Post-Training Report

On-line Training of SAARC Professionals of Small, Mini and Micro Hydro Power (SMMHP) Generation

Sept 13 – 17, 2021

Organized by

SAARC Energy Centre, Islamabad

Conducted by

Hydro and Renewable Energy Department (HRED)

Indian Institute of Technology (IIT) Roorkee, India

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Introduction

As part of Programme Activities for FY2021, SAARC Energy Centre (SEC), Islamabad organized a 5-day on-line training for SAARC Professionals on "Small, Mini and Micro Hydro Power (SMMHP) Generation" held from Monday, 13rd September 2021 to Friday, 17th September 2021. The on-line training was conducted successfully by selected party Indian Institute of Technology (IIT) Roorkee, India. The detailed agenda of the training is available at Annexure-I.

The aim of the training was to familiarize the participants on various aspects of Small, Mini, and Micro Hydropower, i.e., fundamentals, planning, design, construction, operation, maintenance, economics, regulations and environmental/social aspects. The five-day technical sessions were focused on: site selection, and investigations; design of civil structures; design of electro-mechanical components; technical considerations in planning; selection and dimensioning of major components; construction and operation & maintenance strategies; hybridization with SMMHP plants; socio-economic and environmental aspects; economic, regulatory, policy consideration; maintenance and performance evaluation aspects; online training of laboratories. These comprehensive sessions were designed to target a broad audience, ranging from project developers, researchers, nodal agencies and other stakeholders working on the small, mini, and micro hydropower generation.

Participation

The training was attended by 119 professionals representing various government organizations, private sector companies, academia and researchers from the SAARC Member States. The list of registered participants and day wise attendance sheets are available at Annexure – II and Annexure – III respectively.

Description

The training commenced with the introductory remarks by Programme Coordinator/Moderator, Mr. Tula Ram Poudel, Research Fellow, of SEC. This was followed by the inaugural address by Dr. Nawaz Ahmad, Director, SAARC Energy Centre, Islamabad and Prof. Manish Shrikhande, Dean SRIC, Indian Institute of Technology, Roorkee. The training comprised of five days interactive sessions including the presentations by the trainers followed by Q&A sessions and short, self-assessment quiz for the participants. The discussion about the design, construction, operation and maintenance of SMMHP plants and the online demonstration of hydraulic turbine model testing and sediment measurement laboratories as well as real time hydropower digital simulator proved to be the main highlights of the training program.

Inaugural Address

The inaugural address by Dr. Nawaz Ahmad, Director, SEC highlighted the present status of hydropower potential in SAARC Member states. He mentioned that the availability of hydropower potential can be harnessed to meet increasing energy requirements for socio-economic development in the region. Besides large hydro, there are certain prospects of development of SMMHP projects in the region. Small hydropower projects provide reliable energy supply with minimum adverse environmental impacts. Unlike the other energy sources, the micro hydropower can be developed

using locally available sources to meet the energy sources in the rural areas. Thus, their development can help in boosting the access to electricity in sustainable manner in SAARC member states. However, the development of both commercial and community based SMMHP projects are facing challenges and risk due lack of policy interventions, improper planning and site selection etc. Besides the technical challenge, there are financial challenges in the development of SMMHP projects. The inaugural address was further concluded by a brief outline of the various sessions of the training programme.

Prof. Manish Shrikhande, Dean SRIC, IIT Roorkee, highlighted the background of IIT Roorkee, particularly in the field of water. He added that water has always been a thrust area since the establishment of IIT Roorkee. He discussed the relevance of Department of Hydro and Renewable Energy (HRED), IIT Roorkee in providing training and assistance for the development of hydropower. He discussed the importance of hydropower in limiting the carbon emissions and encouraged the speakers and the participants to contribute towards interactive sessions. He emphasized the importance of discussions and Q&A sessions in such training programs to achieve the learning objectives.

Technical Proceedings

The training was conducted for 5 days, with each day 2 (forenoon as well as afternoon) technical sessions comprising of 4 – 5 lectures by trainers followed by the Q&A. The technical sessions included quizzes for self-assessment of the participants, discussion on case studies, participant feedbacks, short videos (with rich graphics) and open discussions to meet the learning objectives. The sessions were moderated by Mr. Tula Ram Poudel. The trainer's profiles along with their presentations are available at Annexure – IV and Annexure – V respectively. The list of suggested reading materials is available at Annexure – VI.

Training Sessions

Day 1, Sept 13, 2021

Slot 1, 11:20 – 12:45 PM

Prof. Arun Kumar discussed the potential, prospects, opportunities, and challenges of SMMHP with SAARC, Europe and global perspectives. The lecture gave insight into the classification of SMMHP and its current installed capacity against the total potential with SAARC and global perspectives. The barriers to SHP development which are normally technical, institutional, financial, and social, can be eliminated by capacity development, higher participation of public sector, upfront public financing, and support of R&D. Development of ultra-low head schemes (<3m head) with different types turbines such as Archimedes screw, vortex, crossflow, very low head, belt, hydro kinetic are available for ultra-low head schemes. The department of Hydro and Renewable Energy (HRED) imparts education, training, research and development related to SMMHP and other renewable energy sources as well as environmental management of water bodies. HRED has the facilities of performance evaluation of hydropower plants, International standard laboratory of hydraulic turbine R&D, sediment monitoring and impact analysis laboratory and real-time digital simulator for hydropower plants.

Slot 2, 2:00 – 3:00 PM

Prof. Sunil Kumar Singal discussed the basis of site selection, surveys and investigations for SMMHP development. The lecture covered the criteria for site selection of all components of SMMHP schemes such as diversion weir, intake channel, desilting tank, forebay, spillway, penstock and power house etc. The surveys and investigations stages involve reconnaissance level, feasibility/detailed level and execution. The step-by-step procedures of surveys involved in different levels of investigation were discussed in detail.

Slot 3, 3:05 – 3:55 PM

Mr Arun Tyagi discussed the socioeconomic and environmental impacts of SMMHP. As compared to the large hydro, SMMHP have relatively low negative environmental and socio-economic impacts. Some negative impacts are impact on flora and fauna along dry river stretch, sedimentation and eutrophication in shallow ponds and reduced water quality. Despite negative impacts, SMMHP schemes have positive impacts viz., income generation, less dependence on gasoline and batteries, gender equality, global partnership, enhanced telecommunication, awareness of proper watershed management and reforestation to secure the sustainable use of water resource. The clearances required for the development of SMMHP were discussed in detail. In addition, a case study of Ramgad small hydropower plant was discussed which focused on positives impacts in terms of revenue generation and changes in the lifestyle of the villagers.

Slot 4, 4:00 – 4:30 PM

Prof. Arun Kumar addressed the problems being faced by stakeholders in SMMHP sector and invited the participants to share their problems about the challenges they faced in the development of SMMHP so that the same may be discussed by the experts.

Slot 5, 4:30 – 5:10 PM

Prof. Himanshu Jain discussed the concept of hybridization with SMMHP plants. Hybrid power plants for grid connected systems is a new development. The main reason for interest in hybrid power plants is increasing variable renewable generation. This can help variable renewable power plants to extent duration of plant operation, bid in capacity markets, and provide ancillary services. Hybrid power plants include at least one variable renewable source. The steps for developing hybrid power plants are selected of hybrid technologies, design and optimization of plant, and operation and control of hybrid plants. SMMHP plants and inverter-based generators can mutually benefit from hybridization.

Day 2, Sept 14, 2021

Slot 1, 11:30 AM – 12:45 PM

Prof. Arun Kumar discussed the technical considerations to be followed in the planning of different components of SMMHP. This lecture involved challenges in SMMHP planning, ownership models and consideration and requirement for prefeasibility and feasibility studies. The operation of different components of SMMHP plants were discussed through the photographs.

Slot 2, 2:00 – 3:00 PM

Prof. Bernhard Pelikan discussed the criteria of selecting and dimensioning the major components of SMMHP projects which involves weirs, water intake systems water conveyance systems. The lecture involved design and selection of weirs, design criteria for desilting tank and trash rank, and criteria for selecting suitable material for penstock based on pressure and water discharge.

Slot 3, 3:05 – 4:05 PM

Prof. Mukesh Kumar Singal discussed in detail the design methodologies of all the civil components of SMMHP projects i.e. diversion, feeder channel, desilting tank, forebay, penstock, power house and tail race. The purpose of the lecture was to provide to the participants detailed guidelines and parameters related to the planning and design of civil components of SMMHP projects.

Slot 4, 4:10 – 5:10 PM

Prof. Rajeshwar Prasad Saini discussed in detail the design methodologies of electro-mechanical equipment of SMMHP projects which involves hydraulic turbines and generators. The purpose of the lecture was to provide to the participants details related to the selection and design of electro-mechanical of SMMHP projects.

Day 3, Sept 15, 2021

Slot 1, 11:30 AM – 12:45 PM

Mr. Rajesh Kumar Sharma discussed the strategies for the construction of SMMHP projects. The lecture involved the steps for construction of different components of SMMHP projects. The developers may face problems in construction of SMMHP projects such as unreasonable demands by

local bodies, difficulties in availability of electricity, and unavailability of construction materials in the vicinity of project location. Construction of SMMHP projects is challenging since there are several factors viz land acquisition is difficult, unavailability of reliable data, delaying in clearances, high risk factors related to flash flood and cloudburst and landslides etc.

Slot 2, 2:00 – 3:00 PM

Mr. A. K. Goel discussed the strategies that are followed for the operation, monitoring and control of different components of SMMHP plants. In addition, the lecture involved the procedure to maintain the daily data sheets as well as the safety measures to be taken during the plant operation. The inventory management for required spare parts are highly useful for efficient O&M.

Slot 3, 3:05 – 4:05 PM

Mr. Satyendra Kumar Tyagi discussed the operation and maintenance strategies of SMMHP plants. This lecture mainly focused on the strategies of maintenance that are followed in the plants. The plant maintenance can be in the form of routine maintenance, preventive maintenance, breakdown maintenance, and capital maintenance.

Slot 4, 4:10 – 4:40 PM

Prof. Himanshu Jain discussed the technological advancement for the operation of SMMHP plants. This lecture involved the information on variety of software used for SMMHP plant operation.

Slot 5, 4:40 – 5:10 PM

Under this period, the online training on real time hydropower digital simulator for different aspects of operation and maintenance of SMMHP plants was demonstrated. The real time digital simulator provides hardware in the loop simulations between software model of real SMMHP plants in India and the hardware replica of their electrical controls.

Day 4, Sept 16, 2021

Slot 1, 11:30 AM – 12:15 PM

Prof. Sunil Kumar Singal presented the economic consideration in the planning of SMMHP projects. This lecture focused on the cost estimation of different components as well as techno-economic aspects of SMMHP projects.

Slot 2, 12:15 – 1:00 PM

Prof. Anand Kumar discussed aspects of tariff structure and power purchase agreement of SMMHP plants. This lecture focused on the procedure of tariff fixing in a regulated regime following specific regulations of India along with the significance and need of power purchase agreement.

Slot 3, 2:00 – 3:00 PM

Prof. Arun Kumar presented the financing mechanism and business models of SMMHP plants that are relevant for SAARC member countries. This lecture involved aspects of financial evaluation of projects; risk and challenges during construction and operation which may cause financial loss; aspects of insurance for SMMHP plants; and characteristics of various business models.

Slot 4, 3:05 – 4:15 PM

Prof. Arun Kumar discussed the existing policies and regulation for SMMHP plants in SAARC member countries. This lecture focused on the licensing methods, existing models, process of allotment which involves role of government, sale of power, wheeling charges, evacuation of power, and banking etc.

Dr. R. P. Dhital discussed the status of SMMHP development and relevant policies in Nepal. This lecture mainly focused on the challenges and opportunities of SMMHP development in Nepal.

Slot 5, 4:20 – 5:10 PM

Mr. Tula Ram Poudel presented the hydropower development process in Nepal. This lecture focused on modality of development, licensing process and environmental clearance process. He also highlighted the major roles and responsibilities of Independent Power procedures (IPPs) and Government during construction and operation of hydropower in Nepal.

A panel discussion on the existing policies and regulations for SMMHP plants with the experts namely **Prof. Arun Kumar** and **Dr. R. P. Dhital** was held. Participants were benefitted with questions and answers on policies and regulatory matters. For instances in Sri Lanka, the SHP on irrigation facility is not allowed by private sector and not being done by government fully.

Day 5, Sept 17, 2021

Slot 1, 11:30 – 12:45 PM

A panel discussion on the operation and maintenance as well as performance evaluation of SMMHP plants with the experts namely **Prof. Rajeshwar Prasad Saini, Shri A. K. Goel, Mr. Satyendra Kumar Tyagi, and Mr. Arun Tyagi** was carried out. Participants discussed various aspects of O&M with the experts.

Slot 2, 2:30 – 3:00 PM

In this slot online operation of International standard laboratory of hydraulic turbine and sediment monitoring and impact analysis was demonstrated. The session was highly appreciated by the participants.

Slot 3, 3:00 – 4:00 PM

Prof. Rajeshwar Prasad Saini discussed aspects of performance measurements of SMMHP plants. This lecture involved standard procedures and instrumentation for performance evaluation of SMMHP plants. The objective of performance evaluation is to ensure that all parts and system in the power station are performing their assigned function.

Slot 4, 4:00 – 4:15 PM

Trainees gave the feedback on the entire training program through a structured form used online.

Annexures

Annexure – I: Agenda

Day/Date	Pakistan Standard Time	Title & Speaker	Broad content to be covered
Theme of the session: Introduction to SMMHP and Site Selection			
Day 1 September 13, 2021	11:00 – 11:20 am	Inauguration of the Training program	Inaugural address **by Dr. Nawaz Ahmad** Director SAARC Energy Centre Inaugural address by **Prof. Manish Shrikhande,** Dean SRIC, IIT Roorkee
	11:20 – 12:45 pm	Slot 1: Introduction to Small, Medium and Micro Hydropower by **Prof. Arun Kumar**, HRED IIT Roorkee, India	Prospects, opportunities, and challenges of SMMPHP in SARRC. Categorization of SMMHP plants will also be explained Above topics with Europe and global perspectives will also be covered
	12:45 – 2:00 pm	Lunch Break	
	2:00 – 3:00 pm	Slot 2: Site selection and investigation of SMMHP plants by **Prof. Sunil Kumar Singal**, HRED IIT Roorkee, India	This lecture will focus on the various considerations for selecting sites for SMMHP plants Investigations required for site selection will also be covered
	3:00 – 3:05 pm	Break	
	3:05 – 3:55 pm	**Slot 3:** Socioeconomic and environmental aspects of SMMHP plants by **Mr. Arun Tyagi, UREDA, India**	The socioeconomic and environmental considerations that should be made while planning for SMMHP projects will be covered in this lecture
	3:55 – 4:00 pm	Break	
	4:00 – 4:30 pm	**Slot 4:** Discussions on the problems being faced by SHP sector by different stakeholders by **Prof Arun Kumar, HRED IIT Roorkee, India**	Participants shall share their problems about the challenges being faced by them in SHP
	4:30 – 5:10 pm	Slot 4: Hybridization with SMMHP plants by **Prof. Himanshu Jain**, HRED IIT Roorkee, India	In this lecture hybridization opportunities and challenges with SMMHP plants will be discussed
	5:10 – 5:20 pm	Evaluation	This session will have an MCQ quiz

Day/Date	Pakistan Standard Time	Title & Speaker	Broad content to be covered
Theme of the session: SMMHP Planning and Design			
Day 2 September 14, 2021	11:30 am – 12:45 pm	**Slot 1:** Technical considerations in planning of SMMHP plants **by Prof. Arun Kumar**	SMMHP potential estimation Challenges in SMMHP planning Ownership models Major consideration and requirement for prefeasibility and feasibility studies
	12:45 – 2:00 pm	Lunch Break	
	2:00 – 3:00 pm	Slot 2: Selection and dimensioning of major components of SMMHP plants **by Prof. Bernhard Pelikan**, Carinthia University of Applied Science, Austria	The focus of this lecture will be on explaining the considerations made in selecting the major components of SMMHP plants and how these should be dimensioned based on the type of SMMHP plant
	3:00 – 3:05 pm	Break	
	3:05 – 4:05 pm	Slot 3: Civil engineering aspects of designing SMMHP plants by **Prof. Mukesh Kumar Singhal**, HRED IIT Roorkee, India	This lecture will cover key engineering considerations in the design phase for the civil works
	4:05 – 4:10 pm	Break	
	4:10 – 5:10 pm	**Slot 4:** Mechanical and electrical engineering of designing SMMHP plants by **Prof. Rajeshwar Prasad Saini, HRED IIT Roorkee, India**	This lecture will cover key mechanical and electrical engineering considerations in the design phase of the SMMHP plants
	5:10 – 5:20 pm	Evaluation	This session will have an MCQ quiz
Theme of the session: SMMHP Construction and Operations & Maintenance			
Day 3 September 15, 2021	11:30 am – 12:45 pm	Slot 1: Construction of SMMHP plants by **Mr. Rajesh Kumar Sharma**, Bonafide Himachali Hydropower Developers Association, India	Major considerations, requirements, and challenges during construction of SMMHP plants will be covered in this lecture
	12:45 – 2:00 pm	Lunch Break	

Day/Date	Pakistan Standard Time	Title & Speaker	Broad content to be covered
	2:00 – 3:00 pm	**Slot 2:** SMMHP operations, monitoring, and control by **Mr. AK Goel, Aleo Manali SHP, India**	SMMHP monitoring and control Safety, and reliable operation of SMMHP plants
	3:00 – 3:05 pm	Break	
	3:05 – 4:05 pm	Slot 3: Operation and maintenance of SMMHP plants by **Mr. Satyendra Kumar Tyagi**, Formerly UPJVN, India	maintenance of SMMHP plants will be covered
	4:05 – 4:10 pm	Break	
	4:10 – 4:40 pm	**Slot 4:** Understanding SMMHP plants operations using software by **Prof. Himanshu Jain, HRED IIT Roorkee, India**	Software (e.g., PSSE) that can be used for electrical operations of SMMHP plants will be discussed
	4:40 – 5:10 pm	**Slot 5:** Online training on Real Time Hydropower Digital Simulator by **Prof Mukesh Kumar Singhal, HRED IIT Roorkee, India**	Real time hydropower simulator for training of different aspects of operation and maintenance of SHP plants Hardware-in-the-loop simulations between software model of real SHP plants in India and the hardware replica of their electrical controls
	5:10 – 5:20 pm	Evaluation	This session will have an MCQ quiz
Theme of the session: SMMHP Cost Estimation, Financial, Regulatory, and Policy Considerations			
Day 4 September 16, 2021	11:30 am – 12:15 pm	**Slot 1:** Economic considerations in planning of SMMHP plants by **Prof. Sunil Kumar Singal, HRED IIT Roorkee, India**	Cost estimation of SMMHP plants Techno-economic aspects of SMMHP plants
	12:15 – 1:00 pm	**Slot 2:** Tariff structures and power purchase agreements of SMMHP plants by **Prof. Anand Kumar, HRED IIT Roorkee, India**	In this lecture the fundamentals of tariff structures and power purchase agreements for SMMHP plants will be covered along with examples from SAARC countries
	1:00 – 2:00 pm	Lunch Break	
	2:00 – 3:00 pm	**Slot 3:** Financing mechanisms and business models of SMMHP plants by **Prof. Arun Kumar, HRED IIT Roorkee, India**	Financing mechanisms and business models for SMMHP plants that are relevant for SAARC Member States will be covered

Day/Date	Pakistan Standard Time	Title & Speaker	Broad content to be covered
			Fundamentals of these topics along with actual financing and business models used in SMMHP plants in SAARC will be covered
	3:00 – 3:05 pm	Break	
	3:05 – 4:15 pm	Slot 4: Policies and regulations for SMMHP development by **Prof. Arun Kumar**, HRED IIT Roorkee, India and **Dr. RP Dhital**, Member (Nepal Electricity Regulatory Commission), Mr. Tula Poudel (SEC)	In this lecture the existing policies and regulations that govern SMMHP development in SAARC and outside SAARC will be covered An overview of the application process for SMMHP plants in Nepal will also be covered
	4:15 – 4:20 pm	Break	
	4:20 – 5:10 pm	Slot 5: Discussion on policy gaps and approaches to address them by **Prof Arun Kumar**, **Dr RP Dhital**, Member (Nepal Electricity Regulatory Commission) and **Mr. Arun Tyagi** Presentation on Processing of small hydropower application by private sector by **Mr. Tula Ram Poudel**	This slot will be structured as a panel discussion with the three experts who will discuss the gaps in the existing regulations and provide recommendations for addressing these gaps. Panel presentation will be followed by Q&A with the trainees
	5:10 – 5:20 pm	Evaluation	This session will have an MCQ quiz
Theme of the session: Performance Evaluation of SMMHP/ Software and Online Laboratory Training			
Day 5 September 17, 2021	11:30 am – 12:45 pm	Slot 1: Discussion on operation and maintenance and performance evaluation by **Prof. Rajeshwer Prasad Saini**, **Mr. AK Goel, Mr. SK Tyagi,** and **Mr. AK Tyagi**	This slot will be structured as an open discussion where trainees can ask questions to the four experts on operation and maintenance and performance evaluation of SMMHP plants
	12:45 – 2:30 pm	Lunch Break	
	2:30 – 3:00 pm	Slot 2: Online laboratory training by **Prof. Himanshu Jain**, HRED IIT Roorkee, India	Live demonstration of Hydraulic turbine model testing and sediment erosion measurement

Day/Date	Pakistan Standard Time	Title & Speaker	Broad content to be covered
	3:00 – 4:00 pm	Slot 3: Measurement of performance of SMMHP plants by **Prof. Rajeshwar Prasad Saini**, HRED IIT Roorkee, India	Key practical considerations in operations and Focus on the standard approaches for measuring the performance of SMMHP plants
	4:00 – 4:15 pm	Feedback on the training by the trainees	This slot is intended to obtain trainees' feedback on the entire training program
	4:15 – 4:30 pm	Valedictory session	Closing remarks

Annexure – II

List of Registered Participants

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158	Kithsiri senevirathne Mahindasinghe	GM,peotech Lanka	kithsiri@peotechlanka.com	Sri Lanka
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160	Om Bahadur Thapa,	CEO Radhi Bidhyut	om.thapa@chf.com.np	Nepal
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Annexure – III

Attendance sheet for each day

Sept 13, 2021

Abdullah Joni (Guest)
Abhay (Guest)
acharyasujan01 (Guest)
agmahamudul (Guest)
Ahsan Javed
Amandi (Guest)
AMHE
amiladananjaya (Guest)
Amruddin Rahguzar (Guest)
Anjana Liyanage (Guest)
Anwar Ahmad (Guest)
Arun Kumar Tyagi (Guest)
ARUN SHARMA (Guest)
Ashraf (Guest)
Ashraf_BD (Guest)
Atif KHAN
B. P. L. De Silva (Guest)
Bashu Gautam
Basit Ali BUKC
Bhushan Ravindra Rode
bilal_latif14 (Guest)
ceesnsit.cs (Guest)
Chaitanya (Guest)
Chaminda Edirisinghe (Guest)
Chaminda Karunasena
chan_kmr (Guest)
Chanaka I Kodithuwakku
Chithral Ambawatte
Choten Duba (Guest)
Conference Room (Guest)
D.V. Nishshanka (Guest)
Dhanjit Singer (Guest)
dilanijayasinghe86 (Guest)
dilharap (Guest)
Dinesh Dissanayaka
Dipak Paudel, AEPC (Guest)
Dr. Muhammad Imran Khan (Guest)
Dr. Nawaz Virk (Director) (SEC) (Guest)
Dr. Prasanna Gunawardane (Guest)
Dr. Shanawar Hamid (Guest)
Duminda (Guest)
eemmncp.dd1 (Guest)
Engr. Muhammad Bilal Latif (Guest)
Faizullah Khan (Guest)
Furugaan Ibrahim
Gordhan Das (Guest)
Haider Ali Shah (Guest)
Hari Bahadur Thapa (Guest)
Hashini Edirisinghe
Himali Lakshika
Himanshu Jain
Hira Adnan (Guest)
HS Lakmal Perera (Sri Lankan) (Guest)
Hydro and Renewable Energy Department
Ishan Pataabendige
isurushanakalakmal (Guest)
iuatt (Guest)
J.M.G.A. Urvindri
Janaki Rupasingha (Guest)
K U C Perera (Guest)
K.G.Maheswaran
k. wangmo2469 (Guest)
kalanamunasinghe6 (Guest)
Kamal Dayananda (Guest)
Kanagaratnam Ratneswaran
KASUN UDAYANGA (Guest)
kasunudayang (Guest)
kishor (Guest)
Kithsiri Mahindasinghe (Guest)
Krishan De SILVA (Guest)
Kulesh (Guest)
Lasith (Guest)
Lasith Premarathna - SLE (Guest)
LAV TYAGI, CREDA (Guest)
Lekha (Guest)
live:.cid.4eb8392a61a645a3
M.K. Sithumini Sankalpana (Guest)

M.V.C.P. Rathnayaka (CEB, Sri Lanka) (Guest)
Mahbub.sumon (Guest)
Mahesha Harshani (Guest)
mahobul islam plabon
malithchathu (Guest)
Manish Shrikhande
masum.mbesl (Guest)
Md. Omar Faruq (Guest)
Md.Mahamudul Hasan (Guest)
Mishra Kumar Chaudhary (Guest)
Mohmad Bardudoja
Mooha (Guest)
Ms. APHSD Silva
Muhammad Kashif (Guest)
Muhammad Tariq (Guest)
NAMAN ARORA
Namiz Musafer - Sri Lanka (Guest)
Nandika Pathirage (Guest)
Nilan Hemachandra (Guest)
Niroshan Ekanayake (Guest)
noreen.ideal
ntsenarathna95 (Guest)
P.A.K. Karunananda (Guest)
P.A.N. Shantha (Guest)
p.zam2162 (Guest)
Padmadewa Samaranayaka -Sri Lanka (Guest)
Pankaj Kumar (Nepal) (Guest)
Pawan Adhikari (Guest)
Phub Zam (Guest)
Phyoe Wai Aung (Guest)
Poudelsunil2039 (Guest)
Prakash (Guest)
Prasanna Liyanage (Guest)
Pravinth Balthazar
Prof Arun Kumar
Rabia Liaquat
Raihanul Haq
Rajan Acharya (Guest)
Ram P Dhital (Guest)
Ram Pandey
Ram Pd. Panday
Ranjith Kumara (Guest)
Ranuditha Samarathunga
ranundeniya (Guest)
Rasika Jayawardane (Guest)
Ravindu Rajapakshe (Guest)
Redwanoor Rahman BulBul (Guest)
rgjayawardane (Guest)
Rinzin Dorji (Guest)
Riyaz (Guest)
Riyaz SEUSL (Guest)
Ruchira Gunawardana
s.yoezer1897 (Guest)
Sachini Somathilaka (Guest)
Sagar Shrestha (Guest)
Sahabuddin Khan
saman (Guest)
Sandaru Akalanka (Guest)
santosh046 (Guest)
Saurabh Sharma (Guest)
Sehani Siriwardana (Guest)
Semini (Guest)
Semini Wickramasooriya (Guest)
Shahadev (Guest)
SHAKIL AHMED JISKANI (Guest)
Shaligrambhandari879 (Guest)
shantha CE Galle (Guest)
SHARAF SULTAN (Guest)
Shashitha Weerasooriya
Singhal SunilKumar
SLSEU_Riyaz (Guest)
srekanayak (Guest)
Suchithra (Guest)
Suchithra Lalintha Panditharathna (Guest)
Sunera Samaranayake (Guest)
Supun (Guest)
Syed Faizan Ali Shah
T Jeyadarsan (Guest)
Talukder, Arifur
Tanzeelur rehman
Tassawar Hussain
Tempa Tshering (Guest)
Tenzin Choden (Guest)
tharaka.iet (Guest)
Thilina R SL (Guest)
Thilina Rajapaksha (Guest)
Tshering Tshomo (Bhutan) (Guest)
Tula Ram Poudel
U.L.D.Sampath Anurasiri (Guest)
Ubaid ur Rehman Zia (Guest)

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Upul Dissanayake (Guest)
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Vidura Sonnadara
Viraj Dissanayake (Guest)
waqas (Guest)
Waqas Ali (Guest)
Wijesinghe (Guest)

Sept 14, 2021

Abdul Mosawer (Guest)
acharyasujan01 (Guest)
agmahamudul (Guest)
Akhila Rangana (Guest)
Amandi (Guest)
AMHE
Amruddin Rahguzar
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Bernhard Pelikan
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KY (Guest)
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Lekha (Guest)
Mahbub Sumon (Guest)
Mahesh Weerasooriya (Guest)
Maheshaharshani (Guest)
malithchathu (Guest)
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Mathusnavi 2023
Md.Mahamudul Hasan (Guest)
Mishra Kumar Chaudhary (Guest)
Mohmad Bardudoja
Mooha (Guest)
Mr. H.S.L. Perera
Muhammad Kashif (Guest)
Muhammad Tariq (Guest)
MukeshKumar Singhal
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Nilan Hemachandra (Guest)
Nimal Shantha (Guest)
Niroshan Ekanayake (Guest)
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om.thapa (Guest)
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Pravinth Balthazar
Prof Arun Kumar
Pumuditha Samarathunga
RABIA KHATOON-PAK (Guest)
Rafay Motasim Ali (Guest)
Raihanul Haq
Rajan Acharya (Guest)
Ram Pandey (Guest)
Ranjith Kumara (Guest)
ranundeniya (Guest)
Ravinda (Guest)
Ravindu Rajapakshe (Sri Lanka) (Guest)
Redwanoor Rahman BulBul (Guest)
rgjayawardane (Guest)
Rinzin Dorji (Guest)
Riyaz SEUSL (Guest)
Ruchira Gunawardana
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Sachini Somathilaka (Guest)
Sagar Shrestha (Guest)
Sahabuddin Khan
Sahan - Sanota (Guest)
Sahan Ranasinghe (Guest)
Saini Rajeshwarprasad
sanjeewa (Guest)
santosh046 (Guest)
Satya Saswat
Saurabh Sharma (Guest)
Saurabh Sharma (Guest)
Semini Wickramasooriya (Guest)
Shahadev (Guest)
Shashitha Weerasooriya
Sithumini Sankalpana (Guest)
srekanayak (Guest)
Suchithra Lalintha Panditharathna (Guest)
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Upul Dissanayake (Guest)
upul.mail (Guest)
Vidura Sonnadara
virajkavindra (Guest)
Waqas Ali (Guest)
Waris Ali (Guest)
wasi ullah (Guest)
Wijesinghe (Guest)

Sept 15, 2021

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AMHE
Ananda Chandrakumara (Guest)
Anjana Liyanage (Guest)
Anwar Ahmad
Anwar Ahmad (Guest)
ARUN SHARMA (Guest)
ASHWANI KUMAR GOEL (Guest)
asifijazch (Guest)
Avinash Sharma (Guest)
B. P. L. De Silva (Guest)
Bashu Gautam
Basit Ali BUKC
Bhushan Ravindra Rode
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Chaminda Edirisinghe (Guest)
Chanaka I Kodithuwakku
Chithral Ambawatte
Choten Duba (Guest)-Bhutan
CIPM Participant 59
Dilani Jayasinghe (Guest)
Dilhara Sethunga (Guest)
Dinesh Dissanayaka
Dipak Paudel, AEPC (Guest)
Dr. Chaminda Karunasena (Guest)
Dr. Prasanna Gunawardane (Guest)
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ER.SAGARSHRESTHA (Guest)
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Haider.shah (Guest)
Hari Bahadur Thapa (Guest)
Himanshu Jain
Hobanayaka Bandara (Guest)
HS Lakmal Perera (Guest)
Hydro and Renewable Energy Department
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Ishan Pataabendige
isurushanakalakmal (Guest)
jamuathula (Guest)
Jeyadarsan Tarciusthevarajah (Guest)
K U C Perera (Guest)
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kalanamunasinghe6 (Guest)
Kamal Dayananda (Guest)
Kanagaratnam Ratneswaran
karma Yoezer Bhutan (Guest)
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KASUN UDAYANGA (Guest)
KFUEIT-Dr. Muhammad Bilal Tahir (Guest)
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Kithsiri Mahindasinghe (Guest)
Krishan De SILVA (Guest)
Kulesh (Guest)
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Lekha Bakmeedeniya (Guest)
Madhushanmms.bc (Guest)
Mahamudul Hasan (Guest)
Mahbub.sumon (Guest)
Mahesh Weerasooriya (Guest)
Maheshaharshani (Guest)
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Md.Mahamudul Hasan (Guest)
Mishra Kumar Chaudhary (Guest)
Mooha (Guest)
Mr. H.S.L. Perera
Muhammad Kashif (Guest)
Muhammad Tariq (Guest)
Nadun Senarathna (Guest)
NAMAN ARORA
Namiz Musafer (Guest)
Nilan Hemachandra (Guest)
Nimal Shantha (Guest)
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Poudelsunil2039 (Guest)
Prakash (Guest)
Prasanna Liyanage (Guest)
Pravinth Balthazar
Prof Arun Kumar
Pumuditha Samarathunga
r.dorji237 (Guest)
Rafay Motasim Ali (Guest)
Raihanul Haq
Rajan Acharya (Guest)
Rajesh (Guest)
Ram Pandey (Guest)
Ram Pd. Panday
Ranjith Kumara (Guest)
Ranuditha Samarathunga
ranundeniya (Guest)
ravinda (Guest)
Redwanoor Rahman BulBul
rgjayawardane (Guest)
Rinzin Dorji (Guest)

Riyaz (Guest)
Riyaz SEUSL (Guest)
S K TYAGI (Guest)
s.yoezer1897 (Guest)
Sachini Somathilaka (Guest)
Sagar Shrestha (Guest)
Sahabuddin Khan
sahan (Guest)
Sahan Ranasinghe (Guest)
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santosh046 (Guest)
Saurabh Sharma (Guest)
semini (Guest)
Shahadev (Guest)
SHARAF SULTAN (Guest)
Shashitha Weerasooriya
Singhal SunilKumar
Sithumini Sankalpana (Guest)
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Talukder, Arifur
Tek Raj Subedi (Guest)
Tempa Tshering (Guest)
tharaka.iet (Guest)
Tshering Tshomo (Bhutan) (Guest)
Tula Ram Poudel
U.L.D.Sampath Anurasiri (Guest)
Ubaid ur Rehman Zia
UDARALOGUS (Guest)
Unknown User
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Vidura Prasanga Sonnadara (Guest)
virajkavindra (Guest)
Waris Ali (Guest)
Wijesinghe (Guest)

Sept 16, 2021

Abdul Mosawer (Guest)
Abhay Sharma (Guest)
acharyasujan01 (Guest)
Akhila Rangana (Guest)
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Anjana Liyanage (Guest)
Anwar Ahmad (Guest)
ARUN SHARMA (Guest)
Ashrafuzzaman Khan (Guest)
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Avinash Sharma (Guest)
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Bashu Gautam/Nepal (Guest)
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Chanaka I Kodithuwakku
Chithral Ambawatte
Choten Duba-DRE (Guest)
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Dhanjit Singer (Guest)
dhanukaceb (Guest)
Dilani Jayasinghe (Guest)
Dilhara Sethunga (Guest)
Dinesh Dissanayaka
Dipak Paudel, AEPC (Guest)
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Haider Ali Shah (Guest)
Hari Bahadur Thapa (Guest)
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Waris Ali (Guest)

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dipak.paudel (Guest)
Dr. Chaminda Karunasena (Guest)
Dr. Nawaz Virk (Director SEC) (Guest)
Dr. Prasanna Gunawardane (Guest)
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Vidura Prasanga Sonnadara (Guest)
virajkavindra (Guest)
Waris Ali (Guest)
wasi ullah (Guest)

Annexure – IV

Trainers' profiles and contact details

Lead Trainer/Coordinator:

Prof. Arun Kumar
Hydro and Renewable Energy Dept.,
Indian Institute of Technology Roorkee, INDIAEmail: arun.kumar@hre.iitr.ac.in

Co-trainers:

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Hydro and Renewable Energy Dept.,

Indian Institute of Technology Roorkee, India

Email: himanshu.jain@hre.iitr.ac.in

Prof. Sunil Kumar Singal

Hydro and Renewable Energy Dept.,
Indian Institute of Technology Roorkee, India
Email: sunil.singal@hre.iitr.ac.in

Mr Arun Tyagi

Uttarakhand Renewable Energy Development Agency,
Dehradun, India
Email: aruntygi@gmail.com

Prof. Anand Kumar

Hydro and Renewable Energy Dept.,
Indian Institute of Technology Roorkee, India
Email: devinaanand@gmail.com

Prof. Bernhard Pelikan

Institute of Water Management, Hydrology and Hydraulic Engineering, University of Life Sciences, Vienna, AUSTRIA
Email: bernhard.pelikan@boku.ac.at

Prof. Mukesh Singhal
Hydro and Renewable Energy Dept.,
Indian Institute of Technology Roorkee, India
Email: m.singhal@hre.iitr.ac.in

Prof. Rajeshwer Prasad Saini
Hydro and Renewable Energy Dept.,
Indian Institute of Technology Roorkee, INDIA Email: rp.saini@hre.iitr.ac.in

Mr Ashwani Kumar Goel

Aleo Manali SHP, Noida, India
Email: akgoel.hydro@gmail.com

Dr Ram Prasad Dhital,
Member, Nepal Electricity Regulatory Commission, NEPAL Email: ram.dhital@erc.gov.np
Mr Satyendra Kumar Tyagi Formerly UPJVN, Haridwar, India
Email: sktyagi.iitr@gmail.com

Shri Rajesh Kumar Sharma
President
Bonafide Himachali Hydropower Developers Association, Shimla
Email: rajeshtiba@gmail.com

SEC Program Coordinator:

Mr. Tula Ram Poudel
Research Fellow (Energy Trade)
SAARC Energy Center
rfet@saarcenergy.org/poudeltula123@gmail.com

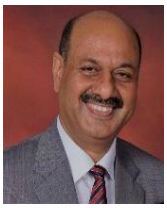
Prof Arun Kumar is a civil engineer with specialization in water resources andhydropower engineering by education is working at Department of Hydro and Renewable Energy, Indian institute of Technology, Roorkee since 1981. He hasbeen awarded MNRE Chair Professor (Renewable Energy) in July 2013 and again in April 2015 by IIT Roorkee. He served as independent director on Board of NHPC Ltd, Govt of India PSU during 2015-2019. His research areas are Hydropower Development, Environmental Management of Water Bodies, Energy Economics and Policy. Prof. Kumar has over 39 years of experience in the field of Hydropower and environmental management of river and lakes. He served CLA for Hydropower on SRREN for IPCC. He hasbeen elected on the board of London based International Hydropower Association and is VicePresident of Federation of Indian small hydropower. He is Bachelors in civil engineering and PhD in hydropower from IIT Roorkee, Masters in Civil Engineering from IISc Bengaluru and Hydropower Diploma studies from NTH, Norway. He is Fellow of ASCE, International association of Hydropower, Institution of engineers (India), IWRS. He was appointed as Coordinating Lead Author (chapter 5 on Hydropower) for preparing Special Report onRenewable Energy Sources (SRREN) for IPCC – working group III during 2009–11. He has been involved as international expert in various UN sponsored projects on assessment of small hydropower and Capacity Building in Zambia, Sierra Leone, Tanzania, Cambodia, Sudan and Indonesia.

Prof. Himanshu Jain is an Assistant Professor in the Department of Hydro andRenewable Energy at IIT Roorkee. He has over 10 years of combined researchand industry experience in modelling and analyzing the impacts of integrating high levels of renewable energy in power systems. Before joining IIT Roorkee, Dr. Jain worked as a Senior Research Engineer and Research Engineer at the National Renewable Energy Laboratory (NREL), Golden, Colorado, USA from February 2017 to February 2021. At NREL, he led projects and tasks worth $1.9 million and worked on several other high impact research projects that focused on improving the reliabilityand resilience of power systems under high penetration levels of renewable energy resources.Dr. Jain also has two and half years of industry experience having worked at ICF as a SeniorAssociate and Associate from 2011 to 2013, where, among other things, he led the efforts todevelop distribution systems analysis capabilities. Dr. Jain has published 18 peer-reviewed journal and conference articles. He holds PhD, MS, and B. Tech degrees in Electrical Engineering from Virginia Tech, the University of Texas at Arlington, and G.B. Pant Universityof Agriculture & Technology, respectively.

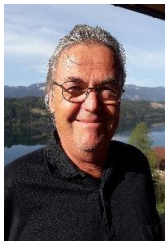
Prof Sunil Kumar Singal is a civil engineer with specialization in structural dynamics and hydropower engineering by education is working at Department of Hydro and Renewable Energy, Indian institute of Technology, Roorkee since1984. Presently he is Head of Department of Hydro and Renewable Energy. Hehas over 36 year experience of research, development, extension and teachingexperience in the area of small hydropower and other renewable energy sources. He has been member National committee for development of R&M of SHP stations in Himachal Pradesh and solar and SHP projects in boarder areas for defense establishments in the year 1998. He has worked for developing 27 National Standards/ guidelines for SHP development. He has developed course on Environmental Impact Assessment and Auditing under National Mission Project on Pedagogy. He has successfully completed many nationaland international research and development grants, and consultancy

projects, and is memberof many advisory and editorial boards. He has been involved as international expert in variousUN sponsored projects on assessment of small hydropower and Capacity Building in Uganda,Zambia and Cambodia.

Mr. Arun Kumar Tyagi is an electrical engineer with postgraduate in power management. He is working as Chief Project Officer in Uttarakhand Renewable Energy Development Agency (UREDA), Department of Energy, Government ofUttarakhand and has 36 years of progressive experience in the field of renewable energy and energy efficiency. He has developed several innovativeand attractive policies in Uttarakhand for the generation of power from hydro, solar, biomass (pine needles), etc. through community participation that has resulted not only the green energy generation but also has avoided migration of people from rural hilly places by generating entrepreneurship at the village level. Under his leadership, the Uttarakhand state has been recognized several times by Ministry of New and Renewable Energy (MNRE)& Bureau of Energy Efficiency (BEE) for their outstanding efforts in renewable energy and energy efficiency respectively. During the calamity disaster in Uttarakhand, he has led the team and ensured the restoration of electricity supply to Shree Kedarnath Temple and camp by restoration of 100 KW SHP on 13 Aug 2013. He has been awarded for "Chief Minister's Excellence and Good Governance Award" for 2019-20, Uttarakhand Eminent Engineers Award-2013. He has been made as an expert in several national and international conferences and involved in several sponsored projects of GiZ, UNDP, ADB etc. in Uttarakhand.



Prof. Anand Kumar is currently working as Professor of Practice in Electrical Engineering Department at Indian Institute of Technology, Gandhinagar, Gujarat. Prior to this, he worked as Chairperson of Gujarat Electricity Regulatory Commission & Meghalaya State Electricity Commission. He also served Uttarakhand Electricity Regulatory Commission as Acting Chairperson & Member. He holds Master of Business Administration (Finance) degree and Graduate degreein Electrical Engineering from IIT-Roorkee. He has done Advanced Software Programming Training Course from Hitachi, Japan and training in Economics Regulation from National Regulatory Research Institute, at Ohio University USA. Out of some key assignments, was hisassociation in Unbundling and Restructuring of the power sector in Uttar Pradesh and assignments at 4 State Electricity Regulatory Commissions of Uttar Pradesh, Uttarakhand Meghalaya and Gujarat.



Prof Bernhard Pelikan is a civil engineer specialized in hydropower engineering, river regulation, hydromechanics and flood protection. He has been working at the Institute of Water Management, Hydrology and Hydraulicengineering, University of Life Sciences, Vienna, Austria since 1980. Besides his main obligations at the University, he served in several activities such as legal expert for "Hydropower exploitation" and 'Flood protection', CEO and owner of a technical engineering and consulting company (since 1990), CEO and senior consultant at Austrian Small Hydropower Association (1986 - 2004), taught at Carinthia University of Applied Sciences (since 1997), TGM Vienna (2001 - 2018),Technical University of Vienna (since 2006),UNESCO IHE in Delft, Netherlands (2007), Technikum Wien(2009 - 2018), Scientific advisor in UNESCO NBCBN (2006 - 2010), Project evaluator for (a) EC THERMIE project (1995 – 1998), (b)FFG (Austrian Research Promotion Agency) (since 2007) and (c) research council of Norway (since 2008), CEO and Co-owner of Alpenkraft – Energieer zeugungsgesmbH (2006 - 2015), Approved Mediator (since 2003),. President of European

Small Hydropower Association (June 2004 – June 2010). Prof. Pelikan participatedin a leading function in numerous EU financed projects such as SHERPA, SHAPES, TNSHP, Layman's guidebook on how to develop a small hydropower plant, SHP Stream map and others. He participated in a leading role in the design of approximately 50 SHP mainly locatedin Austria. His high interest id dedicated to the environmental aspect of SHP engineering focusing on the design of fish bypass facilities. He is owning a patent related to a fish lift. He is an internationally renowned expert in the field of hydropower.

Prof. Mukesh Kumar Singhal has received his B. E (Civil), M. E (Structure)and PhD degree from Indian Institute of Technology Roorkee and is currently working as Associate Professor in Department of Hydro and Renewable Energy at Indian Institute of Technology Roorkee. He is actively involved in teaching, research, development and consultancy work for investigation, planning, designing, preparation of DPRs, technical specifications, techno-economic evaluation reports, costing and financial aspects of SHP projects for last 36 years. He has supervised 76 M. Tech Thesis and published 46 research papers in International/National Journals/ Conferences. His current research includes development of software for computer aided planning and designing of civil Works of SHP projects. He is involved in planning, designing the SHP projects and evaluating the DPRs for SHP Projects for different state governments and Private institutions. He has visited U.S.A, Canada, Germany, United Kingdom, Nepal and Bangladesh in relation with training and research in the field of SHP Development.

Prof Rajeshwer Prasad Saini is working as Professor in the Department of Hydro and Renewable Energy, IIT Roorkee. He has research experience of 34 years in the areas of renewable energy especially Small Hydro Power, Solar and Wind. He is also working as MNRE Chair Professor (Renewable Energy) for the Ministry of New and Renewable Energy, Government of India since July 2019. He did his Ph.D. in Mechanical Engineering from IIT Roorkee.He has published more than 320 Research Papers in International/National Journals and Seminars/ Conferences. 27 Ph.D. thesis have been completed and another 17 are in progress under his supervision in the area of renewable energy. He has guided more than 200 M. Tech. dissertations/projects. About 268 Consultancy and Sponsored Projects including UNDP have been handled by him. He has also coordinated about 35 International/National training courses. Two patents on Micro Turbines from his research havebeen granting. He has received several awards including 'best teacher award of IIT Roorkee' in 2012 and was adjudged as the 'star performer of IIT Roorkee' in 2003-04 and 2004-05. Hehas visited more than 22 countries. He is fellow of Institute of Engineers India and has Life Membership of (i) International Association for Small Hydro (ii) Solar Energy Society of India and (iii) Indian Association of Hydrologist.

Er. Ashwani Kumar Goel Graduated in civil Engineering from I.I.T. Roorkee, India in 1970 (Formerly University of Roorkee). He is presently Managing Director of Aloe Manali Hydropower Pvt. Ltd. Own & Operate three hydropower generation projects in Himachal Pradesh, India. He carries a distinguish carrier as contractor, Senior Consulting engineer in Governmentorganization. Fellow TERI (The Energy Resource Institute), Manager Winrock International US based NGO, Hydropower Consultant, developer and operator of three Hydro Electric project in Himachal Pradesh, India. He has over four decades experiencein civil and

Electrical Engineering field especially for all aspects of SHP covering technical, financial, technological, and managerial and policy related matters. He Participated and delivered talks in many national & International conferences and have contributed more than 35 papers in Hydropower Sector. He visited Hydro Power Projects in many countries viz U.S.A, U.K., Germany, France, China, Netherlands, Switzerland, Hungary, Sri Lanka and Nepal. He has to his credit more than 50 Hydro Electric Projects as designer, consultant & advisor. He has been instrumental in development and implementation of chain of communitybased Micro Hydel Projects of 10-100 KW range in remote hill area of Uttarakhand, India. These Projects are manned, managed & operated by local village committees and supply electricity to villagers living in remote areas. He Implemented Aloe HEP (3MW) in Manali (HPIndia) on BOOT basis from concept to commissioning in record time of 14 months. He is instrumental in vast improvement in power generation of Rukti-II (5MW) HEP located in veryremote snow bound area of Kinnaur district in Himachal Pradesh, India at an elevation of 3000M.

Dr. Ram Prasad Dhital is member of the electricity regulatory commission inNepal. He is responsible for planning and monitoring, institutional development, regulatory and external affairs in the commission. He is also thespokesperson of the commission. Mr. Dhital has spent two decades working in the renewable energy sector on national and international levels, in executive, advisory and technical roles. He served as the Executive Director of Alternative Energy Promotion Center under the ministry of energy, water resources and irrigation overseeing operations, strategic and technical initiatives in Nepal. He also worked as the Energy Advisor in Afghanistan for two years and Vanuatu in the south pacific for a year.He has been able to utilize the learning in national level by reforming renewable energy subsidy policies, institutionalizing central renewable energy funds and mobilizing internal andexternal resources (annually USD 55 million) to realize Nepal government's target of clean cooking and lighting solution to all by 2022. Mr. Dhital holds a Masters and PhD degree in Renewable Energy Engineering. He has more than 15 research publications and conference paperswritten and presented at national and international platform globally representing Nepal.He is also an APMG certified PPP professional, Nepal Engineering Council certified Professional Engineer and National Vigilance Centre certified Technical Auditor.

Mr. Satyendra Kumar Tyagi, Chief Engineer (Retd.), UPJVNL, did BE (Electrical)from University of Roorkee (Now IIT, Roorkee) in 1967 and joined UPSEB as Assistant Engineer in Oct 1967 at Hydro Electric Projects, Dehradun, UP, India and rose up to the level and Chief Engineer where he served up to October 2002.During this period, he worked in the field of Design, Erection, Testing, Commissioning, Operation and Maintenance, Renovation, Modernization and uprating of various Hydro power plants of Uttarakhand and Uttar Pradesh ranging from 3MW to 250MWROR, Storage, Surface and Underground Power Plants. Since 2007 he worked on various aspects of hydropower for designing and training using Real Time digital Simulator and Hydraulic Turbine Test Laboratory at HRED, IITR. He presented about 30 technical papers ontypical problems of hydro power stations in various national and international seminars, mostof which fetched best paper and merit awards. He is recipient of prestigious national award "CBIP, GOI- Pandit Jawahar Lal Nehru birth centenary award" for research and developmentin Hydro Power Engineering in 1995. He is fellow of Institution of Engineer (FIE). He had special training in Hydro Power Engineering in 1985 in Japan under Colombo Plan as JICA participant.

Mr. Rajesh Kumar Sharma, President, Bonafide Himachali Hydro Power Developers Association and Managing Director, Allied Hydro Engineers & Consultants Pvt. Ltd. and has 25 years of experience in the field of planning and execution of small hydropower projects. Some of the small hydropower executed by him are Kuwarsi – II SHEP 15 MW, Salun SHEP 9 MW, Jogni II SHEP 5 MW and Gurahan SHEP 1.5 MW on different ownership basis along with developers.

Annexure – V

Technical presentations

All technical Presentation has been received and updated in SEC website: https://www.saarcenergy.org/on-line-training-smmhp-generation/

Annexure – VI

List of suggested reading materials

S. No.	Name of Authors/Books/ Publisher	Year of Publication / Reprint
1.	Harvey, A., Brown, A. and Hettiarachi, P., "Micro Hydro Design Manual", Intermediate Technology,	1993
2.	Fritz, J.J., "Small and Mini Hydro Power Systems: Resource Assessment and Project Feasibility", McGraw Hills.	1984
3.	Gulliver, J.S. and Arndt, E.A., "Handbook of Hydro Electric Engineering", McGraw Hills.	1993
4.	Kausal, M.L. and Chauhan, G., "Planning and Design of Small Hydroelectric Projects", (Publication No. 305), Central Board of Irrigation and Power.	2006
5.	"Civil Engineering Guidelines for Hydroelectric Projects", (Vol. 4-Small Hydro), ASCE.	1989
6.	Nigam, P.S., "Handbook of Hydroelectric Engineering", Nem Chand and Bros.	2006
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