

**INTERNATIONAL TRAINING COURSE ON TECHNOLOGY SELECTION FOR SMALL
HYDROPOWER DEVELOPMENT, ALTERNATE HYDRO ENERGY CENTRE
(AHEC), IIT, ROORKEE (INDIA), FEBRUARY 18-28, 2003**

PARTICIPATING COUNTRIES: 17 (INCLUDING 13 MEMBER COUNTRIES OF THE CENTRE)

**NUMBER OF PARTICIPANTS: 35 (INCLUDING 25 FROM THE MEMBER COUNTRIES OF THE NAM
S&T CENTRE, OF WHICH 6 FUNDED BY THE CENTRE)**

Mankind has used the energy of falling water for many centuries, at first in mechanical form and since the late 19th century, by further conversion to electrical energy. Historically, hydropower was developed on a small scale to serve localities in the vicinity of the plants. With the expansion and increasing load transfer capability of transmission networks, power generation was concentrated in increasingly larger units. There is a considerable demand throughout the world for increased electricity supply in rural and outlying areas, but only about 5% of the population living in such areas in the developing countries have access to an electricity supply.

The development of small hydropower around the world is on the increase. Much of the world has huge potential to further develop this resource. Small hydro offers a wide range of benefits – especially for rural areas and developing countries. The resource is environmentally responsible and has substantial economic advantages. Governments, financiers and developers are finding new ways to fund and promote small hydro development. Efforts are also being made to improve the exchange of ideas and technology related to small hydro. Small hydro stations throughout the world contribute more than 34,000 MW, representing about 5 percent of the installed hydro capacity worldwide.

There is an urgent need to develop this promising sector of renewable energy in all developing countries as only a fraction of available potential has been harnessed so far. In order to further boost the development of this sector, there is a need to train the field engineers, planners and researchers through advances made in the technology selection for small hydropower development. With all of the varied efforts underway to promote the development of small hydropower, a need has been felt to share information on what has worked, and what hasn't.

Considering the rapid advances in technology for harnessing small hydropower, it is felt necessary to provide a forum for exchange of experiences to facilitate flow of technology from one country to other. In this context, the NAM S&T Centre in association with the Alternate Hydro Energy Centre (AHEC), Indian Institute of Technology, Roorkee and Ministry of Non-Conventional Energy Sources, Govt. of India as sponsors organised the International Course on "Technology Selection for Small Hydropower Development" at Roorkee, India during Feb. 18-28, 2003.

Out of a total of 95 International nominations received, 35 applicants were selected on merit basis to attend the course, out of which 26 were from 13 member countries of the NAM S&T Centre, namely, Bhutan (Mr. Kuenzang and Mr. Wangdi from Bhutan Power Corporation and Mr. Karma Tshewang from the Department of Energy), Egypt (Mr. Magdy Sadek Farahet El Namer of Hydro Power Plants Executive Authority HPPEA in Cairo), Indonesia (Mr. Akmadi Abbas of the Institute of Sciences Centre for Appropriate Technology Development and Dr. Herman Augustiawan of the Energy Technology Laboratory of the Agency for the Assessment and Application of Technology LSDE BPPT), Mauritius (Mr. Mahenranath Bolah of the Central Electricity Board), Myanmar (Ms. Aung Ze Ya of Insein, Government Technical Institute), Nepal (Mr. Mohan Ratna Shakya of the Nepal Electricity Authority, Mr. Bhai Raja Mahrjan of the Alternative Energy Promotion Centre in Pulchowk and Mr. Bhuban Prasad Dhakal of Butwal Power Company Ltd.), Nigeria (Mr. Lawal Umar Kangiwa and Mr. Garba Saidu of Sokoto Energy Research Center), Sri Lanka (Mr. J. D. Kishantha Ganga Hemaratne of Central Engineering Consultancy Bureau in Homagama, Mr. Panditawattage Upali Wickramaratna of the Irrigation Department of Sri Lanka, Mr. Hemantha Kumara Karunasekara Hetti Patipanehelage of the National Engineering Research & Development Centre NERD in Ja – Ela and Mr. A. U. Walpola of the Hydro Power International Pvt. Ltd. in Boralesgamuwa), Syria (Dr. Ibrahim Machael Damerji of the Faculty of Mechanical Engineering, Power Department, Aleppo University and Dr. Mohammed Saleh El Ayoubi of Damascus University), Tanzania (Mr. Amir Hamza Umar of Amir Hamza (T) Ltd. and Mr. Kabiruddin Rahim Abdulla and Mr. Elineema N. K. Mkumbo of TANESCO in Dar-Es-Salaam), Uganda (Mr. Moses Murengezi of the Ministry of Energy and Mineral Development), Vietnam (Mrs. Tan Hai Anh of the Power Engineering Consultancy Company PECCI in Hanoi) and Zambia (Mr. Edwin Miselo Kunda and Mr. Wilson Sabeta Banda of ZESCO Ltd. in Lusaka). The remaining participants were from Iran, Mongolia, Sudan and Uzbekistan.

The course faculty consisted of experts from AHEC, other departments of IIT, Roorkee, private developers, manufacturers, government and non-government organisations enriched with the field and research experience. The resource persons who delivered lectures during the course were drawn from Ministry of Non-Conventional Energy Sources, IIT, Roorkee, AHEC, Indian Renewable Energy Development Agency Ltd., M/s Jyoti Limited, Maulana Azad National Institute of Technology, Bhopal, M/s Bharat Heavy Electricals Ltd., Bhopal, M/s Alstom, Noida, FORARD, New Delhi, Experienced M/s Dulas Pvt. Ltd. U. K., Uttaranchal Jal Vidyut Nigam Ltd. Dehradun, entrepreneurs and professional consultants, M/s Bharat Heavy Electrical Ltd., Hardwar, M/s VA Tech Faridabad, M/s Small Hydro Innovations Pvt. Ltd., Chandigarh and M/s Alstom. Noida presented their manufacturing capabilities to the participants

Engineers and scientists from six member countries of the NAM S&T Centre presented their country status report comprising a vivid picture on the status of Small Hydro power development in their country. These presentations included

those from Mr. Karma Tshewang, Planning Officer, Planning and Coordination division, Department of Energy, Ministry of Trade & Industry, Bhutan; Mr. Magdy Sadeek Farahet El Namer, Senior Engineer, Hydro Power plants Executive Authority (HPPEA), Egypt; Dr. Herman Agustawan, Head of Energy Technical Division, Indonesia; Mr. Aung Ze Ya, Assistant Lecturer, Ministry of Science and Technology, Department of Technological and Vocational Education, Myanmar; Mr. A.U. Walpola, Engineering Manager, Hydro Power International Pvt. Ltd., Srilanka; Mrs. Hai Anh Tran, Senior Energy Expert, International Cooperation Department, Power Engineering Consulting Company 1 (PECC1), under Electricity of Vietnam. Mr. Abdul Kader Mohameed Ahmed, Chief Engineer, Commission of Electricity Production Company/Middle, Baghdad, Iraq, though nominated, could not attend the course.

Prof Arun Kumar, Course Director, AHEC, Prof. Arun P Kulshreshtha, Director, NAM S&T Centre and Dr. S. N. Singh Course Coordinator, AHEC jointly inaugurated the workshop. Prof. Arun Kumar welcomed the participants to the workshop and gave them a brief overview of the history, various R&D and academic activities of AHEC. He hoped that participants would gain from the deliberations and field visits made during the course. In his inaugural address Prof. Kulshreshtha briefed the gathering about the various activities of the NAM S&T Centre and urged the participants to enrich the deliberations with their experiences and knowledge. He also proposed to the participants to keep abreast of the latest developments and to find out a suitable strategy for better implementation of the experiences as well as knowledge gained through such type of courses. Therefore the future participants would be required to submit a report containing the progress in their respective countries in this area. Dr. S. N. Singh detailed the participants of the course structure.

The course was designed to acquaint the participants with SHP techniques & methodologies of Technology Selection for Small Hydropower Development in such a way that the participants drawn from various foreign countries and with relevant engineering background and requisite work experience in the field could derive maximum benefits by sharing their knowledge and experiences with international participants so as to keep abreast with the latest developments in this field. The objectives of the Course were advanced training to the participants in Technology Selection for SHP and facilitating the exchange of information of latest developments made in the field of SHP throughout the world and their applications in different countries. The contents of the course touched upon various aspects of small hydro project development and it was hoped that this course would help participants in providing inputs to Small Hydropower Development on canal falls, irrigation dams & hilly areas.

During the course, four excursion tours to different types of powerhouses, located on canal falls and hilly areas were arranged to impart practical training to the participants. The participants visited the Mohammadpur (3 x 3.1 MW) SHP and Pathri Power House (3 x 6.6 MW) SHP in Hardwar, Babail (2 x 1.5 MW) and Belka

(2 x 1.5 MW) SHPs in Saharanpur and Neergad Water Mill Site (1x5.0 kW), an individual based micro hydro in Dehradun district. Course participants also visited Bharat Heavy Electrical Ltd. (BHEL) Hardwar, manufacturer of hydro turbines, generator etc. and VA Tech Escher Wyss Flovel Ltd., Faridabad, where they observed the manufacturing ability of turbines and control system. A special session was organised for the manufacturers so that the participants and manufacturers could know each other's capabilities and requirements..

Prof. Prem Vrat, Director Indian Institute of Technology (IIT) Roorkee was the chief guest of the valedictory function and gave away the certificates of participation to the participants. In his address he highlighted that Roorkee, a town known for water engineering, is serving and supporting the engineers in the developing world since last five decades.