

THE POWER OF HUMAN UNITY



Renewable Energy in Auroville

In the first of a new Refocus Sustainable Communities Series, Judith Lipp and Jos van den Akker focus on the community of Auroville in India that is embracing renewable energy as a key pillar in its adherence to collective and harmonious living with nature.

Auroville Universal Township, founded on a vision for human unity, has been growing into a place of peace and stewardship since its beginnings in 1968. Located 10 km North of Pondicherry and 160 km South of Chennai, in the South Indian State of Tamil Nadu, this community is showing the world what it means to live and work in harmony with nature and each other. Arising from Auroville's adherence to principles of collective and harmonious living, renewable energy development and implementation has come to feature strongly in the community. On its projected 2000 hectare site, the community can boast many renewable energy applications, including electricity generation from an assortment of solar PV installations, wind and solar water pumping, domestic biogas digesters and a

large solar concentrator for communal cooking. In addition, there are numerous local enterprises in Auroville that between them have over 50 years of renewable energy expertise, which they apply within the community and 'export' beyond. This is the story of the renewable energy activities in Auroville, but first a short introduction to the community and its vision.

Community of future realisations

"Auroville wants to be the bridge between the past and the future. Taking advantage of all discoveries from within and from without, Auroville will boldly spring towards future realisation." from the Auroville Charter

Since its inception, the Auroville community has made steady progress towards its

goal of becoming a city dedicated to the implementation of the ideal of human unity. A woman of French-origin, who dedicated her life to the Sri Aurobindo Ashram in Pondicherry and known to all as The Mother, was the visionary and principal force behind Auroville. According to her teachings, the central tenet of the Auroville vision was to create a place "that no nation [can] claim as its sole property, a place where all human beings of good will, sincere in their aspirations, [can] live freely as citizens of the world". The community was to have a strong spiritual focus emphasising peace and harmony with all things, and through a community effort the needs of all citizens would be attended to. Although inaugurated in 1968, noone lived in Auroville until the early 70's when together with the build-

About the authors

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at Oxford Brookes University. He has extensive experience working in developing countries, including 5 years in Africa. In India he has worked on solar installation projects in Arunachal Pradesh, Punjab, Ladakh, Gujarat and Tamil Nadu. E-mail: jos@auroville.org.in

Judith Lipp is a PhD student at

Dalhousie University, Canada, where she is researching sustainable energy policy issues. She has had the privilege of visiting Auroville and was inspired by the many RE activities going on there. She can be e-mailed on jlipp@dal.ca, but questions about Auroville are best directed at the individual groups listed in the article.

ing of the Matrimandir (the spiritual centre of the township) about a dozen pioneers established themselves in Auroville near the local people already living in the area. Since then the population of Auroville has reached 1800 representing more than 30 nationalities. The vision is for a community of 50,000 people but at a slow growth rate to allow the community to absorb and accommodate all new citizens. There is a strong environmental focus within the community. Land regeneration and reforestation were some of the earliest activities undertaken to revitalise the area, which had been severely eroded. Any developments in Auroville emphasise low impact and natural techniques and so the community provides an excellent display of various low-cost, low-tech and low-impact building, living and livelihood applications. One of the many areas that have found favour in the community is renewable energy (RE).

RE use in Auroville

The history of RE in Auroville goes back to 1972, when the first windmills for water pumping were erected. These windmills were discarded remains from an unsuccessful Government of India project and offered to Aurovillian settlers free of charge. Auroville resident Robi Trunz recalls: "In those early days I found myself pumping water with a hand-pump. Every day that took me 2-3 hours. I was thinking that there must be a more efficient way of doing this and I started investigating using wind to do the job". This investigation, over many years, eventually led to the development of the AV55 model. Scrutinised in an international cost-comparison study, this wind-pump has been found to be, by far, the most cost effective wind pump in India and possibly the world (see photo p.26).

In the early days of Auroville, before the community was connected to the electricity grid, solar photovoltaics (PV) made its debut appearance in the community. It was

1980 when the first PV panel was hand-carried into the country by an intrepid Aurovillian who desperately wanted some electrical power to light up his house. Airport customs officials were very suspicious of the strange-looking glass plate he was carrying, but finally let him through after much explanation. Today, more than 200 households in Auroville use solar energy for their electrical power supply and/or water heating. The total installed PV capacity of Auroville is estimated to be about 250 kWp, while the installed solar water heating capacity is in the order of 12,000 litres per day. Apart from lighting, solar PV energy in Auroville is used extensively for water pumping.

A more concerted effort toward the application of RE technologies in Auroville came in 1984, when the Centre for Scientific Research (CSR) was established. Its aim was to pioneer various sustainable technologies, including renewable energy (i.e. wind, solar and biogas), and develop these for wider use by people living in Auroville and the surrounding villages. In 1997, CSR completed its first major RE project in Auroville, installing a 36.3 kWp solar PV power plant. Built in a record 29 days, it was one of the first of its kind in India. After more than 6 years of trouble-free operation, this solar plant continues to generate an average 130 kWh per day, supplying the Matrimandir with clean, reliable power (Figure 1).

Two years later CSR embarked on another major demonstration project, the Solar Bowl, installed at Auroville's collective kitchen, the Solar Kitchen. This 15 metre diameter, inclined, spherical solar concentrator is integrated into the roof of the Solar Kitchen. The



A small Solar Home System (SHS) in Auroville

bowl's sub-structure is assembled out of 96 prefabricated ferro-cement segments, on the inside covered with 11,000 small mirrors. Walls of compressed earth blocks support the entire structure. A solar tracking receiver probe is suspended above the bowl, which is automatically kept in the focal point at all times by a computer controlled steering mechanism. The Solar Bowl has a thermal output capacity of 75 kW, generating enough steam to cook about 1200 meals on a clear day. The system has two diesel-fired heaters to provide back-up on cloudy days. In 1999, when the Solar Bowl was commissioned, it was India's largest solar cooker. The Indian Ministry of Non-conventional Energy Sources (MNES) funded both solar R&D projects (Figure 2).

Another RE application found in Auroville is biogas digesters. CSR developed a biogas digester made out of ferro-cement, and some 20 of these are operational in Auroville itself. Another 150 or so have been installed outside Auroville, including on the remote Andaman & Nicobar Islands.

For additional details on various aspects of this article visit:

AUORE:	www.auroville.com/aurore
AEP:	www.aep-auroville.com/ie/aep.htm
Aureka:	www.aureka.com/
CSR:	www.auroville.org/research/csr/csr.htm
AWS:	www.AurovilleWindSystems.com
Auroville:	www.auroville.info/ACUR/templates/about_auro.htm www.auroville.org/av_brief.htm

AUORE Projects

India's breadbasket, the northern state of Punjab, has seen conspicuous structures sprouting up in its green fields since the beginning of 2001. In that year the Indian government sanctioned and subsidised the installation of 500 solar pumping systems (1800 WP each, directly driving a 2 HP centrifugal surface pump), and the Punjab country-side is now dotted with solar trackers supporting thousands of solar panels. The programme was so successful that it has been repeated every year since. AUORE was active in Punjab with installing these systems from the very beginning and has installed over 500 of them (in addition to 100 in the neighbouring state of Haryana). The systems are maintained from a service centre AUORE has set up in the southern Punjabi town of Bathinda.



Apart from solar pumping systems, AUORE installs Evacuated Tube Collector (ETC) solar water heating systems in and around Auroville, has managed the installation of over 8,000 solar home systems (SHS) in the remote Himalayan region of Ladakh, and is renting solar lanterns on the beaches of Chennai, based on the fee-for-service concept.

See also:
www.re-focus.net/novdec2002/thinkingbig.pdf

Punjabi farmer with his solar pumping system

RE Enterprises

In keeping with Auroville's original intent as a place of experimentation, learning, and teaching, the knowledge and experience gained is shared beyond the community and made accessible to others who want to learn. This applies as much to the RE experience in Auroville as everything else. Various small enterprises active in designing, manufacturing, integrating, installing and maintaining RE systems and system components have sprung up over the years. The main ones are introduced here.

Aureka is a mechanical workshop in Auroville, established in 1986. Aureka produces vastly improved versions of those first windmills that started the RE history of Auroville, and has installed over 30 windmills in Auroville itself, with another 60 in various parts of India. Employing about 70 people full time, Aureka also produces earth construction equipment, organic waste shredders and track racks for solar PV pumping systems.

Auroville Energy Products (AEP) was founded in 1996 by German electronics engineer Carsten Michelsen. AEP focuses on

high quality and efficient electronic control components for renewable energy systems such as solar charge controllers and solar hybrid (wind / hydro) controllers.

Auroville Solar Service is a small unit responsible for checking the many battery banks in Auroville on a monthly basis. The history of each battery is recorded on a chart so its condition can be monitored. Besides this essential maintenance work, Solar Service installs solar home systems for Aurovilians (See photo p. 27).

Auroville Wind Systems (AWS) specializes in power generation from wind electric generators. AWS manufactures and sells wind battery chargers (WBC) in the 1.5 - 10 kW rated output range. These systems find application in small, remote communities where the utility grid does not extend. WBCs are often installed in combination with solar power or diesel generators. AWS has installed Wind-Hybrid Systems in many Indian states, including Tamil Nadu, Gujarat, Sikkim, Ladakh and West Bengal. AWS is the first company in India to offer an entirely indigenously manufactured wind battery charger - the AWS 1500 Watt - manufactured in Auroville. A bigger 5000 Watt version is under development.

Auroville Renewable Energy (AUORE) is one of the units operating under Aurore Trust. AUORE was established in 1997 to



Figure 1: Matrimandir solar PV power plant.

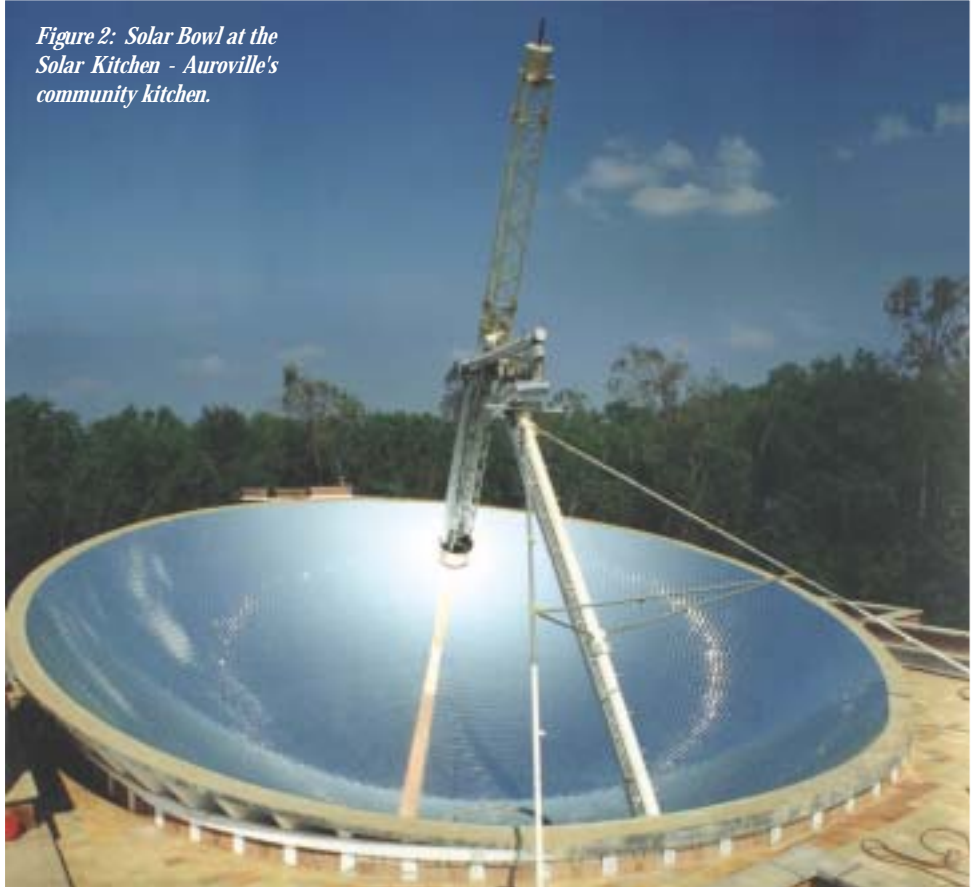
manage the commercial RE activities that developed out of CSR's various research activities. AURORE has concentrated on making RE technologies, in particular solar PV and solar thermal, accessible and affordable for as many people as possible inside and outside Auroville, in rural as well as urban environments. In line with the exponential world-wide growth of solar, AURORE has expanded fast, from just 2 people in 1999, to 12 full-time staff at present.

Over the years, AURORE has developed a particular expertise in solar water pumping systems, installing more than 1,000 of these systems all over India, with a total installed capacity of more than 1.6 MW. In close cooperation with Aureka a 2-axis manual solar tracker has been developed to maximize solar gain. These track racks have been gradually improved and enlarged and are now capable of carrying 900 WP of solar modules each. The design has been so successful that it is now being widely copied by other suppliers.

Summary

For a small place, Auroville has big dreams and through many, small, dedicated actions it is beginning to achieve those dreams. Renewable energy is only one example of the sustainability spectrum

Figure 2: Solar Bowl at the Solar Kitchen - Auroville's community kitchen.



being applied in the community and shared far beyond - Auroville is demonstrating to the world what it means to live harmoniously with nature and community. No

doubt there are struggles along the way, but the results speak for themselves - renewable energy for powering human unity is not just a utopian dream.