SELCO-INDIA
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the **Ashden Awards**
for sustainable energy

Solar photovoltaics enabling small businesses to develop

Summary

SELCO-India is a private business which provides photovoltaic (PV) solar-home-systems to provide power for lighting and small appliances, and other solar services, to low-income households and institutions in South India. It works from a head office in Bangalore with a network of local sales and service centres. The underlying conviction of SELCO is that solar energy is cheap for the poor but expensive for the rich – that is, poor people can afford to buy solar systems, because they pay so much for other forms of energy like kerosene and batteries. What is essential is to have suitable systems and appropriate financing. SELCO is committed to providing high quality systems, and in order to provide an effective backup service it will sell systems only within a two-hour motorcycle trip from a service centre. SELCO as a whole has a very focussed business approach. In addition, each service centre must be financially viable, thus centres are opened only where there is real demand for systems, and also where local financial institutions are able to provide customer finance.

SELCO won a 2005 first-prize Ashden Award for enterprise, in recognition of its success in building up, over ten years, a thriving business which supplies poor people with high-quality PV systems. At that time it had 170 employees and 25 services centres, and had sold 48,000 solar home systems, serving around 220,000 people. One benefit of the Ashden Award was to raise the profile of SELCO with microfinance organisations, resulting in three new financial partners, five additional services centres and the sale of over 23,000 more systems. This growth has taken place despite a 47% increase in the price of small PV modules on the world market – an unfortunate side-effect of the enormous demand for PV in Europe and Japan.

The most significant new partnership is with the Self Employed Women's Association (SEWA) bank in Gujarat. By opening new service centres directly linked to bank branches, SELCO has the opportunity of working with the over 300,000 female customers of the bank. These centres will provide a range of energy services, not just PV, and have already sold over 3,000 efficient stoves.

Most people who buy systems from SELCO need loan finance from a bank or microfinance organisation, and are required to make a down-payment of typically 15% of the cost. As a pilot, SELCO has used part of the Ashden prize money as a 'down-payment guarantee' so that banks will sell to customers who cannot provide upfront capital. This is proving very successful.

Like many small and medium sized businesses, SELCO grew by focussing on its core market of home systems. Although staff were actively encouraged to contribute ideas to the company, there was insufficient time to develop these very far. SELCO therefore used some of the Ashden prize money to set up a small innovation department at its head office, tasked with looking at new ways of providing people with solar and other energy services, and in particular at how to promote income

generation. New solar-related businesses which the innovation department has helped with technology, business planning and securing finance include: PV-powered battery-charging businesses which supply single-lamp systems for both street vendors and poor homes; PV-power for sewing machines, to increase the productivity of sewing businesses; PV-powered soldering irons for TV repair; and small PV-powered silk looms. In all cases, the increased income resulting from the use of PV has to be sufficient to cover the repayments on the capital cost of the PV system.

The 2005 Ashden Award raised the international profile of SELCO. Harish Hande has been invited to lecture on the SELCO business model at university business schools in the USA, India and Singapore, and has hosted many visits and studies from academic groups. To help continued development, SELCO also used part of the Ashden prize money to prepare a 5-year business and investment plan, with the aim of reaching a further 200,000 customers by 2010.

The organisation

SELCO-India was founded in 1995 by Harish Hande, the current managing director, and Neville Williams. It is managed by a board of directors, and currently employs over 180 people, at its headquarters in Bangalore and at 30 service centres in South India. Its annual turnover is about £1.5 million.

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Context

Statistical information - India

Population (2004)	1,087.1 million
Urban population (2004)	28.5%
GDP per capita US$ (2004)	$ 640
- at purchasing power parity	$ 3,139
Population living on less than $1 a day (2004)	34.7%
Population living on less than $2 a day (2004)	79.9%
Population with access to electricity (2000)	43%
Per capita annual electricity consumption (2003)	594 kWh
Annual CO_2 emissions per capita (2003)	1.2 tonnes
Population undernourished (2001-03)	20%
Population with access to an improved water supply (2004)	86%

Sources: UNDP, World Resources Institute

Around 57% of the population of India do not have mains electricity, and for many others the supply is unreliable. The use of photovoltaic solar-home-systems can provide reliable power for lighting and low-power appliances, which brings great practical benefits. One of the benefits of lighting is extended hours for income generation, both in small businesses and homes. PV power has the potential to enable many more business opportunities, provided that the increased income can cover the cost of the PV system.

Technology and use

The core business of SELCO-India is the design and sale of photovoltaic (PV) solar-home-systems (SHS), principally to provide lighting, but also suitable for radios, cassette players and fans. A common system design supplies four 7W compact fluorescent lights (CFLs). Electrical power is generated by a 35 Wp PV module, which is usually mounted on the roof of a house. A 90 Ah lead-acid battery is used for storage, so that the system works both day and night and throughout the year. The batteries used are designed to withstand significant discharge each day without rapid deterioration. (Cheaper car batteries cannot withstand this, and would become unusable within about six months). An electronic charge-controller protects the battery from charging or discharging too much, and enables the battery to be used for at least five years. However, systems are individually designed to meet the needs (and budget) of each customer, and there are many variations which can be used. The installation of the system is carried out by SELCO technicians, and great emphasis is placed on appropriate siting of all components, and tidy wiring.

One innovative idea from SELCO to make systems affordable is to mount a light in the corner of one room and remove bricks into other rooms, so that a single light provides background illumination in three rooms. Another feature which allows flexibility at low cost is having lights which can be moved from one place to another, and installing the wiring and brackets for six lighting points in a four-light system.

Similar systems have been sold to stallholders in street markets. Here, less individual lights may be needed, but with higher illumination or for a longer period, so custom design is again important. SELCO is now focussing on PV power for other forms of income generation, and therefore designs customised systems for particular applications.

All the components of the PV systems are manufactured in India. PV modules and batteries are bought in, but SELCO initially had problems with the quality of CFLs, so set up a sister-business to manufacture both CFLs and charge controllers.

How users pay

£1 = Rs 85 Indian Rupees [March 2007]

A core principle of SELCO-India is that poor people are able to afford modern energy services – and that in the case of PV, an energy source which is regarded as expensive by the rich (in comparison with grid electricity) is actually cheap for the poor (in comparison with kerosene lamps and dry cell batteries). The main problem is lack of initial capital.

SELCO does not provide credit or loans, but has built up working relationships with local banks and microfinance organisations over many years. This has given finance organisations the confidence to provide credit for PV systems, and an understanding

of the payment terms which different owners may need. Some users work directly with the finance organisations, others work through self-help-groups which provides additional security that a loan will be repaid. One of the key benefits of winning an Ashden Award in 2005 was that the profile of SELCO (and PV) was raised with banks and microfinance organisations, and new partnerships set up. The most significant of these is with the Self Employed Women's Association (SEWA) bank in Gujarat, where SELCO has started to open service centres directly linked to bank branches.

A typical 4-light SHS costs the user about 18,000 rupees (£220) including design, installation and a one year service contract. In the past there has been a 33% government subsidy, but this has been discontinued, so users now pay the full cost. Microfinance organisations usually require a small down-payment, and then instalments of 300 to 400 rupees per month (£4 to £5 per month) over five years. This level of payment can often be affordable from the extra earnings which the light enables: one woman visited by an Ashden judge had increased her production of bidis (traditional cigarettes) from 400 to 600 per day, and her extra daily earnings of 13 rupees were more than enough to cover the 300 rupees/month repayments on her loan. Other women use the extra time to increase their work and income from tailoring, basket making or betel-nut shelling.

Many poor households who could afford the monthly loan repayments still find it difficult to save the down-payment. As a pilot, SELCO has used part of the 2005 Ashden prize money as a 'down-payment guarantee' so that banks will sell to customers who cannot provide a down-payment. This is proving very successful.

Users have the option of including the cost of a second battery via slightly higher monthly instalments, so that they are not faced with the cost of a replacement battery just when their loan has been repaid. This ensures that the replacement battery is a proper PV battery, rather than a cheaper car battery. It also makes sure that spent batteries are returned to SELCO for recycling.

Street vendors normally use large kerosene pressure lamps. For them the savings on kerosene can repay the loan on a PV system, but they are not used to monthly budgeting. One vendor whom the Ashden judge met thought that he would not be able to manage the bank repayments of 200 rupees/month for five years, even though SELCO had helped him to work out that he was saving 14 rupees/day or 420 rupees/month on kerosene. So SELCO provided a money box for him to deposit 14 rupees at the end of each day, and he now takes 200 rupees to the bank at the end of each month and still has an extra 220 rupees to spend! Another way in which systems have become affordable for very poor traders is through PV battery-charging businesses. These charge the batteries during the day, and hire them to traders each night for a rental fee. In this way the trader has to pay only for the CFL, and the regular payment is brought down to a more manageable daily basis.

Provision of light to homes and market stalls is one way of increasing income. Many more income-generation ventures would be possible using PV on a somewhat larger scale to power small items of electrical equipment. However, for a bank to finance the capital cost of the PV for such ventures, there must be real markets for the goods or services provided. SELCO used part of the 2005 Ashden prize money to set up an innovation department to look in detail at potential income-generation ventures, and persuade banks to finance those which were viable. Several sewing businesses have been able to provide PV power for sewing machines, and greatly increase their production. The SELCO innovation department helped these businesses identify markets for their increased production, and thus the income to pay back the loan on

the PV system. Other ways in which PV power has been used include battery-charging businesses which supply single-lamp systems for both street vendors and poor homes; PV-powered soldering irons for TV repair; and small PV-powered silk looms

Training, support and quality control

For customers, SELCO-India provides individual design, to produce a system which meets both their wishes and their budget. All installations and user training are carried out by SELCO technicians. Service is free during the first year, and SELCO staff visit each system every three months to make sure that it is working correctly. All SELCO service centres hold full stocks of spares, so that replacements can be made quickly if there is a problem.

PV modules supplied by SELCO come with a 10-year guarantee and batteries with a 3-year guarantee: any faults are reported to the SELCO head office, which keeps full details of all systems, so that problems with suppliers can be tracked down quickly.

Benefits

The immediate benefit to users is the provision of clean, good-quality light, and power for small appliances. Good light improves morale and opportunities in ways which are difficult to quantify. Children are able to study (or, as one homeowner told the Ashden visitor 'they have no excuse for not studying'!), domestic tasks are done more safely and easily, and there are increased opportunities for income generation. For vendors, produce from stalls is displayed better, and they do not have to work with the smell and heat from kerosene lamps.

For both homes and street vendors, the reliability of the PV systems is a major benefit. Users remember one or two days each year in the monsoon season where there was not sufficient output, but that is in a region where the mains electricity fails for an average of four hours per day.

There are significant environmental benefits from the PV systems. The immediate benefit is that the use of smoky, dangerous kerosene lamps is minimised. In addition, owners no longer use and dispose of dry-cell batteries. Families who use kerosene for lighting consume about 120 litres per year, so the 71,000 systems installed avoid the emission of about 21,000 tonnes of CO_2 equivalent per year. (This figure takes into account CO_2 equivalent 'embodied' in the manufacture of the SHS.)

The operation of SELCO has provided valuable employment opportunities. The total number of employees is about 184, most of whom are in the 30 local service centres. Service centre staff are recruited locally, and all start with few qualifications. SELCO provides good opportunities for career development, and many staff stay with the company for a long time, and move up to senior positions. Employment has also been generated outside the company, including increased sales of small electrical appliances like fans and radios. One effective way of bringing in customers is using local agents who receive a percentage commission for each SHS sale which they initiate: in some service centres, local agents are the initial point of contact for up to 70% of customers.

Many of the benefits of the work of SELCO are particularly significant for women: they often spend more time in the home and therefore appreciate the improved light and income-generation opportunities. Many women take the responsibility of paying

for the SHS, and through this gain confidence in financial management. SHS owners who were visited by an Ashden judge were very pleased with their systems, and clearly took pride in them. Within SELCO, 21% of service centre staff and 43% of head office staff are female, and their sister-company has an entirely female workforce. The new partnership with the SEWA bank will provide its 300,000 female customers with access to SELCO service centres. These centres will provide a range of energy services, not just PV, and have already sold over 3,000 efficient stoves.

Replicability

SELCO provides an excellent, replicable model for providing better energy services to poor people, while at the same time developing a thriving business. They have shown that solar electricity can be successful and affordable, provided that a proper service and financing system is in place. Within India alone, 57% of the population do not have grid electricity, and many more have an unreliable supply, so the opportunities for similar enterprises are enormous.

Winning the 2005 Ashden Award raised the international profile of SELCO. Harish Hande has been invited to lecture on the SELCO business model at universities including the Massachusetts Institute of Technology, University of California at Berkeley, Cornell, and University of Michigan in the USA, the Indian Institute of Technology Bangalore, and INSEAD Singapore. SELCO has also hosted many visits and studies from academic groups.

Management, finance and partnerships

SELCO-India has exemplary management practices, and it is through these that they have been able to build a thriving enterprise, as well as provide energy services to the poor. These management practices are evident in their dealings with customers and external agencies, and also within their organisation.

The main work of SELCO is carried out by local service centres, and the aim is that all customers should be within 3 hours travelling distance of a centre. Each centre keeps a stock of components and equipment, and has clear operational requirements, and monthly targets for both number of systems sold and financial turnover. Service centre managers report daily by email to Head Office, and have weekly and monthly meetings, and this close liaison avoids many operational problems. Within each centre, roles are clearly defined. The sales agents are responsible for promoting the business, visiting potential customers, designing systems and taking payment. The technicians install and maintain the systems, but do not deal with any financial matters.

SELCO has been approached by people who would like a franchise to sell their systems. However, they have deliberately not followed this option, because the reputation of their brand name depends on the service which they provide as much as the hardware, and it is much more difficult to guarantee service within a franchising system. SELCO will only move to a new region if they have good contacts there, both for dissemination of information and for providing finance. For instance, in Belthangadi region in Karnataka, the main partner is the NGO Shri Ksetra Dharmastala Rural Development Project (SKDRDP) which runs a network of 5,000 self-help groups. These groups meet to support members in domestic and farming matters, and make regular savings. If a member wants a loan – for instance, for an SHS – the group decides whether it is an appropriate purchase, and the group as a whole takes out the loan. Although there is great enthusiasm to purchase SHS in this

way, the groups make sure that members have covered more basic needs (like wells or farming equipment) before they invest in an SHS. Because of the interest from SKDRDP, SELCO opened a service centre in the region, and most of the 3,000 SHS which this centre has installed have been for members of the self-help groups. A separate division at the SELCO Head Office deals with large projects, such as lighting systems for religious houses and emergency lighting in parks. It also deals with sales to entrepreneurs who hire out batteries. This means that the local service centres can focus on their core product, the SHS.

Use of the 2005 Ashden Award

SELCO-India used the 2005 first-prize Ashden Award to develop new possibilities for the business. Part of the Award enabled SELCO to set up an innovation department, to explore new products, services and partnerships. This has been particularly effective in enabling businesses to start or grow using PV power.

Another part of the Award was used for a pilot project, to guarantee the down-payments on SHS, so that a bank was willing to provide solar loans to a group of very poor households.

As well as supporting the growth of other businesses, SELCO itself has continued to grow, with 23,000 more PV systems installed, and five more service stations. Looking forward, SELCO used the rest of its 2005 Award to prepare a 5-year plan for business and investment, with the aim of reaching a further 200,000 customers by 2010.

This report is based on information provided to the Ashden Awards judges by SELCO-India; findings from a two-day visit by one of the Ashden judges to see their work in Karnataka; and presentations by Harish Hande at Ashden Awards seminars in London in 2005. Further information was provided in 2007.

Dr Anne Wheldon, Technical Director of the Ashden Awards, June 2007.