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PIC torial

Solar barber

So far, only 6 % of Ethiopians have a power connection, one of the lowest rates in Sub-Saharan Africa. Off-grid solar power, at a price of about 9.53 Birr (Br), or 44 €-ct/kWh, is far cheaper than power from diesel generators, which costs about Br 30.7 (€ 1.41) per kWh, making off-grid solar a viable option to generate income – not just for a solar barber. Read more about it at page 12 to 15.

Photo: Phaesun

Solar barber gets a warm reception

Light is not all solar power brings to Ethiopia's villages. It also brings jobs and the prospect of new income sources.



Successful entrepreneur's business: the mobile solar hairdresser at work Photos (2): Phaesun

Some 40 km outside of Arba Minch, there's no going any farther. The knobby tires of the pickups spin in the mud. Even the arms of strong men and logs laid under the tires bring no progress. Flash floods have transformed the road in the mountain village of Laka in southwest Ethiopia into a roiling creek overnight and caused a mudslide. Early the next morning, the trip continues on foot, a good 20 km up rich green hillsides. Two horses strain at their bits, hauling a handcart, solar modules, batteries and coolers.

Just in time for the falling dusk, Laka comes into view. It is a collection of round, reed-roofed huts, clay houses and a scattering of shops. Few lights illuminate the village at night. Like most of Ethiopia's villages, Laka and its thousand or so inhabitants are not connected to the power grid. The few who can afford electricity have generally relied on expensive diesel generators for their power. But that is beginning to

change. Power from off-grid photovoltaics with integrated batteries has become less expensive in Ethiopia in recent years.

Off-grid solar power, at a price of about 9.53 Birr, or 44 €-ct/kWh is far cheaper than power from diesel generators, which costs about 30.7 Birr (€ 1.41), says Engidaw Abel Hailu, the manager of Arba Minch University's Solar Competence Center. Over the past year, prices for 60 W PV systems have come down from approximately 20,000 Birr (€ 916) to some 12,000 Birr (€ 550). That is still much more than many Ethiopians earn in an entire year, however. According to the World Bank, Ethiopians had an average annual per capita income of € 324.

When the "solar wagon" comes

The solar off-grid systems installed in handcarts and set up by eight electrical engineers from Arba Minch in the centre of Laka are designed especially for small businesses: a hairstylist, a charging station for mobile phones that also rents LED solar lamps, and a cafeteria with a cooler and a television. "The systems are expected to be paid off within a reasonable amount of time and generate income," explains Hailu. Interest in Laka is huge. Clusters of brightly clothed locals gather round the somewhat exotic looking solar wagons.

Local young entrepreneurs, who were trained by the students on the solar equipment and in business fundamentals, can scarcely keep up with the demand for haircuts and styling, serving up cooled drinks, and charging mobiles. The university has provided them with mobile PV systems. Within two years, the systems have to be paid off at a monthly rate of 1,000 Birr, or a total of 24,000 Birr (€ 1099). "Our initial experiences in Laka have shown that due to high demand our calculations were both realistic and possible," says Hailu after he returns to Arba Minch.

The initiative is part of the Applied Entrepreneurship Education Programme (AEEP) project, a collaboration between the University of Arba Minch, the University of Applied Sciences Neu-Ulm in Germany and the off-grid system provider

Enormous opportunities

"Steca and the German solar industry have managed for many years to revolutionise the off-grid PV market by providing intelligent solutions and products. Off-grid PV no longer just means home PV systems in rural areas but also, thanks modern features, a whole range of applications. For these numerous business models to be exploited, users need just a little creativity to adapt the systems and existing solutions to local needs. We heartily welcome any effort to develop these business opportunities, and see enormous opportunities in these efforts, both for the local population and for quality manufacturers like Steca", says Huguette Kolb-Aust, Head of Sales Solarelectronics at Steca. (hcn)

Phaesun GmbH of Memmingen, Germany. “We want to use off-grid systems to enable small-scale entrepreneurs to generate a sustainable source of income and create purchasing power in rural regions,” says Phaesun CEO Tobias Zwirner. The Memmingen-based SME, which has been active for some time in Africa, has developed a concept it calls BOSS, which stands for Business Opportunities with Solar Systems. The project is co-financed by the German Academic Exchange Service with funding provided by the Federal Ministry of Education and Research. Since the summer of 2014, a total of 50 electrical engineering students in Arba Minch have been developing business ideas and plans for small businesses using off-grid photovoltaic systems. Now those plans will be tested in Laka and other surrounding villages and create new jobs in rural areas based on franchise models.

The Ethiopian government, with its Rural Electrification Fund (REF), is also promoting distributed electricity generation, “especially from off-grid photovoltaic systems” says Sahele Tamiru Fekede of the energy ministry in Addis Ababa. The aim is to extend loans with a maturity of five to seven years and an interest rate of 7.5 % to public institutions, micro financing institutions, households and small businesses. The required equity share for small business owners is 30 %, and collateral is also required. The Ethiopian Development Bank acts as the trustee of the fund, and in 2012 received the first tranche of US\$ 20 million from the World Bank, says Fekede. The bank has already approved or paid out US\$ 10 million.

Stumbling blocks

According Engidaw Abel Hailu, the fund has helped put distributed PV systems in 100 rural schools, 200 health centres and hospitals and 600 households so

Solar kiosks expand services

Hundreds of solar kiosk projects have become a reality over the past ten years in remote rural areas around the world. The projects use off-grid PV systems and offer mainly charging services for mobile phones and lamps, particularly for low-income populations. Numerous different companies and organisations operate solar kiosks, among them multinationals, like Coca Cola and Schneider, start-ups, government initiatives and non-government organisations. Only three from among a total of 23 companies and organisations offering such services operate more than 25 kiosks. Most of these are still in the pilot phase and are not yet fully profitable, as demonstrated in a study entitled “The Energy Kiosk Model – Current Challenges and Future Strategies” published by the consultancy Endeava. “Due to the challenges of operating a sustainably profitable operation, many solar kiosk businesses offer extended services beyond the initial focus of charging electronic devices,” write the authors of the study, Claudia Knobloch and Judith Hartl. Many solar kiosks now offer additional services and products, have been sold to local operators, or have been pared down to local micro-charging stations, the study concludes.

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Solar installation in Laka

far. Private small businessmen have come up mostly empty-handed, however. “Even with microloans, they often find it hard to manage the interest at between 10 and 15 %,” says Hailu. In addition to their own capital share, they often have to provide evidence of ownership of a plot of land and house, or at least a registered address. Many cannot meet this requirement, however.

Often money pots, such as the Rural Electrification Fund tend to “evaporate” at the administrative level, says Bernhard Glaeser, who has been working as a consultant for solar energy and rural electrification in Ethiopia for years. The engineer sees high import duties as a key obstacle to the fledgling solar market. “Officially certified solar panels and photovoltaic systems are exempt from duty, but for private entrepreneurs, at least, this rule is not implemented properly,” he says. The upshot is that prices for PV systems and power is unnecessarily inflated. But

Dereje Walelign, the Managing Director of Lydetco, a partner company of Phaesun, has had positive experiences. He had no problem importing his systems duty-free, he says.

But even Glaeser sees positive developments. “Awareness of the potential and possible applications of renewable energy – particularly solar and wind – has increased significantly,” says the former project staff member of the German Society for International Cooperation (GIZ).

Ethiopian expansion plans

According to official data, photovoltaic systems with a total capacity of approximately 5.3 MW have been installed in Ethiopia so far, of which 13,200 are off-grid systems. The expansion plans for the coming years are ambitious. By 2020, according to energy ministry spokesperson Fekede, grid-connected PV systems with a total capacity of at least 300 MW will be installed, and wind turbines with at least 900 MW of generation capacity will be added.

In October last year, in Ashegoda in the northeast of the country, the largest wind farm in Africa with 120 MW of capacity went into operation. If the second phase of the Adama wind farm south of Addis Ababa is completed as planned by the end of next year, the amount of installed wind power at that location will quadruple from the current 51 to 204 MW. Record levels are also planned for the generation of electricity from geothermal sources. An Icelandic company started digging test borings for a geothermal power plant in the East African rift valley of Corbetti last July. The plan is to complete a plant by 2030 capable of producing 500 MW of electricity.

“The fundamental basis of meeting our rapidly growing electricity demand, however, is still hydro-electric power,” says Fekede. Currently, up to 90 % of electricity is produced with generators at dams. Other

Solar start-ups in Laka

“The young solar entrepreneurs’ businesses in Laka got off to a strong start in the first four weeks,” says Abel Engidaw Haile, manager of the Solar Competence Center at the University of Arba Minch. “The solar mobile hair salon operates a straightening iron, hair clippers and a cold dryer. A haircut is currently on offer for 5 Birr (€ 0.23). On a normal day there are four to eight customers, mostly men. On market day (Sunday), many people come from the region and the surrounding villages, and the hairdresser serves some 20 to 30 customers. Women usually only have their hair done on holidays (about ten per year).” The solar charging station is equipped with ten modular LED lamps with integrated batteries for rent and ten mobile phone charging terminals. The lamps are all rented for

50 Birr per month (€ 2.29) and the customers come to top up the charge on the lamps approximately every two days. In addition, 10 to 30 phones are charged daily for five Birr (€ 0.23).

The mobile solar cafeteria is equipped with a solar-powered television and a cooler. The cooler is rarely used because it is often quite cold in Laka. The cafeteria is doing well. It offers food and drinks, but no beer. A local lunch and dinner (mix of potatoes and cabbage) is offered for 3 Birr (€ 0.14), and a soft drink costs 10 Birr (€ 0.46). The soft drinks are transported to Laka by donkey and purchased for 5 Birr (€ 0.23). There are about 30 customers per day, and on market days more. Watching television is free and many people come especially for that. A team of three people runs the cafeteria. One

of the three opened the first (non-solar) cafeteria in Laka a few months ago and still operates it on the side. Some customers frequent that one as well but not as many as come to the solar cafeteria.

People from the neighbouring villages do not make the trip to Laka for the solar services alone. If they go to Laka on market days anyway, they take advantage of the opportunity to use the services. In the surrounding villages there is little competition. In the village of Bonke (about 15 km away), there is a diesel generator for charging mobile phones. In the village of Sediki (about 20 km away) there is a solar powered school (initiated by Sahay Solar), which also offers haircuts and mobile phone charging to generate income for the school.”

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Off-grid market trends

“Solar off-grid solutions offer huge opportunities to supply people with reliable environmentally friendly energy. It is not just a way to provide electricity to far-flung settlements, boats, caravans, and for lighting remote roads. There is also a new trend of operating monitoring systems with off-grid power. Such systems can monitor motorways, parking areas and buildings; they can be used for toll systems or for inspecting oil and gas pipelines. Telecommunications equipment can also be monitored with off-grid systems via cameras and data loggers with MODCOM monitoring software made by Phocos. “There are telecommunications projects in Morocco and Burkina Faso, where 20 or 80 modular power management (MPM) systems were used by Phocos to check remote communications stations without a grid connection,” says Werner Weiss-Oberdorfer, who supervised the projects on the ground. Another new market is fisheries monitoring. For example, an Icelandic company uses off-grid PV systems with Phocos components to get a daily overview of their fish stocks, the average weight and size of the fish, their condition and growth.” *(hcn)*

major projects, the most spectacular of which is the Grand Renaissance Dam on the Blue Nile designed for an output of 6,000 MW, are currently in planning or under construction. These projects stem from Ethiopia’s desire to become the largest exporter of electricity on the horn of Africa. Chinese companies, in particular, are involved in the development of energy infrastructure in the country which counts 87 million inhabitants.

Dual strategy with mini-grids

Will remote mountain villages such as Laka soon be connected to the national power grid? And, if so, will independently operated small solar power plants become obsolete? No, says energy expert Hailu. So far, only 6 % of Ethiopians have a power connection, one of the lowest rates in Sub-Saharan Africa. The vast majority of the country and its rugged landscape makes, “grid-based electrification too expensive,” he says. The Ethiopian government is therefore pursuing a dual strategy. Towns in rural areas will be connected to the grid, while remote areas will be supplied by off-grid systems and distributed autonomous power networks, or so-called mini-grids.

For the future, Hailu sees numerous possibilities for creating jobs in Ethiopian villages with the help of off-grid PV systems. Farmers could acquire solar-powered grain mills, process their own products and also offer the same service to others. Until now, they have often had to pay five times their producer price to have their grain ground in a mill powered by a diesel generator, he says. However, the investment cost for a solar system to power a grain mill, at up to 128,000 Birr (€ 5,860) is comparatively high. But that does not dampen Hailu’s confidence. “We want to develop the idea. I am confident that it is a successful business model,” he says. *Hans-Christoph Neidlein*

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