

Handbook for Financial and Development Organizations

Chapter 2

Enterprise and Project Examples

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- **Kanata** – Grid Connected Hydroelectric

- **Mae Ya** – Grid Connected Hydroelectric

- **SELCO** – Off-grid solar electricity – cash and credit

- **SOLUZ** – off-grid solar electricity – market-based fee-for-service

- **RAPS** – off-grid solar electricity and other energy carriers –concession-based fee-for-service

- **NOORweb** – off-grid solar electricity combining different approaches

- **Riberalta** – local area grid using biomass combustion

- **Gam-Solar** – off-grid solar electrification and solar hot water heating

- **Rural Industries Innovation Centre (RIIC)** – productive use kits and training

- **SUGGESTED ADDITIONAL EXAMPLES TO ADD: CHINA COASTAL ISLAND HYBRID, PHILIPPINE OR THAI LARGE FARM BIOGAS, RSA PRODUCTIVE USE CENTER, RED CERAMICS...**

Kanata is a 7.4 MW hydro project located in Cochabamba, Bolivia. Its operation allows the production of electricity for the local utility and provides a 30% increase in the potable water available to the city of Cochabamba, a city that suffers regular drought conditions. The project harnesses the outflow from an existing high-altitude dam. Initially, the water passed through an open canal and a gully that were being used to provide drinking water to the city. This conveyance system lost a great deal of water due to the spillage that occurred as the water descended from the reservoir. The project sponsor received a concession for hydropower exploitation from the Bolivian state in 1995. The municipal water supply company retained water consumption rights. The project was designed so that it would rehabilitate the open canal and a penstock would be constructed that would capture 100% of the water flow and lead to a small-turbine power plant. Initial activities included the construction of a forebay, the installation of site facilities, call for bids from equipment suppliers and debt and equity commitments from investors. Kanata's power began to feed the Bolivian grid in May 1999, making it the first Independent Power Production project of its kind in the country and displacing thermal generation. The hydro development has provided a 4km-grid line that will also enable the expansion of the electricity distribution network to the unelectrified rural communities surrounding the project.

The **Mae Ya** small hydro power plant is located in one of Thailand's National Parks on the Mae Ya river in the north west of the country, and is owned and operated by the Provincial Electricity Authority (PEA). The penstock is an exposed steel pipe 900 mm diameter and 370 m long. The turbine house is located 100 m below and adjacent to the river where a 1.15 MW Turgo turbine is located. The generator is connected to the local grid through power transmission lines, mounted on overhead poles. The flow's peak is at 1.37 m³/s but it has a large seasonal variation. To solve one of the most acute problems of small hydro facilities in Thailand – highly abrasive silt - a desalting unit was built at Mae Ya behind the weir. The plant has been in operation since 1991 performing at a 55% load factor

VACVINA, a Vietnamese rural development agency, established a small enterprise distributing and installing household biogas systems. These family-sized bio-digestors are marketed to local farmers and are fueled by household pig or poultry waste. The systems are constructed with locally available plastic sheeting and piping and produces methane gas suitable for cooking. Some 2,500 of these systems have been installed and sales are continuing. Technological development work has continued and Vacvina has designed and installed a more robust unit that can use a brick/plaster construction or reinforced concrete. These units use considerably less ground space than the plastic units and allow their placement under piggeries and/or other farm

structures. The VAC Company plans to install some 10,000 household biogas systems by the year 2001. With financing, the company is implementing a project that allows the bulk purchase of materials, the continued promotion of the technology and the training of local technicians in the installation and maintenance of the systems. The financing is being structured on a risk share basis in that its repayment will be based on a “royalty” payment received from each sale of the biogas system.

Solar Electric Light Company, **SELCO**, is a solar energy services company that markets small-scale photovoltaic (PV) power systems in southern India. It also has operating subsidiaries in Vietnam and Sri Lanka. These renewable energy systems offer an affordable and sustainable alternative for lighting and communication in rural households not serviced by the electric grid and provide a stable backup to households on the grid. The current market for residential systems in the off-grid, rural areas of the southern Indian states of Karnataka, Andhra Pradesh, northern Kerala and Tamil Nadu is estimated to be 290,000 households. SELCO has established marketing, sales, installation and service operations in areas of Karnataka and Andhra Pradesh to serve this market through cash and credit sales of household systems. SELCO India also formed partnerships with local suppliers of balance of system components, which resulted in reduced costs. SELCO India’s early success in demonstrating the market demand resulted in a number of rural banks offering financing for credit sales. This has allowed SELCO India to further penetrate the rural household market. The successful development of SELCO is demonstrating to both the public and private sectors the commercial viability of rural household PV systems and is seen as a model for replication elsewhere in India and throughout emerging markets.

Soluz is a company that grew from efforts of international and local non-governmental organizations that funded successful demonstrations in Central America that showed a market existed for the credit financing of household PV systems in unelectrified rural villages, specifically in the Dominican Republic and Honduras. However, these projects also demonstrated that cash and credit-based approaches would only reach about 20% of the unelectrified rural population.

This realization spurred Soluz to develop a strategy of providing PV household energy services on an affordable monthly rental basis that would allow the provision of energy services to those who could not afford the services on a cash or credit basis. In 1993, \$100,000 was provided to Soluz to implement a prototype demonstration of its SEED model, Solar Electric Energy Delivery, which is the provision of PV solar home systems (SHS) on a monthly-fee for service basis. This economic and technical feasibility work produced a measurable demonstration case and a business plan.

In the Dominican Republic, Soluz Dominicana is following a business strategy to grow the company operations to the next level of 5000 systems by 2002. It has done a successful job of installing systems in the field with a payment collection rate exceeding 95%. Its fee-for-service approach (monthly charges of \$10 - \$20 per household) is recognized by the industry as highly innovative and ground-breaking. Soluz looks to improve the local benefits of its operations: it has assembled a strong Dominican staff and it maximizes the use of local products and services. Soluz has also established a fee-for-service operation in Honduras.

RAPS is a newly created enterprise with a core business activity to supply electricity and other energy products to the rural community in South Africa. The strategy is to establish privately owned energy stores, called RAP Stores, to oversee the service and maintenance of PV solar systems as well as the supply of complimentary energy products and equipment. The local stores would be established as RAPS' franchises and would receive intensive training by RAPS and standardization of products and services. An innovative feature of RAPS implementation plan is to use a pre-payment system. With this system, the users purchase tokens or cards from the franchises or designated community place. These tokens or cards are then inserted into the solar home system and energy services can be accessed – without the prepaid token, the system won't work. This approach to collection reduces the risk of not receiving regular monthly payments from the users.

RAPS has evolved along with the national government's program to expand the provision of electricity in the rural areas. The RAPS business plan is based on the government concession program. This program establishes rural concessions of 80,000 households. Following a proposal process, private companies were selected to implement a fee for service PV rural electrification program, receiving a government subsidy of ~3000 Rand per household (~US\$450) as part of the program. RAPS was selected as one of the concessionaires. The government regulatory and approval process for the concessions has not advanced as rapidly as originally forecast. While RAPS is still in line to participate, it has had to seek out additional business opportunities while the concession process is delayed.

NOOR Web is a four-year old private company headquartered in Marrakech, Morocco that was established to provide energy services to the large rural unelectrified population in Morocco. NOOR serves this market through two main strategies, first by empowering local entrepreneurs to open and operate their own DAR NOORs, or solar boutiques -- directly in the villages -- to supply their neighbors' needs by recharging batteries and by selling solar home systems and other appropriate items including batteries, electric equipment and low-voltage TV sets; and second by providing, under contract to Moroccan and foreign government agencies, as well as charitable

non-governmental organizations, the equipment, installation, maintenance and after-sales service of photovoltaic systems for the rural population. Over time, the company's strategy evolved from a battery - charging station concept to one where numerous distribution approaches will be incorporated, including cash, credit and fee-for-service. This evolution was influenced by numerous changes in the electrification strategy of the National Utility (ONE) to introduce solar power on a widespread basis. While this significantly impacted the ability of NOOR to develop, it did result in a new business opportunity. In 1998, NOOR was awarded a 7,000-unit contract to act on ONE's behalf in the installation and maintenance of the rural household PV systems.

Riberalta is a 1 MW biomass power plant in Bolivia that uses 2 tons of Amazonian (Brazil) nut husks/hour and residual scrap wood from local sawmills to produce electricity that feeds an existing distribution system. Prior to the plant operations, the nut husks were dumped in the local rivers, creating significant pollution, and electricity was produced through the use of diesel fuel. Both were significantly altered as a result of this project. The project became operational in 1997. Since that time, it has encountered significant mechanical and institutional barriers that have prevented it from producing at full capacity and easing the power demands of Riberalta. First, the other diesel generators, which combined with the biomass plant produced the full capacity for the Riberalta system, went out of service, putting complete load responsibility on the biomass plant. This prevented needed maintenance and required the biomass plant to be in operation continuously. Additionally, there was a technical complication resulting from excess moisture in the nut husks. Lastly, the operators of the Riberalta system, the Cooperativa Eléctrica de Riberalta (CER), did not execute the necessary institutional and procedural improvements required by the project's main funder, the National Rural Electricity Cooperatives Association (NRECA). As a result, NRECA took over operation of the plant and is now in the process of implementing the require technical upgrades and maintenance.

The response of the Riberalta community has also impacted the project's success. Initially, the community was supportive. However, when all the diesel systems went down, it was blamed on the biomass plant. What the community failed to recognize was that without the biomass plant, when the diesels failed, there would have been no power supply.

Gam-Solar is focusing on (1) household scale solar electrification and water heating in the rural portions of The Gambia and (2) larger scale solar water heating in hotels. Presently Gam-Solar plans to install over 240 rural household hot water or PV electricity systems and undertake one larger hotel conversion to solar hot water. A second stage of activity is planned that would bring the company to financial self-sufficiency by late 2001. Gam-

Solar's strategy is to align itself with well-established in-country entities for rural energy projects and to partner with international energy companies for the larger scale hotel conversions. The company believes these alliances will allow it to establish a presence in both the rural and urban markets without having to build substantial in-house staff and overhead. Limited product and market diversification (large and small, rural and urban, household and hotel, hot water and electrification) is a sound second strategic element. Gam-Solar's products are affordable to large segments of the rural population as a combination of it offering small as well as mid-sized systems and its partnership with an organization offering agricultural-cycle based loans.

The **Rural Industries Innovation Centre (RIIC)**, Botswana's national appropriate technology center, designs and manufactures technologies geared to employment creation and sustainable development, especially in rural areas. RIIC also provides short courses in training for income-generation skills for village people. Through RIIC, the government of Botswana will be making available loans to rural households, payable over 4 years for the installation of PV systems. Customers are required to pay a non-refundable deposit and make monthly payments. Appliances that can be used with PV electricity include: water pumping, lighting systems, TVs, radios, vaccine refrigeration, and sewing machines.

