

November 2012

Amaray

Energy and development for rural areas



Photovoltaic Systems

Making the Sun Shine at Night

Yanacolpa

Energy solutions at
4000 meters

How much longer?

Yanacolpa, Huancavelica

September 28, 2012

Dario Toledo and his daughter Yesenia observe our faces, illuminated by a diesel fueled light. Until a few months ago, this flame was their main source of lighting and still remains the reality of thousands of families across the country today. According to the National Rural Electrification Plan 2012-2021 of the Ministry of Energy and Mines, in Peru 3 million people still do not have electricity.

So close, yet so far...

Santa Lucía, Ica

September 24, 2012

When night falls on the town of Santa Lucía, in the distance you can see the lights from the district of San Clemente de Pischo, which seem to prolong the sunset. Despite living just 6 miles away, the families of Santa Lucía are still waiting for the expansion of the grid in order to have electricity in their homes.

Pico PV Systems

Santa Lucía, Ica

September 25, 2012

To face the challenge of electrification, which many towns still lack, Pico Photovoltaic Systems (Pico PV) offer an alternative that provides access to basic lighting and communications. They can be permanently installed at home or used as mobile systems; they can charge a radio or cell phone and lead to savings in everyday spending for low-income families.





Dear Readers,

I recently met a woman named Doña Mariana Quispe in an isolated village in the Peruvian jungle, who told me about the difficulties her two children face in order to do their homework at night, since they do not have electricity. Her community has struggled for many years to secure access to energy services. Unfortunately, their demands have not been met and continue to go unnoticed.

This story shows, on the one hand, the need for access to electricity and, on the other hand, the impact of improving standard of living, in the aforementioned case, through education, the same can be said of the field of health, nutrition and hygiene, among others. Furthermore, access to energy through the interconnected national power system is not always feasible.

For the stated reasons, appropriate technological alternatives are spreading to different sectors of the population, especially to the poorest and most isolated. Solar energy is today practical and feasible, thanks to the scientific and technological advances that have been achieved in the field.

Currently in the San Martín region, five of every 200 families receive electricity from Pico photovoltaic sources; likewise, communities in Piura, Cusco and Cajamarca, among others, have been able to solve their problems through household photovoltaic lighting systems. Various different entities are involved in the effort to distribute and install these systems, including the Ministry of Energy and Mines, regional governments, private companies and international cooperation organizations.

Doña Mariana now has the opportunity to realize her dream of overcoming the obstacles to access energy services; this will improve the lives of her children, her family and her community.

Thus, because a family, a community, a developing country, is seeking and promoting access to energy services, in this issue you will find articles regarding the technology and experiences with solar energy in our country.

Warm Regards,

Ana Isabel Moreno
Project Manager, Energising Development / GIZ - Peru

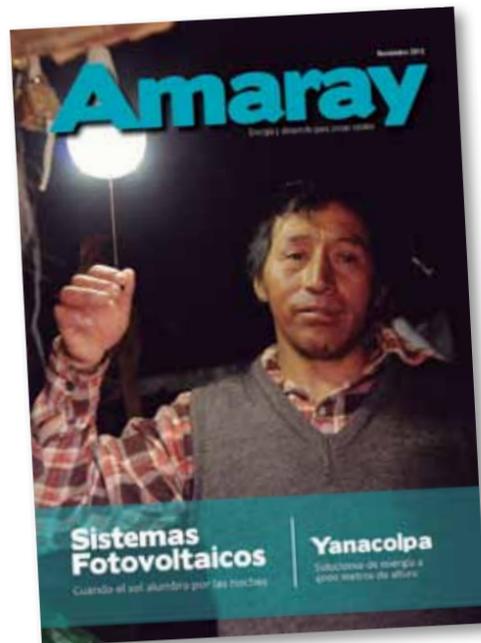


Carlos Bertello

Special. Pico Photovoltaic Systems
An alternative for remote and dispersed populations

20

Carlos Bertello



Rubén Aruní, resident of Yanacolpa, Huancavelica, turns on one of the lights of the Pico Photovoltaic System that is installed in his home. Millions of people like him would be able to benefit from access to these technologies, which promote human development and allow people to overcome energy poverty.

State Policy. Solar Home Systems Rural electrification by means of renewable energies in Peru	10
Interview. Sandra Manco Menéndez A guide for public photovoltaic investment in Solar Home Systems	14
Sustainable Market. Microfinance and Energy Promoting access to renewable energy	16
Portraits. Yanacolpa Power solutions at 4000 meters	28
Opinion. Rafael Rengifo San Martin, pioneer region in renewable energy	40
Energy Inclusion. Acciona Microenergía Household Electrification in Peru	42
International. Lighting Africa Clean lighting for millions of people	46

CREDITS

General Management: Ana Isabel Moreno Morales

Editorial Management: Carlos Bertello

Photo Editing: Carlos Bertello, Susan Morales

English Translation: Patrick Barnosky

Contributions: Ivo Salazar Taute, Natalia Realpe Carrillo, Carla Palomares, Angel Verástegui, Fernando Gonzáles-Olaechea Troysi, Julio Eisman, Jessica Olivares.

Photography: Leslie Searles, Carlos Bertello, Andres Bifani, Practical Action, Fondesurco, MicroEnergy International, ACCIONA Microenergía.

Design, Formatting and Printing
Cinco Elementos Publishing Company

This publication was developed by GIZ's Energising Development Project (EnDev), in collaboration with GIZ's Adaptation to Climate Change and Disaster Risk Reduction in Prioritized Watershed Areas of Ica and Huancavelica Project (ACCIH). For further information please contact us at proyecto.endev@gmail.com.

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Prolongación Arenales 801
Miraflores, Lima 18, Perú
(511) 422-9067

giz-peru@giz.de

Amaray ©

Energy and development for rural areas

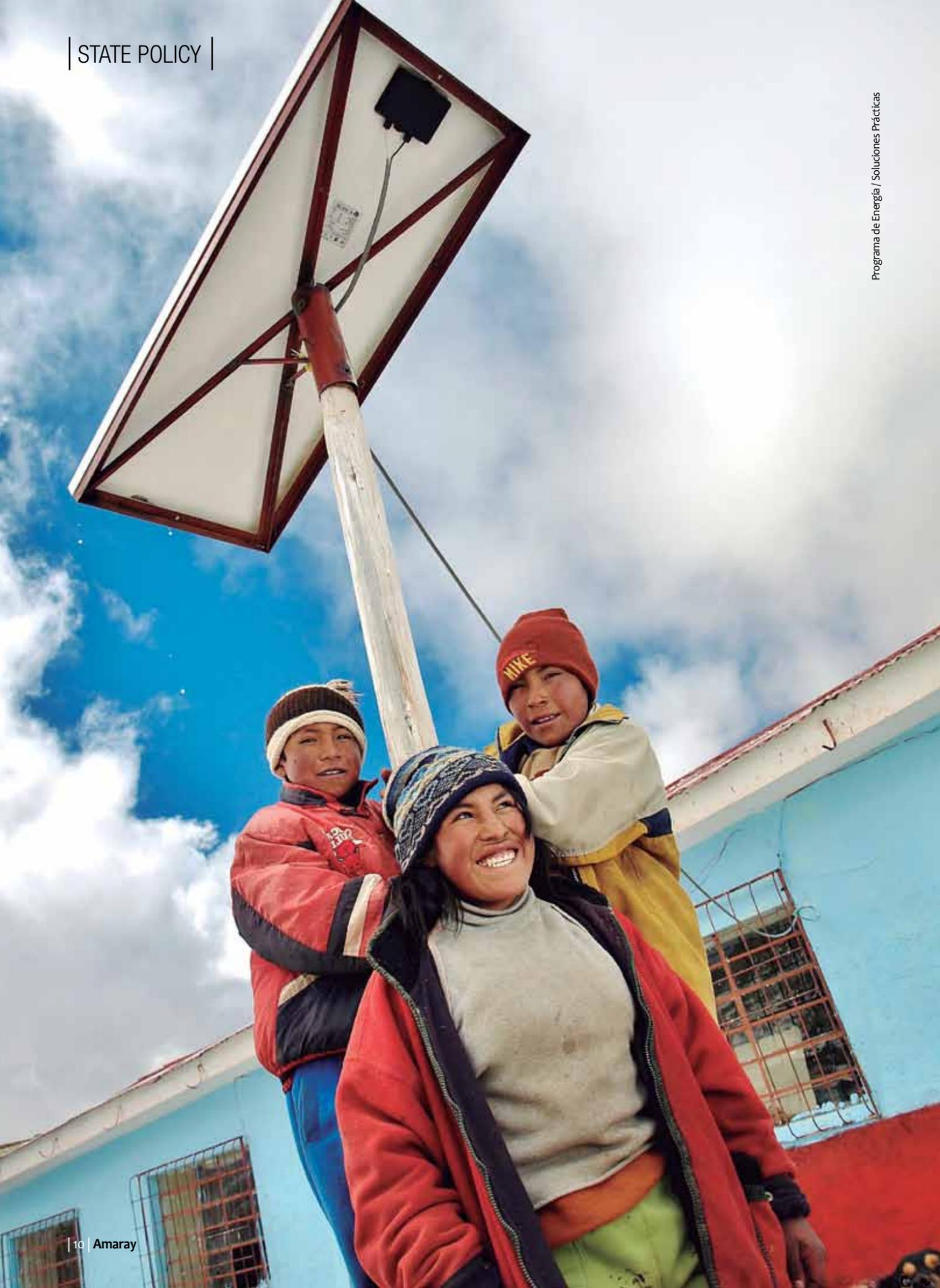
November 2012, N°2

Partial or total reproduction of the contents in this publication in any format and by any means without proper authorization is strictly forbidden.



Portfolio. Maternal Homes
Photographs by Leslie Searles

34



Rural electrification in Peru by means of renewable energies

Solar Home Systems

Solar energy has proven to be an effective alternative for isolated and rural populations, adapting to and providing for all of their energy needs. In addition, photovoltaic electric costs are highly competitive when compared with the cost of extending the electric grid or the daily use of diesel generators.

By Ivo Salazar Taute, Technical Manager, Deuman – Energy and Climate Change Consultants

In Peru, a series of renewable energy projects have been implemented, predominantly using hydropower and solar photovoltaics (PV). Solar energy is a reliable source because it involves no moving parts, is easily applicable to the geographic conditions of rural populations, and relevant information is readily available.

About 21% of the population of the country is without electricity and the only way for these people to access it is if existing networks are extended or renewable energy projects implemented. Thus, the General Directorate of Rural Electrification (DGER) estimates that approximately 2.48 million people in Peru could be provided with electricity through renewable energy.

Photovoltaics have become, in recent years, a viable option for rural and isolated populations, because their electric generation costs have become competitive compared to other options, such as the extension of the conventional power grid or the use of diesel generators.

The first attempts to implement photovoltaic projects began in 1968, with the installation of a system of 48 Wp (Pico solar panel power) in Nigeria, to provide electricity to a local school, followed by various pilot projects that continued until the early 90s, when the number of rural electrification projects in various countries, including Peru, increased significantly.

The beginning of this new era in our country coincided with the formation of several initiatives, among which were those of the GTZ (now GIZ). In conjunction with the former Tacna-Moquegua-Puno Region, they promoted various applications of PV technology, trained locals and established funding mechanisms for the purchase of photovoltaic systems.

At the same time, the national government, through the Ministry of Energy and Mines (MEM), initiated their first pilot project in the town of San Francisco, Pucallpa, which involved the installation of 134 Solar Home Systems (SHS) of 53 Wp. This project was expanded in the following years to the point that they put into operation about 1500 SHS in various parts of the country.

Also, the MEM, with the Renewable Energy Center of the National University of Engineering (CER-UNI), promoted a pilot project, that offered credit for the purchase and installation of SHS, primarily to families living on the islands of Lake Titicaca. This included after-sales service for a year. Through this initiative about 500 SHS were installed. The MEM also implemented pilot projects to install photovoltaic

Children from the school in Toxaccota, in the province of Canchis, Cuzco, at 4600 meters.

MANAGEMENT BY ADINELSA

The Rural Electrification Act, No. 28749, passed on June 1, 2006, declared the electrification of rural, isolated communities a matter of national necessity and public welfare, as it contributes to socio-economic development, improves the quality of life of the population, combats poverty and discourages migration from the countryside to the city.

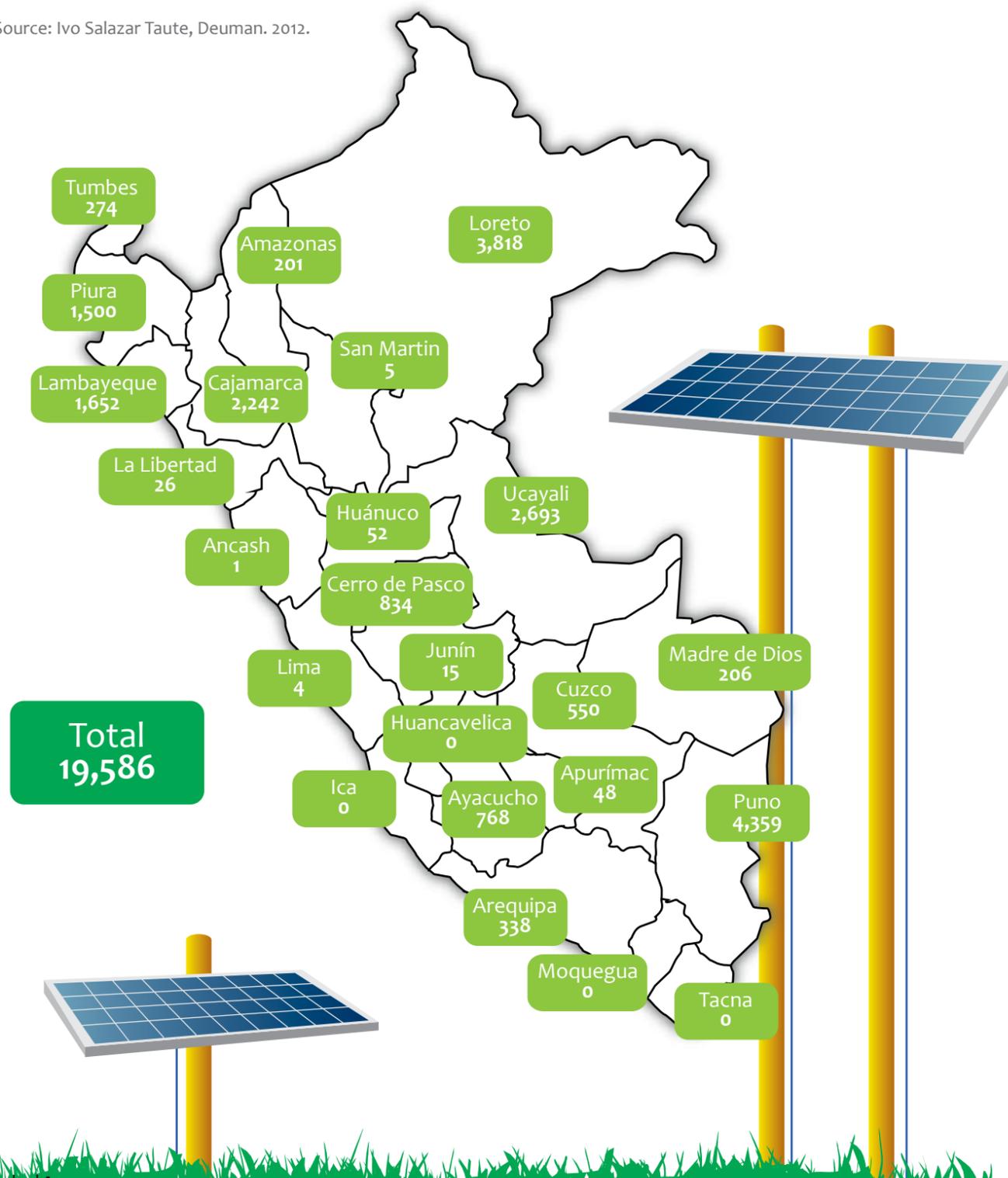
On May 3, 2007, a regulation that consolidated the role of the Electric Infrastructure Management Enterprise (ADINELSA) as a leader in rural electrification, was approved by Supreme Decree No. 025-2007-EM.

ADINELSA manages the electric service provided by Solar Home Systems. The company installs and maintains the equipment, while the user pays the "rural rate" for use, an amount that is subsidized by the state. The systems are not owned by the resident, as ADINELSA retains ownership over them.

Solar Home Systems in Peru

Programs executed by the Ministry of Energy and Mines, local governments, the Center for Renewable Energy of the National Engineering University (CER-UNI), the GIZ (formerly the GTZ), in collaboration with the former Moquegua-Tacna-Puno region and the organization Acciona Microenergía Peru.

Source: Ivo Salazar Taute, Deuman. 2012.



and wind systems of 1 kW in community centers and health posts in eight isolated parts of the country.

Resident of the Pata Quenamari community, in the province of Canchis, Cuzco, at 5200 meters.

PHOTOVOLTAIC RATE

Given the large number of SHS installed in various parts of the country, the Supervisory Agency for Investment in Energy and Mining (OSINERGMIN) established a fixed rate for photovoltaics.

The experience gained from these projects has served to improve the implementation of future PV projects, through the program "Photovoltaic Based Rural Electrification in Peru," funded by the Global Environment Facility (GEF), the MEM and in partnership with the United Nations Development Program (UNDP), which has led to the following:

This rate applies to electric generation between 50 and 320 Wp. However, about 80% of the users of this system receive state-subsidized rates, which have substantially improved the sustainability of the projects, as they are managed by governmental, non-governmental and private entities.

- Development of a Solar Energy Atlas through an agreement with the National Service of Meteorology and Hydrology (Senamhi);
- Creation of a database of geographic information of PV systems installed;
- Training at different levels (consumer, preventive and corrective maintenance technicians, installers, authorities and the general public) through workshops and the publication of manuals, posters, among others;
- Institutionalization of the certification process, by strengthening two national laboratories and approving the regulation "Technical Specifications and Evaluation Procedures for Photovoltaic Systems and Components";
- Development of management models for SHS and pilot projects;
- Implementation of pilot projects and hybrid wind-solar systems of 150 W;

It is important to note that the solar energy market has generated about 14 million Peruvian Nuevos Soles between 2010 and 2011, either for the replacement of components or the implementation of new projects in both the private and public sectors

Finally, it is important to note that the solar energy market has generated about 14 million Peruvian Nuevos Soles (about 5.4 million dollars) between 2010 and 2011, either for the replacement of components or the implementation of new projects in both the private and public sectors.

In 2010 and 2011, public institutions, from the MEM to district municipalities, invested about 5 million Peruvian Nuevos Soles (about 1.9 million dollars) in new projects and it is expected that this year investment will continue to grow, bringing renewable energy to the forefront in rural areas, which will aid its development.

As other renewable energy sources such as wind, biogas, among others, are still finding their way into the market, it is expected that the experience of photovoltaic projects will pave the way for different technologies to play an important role in rural electrification and production activities.

The project facilitated the installation of 4200 SHS in the Amazonian regions of Cajamarca, Loreto, Ucayali and Pasco; they were later transferred to the Electrical Infrastructure Management Company (ADINELSA) for administration.

Interview with Sandra Manco Representative of the Directorate General of Investment Policy of the Ministry of Economy and Finance

A guide for photovoltaic investment

By seeking efficient use of public resources for electrification projects that utilize solar panels, the Ministry of Economy and Finance (MEF) is conducting research to establish guidelines to optimize the State's investment in Solar Home Systems

By **Carlos Bertello**, Communications Officer, Energising Development Project / GIZ – Peru

How did the photovoltaic electrification study come about?

First, it must be credited to the increase in similar initiatives of the National System of Public Investment (SNIP). The foundational entities assigned to SNIP registered investment initiatives they planned to manage, so a review of this gives us an idea of the most common types that require further development.

A second factor was that the Ministry of Energy and Mines (MINEM) has declared that conventional electrification will not be able to provide for some areas in the short term, so they have set as a goal to identify the potential application of renewable energy in these areas.

So there is a particular interest in solar power projects...

Yes, energy produced by solar panels has been the most common thus far. A map of solar radiation has been created, this type of Public Investment Project (PIP) has been included in the National Rural Electrification Plan developed by the MINEM and, since 2010, OSINERGMIN, a regulatory entity for energy services, has established a standardized price for these systems. Therefore, it is evident that this technology has an adequate legal framework to develop a guide to the formulation of these investment initiatives.

However, although these types of projects are within our scope, it is still not clear whether the studies reach the minimum requirements to be declared legitimate. Our consultants must also learn about the situation from reviewing local and regional government projects. We seek to identify any gaps that may exist and propose specific solutions.

How is the research being developed?

Our research has been divided into two phases: the

“Energy produced by solar panels has been the most common thus far.”

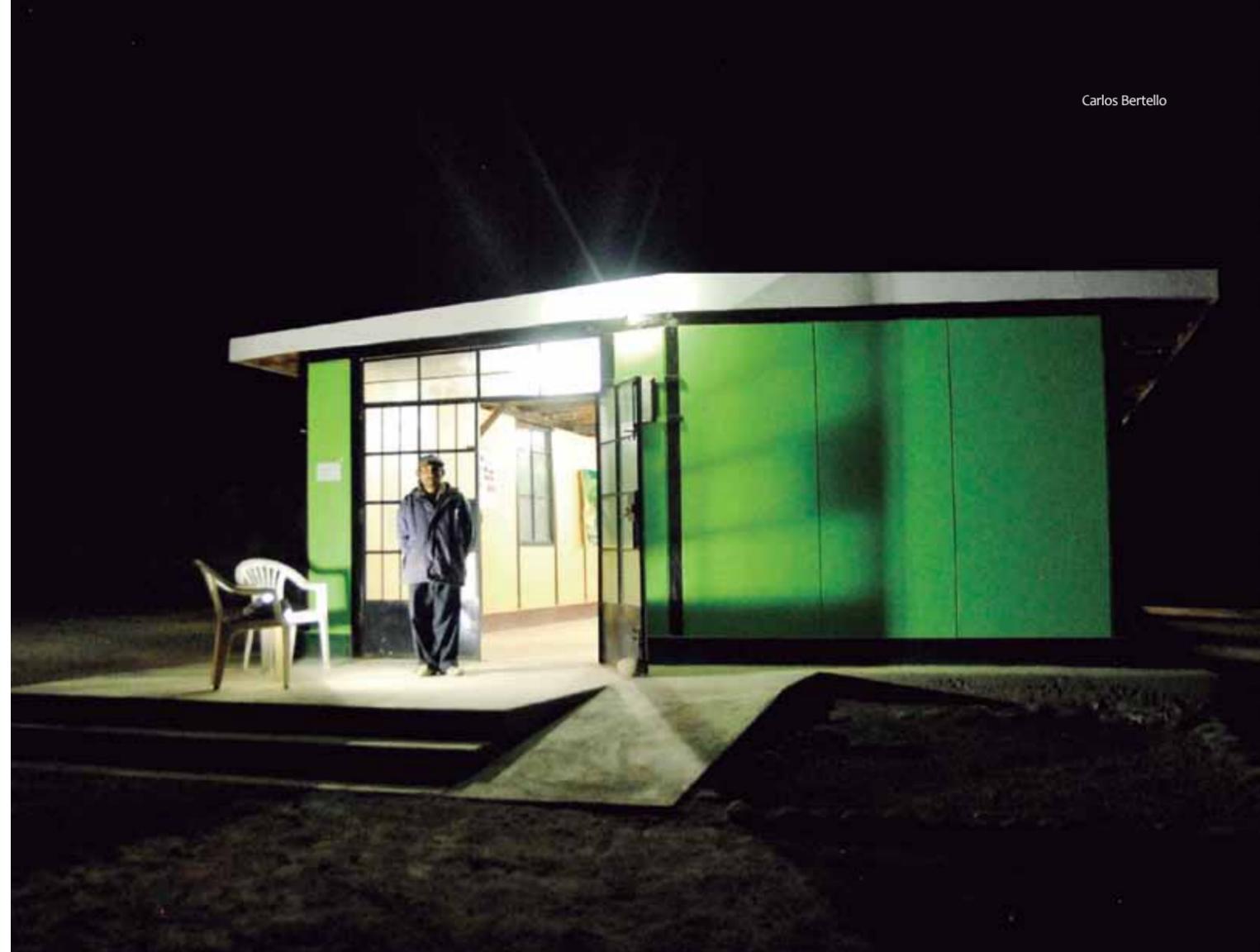
first will allow us to know the current status of the PIPs that use solar panels on the regional and local government levels, as well as take into account the expertise of a consultant who identifies weaknesses in the implementation plans of these projects and help develop proposals.

The second phase aims to develop the "Guidelines for the Development of Rural Electrification Projects using Photovoltaic Systems under the SNIP". This is the goal that we pursue as a team, which will enable us to track the technical, legal and methodological requirements that must be met for developing such projects within the framework of the SNIP.

In addition, the research can be used to identify the possible tools consultants and evaluators may demand. These are tools that General Investment



Carlos Bertello



Policies (PGD) must develop in the future as requirements for the implementation of these projects.

Have you managed to get any results?

So far we have managed to validate our hypothesis that these types of projects are being developed without respect for the basic regulations which would ensure their viability. This downfall is evident not only on the local government level, but also in the regional government, thus, training in the formulation of these projects should be developed with equal emphasis on both levels of government.

Currently, projects are formulated on the basis of the criteria of the consultant responsible for the formulation, thus promoting approaches that are not necessarily the most appropriate or unified. This, coupled with the inexperience of consultants in these types of projects, requires massive training in order to develop this type of PIP.

So this work is coordinated with the programs implemented by the MINEM...

We must start from the premise that for a project to be declared feasible, it must be socially beneficial, sustainable and follow the policy guidelines of the sector. Thus, if the MINEM has identified a feasible way of providing energy services to areas without

The community center in the village of Santa Lucia, in Ica, now has electricity through a Solar Home System.

electricity, which can be achieved using alternative energy sources such as solar panels, among others, and they have a fixed rate for this type of technology, it is logical that the governing body of SNIP should concern itself with managing these projects. The projects must be in accordance with both the technical and legal requirements specific to the energy sector, as well as the methodological approach provided by the SNIP.

We know that the industry is working hard to identify renewable energy that could be implemented in our country. This is in part to identify the potential in the various regions of the country to work with these technologies, but also to develop the regulatory and technical guidelines necessary to apply these technologies.

Not all technologies that have been evaluated to date are developed to promote mass implementation of these projects, for example, some do not have a fixed price. Consequently, the MINEM should identify and promote the appropriate technology, while the SNIP governing body should provide the development of specific methodological tools. For example, to help these new technologies have the tools necessary to demonstrate that they are socially beneficial and sustainable over time.

“The Ministry of Energy and Mines has declared that conventional electrification will not be able to provide for some areas in the short term.”

Promoting access to renewable energy

Microfinance and Energy, a fruitful partnership

By Natalia Carrillo Realpe, Microenergy Consultant, MicroEnergy International and by Carla Palomares, Project Manager, Appui au Développement Autonome

Presented as a key tool to combat poverty by providing marginalized populations access to financial services, microfinance has helped millions of people worldwide finance their businesses and access basic services such as health care and education. However, the role it can play in accessing energy services remains relatively unexplored.

Microfinance institutions (MFI), such as municipal banks, financial banks or Edpymes -which offer small loans in Peru- are characterized by the personal relationship they have with their customers. MFIs know the needs of their clients and offer tailored financial services, while, at the same time, provide the human resources and organizational structure necessary to serve a low-income population.

This segment of the population is usually found in rural or suburban areas. It is precisely this demographic which needs support in order to access basic energy services. These people are not connected to the electric grid or they might have an unreliable connection and regularly suffer from blackouts, leading to the use of fossil fuels and damage to appliances from energy surges. Cooking with firewood, coal, or charcoal puts people's health and safety at risk, especially those of women and children, by creating household pollution. Furthermore, the lack of a reliable energy source creates dependence on diesel

generators, batteries or small rechargeable car batteries, which can cost as much as half of a household's monthly income.

To address this problem, access to "green" energy services must be presented as the solution. However, these environmentally friendly technologies represent an investment that many people cannot afford. The loan that MFIs can provide can be, in many cases, the key factor that drives customers to adopt clean energy technology, which is financially viable in the long term but expensive at the time of acquisition.

TAKING ON THE CHALLENGE

Considering the aforementioned dilemma, in 2010, the NGO from Luxembourg, Appui au Développement Autonome (ADA) and the German consulting company, MicroEnergy International (MEI), jointly developed the "Micropower Atlas", which estimates the potential for microfinance funded energy projects from an analysis of indicators from both sectors. The study highlighted the potential of Peru as a country that has a mature microfinance market (it is considered the industry leader in Latin America) and has optimal energy conditions (it received one of the highest solar annual averages in the world: 2300 kWh/m²). This is why it was chosen as the country to implement the pilot project of the Energy Inclusion Initiative (EII), which supports

The results of the research identified solar water heaters, improved ovens and solar dryers, as technologies that meet the energy needs of its customers





©MicroEnergy International

both European institutions to provide disadvantaged people with access to "green" technologies through microfinance.

Solar dryers improve the productivity of small businesses.

Thus, a partnership was established with the Energising Development Project of the German Agency for International Cooperation, GIZ, in Peru (EnDev/GIZ) and the MFIs, Caja Huancayo and Fondesurco to implement the projects. Both institutions were selected for their high level of motivation, experience and management skills, to take on the challenge of diversifying its portfolio with a micro-finance energy program and creating a triple impact with its work: economic, social and environmental.

"BOTTOM UP" APPROACH: CUSTOMER NEEDS
Technologies that could incorporate the MFIs' financial programs were selected through a methodology that prioritizes the energy needs of current and potential customers. Through a field study, information was collected on the uses of energy and energy costs of each institution, as well as analyses of the breadth and quality of the supply of clean energy technology.

The results of the research identified solar water heaters, improved ovens and solar dryers, as technologies that meet the energy needs of its

The loan that MFIs can provide can be, in many cases, the key factor that drives customers to adopt clean energy technology

customers, in order to promote access to clean energy and to significantly improve the financial situation in households and for entrepreneurs, which can put these products to good use. Renewable energy systems, such as solar water heaters, give a competitive edge to the lodges that install them, because by offering hot water service to tourists, they can increase their prices. Solar dryers for coffee, which protect the beans during drying, reduce waste by 80% in comparison with traditional drying methods. Meanwhile, the improved ovens save up to 50% of fuel consumed using traditional ones and also reduces household pollution by 99%.

Once the specific technologies were selected, partnerships with local suppliers were established after a detailed technical assessment. All equipment was validated by EnDev/GIZ and MEI personally, in order to guarantee that it will function properly in the climatic conditions of the regions where the MFIs are located: the highlands of Junín, Arequipa and Satipo, in the Amazon.

GROWING TOGETHER: THE FIRST LESSONS
The implementation of the EII in Fondesurco and Caja Huancayo, with its Renewable Energy Solutions (SER) program and Green Line Program

(PLE), has been carried out methodically, adapted in each case to the characteristics of the institution and its work areas. This was designed and launched in mid-2011, with loans specifically to finance energy technology: Crediecológico in Caja Huancayo and FondeEnergía in Fondesurco.

Marketing loans for energy technology presented a number of challenges for both the MFIs and suppliers. Both had to adapt their work methods to establish an efficient supply chain to meet the needs of customers: from the soliciting loans to the acquisition of the technology, to the maintenance service after the sale, to the transportation and installation of the equipment.

These efforts are beginning to bear fruit, as now around 200 energy systems have been placed in households and small businesses, and the potential for growth is encouraging. The results of the evaluation of the first phase of the project SER, under Fondesurco, have reaffirmed the potential of these types of energy programs and customer satisfaction with green energy technology: 85% believe the quality of the equipment is good or very good and 100% would recommend the technology to relatives and acquaintances.

The next step is marketing on the small scale: the MFIs will provide more loans to agencies and regions to acquire green technologies. Further challenges arise from consolidating the supply chains. While MFIs focus their efforts on promoting these products by acquiring expertise in the field of clean energy, providers are prepared to supply the regions where energy programs are established.

Establishing providers is an important step towards the success of the project, which has recently signed an agreement with the NGO Hivos to implement a program to strengthen the providers of each program. Thanks to this initiative, the microfinance market is fostering the development of green energy in the country.



CAJA HUANCAYO AND FONDESURCO

CAJA HUANCAYO
Customers through May 2012: 149,397 - of which 36% are in rural areas
Loans: USD 100,506
Average loan per customer (monthly): USD 1,649
Agencies: 56 distributed in Junín, Pasco, Huanuco, Huancavelica, Ayacucho and Lima.

FONDESURCO
Customers through May 2012: 13,760 - of which 96% are in rural areas
Loans: USD 20,043
Average loan per customer (monthly): USD 1,811
Agencies: 16 distributed in Arequipa, Moquegua and Ayacucho.



The "Energy Inclusion Initiative" in April 2012 won the "Green Finance Award" in Luxembourg.

Home lighting for rural and dispersed populations

Pico PV Systems An alternative for lighting (and more) in the home

It cannot be disputed that the entry of LED bulbs into the market created an energy revolution and today there are lighting products that require minimum power consumption. Examples include the Pico Photovoltaic System, which is an environmentally friendly technology that has become a route to improving quality of life by providing basic access to lighting and home communications.

By **Angel Verastegui Gubler**, Renewable Energy Advisor, Energising Development Project / GIZ – Peru

Development often goes hand in hand with technology, especially in the case of electrification, when you consider all the advantages of having electricity at home. At night, it allows us to sit around a table, share our food under a light and breathe clean air while we exchange stories with our loved ones.

Electricity is still a luxury for many people, although it is taken for granted within cities and large towns throughout the country. According to the National Rural Electrification Plan 2012-2021 from the Ministry of Energy and Mines, despite efforts to implement rural electrification projects, three million people in Peru still lack access to electricity and are forced to use batteries, candles and lighters, spending about 40 soles per month on low quality lighting.

Given this reality, Pico Photovoltaic Systems, also called Pico PV, provide an alternative pre-electrification plan for remote and scattered rural communities throughout the nation. These products are inexpensive, easy to transport (less than 2 kg), and involve simple installation, use and maintenance. They also have high energy efficiency, providing quality lighting that meets the daily needs of a family, while consuming less than 1 kWh per month. The systems can be used in a fixed or portable manner, they can charge a radio or cell phone and in this way allow low-income families to cut down on their daily spending. They provide greater security for the family and eliminate household pollution created by the use of diesel and other fuels used in rustic lighting. They are also a source of clean energy which decrease CO₂ emissions in the environment.

Pico Photovoltaic Systems, also called Pico PV, provide an alternative pre-electrification plan for remote and scattered rural communities throughout the nation

Bertha Saavedra, resident of Santa Lucia, in Ica, turns on the light of her Pico PV System.

Pico Photovoltaic Systems are more than just lights charged by solar panels. They are energy-efficient systems that provide lighting with a minimum power consumption, whose development has been achieved, in less than a decade, thanks to the technological innovation generated by LED lights (Light-Emitting Diode), which are already considered by many as the "light source of the future".

While the LEDs have been in the market for almost a decade, they have revolutionized the world of lighting energy. Today used in cars or computers, and essential to the development of Pico PV Systems, LED lighting may be regarded as the forefather of Pico PV. Thus, the term "pico" (which is a term that refers to the small scale, like "mini" or "micro") is used not only because it is a product of small dimensions, but also because of its low energy consumption.

SMOKE-FREE LIGHTING AND SAVINGS

Various specialized companies and an entire industry have developed around this technology in the past four years, seeking to attract potential consumers, especially within the markets of developing countries. In this sense, one might think that these systems are just responding to the market. However, because of the impact they generate in terms of human development, they are products with a clear social aspect, which seek to improve the quality of life for families and communities that still lack a permanent power source.

They do so by directly addressing the basic needs





of the large segment of the population, in many countries, that live in remote, rural areas, far from the conventional electric network. And thanks to its small size, the systems can use high quality Lithium-Ion batteries, the same as those used in cell phones and laptops, leaving behind lead-acid batteries, which pose an environmental and health risk.

Also, due to its small size, the system can, in good conditions and when fully charged, be used for up to 6 consecutive hours at the maximum intensity level (greater than 100 lumens) and up to 50 hours at the minimum intensity level (greater than 20 lumens). Thus, given that these systems have different levels of intensity, the user can manage the stored energy as needed.

Financial gain is a powerful motive. A typical energy consumer spends about 30 or 40 soles in batteries, fuel or candles for lighting. Thus, a Pico PV system, the price of which varies between 50 and 100 dollars, depending on the model and brand, is equal to the cost of a half of a year of traditional lighting, with the advantage that it does not entail any future costs. Because of the savings and positive impacts provided in health, education and communication, Pico PV is a step towards a better quality of life.



Above: A basic Pico PV System provides lighting for two rooms with just one solar panel. Below: Residents of the town of Santa Lucia, in Ica.

Usually, the lights have an input jack where you insert the cable coming from the solar panel, which is installed on the roof of the house and which must stay connected during the day to recharge. Once charged, it is possible to use the accumulated electricity, not just for lighting, but also to recharge cell phones and radios, via an output cable, which is connected to the battery. Depending on the model, this output can even be a USB, allowing you to recharge any device that has a USB port (digital camera, MP3 player, etc.). This is why Pico PV Systems are more than simple solar lights; they are integral domestic systems for lighting and basic communication. The purpose of Pico PV is not just to provide lighting at night, but also to open a window to communications technology, which is vital to the 21st century citizen.

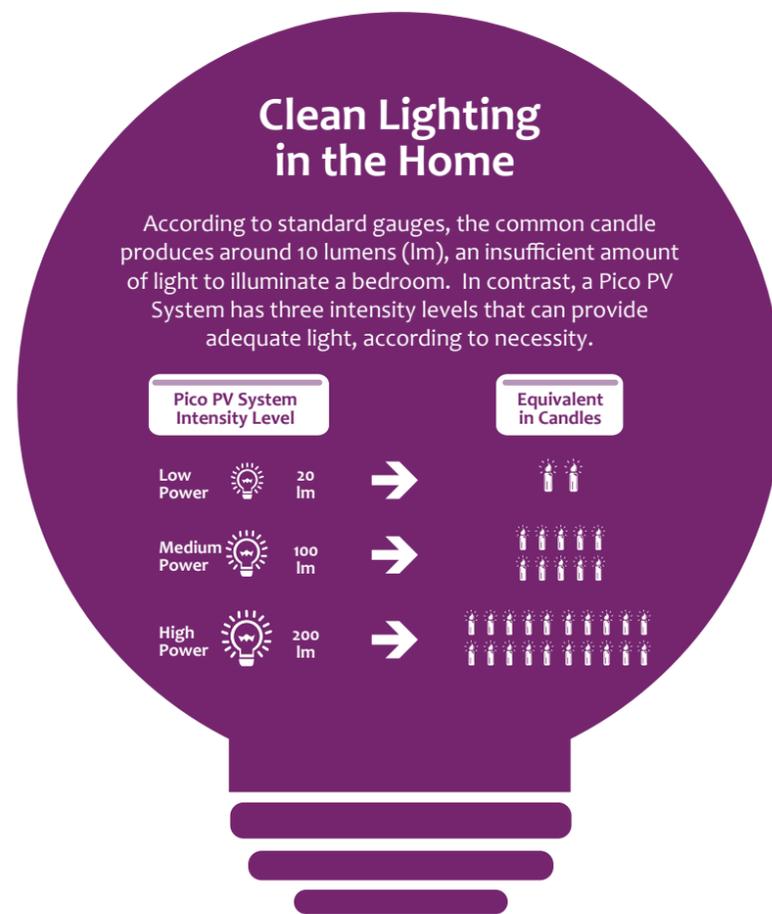
It was necessary to create a lightweight and durable product that could be taken to remote areas without difficulties. In general, these systems are modular and are purchased as part of a kit, which includes a light with battery, a 3 Wp solar panel, phone charger, cables and accessories. A second light can also be acquired separately and charged by the same panel. In addition, a basic kit does not weigh more than 2 kg and can therefore be easily transported to remote areas, even in a backpack.

Normally, solar panels are installed and remain stationary on the roof of the home, pointing north, so that it receives sun all day. One panel can charge up to two lights, which provides lighting for two rooms. In addition, most systems can be transported easily from room to room or carried as flashlights, because each light has its own battery, and certain models are even designed to be resistant to water, dust and impact.

Finally, for a product to be considered a Pico Photovoltaic System, it must have a maximum of 10 Wp panel, from which the light fixtures should be able to put out at least 100 lumens. There are also similar technologies on the market, such as lamps and flashlights charged by solar panels, but these do not afford the brightness of Pico PV Systems nor do they recharge radios and cell phones. Furthermore, they use lead-acid batteries, which can be toxic in environments above 35 °C.

OPENING THE DOORS TO THE LOCAL MARKET
In Peru, the first products of this kind appeared in the capital in 2010. However, the market is still growing and therefore, they have mostly been utilized as part of projects that seek to promote human development through basic access to energy in the home, which is why the supply of these products has gone hand in hand with social initiatives from international cooperation organizations and the private sector.

These systems offer features suitable for remote locations, where installing other, more complex and powerful technologies, would be too costly or complicated for the locals. Also, this is an



These products are inexpensive, easy to transport (less than 2 kg) and involve simple installation, use and maintenance. They also have high energy efficiency, consuming less than 1 kWh per month

electrification alternative that comes with a guarantee from suppliers. Currently, they are working on providing a deal which includes a permanent service technicians in the San Martin region and replicating this model in Cusco and Cajamarca, according to the growth of the demand of the population. Generally the guarantee lasts one year. Moreover, these service centers are essential to the sustainability of the products, which may require maintenance, repairs or replacement batteries.

The GIZ's Energising Development Project has been promoting the supply, demand and policy framework for these technologies in various regions of Peru, introducing products that have been tested for certain quality standards. Studies have been conducted in the laboratories of the National Engineering University (UNI) to ensure the capacity, efficiency and functionality of the systems.

Thus far, all the systems have been produced abroad. Some of these companies are looking for local suppliers within the country to become their outlets. Similarly, the systems are also gaining ground in other developing countries, so they are responding to a market demand with global dimensions.

The systems, tested in the field, have shown to be resistant to wear over time, and have generated

positive social impact by replacing candles and diesel burners. For example, children can now study at night and people are now able to do household chores at night, which they used to do during the day. There have been clear economic advantages, as the use of fuel for generators, which would light up one or two bulbs, has decreased sharply. Besides, this adds up to environmental conservation by contributing to the reduction of CO2 emissions.

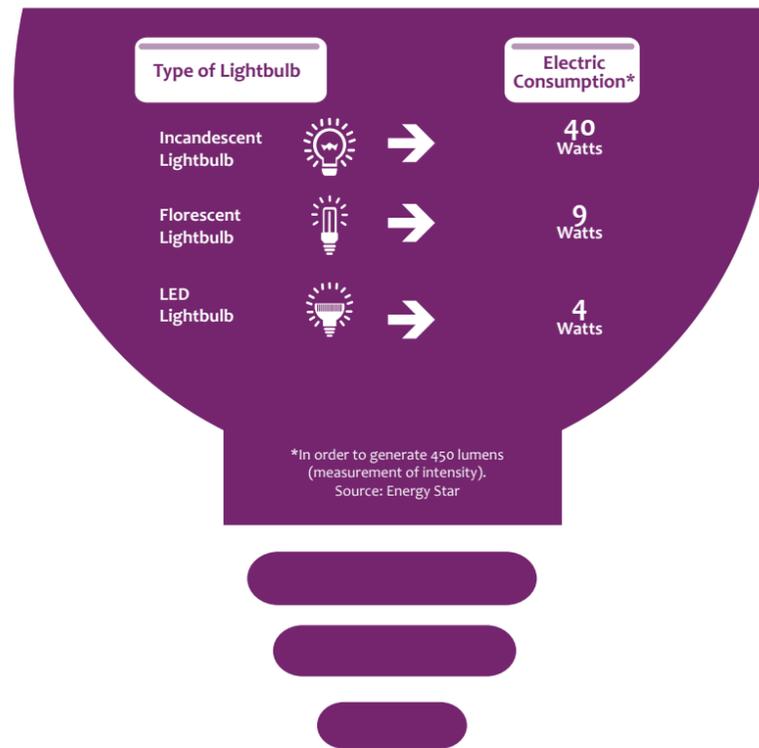
The total replacement of batteries is still a work in progress, since some residents prefer having the equipment hanging in their rooms and not exposed to the elements, or they think equipment may be damaged by falling or getting wet and in some cases the residents have permanently installed the technology in their rooms and therefore continue to use regular flashlights for specific activities.

In addition, the use of batteries for radios is still common. However, there are now radios that work with USB music players and use cell phone batteries, which can be recharged via a Pico PV system. These radios have caused a sensation in the Peruvian market, especially among rural and suburban youth, which could help replace the use of battery-powered radios with these new rechargeable ones.

Overall, we now have a tougher, multifunctional clean energy product, which involves an important social element contributing to the human development of people around the world, providing access to basic communications and clean lighting in home. In other words, a step forward in this technology has opened a door to development.

The Future of LED Lights

Thanks to their minimal electric consumption, LED lights represent evident savings and are considered by many as the "light of the future". These lights are one of the principal components in Pico PV Systems.



Solar Panels in Santa Lucia

A town in the province of Pisco, hit by the 2007 earthquake, talks about access to energy through photovoltaic systems.

By Carlos Bertello, Communications Officer, Energising Development Project / GIZ - Peru

Obispo Salguero, president of the neighborhood association in Santa Lucia, holds the key to the community center. The facility can be used at any time, but it is mostly at night that they open their doors. "The neighbors come and take turns charging their phones. Ashley, a girl who goes to college, uses a computer for her studies. Before, nobody had a laptop because there was no electricity", he says.

The people of Santa Lucia are still not connected to the electric grid, but the Solar Home System (SHS), which is in in the community center, and the Pico

Photovoltaic Systems (Pico PV), which they have in their homes, provide them with access to electricity. The town pertains to the District of Independencia, in the province of Pisco, but still lacks adequate road access. "On weekends, we call one or two cars and the women travel to San Clemente to do grocery shopping. They charge five Peruvian Nuevos Soles per person, one way. Also, there is a police station, a medical center and a market", says Obispo.

He reminds us of their long struggle for a better future that began when this group of families

The solar panel of a Pico PV System is small, about the size of a notebook, and easy to install.



decided to come and live on the coast. Santa Lucia is a town that was formed by the arrival of migrants mostly from of Ayacucho, Apurimac and Huancavelica over 15 years ago. Currently, the community is comprised of about 30 families, all of which work in agriculture and raising livestock.

In 2007, they were hit by an earthquake that struck the central coast, and many lost their homes. In 2010, 15 homes were built by the Construction of Earthquake-Resistant Homes and Disaster Prevention Project (COVIPRED) of the GIZ. "The residents themselves built the homes, the project provided all the technical assistance and materials, but they directly constructed their own homes. There are even some people who have extended their houses using the same technology", says Gari Solórzano, a representative of the project, which ended in 2011 to make way for the Adaptation to Climate Change and Disaster Risk Reduction in Prioritized Watershed Areas of Ica and Huancavelica (ACCIH) Project, which developed a project to build the community center and install photovoltaic technologies.

Julia Sandoval is one of the beneficiaries. Fourteen years ago she arrived from her native Ayacucho and at this time only used kerosene and candles for lighting. "The panels were installed a year ago and the advantage is that we no longer have to use candles. In addition, we can stay up later and there is less danger of burns and fires. Sometimes at night we would use two or three candles. In this house not as much, but in a hut, the wind gets in and makes the candle burn quicker", she remembers.

"Candles produce smoke, but lanterns are even worse, they smell horrible and irritate your eyes. I suffered from asthma and kerosene is bad for your lungs, especially if you repeatedly use it at night", recalls Bertha Saavedra, one of the residents who was not able to benefit from the improved housing construction project, but now has smoke-free lighting in her home from Pico PV Systems.

Meanwhile, Julia recounts the damage they suffered after the earthquake. "That night we felt it coming like a wave and there was not even time to blow out the candles. Here we are a half hour away from Pisco, and many houses had fallen. Fortunately, the houses we have now are more resistant. I, for one, have constructed another room following the same guidelines and using the same materials. Over time, we have become engineers", she declares.

Between these two women, neighbors for almost two decades, they have so many stories that we would not be able to hear them all even if we stayed up all night. But one thing is for sure, we know that these stories are no longer accompanied by the smoke from candles or lanterns because they now use quality lighting while sharing these moments around the table.

"I cannot sleep with the light on, but one night I was reading the newspaper when I fell asleep, so I slept with the light bulb (Pico PV) on. Then later, when I woke up, there was a lot of light and I said: is the

The systems can be used in a fixed or portable manner, they can charge a radio or cell phone, and in this way allow low-income families to cut down on their daily spending

The neighbors of Santa Lucia often meet to converse at night.



sun already coming out? Then I realized it was actually the solar light that was shining!" Bertha tells us.

Beyond Santa Lucia, there are still around 3 million Peruvians awaiting effective solutions to confront the lack of domestic energy services, either permanent, or as in the case of Santa Lucia, while waiting for the extension of the national electric grid.

THE ACCIH PROJECT

The Adaptation to Climate Change and Disaster Risk Reduction in Prioritized Watershed Areas of Ica and Huancavelica (ACCIH) Project, aims to improve the productivity and quality of life of families in select villages in the Ica and Pisco river valleys, by taking measures to adapt to climate change and reduce the vulnerability of the population to disasters. According to one of the project's sectors that focus on home improvement, the introduction of clean cookstoves or Pico PV Systems has a positive impact on the health and economic situation of the household.

"WE ARRIVED IN '98...

Every cotton picking season in Ica, we would come from our towns to work. Several of our relatives lived there and we asked them if they knew of any plots of land that we could purchase in order to come and work permanently on the coast. They said they knew of a place and one Sunday, we all walked there together. This is the place, they said.

We are only a few miles outside of Pisco. Several mud houses collapsed in the 2007 earthquake, but most were made of wood from river cane. After the disaster, several NGOs appeared in the area, looking to help us, but we were not able to access the aid. It was 2010 and we had already been trying three years to improve our situation.

Later, after much effort we were able to access a social aid program. It was a communal effort in which everyone in town

helped build the houses. In addition, there was a training session that included supervision of the construction. In two months, we were able to build 15 homes that were inaugurated on December 23rd, 2010. Later, we took advantage of the opportunity to build a community center and install solar panels.

Before this, to charge our cell phones, every Sunday we would go to San Clemente and pay one Peruvian Nuevo Sol in stores where phones are repaired. You could only use the phone for a half an hour to an hour per day. Fortunately, things have changed. Now I have lighting at home and my phone on all day. All things considered, we save a lot of money."

Obispo Salguero Bravo, President of the Community of Santa Lucia.

Yanacolpa, life under the sun

Power solutions for 4000 meters

By Carlos Bertello,
Communications Officer,
Energising Development
Project / GIZ – Peru

"The clean cookstove works well and saves a lot of dung. It also helps us with the cold and, most importantly, the smoke goes out through the chimney. Now we want to get some white paint to draw little flowers on it. That would make it look even better." Ulises Castro, resident of San Juan de Yanacolpa.



Cattle raising is the principal economic activity and source of income for the residents.

In the highlands of Huancavelica, at the foot of the mountains, one feels the imposing magnitude of nature that is constantly on display. There are incredible and surreal landscapes, touched by the hands of God. Three year old Emely plays with two balloons, her hands, burned by the cold and dry climate, go unnoticed because of her liveliness and joy, as she walks towards us almost as if she were waiting for us.

Despite the harsh conditions, to venture to San Juan de Yanacolpa also means to feel the warmth of those families that open their doors to us after several hours of travel. Yanacolpa is one of the towns that comprise the district of Santiago de Chocorvos, in the province of Huaytará, in Huancavelica. All of these communities are located around 4000 meters.

Dario Toledo and Arbelia Mantarí, Emely and Yesenia's parents, want the best for their daughters. Yesenia, 12, attends the school that can be seen from the doorway where we are welcomed, which leads to a small room that has no windows. This is typical of local buildings, in order to keep out the cold.

The school, though empty, is the nearest building and their only neighbor, so to speak. In Yanacolpa, families live in houses mostly built of stone, with low ceilings, that are dispersed by several miles between each one. Families, who raise cattle as their only source of economic activity and survival, rely on grazing animals such as sheep, llamas and horses. Under the sun at 4000 meters high, traditional agriculture is not feasible. Moreover, due to the lack of firewood for cooking, every day women must gather dung (manure from grazing animals), to use as fuel in their cooking fires. "We

collect it every day, sometimes searching for up to an hour," says Arbelia.

In Yanacolpa, each family has large tracts of land, yet this does not always guarantee sufficient food for their animals. In addition, the variable climate, which in a few minutes can change from a clear, sunny day, to a rain and hail storm, is not ideal for raising livestock. There are no nearby roads or electric grids, and Yanacolpa still feels hindered by isolation and the lack of communication networks, which would allow for more dynamic trade with the rest of the region and generate more income.

WALKING THROUGH THE HIGHLANDS

We were taken aback by the incredible blue color of the sky, and the white of the clouds, which seemed like a painting, when we decided to take a walk to meet more of the residents. It was a sunny and dry day, and the sun's rays lit up our faces. The families that lived on the next plot of land welcomed us enthusiastically and told us about their lives. They said that in the last few months they had felt their lives change. They pointed to small solar panels on the roofs of their houses and asked us to come see the light generated by their

"With the lantern we could never see well. When we would put it in a corner, it only lit part of the room and left the roof black. Before, every two weeks we had to purchase two gallons of oil in Ica, but now with the solar lights, there are no additional costs." Dario Toledo, resident of San Juan de Yanacolpa.

How was the project implemented?

The initiative was implemented by the Adaptation to Climate Change and Disaster Risk Reduction in Prioritized Watershed Areas of Ica and Huancavelica Project (ACCIH) of the GIZ, together with the Municipality of Santiago de Chocorvos, which assumed the cost of transporting the materials, while the project provided locals with the technologies and oversaw their installation.

A total of 115 Pico Photovoltaic Systems (Pico PV) were installed alongside 115 clean cookstoves in seven communities in the district of Santiago de Chocorvos, in the Huaytará province of Huancavelica. Furthermore, the families themselves paid for the Pico PV Systems and were able to choose between three different models ranging from 60 to 100 Peruvian Nuevos Soles (about 23 to 39 dollars). The money raised from this was allocated to a common local fund for the communities.

Pico Photovoltaic Systems. They also told us about their clean cookstoves. They told us that the cookstoves make a big difference and they feel relieved that now there is less smoke in the home.

We returned from the walk and the sun seemed to hide to allow us to cool down. We had no idea that this was the warning sign that heavy rains were about to be unleashed. Luckily, we made it back in time and found Dario just before the impending storm. He and his family are accustomed; they know how to wait patiently. But how can one prepare for such harsh, extreme and unpredictable conditions?

Time passes and we come to realize that this is just the way people live in the Andean highlands, in many regions similar to Huancavelica, which is one of the most isolated and poor rural areas of Peru. But the warmth of a family always makes things right and we thank Dario and his family for their hospitality and the opportunity to share these moments with them around their kitchen table. Night falls and Arbelia lights up the dung inside the clean cookstove which will warm our food.

Arbelia's kitchen is a small and windowless stone room. In a small space like this, smoke can be fatal, especially if one spends several hours near an open fire or a kerosene lamp. However, today the people of Yanacolpa are much healthier because of access to clean energy in their homes. They now have a clean cookstove, which carries toxic gases out of

the house through a chimney and saves fuel, and they have a Pico Photovoltaic System which provides them with lighting at night. Clean energy for lighting and cooking is a comprehensive combination, providing access to basic energy services in the home.

Night falls and Dario turns on the Pico Photovoltaic System lights. We have a thermometer that reads 16 °C in the room. But what is the temperature outside? We know, from the air coming through the slots in the door, that it is cold. Furthermore, although the rain has ended, one still feels the moisture in the air and we know that in September the temperatures can be quite low. To verify this, we leave the thermometer outside. We check it after an hour and see that it has gone down to 2 °C. Without a doubt, this is a difficult climate.

Arbelia continues cooking and as our dinner is almost ready, the temperature drops inside the house, but we know the cookstove would help to warm us, so several of us sit next to it. We wait for our dinner quietly, give thanks to the family that has offered us their hospitality and feel glad that these technologies have become a source of health and well-being for all those that sit around this table.

Thus, after seeing this positive impact, all we can do is continue to strive so that people from all over Peru can access similar technologies, which equate to savings for low-income earners and improved health for the entire family.

The lighting generated by a Pico PV System illuminates the home of the Toledo Mantari family.



Improving the quality of life

"We are very pleased to have been able to improve the quality of life of our citizens, especially in terms of health. Respiratory infections are a serious issue in the highlands. Smoke produced by burning dung for cooking was polluting the lungs of our residents, especially children, but this problem has been solved thanks to clean cookstoves.

Moreover, all those that have Pico Photovoltaic Systems can stay awake one or two more hours, children can do their homework, and they are even happier to know that they do not have to pay for the service. Before, they spent money on candles and fuel in order to light their homes. These technologies have been sent specially to the places that need them

most, the outlying areas of the region.

Thus far we have implemented projects in seven villages, the most remote and isolated towns at around 4500 meters. This is a great contribution, but there are still more than 32 other towns that could be aided in the same way, villages that the electric grid will never reach. For example, when you arrive to Yanacolpa, it means you have already crossed the mountain range and it is logical that a private company would not sell its services to such a remote and scattered population. For me, photovoltaic systems are the only viable alternative, plus, once installed, the service is free."

Cesar Araujo, Mayor of Santiago de Chocorvos

The families of the high Andean regions can now access clean energy services in their homes.





When adequate conditions are lacking at home...

Maternal houses are centers where pregnant women can go to get their check-ups and be attended to, so they do not have to make long journeys from their communities. They also provide for basic needs often lacking in the home, which puts their health and that of their babies at risk.

Photography by Leslie Searles / Article by Fernando Gonzáles-Olaechea Troysi

Marisol Ayhua was nine months pregnant when she saw Flora Puma, who had been pregnant a month less than her, die. They had traveled together from the Antabamba Support Hospital No. 6, where Marisol works, to the Abancay Regional Hospital.

Flora could not make it through the twelve hours trip: she had suffered a placental abruption, which is why she left her home in Huaquilla, to go to the hospital where she met Marisol. Neither Huaquilla or Antabamba could provide her the treatment she require, so they traveled to the capital of the region. Flora's cardiac arrest was swift. Suddenly, three children in Huaquilla were orphaned.

The vulnerability of expectant mothers in rural areas of the highlands and the jungle is real and difficult to deal with. According to data from the National Statistics Institute (INEI) and Unicef, the number of deaths in the last 15 years are down from 24 to 11 per 1000 newborns. However, the difficulty of access to health services and cultural differences prevent discerning an accurate figure.

Apurímac, Cusco, Puno, Loreto and San Martín all reflect high numbers of newborn deaths. Thus, baby care begins with taking care of the mother, doctors and specialists will agree. With that said, the role of maternal houses is clear.

Currently there are 435 such centers in the country. One of these is the Abancay Maternal House, home to high-risk pregnant women recommended by health facilities throughout the region. Each month about 45 mothers stay there an average of 21 to 30 days.

Many of the mothers who come to the center are minors. The risk is greater in their case, and they therefore require closer observation. Maternity rights imply that pregnant women and newborns have must adequate access to health care and clean energy in the home, with the goal that the story of Flora becomes only a thing of the past.

Leslie Searles. Arequipa, Peru, 1978. Studied Mass Communication with a major in film at the University of Lima and studied Photography at the London College of Communication. She took art courses in the Gerrit Rietveld Academy in Amsterdam. For two years she worked as a photographic assistant to the renowned Italian photographer Giorgia Fiorio, during the Don project. In 2006 she was selected to be part of Reflexions Masterclass. This year she was a finalist in the PHE Fisheye Prize in Spain and selected to participate in the viewing of portfolios in Costa Rica Transatlantic, organized by Photo Spain. Since 2009 she works for the Peruvian newspaper El Comercio, as part of the photography staff.

Fiorella, Curahuasi



Maricruz, Abancay



María, Abancay



Yuliza, Abancay



Ana Flor, Abancay



Hermína, Curahuasi



Regional Director of Energy and Mines from the Regional Government of San Martin, Rafael Rengifo

San Martín, pioneer region in renewable energy

The representative exhibited the projects that are managed by the regional government, with the support of international aid agencies and the state, to bring power to remote rural areas.

By Carlos Bertello, Communications Officer, Energising Development Project / GIZ - Peru

What is the situation with regards to access to basic energy services in the San Martin region?

The Regional Government of San Martin, within the framework of the regional energy policy, has set as a priority to ensure universal access to energy, using primarily renewable energy. To date, we have identified 322 villages that have no access to the electric grid and require energy from renewable sources. There are also 217 localities, which, because of their proximity to the power grids, should be provided with conventional electrification systems through network expansion.

What action has the region taken using renewable energy?

Based on the Regional Plan for Rural Electrification with Renewable Energies 2010-2014, we have been developing rural electrification projects using renewable sources, which include the following projects:

- Installation of a micro-hydropower system in the village of Marisol, which uses a floating micro-turbine that generates 5 KW for 22 users; the project is being managed by EnDev/GIZ, Smart HydroPower and the Regional Government of San Martin.
- Generation of electricity from biogas in the town of Santa Rosillo, which uses two 16 KW biogas fueled generators to provide power for 47 users; the project is managed by SNV, Practical Action, the Regional Government of San Martin and co-funded by the FACT Foundation and Cordaid. It was inaugurated on October 27th, 2012.
- Implementation of a rural electrification project by means of a solar park in the town of Alto Ungurahui, which will supply 6.6 KWp to

benefit 22 users and provide wireless internet for the town's educational center. This project is in the preliminary stage but will be the only such project in the nation.

- Implementation of Pico PV Systems, in different locations in outlying areas of the region. These are small pre-electrification programs, which are vital to the reduction of the use of candles, lighters and batteries in very isolated places; this project was implemented in partnership with GIZ through its EnDev program and has had impactful results for the target population.

Finally, we are developing rural electrification projects with Solar Home Systems to be implemented in 2013, by taking advantage of the Social Inclusion Energy Fund administered by the Ministry of Energy and Mines.

How many of these projects are carried out independently and how many are part of national government programs?

Actually, the project designs are made autonomously, but in accordance with the national rural electrification plan formulated by the Ministry of Energy and Mines (MEM), to avoid repetition of towns in the national public investment system. The Regional Government of San Martin signed an agreement with the MEM, which is under revision, to finance rural electrification projects (both conventional and photovoltaic systems) for up to 40 million Peruvian Nuevo Soles. According to the agreement, the regional government formulates the project plans and then they are evaluated, approved, funded and implemented by the Ministry of Energy and Mines. This has been a great strategy to expand electricity coverage, considering that in 2005 the region had 52%

“We have developed the first regional energy policy and the first rural electrification plan that implements renewable energy, which no other region in the country has done.”

electrification and we are currently at 83%. Furthermore, it should also be noted that the projects developed and financed by the Regional Government in partnership with other organizations have opted for innovative technologies, such as renewable energy, which even the MEM still has not initiated.

What objectives constitute your medium-term vision and what has been proposed for the future?

The regional energy vision is aligned with Peru's national goals, as we would like to be a region with an energy system that meets domestic demand effectively, self-sufficiently and sustainably, with renewable sources, exporting surpluses. This is why we promote the construction of hydroelectric and photovoltaic plants, and currently private companies are interested, with studies underway. As for rural electrification, the medium-term objective is to increase the percentage to 88% by 2014.

What role do private companies and international cooperation organizations play in the region in terms of renewable energy?

In the process of transforming San Martin into a pioneering region in renewable energy, both the private sector and international cooperation play a vital role. With GIZ, SNV and Practical Action, among others, we have developed the first regional energy policy and the first rural electrification plan that implements renewable energy, which no other region in the country has done. Meanwhile, private companies hope to establish regional sales centers for renewable energy systems, offering services and providers. This is a clear sign that the market for renewable energy is expanding and the technology is

“In 2005 the region had 52% electrification and we are currently at 83%.”

becoming more accessible to the local population.

What have been the results and the response of the population to these technologies?

Contrary to what many think, people accept and adapt quickly to new technologies. This requires technical training to ensure the sustainability of the system's operation in rural areas. A clear example is the Pico Photovoltaic System (Pico PV), which because of its ease and simplicity of operation is quickly adapted to the daily routine of the rural population; the challenge is to expand the market for these technologies and facilitate access to them.

What difficulties are there in the field, whether logistical, geographical, regulatory...?

There are many obstacles on the regional level. The main one is the low budget allocation for the formulation and implementation of projects, which is much lower for pilot projects. At the policy level there are still many gaps to be filled, for example pre-electrification photovoltaic systems are not yet covered by public policy, which prevents the development of these type of projects, although they represent an important alternative for isolated locations that cannot be provided by state providers or ADINELSA. It is also essential to establish rates for biomass-fueled energy generation systems and micro-hydro plants; it is absurd that the rate for a public photovoltaic electrification project is less than one run by a private company. Thus, the private sector cannot compete or be a partner in photovoltaic electrification in rural Peru; only one national NGO has entered into the Electric Social Compensation Fund (FOSE) to serve isolated locations with Solar Home Systems.

Rafael Rengifo –fifth from the left in the last row– next to residents from San Juan del Abiseo during a project using Pico Photovoltaic Systems.

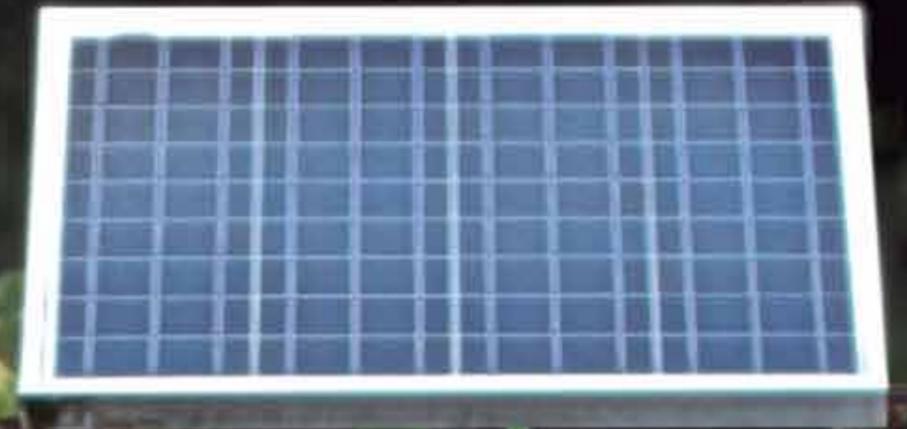
Carlos Bertello



Household Electrification in Peru

This initiative of the organization "ACCIONA Microenergía Peru" now serves thousands of residents and seeks to serve as a management model for the implementation and administration of Solar Home Systems (SHS). Its programs have been successful in the industry and could point to the future role of photovoltaics in rural electrification, in places far from the conventional power grid.

By Julio Eisman, Vice-president ACCIONA Microenergía and by Jessica Olivares, General Manager ACCIONA Microenergía Peru





©ACCIONA Microenergía

Would you like to have lighting in your home? This was the question that marked the beginning of the activities of ACCIONA Microenergía Peru (AMP) and now, after three years and a consolidated management model, guarantees a positive response.

To date, 610 families in isolated rural towns in the Cajamarca region have benefited from the Home Lighting Program, a figure that will increase sharply in the coming months with the financial, technical and managerial support from ACCIONA Microenergía (Spain) and the recent loan approved by the Inter-American Development Bank (IDB). The investment will end 2013 and provide for more than 3,000 families.

Thus, about 12,500 people who, until recently, had not expected to have electricity in their homes, now will have access to clean and safe lighting and be able to use radio and television, as well as charge their cellular phones. This will also have a positive impact on the health, safety and scholastic performance of the children, considering that over 50% of the beneficiaries are children who attend school.

ACCIONA MICROENERGÍA PERU

Since its inception, AMP has understood that the installation of photovoltaic systems is not the most important thing; the primary objective is to provide energy services to people who live in rural settings where the dispersion of housing, weather conditions and lack of infrastructure pose serious challenges. To overcome these circumstances, it is necessary to develop an innovative management

model that involves all stakeholders (municipal, regulatory, community members and AMP), at the heart of which is the Photovoltaic Electrification Committee of each locality. This committee is the link between community members and AMP, and its treasurer is responsible for collecting monthly fees from users and delivering them to the local AMP.

With the paramount objective of promoting economic sustainability, AMP has committed itself to the development of a regulated electrification system for isolated areas through renewable energy. It seemed incomprehensible that the subsidy of the Electrical Social Compensation Fund (FOSE), funded by the biggest consumers to provide a discounted rate to the smallest consumers, could only be granted to users connected to the grid, denying those who have never had access to electricity.

Then, in August 2010, a new photovoltaic energy rate (BT08) was offered by OSINERGMIN and in December 2010 FOSE extended it to all alternative electrification, with a subsidy of up to 80% of the price.

In 2011, AMP joined the state-regulated system, which is operating well. The organization believes that this system is not only an economical option, but implies a commitment on the part of the state to isolated rural communities and creates a framework of rights and responsibilities that empowers citizens and distances them from systems that create dependence.

It is necessary to develop an innovative management model that involves all stakeholders (municipal, regulatory, community members and AMP), at the heart of which is the Photovoltaic Electrification Committee of each locality

THREE YEARS OF SERVICE

It was in January 2009 when the Foundation ACCIONA Microenergía (a corporate entity of the Spanish company ACCIONA) created a nonprofit initiative in Cajamarca, ACCIONA Microenergía Peru. Since then, the organization has faced the common difficulties of a new initiative that navigates uncharted territory with an innovative management model, in a regulatory environment which is underdeveloped, in order to focus its efforts on isolated rural communities where poverty is prevalent and the people lack basic services.

It has been a long journey, but with the satisfaction of having achieved significant milestones such as receiving the Rural Electric System (SER) qualification from the Directorate General of Electricity of the Ministry of Energy and Mines, for each location where AMP was present. AMP also won the first Rural Electrification Award for its photovoltaic systems in Peru, and the regulatory entity, OSINERGMIN, recognized AMP as an energy supplier with access to FOSE.

The model implemented consists of the payment of a fee for a service, in which AMP owns the SHS and loans them for as long as the user needs and wants, provided that they comply with their commitments to both the use and maintenance of the SHS (for which they receive training prior to installation), and punctual payment. In return, AMP ensures the proper functioning of the system, carrying out maintenance and replacing components when necessary.

AMP strives for its users to understand that their

The fee to be paid by each user is 10 Peruvian Nuevos Soles per month, a decrease of 30% in energy costs which, according to a socio-economic study conducted, was spent on alternatives such as candles, kerosene, oil, batteries, etc.

Residents of a town in Cajamarca organize themselves in order to access the Home Lighting Program.

participation and fulfillment of commitments are essential for project sustainability and that payment of the monthly fee, as well as the contribution of FOSE, serve to ensure the effectiveness of their systems and does not involve AMP profit (for it is a non-profit association), but a guarantee of continuous electric service.

The fee to be paid by each user is 10 Peruvian Nuevos Soles (about 3.8 dollars) per month, a decrease of 30% in energy costs which, according to a socioeconomic study conducted, was spent on alternatives such as candles, kerosene, oil, batteries, etc.

After nearly two years of operation, the treasurers were surveyed and claimed to be satisfied with the attitudes of the users in 100% of cases. The low default rate, less than 1% at the end of 2011, is also indicative of how well the program has been accepted.

LOOKING TOWARDS THE FUTURE

AMP is constantly identifying improvements to be made to overcome the difficulties which arise. It seeks to create regulatory improvements, train local technicians, incorporate energy storage technologies and lighting that is more efficient and environmentally sustainable, as well as give the option of paying the monthly fee by cell phone.

Above all, the organization is thinking about how to reach those 350,000 households, which, according to the Republic of Peru's Master Plan for Rural Electrification through Renewable Energy, do not have access to electric grids.

©ACCIONA Microenergía





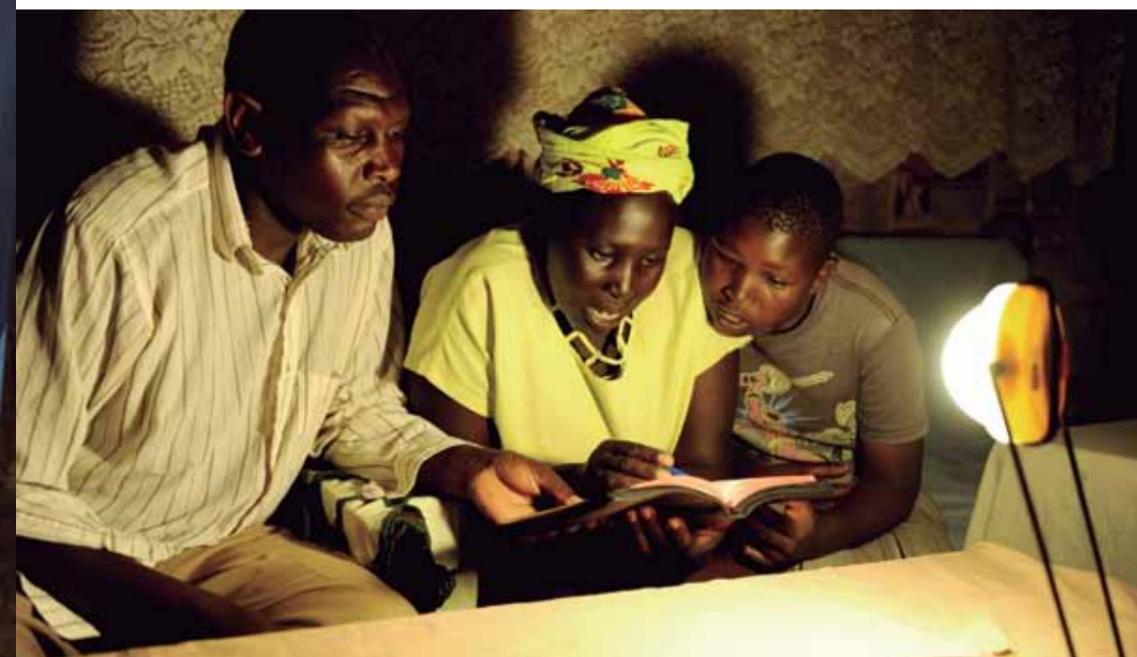
Interview with Benedicte Walter, Communications Officer of Lighting Africa

Lighting Africa

From Nairobi, Kenya, Benedicte tells us about the challenge of promoting alternative solutions to provide light to millions of people that still lack access to electricity in Africa.

By promoting a wide range of products, this initiative seeks to stimulate the market for clean lighting technologies.

By Carlos Bertello, Communications Officer, Energising Development Project / GIZ – Peru



©Andres Bifani / Lighting Africa / 2012

When was Lighting Africa created and what is its main objective?

The program was created in 2007 by the World Bank and the International Finance Corporation (IFC), with the goal of stimulating the market for clean lighting products for locations that lie outside of the conventional electric network. This means addressing the reality of almost 600 million people in Africa, families that are currently using kerosene lights, candles or battery operated lamps, which are expensive and inefficient products, and in the case of kerosene, pollutants.

We work in the region of sub-Saharan Africa. We started in Ghana and Kenya, but we are now in 9 countries, each with a different type of market and electrification system; we must adapt to the specific

situation of each country. We seek to strengthen the market, keeping in mind our goal of improving quality of life.

So you work with companies that offer products which are beneficial to human development...

We work with several companies that are driving growth in the African market. We also provide assistance to those seeking to enter the market.

What is the percentage of electrification in these countries?

Depends on the country; for example, in Kenya, 77% of the population still does not have access to electricity. Similarly, in Liberia electrification percentage is less than 1%. However, the problem is that people spend money daily on kerosene, candles or batteries. The



way we see it is that there is a market of 600 million people spending their income to illuminate their homes with low quality products. Our goal is to replace these products with appropriate technological alternatives which are also more economical and efficient.

And how have the people responded to these products?

In general there are a whole range of products on the market, but we only work with those that comply with our standards of quality. One can find all kinds of products, which is a problem for the consumer, because people save money to buy something that will provide them with better lighting, but if the product only lasts a month, this acquisition equates to a waste of money. That is why we regularly evaluate our products and present to consumers those which have passed quality testing.

Furthermore, although we promote lighting products, today people need to recharge their mobile phones and those without electricity spend money to do so every week. So now nearly all the lamps we promote also include a charging station for cell phones, batteries and even radios.

So you promote more than one product...

We are currently working with 21 different companies, promoting 40 products that meet our quality standards. These products are shown on our website, but since not everyone has access to the Internet, we promote them through educational campaigns for consumers.

Furthermore, when testing a product, one of the conditions that must be met is a minimum guarantee

of six months. So far these products are mainly from India and China.

This is to say that you hold promotional campaigns for these products...

First, we teach people the benefits of giving up kerosene and switching to economical solar energy sources, to produce clean and safe energy. Second, we present them with quality products, how they work and how resilient they are. We also clear up doubts and campaign on the radio, television and in local newspapers. Overall it is quite comprehensive.

Where can you buy these products? Do you have to go to the cities?

Our goal is to reach even remote areas and create relationships with the locals. To do so, we campaign, show a range of products, and for some of them we work together with microfinance.

In addition, as part of these campaigns, we drive to isolated villages in very rural parts of countries like Kenya and Ghana. We believe that a distribution network concentrated in cities would not have the impact we desire, to reach consumers in the countryside.

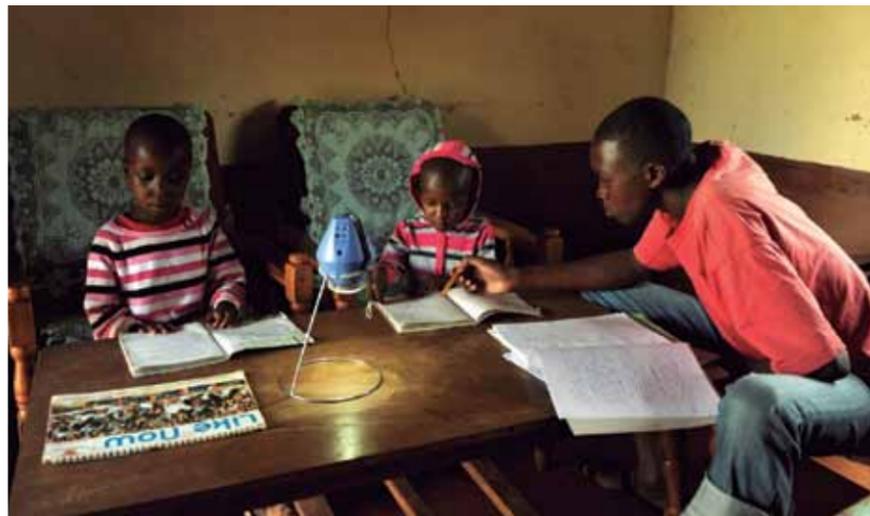
How do prices vary?

The cost varies according to country and depends entirely on the market. When we began, our goal was to offer products for between 20 and 25 dollars and now we promote 5 in this price range. We also have other more expensive products that can even light up a whole house. We continue to test new products, incorporating new ones which meet our quality standards into the program regularly.

Moreover, to reach the most needy, those who are at the "base of the pyramid" (people who earn about two dollars a day), we promote inexpensive products that are designed specifically for their needs.

And what about Lighting Asia?

Indeed we are initiating a similar program in India called "The Lighting Asia-India Program," taking into account that they have a very different market there.



giz Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH



Ministerio holandés de Asuntos
Exteriores



 Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Agencia Suiza para el Desarrollo
y la Cooperación COSUDE

