



sun connect

rural electrification with photovoltaics

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Harald Schützeichel

Solar projects or solar development?

In recent years, both state and non-state aid organizations have spent a great deal of money on rural electrification, but until now, no substantial changes have been made in the situation: 1.6 billion people throughout the world are still without access to clean light. It is time to ask whether something should change in the type of action taken.

Those who are concerned with solar energy in developing countries today usually work on a project basis. Isolated projects are planned, money is announced and awarded, and projects realized, and ultimately celebrated as successes in press releases. Without a doubt, from a budgetary point of view, projects have a great advantage for financial backers: they are limited in terms of time and location, their content is manageable, they do not demand commitment to longer term engagement, and therefore do not place a permanent burden on budgets. Projects can be planned well and documented quickly in a way that creates effective public exposure.

But what is the situation just one year after the conclusion of many solar projects? Do the systems still work? Does the project trigger social or economic development? Was it possible to initiate local solar businesses that work long-term for solar energy and are increasingly independent of subsidies? Often, precisely the opposite is the case: in many developing countries, local solar businesses still orient themselves on whether subsidies are available, and how many. They become accustomed to thinking in relation to subsidies and remain stuck in a waiting position until some type of project money or another is announced. This method does not allow for the development of permanent solutions to rural energy problems. →

The situation must be thought through anew! It is not possible that most money issued is project-related. We have to begin to think more on a long-term basis and in a business-like way: also as private and state aid organizations. Our main concern cannot be to educate people how to optimally collect subsidies. Instead, the main concern should be long-term activation of a self-sustaining development that aims at substantial, rather than selective eradication of poverty based in energy problems.

However, those who pursue this approach must learn to deal with two things. For one, long-term development cannot be planned. Obstacles constantly arise that make short-term changes necessary. Flexibility is a key requirement, as is the ability to deal with things that cannot be planned. For another, one has to be prepared for a long and often difficult path that is far less effective in terms of public exposure than the realization of an isolated project.

Yet, if we are not prepared to think things through anew, then a lot of money will be spent for rural electrification without effecting any changes. Project-related thinking by financing organizations is increasingly proving to be an obstacle on the path to long-term change in the living conditions of people in developing countries.

Harald Schützeichel is the founder and chair of the Stiftung Solarenergie – Solar Energy Foundation, www.stiftung-solarenergie.org.

LED lamps 12V market overview

LED lamps are becoming ever more important for use in DC solar facilities. Development is proceeding in major steps. An increasing number of manufacturers offer these future-oriented and energy-efficient sources of light. A market overview.

Supplier	Product model	Operating voltage	Operating current
Phocos	SL 1210CF40	12 V (11–15)	85 mA ± 5%
Phocos	SL 1210WF22	12 V (11–15)	85 mA ± 5%
Steca	ULED11	12 V	92 mA
Philips	DLE C-202	12 V DC	
Philips	MASTER LEDspotLV 3W GU4 2700K MR11 24D	12 V	380 mA
Philips	AccentLED 4W GU5.3 CW 12V MR16 10D 1CT	12 V	360 mA
Philips	AccentLED 4W GU5.3 WW 12V MR16 10D 1CT	12 V	360 mA
Osram	Parathom MR16 20–35	12 V	
ABLamp	LED-H-1W	12 V AC–DC	
Haijian Lighting Electric Co.	MR16 12V	12 V AC–DC	350 mA
Sundaya	Luna 60		
Royal Light Electronics	MR16-12V-1W/3W	12 V AC–DC	
Ledrise	Cree X-re Q5 LED	12 V	
Ledrise	LED Spot with 18 LEDs, MR16, 12V, White, 40lm	12 V	
Cree	Xlamp	3.75 V	350 mA



Electrical power	Ambient temperature	Ambient humidity	Irradiation angle	Light color	Light output	Light efficiency	Socket	Weight
1W	-20 to +40°C	Max. 95% (no condensing)	40°	Cool white (CCT: 5000–10000 K)	40 lm	40 lm/W at 12 V	E27	
1W	-20 to +40°C	Max. 95% (no condensing)	60°	Warm white (CCT: 2500–3200 K)	22 lm	22 lm/W at 12 V	E27	
1.1 W	-30 to +60°C			Warm white (3300 K)	45 lm	42 lm/W at 12 V	E27	70 g
1 W	-20 to +50°C		115°		5.4 lm	5.6 lm/W white		
3W			24°	Warm white (2700 K)				
4W				CW cool white	41 lm	10.5 lm/W	MR16	30 g
4W				Warm white (3100 K)	31 lm	10.0 lm/W	MR16	32 g
4.5W			36°	Warm white (3000 K)	400 cd			62,6 g
1W			30–60°	Pure white, warm white	75 lm		E26 E27	
1 & 3 W	<60°		45°	Cool white				
					60 lm			
1 & 3 W			15°, 35° or 60°	3000K–8500 K	52 lm/1W; 90 lm/3W		MR16	65 g
1.5 W	-15 to +40°C		60°	White (6600 K)	120 lm	66 lm/W	MR11 (G4)	87.6 g
1.5 W	-15 to +40°C		20°	White (6600 K)	40 lm	27 lm/W	MR16(GUS5.3)	61.8 g
3.3 W	-20 to +75°C		125°	White (5000–8300 K)	114 lm			



“A panel on every roof by 2020!”

In rural areas of Senegal, only 10 percent of the population has electricity. The sparse settlement positively demands decentralized, mini electricity production facilities that use an inexhaustible resource—the sun. Since its founding in 2008, the firm SolarSenegal has popularized electrification with solar energy among the general public and has installed countless facilities.



Merely 33 percent of the 10 million Senegalese currently have access to electricity, and in rural areas, only just 10 percent. Since the West-African state does not possess any fossil fuel resources, and conventional energy production is not growing parallel to the population, alternative resources are more than just an ecological consideration. Instead, they are a necessity to overcome the great energy deficit and enable social development.

The sign of the times has also been recognized at a state level. For example, tax reductions for components of solar or other renewable energy systems now make their distribution easier. But, as Mamour Dioum from SolarSenegal explains, there are still not many other incentives available, and the banking sector reacts hesitantly to matters concerning the financing of new systems.

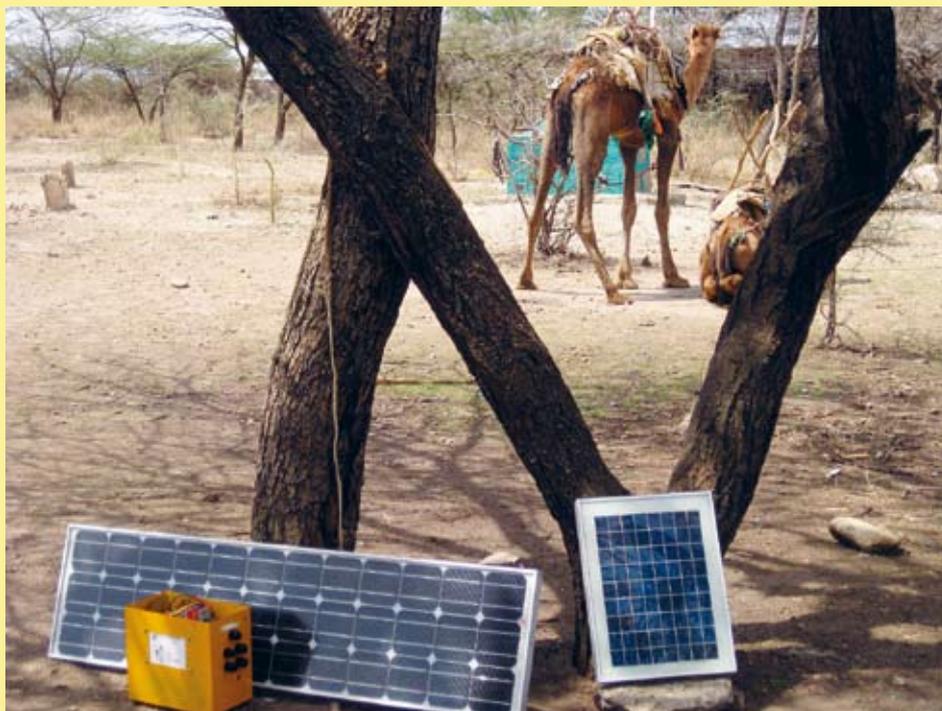
Together with Baidy Thiongane and Seydina Ndiaye, he founded the private enterprise in 2008, demoralized by constant electricity fall-outs for several hours each day, and excited by the wish to increase the percent of households with electricity, and thereby stimulate economic growth. As he recalls: “To walk the talk of the long discussions.” The sparse settlement truly did call for decentralized, mini electricity production facilities; and the sun, an available renewable resource, convinced them, and also other, international partners, including the Indian group Tata, of their plans.

Indeed, a shy attempt at a solar industry had existed previously in Senegal: after all, in 2007, Senegal was home to the second congress on renewable energies, in

which numerous local and international firms took part. But SolarSenegal was the first to inform—especially through their website—the general public about this new way of gathering energy. “The huge demand even surprised us,” reports Mamour Dioum. “We received lots of emails from emigrants who wanted to set up energy systems for their families out in the countryside.”

SolarSenegal offers its customers, who for the most part are private individuals, holistic electrification solutions with solar energy (PV and heating). Since August 2008, the firm has carried out countless installations, including a total of 15,685 wattpeak and ten solar water heaters. One of their most impressive contracts was in a small village in the Casamance, in the south of Senegal: indeed, not a very extensive project, but a community that developed a true passion for this type of energy. The mosque at the center of the village, around which a majority of the daily activities are carried out, had been illuminated up to now with candles and flashlights. Solar panels would now supply it with electricity, facilitating the inhabitants’ community life. Thus, those responsible at SolarSenegal decided to realize the project despite logistical difficulties and low profitability. “When the team returned from the installation, one could truly sense their happiness at what they had achieved,” explains Mamour Dioum.

SolarSenegal’s vision is ambitious: “A panel on every roof by 2020!” In the next two years, they want to continue to concentrate on Senegal, but then also approach supra-regional markets. At the same time, also on the agenda are the development and implementation of solar water heaters, solar batteries, solar chargers, and converters. SolarSenegal is likewise making an effort to call to life a micro-financing system, particularly for rural areas. The projects by SolarSenegal should, on the other hand, become prosperous economic enterprises that are not reliant on subventions. “We want to be taken seriously in our professionalism, and in our pleasure in contributing to the well being and development of our fellow countrymen.” *me*



Waiver on customs duties

The Ministry of Finance and Economic Development (MoFED) removed duties on the import of solar energy equipment. The duty-free items include solar panels, certain types of battery lamps, invertors, and regulators used in solar set-ups. Customs duties and VAT were the main barriers to the expansion of the market for solar products in Ethiopia. This decision is expected to enhance Ethiopia's attractiveness as a market for solar products. www.mofed.gov.et

Sales of solar lamps at gas stations

The oil company Total has started a pilot program with solar lamps in Senegal. Since April 2010, solar lamps from the firm SunTransfer will be distributed through the local network of gas stations. The lamp in question is a high power LED lamp with an integrated mobile phone charger. The lamps, which can be used for both mobile and stationary purposes, are available at all Total gas stations. www.total-senegal.com

Medicine refrigeration without electricity

The solar refrigerator "SolarChill" has received approval from WHO for use throughout the world in crisis areas. The device was developed by the Danish technology and research center DTI and

the refrigerator manufacturer Vestfrost. SolarChill is meant to replace gas powered and battery dependent refrigerators and thereby assure the supply of vital medications also in inaccessible regions and developing countries. Every year, vaccines worth several million dollars spoil due to a lack of electricity or gas. SolarChill works with the environmentally-friendly and technologically reliable Greenfreeze refrigeration technique, which functions without batteries or electricity. Innovative about this refrigeration technology is that the solar energy is stored in ice and not in the battery. www.solarchill.org

Solar home system for Ethiopian schools

Under contract by the foundation "Menschen für Menschen," the Solar Energy Foundation in Ethiopia, at 144 locations scattered throughout the country, has equipped rural schools with solar home systems. Roughly 1,500 systems now each supply a school room and all teachers' homes with the electricity necessary for lighting and radio. A key component of this unique project by "Menschen für Menschen" in Ethiopia is the guarantee of reliable and permanent maintenance of the systems. www.menschenfuermenschen.com

Eveready batteries starts production of solar panels

Kenya-based Eveready East Africa is placing all bets on new product lines, including local production of solar panels, in order to battle cheap Chinese imports. The company plans to begin production of solar panels, however, dry cell batteries account for 90 percent of Eveready sales. Eveready has one of the largest battery factories in Africa with a capacity of over 200 million batteries annually, employing about 250 people. www.eveready.co.ke

Installed PV capacity will grow by 93 percent in 2010

The prognosis by the photovoltaic branch analyst iSuppli Corporation (El Segundo, California, USA) announced in April calls for enormous growth in the photovoltaic branch. iSuppli forecasts that the newly installed PV capacity worldwide will reach 13.6 gigawatt (GW) this year (2009: 7 GW). With 3.8 GW new installations, Germany took the top position globally also in 2009. The analysts from iSuppli anticipate that the US will challenge Italy as the second strongest PV market, and predict an increase in the remaining global solar market. www.isuppli.com

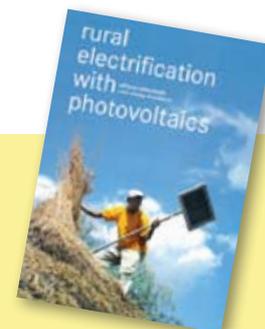
The essential reference book for practice and instruction

rural electrification with photovoltaics

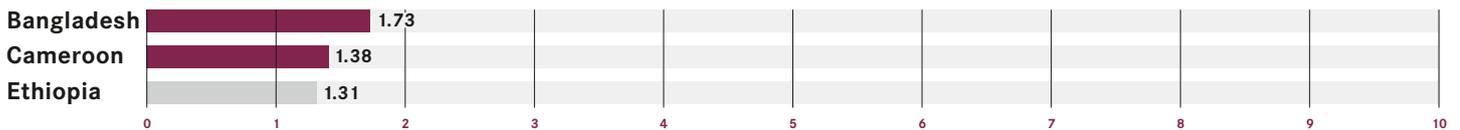
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soft cover, spiral binding
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ISBN 978-3-033-01926-3

Orders: order@stiftung-solarenergie.org
www.stiftung-solarenergie.org

US\$ 35.00
€ 28.00



Rural Solar Energy Index: 1.73 (1 = poorest, 10 = best performance)



Geography/demography/education

Location (continent): Southern Asia

Form of government: Parliamentary Democracy

Surface: 143,998 sq km

Population: 156,050,883

Population density: 1083/sq km

GDP per-capita: US\$ 1600

Life expectancy: 60.25 years

Urbanization: 27 %

Literacy rates (of population 15 +): 47.9 %

Religions: Muslim (83 %), Hindu (16 %), other (1 %)

Human Development Index (HDI): 0.543

Economy

Gross national income (PPP): US\$242.4 bn

Economic growth: 5.6 %

Share of agriculture: 18.7 %

Inflation rate (CP): 5.1 %

***Economic transformation index (Bertelsmann):** 5.74

***Corruption index (Transparency International):** 2.4

***International Property Rights Index (IPRI):** 2.9

Electricity

Electricity consumption: 21,181 GWh

Electricity production: 24,378 GWh

Electricity export: 0

Electricity import: 0

***Share of PV in electricity production:** 0

Percent of the overall population with access to electricity: 41 %

***Percent of the rural population with access to electricity:** 28 %

Photovoltaic (PV)

Daily sun-hours: 4–6.5 kWh/sq m/day

***Tax exemptions/incentives for Photovoltaic:** –

***Market introduction programs for PV, general:** –

***Market introduction programs, special for off grid:** –

Amount of installed PV capacity: 25 MWp

*included for calculation of Rural Solar Energy Index



Sources: Bertelsmann Transformation Index 2009/10, CIA, Human Development Report 2007/08, IMF, International Energy Agency, International Property Rights Index 2009, Renewable Energy and Environmental Information Network (REEIN), Rural Poverty Portal, Transparency International 2009, Unctad, World Bank.

Bangladesh



Controlling and using solar power. New additions for 2010.

phocos

Pico combination solar lamp
with integrated charge
controller, rechargeable
battery and USB-mobile
phone charger



MPPT 200/100

Phocos' strongest Maximum
Power Point Tracker



CIS charge controller

first fully encapsulated solar
charge controller with infrared
remote control



inter solar
connecting solar business | EUROPE

Hall B4
Booth 471

Phocos is one of the global, market-leading manufacturers of solar charge controllers and components for autonomous power supply. Products from Phocos provide efficient use of solar energy in the rural electrification, industrial/telecommunication, street lighting and recreation markets.

www.phocos.com

After sales service

With after sales service, customer relationships do not end with the conclusion of a transaction, but are maintained for a product's entire duration of use. Unfortunately, solar companies, especially in developing countries, grant after sales service much too little importance. This is fatal, as substantial deficits in after sales service are currently one of the reasons for solar products' negative image among large portions of the population in rural regions. Poor after sales management is, notably, not compensated for by other positive factors, such as first-class quality. Service realized after sales is decisive in a product's success or failure and in customer satisfaction.

1

1. Employee training

After sales service does not focus solely on a product's technical ability to function, but also on customer satisfaction. Many employees in solar businesses are primarily technicians who are capable of selling products and installing them. They speak, think, and argue in technical categories. Customer-oriented thinking is foreign to them. They can learn it, in the best cases, through further training. Along with giving them theoretical knowledge of after sales management, practical experience in everyday life provides the best opportunity to learn customer-oriented thinking.

2. Customer training

Many people today have expectations of solar technology that are often not possible to fulfill: a simple solar lamp is meant to not only additionally charge a mobile phone, but also supply a radio or even better yet, a small television with power. And, if possible, do so twenty-four hours a day. No one would expect that of a mobile phone, but many technical laypeople expect solar technologies to be super products. Most products used in daily life require no special explanation: their benefits and disadvantages are obvious. With solar facilities, it is different: only very

few people have been able to gather experience with this technology or have observed from others, how it works. They do not know what care the product demands or when it has reached its limits. Thus, in addition to instructions for how to correctly charge the battery, customer training must also include how to care for and deal with the product as a whole.

3. Maintenance and repair services

Quick and reliable repair of technical deficiencies is a mark of quality for every business. A requirement for this, however, is that the employees are in a position to offer such after sales service through the availability of replacement parts. Frustration is preprogrammed when replacement parts are available in the capital only, which means that weeks pass by until they reach the customer out in the countryside. Professional personnel must be stationed close to the customers and must have available an appropriately furnished repair workshop with replacement parts. Customers must, and want to see that they are not left alone with their technical problems.

4. Customer loyalty as goal

Only when solar technology fulfills customers' expectations day in and day out, are they satisfied with their investment. And only then can an emotional bond to the supplier gradually develop. The customer bond then turns into customer loyalty. Solar organizations that place value in good after sales management experience this loyalty emphatically. Their customers try to maintain the relationship to them even when a different supplier makes a seemingly less expensive offer. They know that they have a reliable partner with their supplier, someone who is capable of carrying out repairs and providing replacement parts. *hs*

What? Why? Wow! – Understanding consumers' needs

Lighting Africa developed a market research program in order to understand consumers' needs, preferences, and financial situations. The quantitative testing of lighting devices carried out by Research International East Africa included five countries and evaluated five products.

Lighting Africa is a joint IFC and World Bank program that seeks to support the global lighting industry in developing affordable, clean, and efficient modern lighting and energy solutions for millions of Sub-Saharan Africans who currently live without access to the electrical grid. It provides services in the fields of quality assurance, business linkages, consumer awareness, and market research.

In response to the industry's call to provide greater understanding of the scope of this promising market opportunity, Lighting Africa developed a market research program to give manufacturers, businesses, and project developers a thorough grasp of consumer needs, preferences, and financial situations. The research was conducted by Research International East Africa and included two key market segments (households and micro-businesses in rural and urban areas) in five countries (Ghana, Kenya, Zambia, Ethiopia, and Tanzania), with twenty interviews conducted in each country. After an exploratory phase involving qualitative product testing and a quantitative survey of the populations' habits and attitudes, Research International East Africa carried out quantitative testing of lighting devices using the proprietary eEvaluate™ methodology.

Since consumers in developing markets have little disposable income, measures of new product success are slightly different than in other parts of the world. In order to predict the likelihood of a successful launch, it is important to evaluate three critical factors: the "WHAT?" (consumers' understanding of the various lighting devices); the "WHY?" (consumers' need for the various lighting devices); and the "WOW?" (consumers' excitement over the various lighting devices).

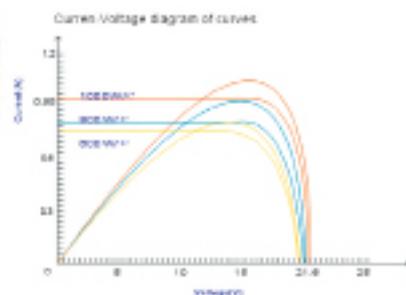
Tested were five products: a table lamp and two flexibly mountable lamps powered by means of small, portable solar panels; one flashlight powered by solar panels; and a second flashlight powered by common batteries. In all five countries, the product consisting of a solar panel and two flexible, round lamps, achieved top scores. In the intention to buy a product, the good quality of the light proved more decisive than affordability or diverse possibilities for use (multi-room use, possibility to charge other devices). It comes as no surprise that in countries in which only fifteen to twenty percent of the population has access to the electrical grid, operation with solar energy was likewise an important factor in decision making. The flashlight powered by a common battery consistently achieved the worst scores in nearly all five countries. *me*

More information at www.lightingafrica.org/node/191/



PHOTOVOLTAIC MODULE

The SPM Solar Module series consists of 1Watt~280Watt, mono-crystalline silicon & multi-crystalline solar cells (125*125mm or 156mm*156mm) with high efficiency, high transmission rate and low iron tempered glass, anti-aging EVA and high frame resistant TPT to laminate and anodized the aluminum alloy. The products have high efficiency, long life, strong wind and hail impact resistance, and are easily installed.



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New books

Travis Bradford

Solar Revolution. The Economic Transformation of the Global Energy Industry

240 pages, paperback, English

MIT Press, 2008

ISBN 978-0-262-52494-0, 19.95 \$



Many people in government, economics, and ecology still view solar energy as being far from cost-effective or efficient. Travis Bradford, founder of the Prometheus Institute for Sustainable Development, argues however

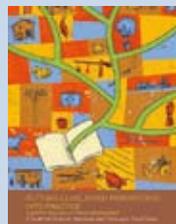
that over the next two decades solar energy will become the best and cheapest choice for most electricity and energy applications. He recommends thinking of solar energy as an industry and economic reality rather than as a philosophical goal, encouraging the involvement of a new generation of professionals. *Solar Revolution* outlines the path by which the transition to solar technology and sustainable energy practices will occur. An additional benefit is a well-researched and detailed history of solar energy and its cornerstones, for example, the first solar cooker invented by William Adams as early as 1860.

Carefully researched and sweeping: for everyone who wants to understand the ultimate energy answer.

SDC

Putting a Livelihood Perspective into Practice. Systemic Approach to Rural Development. A Guide for Analysis, Appraisal and Planning in Rural Areas

www.poverty-wellbeing.net/en/Home/Livelihood_Approaches/Experience_and_Practice, 2009



The Systemic Approach to Rural Development (SARD) offers the establishment of a differentiated understanding of poverty, livelihood patterns, and relations between stakeholders in a rural setting. The diagnosis provides a systemic understanding at three levels: the household, its livelihood choices, assets, and vulnerability; the local population, through a household typology that captures the diversity of people's livelihoods; and the area, through an overview that integrates a historical perspective, significant change patterns, as well as identifying the main stakeholders and their interrelations. This guide builds on the use of a sustainable livelihood approach and describes a way to put such an approach into practice. It provides all things needed for its implementation, and can—if adapted locally and complemented accordingly—be put into practice directly.

Detailed and tested: for development practitioners and rural local governments.

Asian Development Bank

Complaint Handling in the Rehabilitation of Aceh and Nias Experiences of the Asian Development Bank and Other Organizations

Manila 2009, ISBN 978-971-561-847-2

In development projects, an effective system for handling complaints is key to resolving problems, before they escalate. It is therefore recommended to establish a complaint-handling unit at the start of a project. This publication provides valuable input for capacity building in complaint handling with governments and non-governmental organizations. The eighteen authors were involved in the Asian Development Bank assisted Earthquake and Tsunami Support Project in Indonesia, and similar initiatives supported by other organizations, in the rehabilitation of Aceh and Nias following the disasters there in December 2004 and March 2005. The book provides many practical lessons that can be applied not only to post-disaster projects, but other development projects as well.

Extensive and solution-oriented: for anyone interested in designing and implementing a complaint-handling unit.

Agenda

June 9–11, 2010

Intersolar Europe Munich, Germany

As the international platform for solar technology, Intersolar reflects dynamic developments along the entire value-added chain in the areas of PV and solar heating. Intersolar brings together people and markets under the central theme "Connecting Solar Business." www.intersolar.de

June 28–29, 2010

Maghreb/Middle East Renewable Energy Conference 2010 Marrakech, Morocco

This conference is geared towards facilitating the regions' and participants' developing strategies and positioning the regions' participants and stakeholders to identify key partners and investors.

www.magenta-global.com.sg/merec10/index.php

July 13–15, 2010

Intersolar North America San Francisco, USA

The third Intersolar North America has also set its focus on photovoltaics, solar heating,

and solar architecture. It defines itself as an international branch platform that covers the entire value chain of solar technology under one roof.

www.intersolar.us

July 17–19, 2010

International Building Energy-saving & Renewable Energy Utilization Fair Qingdao, China

Businesses from the entire sector of renewable energies will present themselves here. A section of the fair is devoted to projects from the areas of photovoltaics and solar heating.

www.qdcese.com

July 28–30, 2010

Indo Renergy Jakarta, Indonesia

A fair for photovoltaics, solar heating, and other segments of the renewable energy market. It is aimed at energy service providers, manufacturers, and government organizations, as well as financial institutions and NGOs.

www.indorenergy.com

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SUNTRANSFER 2 –

Better light and mobile phone charging – independent from the power grid



In developing countries, this multi-purpose solar lamp is replacing the kerosene lamp, providing safer and more affordable lighting. It makes an important contribution towards education and development, especially in rural areas. The SunTransfer 2 is also a high-power LED lamp, enabling mobile phone charging independent from power grids – Innovation from Germany.

- * High-power LED technology
- * Mobile phone charger
- * Can be fixed to the ceiling or used as a torch
- * Stackable
- * Reliable and easy to operate
- * Durable and robust
- * Water and dust resistant, standard IP 65
- * Designed in Germany
- * 1 year warranty

Solar lamp

- 3 light settings: low / medium / high
- Hours of light with full battery: low: at least 150 hours, medium: at least 15 hours, high: at least 6 hours
- Battery capacity indicator
- Extendable switch cable for remote switch on / off
- High-power LED: 90–100 lumen; service life 30,000 hrs (decrease less than 20 %)
- Durable, long life GEL-battery 6 V / 4.5 Ah
- CE & ROHS certificate, IP 65

Mobile charger

- USB 5 V DC output for mobile phone and 3 C device
- USB cable with 8 adaptors for the most common mobile phones: Samsung D800, Sony Ericsson, Sony Ericsson K750, Nokia Φ 3.5, Nokia Φ 2.0, Micro 5P, Motorola V3, iPod

Solar module

- 2 Wp crystalline silicon solar module with aluminium frame and tempered glass
- 3 meter connector cable

Optional

AC charging adaptor (for using grid electricity)

Size

Lamp: 125.6 x 106.5 x 137.4 mm
Module: 140 x 165 x 17 mm



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making life brighter

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www.suntransfer.com

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