

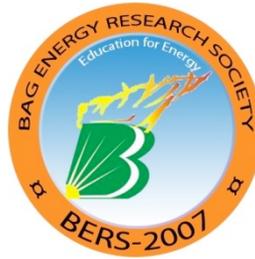
Report

Training and Awareness Program cum Workshop

on

Implementation strategies for the transfer of hybrid photovoltaic-thermal technology (H-PV/T) from research laboratory to field

(August 25-28, 2009)



Conveners

G N Tiwari, BERS New Delhi and IIT Delhi, India

Håkansson Krister, University of Växjö, Sweden

Funded by

Swedish South Asian Studies Network (SASNET), Sweden

Organized by

**Bag Energy Research Society, India
Indian Institute of Technology Delhi, India
University of Växjö, Sweden**

Background

The main objective of this workshop cum training was to create a platform at Indian Institute of Technology Delhi, New Delhi, for interaction amongst scientists, academicians, manufactures, potential users/farmers, maintenance engineers, executives of NGO, social workers that are working in area of renewable energy particularly in the area of Photovoltaic (PV) systems, Photovoltaic Thermal (PV-T) and Solar Thermal systems. Furthermore, networking of participants has been developed through their email addresses(Annexure-I)when possible for faster communication to promote the implementation of successful technologies from the research laboratory to the field.

Participants: Twenty five participants from across the country (India) have attended the workshop/training program. There were eight farmers from rural areas, mostly from UP and Haryana, one manufacturer, two maintenance engineers, two social scientist/workers, eight technical experts and remaining representing three different NGO:s, most of them from Bag Energy Research Society (BERS). In addition, there were five female participants from various areas who attended the workshop.

Inauguration

The inauguration of workshop cum training was held on August 25, 2009 in the committee room of Centre for Energy Studies, IIT Delhi at 10 am. The inauguration function was coordinated by Shri Subhash Solanki, Associate Professor, Government Engineering College, Ujjain (MP). Shri Solanki welcomed Padmashree Professor M.S. Sodha, Chief Guest, Prof. S.K. Dube, Former Director IIT Kharagpur, Guest of Honor, Prof. Jagsish Rai, IIT Roorkee and Dr. Krister Håkansson by presenting a bouquet of flowers from various participants. The lighting of lamp was also done by Chief Guest and Guest of Honors. The background and objective of the workshop and the establishment and role of Bag Energy Research Society-2007 was briefly mentioned by Prof. G.N.Tiwari. Prof. Tiwari also appreciated the efforts and contribution of Late Professor Om Prakash Srivastava, University of Växjö, Sweden for his participation in the development of the concept of this conference, his commitment to the project and also for having managed to locate financial support through Swedish South Asian Studies

Network (SASNET), Lund, Sweden. Tiwari said that he would like to honour these efforts by dedicating the conference to the memory of Om Prakash.

Professor M.S. Sodha, Former Vice Chancellor of Indore, Lucknow and Bhopal Universities inaugurated the training and awareness program cum workshop and mentioned that it is an appropriate time to have such a training and workshop for farmers, manufacturers, technical experts and NGO's representative. In his inaugural speech he expressed his sympathy and support for the idea to take advanced research work in the area of solar energy, particularly photovoltaic thermal (electrical and thermal energy) in research laboratory of IIT Delhi, to the field for common man use in semi-urban/rural areas. He said this is an example of showing that we have the capacity to do something to create a safe future for our children and grandchildren. Doing so, we can have a cleaner environment by minimum use of limited resources such as coal/petroleum/natural gas for production of electrical energy. During the workshop, the participants will learn through experiments and their applications how such a technology can be promoted in different parts of the country. Professor Sodha also appreciated the concept of BERS' complex (passive house) at Varanasi with an integrated temple and various cultural communal activities to maximize the promotion among citizens of this technology.

Professor S.K. Dube, Former Director IIT Kharagpur expressed his happiness about the workshop on transfer of hybrid photovoltaic-thermal technology (H-PV/T) from research laboratory to field through Bag Energy Research Society at Varanasi (UP). He pointed out that we, scientists/engineers should also work for common people in rural area so that their living life can be upgraded without affecting the climate. Through the creation of better living conditions in rural areas, migration of rural people to the city can be reduced. We need a technological research on small-scale energy production that can offer citizens simple and practical solutions, but this does not mean that we should not work in high technological research areas as well. In his speech, Professor Dube also supported the view expressed by Prof. M.S. Sodha that the farmers are important participants in the conference as they will be the messengers of solar technologies in

different parts of the country with the knowledge on the subject they will have gained from this conference.

Prof. Jagdish Rai of IIT Roorkee, who is also member of Governing body of Bag Energy Research Society (BERS), pointed out that our lakes and rivers are polluted due to heavy use of non-renewable energy sources. He felt very strongly that other NGOs should also come forward to organize similar workshops as this one for farmers with the participation of manufacturers and trainers/experts. He also mentioned, as another example of renewable energy, the efforts that are made to use laser technology to trap energy from cloud lightning in the atmosphere.

In his opening remarks, Dr. Krister Håkansson pointed out his serious concern for the rapid global population growth and its consequences that can be expected up to 2050. A large part of this huge population is now rising from poverty and will be able to enter into the consumer market, which, although in itself something to celebrate, further increases the risk of detrimental ecological consequences. The more we are, the smarter we need to live. Old technology with unsustainable consequences must be replaced by a technology that is friendly to the environment and that do not overtax limited resources. Although many of the consequences, such as global warming, are truly global and largely unrelated to the geographical source of the problem, others hit more directly the region where unsustainable habits origin from. One example is the pollution of water due to use and overuse of pesticides and fertilizers. This means that modern and environmentally friendly technologies are especially important for a country like India with among the largest populations and also the highest population densities in the world. Through new energy technologies that are simple, cheap and easy to maintain, people can get hope for today and also afford to mind about a tomorrow without fear or guilt. The closer to its original form we can pick up and use the energy from the sun, the fewer complications. He expressed his desire to form a group of people at University of Växjö to work in collaboration with Members of BERS and IIT Delhi in the future for the good cause of a sustainable environment.

Activities of workshop:

Day 1 (August 25, 2009)

The video film of an hour made on Solar Energy Park at IIT Delhi was screened for participants. Through this film, the working principle and utility of various solar hybrid systems namely water pumping for potable water, greenhouse dryers, solar stills for purification of brackish water, aquaculture inside greenhouse, standalone photovoltaic for power generation, passive mud house integrated with day lighting and earth air heat exchanger, hybrid thermal air collector, street light and measuring instruments for measuring climatic parameters such as solar radiation, wind speed, relative humidity, sunshine hour and ambient air temperature etc..

Further, Professor G.N.Tiwari has presented the research project to be executed at Varanasi through Bag Energy Research Society (BERS) by incorporating the various heating/cooling concepts. He also explained the innovative technologies developed at IIT Delhi by which about 70% of energy can be saved which will help in maintaining the clean environment. A copy of this project was given to Dr. Håkansson Krister to form the basis for a submission to SIDA, Sweden for financial support (Annexure-II).

After presentation, the participants along with both conveners visited Solar Energy Park (research laboratory) in the presence of manufacturer and technical expertise available at the site. The manufacturer explained the methods for assembly of some solar devices, its utilities, importance and their maintenance. He also explained the advantages and disadvantages of the solar devices.

Day 2 (August 26, 2009):

The participants along with Dr. Krister Håkansson visited Maruti Driving and Training Centre where PV has been integrated to operate traffic signals and streetlamps at Sarai Kale Khan, New Delhi. The participants came to know closely the working of PV system in the field and the importance of proper maintenance of the system. After the demonstration visit, the participants visited and spent about five hours in Akshardham Temples situated about 25 km from IIT Delhi. The passive concepts have been used in the design of Akshardham Temples.

Day 3 (August 27, 2009):

Some of the participants coming from various part of UP, mainly farmers and some of the NGO representatives along with Dr. Krister Håkansson visited Agra to visit the Tajmahal and Fatehpursikari and Vrindaban, near Mathura (UP). The passive concepts have been used in the design of Tajmahal and Fatehpursikari for cooling purposes. Another purpose was to build and reinforce a social network among participants as a foundation for continued activities and cooperation. The remaining participants prepared the experimental set- up with the help of manufacturer and technical staff at IIT Delhi.

Day 4 (August 28, 2009):

Four groups were formed from participants with one group leader to conduct the most of experiments (Annexure-III) prepared for workshop and training program. After completion of experiments, a prepared questionnaire (Annexure-IV) was circulated among the participants to take the feedback from participants. Krister Håkansson presented some of the most important psychological mechanisms, among these social liking, reactance and building trust, that need to be addressed when working with change of attitudes and habits. How such principles can be applied to implementation of solar energy was discussed. Among the conclusions were that identification of key persons in the villages and the creation of good examples (installations that work and generate benefits for its model user) are essential to start the process. Building trust through openness about advantages and disadvantages and proper training in the maintenance of the equipment were factors which were emphasized. A certificate has been given to each participant(Annexure-V)

A concluding meeting was arranged between participants and conveners about the workshop and training program and the following decisions were taken:

- (i) An implementation/research project (the BERS complex in Varanasi) was presented by Prof. G.N.Tiwari and approved by the participants. It was decided that Dr. Krister Håkansson and the group that is being formed around

this project at Växjö University to submit this project to SIDA, Sweden for financial assistance.

- (ii) A second project based on the research results from Solar Energy Park at IIT Delhi will be prepared and will be submitted for financial support to any one of organization namely European Commission/UNESCO/World Bank etc.
- (iii) That the dialogue and the discussions within the network that was formed through the conference should continue in order to develop these projects further and that this continued discussion will take place through an Internet web page until the next conference will be held.

(Day 5 August 30)

A few of the participants remained to summarize the results of the conference and prepare the steps to be taken according to the decisions from the conference.