

1. Workshop on Geological and Hydrological Issues for Hydropower Design

Training on “Geological and Hydrological Issues for Hydropower Design”

2. Background

Hydropower projects development has been high priority for the government for quite some time now. Since 2008, the Government, on different occasion, has expressed its vision of thousands of megawatts construction with one or two decades.

These are not mere words, the recent report from the Ministry of Energy, Water Resources and Irrigation has said that Nepal has a total of 1,073MW is now in the national grid and within a year another 1000MW will be added in the grid. Until recently, Nepal Electricity Authority has done power purchase agreement (PPA) with 244 projects totalling 4138 MW. Majority of these projects are about to conclude their financial closing.

Government of Nepal is planning 15,000 MW to be constructed by 2028. As hydropower projects are cost intensive and have a commercial operation period of over 30-35 years, hence robust design, standard construction and efficient operation are must for sustainability. Out of the several factors affecting hydropower sector, geological and hydrological factors are the most significant and without due consideration to these factors hydropower projects may suffer negative impacts.

3. Workshop Rationale

Majority of hydropower projects are located in the mountainous terrain and now with development of more projects they are located in the Himalayan region. It is needless to point out that this region of Nepal has a fragile geology owing to which hydropower development is a challenge. Furthermore, the rivers, on which hydropower plants are based, are fed by either the glaciers or those originating from the Mahabharata Range are often laden with sediments. In addition, as most studies point out, the dreaded climate change is more likely to affect the hydrological regime of such rivers. Under such context, hydropower development is extremely challenging and requires robust design considering the geological and hydrological conditions.

In Nepal, there have been instances where the project cost and time have escalated due to geological condition, for instance the 30 MW Chameliya project developed by the state. More recently, reports of generation impact due to hydrology variation in rivers and wear and tear of turbines due to siltation have been widespread increasing downtime of power plants and maintenance cost. The mega earthquake of 2015, frequent landslides and occasional GLOFs have also devastated hydropower projects. Hence, without proper consideration to geology, hydrology and sediments successfully landing a hydropower project is not possible.

In this context, Independent Power Producers' Association Nepal (IPPAN), Nepal Tunnelling Association (NTA) and Hydro Lab Private Limited (HL) intend to conduct a training program to build capacity of private hydropower developers on "Geological and Hydrological Issues for Hydropower Design". Viewing this as an important need, Independent Power Producers

Association, Nepal (IPPAN) has developed a three-day residential training workshop for training and visit to hydropower construction site for the hydropower developer and associated industry workforce.

The main objective is to organize a training course in geological and hydrological conditions for robust design of hydropower projects representing private or public enterprises, employers, consultants or contractors.

4. IPPAN's role as capacity building for hydropower developers in Nepal

Independent Power Producers' Association, Nepal or commonly known as IPPAN was established in 2001 with an objective to facilitate and encourage private developers in hydropower sector. IPPAN is a member owned, non-profit, non-government and autonomous organization.

IPPAN's public affair work is to educate, advocate and act so as to remove barriers to hydropower project development. One of its main purposes is to act as link between the private hydropower developers and government ministries and departments so as to hasten the pace of hydropower development in the country.

IPPAN has been relentlessly working for capacity building of hydropower sector. It has organized numerous workshops, seminars and trainings for empowerment of the sector in technical, financial, risk management, and insurance sector related to hydropower. Notably, IPPAN organizes Nepal Power Summit every three years which provides a common platform for national and international hydropower companies and associated corporation to engage in dialogue for policy reforms necessary to expedite development of the sector. Recently IPPAN co-organized 'Himalayan Hydro Expo 2019' after success of the expo in 2018 bringing together national and international companies with hydro-power related product and services, banks, insurance companies, investors, electric vehicle dealers and manufacturers, construction equipment suppliers, for imparting knowledge, sharing and networking. The event was attended by over 60,000 visitors and received positive reviews.

5. Scope and Contents of the Workshop

The main objective of the project is to conduct a workshop on "Geological and Hydrological Issues for Hydropower Design". The workshop is intended to provide understanding of good practice geological investigation, hydrological study and design consideration. The training shall be conducted in a participatory approach with hands on activities and will cover the three main areas.

- Geology
- Hydrology
- Design Consideration

6. Tentative Workshop Plan (*tentative*)

Day 1: Travel to training Venue from Kathmandu and Site Visit

Day 2: Geology

- Geological Classification
- Geotechnical Investigation and Laboratory Testing
- Seismic aspect and Hazard Mapping
- Quantifying Risks for project cost calculation
- Geological Risk Sharing through contracts

Day 3: Hydrology

- Using time series data and rating equation
- Digitizing river flow information
- Using Hydro-met data
- Energy Generation Sensitivities owing to change in hydrology
- Climate Change Impact on river hydrology and energy generation

Day 4: Design Consideration:

- Basic Design Criteria (Hydrology and Geology)
- Resilient Design for extreme climatic variation
- Safeguarding Structure through design and early warning

Day 5: Travel back to Kathmandu

7. Duration of Training

Five days residential workshop with hydropower construction site visit

8. Participants and Venue

Participants will be from private hydropower developers as well as government officials engaged in hydropower. The course will be designed for 20-25 participants and organized at Trishuli, Nuwakot, Kathmandu