Aurore, India
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the Ashden Awards for sustainable energy

Solar power for communities, farmers and market traders across India

Summary

Aurore is a community-owned enterprise based at Auroville, near Pondicherry in Tamil Nadu, India. Over the past six years it has facilitated the installation across India of nearly 2 MWp of photovoltaic (PV) systems, including 845 PV-powered water pumps, 8,700 domestic PV systems, and over 6,000 PV-powered lanterns.

The Ashden judges commended Aurore for its integrated approach to supplying energy services, combining technical and business competence with a strong commitment to the greater use of sustainable energy.

The organisation

Aurore is a non-profit organisation which was established by the trustees of the Auroville Centre for Scientific Research in Auroville, Tamil Nadu, India in 1998. Established over 30 years ago, Auroville is a unique hybrid of spiritual retreat, experimental multinational community and environmental research centre.

Notwithstanding some of its more alternative / New Age aspects, it combines a powerful spiritual and environmentalist ethos with a down-to-earth commitment to practical change, reflected in the spectacularly successful reforestation schemes which have reclaimed large areas of overworked farmland, in its array of innovative sustainable architecture, its internationally respected research and educational programmes, and its hard-headed, but socially progressive activities such as those of Aurore.

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Context

Solar PV has enormous potential both to replace existing, fossil-fuel based energy services, and to provide new ones. It can also serve as a valuable backup to the mains electric grid, which in India is notoriously prone to blackouts.

Barriers to more widespread use include the availability of suitable systems, affordability (since most costs are up-front) and long-term reliability. There is a key role for organisations with expertise in all these areas to act as service providers rather than simply component sellers or installers. The ambition of Aurore is to catalyse the establishment of a wide range of businesses to provide solar and other sustainable energy services.

Technology and use

Aurore has worked with three main types of PV system: water pumps, solar home systems and solar lanterns. All are stand-alone systems which supply services away from the mains electric grid. Most of the system components are available on the market, although Aurore also works to improve existing products, to make them more suitable for their users' needs. (Hence, for example, it is developing its own robust solar lantern - see below).

Water pumps
PV modules are very useful for powering water pumps, because both the source of water and the use for it may be at some distance from mains electrical supplies. The pump lifts water from a well or borehole, and may also be used to run an irrigation system. Aurore encourages the application of irrigation techniques which use water sparingly, such as drip irrigation.

The PV water pumping systems installed by Aurore require an array of PV modules, to give a power rating from 900 to 1800 Wp (about 8 to 15 m2 area of PV).

Two types of pump have been used. One is a centrifugal pump which is mounted on the surface, and runs on the DC electrical output from the modules. Water is pumped out of the borehole through a suction pipe. This type of pump is easily accessible for maintenance.

The other type is a submersible pump, which is sunk to the bottom of the borehole or well. This requires AC power, and the PV output is therefore fed via an inverter which converts from DC to AC.

Solar home systems
The solar home systems used by Aurore are designed to supply light to individual homes. Each system has a 37 Wp PV module with a 12 V lead-acid battery providing 75 Ah storage capacity.

The batteries are specifically designed for PV use, with tubular plates to allow much more of the capacity to be used than with a standard car battery, of the type normally used in conjunction with simple domestic solar set-ups. Most of these solar home systems are installed in the Ladakh region, where temperatures fall well below freezing in winter.

The batteries are therefore mounted in insulated boxes, and use a high specific gravity electrolyte to reduce the risk of freezing. A charge controller prevents both overcharge and excessive discharge of the battery, and also has a socket for a DC television. Such a system provides a daily electrical output of about 65 Wh DC - enough for three hours of light each night from two 11 W fluorescent lamps.

Solar lanterns
Solar lanterns have a vital role to play in outdoor evening markets, which are common in India. This is an area where Aurore has identified major opportunities for small solar businesses. These market lanterns have a single fluorescent tube, rated at between 7 and 11 W, and a lead acid

battery. They are charged during the day at a central charging station - typically an array of solar panels on an area of flat roof nearby - with one 37 Wp PV module charging four lanterns.

The lanterns are no more expensive than their kerosene equivalents, but are much more reliable, provide a more constant light, and are cleaner too.

Solar lanterns are also suitable for home use: these are supplied with an individual 10 Wp PV module.

Aurore has worked with users in improving these lanterns, responding to feedback by making the market version more rugged and incorporating an additional socket for powering appliances like radios in the home lantern.

Training and support

The success of Aurore is due to the integrated approach which they take in all their programmes, combining technical, practical, financial, management and even political skills. They also help develop managerial and technical capacity at a local level.

Aurore has enabled the installation of PV pumps in many regions of India. They play a key role as an intermediary in this process, negotiating deals for bulk supply of equipment which brings down the cost to users; coordinating access to government subsidies which can sometimes provide up to 80% of the installation cost; and negotiating with banks to provide suitable loans to users to pay their contribution to the cost.

The major involvement of Aurore with providing solar electricity to homes is in the mountainous Ladakh region, where the government is funding a major programme to electrify the 18,000 off-grid villages. Aurore have worked alongside BP Tata in managing the supply of components to this very remote region, along with installation of systems and the structures set up through which households benefiting from the power help pay for the cost of its delivery. Users pay an initial charge of 1,000 rupees (£12) which is about 10% of the system cost, and then a rental fee of about 80 UK pence per month, which is collected by village-level workers. If the rent is not paid, the system will eventually be taken away from the defaulting household.

This money is retained in a village-based fund, used for system maintenance and battery replacement. Previous programmes in the region had provided free PV systems which, as is often the way in such cases, were not maintained properly.

Aurore has used PV lanterns in the Ladakh electrification programme, but the applications where they see significant long-term business opportunities is in renting lanterns to market traders.

In Chennai (formerly Madras), Aurore has set up a pilot project to help five young people start a business renting lanterns to street hawkers and market stallholders. Users pay a refundable deposit of 100 rupees (£1.20) and a fee of 15 rupees per night, which is equivalent to the cost of fuel for a kerosene lantern. The lanterns are charged from a static PV array, and maintained by the five owners. This business runs without any subsidy.

Aurore recognises that PV must increasingly work as a commercial, non-subsidised, business, and one of their main commitments is to nourish 'solar entrepreneurs' like the rent-a-lantern pioneers.

Benefits of the project

Aurore's work has helped bring solar electricity to over 20,000 families during the past six years.

Among the benefits of PV water pumps are reliability (compared with diesel pumps or the unreliable and intermittent mains supply); fossil-fuel savings (each pump replaces about 1,750 litres of diesel per year); and quietness in operation. Because PV pumps can operate economically

over the full day, they avoid the over-pumping which often results with diesel, since farmers are keen to pump up as much as possible during the hour or two they can afford to run the pump.

Solar home systems bring safer and brighter light than kerosene lamps or candles, each system saving about 60 litres of kerosene per year. The ability to run small appliances such as radio or television saves the cost of batteries and opens up possibilities for both entertainment and education.

Lanterns have similar benefits to solar home systems when used indoors, albeit with lower output. The benefits of good quality light are particularly appreciated in the outdoor markets, where food can be displayed better and without the taint of kerosene fumes.

Management, finance and partnerships

The PV work of Aurore is run on a commercial basis. A key role which Aurore plays is to link the input of other organisations, for instance coordinating financial organisations to make best use of government subsidies. Aurore can also buy from suppliers on a significant scale, thus reducing costs while maintaining optimal product and component quality. Aurore staff have a range of business and financial skills, and their ability to offer both technical support and business advice is key to the establishment of new solar enterprises.

Much of the PV market in India has been subsidised in the past, and by discouraging a culture of enterprise and 'ownership', such subsidies have sometimes stymied, rather than fostered, the successful spread of solar. Aurore sees its main challenge as to set up viable businesses providing PV on a non-subsidised basis. It will focus the use of the Ashden Award on improving PV products and on setting up new PV businesses, like the successful rent-a-lantern enterprise in Chennai.

This report is based on information provided to the Ashden Awards judges by Aurore, and findings from a visit by one of the judges to see their work.