

**INTERNATIONAL WORKSHOP ON RENEWABLE ENERGY APPLICATIONS -  
PHOTOVOLTAIC, WIND AND SMALL HYDRO, NEW DELHI (INDIA),  
DECEMBER 3-7, 1996**

**PARTICIPATING COUNTRIES : 17 (INCLUDING 11 MEMBER COUNTRIES OF NAMS&T CENTRE)**

**NUMBER OF PARTICIPANTS : >18**

**NUMBER OF WORKSHOP FACULTY MEMBERS : 29**

A 3-day International Workshop on 'Renewable Energy Applications: Photovoltaic, Wind and Small Hydro' was organised by the NAM S&T Centre in association with the Asian and Pacific Centre for Transfer of Technology (APCTT) at the Indian National Science Academy (INSA), New Delhi, India during December 3-7, 1996. The Third World Academy of Sciences (TWAS) and the Ministry of Non-Conventional Energy Sources (MNES) and the Department of Scientific & Industrial Research (DSIR) of the Government of India also supported the workshop. Besides a number of Indian participants and 11 scientists from other member countries of the NAM S&T Centre, viz. Bangladesh (Dr. Choudhury Sazzadul Karim of Bangladesh Atomic Energy Commission and Dr. Md. Hasanuzzaman of the Institute of Fuel Research & Development, Bangladesh Council of Scientific & Industrial Research), Bhutan (Mr. Tenpa Gurme of the Division of Power, Thimpu), Egypt (Prof. Dr. Mansour Awad of the National Research Centre, El Dokki), Indonesia (Mr. Mochtar Machful of the State Ministry of Research and Technology), Labanon (Dr. Khaled Zahraman of the National Centre for Renewable Energy, Beirut), Malaysia (Mr. Othman Bin Ayub of the University Technology Malaysia in Johor), Nepal (Mr. G. R. Shakya of the Royal Nepal Academy of Science and Technology, Kathmandu), Sri Lanka (Mr. D. G. Senadhipathy of the Ministry of Science, Technology and Human Resource Development), Vietnam (Mr. Nguyen Manh Quan of the National Centre for Scientific & Technological Information and Documentation, Hanoi) and Zimbabwe (Mr. Emmanuel Chitate of the Scientific & Industrial Research and Development Centre, Harare), scientists and experts from Australia (Prof. C. V. Nair, Director, CRESTA, Perth), China (Mr. Li Jiquan of the Office of Technology Market Management of the State Science & Technology Commission of China and Mr. Li Tian ming of the Qingdao Municipal S&T Commission in Xianguan Island), Republic of Korea (Mr. Han Poong Woo of the Ministry of Science and Technology), Mongolia (Mr. G. Damdinsure of the Ministry of Infrastructure Development), Philippines (Dr. Vinluan Felipe of the Industrial Technology Development Institute, Manila) and Thailand (Mr. Somjet Thongkumwong of the Energy Conservation center of Thailand in Bangkok) also attended the workshop. Iran, Pakistan and Uganda, which had nominated their representatives, could not attend.

Inaugurating the workshop, Mr. Ashok Parthasarathi, Secretary to the Government of India in the Ministry of Non-Conventional Energy Sources (MNES), highlighted the gap in meeting the increasing power requirements of developing countries where nearly 2 billion people still have no access to grid electricity. A major challenge before the world community is not only to provide for this increasing demand for their economic development and increased food production, industrial output and employment generation, but also to achieve this in a sustainable manner. Detailing the thrust given by the Government of India to commercialize wind energy, solar PV and small hydro, he said that the emphasis is on grid quality power generation and to meet the rural energy needs. He stated that the Indian renewable energy programme was one of the largest programmes in the world and India has already installed 22 MW of SPV, 815 MW of wind energy and has made an impressive beginning with small hydro. Simultaneously, indigenous capacity has been set up for manufacture of SPV panels, wind and small hydro generators. While India is already cooperating with Cuba, Indonesia, Mali, Oman and Syria, and participating in 'G-15' programme on Solar Energy, Mr. Parthasarathy offered Indian experience and available facilities to other countries participating in the workshop in the spirit of TCDC (Technical Cooperation among Developing Countries).

At the Inaugural Session Prof. M.Y. Saada, President of the Governing Council of the Centre called upon the member countries of the Centre for increased efforts for application of renewable sources of energy and deplored the lack of interest in developed countries on use of renewable energy as also on transfer of technologies in this area to developing countries. Prof. V.S. Ramamurthy, Secretary to the Government of India in the Department of Science and Technology and Vice-President of the Governing Council of the Centre, highlighted the increasing demand of power for rapid industrialization and in the liberalization of economy in developing countries and the role which the renewable energy can play to help in meeting this demand with its short gestation period.

Apart from the Inaugural Session there were two Plenary Sessions in which the participants presented their country reports. Presentations were also made on resource mobilization for the development of renewable energy and on human resources development. There were 16 technical presentations spread over three Technical Sessions on Solar PV, Wind Energy and Small Hydro. In each of these technical sessions, the presentations included an overview, resource assessment, development and production of generators and planning, installation and maintenance of each of the systems. There were a number of presentations on case studies on installations already in operation. In case of Solar PV, case studies included those relating to PV power plants, PV water pumping and PV lighting systems and also Hybrid Solar PV/Wind. The expert from Australia and Indian experts from Central Electronics Ltd., Bharat Heavy Electricals Ltd., Jyoti Ltd., India Meteorological Department, Ministry of Non-Conventional Energy Sources (MNES) as also some of the leading consultants

comprised the faculty. The speakers included Dr. C.V. Nair from the University of Technology (CRESTA), Australia, Mr. K.S. Srinivasan, General Manager, BHEL, Bangalore, Dr. R.P. Gupta, Dy. General Manager (R&D), BHEL, Hyderabad, Dr. S. Rangarajan from the Indian Institute of Tropical Meteorology, Pune, Mr. R. Palani. General Manager, Jyoti Ltd., Baroda, Dr. V. Bakthavatsalam, Managing Director, IREDA, Mr. B.S.K. Naidu, General Manager, IREDA, Dr. E.V.R. Sastry and Mr. Ajay Gupta, Advisers in MNES and Dr. B. Bhargava and Dr. T.C. Tripathi, Directors in MNES, Mr C.D. Sharma, Asst. General Manager, CEL, Dr. Arun Kumar, AHEC. Roorkee and Dr. M.K. Deb, Dr. S.K. Tewari, Mr. A.K. Goel and Brig. M.R. Narayanan, Consultants.

Prof. Dr. Mansour Awad Khalil of NRC, Cairo, Prof. Yu Shijie of Energy Research Institute, Hefei University, Mr. Li Tianming of Qingdao S&T Commission, China and Mr. Shyam Sunder from ITGP, Colombo presented the case studies. Besides them, the Indian speakers on case studies were Mr. S.P. Gon Chowdhury, Director, WB REDA, Dr. S.K. Sangal of CEL, Dr. G.N. Qasbah, Director, J&K, EDA, Mr. R.K. Ayyadurai, Tamilnadu Electricity Board and Dr. Arun Kumar, National Project Coordinator, GEF Small Hydro (Hilly Region) project.

The workshop was followed by the field visits to the Central Electronics Limited to see the production of the solar photovoltaic panels and to the Solar Energy center for seeing the testing and development of solar devices. The participants also visited the Rajasthan Electronics Ltd. and its installations in Jaipur nearly 200 km west of Delhi.