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sun connect

rural electrification with photovoltaics

Harald Schützeichel

NGO or business? Hybrid!

There has been a lot going on in rural electrification in the past several years, but nonetheless, little has changed. On the contrary: the number of people who have to live without electricity continues to grow. Has the time come for a new approach?

On the one hand, charitable NGOs are active in this area, and, on the other hand, profit-oriented businesses. Despite a strict dissociation of their working methods, both must accept that neither the one nor the other approach can, per se, substantially foster rural electrification. An NGO lacks entrepreneurial thinking, which is what first allows for sustainability and growth. A commercial enterprise lacks the financial possibilities to build up a service network in rural regions, and, thus, the chance to guide the population in their long-term development. Yet solar energy is more than just electricity. It offers people an opportunity for social development and economic prosperity. In order to unfurl its full potential, ideological walls must be torn down, and the advantages of both paths merged to one single approach. While a donation-financed NGO approach is particularly suitable for initiating economic growth in rural areas, accompanying social developments, and offering the necessary professional training, a profit-oriented approach shows its strengths in terms of efficient and financially sustainable provision of solar products.

An intelligent combination of these two ways will decisively change rural development. The Solar Energy Foundation, together with its subsidiary SunTransfer, is successfully pursuing such a hybrid approach. It is admittedly so new and the ideological walls between NGOs and businesses so high, many people find it difficult to understand. Nonetheless, the time has come to set out on a new path, so that not only a lot goes on, but also, a lot changes, permanently.

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Solar refrigerators: What is being offered on the market?

In rural regions not linked to an electricity network, cooling of foodstuffs, medication, and vaccines is an urgent problem. Until now, kerosene operated refrigerators have been used as a last resort, however, they are not very satisfactory in terms of energy source or energy demand: with a daily consumption of one liter kerosene, each unit has an annual emission of circa 1.2 tons of carbon dioxide.

Meanwhile there are excellent alternatives available. The market offers ever more refrigerators operating with solar energy. Their greatest advantages: by using the sun, they have an energy source that is available free and in endless supply, yet they are also environmentally-friendly and maintain a steady temperature more reliably than their kerosene-operated competitors—which is crucial, especially for vaccines. Solar units thus combine healthcare, environmental protection, and development aid in one.

The latest generation of solar refrigerators, available since mid-2010, offers an additional benefit: these units no longer require a battery. In phases without sunlight, they draw their cooling energy from built-in ice storage. Depending on the model, gaps of up to five days can be covered in this way. In addition: because no (expensive) batteries are required, at a purchase price of circa 1,500 US dollars, these newest solar refrigerators are up to a third less expensive. *cs*

Company	SolarChill 1)	Sun Frost
Model	MKS 044 2)	R Pb-X 2)
Dimensions		
Capacity	19 l	64 l
Size (heigth x length x depth)	88 x 73 x 70 cm	94 x 86 x 70 cm
Weight	n.a.	110 kg
Power		
Power consumption 4)	n.a.	n.a.
Load induced stress	12 / 24 V	12 / 24 V
Battery	–	–
Minimum of required PV output	160 W	100 – 160 W
Cooling		
Duration of cooling withouth energy input	4.75 days at 32°C	4 to 5 days at 32°C
Minimum cooling temperature	2°C	2°C
Webpage	www.solarchill.org	www.sunfrost.com

Best practice

Since 2005, the Solar Energy Foundation has installed solar cooling systems in several health stations in Ethiopia, thereby replacing kerosene-operated refrigerators. The provision of kerosene in these remote areas, especially during the rainy period, proved incredibly difficult.

These health stations provide the rural population with vaccines and basic medical care. Vaccines are delicate and must be stored at a constant temperature of 2 to 8 degrees Celsius. In order to reliably assure this temperature, solar systems with 240 wattpeak have been installed. For the cool boxes, a model with a 21-liter capacity has been chosen that can both cool and also freeze at temperatures as low as 18 below Celsius. In order to increase the operational reliability and save on energy, two cool boxes are used at each station. One is used solely for vaccines and runs constantly. The second cool box is used only for deployments in the field. Ice packs are frozen in it in the morning, which are then used to keep the medicines cool during transport. After completing the medical operation, this cool box can be turned off, or in the case of a blackout, it can also be used for vaccines.

Engel	PolarPower	SunDanzer	Steca	Phocos	SunDanzer
MT80F-U1	RR2	DDR165	PF166	FR 165 R	RCS-R20 3)
92 l	127 l	165 l	166 l	165 l	22 m^3
79 x 53 x 48 cm	71 x 66 x 96 cm	94 x 66 x 87 cm	92 x 87 x 71 cm	98 x 76 x 98 cm	243 x 61 x 243 cm
39 kg	72 kg	57 kg	61 kg	51 kg	4150 kg
0.7 – 3.6 Amp / h	2 Amp / h	n.a.	50 – 150 Wh / d	168 Wh / d	11.8 kWh / d
12 / 24 V	12 V	12 / 24 V	12 / 24 V	12 / 24 V	24 / 48 V
5)	5)	–	5)	5)	yes, 5)
n.a.	n.a.	120 W	75 W	n.a.	3000 W
n.a.	12 hours at 43°C	4 days at 32°C, 6)	n.a.	n.a.	n.a.
– 17° C	– 25°C	– 1°C	– 20°C	n.a.	n.a.
www.engel-usa.com	www.polarpowerinc.com	www.sundanzer.com	www.stecasolar.com	www.phocos.de	www.sundanzer.com






1) Mutually developed by Greenpeace, GTZ, WHO, UN, and others
2) Equipment specially designed for vaccines
3) RCS-R20 is a large cooler
4) Measured at 32° outside temperature, or minimum/maximum specifications
5) These devices do not have their own batteries, but are reliant on external systems to bridge gaps in the energy supply
6) Using an additional 2.54-centimeter-thick ice cover

n.a. = data not available

Earth, water, air, and shade

Open the door and take a cool drink out of the refrigerator. An entirely automatic action for the one, and entirely unknown for the other. The cooling of food and drink without electricity is an old science and still a common one for billions of people today.

Once a forested area, soil erosion is now a major problem in this Ethiopian region; and the wells are a long way from the villages.

In previous summers, milk products were stored in snow-filled "nevère" in Ticino, Switzerland.

A winter day in middle Europe. It is snowing; other than very few exceptions, the thermometer has read between 2 and 8 degrees Celsius for weeks. The perfect temperature to keep food cool. One could make use of nature and simply turn off the refrigerator for a few weeks. Save on electricity and, on top of that, lower carbon dioxide emissions by storing milk and butter, meat and vegetables on the balcony. Or even better, in a dark, well-ventilated pantry, which was found in every home before the invention of the refrigerator.

Although every second house in the U.S. had a refrigerator in the 1930s, in most European countries, twenty years later only ten percent of the households had one. Today, there are circa 500 million and circa 60 million new ones are manufactured every year. The refrigerator has simplified our lives and decisively changed our eating habits. But the science of natural cooling has been virtually lost. The numerous inquiries on advice pages on the Internet provide evidence of that. How can I keep beer cool at a picnic? How can I store meat when camping? Questions that, at most, a boy scout would be able to answer these days: And undoubtedly, the nearly two billion people in the world who have to get by without electricity. They are not really concerned with a cool beer after work, but rather, the proper storage of foodstuffs. They pass on their knowledge from generation to generation, but they, too, are dependent on the building blocks necessary for natural cooling: earth, water, air, and shade.

Ice houses and air fountains

Since time eternal, these elements have been used for cooling foodstuffs and medications. Already in classical antiquity, in the Mediterranean area, ice was stored in so-called ice houses year round. As a rule, these were underground chambers built close to fresh water lakes. In the winter, the ice was brought into well-isolated cellars and it remained frozen there for several months. For another cooling principle that is used throughout the world, a hole is dug in the ground and covered with wet towels or straw. Clay pots are also suitable for natural cooling when one stores them in an airy, shaded place, and covers them with wet towels.

More elaborate, but also used for centuries is geothermal power for warming and cooling, via so-called air fountains, a special type of geothermal energy exchanger. In the cold seasons the outside air is not led directly into the building, but pre-warmed in the soil. In the summer, the system works the other way around: the air, cooled in the soil, provides comfortable, cool temperatures inside.

Forest

One of the most important building blocks for natural cooling is unfortunately not available everywhere today: the forest. Due to deforestation in many areas of the world, soil erosion is a major problem. The annual loss of forested area comprises, according to the FAO, in a country such as Ethiopia alone, more than 200,000 hectares. Villages without shade in southern Europe and Africa, ground water that sinks ever deeper. Where there are no trees, there is also less wind, not to mention a lack of natural shade. Whereby trees are perfect cooling systems, par excellence. They gather rainwater in their roots, which prevents the earth from drying out and eroding. Their canopy of leaves offer shade, and the wind, which wanders through their leaves, creates clouds that bring vitally important rain.

A tree cannot, however, arrange much alone. The countless reforestation programs in these countries are, indeed, important, but in terms of amount, only a drop in the ocean. Whereby, one single hectare of forest is enough to bind 60 to 1000 tons of soil (depending on the region and type of tree). And that would recover, for the most part, the basic elements for natural cooling—earth, water, air, and shade. *us*

Hybrid into the future

Hybrid systems are a reliable means for supplying people in remote areas with energy: the combination of several energy sources allows for greater energy security.

Hybrid systems are flexible and balance out the disadvantages of one energy component with the strengths of another.

Hybrid systems are like the daily special at a restaurant: there is not just an entrée on the plate, but a combination of meat, vegetables, and side dishes. Applied to the energy sector, that means not only one supplier—for example, photovoltaics—is used to provide energy. Hybrid systems unite what is available in each particular situation in terms of energy carriers. In southern countries, that means mainly sun and wind power. When sensible and available, added to that are also hydroelectric power and biomass, and if need be, conventional generators.

Hybrid systems are flexible and balance out the disadvantages of one energy component with the strengths of another. For example, a hybrid system would use sunlight by day and wind power at night, while generators—often pre-existing—are used when shortages occur. However, here, electricity is preferably not generated by diesel, but, for example, by Jatropha oil, a fuel produced from the nuts of the Jatropha plant that neither animals nor humans compete for. The toxicity of the seeds makes the oil inedible.

Among the major advantages of hybrid systems is the ability to seamlessly combine individual energy suppliers, so that an additional source can be accessed in times of increased demand. This process is controlled by corresponding intelligent software, which turns the separate components on or off depending on the demanded capacity, or, for example, channels surplus energy into batteries. Depending on the construction standard, capacity fluctuates between 3 and 60 kilowatts. To meet even higher demands, several facilities can be combined. Thanks to this combinability, hybrid systems are not only capable of being used for extremely diverse purposes, but are also reliable and efficient.

Hybrid systems are suitable for use mainly in remote regions without access to a network. Worldwide, 1.6 billion people are still waiting to be supplied with electricity. Such systems are just as suitable—in mobile versions—for crisis areas in which the energy supply has broken down.

Hybrid systems not only help people improve their incomes and thereby guard against land flight, they are also a convenient means to counteract further shortages of the raw material oil, and to fight against global warming and air pollution. Cost comparisons of hybrid systems and common energy generation show that higher investments for hybrid systems are balanced out after just a few years through their lower operating costs as compared with diesel generators. Hybrid systems thus have extremely great potential for development.

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International

Founding of International Off-Grid Lighting Stakeholder Association

On 16 February 2011, 24 independent organizations active in the international off-grid lighting market launched the International Off-Grid Lighting Stakeholder Association (IOGLSA). With this union of leading entrepreneurs, the association is expected to emerge as a respected global leader in the off-grid lighting area. Among the Association's main goals are transforming the market for affordable, clean, and quality off-grid energy products and services, and promoting the development of off-grid energy technologies and business models, among other ways, by addressing key market barriers. Internationally, the parties want to adopt and implement a purpose-developed harmonized standard, which will also be propagated at national and regional levels, as well as standardized testing procedures. The idea for the association arose in May 2010 at the Lighting Africa Conference in Nairobi. Among the founding parties are Fraunhofer ISE, MicroEnergy International, Osram, Philips, SunTransfer, Sunlabob Renewable Energy, Tata BP Solar, Teri, and Total.
http://offgridlighting.posterous.com/off-grid-lighting-stakeholder-association

International

Rural Poverty Report 2011

The International Fund for Agriculture and Development (IFAD) has released the "Rural Poverty Report 2011." The report provides a coherent and comprehensive look at rural poverty, its global consequences, and prospects for its eradication. Released on 6 December 2010, the report contains updated estimates by IFAD regarding how many rural poor people there are in the developing world, poverty rates in rural areas, and the percentage of poor people residing in rural areas. Since the last "Rural Poverty Report" published by IFAD in 2001, more than 350 million rural people have lifted themselves out of extreme poverty. But the new report notes that global poverty remains a massive and predominantly rural phenomenon—with 70 percent of the developing world's 1.4 billion extremely poor people living in rural areas. Key areas of concern are Sub-Saharan Africa and South Asia.
www.ifad.org/rpr2011/index.htm

United Arab Emirates / U.S.

Zayed Future Energy Prize for E + Co

The clean-energy investment company E + Co is one of the Zayed Future Energy Prize winners. E + Co was awarded a runner-up prize of US$ 350,000 for its pioneering investments in the developing world. The prize represents the vision of the Late Founding Father and President of the United Arab Emirates, Sheikh Zayed bin Sultan al Nahyan. E + Co supports and invests in small and growing clean-energy enterprises in developing countries to impact climate change and energy poverty.
www.zayedfutureenergyprize.com

Best practice

Philippines

Founding of the Stiftung Solarenergie – Solar Energy Foundation Philippines

On 16 March 2011, the Stiftung Solarenergie – Solar Energy Foundation Philippines was founded. Now, after Ethiopia, Germany, and Switzerland, it is also represented in the Philippines. Chair is Jim J. Ayala (Filipino). He is a social businessman and founder of Hybrid Social Solutions, a public service-oriented company that provides rural communities access to electricity, water, and other essential services by distributing innovative products such as solar lighting and charging and water purifiers. Vice president Dr. Harald Schützeichel (German) is the founder of Stiftung Solarenergie – Solar Energy Foundation (non-profit) and SunTransfer GmbH (for-profit), with offices in Germany, Switzerland, Ethiopia, and Kenya. Vice president Vince S. Pérez (Filipino) is CEO of Alternergy Partners, a power company developing renewable energy in emerging countries in Asia, and chairman of Merritt Partners, an advisory firm for energy investments in Asia, and Chair of WWF Philippines, the Malampaya Foundation, and the Philippine Solar Car Challenge. From 2001 to 2005 he was Philippine Energy Minister. Stiftung Solarenergie – Solar Energy Foundation, SunTransfer, and Hybrid Social Solutions will form a network in the future in the Philippines. *hs*
http://stiftung-solarenergie.org.ph/

Ethiopia

Successful microfinancing of solar products in Ethiopia

The Ethiopian Stiftung Solarenergie – Solar Energy Foundation (SEF) began developing its own organization for the financing of solar home systems in 2008. It is based on years of experience collecting small fees for the maintenance of solar home systems in the solar village of Rema. Beneficiaries are families in the ten rural regions of Ethiopia where the Solar Energy Foundation maintains its own solar centers. The supply of loans occurs based on precisely determined rules. After checking credit worthiness, a down payment must be made and following that, the solar facility is installed. Monthly installments are collected by solar technicians. The credit term is two years, and during this time, maintenance is free of charge. The software for this internal management information system (MIS) was developed together with Arc Finance. It makes it possible to reliably and professionally monitor the loans. In addition, certificates for carbon dioxide trading are processed by the MIS. The experiences with these microcredits have been entirely positive and the repayment quota is close to one hundred percent. This is due, no least, to a timer that is built into the charge controller of all SunTransfer solar home systems. It automatically stops the system after the course of a determined period of time

Street scene in a Filipino village.

if the installment has not been paid. Based on its good experiences, the Solar Energy Foundation plans to also offer microcredits for solar home systems in Kenya. *yd*

Lighting Africa Quality Testing Results

The firm SunTransfer distributes solar lamps, mainly in Ethiopia, Kenya, and the Philippines. Following the naming of SunTransfer's solar lamp ST2 as "outstanding product," the smaller SunTransfer 1 has now also been tested. The test method, identified as Lighting Africa Quality Test (LAQT), was developed by the German Fraunhofer Institut ISE. Tested among other things are longevity, durability and performance as well as accuracy of the product description. The tests were carried out on twelve ST1 SunTransfer solar lamps introduced in Ethiopia.
Result: "Your product passed the thresholds set by Lighting Africa to qualify for Associate status. Congratulations! The SunTransfer 1 is among the best off-grid lighting products that are available today to African consumers. The SunTransfer 1 will now be qualified for the Associate-level services currently enjoyed by the SunTransfer 2."
More about the test methods at: www.lightingafrica.org *yd*

Solar competence center opens its doors

Solar light has already become self evident in many villages. There, solar development is going one step further. On the inhabitants' wish list are water disinfection, refrigeration, and televisions. In January 2011, Solar Valley Addis Ababa began operations under the direction of The Solar Energy Foundation. Products are built, tested, and repaired here, for example, in a battery capacity test, battery life test, battery cycle test; solar module electrical characteristic test for crystalline and thin film modules; LED varity curve test, LED electricity parameter test, LED intensity vs. time test, CFL intensity, and flux/lumen test. All tests are carried out by qualified Ethiopian employees. *yd*

Battery exchange and recycling

Batteries have a limited lifetime. Lead-gel batteries last circa five years, then they have to be replaced. For the Solar Energy Foundation, battery exchange is routine. For the 2500 solar home systems installed in the Ethiopian villages of Rema and Rema-Dire, the exchange of batteries is now due. The inhabitants have paid their maintenance fees monthly for five years, which include, among other things, replacement of batteries. The exchange of batteries is carried out by trained solar technicians who use this occasion to also check and service the entire system. *yd*

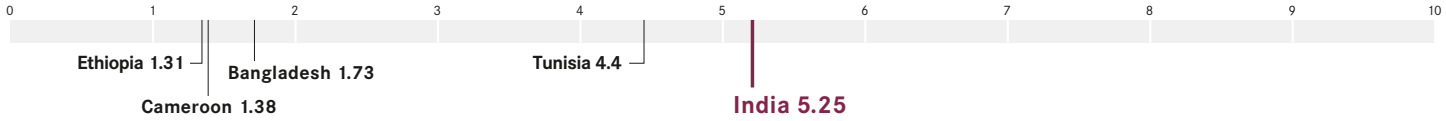
Kenya

Providing equal opportunity in education through quality solar lighting

For many children in rural primary schools without electricity, the sunset marks the end of the learning day. This was also the case for children in the Nasiger Primary School in Turkana, more than thousand kilometers Northeast of Nairobi. Without access to quality lighting, smart but poor children in both urban and rural areas lack the crucial "equal opportunity" to study at night. SunTransfer Kenya (STK), in conjunction with the national utility, the Kenya Power & Lighting Company (KPLC), has developed an innovative solar solution to address this challenge. The initiative aims to provide poor children with rechargeable solar lanterns for use at home, thus enabling evening study. It targets day schools in poor and remote areas where access to electricity remains a dream and kerosene is unaffordable for most families. Each family with at least one child attending the beneficiary school will be allocated a solar lantern. Every morning, the children bring the lamps to school where they can be charged during the day at a centralized charging station. In the evening, the children return home with fully charged lanterns, thus making evening study possible. Shortly after its introduction, the pilot project in Nasiger Primary School demonstrates that this high-impact, low-cost replicable model actually provides equal learning opportunities through quality lighting. *kg*

Corrigendum:
Sun connect 1/November 2010, p. 6
1.5 billion (not, as falsely stated, 1.5 million) people in rural regions live without access to electricity.

Rural Solar Energy Index: 5.25 (1 = poorest, 10 = best performance)



Geography / demography / education

Location (continent): Southern Asia
Form of government: Federal republic
Surface: 3,287,263 sq km
Population: 1,173,108,018
Population density: 383.4 / sq km
GDP per-capita: US$ 3354
Life expectancy: 64.4 years
Urbanization: 29%
Literacy rates (of population 15 +): 63%
Religions: Hindu (80.5%), Muslim (13.4%), Christian (2.3%), Sikh (1.9%) and other (1.8%)
Human Development Index (HDI): 0.519

Economy

Gross national income (PPP): US$ 4.046 trillion
Economic growth: 8.3%
Share of agriculture: 16.1%
Inflation rate (CP): 11.7%
***Economic transformation index (Bertelsmann):** 7.33
***Corruption index (Transparency International):** 3.4
***International Property Rights Index (IPRI):** 5.5

Electricity

Electricity consumption: 568 billion kWh
Electricity production: 723.8 billion kWh
Electricity export: 810 million kWh
Electricity import: 5.27 billion kWh
***Share of PV in electricity production:** 0.002%
Percent of the overall population with access to electricity: 88%
***Percent of the rural population with access to electricity:** 57%

Photovoltaic (PV)

Daily sun-hours: 7.8 hours per day
***Tax exemptions / incentives for Photovoltaic:** yes (100% depreciation first year of installation, no excise duty for manufacturers, low import tariff for raw materials/components, soft loans)
***Market introduction programs for PV, general:** yes (Special Incentives Package Schemes for solar manufacturing; Generation Based Incentives: feed-in tariffs of 15 INR/KWh, capacity cap of 50 MWp)
***Market introduction programs, special for off grid:** n. a.
Jobs in solar energy: ca. 90 companies (9 manufacturers: solar cells, 19: PV modules, 60 companies in assembly/supply PV systems)
Amount of installed PV capacity: 9.84 MW (2009)

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

Sources: Bertelsmann Transformation Index 2010, CIA, www.climatetemp.info, Human Development Report 2010, India Energy Portal, IMF, www.indiasolar.com, International Energy Agency, International Property Rights Index 2010, Ministry of New and Renewable Energy India, Transparency International 2010, Rural Poverty Portal, Unctad, Unido, World Bank.

India

A village woman makes cow dung cakes, and arranges them to be sun dried in Allahabad, India. © Rajesh Kumar Singh/AP/Keystone

Linking energy enterprises, financial institutions, and end-users

Various service providers carry out country and market studies for energy enterprises and financial institutions. They bring the appropriate energy technology and financial partners together in order to realize projects in the area of rural electrification in a way that is as sustainable and profitable as possible for all. A comparison of three service providers.

Two essential demands arise with the introduction of rural, PV-based electrification: on the one hand, it is necessary to develop instruments that are adapted to local conditions and easy to operate by what is in most cases a population that has had little contact with such technology. On the other hand, finance models must be worked out to first enable the end users' purchase and sustainable operation of the equipment.

Various firms carry out market and country analyses for energy technology firms and financial institutions. They function as actual matchmakers when it is time to bring together investors, philanthropists, and practitioners and their various sets of expertise.

It comes as no surprise that the Fraunhofer ISE, founded in 1981, a daughter firm of the Fraunhofer Institute, with 930 employees, is able to provide the broadest palette of services. Their offer is thus also in demand among smaller institutions. However, in many projects, it is precisely smaller organizations that provide valuable services, too. MicroEnergy International, based in Berlin and founded in 2002, is especially active in Asia, Africa, and now also in Peru. Their clients are, in particular, MFIs for whom MicroEnergy International carries out market analyses regarding end users and evaluates suitable technology partners. They distinguish themselves mainly through their technology and product neutrality, and close cooperation with fifteen different universities, also in project countries. Arc Finance, which has been in existence for three years now, is likewise active in Asia and Africa, and focuses on dialogue between two sets of actors who don't really understand each other—microfinance institutions and energy enterprises—in order to facilitate and create viable partnerships for sustainable rural electrification. *me*

	MicroEnergy International
Founding	2002
Location	Berlin
Staff	15
Goal	productivity growth in rural areas; supplying 2 billion people with clean energy

Services	
Analysis of need / Analysis of situation	– evaluation of the entire value chain for MFIs, market analyses oriented on the energy needs of the end users – concepts for rural energy supply → public and private stakeholders – evaluation of suitable technology suppliers and partners
Design and optimization	– development, adaption, optimisation of energy technology, addressing challenges of after-sales and microfinance
Covering costs / Financing	– financial instruments for this sector, addressing both needs of energy companies and of social investors
Exchange of experience / Lobbying	– association for sponsors and supporters – advising the rural electrification agencies from governments (but also bi- and multilateral companies) when formulating framework conditions and quality standards
Quality management	– moderating international quality group for exchange of experiences, enhancing development of certification procedure – working together with specialized external labs due to a broad palette of offers who check the products implemented based on MicroEnergy International's test claims – condition-monitoring
Education	– various courses and training programs (3-day industry workshop, 2-week microenergy summer school, 5-day program for decision makers, etc.) – being a spin-off of TU Berlin, closely connected to science; initiated postgrad school "Microenergy Systems" – close collaboration with fifteen different colleges and universities, also in project countries
Countries	Africa (Ethiopia, Kenya, Mali, Senegal, South Africa, Tanzania, Uganda), Asia (Bangladesh, India, Sri Lanka), Middle East (Jemen, Jordanien), Peru
Webpage	www.microenergy-international.de

Arc Finance	Fraunhofer ISE
2008	1981
U.S.	Freiburg i. Br.
n.a.	ca. 1000
access to financing for modern energy to build the income and assets of poor people around the world → bring together the three groups that must be connected for this (financial institutions, energy enterprises, end-users)	sustainable concepts for rural electrification
– market research – energy needs assessments – design and evaluation of pilot programs – identifying end-user financing investment opportunities	– analysis of basic social conditions at all levels to assure maximum acceptance by users – market and country studies, advise and support firms in their market entry (at national and international levels: governments and various organizations) – operation and financing: analysis of cultural environment, specific national traditions, income structure of the population, state regulations, and existing credit and financing institutions – test models for financing, from the perspective of the facility user and the firms and financing organizations
– technical assistance – technical assistance in designing business models	– technical concepts considering lifetime costs and socio-economic framework conditions – simulation and coordination with standard software, or with own simulation and coordination tool Talco, the latter optimizes also economic aspects in addition to technical ones
– energy loan products – planning energy-financing programs	– support financing models such as “fee for service” through development of appropriate technical processes for service and energy limitation, or accounting (e.g., energy dispenser or prepayment systems based on chip cards) – broad palette of sponsoring possibilities: research to find a suitable sponsoring program and support in putting together applications
– facilitation and development of partnership arrangements with energy enterprises – building linkages with local stakeholders, including small and growing energy businesses, and MFIs	– Club for Rural Electrification: political lobbying, communication, and provision of information, support in the acquisition of world bank projects and development of contacts with long-term effectiveness in the target countries – common initiative “Development of the World Bank for Business Consortia,” supports the involved firms in lobbying, with information about interesting announcements and in meeting World Bank demands
– establishing monitoring and evaluation systems	– testing and evaluating the quality of components in own lab – support the local development of testing labs
– building the capacity of staff and management – client training and awareness raising	– training of technicians and engineers on site
Africa (Kenya, Ethiopia, Uganda), Asia (India, Philippines), and Latin America (in planning)	n.a.
www.arcfinance.org	www.ise.fraunhofer.de/geschaeftsfelder-und-marktbereiche/regenerative-stromversorgung/autarke-stromversorgungen-und-inselnetze/landliche-elektrifizierung-und-wasserversorgung

Keyword: Kerosene

There are 1.6 billion people who use kerosene as lamp oil. A decline in numbers is estimated in most countries by 2030. Not so in Eastern Africa. There, use continues to grow. Currently, 440 million barrels of oil are used for kerosene lamps annually. That corresponds with circa 190 million tons of carbon dioxide.

Burning a kerosene lamp for one and a half hours corresponds with the pollution of circa forty smoked cigarettes.

Use

The light from a kerosene lamp equals roughly ten lumens. This is enough to allow orientation, but not enough to move safely. Reading, studying, and handwork activities require more light. In addition, the walls of huts with such lamps are, as a consequence, black from smoke and soot, and absorb most of the light. Use is therefore very limited.

Health

Kerosene lamps are extremely sooty. Burning a lamp for one and a half hours corresponds with circa forty smoked cigarettes in terms of pollutants emitted in the air. Pollutants are inhaled through the respiratory passages and accumulate in the body. Fumes from a kerosene lamp are toxic. They irritate eyes, burden airways, and can lead to chronic illness and even death.

Statistics show that 1.6 million people (mainly children) die every year due to the extreme air conditions in huts. That means: every twenty seconds a person dies from intoxication. Added to that figure are one million deaths and a great number of injured persons every year from burning. In India alone, 2.5 million burn victims from kerosene lamps are registered annually.

Most frequent symptoms of illness

The effects of pollutant and soot exposure are expressed in extreme impairment of the central nervous system, for example, loss of consciousness, concentration disorders, dizziness, coordination problems, and respiratory diseases, mucous infections, impaired vision, and eye infections.

Climate

Kerosene lamps play an enormous role in climate change. Even though carbon dioxide emissions are distributed among billions of people, as a whole they correspond with greenhouse gas emissions from thirty million cars. Every replaced lamp relieves the environment and thus the climate of approximately 0.1 tons of carbon dioxide per year. *yd*

Dealing with solar products: 5 tips for user training

Dust, heat, and improper treatment afflict solar products. In places where external conditions are extreme, solar facilities and equipment require particular care. Certain products can be adapted technically to meet these demands, others cannot, or only at extremely high additional costs. Careful treatment and maintenance is therefore demanded, which, unfortunately, too many users are far too little aware of.

1. New frontiers

For most people in rural areas, solar technology is an entirely new technology. Also, the discrepancy to other technologies is often quite great. The clearest example is certainly the difference between a traditional kerosene lamp and a modern LED lamp. The purchase of a solar facility is expensive and often linked with a microcredit. Thus, a careful and clear introduction to the product becomes that much more important. Printed instructions do not really help much. Since most people have some experience with standard technical equipment, such as radios, tape recorders, and mobile phones, that is a possible starting point for training.

2. Balance

Solar energy is based on a natural resource. In solar technology, natural factors, such as changing radiation, must be taken into consideration, while, on the other hand, nature regulates the length of use of attached lamps and other equipment. The sun does not shine with the same duration or intensity every day, and during the rainy period, it sometimes lacks the power to entirely recharge the energy used. Knowledge of this balance of electricity consumption and recharging is important for the optimal use of a solar system. According to experience, users quickly discover an optimal mix. Nonetheless, they must be informed about it beforehand.

3. Care

Every piece of technical equipment requires cautious and constant care for long-term, optimal functioning. Unfortunately, many users have no understanding of this. Whether due to a lack of experience or simply a lack of concern, many use equipment until it breaks. Then, it is either repaired or thrown away. Often, it is difficult to mediate to them that an equipment's lifetime is significantly lengthened through care and maintenance. Sometimes a service contract with the user helps to guarantee such care. However, the assumption here is that the solar firm also has technicians in rural areas. Should this not be the case, it would be helpful to show users at least how a module can be cleaned, or a LED lamp freed of dust and soot.

4. Diligence

With sufficient quality, solar technology itself (module, battery, charger, cable, LED) can be manufactured robustly enough for use in rural regions. For Solar Home Systems (SHS), battery and charger are carefully stored in a stable box; and nowadays, modern solar lamps, such as the ST2 by SunTransfer, have high standards with regard to water, dust, and shock resistance (IP65). Yet this does not apply to a lot of instruments that are run with SHS, such as TVs, refrigerators, DVD and media players. Also, such equipment cannot be manufactured with a standard IP65. It is neither economical nor sensible to equip a television with high shock resistance. Users in rural regions do not require any special configuration, but they must be better instructed by installation firms about proper treatment of solar technology and modern technical equipment.

5. Exchange of ideas

With its famous Tupperware parties, the eponymous U.S. plastic kitchenware manufacturer successfully paved a way that might also be interesting for solar technology: at these parties, (mainly) women meet to exchange their experiences and ideas about use of the products. The idea came about because plastic containers were, at the time, a new technology. Transferred to solar technology, that means: not only the use of Solar Home Systems, but also experiences in dealing with mobile solar lamps could be discussed at such meetings. In the Philippines, this is successfully practiced, whereby in addition, a competition is called every so often for the most intelligent and best ideas for the use of solar products. And quite a few manufacturers would be surprised to learn of all the things their small, mobile solar lamps are used for. Such meetings have the advantage that the users mutually support one another and exchange tips for taking care of minor problems—and solar companies have the opportunity to point out the proper way of dealing with the products based on concrete examples. *hs*

A day at Abejay Solar Center

In the Abejay Solar Center, one of the Solar Energy Foundation's eleven centers, lives and works a team of four solar technicians. Every day they go from house to house maintaining, installing, and upgrading the PV installations of the rural inhabitants.

The team of four technicians in front of the Abejay Solar Center.

I, Haregewayn Amare from Addis Ababa, am the inspector of the Abejay Solar Center's technician team. I finished my education at the Solar Energy School in April 2008, just like my colleague Wondmagegn Reta from the Ziwaay Oromia region. The other two technicians, Laiso Tesfaye and Yenene Data from the Hosana Hadiya South Region, received their degrees in March 2009. For the last two years, the four of us have worked together as a team.

The solar center's three-room house is our home and the starting point for our work: one space contains the living room and kitchen; two of us sleep in this room, while the other two technicians sleep in a second room; the third room houses the store of the solar center and is also used as an assembly room.

On a normal day we get up at 6:30 a.m. We eat breakfast and are ready to go by 8 a.m. Usually, the first thing to do is to assemble the necessary systems and organize the tools we need for a particular day. Then we head to work.

The Abejay village is situated 220 kilometers from Addis Ababa and 65 kilometers from the Wolkite solar center. It is surrounded by a forest of Eucalyptus trees and villagers' farms. 2500 inhabitants live in 530 households.

We go from house to house, from tukul to tukul, wherever work needs to be done. We mostly walk to the clients' houses; sometimes the clients come on horseback or motorcycle and take us to their homes. Our customers are mainly farmers from the village. But sometimes business people from the city buy solar systems for their elderly parents who live in the village.

We install SunTransfer lamps ST 10, ST 20, and ST 60 SunTransfer televisions, radios, tape recorders, and mobile chargers.

Today we have to go to three different households: In the first house there is some maintenance to do. For the second family we have to remove a ST 10 system from one house and install it on another house. And for the third party we have to install a SunTransfer TV, which the clients bought from us yesterday, on an ST 60 system.

We hardly face any technical problems or problems with the clients. Our service is very much appreciated by the community. A frequent problem, in contrast, is how to get to the houses of our clients: Sometimes we have to walk for hours to get to our work.

We finish our work between 6 and 8 p.m., depending on the day's work and the traveling time. After work we read books, listen to the radio, and prepare dinner. We cook in shifts: One of us cooks breakfast, another one cooks dinner. At lunch, we usually don't eat at home because we are away most of the time; and the clients won't let us go without inviting us to eat after work. That's a tradition of the area.

Between 10 and 11 p.m. we go to sleep.

New books

Ease

Business Models for Energy Access
76 pages, PDF, English
ETC Foundation, 2010
ISBN 978-90-77347-15-7,
www.ease-web.org / ?page_id=27

EASE, short for Enabling Access to Sustainable Energy, is a network of 19 partners in 8 developing countries. The partners believe that in any rural area, people should be able to get the needed energy services on a commercial basis from a local supplier.
This publication shows the strategies and activities that EASE partners in Bolivia, Cambodia, Laos, Mali, Senegal, Tanzania, Uganda, and Vietnam are implementing to scale up energy access markets in rural areas. It is the final product of a BDS capacity building trajectory, in which they have been trained and coached on how to best stimulate market development. The Business Development Services paradigm has been adopted to analyze the architecture of market development projects, and to clarify the facilitating role of NGOs and project support, in terms of service provision to the primary market chains.

Multifaceted and analytical: for NGOs, firms, and developers who want to substantially promote rural electrification.

Tania Urmee, Sivanappon Kumar

A Planning Tool for Pre-feasability of Wind-PV Hybrid Systems. Using Geographic Information System (GIS)
128 pages, paperback, English
VDM Verlag Dr. Müller, 2010
ISBN 978-3639211092, 78.00 US$

The success of renewable energy electrification projects depends largely on the selection of sites that have the appropriate conditions, such as resource availability, terrain characteristics, electricity demand, and electricity usage patterns. Authors Tania Urmee and Sivanappon Kumar recommend using Geographic Information System (GIS) in order to identify suitable sites. The proposed method focusing on the potential for decentralized hybrid wind and PV systems evaluates the wind and solar energy resources in rural areas and determines the potential of wind PV hybrid system (WPVHS) for meeting the electricity demand. The publication covers energy policy, energy efficiency, and sustainable energy in developing countries. Urmee gains her knowledge and experience from research in rural communities in Asia and the Pacific region.

Effective und field-tested: for electric technicians and development workers, who aim for the greatest energy security possible.

Dictionary

hy|brid [hi'brid]
The term "hybrid" is from Latin and means mixed, of two origins, arising through crossing or mixing. The word indicates an element that unites two different functions. The term is most common in technology. There, it identifies a system that combines two technologies that could also function alone thus generating a new quality. However, hybrid is present as a concept in almost all areas, including business administration. There one speaks of a hybrid product or model when it includes both a technical benefit as well as a service.

New Media

www.eldis.org

Eldis aims to share the best and most current information in development, policy, practice, and research with development practitioners, policy formers, and researchers at national and international levels. The site, a knowledge service from the Institute of Development Studies, Sussex, provides its information free of charge. It contains, among others, 26,000 editorially selected and abstracted full-text documents from more than 7,500 different publishers, 24 subject-focused guides, and country profiles with quick links to country briefing services on other websites. Naturally, also a newsletter and newsfeed service are included. The well-structured and pleasant website offers profound information and input for the professional, and entices those with a bit more time to discover new topics and issues.

Selected and substantial: for development professionals, donor agency staff, policy-makers, NGOs, and researchers in both the North and South.

http://www.youtube.com/watch?v=oW8NWj5XbhU

"Trust in Allah, but tie your camel," is what Winston Soboyejo, engineering professor at Princeton, might have said when he started to develop a PV panel in a bamboo frame to be strapped to a camel's hump.
In a remote region in Kenya, a surface area twice as large as Israel, a mobile unit of the Impala clinic provides medical care for circa 312,000 inhabitants. Vaccines and medicines are—due to a lack of navigable roads—transported on camelback. As the freight cannot be kept sufficiently cool on the several day journey without electricity, there are daily losses of medication. Soboyejo wants to ease the situation with a mobile PV panel unit.
He tested out the practicability of his design, which was developed in the context of the Princeton Grand Challenges program, in the Bronx Zoo, with real camels.

Unconventional and inspiring: for researchers, designers, and healthcare employees.

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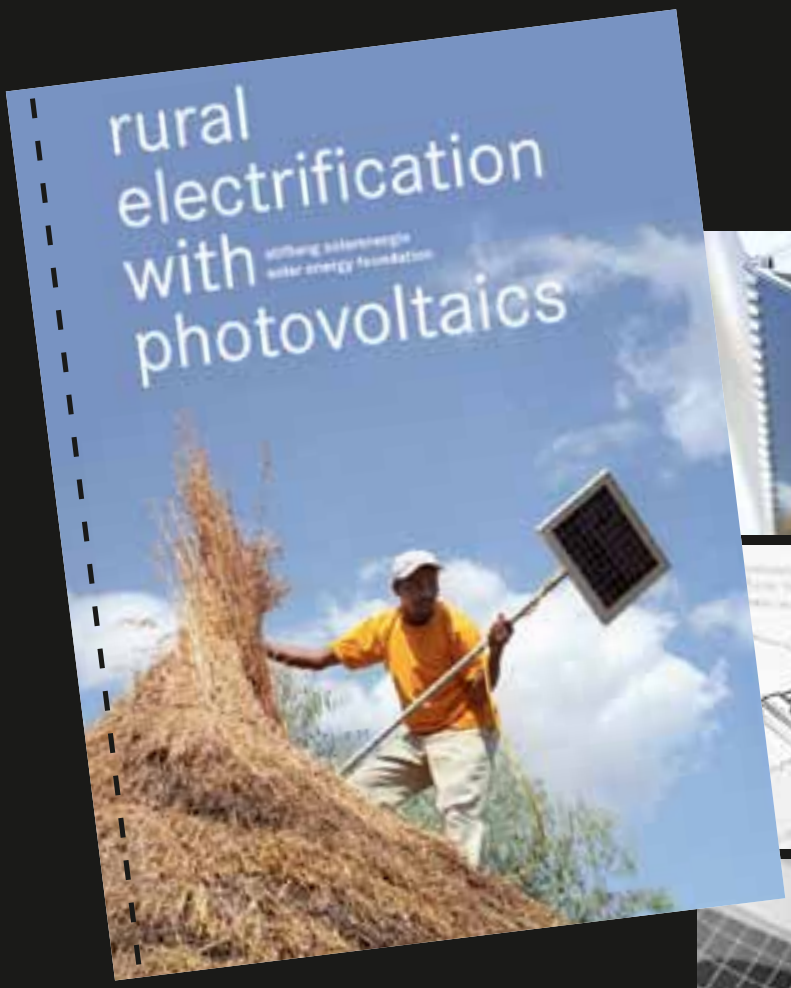
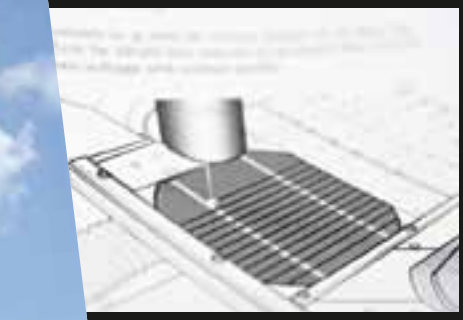
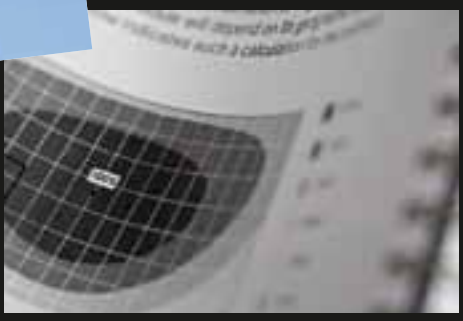
PV panel (©fotolia)

rural electrification with photovoltaics







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