



Alumni - Nepal



**GREEN  
HYDROGEN  
LAB**

**Kathmandu University**

A Report of Webinar on

**“Hydropower to Hydrogen in Nepal:  
Opportunities, Challenges, and Way Forward”**

Jointly Organized by:

**NTNU Alumni Nepal, and  
Green Hydrogen Lab, Kathmandu University**

**11th September 2020**

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## SUMMARY

The Webinar, “Hydropower to Hydrogen in Nepal: Opportunities, Challenges, and Way Forward”, was organized to on 11 September 2020. NTNU Alumni Nepal and Green Hydrogen Lab, Kathmandu University have jointly hosted the event with the expectation to initiate discussions towards the transition of energy and economy of Nepal towards green hydrogen.

Recently there has been a sudden surge for discussions around the sustainability of the hydropower business in Nepal. Hydrogen to Fertilizer production is also evolving as the potential business for Nepal that could contribute to hydropower, food security, local employment, trade deficit, and many others to list. It seems to be a bit ahead of the development curve in Nepal for hydrogen, but a long transition phase is necessary and a prominent start is the discussions like this one.

The event turned out to be a huge success with a total of 693 registrations. There were 504 active participants, from 18 different countries in the meeting room, and an equally large number of viewers in the live streaming. The discussions and question answers were coherent. The take-home message was that Hydrogen could be new energy and economic era for Nepal, and all need to work together to achieve it.

The video of the complete event is available in this link: <https://youtu.be/vwORh3tWacI>

The slides from the speakers and other relevant documents about the webinar are available at <http://ghlab.ku.edu.np/activities/webinar110920/>

### Moderator

Pratik Pradhan, NTNU Alumni and Vice President at Butwal Power Company Ltd.

### Speakers

**Prof. Bhola Thapa**, Professor at the Department of Mechanical Engineering at KU, Member of operation and management committee of TTL, Advisor of GHLab at KU.

**Dr. Biraj Singh Thapa**, Assistant Professor at the Department of Mechanical Engineering at KU, Faculty In-charge of TTL, Team leader of GHLab at KU.

**Prof. Bruno G. Pollet**, Professor at the Department of Energy and Process Engineering at NTNU, Leader of Team Hydrogen at NTNU.

**Prof. Ole Gunnar Dahlhaug**, Professor at the Department of Energy and Process Engineering at NTNU, Leader of the HydroCen Project at NTNU.

**Prof. Krishna Kantha Panthi**, Professor at the Department of Geoscience and Petroleum at NTNU.

**Mr. Krishna Prasad Acharya**, President of Independent Power Producers’ Association Nepal (IPPAN).

**Er. Hitendra Dev Shakya**, Managing Director at NEA Company Limited.

### Rapporteurs

Ms. Anmol Parajuli, Environmental Engineer, Intern RA, Green Hydrogen Lab.

Mr. Pranabh Regmi, Mechanical Engineer, Intern RA, Green Hydrogen Lab.

## PROGRAM SCHEDULE

**14:00** – Opening remarks from the Chair of NTNU Alumni Nepal

**14:05** – Prof. Bhola Thapa, *Setting up the stage: Nepal Norway Cooperation in R&D for Hydropower Developments*

**14:15** – Mr. Krishna Prasad Acharya, *Current challenges for private hydropower developers in Nepal and way forward*

**14:30** – Prof. Krishna Kantha Panthi, *Preparedness of Hydropower sector in Nepal for alternative directions*

**14:45** – Prof. Ole Gunnar Dahlhaug, *European perspectives on H2H applications and message to Nepal*

**15:00** – Assist. Prof. Biraj Singh Thapa, *Opportunities from Hydropower to Hydrogen in Nepal and initiatives from KU*

**15:15** – Prof. Bruno G. Pollet, *Challenges with hydrogen technologies and lesson learned by NTNU*

**15:30** – Er. Hitendra Dev Shakya, *Government priorities for sustainable hydropower development in Nepal and Role of NEA*

**15:45** – Discussions

**16:00** – Remarks from distinguished guests:

- Mr. Jan Erik, Councillor (Energy), The Royal Norwegian Embassy in Nepal
- Dr. Rita Kumar, Senior Advisor, Office of International Relations, NTNU
- Dr. Damber Bahadur Nepali, Dean School of Engineering, KU

**16:20** – Vote of Thanks and Closing from Co-Chair, NTNU Alumni Nepal

## SYNTHESIS

### Abstract

This webinar focused on the idea of green hydrogen production in Nepal, discussing the opportunities, challenges, and way forward. Hydropower development in Nepal is at the focus of the national priority. More than 20000 MW of hydropower projects are under some stage of development. With the forecasted domestic demand for electricity is much lower than its production within a few years, there has been a sudden surge for discussions around the sustainability of the hydropower sector in Nepal.

The production and supply of green hydrogen energy from hydropower could be one of the innovative businesses for Nepal in the future. As the rest of the world is making a transition towards the hydrogen-based economy, the developing country like Nepal cannot alone remain behind. There is a need for a broader international collaboration for the knowledge and technology transfer to Nepal.

Since the technology has achieved a much higher development stage at the global level, for Nepal the start would be knowledge transfer and local adaptation. If the initiation is taken earlier, the transition period of the technology transfer will be much shorter. Intervention made by the Universities, Government, and Industries at present can open a new dimension for sustainable hydropower and hydrogen ecosystem in Nepal.

### **Summary Notes of the speakers**

The opening of the webinar was done by Moderator Mr. Pratik Pradhan. He highlighted the fact that Nepal has now become matured in Hydropower.

Mr. Narayanhari Rijal, the Chair of NTNU Alumni Nepal welcomed all the panelists and attendees. He talked about the huge potential of Nepal's hydropower and its growth in collaborations with Norway. He expressed his opinions about green hydrogen being a future source but also highlighted that no industrial setup was made to benefit this transition. He appreciated the sturdy steps taken towards green hydrogen in Nepal by GHLab, KU.

Prof. Bhola Thapa started by honoring the contribution of Prof. Igne Johansen as "Father of Engineering Program" in KU and remembered how Prof. Igne Johansen advised in establishing Mechanical Engineering education in Nepal. He honored Odd Hoftun and his contributions towards hydropower in Nepal. He drew similarities to the ideas of starting engineering in Nepal with investing in hydropower to hydrogen (H2H). He stated that KU emphasizes water and utilization of water, something which has been achieved by Norway-Nepal collaboration. He also listed the collaboration works in setting up engineering, increasing capacity in Nepal through TTL and HydroLab, PhD programs, and other programs. He advised focusing on the operation and management of the resources to generate the economy.

After the successful setting up phase, the program proceeded with the presentations by the speakers. Krishna Prasad Acharya expressed how the private sector participation has been flourishing in the Hydropower sector of Nepal contributing to 55% of demand and supply. He also stated the challenges faced by the hydropower sector in the country and what can be done to overcome the challenges. Prof. Krishna Kantha Panthi expressed the preparedness and capacity of hydropower development in terms of political leadership and vision. He presented on how preparedness depends upon the societies' vision, the vision of political leaders, the decision process, the environment for foreign investment, and most importantly the knowledge base. He related his understandings with three projects (Melamchi, Upper Tama Koshi, and Khimti) to demonstrate how projects are handled in Nepal. He mentioned that producing Hydrogen can be a good direction provided that there is government support.

Prof. Ole Gunnar Dahlhaug presented European perspectives on H2H applications and gave a message to the viewers about how Nepal can adopt the technologies adopted in Europe. He stated that hydrogen is a huge possibility in Nepal. He summarized the renewable energy milestones by the EU where he specifically spotlighted Norwegian ambition in reducing Carbon emissions with a 50% reduction by 2030. He gave a perspective of Kathmandu valley being free of fossils fuel in the future and highlighted that it is a possible dream to achieve.

Asst. Prof. Biraj Singh Thapa presented opportunities from Hydropower to Hydrogen in Nepal and the initiatives of GHLab. He put forth the importance of investing in alternative forms of energy due to the rising concerns of climate change and environmental concerns at the global level and surplus energy in the country. He shared the dream agenda carried by the GHLab for developing a hydrogen ecosystem in Nepal by the year 2040.

Prof. Bruno G. Pollet explained the challenges and opportunities with Hydrogen technologies and lessons learned by NTNU in terms of technical information. He showcased the experiences of Hydrogen and Fuel Cell Infrastructure at NTNU and focused on the role of education in terms of providing masters and doctoral studies programs related to Hydrogen technology. He explained about the technical features of different water electrolyzers systems where he discussed on the efficiencies of electrolyzers and how the existing efficiency can be improved.

Er. Hitendra Dev Shakya put forth Government priorities for sustainable hydropower development in Nepal and the role of NEA. He provided the current status of demand and supply and how it has progressed over time. He also goes on to state that the projections for demands are optimistic because even if full-electric society is achieved, the demand will still be lower than projected. He also mentioned that projects should not be carried out with the hope of foreign export. He stated that the system of Nepal demands for energy storage and focus should be put into that approach. He accepted that hydrogen is not economical now but finds no reason to not believe that it will be the future.

After the presentations, the program forged ahead with discussions and conclusions. Jan Erik started the conclusion phase of the webinar and expressed how Nepal has been progressing in terms of eradication of load shedding and green hydrogen is an excellent way forward. From the NTNU Official side Rita Kumar, NTNU Alumni, expressed that the program was very productive. She also rejoiced the bond between Nepal and Norway and is looking forward to furthering contributions. Dr. Damber Bahadur Nepali, Dean, SoE, KU, expressed special thanks to all the speakers, NTNU, NTNU Alumni, GHLab, and Norwegian Embassy for taking the step for clean energy. He added by establishing himself as a firm believer in green hydrogen technology and is looking forward to the progress of GHLab. Pratik Pradhan expressed his happiness towards the direction Nepal is taking in eradicating non-renewable sources and ultimately contribute to economical sustainability. He ended his remarks by stating his excitement and thanking the speakers, NTNU, NTNU Alumni, GHLab, and Norwegian Embassy. Nabin Basnet, Co-Chair of NTNU Alumni Nepal thanked all the participants, NTNU officials, and KU for the valuable remarks. He also thanked NREN and Dr. Rajendra Adhikari for providing technical support for the success of the webinar.

## **Conclusions**

1. Nepal needs to focus on the market for the electricity and should lean towards the prospect of using hydrogen for that purpose.
2. To make a transition towards the Hydrogen economy, one of the major areas that Nepal should focus on is industrial setup and readiness.
3. Hydropower is a means for prosperity and exporting and substituting fuel cannot be the only option. It is not to be thought about the immediate return in investment but Hydrogen could be an alternative option.

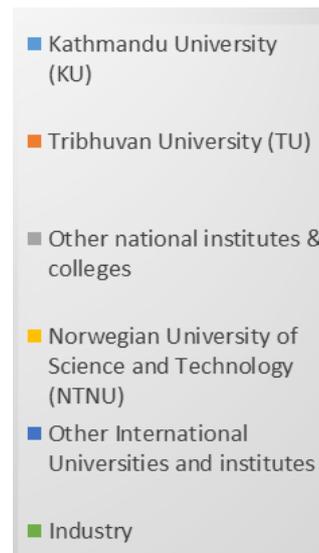
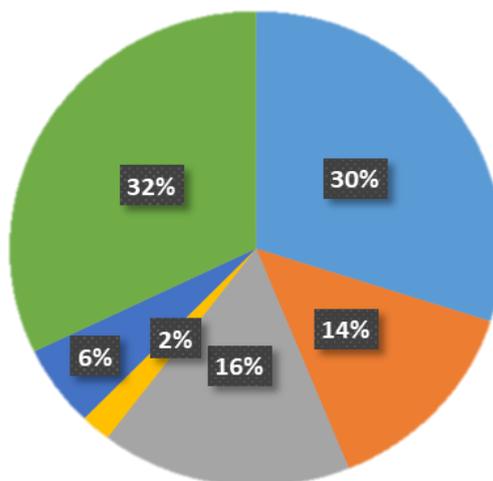
4. The opportunity of production of Hydrogen fuel can be explained by the fact that there is a target for 3,000 MW electricity addition in 3 years and 15,000 MW in 10 years.
5. The challenges in the hydropower sector can be addressed by changing policies, changes in pricing and tariff, improvement in transmission lines transforming hydropower execution to one window system, facilitate FDI, addressing projects under financial crisis, creating demand, aligning national trade policies, and targeting international markets.
6. The readiness to move in the direction of H2H can be achieved through well-thought planning, joint effort, and visionary leadership. The areas like research, education, and engineering institutions should be emphasized for the proper operation of new technologies.
7. Small scale production system of hydrogen from hydropower could be a precursor for aligned bigger projects.
8. Green Hydrogen can be a potential strategy for energy balance, operation, and production of fertilizers, industries, mining, and export.
9. Even if there is an electrification facility, diesel operated components cannot be replaced, and this suggests hydrogen fuels to be the closest alternative.
10. The contribution from the academic side to the cause with the initiation of a full-fledged green hydrogen lab in Kathmandu University with research on H2H-FIT sets priorities and can accomplish its targets provided that there are equal participation and involvement of industries and the government sector.

## APPENDIX-I: Participants Summary

**Total number of Participants: 504**

**List of Attendees (Country Wise login): 18 countries**

- Nepal: 452 participants
- Norway: 20 participants
- India: 6 participants
- Australia: 5 participants
- Finland: 3 participants
- Mongolia: 3 participants
- Hong Kong: 3 participants
- Denmark: 2 participants
- USA: 2 participants
- China: 1 participant
- Bhutan: 1 participant
- Germany: 1 participant
- Korea Republic: 1 participant
- Netherlands: 1 participant
- Pakistan: 1 participant
- Qatar: 1 participant
- Singapore: 1 participant
- UK: 1 participant



**List of Attendees (Organization Wise)**

- Kathmandu University (KU): 151 participants
- Tribhuvan University (TU): 70 participants
- Other national institutes & colleges: 83 participants
- Norwegian University of Science and Technology: 10 participants
- Other International Universities and institutes: 28 participants
- Industry: 162 participants

## APPENDIX-II: Program Document

## Talk Series (NTNU Energy): Episode 2

A Webinar on:

# “Hydropower to Hydrogen in Nepal: Opportunities, Challenges and Way Forward”

### Schedule:

14:00 – N-10:15	Opening remarks from NTNU Alumni official
14:05 – N-10:20	Prof. Bhola Thapa, <i>Setting up the stage: Nepal Norway Cooperation in R&amp;D for Hydropower Developments</i>
14:15 – N-10:30	Mr. Krishna Prasad Acharya, <i>Current challenges for private hydropower developers in Nepal and way forward</i>
14:30 – N-10:45	Prof. Krishna Kantha Panthi, <i>Preparedness of Hydropower sector in Nepal for alternative directions</i>
14:45 – N-11:00	Prof. Ole Gunnar Dahlhaug, <i>European perspectives on H2H applications and message to Nepal</i>
15:00 – N-11:15	Assist. Prof. Biraj Singh Thapa, <i>Opportunities from Hydropower to Hydrogen in Nepal and initiatives from KU</i>
15:15 – N-11:30	Prof. Bruno G. Pollet, <i>Challenges with hydrogen technologies and lesson learned by NTNU</i>
15:30 – N-11:45	Er. Hitendra Dev Shakya, <i>Hydropower to Hydrogen to Urea for surplus electricity management.</i>
15:45 – N-12:00	Discussions
16:00 – N-12:15	Remarks from Norwegian Embassy/ NTNU Officials/ KU officials
16:20 – N-12:35	Vote of Thanks and Closing

**Date: Friday, 11<sup>th</sup> September 2020**

**Time: 14.00 – 16.30 (NPT)**

**Register here:**



<https://bit.ly/3hgoa5a>

## Brief Biography of the Speakers

	<p><b>Prof. Bhola Thapa</b> is a Professor at the Department of Mechanical Engineering at Kathmandu University. He is a member of the operation and management committee of the Turbine Testing Lab and Advisor of Green Hydrogen Lab at Kathmandu University. He has served KU as the Head of the Mechanical Engineering Department; Dean School of Engineering, Registrar, and Acting Vice-Chancellor. He has completed his PhD from NTNU in 2002 in the field of Sediment erosion in hydraulic machines. Email: <a href="mailto:bhola@ku.edu.np">bhola@ku.edu.np</a></p>
	<p><b>Dr. Biraj Singh Thapa</b> is an Assistant Professor at the Department of Mechanical Engineering at Kathmandu University. He is serving as the Faculty In-Charge of Turbine Testing Lab, and Team Leader of Green Hydrogen Lab at Kathmandu University. He has completed his PhD from NTNU in 2016 in the field of Sediment erosion in Francis Turbines. Email: <a href="mailto:bst@ku.edu.np">bst@ku.edu.np</a></p>
	<p><b>Prof. Bruno G. Pollet</b> is a Professor at the Department of Energy and Process Engineering at NTNU. He is the Leader of Team Hydrogen at NTNU, which is the largest hydrogen project in Norway. Email: <a href="mailto:bruno.g.pollet@ntnu.no">bruno.g.pollet@ntnu.no</a></p>
	<p><b>Prof. Ole Gunnar Dahlhaug</b> is a Professor at the Department of Energy and Process Engineering at NTNU. He is the Leader of the HydroCen Project at NTNU, which the largest R&amp;D project in hydropower in Europe. Email: <a href="mailto:ole.g.dahlhaug@ntnu.no">ole.g.dahlhaug@ntnu.no</a></p>
	<p><b>Prof. Krishna Kantha Panthi</b> is a Professor at the Department of Geoscience and Petroleum at NTNU. He has 27 years of experience in research and implementation of rock engineering, tunneling, and hydropower projects. He has contributed to the development of many hydropower projects in Nepal and still very active in the Nepalese hydropower community. Email: <a href="mailto:krishna.panthi@ntnu.no">krishna.panthi@ntnu.no</a></p>
	<p><b>Mr. Krishna Prasad Acharya</b> is the President of the Independent Power Producers' Association Nepal (IPPAN). IPPAN was established in the year 2001 with the intention of encouraging the private sector to work in the area of hydropower in Nepal. He is Executive Chairperson of Peoples Energy Ltd developing the Khimti-II HEP 48.8 MW project and also Chairman and Director of several hydropower projects Email: <a href="mailto:bhuwajee@gmail.com">bhuwajee@gmail.com</a></p>
	<p><b>Er. Hitendra Dev Shakya</b>, Managing Director at NEA Engineering Company Limited, which is a Nepal Government-owned company, established to provide complete engineering services and solutions to hydropowers and infrastructures. He has a multitude of work expertise. He was positioned as the director of the Nepal Electricity Authority. He also served as a power sector specialist at the Office of Millennium Challenge Nepal. Currently, he is a PhD candidate at KU with the subject of Electricity Trade Policies. Email: <a href="mailto:hitendradev@hotmail.com">hitendradev@hotmail.com</a></p>