maintain focus on end-user lending. For others, involvement in marketing and sales early on is viewed mainly as a temporary strategic means of building markets and cultivating future business loan clients throughout an emerging local energy value chain.

2. Common barriers to energy lending

According to survey participants, the perception of risk can leave many MFIs struggling to convert initial interest in energy into new lending programs. Uncertainty concerning energy product quality and manufacturer legitimacy was cited as the leading factor postponing earlier portfolio development. MFI success depends on client trust, and therefore doubt surrounding long-term technical performance is often sufficient to preempt the take-off of energy programs. MFIs also recognize, correctly, that managing an energy loan portfolio is different, in several critical respects, from established small business loan practices. Energy program development requires technical know how and service capabilities that are beyond the core competencies of most MFIs. These uncertainties and gaps in experience can be overcome, but only with investments of both time and money—commitments that many institutions are not prepared to make. Importantly, all four survey respondents indicated that external support in the form of product subsidies, grants or loans to fund technical advisors, capacity building, or startup inventory was critical to the further growth of their energy lending programs.

3. Keys to early success

MFIs identified common factors related to customer, staff, and manufacturer relationships that contributed to the early success of their energy lending programs. First, each stressed the importance of determining the specific energy needs and preferences of customers through market research, and using research findings as a basis for selecting energy technologies and designing loan products. Additionally, product demonstration should be the centerpiece of an MFI's marketing strategy, since customers require exposure to products in order to gain confidence in their benefits. Additionally, sales messaging should prioritize cost savings and product capabilities over environmental impacts. Cultivating a sales force that is knowledgeable and enthusiastic about the product is critical, which means that investments in staff training and education are essential. Respondents also reported that new incentive structures for loan officers are necessary to overcome any resistance to promoting energy products based on perceived technical risks, added work load, and comparatively low returns vis-à-vis other forms of lending. Finally, MFIs cautioned that an absence of permanent systems to ensure long-term product maintenance and replacement parts constitutes a major threat to program viability. Therefore, cultivating active partnerships with quality manufacturers who can provide technical and logistical assistance both prior to and after product sales was considered indispensable. Furthermore, MFIs demand assurance that manufacturers will honor warrantees and prove dependable in supplying products to meet growing customer demand as their energy lending programs increase in scale over the long-term.

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1 Faulu Advisory Services (Nairobi, Kenya); Negros Women for Tomorrow Foundation (Bacolod City, Philippines); Tujijenge Africa (Dar es Salaam, Tanzania); XacBank (Ulaanbaatar, Mongolia)

Traveling the "Via del Sol" for more justice

For Enrico Turrini, 72, there is only one way to the future: the "Via del Sol," the "way of the sun." The sun is not only an energy source, but also a political symbol. Freely available to everyone, it embodies equality and solidarity. And where else than in socialist Cuba is it possible to realize this way?

For Enrico Turrini, "Via del Sol" is a lifestyle and a kind of "solar socialism."

Enrico Turrini has two favorite sayings: "That's fun." And: "That is not fun." If something is not fun, he draws conclusions from that. This applies to his life story, too: Enrico Turrini, raised in Brescia, Italy, began to work for the atomic power industry after his engineering studies. There, he soon realized that this kind of energy production did not appeal to him at all: "Much too dangerous." Moreover, he didn't like the ownership structure: "All monopolies." Turrini's conclusion: "That is not fun."

He thus changed his way of thinking in the early 1980s. Turrini turned his back on the technocratic high-tech industry, and together with like-minded people founded Eurosolar (European Association for Renewable Energy) and became one of the most active protagonists of solar energy.

In the meantime, thirty years have passed and Turrini has retired. He spends his time as a polyglot traveler in matters of sustainable energy. As Eurosolar representative, he attends international conferences to promote energy change. Yet that is only one part of his involvement. His travels take him back to Cuba time and time again. There, Turrini has found the best conditions for realizing his vision of a sustainable and likewise socially-just form of energy production.

When Turrini first landed in Havana in1993, he arrived in a country in a state of emergency. The Soviet Union, hitherto its most important trade partner, had just collapsed, which meant that inexpensive Russian crude oil, the most important energy source, was no longer available. But the emergency also had its positive aspects. Fidel Castro grasped the crisis as a chance to convert the country's energy supply. Together with the Cuban energy ministry, local NGOs, and Eurosolar—which is also the financer of the major change—Turrini began to realize his long fostered idea: "Via del Sol."

On the one hand, Turrini understood this as energy production on the basis of sun, wind, water power, and biogas. On the other hand, for him, the "Via del Sol" is also a lifestyle. It is the opposite of technologies such as nuclear power with its destructive potential and it has nothing to do with energy forms that are responsible for climate change, thereby endangering the future of the planet. "Via del Sol" embodies instead what Turrini identifies as "solar socialism." It relies on decentralized energy sources that are equally available to all. "Energy is the motor of life," says Turrini. Therefore, for him, energy does not belong in the hands of just a few, but "in the hands of the people."

Turrini has returned to Cuba every year after his first visit and has been able to follow the country's changes. Already in 1997, the first biogas facilities went into operation. Shortly thereafter, the first photovoltaic facility—with an output of 1 kWp—began delivering energy.

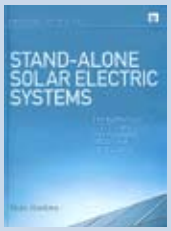
In the meantime, roughly 700 biogas facilities are in operation, numerous wind parks and hydroelectric power plants are under construction, and photovoltaic panels have been installed in nearly 2000 schools. In addition to delivering light, the facilities also supply computers and televisions with energy. The next major step in the works is to provide electricity to as many as possible of Cuba's 100,000 households far beyond the reach of any electricity supply.

Turrini's current involvement is primarily with a student city of 5000 inhabitants in the east of the country. He lives there during his stays in Cuba, educates instructors and together with the residents works on creating a "solar center" whose energy supply is based exclusively on photovoltaics, biogas, and wind power. This work "is a lot of fun," says Turrini, and it is also very important, "since these young people, as the next generation, are responsible for the future of the planet." *cs*

New books

Mark Hankins

Stand-alone Solar Electric Systems: The Earthscan Handbook for Planning, Design and Installation
232 pages, paperback, English
Earthscan, 2010
ISBN 978-1844077137, 43.99 €

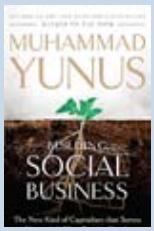


With *Stand-alone Solar Electric Systems,* solar pioneer Mark Hankins delivers the continuation of his *Solar Electric Systems for Africa*, published in the 1990s and out of print for quite some time. In addition to the entirely reworked contents of the previous publication, the book contains a great deal of new information based on rapid advances in solar, battery, charge controller, inverter and lighting technologies. Hankins presents a truly comprehensive and detailed user guide with 232 pages, roughly 100 illustrations, and 40 tables. It remains to be seen if it is so practical and "hands-on" as the publisher claims, with its large format and the considerable page count. The hefty price might also prevent some of the targeted readers from gaining access to the compendium.

Detailed and comprehensive: for electric technicians and designers, development workers, and anyone who wants to install their own off-grid solar PV system.

Muhammad Yunus

Building Social Business: Capitalism That Can Serve Humanity's Most Pressing Needs
256 pages, paperback, English
Perseus Books, 2010
ISBN 978-1586488246, 16.95 €



Muhammad Yunus, the practical visionary who pioneered microcredit and, with his Grameen Bank, won the 2006 Nobel Peace Prize for his world-changing efforts, develops here a bold new concept that promises to revolutionize the free-enterprise system: social business. As a logical further development of microcredit, social business should help fight poverty and the lack of nutrition and education, improve infrastructures, and create jobs. And it works like this: Social Businesses act within the free market, but do not pay any dividends to investors. All profits are reinvested in the enterprises, thus better fulfilling their social purpose. But the concept should not be confused with social enterprise. In his book, Yunus traces the development of the social business idea and offers practical guidance to those who want to create social businesses of their own.

Highly interesting and motivating: for everyone, especially entrepreneurs interested in positive action for a better world.

Dictionary

Car|bon fi|nan|ce ['carbon fi'nan'ce]
Financial incentives provided to projects generating carbon or greenhouse gas emission reductions in the form of the purchase of such emission reductions. Carbon Finance was developed as part of the Clean Development Mechanism (CDM). This mechanism provided by Article 12 of the Kyoto Protocol was designed to assist developing countries in achieving sustainable development by permitting industrialized countries to finance projects for reducing greenhouse gas emissions in developing countries and receive credits for doing so.
Source: World Bank

New Media

www.ruralpovertyportal.org

At the heart of every human experience is the desire to survive and prosper. To live without fear, hunger or suffering. To imagine how your life could be better and then have the means yourself to change it. Yet, every day, 1.2 billion people—one fifth of the world's inhabitants—cannot fulfil their most basic needs, let alone attain their dreams or desires.
Empowering rural people is an essential first step to eradicating poverty. It respects the willingness and capability that each of us has to take charge of our own life and to seek out opportunities to make it better.
Powered by the International Fund for Agricultural Development (IFAD), the Rural Poverty Portal is a website where the people concerned and development partners can share information about eradicating rural poverty.

Informative and in-depth: for policy-makers, non-governmental organizations, and other development partners.

PV Master iPhone and iPad App

The five sections of the PV Master App deliver all relevant information for setting up a green energy system. "Data" automatically calculates the user's precise location and all necessary information (number of clear / near-overcast sky days, insolation incidence, hourly solar angle relative to horizon, a. o.). Should one have no internet connection "in the field," the site coordinates remain stored. The "guide" informs new PV solar planners first starting out, about the initial steps for setting up a PV panel system. The most frequently asked question—"how many panels will I need?"—can be easily answered thanks to the "panel calc." The "battery calc" just as easily calculates the capacity and quantity of batteries you need. Finally, the "glossary" benefits newcomers and old hands alike, who find definitions of terms, truly clarifying them for the first time.

Future-oriented and well thought through: for professionals in the photovoltaic / solar panel industry.

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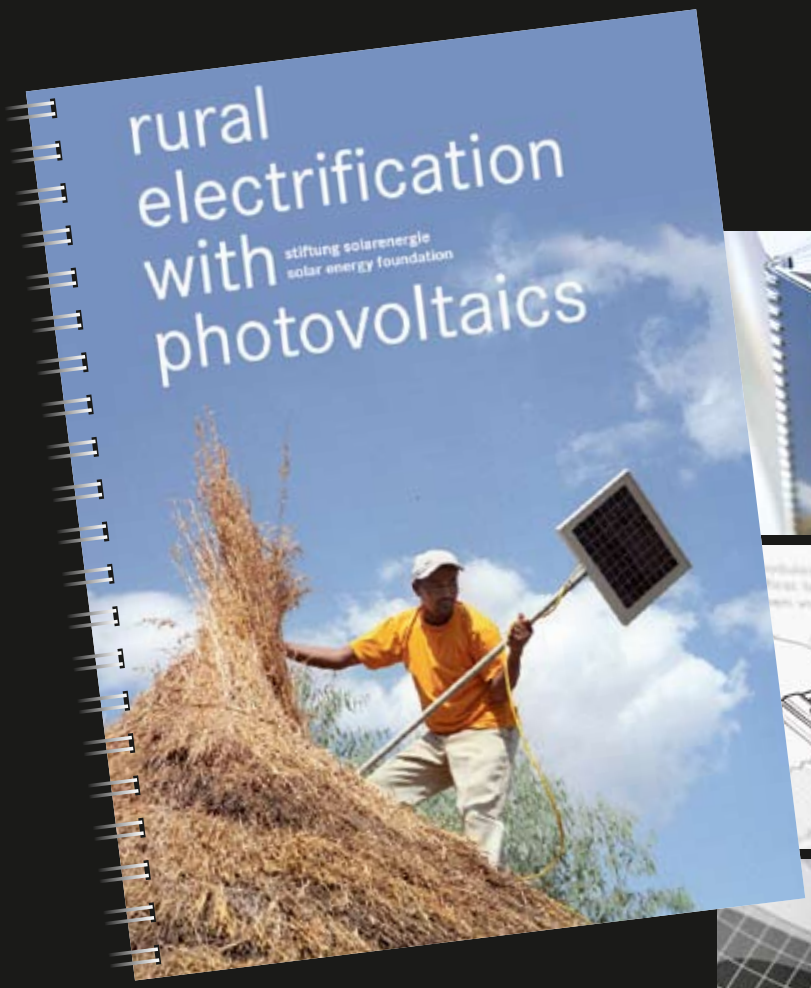
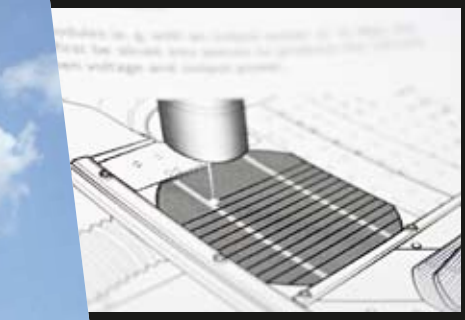
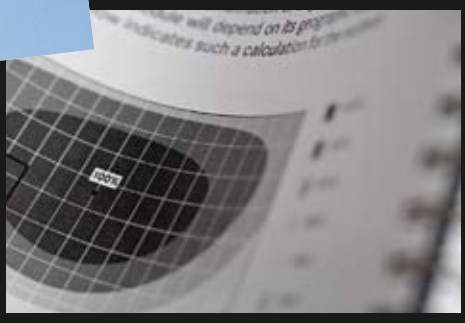
rural electrification with photovoltaics







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