

## PROJECT LADAKH – MODULAR PV HYBRID AC SYSTEM FOR HIMALAYAN REGION IN INDIA RENEWABLE ENERGIES - PV FOR DEVELOPING COUNTRIES

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Modular PV-hybrid AC-Systems make it possible to connect different electrical sources and equipments with 230/400 VAC interface. Project Ladakh is one of the highlights to show the positive experiences with this system. The idea presented Prof. Jürgen Schmid at the European Photovoltaic conference in Barcelona 1997.

The content of our paper should be the positive experience, the possibility for extension, the rural electrification, the international cooperation and the improvement of the living situation of the target group of children, old people and patients of the social centre.

Project Ladakh is the holistic connection between photovoltaic, thermal collectors, passive solar energy, building insulations, pumping system for water supply, waste disposal, waste water treatment, composting, re-cultivation and communication for tele-clinic and monitoring. Project Ladakh in the Himalayan region in 3.500 m altitude should be a sample for cycles of ecology and economy and should show us the aim for rural territories in foreign regions and countries.

It should be our task to help outlying territories and the humans will give us gratefulness, peace, love and assistance in the project. Two Ladakhie assistants get a on-the-job-training till 2004 to realise new little solar systems in Ladakh.

**Keywords:** Rural Electrification – 1: Hybrid - 2: Developing countries - 3:

### 1. MAHABODHI INTERNATIONAL MEDITATION CENTRE – MIMC

Ladakh is situated in the most northern India in the far west of the Himalayan mountain range in 3.500 m over sea level. The living conditions in this region are extremely hard. Temperatures in winter up to  $-30^{\circ}\text{C}$  and inaccessible passes from September till May make the life in this region which is characterised by stones and sand to a fight for survival.

In 1986 Venerable Bhikkhu Sanghasena established the social centre with some friends and on behalf of his teacher and is the spiritual head of it. The MIMC has a NGO-set up and is therefore charitable. Until now a school with a boarding school for girls and boys, a home for old and impoverished people, a mobile medical station, a meditation centre and a hospital have been built.

### 2. DESCRIPTION OF PROJECT

The concept concentrates on the set-up and the improvement of the infrastructure of MIMC, with it an efficient administration of the whole social institution and the communication within the lying wide apart parts can be made possible.

- Installation of an electric energy supply with renewable energies consisting of photovoltaic by using energy saving consumer, as far as they are available in the country
- Installation of a solar collector system to produce thermal energy for supplying the social centre with warm water and heating in the dormitories, living rooms and nursing rooms
  - Using the passive heat of the sun through installation of glass walls put in front as insulation
  - Building a pump station for the production of drinking- and industrial water, for the improvement for the water supply, for the erection of an artificial irrigation in the re-cultivated areas and for the reforestation for the erosion control
  - Analysis and improvement of drinking water with a new simplified quality-test in rural areas
  - Improvement of the communication system for tele-clinic and tele-monitoring with a long distant supervision for a quick support of troubles.

### 3.1 Scientific innovation and relevance

The whole energy concept is based on the high sun irradiation and high altitude of the Himalayan region at 3.500 m sea level. Ladakh has only 5 rainy days per year and the produced sun energy is more than 50 % higher as in Europe, the best place for the realisation of projects with renewable energies

### 3.2 Electrical power supply

The heart of the system is a bi-directional inverter and an energy management system Sunny Island of SMA based on the modular PV hybrid AC-system with special features for rural electrification. Based on these components all other power sources or loads can be connected without further interfaces to the AC-terminal of the inverter. An additional feature is the possibility for a remote control and tele-monitoring.

### 3.3 Thermal collectors for warm and hot water

For the heating system thermal collectors with heat exchangers, storage tanks and wall-heating systems increased the room temperature from  $0^{\circ}\text{C}$  in wintertime 2000 to  $13^{\circ}\text{C}$  in wintertime 2001/2002. Together with the MIMC-members we found an agreement for  $13^{\circ}\text{C}$  room temperature in the bedrooms of the buildings. This is for the people in Ladakh a very comfortable temperature in the relationship of  $-30^{\circ}\text{C}$  in the coldest winter month.

