

# Renewable Energy Jobs & Access

A SERIES OF CASE STUDIES

## Burkina Faso Biomass

### PROJECT PROFILE

FAFASO (“Foyers Améliorés au Faso” i.e., improved stoves in Burkina Faso) is a Dutch-German Energy Partnership Energising Development (GIZ-EnDEV) project that commenced in 2006 and is supported by co-financing from the Dutch Foreign Ministry (DGIS) and the German Ministry of International Cooperation (BMZ).

FAFASO covers all of Burkina Faso, with a focus on the biggest towns, Ouagadougou and Bobo Dioulasso, as well as the South-western and Eastern regions. The project helps to disseminate improved cookstoves (ICS) that save 35–80% of wood or charcoal compared to the traditional three-stone-fire. In 2006–2011, about 180 000 ICS were sold to households, institutions and productive units.

Most of the stoves disseminated are mobile, metal household stoves that are 35–45% more efficient. For poorer households, a mobile ceramic stove is also available and saves 40% fuel.

In addition, FAFASO offers big mobile metal stoves for restaurants and school canteens (saving around 60%) as well as mud stoves for traditional beer brewing (saving about 80%).

The overall objective was to train ICS producers and help them sell the stoves commercially, so that dissemination would continue even in the absence of subsidies.

The project entails marketing (large-scale efforts via TV and radio, small-scale cooking demonstrations, sales events, etc.), introduction of an ICS quality label, and efforts to strengthen the commercial supply chain.

### JOBS AND TRAINING

Two thirds of the overall budget of USD 3.2 million (up to late 2011) has gone into training and marketing efforts; fixed costs for project personnel, etc. account for one third.

A typical training session involves an average of 30 trainees. By the end of 2010, FAFASO had trained a total of 729 people — 285 metal smiths, 264 masons, and 180 potters. The numbers expanded dramatically in 2009, when the project began to train masons and potters. In 2010, when very few potters were trained, the numbers were smaller.

These numbers cannot be considered to constitute new jobs. Rather, the individuals concerned are experienced craftsmen. The training offers them higher qualifications and an opportunity for a sustained role for themselves in the market. Many of the metal smiths and masons do employ apprentices.

Most of the potters are women in rural areas, whose main occupation remains work in the field and the household. But they acquire knowledge that helps them generate additional income (and cope with competition from plastic products). Pottery is caste-bound work dominated by certain families that are unlikely to employ apprentices.

As part of the training, all producers are taught to calculate the prices for the stoves, putting them in a better position in markets.

### SUPPLY CHAIN

#### Upstream Linkages

The stoves are produced domestically, in a decentralised, small-scale fashion. In general, the materials used are indigenous. Previously imported scrap metal is now locally procured, but this does not necessarily indicate increased demand and jobs.





## PROJECT SNAPSHOT

FAFASO is a project that promotes improved cookstoves (ICS) in Burkina Faso, provides training to ICS producers, and offers them help in developing commercial markets for their products.

- » **Technology**  
Improved cookstoves
- » **Employment**  
729 people (potters, masons, metal smiths) trained in 2006-2010

## COUNTRY INFORMATION

- » **Population**  
16.5 million people
- » **GDP/capita**  
USD 536
- » **Electrification rate**  
10% average  
6.3% rural  
25% urban
- » **Access to modern fuels\***  
6.8%

*The data from the case study was provided by FAFASO project staff. Population and GDP data are taken from the World Bank Indicators (<http://data.worldbank.org/indicator/>). Energy access data from United Nations Development Programme and World Health Organization (2009) report, *The Energy Access Situation in Developing Countries: A Review Focusing on the Least Developed Countries and Sub-Saharan Africa*. Photographs were provided by the GIZ/FAFASO team.*

*\* Modern fuels refer to electricity, liquid fuels, and gaseous fuels such as LPG, natural gas and kerosene.*

Although FAFASO has sought to strengthen the commercial chain (bringing together producers and salesmen, installing special shops at central places, etc.), the majority of sales are still made directly at producers' workshops or through close contacts. Nearly all efforts to create new distribution models failed.

## Downstream Benefits

The dissemination of ICS did not generate new downstream businesses. Users like beer brewers and restaurant owners were already in business. However, beer brewers (and, to a lesser degree, restaurant owners) were able to realise higher returns due to savings in fuel expenses, allowing them to send children to school, afford medical fees, etc.

Also, housewives are now able to engage in small professional activities (preparation of cookies, roasting of maize, etc.) thanks to reduced fuel expenses. Among households, fuel savings from ICS use have allowed improvements in diet.

## FINANCING

The official minimum income in Burkina Faso is around USD 70 per month. Based on official statistics, more than half the population has incomes below this level. In Burkina Faso's towns, daily expenditures for fuel are about USD 0.2 per day, a little over USD 6 per month — roughly 10% of the minimum income. ICS can cut this expense by a third.

The following information provides a sense of how quickly fuel savings help pay for the cost of improved stoves:

- » *Metal household stoves* (cost: USD 5.20; lifespan 2 years) offer daily fuel savings of USD 0.21, and are amortised within a month.
- » *Metal stoves for institutional/professional use* (USD 56; lifespan 1.5 to 3 years) offer fuel savings of USD 1 per day.
- » *Ceramic household stoves* (USD 2.10; lifespan 1.5 years) offer daily fuel savings of USD 0.21, and amortise within 10 days.
- » *Mud stoves for beer brewing* (USD 42) offer savings of up to USD 28 per week, and are amortised in less than 2 weeks.

A 2009 impact study indicated that at least half the metal stove producers in the two big towns reported higher incomes.

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## East Africa ❖ Biomass/Solar

### PROJECT PROFILE

The Developing Energy Enterprises Project East Africa (DEEP EA) is a five-year initiative funded by the European Union and the Dutch Ministry of Foreign Affairs (DGIS), supported by several partners including the Global Village Energy Partnership (GVEP).

The project assists the entrepreneurs with the identification of viable energy market opportunities, technology options, and service structures to generate revenue and sustain business. DEEP EA also assists entrepreneurs through training and mentoring to develop business plans, access financing, and enable businesses to grow:

- » Entrepreneurs are taught how to keep basic records for their business, including expenditure, sales, and profit figures. This has helped the entrepreneurs set aside money for savings and reinvestments.
- » The DEEP EA program offers an international loan guarantee fund, enabling entrepreneurs to access loans. Since September 2011, GVEP has worked with six financial institutions across three countries. To date, five DEEP entrepreneurs have received and repaid loans; 47 others are currently being financed.
- » DEEP EA assists entrepreneurs in linking to new markets. Group networking and information sharing sessions bring entrepreneurs, customers, suppliers, and other stakeholders together. Entrepreneurs are able to promote their products to customers, and learn about new products from suppliers.

Challenges remain in that entrepreneurs do not always pay sufficient attention to product standards and quality. They often lack appropriate marketing skills (with regard to recognising market segments and the need for product customisation). There is a strong belief that grant support for their businesses is needed.

### JOBS AND TRAINING

By the end of September 2011, there were 885 entrepreneurs that had received DEEP EA support (310 in Kenya, 308 in Uganda, and 267 in Tanzania). Most entrepreneurs are involved in improved cookstoves (ICS), solar technologies, and briquette-making. ICS and solar technologies have received the bulk of donor funding over the years.

In Kenya, ICS ventures are most prevalent (59.4% of all DEEP EA businesses); in Tanzania, solar technologies (51.3%), and in Uganda, briquettes (40.5%).

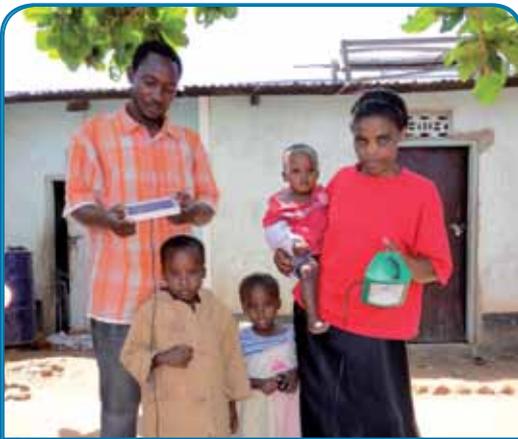
Altogether, females represent 42% of all entrepreneurs. They work mostly in ICS and briquette-making, but only marginally in solar, battery-charging and biogas ventures. Consequently female entrepreneurs are more involved in renewable energy technologies (RETs) that do not need a high level of capital or mobility.

Employment in the DEEP EA enterprises has fluctuated through the course of the program. From a baseline assessment that showed an average of 1.6 employees per enterprise, the most recent year's data indicate an average of 2.4 employees per enterprise.

ICS liner and briquette production are more labour intensive processes. ICS liner production involves preparing the raw materials, mixing, moulding, and firing. Solar phone-charging, on the other hand, requires relatively little labour.

The total number of employees in the three countries has risen (with the exception of Kenya, where a number of enterprises dropped from the project). Available figures do not distinguish between permanent and casual employees.





## PROJECT SNAPSHOT

The Global Village Energy Partnership (GVEP) initiated its Developing Energy Enterprises Project East Africa (DEEP EA) in 2008 to support the development of micro and small-scale energy businesses in Kenya, Uganda, and Tanzania.

- » **Technology**  
Improved cookstoves and solar PV
- » **Employment**  
885 entrepreneurs have received project support

*The data from the case study was provided by the Global Village Energy Partnership. Population and GDP data are from the World Bank Indicators (<http://data.worldbank.org/indicator/>). Energy access data from United Nations Development Programme and World Health Organization (2009) report, *The Energy Access Situation in Developing Countries: A Review Focusing on the Least Developed Countries and Sub-Saharan Africa*. Photographs were provided by GVEP International.*

*\* Modern fuels refer to electricity, liquid fuels, and gaseous fuels such as LPG, natural gas and kerosene.*

Enterprises engaged in briquette and ICS liner production have experienced some fluctuations in employment over time, corresponding to highs and lows in orders, seasonal variations, and other factors.

Among ICS producers, Ugandan enterprises have slightly higher average numbers of employees than Tanzania and Kenya. The difference may be due to the availability of locally skilled labour, wage differentials, or differences in markets for the products.

Casual employment plays an important role in these cases. It affords entrepreneurs flexibility (with regard to salary levels, taxes and other dues, etc.). Often, family members are employed by entrepreneurs.

## SUPPLY CHAIN

### Upstream Linkages

Enterprises that make use of locally sourced materials may be more sustainable than those that depend on remote suppliers. The positive uptake of briquettes in Uganda is encouraged by the relatively low cost of accessing charcoal dust. ICS are produced and sold in all three countries using local resources.

Dissemination of RETs in isolated areas with poor road networks can be challenging. Transportation of products represents additional costs, and entrepreneurs' knowledge of new products may be limited. DEEP EA focuses on a value chain approach to each technology and works with stakeholders along the supply chain. The strengthening of supply chains can help increase an enterprise's chance of survival.

### Downstream Benefits

**ICS:** A complex local value chain means that employment generation spans the whole process from supply of raw materials to production and sales to end users. The GVEP case study profiles one case, Janet Atieno of Keyo Pottery Enterprises in western Kenya, whose business has grown, employing two to six casual employees. She sources the clay and sand for making her liners from local businesses that also benefit from the group's activities.

## COUNTRY INFORMATION

Country	Population (Millions)	GDP/ Capita	Electrification Rate (%)			Modern Fuels Access* (%)
			Average	Rural	Urban	
Kenya	40.5	775	15.0	5.0	51.3	17.3
Uganda	33.4	509	9.0	4.0	42.5	0.4
Tanzania	44.8	527	11.5	2.0	39.0	2.8



**Briquettes:** The supply chain for briquettes is predominantly local. With DEEP EA's help, Jude Kabanda (Uganda) has expanded his sales more than 13-fold since 2008. The acquisition of several briquette machines helped improve the quality and types of briquettes. Four casual employees were added, and another five may be needed. Employees have also started up other enterprises.

**Solar Photovoltaic:** A third GVEP case study, of Tanzanian solar technician and phone-charging entrepreneur Joseph Robert, also indicates a growing business. Two people were hired, and one or two others are casually employed when the need arises, given fluctuations in sales. Finding staff qualified in installation and maintenance of solar systems is a challenge. The installed solar systems have allowed new phone-charging businesses to be set up in the community, providing additional employment.

The cumulative impact of the DEEP EA project is estimated at more than two million beneficiaries of various RETs, the vast majority of which relate to ICS.

## FINANCING

Rural households may not be able to afford large solar home systems; smaller systems may be more suitable, and indeed solar LED lanterns are performing well in the East African market.

Financing represents a major hurdle to the expansion and even the survival of many micro energy enterprises. Most financial institutions are new to the energy sector. Entrepreneurs also lack a good track record of borrowing, some level of collateral and the business plan required to receive financing. GVEP works with entrepreneurs to develop their business plans and has started to link some of the entrepreneurs to financial institutions through a loan guarantee programme.



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A SERIES OF CASE STUDIES

**Gambia** 

## PROJECT PROFILE

NICE International BV, a Netherlands-based initiative of Energy4All Foundation and a member of the Alliance for Rural Electrification (ARE), is promoting solar-powered information, communications and technology (ICT) service centres. These serve people living on less than USD 5 a day in peri-urban and rural areas with either no grid access or very poor grid connection.

Four types of services are made accessible: battery charging, information (access to TV, communication tools, Internet), value-added services (business and banking education) and income generation (online trading, outsourcing).

The project started in 2006 with two pilot centres in Gambia. Five more centres were opened in 2009-2010. Each is operated as a franchise by a local entrepreneur. The franchise and lease arrangement allows local entrepreneurs to run a Centre without having to make a large investment.

With additional funding from several sources, including the EU Energy Facility, the network will be scaled up to a total of 50 centres over the next few years. By 2014, 16 additional locations will be established in Gambia, 20 in Tanzania and 14 in Zambia.

On average, each NICE Centre will be located within easy reach of about 20 000 people. Altogether, the 50 locations will provide access to energy and ICT for up to one million people, providing opportunities for income-generating activities.

The NICE Centres are mostly grid-connected, but in some cases run exclusively on their own solar photovoltaic power and thus are capable of operating in off-grid locations. On average, the solar systems produce 7.5 kWh per day.

## JOBS AND TRAINING

Each NICE Country Organisation employs at least a local managing director, finance manager, technical manager and a service manager. Each Centre is run by a local entrepreneur and employs on average five staff members. The technical and business skills needed to successfully operate a Centre are scarce in developing countries. As such, NICE offers the required capacity-building at a local level. Through the franchising model, the NICE country organisation supports individual centres with training and coaching.

Maintenance and support of the equipment is done by the NICE Country Organisation, backed-up by international suppliers. The franchisees pay a lease fee for the use of the equipment. Technical contractors to the NICE Centres are trained in specific skills in order to effectively support the business.

Further downstream, reliable access to energy is the enabler of development. The NICE Centres are supermarkets for products and services that help people in their personal and economic development (e.g. solar products, IT Education, online healthcare, financial and government services). Their focus is on youth (which represent 50% of users), women (25%), and small entrepreneurs (10%).

Experience to date suggests that, among other impacts, the Centres have helped to

- » increase disposable income.
- » improve the quality of the workforce available for local businesses.
- » improve the quality and competitiveness of local businesses through better ICT skills and networking.





## PROJECT SNAPSHOT

NICE International BV, a member of the Alliance for Rural Electrification (ARE), operates solar-powered information, communications and technology (ICT) service centres in Gambia, with plans to expand to Tanzania and Zambia.

- » **Technology**  
Solar PV
- » **Employment**  
Average of 5 employees/local NICE Centre; at least 4 managers directing country-wide operations

## COUNTRY INFORMATION

- » **Population**  
1.7 million people
- » **GDP/capita**  
USD 467
- » **Electrification rate**  
8.3% average  
2.8% rural  
45.9% urban
- » **Access to modern fuels\***  
4.9%

*The data from the case study was provided by the Alliance for Rural Electrification. Population and GDP data are from the World Bank Indicators (<http://data.worldbank.org/indicator>). Energy access data from United Nations Development Programme and World Health Organization (2009) report, *The Energy Access Situation in Developing Countries: A Review Focusing on the Least Developed Countries and Sub-Saharan Africa*.*

*\* Modern fuels refer to electricity, liquid fuels, and gaseous fuels such as LPG, natural gas and kerosene.*

At the local level, ICT skills are demanded by many employers, but not taught at most schools. Hence those that gain these skills are a major asset to the labour market for youth.

On a regional and national level, ICT services increase access to and quality of education, facilitate and reduce the cost of delivery of information and services by reducing the need for transport to main cities where most basic services are provided.

## FINANCING

NICE centres are set up as local business entities to make them financially sustainable. Through the fees that customers pay on a pay-per-use basis for development services, the centres are able to generate revenues.

The expansion of NICE centres will be financed by franchise fees of the NICE Country Organisations, a subsidy from the European Union (30%), and private investments (such as Rabobank, Schneider Electric).

Experience suggests that the NICE Centres reach a positive cash flow within one year of their establishment and run a profit within three years.

## SUPPLY CHAIN

### Upstream Linkages

The solar systems used by the NICE Centres are advanced systems assembled from components of different suppliers. Solar and ICT equipment are typically purchased internationally.

### Downstream Benefits

Locally, each NICE Centre supports several local businesses, including: internet service providers, technical installation, maintenance and repair, products and services.



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## Sub-Saharan Africa Solar

### PROJECT PROFILE

The Rural Energy Foundation (REF) is a non-profit organisation founded in 2003 based in the Netherlands and a member of the Alliance for Rural Electrification (ARE). In 2010 REF won the EU Sustainable Energy Europe Award and the International Ashden Award.

By strengthening entrepreneurship and the supply chain, REF hopes to increase the use of solar energy in rural Africa. Currently REF carries out operations in nine Sub-Saharan African countries – Burkina Faso, Ethiopia, Ghana, Mali, Mozambique, Senegal, Tanzania, Uganda, and Zambia.

REF started its SolarNow programme in 2007, an initiative to identify and support suitable local retailers and distributors, technicians and sales personnel; training them in solar energy technology, marketing, sales and business administration; and helping them start up and expand businesses selling solar energy products.

Since 2007, REF has sold over 57 000 solar home systems (SHS) (cost: USD 250-630 each) and 36 000 solar lanterns (cost: USD 25-90).

The initial objective was to provide access to affordable solar energy to 110 000 households and small businesses. As of late 2011, the number of people in the program had already reached 492 000 – indicating greater than expected success.

Marketing campaigns, such as village demonstrations, newsletters and radio shows, play a crucial role in stimulating awareness and demand for solar technologies.

### JOBS AND TRAINING

REF seeks to develop a sustainable supply chain, providing employment and income opportunities to local people and increasing their skills. Product quality, reputation, and clients' trust (buffered by after-sales service and warranties) are key to this effort. It has proved more efficient to work with local staff than to rely on regional managers and volunteers (as was initially planned).

Local entrepreneurs who adhere to REF's quality requirements and complete the offered training are allowed to use the SolarNow brand name, and become part of its supply chain.

As of late 2011, there were 200 SolarNow retailers working in the nine African countries. The expansion of local retail networks has created jobs and provided skills-training for about 200 technicians.

There are no fixed prices for the solar products. Local SolarNow retailers are encouraged to study and understand the market and what customers can afford. The capacity of the retail network is constantly being improved through trainings, coaching sessions, and after-sales visits to local retailers.

### SUPPLY CHAIN

#### Upstream Linkages

The photovoltaic modules and charge controllers for the products sold by SolarNow are manufactured in China, the United States, and Europe. But the batteries are often manufactured domestically.

Solar systems are assembled and installed by local technicians trained by REF. A four day training course focuses on technologies, marketing, and sales. REF staffs often visit the technicians on-site, which facilitates problem solving as well as the opportunity to demonstrate new products.





## PROJECT SNAPSHOT

Through its SolarNow program, the Rural Energy Foundation, a non-profit organisation based in the Netherlands and a member of the Alliance for Rural Electrification (ARE), is working to increase the use of solar energy (solar home systems and solar lanterns) in rural Africa. It is currently active in nine countries.

### » Technology

Solar PV

### » Employment

200 retailers in the nine countries. Expansion has provided jobs for about 200 technicians, or 1 per retailer on average

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*\* Modern fuels refer to electricity, liquid fuels, and gaseous fuels such as LPG, natural gas and kerosene.*

## Downstream Benefits

The cost of electricity for local communities decreases significantly with the use of solar technologies. In REF's experience, a SHS system pays for itself in one to three years through savings in kerosene and batteries. REF estimates that an average household saves about 30% on its energy expenses.

These savings mean that less money flows out of the local community and instead can be used for other purposes and income-generating activities.

## FINANCING

Customers pay full price for SHS and solar lanterns, normally in cash. However, the initial investment is still a huge burden for many households. In response, REF developed several financial models to help solve the issue. It started working with microfinance institutions in 2008, providing local retailers and clients with cheaper loan options. Encouraging results of a 2010 pilot with "hire purchase" in Uganda prompted REF to replicate the model in other countries.



## COUNTRY INFORMATION

	Population (Millions)	GDP/Capita (USD)	Electrification Rate (%)			Modern Fuels Access* (%)
			Average	Rural	Urban	
Burkina Faso	16.5	536	10.0	6.3	25.0	6.8
Ethiopia	82.9	358	15.3	2.0	80.0	4.2
Ghana	24.4	1 238	54.0	23.0	85.0	11.1
Mali	15.4	602	17.4	3.7	48.7	0.2
Mozambique	23.4	410	11.7	6.3	21.0	2.7
Senegal	12.4	1 042	42.0	18.0	74.7	41.1
Tanzania	44.8	527	11.5	2.0	39.0	2.8
Uganda	33.4	509	9.0	4.0	42.5	0.4
Zambia	12.9	1 253	18.8	3.3	47.0	15.8

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## Tanzania (A) Solar

### PROJECT PROFILE

Solar Company A, an E+Co portfolio company, installs, maintains solar photovoltaic (PV) systems (20-500 Watts for households; up to 3 000 Watts for health centres) in both rural and urban areas of Tanzania. The company is headquartered in Dar es Salaam, Tanzania's capital with 2.5 million inhabitants. The office serves as the overall hub of operations.

An office in Arusha handles sales and maintenance activities in the northern rural areas of Tanzania. Karatu is one of the five districts in the Arusha Region of Tanzania being served by the company. It has a population of 178 434 (2002 census) out of Arusha's total 1.3 million people.

The company has sold more than 1 000 PV systems since it was established in 2002, and expects 15-20% sales growth in the next five years. About 80% of its business consists of contracts with institutions in rural areas such as health centres and schools, whilst the remainder includes commercial enterprises and households.

Solar PV is experiencing fast growth in Tanzania. This is driven by the difficulties in providing and extending reliable electricity services and the rising demand for power (urban industries and communications). The small diesel generators that are prevalent in remote rural areas are becoming more expensive to run due to increases in fuel costs.

The Tanzanian government has aggressively promoted the reliability, usefulness and safety of solar PV systems. It facilitates a nationwide solar PV awareness campaign on radio and television. These factors have also contributed to the growing demand for solar products in rural areas.

### JOBS AND TRAINING

Company A currently has 14 staff — including four managers, an accountant, a driver, administrative staff/secretaries, three technicians and three sales officers. All employees are Tanzanian nationals.

Salaries range from USD 150-200 per month for Technicians and Sales Officers, and USD 70-100 per month for other staff. Information regarding managers' salaries is not available.

The company has 20 technical contractors and two drivers on call. It provides health insurance to its full time employees, as well as housing and transport allowances and a professional education fund for staff.

The company, along with others in Tanzania, has benefited from numerous technical training programs offered by UNDP/GEF (United Nations Development Programme/Global Environment Facility) and other development aid groups. These training programs have created a well-trained pool of technicians available to meet the demands of growing solar companies.

Solar battery recycling remains a challenge in Tanzania. Some outlets sell used batteries, but a reliable recycling infrastructure remains to be built. This could become the source of additional jobs.

### SUPPLY CHAIN

#### Upstream Linkages

The company imports its inventory from manufacturers and distributors in the United States, China, India and Germany. The products imported include: solar panels, solar batteries, regulators, inverters and solar lights.





## PROJECT SNAPSHOT

Solar Company A sells, installs and maintains solar photovoltaic systems in the capital of Dar es Salaam and rural areas around Arusha. Among its customers are households, institutions, and businesses.

- » **Technology**  
Solar PV
- » **Employment**  
14 employees; 20 technical contractors and 2 drivers

## COUNTRY INFORMATION

- » **Population**  
44.8 million people
- » **GDP/capita**  
USD 527
- » **Electrification rate**  
11.5% average  
2% rural  
39% urban
- » **Access to modern fuels\***  
2.8%

*The data from the case study was provided by E+Co. Population and GDP data are from the World Bank Indicators (<http://data.worldbank.org/indicator/>). Energy access data from United Nations Development Programme and World Health Organization (2009) Report, *The Energy Access Situation in Developing Countries: A Review Focusing on the Least Developed Countries and Sub-Saharan Africa*.*

*\* Modern fuels refer to electricity, liquid fuels, and gaseous fuels such as LPG, natural gas and kerosene..*

African Energy, a U.S.-based distributor, supplies over 80% of the company's inventory. The company sources its DC lights from Phocos in Germany and solar lanterns from D.Light (India and China). The company itself does not produce equipment, but adds value by installing solar PV systems and training customers to maintain these systems.

## Downstream Benefits

The most typical type of business created with the help of small-scale solar PV systems are barber/hair cutting shops; mobile charging stations; and small enterprises such as inns and bars. PV systems used for lighting also help rural entrepreneurs extend service hours. This increases the flow of income to business owners and improves services to the customers. The cost of a 135 Watt PV system used for a mobile phone-charging business can be earned back within seven months or less.

A rural family in Africa uses about 60 litres of kerosene a year—the second-largest expenditure after food. PV systems allow substantial savings of kerosene, candles, or wood and offer considerable health benefits.

## FINANCING

The company secured debt financing from E+Co to procure its inventory in 2006 and in 2011. This allowed the company both to compete for larger government tenders and to purchase and install the products before payment was received.

The company sells to small clients paying cash, as well as to larger institutional clients on a contract basis. This multi-customer approach allows the enterprise to diversify its product offerings and revenue sources, and therefore to mitigate risks.

For future growth, the company will identify microfinance partners to facilitate credit sales. It will pilot its first credit project in early 2012.



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# Renewable Energy Jobs & Access

A SERIES OF CASE STUDIES

## Tanzania (B) Solar

### PROJECT PROFILE

Solar Company B, an E+Co portfolio company, installs, maintains solar home systems (SHS; 14-80 Watts) for residential (40% of sales) and institutional customers (60%). It is headquartered in Mbinga, a peri-urban town in the Ruvuma region in southwestern Tanzania which is home to about 1.1 million people. The company estimates that 10% of households in the region can afford a SHS.

The company has sold close to 300 photovoltaic (PV) systems since it was established in 2006, and expects 10-15% sales growth in the next five years.

Solar PV is experiencing fast growth in Tanzania. This is driven by the difficulties in providing and extending reliable electricity services and the rising demand for power (urban industries and communications). The small diesel generators that are prevalent in remote rural areas are becoming more expensive to run due to increases in fuel costs.

The Tanzanian government has aggressively promoted the reliability, usefulness and safety of solar PV systems. It facilitates a solar PV awareness campaign via radio and TV. These factors have also contributed to the growing demand for solar products in rural areas.

### JOBS AND TRAINING

Company B currently has nine employees — including one manager, two technicians/shopkeepers, one part-time support staff, and five sales representatives. Only one staff member, a technician/shopkeeper, is female.

Salaries for technicians range from USD 100-150 per month. Support staff earns USD 50-70. Salaries for the manager and sales representatives are not available. The company does not provide health insurance.

Technical training programs offered by development aid agencies have created a well-trained pool of technicians for solar companies. The company's sales technicians were trained by a SIDA/MEM (Swedish International Development Agency/The Ministry of Energy and Minerals) program and a wholesaler.

Solar battery recycling remains a challenge in Tanzania. Some outlets sell used batteries, but a reliable recycling infrastructure remains to be built. This could become the source of additional jobs.

### SUPPLY CHAIN

#### Upstream Linkages

There are six large wholesalers of solar PV panels and accessories in Dar es Salaam: Solatek, Chloride Exide, BP Solar, Rex Investments, Zara Solar and Umeme Jua Limited (UJL). UJL supplies the company with complete systems of the following brands: Free Energy Europe, GE Energy and Steca (complete with a ten year manufacturer's guarantee). Batteries are purchased from Chloride Exide and Victron (one and three year warrantees, respectively). Sundaya, an Indonesia company, is the supplier of solar lights. Rex Investment and Zara Solar specialises in solar PV panels and accessories for 50 Watt peak and higher capacities, which are obtained from NAPs, GE Energy and Steca.

Given that all equipment is manufactured abroad, the economic benefit to Tanzania is limited to the wholesaling mark-up, as well as local retailing and installations.





## PROJECT SNAPSHOT

Solar Company B sells and installs solar home systems in southwestern Tanzania, bordering Mozambique. Access to electricity in the Ruvuma region is currently limited to 2% of the population.

- » **Technology**  
Solar PV
- » **Employment**  
9 employees

## COUNTRY INFORMATION

- » **Population**  
44.8 million people
- » **GDP/capita**  
USD 527
- » **Electrification rate**  
11.5% average  
2% rural  
39% urban
- » **Access to modern fuels\***  
2.8%

*The data from the case study was provided by E+Co. Population and GDP data are from the World Bank Indicators (<http://data.worldbank.org/indicator/>). Energy access data from United Nations Development Programme and World Health Organization (2009) report, *The Energy Access Situation in Developing Countries: A Review Focusing on the Least Developed Countries and Sub-Saharan Africa*.*

*\* Modern fuels refer to electricity, liquid fuels, and gaseous fuels such as LPG, natural gas and kerosene..*

## Downstream Benefits

The most typical type of business created with the help of small-scale solar PV systems are barber/hair cutting shops (four new shops resulted from PV systems sold by Company B); mobile charging stations; and small enterprises such as inns and bars. PV systems used for lighting also help rural entrepreneurs extend service hours and thus an increased flow of income.

A rural family in Africa uses about 60 litres of kerosene a year, the second-largest expenditure after food. PV systems allow substantial savings of kerosene, candles, or wood and offer substantial health benefits. Patients at rural health clinics benefit from improved quality of services (e.g. night deliveries of babies; refrigeration of medicines).

## FINANCING

In 2007, E+Co provided a USD 50 000 loan to the company to purchase its inventory. The company was unable to secure local financing.

The company sells on a cash basis to residential and institutional customers. Sales are made directly to customers through a shop. Retail prices range from USD 225 to USD 650 for household SHS, and USD 1 400 for institutional systems.

Partnership with a local microfinance institution and building a track record of government contracts would be required to scale up the company's household market.



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# Renewable Energy Jobs & Access

A SERIES OF CASE STUDIES

Laos Solar

## PROJECT PROFILE

Sunlabob, a private Laotian company licensed in 2001 and a member of the Alliance for Rural Electrification (ARE), provides commercially-viable energy services for remote off-grid areas. Since 2008, Sunlabob also conducts energy audits and efficiency consulting, and supplies and installs energy-efficient materials.

Solar lanterns often fail much earlier than expected, either because low-quality components are used to keep overall costs down, or because batteries are misused or irregularly charged by users. As a result, kerosene lamps continue to dominate the off-grid lighting market.

To overcome these problems, Sunlabob has developed an innovative solution to provide access to electricity. Its award-winning Solar Lantern Rental System (SLRS) is based on a fee-for-service concept, under which end users purchase a service rather than the equipment itself. The model also aims to create opportunities for micro-enterprise formation.

Systems consist of a solar charging station operated by a village entrepreneur and a number of lanterns, typically in the range of 20 to 50 that are communally owned. A 50-lantern charging station is comprised of a 120 Watt peak (Wp) photovoltaic (PV) panel, a 100 Ampere hours (Ah) battery, a charge controller, and a set of charging cables.

It takes about half a day to install the system, an additional day is required for accounting and technical training, and a lamp is charged in about 2-2.5 hours.

Households pay a small fee for a fully charged solar lantern. When the battery is depleted, a customer exchanges it for a fully charged one. Use of a solar lantern offers a 75% reduction in a typical household's lighting bill. The lanterns provide better quality and safer lighting than kerosene lamps and also offer the capacity to charge mobile phones.

## JOBS AND TRAINING

New workplaces are created for people to operate and oversee the system. A village technician/entrepreneur is responsible for operating the charging station. A village energy committee, consisting of 3-4 people, is selected to oversee system operations, and manage the maintenance fund and general financing. It receives a small amount of income for its activities.

Technical and entrepreneurial capacity-building are incorporated into the installation process. Sunlabob provides technical and accounting training. Proper training and follow-up visits after installation are critical to guard against misuse of the system that can shorten its lifespan, and ensure that maintenance funds and spare parts are properly tracked. Experience suggests that in some cases, the village technician and the village energy committee need to receive additional training.

## SUPPLY CHAIN

### Upstream Linkages

Sunlabob sources all components locally. However, more sophisticated items are imported from abroad. Still, even for the imported components, some pre-assembly is done in Laos. Once the system is installed, it is managed locally.

### Downstream Benefits

The SLRS project creates jobs, generates income opportunities, and enables better conditions for micro enterprises in off-grid communities with the help of improved lighting.





## PROJECT SNAPSHOT

Sunlabob, a private commercial company and a member of the Alliance for Rural Electrification (ARE), has developed the Solar Lantern Rental System (SLRS), an innovative model under which end-users purchase a service rather than equipment.

- » **Technology**  
Solar PV
- » **Employment**  
1 technician/entrepreneur per village, plus 3-4 persons in village committee overseeing operations

## COUNTRY INFORMATION

- » **Population**  
6.2 million people
- » **GDP/capita**  
USD 1177
- » **Electrification rate**  
55% average  
42% rural  
84% urban
- » **Access to modern fuels\***  
2.6%

*The data from the case study was provided by the Alliance for Rural Electrification. Population and GDP data are from the World Bank Indicators (<http://data.worldbank.org/indicator>). Energy access data from United Nations Development Programme and World Health Organization (2009) report, *The Energy Access Situation in Developing Countries: A Review Focusing on the Least Developed Countries and Sub-Saharan Africa*. Photographs were provided by the Sunlabob team.*

*\* Modern fuels refer to electricity, liquid fuels, and gaseous fuels such as LPG, natural gas and kerosene.*

Access to electricity allows engaging in several activities previously not possible, such as reading and doing homework at night, making handicrafts, using a mobile phone, and having access to information and communication.

Local people benefit from reduced energy bills, significantly lowering the financial burden on households. The revenue generated by the system is kept within the community, providing income for the village entrepreneur and system maintenance, and hence strengthening local economies.

## FINANCING

Hardware and system installation are sponsored by a donor organisation. A village energy committee oversees the operations of each system and the management of the maintenance fund. Villagers are freed from high up-front capital costs—a key obstacle for many rural communities in the developing world.

A village technician is responsible for collecting fees from households renting lanterns, and is also in charge of running the micro-enterprise associated with the system. A share of the fee is transferred to the maintenance fund for future replacement of components, such as batteries, and other maintenance needs.



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# Renewable Energy Jobs & Access

A SERIES OF CASE STUDIES

## Nepal Hydro/Solar/Biomass

### PROJECT PROFILE

Renewable Energy for Rural Livelihood (RERL) is a joint program of UNDP and the World Bank with the Government of Nepal. It was initiated in April 2011 upon conclusion of the Rural Energy Development Programme (REDP), started in 1996.

The main objective is to increase equitable access to energy services for the poor, women, and socially excluded groups. RERL is primarily promoting micro-hydro plants (MHPs; 10-100 kilowatt (kW)), as well as solar home systems (10-30 Watt peak), biogas (4-6 m<sup>3</sup>) and improved cookstoves.

To date, close to 58 000 households with 350 000 people have derived energy access benefits, in the form of lighting, refrigeration, communications, operating irrigation pumps and running a variety of rural businesses.

REDP/RERL works with multiple community and private sector partners in tandem at various levels (community, district, national). There is a strong focus on decentralised planning and implementation.

### JOBS AND TRAINING

As of late 2011, 555 micro-enterprises had been established in REDP/RERL program areas. Of these, 323 are MHPs that were completed and put into operation since 1998. The number of new plants completed per year has fluctuated considerably since 1998, from as few as five in 2006 to as many as 75 during the following year. A typical MHP requires two persons to operate.

The total man-days required to run the growing number of MHPs has expanded from 8 760 in 1998 to 225 570 in 2010 and 117 895 during the first half of 2011. Figure 1 expresses this information in terms of full-time equivalent (FTE) employment — rising from 24 FTE jobs in 1998 to 618 in 2010. For the first half of 2011, the number is 323 jobs.

Capacity development has been a priority. It has included training for staff and community representatives on how to operate and manage MHPs and other renewable energy technologies; establishment of Rural Energy Service Centres (RESCs); income generating and environmental related activities; institutional development; book-keeping; and decentralised planning. Priority is accorded to women, dalits, ethnic groups, and the poorest of poor.

So far, a total of 34 050 people, including 15 000 women, have received training. Some 2 596 people have been trained on the technical aspects of MHP operations.

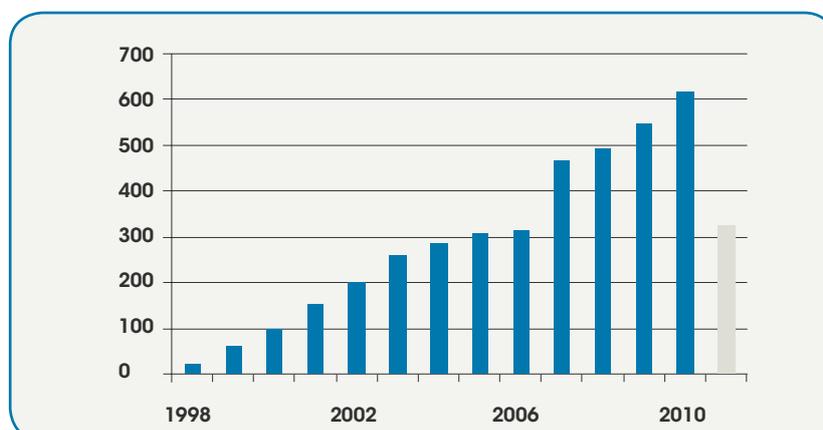


Figure 1. Direct MHP Employment, 1998-2011\* [\* = first 6 months in 2011]





## PROJECT SNAPSHOT

The Renewable Energy for Rural Livelihood (RERL) succeeded the Rural Energy Development Programme (REDP). The program primarily promotes micro-hydro schemes in rural Nepal. It emphasises equitable energy access and social inclusion.

- » **Technology**  
Hydropower, solar PV, improved cookstoves
- » **Employment**  
323 micro-hydro plants (MHP) put in operation since 1998; 2 persons to operate an MHP

## COUNTRY INFORMATION

- » **Population**  
30 million people
- » **GDP/capita**  
USD 438
- » **Electrification rate**  
43.6% average  
34% rural  
89.7% urban
- » **Access to modern fuels\***  
16.2%

*The data from the case study was provided by project staff at the Renewable Energy for Rural Livelihood (RERL) program. Population and GDP data are from the World Bank Indicators (<http://data.worldbank.org/indicator/>). Energy access data from United Nations Development Programme and World Health Organization (2009) report, *The Energy Access Situation in Developing Countries: A Review Focusing on the Least Developed Countries and Sub-Saharan Africa*. Photographs were provided by the REDP/RERL team.*

*\* Modern fuels refer to electricity, liquid fuels, and gaseous fuels such as LPG, natural gas and kerosene.*

## SUPPLY CHAIN

### Upstream Linkages

The Programme puts strong emphasis on enterprise development and especially its contribution to community development. This is done through the Enterprise Development Fund (EDF). Each Micro Hydro Functional Group (MHFG) receives assistance to create an enterprise fund to provide loans to needy villagers at convenient terms.

### Downstream Benefits

All households equally contribute to, own, and benefit from local MHPs (electricity and revenue). Communities have instituted mechanisms to help poor households gain access to electricity:

- » Poor households unable to contribute cash or raise collateral for a bank loan are allowed to contribute in kind and labour.
- » Those unable to pay the electricity tariff in cash are allowed to contribute through canal cleaning and/or repairing.

In RERL-supported communities, 100% of Dalit, Janajati and ethnic/religious minorities are connected to energy services. A quarter of all energy enterprises are owned by these groups and 41% are owned by female entrepreneurs.

## FINANCING

RERL provides grants in support of local energy projects. Project funds are channelled via a District Energy Fund, which in turn channels funds to Community Energy Funds (CEF). CEFs are established by each MHFG and by Micro Hydro Cooperatives to receive funds and to collect revenues from local households and businesses that use energy from RERL-supported projects.

RERL makes an initial contribution of 10 000 Nepalese Rupees (USD 125) per kW (up to a maximum of 250 000 Rupees, or USD 3 125) to each MHFG for creating the enterprise fund. Priority is given to poor households to obtain loans to carry out income generating activities or create micro-enterprises.

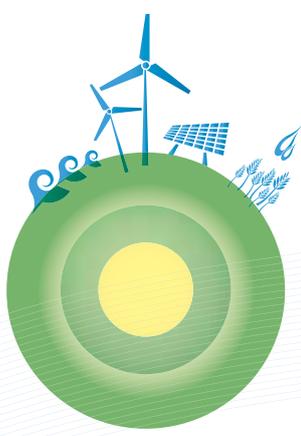


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# Renewable Energy Jobs & Access

A SERIES OF CASE STUDIES

## Central America

### PROJECT PROFILE

Solar Company B, an E+Co portfolio company, was established in 1998. It has 17 branches in Nicaragua, entered El Salvador in 2009, Panama in 2010, and is expanding to Honduras and Guatemala in 2011 and 2012.

It has a strong distribution network, and relies on a computerised accounting system that keeps track of branch sales and inventory. Its business model has won several awards. The company has so far installed more than 50 000 photovoltaic (PV) systems (14-100 Watt) that provide electricity to about 300 000 people. It plans to sell 40 000 systems in the next five years.

In addition, it sells solar water pumps, solar water heaters, and other solar-powered equipment and energy-efficient appliances. Solar water pumps provide 815 people (163 households) with access to water.

In Nicaragua, the company participated in the Government-World Bank PERZA (Programa de Electrificación Rural en Zonas Aisladas) programme that offered subsidies and micro-financing for PV systems. The four year programme, which ended in 2009, also allowed the firm to act as a micro-credit financier, alongside a USD 200 000 credit line from the Inter-American Development Bank (IADB).

In El Salvador, the company is working with the government's FOMILENIO (Fondo del Milenio) Programme. In Panama, it won a concession under with the government's Rural Electrification Office (IADB-supported).

The company set up a battery collection program in Nicaragua, unlike most other solar companies in the country.

### JOBS AND TRAINING

As of late 2011, the company employed 98 people in Nicaragua, El Salvador and Panama, and expects to add 12-15 positions as it expands. There are additional indirect jobs among installers and electricians in the field.

The company enhances skills and capacity among several groups of people:

- » Its technical staff is trained at a laboratory in Managua, including the staff from rural branches.
- » The company encourages its managers to attend courses that will result in better operations control (for example, training provided by E+Co and World Resources Institute's New Ventures is aimed at improving resource management and monitoring).
- » End users receive basic instructions to learn how their systems work.

### SUPPLY CHAIN

#### Upstream Linkages

There is no local sourcing of PV equipment or components and therefore no domestic supply chain. The company imports its entire inventory. It works with a number of Spanish, German, U.S., Japanese and Chinese manufacturers and suppliers, including Isofoton, Solarworld, Komaes, Sony, Phocos, Black & Decker, Morningstar, Alari, Magnum, Motorola, Picana, DEKA, Synthesis Power and Trojan.

#### Downstream Benefits

The installed PV systems assist with income generating activities in local communities. This includes opening small businesses such as mobile phone-charging facilities and small shops known as "pulperias". Access to electricity allows easy refrigeration of goods, and store lighting, leading to longer operating hours. Solar company B also sells refrigerators that have been adapted to work with the PV systems it sells.





## PROJECT SNAPSHOT

Solar Company B is based in Nicaragua. It also operates in El Salvador and Panama and is expanding into Honduras and Guatemala. It sells and installs solar energy products, mostly solar PV equipment.

- » **Technology**  
Solar PV, solar water pumps, solar water heaters, solar appliances
- » **Employment**  
98 employees, plus installers and technicians in the field

## COUNTRY INFORMATION

- » **Population (million people)**  
5.8 (Nicaragua); 6.2 (El Salvador); 3.5 (Panama)
- » **GDP/capita (USD)**  
1 132 (Nicaragua); 3 426 (El Salvador); 7 589 (Panama)
- » **Electrification rate (% average; rural; urban)**  
72.1; 42; 95 (Nicaragua); 86.4; 70; 97.1 (El Salvador); 88.1; 72; 94 (Panama)
- » **Access to modern fuels\* (%)**  
41.7 (Nicaragua); 73.7 (El Salvador); 81 (Panama)

*The data from the case study was provided by E+Co. Population and GDP data are from the World Bank Indicators (<http://data.worldbank.org/indicator/>). Energy access data from United Nations Development Programme and World Health Organization (2009) report, *The Energy Access Situation in Developing Countries: A Review Focusing on the Least Developed Countries and Sub-Saharan Africa*.*

*\* Modern fuels refer to electricity, liquid fuels, and gaseous fuels such as LPG, natural gas and kerosene.*

Households incur savings by not having to buy kerosene, candles or wood, allowing them to spend incomes on other goods or services. Since 2003, the company has reported kerosene savings of 10.3 million litres among users of its products (an average household uses about 20 litres per month).

By gaining access to clean energy, family members are no longer exposed to dangerous indoor fumes that compromise their health. Better health is likely to translate into greater ability to pursue income-generating activities.

## FINANCING

Since 2003, E+Co has invested USD 1.8 million in the company to support its growth.

PV buyers in Central America have so far depended on government/donor assistance. However, there is the capacity for end-user finance (via micro-credit; agricultural cooperatives).



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# Renewable Energy Jobs & Access

A SERIES OF CASE STUDIES

## Guatemala Hydro

### PROJECT PROFILE

Hydro Company B, a Guatemalan private company, upgraded and revitalised an existing 400 kilowatt (kW) plant to 1.1 MW. It is located in the municipality of El Rodeo (36 000 inhabitants) in the Department of San Marcos (total population of about 800 000). The project will generate approximately 5.7 million kilowatt hours (kWh) per year.

Hydro Company B is planning to undertake feasibility studies for additional hydro projects in Guatemala.

Guatemala's state-owned utility INDE (Instituto Nacional de Electrificación) has promoted the connection of isolated small hydro plants into the national grid. The Ministry of Energy and Mines has also promoted a series of private sector incentives for renewable energy development, including exemptions from income tax, machinery import tax, as well as freeing carbon credits from taxation. These policies created an enabling environment for the development of hydropower in Guatemala.

### JOBS AND TRAINING

The total workforce at the hydropower plant comprises 14 persons. All are Guatemalan nationals and thus their salaries directly benefit the local economy. This comprises one manager, three engineers, and ten operator/administrative/support staff.

The project manager is a professional engineer and project developer. His technical team includes civil and electrical engineers with experience in building and operating hydroelectric projects. The remaining staff received on-the-job training from the manager and engineers.

Support staff and operators earn USD 200-300 per month, with a higher rate for operators than for administrative staff. No salary information is available for the manager and engineers. However, an estimate for the engineers is that earnings are 15-20% higher than those of operators.

In 2008-2009, 96 workers were hired from the community when the plant was constructed. These were temporary jobs, however, and employment ended when the plant was completed.

The company does not provide formal medical insurance. However, it does pay for employees' medical treatments as the need arises. The company provides 21 days of paid vacation and three paid sick days per year to full time employees.

### SUPPLY CHAIN

#### Upstream Linkages

The company bought the turbine and other electromechanical equipment from an Italian-owned company manufacturing in Guatemala. The total value was more than USD 800 000. Construction materials for the initial infrastructure for the facility (including wood, steel, cement, etc.) were purchased locally.

#### Downstream Benefits

A local coffee farm is the major business customer for the hydro plant. This represents an upgrade of energy supplies for the coffee farm, rather than supplying additional amount of energy. Therefore, no additional economic activity has resulted.

Because it is virtually impossible to trace the point of power generation origin to the specific households that use grid-electricity, only generic observations are possible with regard to any community downstream linkages beyond the coffee farm. However, with a more reliable supply of energy, shopkeepers are able to operate their businesses





## PROJECT SNAPSHOT

The project in southern Guatemala expanded the capacity of an existing run-of-the-river hydroelectric plant to 1.1 MW. The facility, located in the municipality of El Rodeo, is connected to the Guatemalan national power grid.

- » **Technology**  
Hydropower
- » **Employment**  
14 persons total workforce; 96 laborers during plant construction

## COUNTRY INFORMATION

- » **Population**  
14.4 million people
- » **GDP/capita**  
USD 2 862
- » **Electrification rate**  
80.5% average  
68% rural  
93.7% urban
- » **Access to modern fuels\***  
45.2%

*The data from the case study was provided by E+Co. Population and GDP data are from the World Bank Indicators (<http://data.worldbank.org/indicator/>). Energy access data from United Nations Development Programme and World Health Organization (2009) report, *The Energy Access Situation in Developing Countries: A Review Focusing on the Least Developed Countries and Sub-Saharan Africa*.*

*\* Modern fuels refer to electricity, liquid fuels, and gaseous fuels such as LPG, natural gas and kerosene.*

past dark. This includes small snack shops, restaurants, or bars, as well as micro-enterprises like barber shops and tailors.

Among local households, better access to energy improves the quality of life and allows children to read and study longer. Reduced use of kerosene, candles and batteries saves families money, which can be spent to greater benefit the local economy.

## FINANCING

Total project cost was USD 1.54 million. E+Co provided a loan of USD 1.1 million to fund 72% of the total cost. The remaining 28% of the investment cost (USD 437 650) was covered by the company itself, which also invested USD 286 000 for feasibility studies.

The project has a cost of USD 1 398 per installed kW, a rate judged to be competitive for Central America.

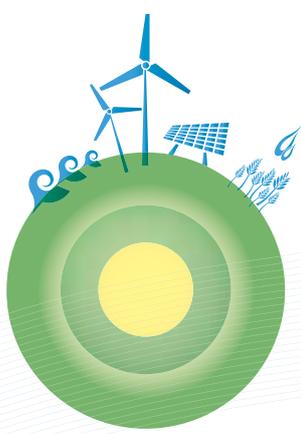


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# Renewable Energy Jobs & Access

A SERIES OF CASE STUDIES

## Honduras

### PROJECT PROFILE

Hydro Company A, a Honduran E+Co portfolio company, developed a 13.5 megawatt (MW) run-of-the-river hydroelectric project in a rural town in the Department of Intibucá in western Honduras (with a population of about 45 000), close to the border with El Salvador. The project entails a cascade of three powerhouses on the Intibucá River. The hydroelectric plant was constructed on the site of an abandoned earlier facility in 2004-2008. In phases, the capacity was increased from 1.4 to 13.5 MW.

Electricity generated by the plant is fed into the national grid, which supplies an estimated 11 000 people in the local community with power. In addition, two local communities are grid-connected as a result of this project, allowing an additional 1 200 people to use electricity for lighting instead of relying on candles, kerosene and batteries.

### JOBS AND TRAINING

The total workforce at the hydropower plant comprises 83 persons, including seven technicians and 62 workers/labourers. Workers and administrative staff earn USD 250-350 per month; the technicians earn 25-30% more than labourers. The company does not make manager income data available.

In 2004-2008, more than 100 workers were hired from the community when the plant was constructed. These were temporary jobs, however, and employment ended when the plant was completed. Now, specialised contractors are hired as needed for tasks such as building construction, turbine installation, or pipe layout. Management consists of trained and experienced engineers. The managers have trained maintenance and nursery labourers to perform their jobs.

### SUPPLY CHAIN

#### Upstream Linkages

The company bought the main technology components, the Pelton turbines, from an international supplier. But construction materials were sourced in Honduras and thus provided employment locally along with the direct (but temporary) construction jobs. No data are available to quantify the impact on the supply chain.

#### Downstream Benefits

Because it is virtually impossible to trace the point of power generation origin to the specific households that use grid-electricity, only generic observations are possible with regard to downstream linkages. However, with a more reliable supply of energy, shopkeepers in Intibucá are able to operate their businesses past dark. This includes small snack shops, restaurants, or bars, as well as micro-enterprises like barber shops and tailors.

Among local households, better access to energy improves the quality of life and allows children to read and study longer. Reduced use of kerosene, candles and batteries saves families money, which can be spent to greater benefit of the local economy.

The hydropower project has also helped improve local road conditions, which may be assumed to be of overall economic benefit to the community.

Finally, the company offers a micro-credit program to its employees, which has helped generate additional local economic demand.





## PROJECT SNAPSHOT

The project is a commercial 13.5 MW run-of-the-river hydroelectric project on the Intibucá River. It is connected to the Honduran national grid and helps ease frequent blackouts in the country. Two local communities are newly grid-connected.

- » **Technology**  
Hydropower
- » **Employment**  
83-person workforce; more than 100 temporary workers during construction

## COUNTRY INFORMATION

- » **Population**  
7.6 million people
- » **GDP/capita**  
USD 2 026
- » **Electrification rate**  
70.3% average  
45% rural  
97.9% urban
- » **Access to modern fuels\***  
45.2%

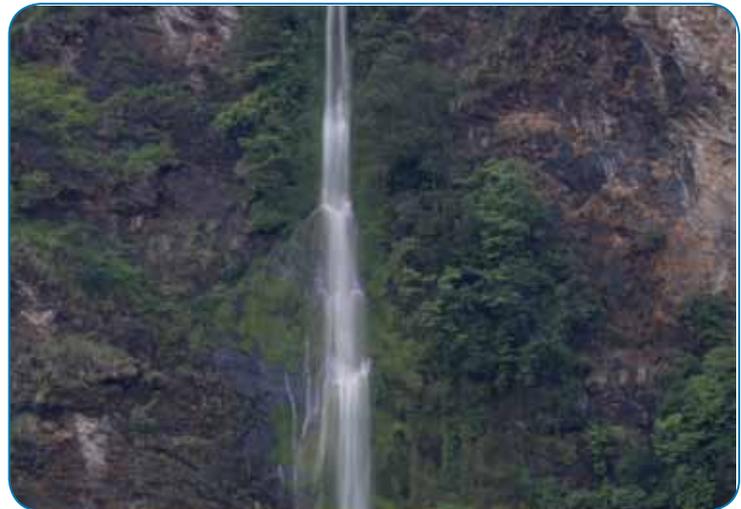
*The data from the case study was provided by E+Co. Population and GDP data are from the World Bank Indicators (<http://data.worldbank.org/indicator/>). Energy access data from United Nations Development Programme and World Health Organization (2009) report, *The Energy Access Situation in Developing Countries: A Review Focusing on the Least Developed Countries and Sub-Saharan Africa*.*

*\* Modern fuels refer to electricity, liquid fuels, and gaseous fuels such as LPG, natural gas and kerosene.*

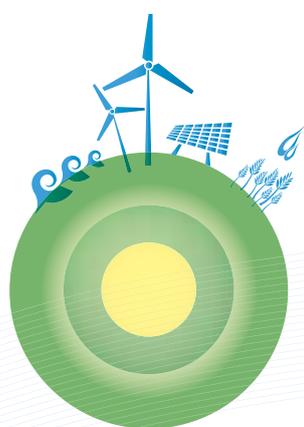
## FINANCING

Total project cost was USD 16.5 million. It attracted finance from local banks and international development finance institutions, and played a crucial role in demonstrating more broadly to local banks the investment opportunity in the hydro sector. E+Co made debt and equity investments of USD 1.35 million.

The Company signed an agreement to sell carbon-offset credits generated by the hydro plant. The project is one of few privately owned projects to successfully do so. This has helped to increase the company's net cash flow.



The Policy Advice and Capacity Building Directorate (PACB) welcomes your comments and feedback at [pcb@irena.org](mailto:pcb@irena.org). These local case studies were prepared by IRENA in cooperation with the organisations described. They intend to explore the employment dimension of renewable energy development and deployment in rural areas in the developing world. For a more detailed version of this case study, please see IRENA (2012), *Renewable Energy Jobs and Access*, which is available at: [http://www.irena.org/DocumentDownloads/Publications/Renewable\\_Energy\\_Jobs\\_and\\_Access.pdf](http://www.irena.org/DocumentDownloads/Publications/Renewable_Energy_Jobs_and_Access.pdf). The views expressed in this publication are those of the author(s) and do not necessarily represent those of IRENA or its Member States.



# Renewable Energy Jobs & Access

A SERIES OF CASE STUDIES

## Nicaragua Solar/Wind

### PROJECT PROFILE

Solar Company A, an E+Co portfolio company, was established in 1999 as a “spin-off” of a non-profit student initiative at National Engineering University, promoting solar energy and training local people on solar technologies. It promotes, sells, installs and services solar home systems (SHS) and solar thermal equipment, as well as small-scale wind power systems.

Headquartered in Managua, the company also has four branches in the countryside. Its activities extend throughout Nicaragua, and the majority of installations have been in rural communities. By the end of 2010, the company had served 2 118 households with more than 10 000 people. The firm’s 3 000 installed solar PV systems have generated a cumulative 591 megawatt-hours of electricity.

Households make up 85% of customers; 10% are institutions and 5% are commercial or business enterprises.

### JOBS AND TRAINING

The company employs 13 persons full-time in Managua as managers, technicians and administrative and support staff. Salaries for non-managers range from USD 200 to 350 per month. Since E+Co first invested in the company, it has estimated general income generation among its employees at USD 47 000.

The company has 15 sales representatives in the field, and has created micro-franchises to distribute products and offer solar solutions. This is providing income to women in rural co-operatives. The company also provides employment to the heads of family in charge of local branches.

Employee benefits include social security, and employer loans for education, health and house improvements. In late 2011, the company began to distribute 30% of its shares to its employees as bonuses.

E+Co has provided training to the company related to operations, management and finance. The company enhances skills and capacity among several groups of people:

- » Local technicians and salesmen are trained to understand the systems they are selling.
- » Branch managers receive training on installation, product specifications, battery maintenance, basic finances, etc.
- » Women from co-operatives are taught how photovoltaic (PV) based products such as lanterns work and how to keep track of sales.
- » Buyers are instructed on how to keep their systems working optimally.

### SUPPLY CHAIN

#### Upstream Linkages

The company purchases all components of the PV systems from international suppliers. Its technicians install the PV panels and produce metal structures to attach panels to roofs.

The company chooses its suppliers carefully to ensure product quality and to avoid any negative social impacts (such as child labor) along its supply chain.





## PROJECT SNAPSHOT

The company primarily sells, installs, and services solar photovoltaic equipment throughout Nicaragua, with a focus on un-electrified rural communities.

- » **Technology**  
Solar PV, solar thermal, and small-scale wind
- » **Employment**  
13 full-time staff in Managua, plus 15 sales representatives

## COUNTRY INFORMATION

- » **Population**  
5.8 million people
- » **GDP/capita**  
USD 1 132
- » **Electrification rate**  
72.1% average  
42% rural  
95% urban
- » **Access to modern fuels\***  
45.2%

*The data from the case study was provided by E+Co. Population and GDP data are from the World Bank Indicators (<http://data.worldbank.org/indicator/>). Energy access data from United Nations Development Programme and World Health Organization 2009) report, *The Energy Access Situation in Developing Countries: A Review Focusing on the Least Developed Countries and Sub-Saharan Africa*.*

*\* Modern fuels refer to electricity, liquid fuels, and gaseous fuels such as LPG, natural gas and kerosene..*

None of the suppliers are local. Focused on selling high-quality systems, the company is working with firms in Germany (such as Phocos and SMA) and in the United States (DC Power) and works with other well-known manufacturers such as Sharp, Kyocera, etc.

The company adheres to Nicaragua's import restrictions to ensure that batteries comply with adequate safety and environmental standards.

## Downstream Benefits

Rural households with PV systems usually see their finances improve. They are able to save expenses from kerosene, firewood, and candles. Households also experience improved health, which translates into decreased medical needs and costs.

Some PV system owners are setting up small grocery shops. PV systems give them access to affordable and reliable refrigeration and allow them to keep their stores open for longer hours—translating into greater business and more income generation.

Since E+Co's investment began, PV owners have been able to displace about 1 million litres of kerosene and 4.2 million paraffin candles, providing substantial savings.

Soft benefits include access to news and education via radio or TV, children's ability to study longer hours and, due to better lighting, overall security in homes is improved.

## FINANCING

Company operations are based primarily on cash sales to households and other customers.



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