Kamal Gautam of rPlus Hydro: Connecting the Global Hydro Community Through the Khimti Forum

The Khimti I Hydropower Project's powerhouse area on the left bank of Tamakoshi River, Kirne, Dolakha, Nepal.

Kamal Gautam is the founder of the Khimti Forum, a virtual network of professionals with a common interest in infrastructure, energy, environment, and economics. In his day job, he is the director of engineering for rPlus Hydro, a pumped storage hydro project development company. He has years of experience in hydropower engineering, spanning Nepal, the United States, Pakistan, Uganda, Laos, and other locations around the world. In this interview, Mr. Gautam tells us more about the many accomplishments of his hydro career, the development of the Khimti Forum, and his current role in pumped storage development.

Hydro Leader: Please tell us how you started your hydropower engineering career.

Kamal Gautam: I started my career in 1993 with the Butwal Power Company (BPC), a pioneering hydropower developer in Nepal. The BPC was established in 1966 by a visionary Norwegian engineer, Mr. Odd Hoftun, as part of his work with the United Mission to Nepal. At the time I joined BPC, Nepal was experiencing several hours of blackouts every day due to a shortage of electricity supply, and the Nepalese government had just introduced the 1992 Electricity Act, opening business opportunities for independent power producers (IPP) to build, own, operate, and transfer (BOOT) hydropower plants. As a design engineer, I was closely involved in the design and engineering of the 60-megawatt (MW) Khimti I Hydropower Project. Statkraft of Norway and BPC developed the project under a BOOT agreement by setting up a special-purpose company called Himal Power Limited.

Although the Khimti project was a medium-sized project by its capacity, it pioneered private-sector investment in hydropower through a power purchase agreement with the Nepal Electricity Authority, the national utility. Multilateral private-sector investors, including the International Finance Corporation and the Asian Development Bank, were the lenders for the project. The Norwegian Agency for Development Cooperation offered grants to support various social and environmental mitigation programs as part of the project funding. For me, as a young engineer, being part of this flagship project was an exciting opportunity. After 3 years of design office assignments, I was asked to go to the construction site and manage construction contracts as the resident engineer, representing the developer. I spent the following 4 years at the construction site, working with the construction companies until the power plant was fully commissioned and interconnected with the Nepalese national grid.

The Khimti project was a complex project from an engineering point of view, with more than 11 kilometers (nearly 7 miles) of tunneling and an underground powerhouse with five Pelton units with horizontal shafts under a design head of 660 meters (2,165 feet). It also included a large desander basin designed to exclude sediment from the Khimti River before the water entered the headrace tunnel. Most of the headrace tunnel and headworks construction was managed without an access road. Construction materials were primarily transported by mules and human laborers.

Not only were there technical and logistical challenges, but there were also social and political challenges. The project was in an underprivileged community. As part of the project, new roads were built, villages were electrified, and social infrastructure such as schools and health centers were improved or built. I volunteered to spearhead the establishment and management of the Khimti Project

PHOTOS COURTESY OF HIMAL POWER LIMITED.

School, which was located in the powerhouse area and open to children of the project workers as well as children from the community. Today, it is a highly regarded high school. Today, the plant has been in operation for 22 years with remarkable reliability and has significantly contributed to supplying clean electricity in Nepal.

Hydro Leader: Would you tell us about your career after the Khimti Project?

Kamal Gautam: After the Khimti Project was commissioned in 2000, I joined a 2-year postgraduate degree program in hydropower and dam engineering at the IHE Delft Institute for Water Education in the Netherlands. Upon completing the program, I started working for a Norwegian engineering firm, NORPLAN, at the Melamchi Water Diversion Scheme, a megaproject designed to bring drinking water into Kathmandu, Nepal, through a 27-kilometer (16.7-mile) tunnel drilled through the mountains. I didn't stay too long in that job, because I wanted to pursue my PhD in engineering. Meanwhile, the project itself was not progressing well due to political instability and an ongoing civil war in the country. In 2004, together with my family, I moved to the United States and began a PhD program at the University of Hawaii at Manoa, where I spent the next 5 years. In 2009, I joined Mead & Hunt, an engineering consulting firm headquartered in Madison, Wisconsin. There, I took a role as a project engineer, investigating the feasibility of adding a hydropower facility to an existing nonpowered dam on the Mississippi River.

Hydro Leader: Would you please tell us about your international work experience?

Kamal Gautam: In 2011, I moved to California for a job with a company called MWH, now known as Stantec. My association with MWH provided me opportunities to familiarize myself with existing hydropower stations in Northern California. As a consulting engineer, I managed a number of refurbishment and upgrade projects for Pacific Gas and Electric Company (PG&E). I also remotely supported a project in Indonesia. Thereafter, I became more interested in international projects and accepted an offer to join the Austrian-German company ILF Consulting Engineers in 2014. That began a new stage in my career with frequent travels across the continents, particularly to Austria, Canada, Germany, Laos, Pakistan, and Uganda, working on various greenfield hydropower projects. Pakistan is a country with a lot of hydropower potential, and it is currently building several large-scale hydropower projects. Another interesting assignment I had was in 2014 in Uganda, where I was asked to audit the ongoing construction of two large-scale hydropower projects funded through bilateral cooperation with the government of China.

Hydro Leader: Why and how did you start the Khimti Forum?

Kamal Gautam: Before the COVID-19 pandemic, I used to travel for my projects and meet people. Once the lockdown started, I was pretty much confined to my house. I needed to figure out a way to connect with my friends, colleagues, and professional networks. I started a small group, primarily composed of the folks that I knew from the Khimti Project, who now live and work in different parts of the world, and in May 2020, I scheduled a Zoom call with about 10 people. We decided to provide a structure to upcoming gatherings by including a professional talk on a preselected topic. Everyone in the group was interested to learn how the Khimti Hydropower Project had performed over the past 20 years, so we agreed to make the topic for the next discussion "Operational challenges and success stories of the Khimti Project." It was led by Mr. Ishwar Deshar, who had known the plant since its commissioning time and is now the plant manager.

After a few monthly meetings, the Khimti Forum gained momentum through word of mouth and gradually transformed into a network of like-minded professionals regardless of affiliation, profession, or location. Now, it feels like a true global network. Our mission is to facilitate knowledge sharing and the exchange of project experience between professionals. I believe this contributes to an open-access knowledge base that can promote better planning and execution of economically affordable and environmentally sustainable projects. The forum's umbrella theme is "Infrastructure, Energy, Environment, and Economics," and our speakers include both seasoned and young professionals in these disciplines from both industry and academia.

Hydro Leader: How are the monthly Khimti Forum talks organized?

Kamal Gautam: Each monthly event has a theme and typically has one main speaker and sometimes a featured guest. Presentations last about 1 hour, and attendees can ask questions or make comments in a chat box. At the end of the presentation, the moderator will summarize these questions and comments and ask the speakers to respond. This will usually generate new questions, and a more direct dialogue opens among attendees and speakers. We also make an effort to introduce new attendees and special guests. The open discussion will last for another hour, often longer. This interaction between speakers and attendees is unique to our forum, and we keep receiving positive feedback about it.

Hydro Leader: How many people participate in the monthly calls today?

Kamal Gautam: The size of the audience fluctuates depending upon the subject of the discussion. Normally, it ranges from 30 to 60. The most I've seen attending live is about 80. We meet every second Saturday of the month, starting at 7:00 a.m. Pacific Time, which is 3:00 p.m. in London, 8:00 p.m. in New Delhi, and midnight in

Melbourne. Although a lot of people want to participate, the meeting time is not always convenient for many.

Hydro Leader: Where are most of the participants based?

Kamal Gautam: Primarily Africa, Asia, Europe, North America, and occasionally South America. The timing is not convenient for participants in Australia and New Zealand. The participation for a given event is strongly influenced by the network of the speakers themselves and the subject of their presentation.

Hydro Leader: Is there a geographical focus when it comes to the projects you're discussing?

Kamal Gautam: At the beginning, we may have appeared to be focused a bit more on Asia because the group started with a large number of professionals connected to Nepal, but we are equally interested in projects in any part of the world.

Hydro Leader: What have been the results of the forum, other than being a source of continuing education?

Kamal Gautam: The monthly presentation series provides a forum for professional networking. At the end of the program, whoever has extra time may stay longer to interreact, casually network, and exchange contact details. Sometimes, people ask me to provide them with contact details of individuals or speakers with whom they would like to discuss specific questions.

As an open-knowledge forum, we aim to contribute to the development of new generations of leaders in infrastructure and energy through knowledge and experience sharing. We are interested in attracting young professionals, especially women and minorities. Some of our advisors also gladly offer mentorship to our speakers, especially young professionals.

Hydro Leader: What differences have you observed between projects in North America or Europe versus in Asia or Africa?

Kamal Gautam: The hydropower industry in the United States and Europe is mature. These countries developed hundreds of hydropower projects during the last century that are now 50–100 years old and are still running well. During my work in Northern California, I saw plants that were built in the early 20th century and are still functional, though the equipment has significant wear and tear and their efficiency is lesser than that of new technology. The U.S. hydropower industry has a lot of opportunities for the upgrade, refurbishment, or replacement of existing facilities. The civil structures of hydropower facilities may last for 100 years or more without the need for any significant improvement.

Some of the dams built early in the last century do not have fish bypass systems. Adding fish bypass structures is an opportunity to update the overall project facilities to make them comply with current environmental regulations. Adding hydropower to existing nonpowered dams is another area, but it may not always be economically attractive.

Now, we are transitioning into carbon-free energy systems that go beyond conventional hydro. The challenge is how to store energy from renewable resources and then use it when it is needed the most. This requires grid-scale storage systems, and currently, pumped storage hydro offers a proven and viable technology to meet that need. Europe and China are developing a lot of pumped storage projects. Australia is currently building the flagship Snowy 2.0 pumped storage project, which is worth more than $6 billion. The United States is slow in this field, but a lot of coal-fired plants are set to retire, and in my opinion, they will be replaced by renewables plus storage plants.

Most developing countries are still developing traditional hydro facilities, and it makes sense for countries like Nepal and Pakistan and many African countries because there are plenty of untapped natural resources. Occasionally, old hydro plants and dams in the United States are retired and removed. I have not come across any such cases in the developing world, particularly in those countries where I have spent time. Renewable energy is also slowly gaining momentum in those countries, mainly because of their abundant solar resources, and the technology is gradually becoming affordable. Some of these countries have also started brainstorming about whether they should start planning pumped storage plants. One of the issues often discussed in the Khimti Forum is how to tackle climate change in the planning and operation of hydropower, energy, and infrastructure projects, which is equally challenging in all countries, regardless of location.

Hydro Leader: Are new hydro and pumped storage plants in developing countries primarily funded by national governments or by private investors?

Kamal Gautam: I have seen three varieties of funding for conventional hydro facilities. First, some are funded by local governments, local utilities, or IPPs with local resources. Second, some are funded by multilateral organizations such as the World Bank, the International Finance Corporation, the German Development Bank, the French Development Agency, the Asian Development Bank, or the African Development Bank. Normally, these funds are directed through national government agencies as either soft loans or grants. Third, some are funded by international IPPs. For example, Statkraft of Norway has projects and plants in Albania, Chile, India, Nepal, Peru, and elsewhere. In countries such as Laos, Pakistan, and Uganda, there is a lot of bilateral funding from China.

Hydro Leader: Are projects in the developing world generally large in scale?

Kamal Gautam: Projects in the developing world range from mini to large scale. There are many mini or small hydro projects in Nepal and similar countries. These mini and small systems are not necessarily interconnected with the grid and may serve small communities and villages. Such projects are owned either by the community or by local entrepreneurs and private owners. Normally, large projects are owned by state-owned utilities or international IPPs, and they are interconnected with national or regional grids to supply cities and industries.

Hydro Leader: What motivated you to join rPlus Hydro, and when did you start with the company?

The Seminoe Reservoir in Wyoming has been proposed to serve as the lower reservoir of the Seminoe Pumped Storage Project being developed by rPlus.

Kamal Gautam: In 2018, while I was part of AECOM's dams and hydropower team, I was introduced to Matthew Shapiro, now the CEO of rPlus Hydro, through a project related to pumped storage. He was deeply involved in identifying and promoting pumped storage projects in the United States. I found his work fascinating, because during my work with ILF Consulting Engineers, I had been exposed to the ideas and benefits that pumped storage projects could provide in the context of renewable energy. I had also visited a couple of operating pumped storage projects in Austria and learned about their benefits. I was familiar with several such projects being built or planned in Europe, and I had realized that the future of pumped storage projects would be coming to the United States soon.

Around fall 2020, the position of director of engineering was open at rPlus Hydro. I expressed my interest to Matthew, and he introduced me to the rPlus leadership team. rPlus is a future-oriented company with a stellar team of professionals, and it is growing. Matthew Shapiro is the mastermind behind these projects, and Luigi Resta, the president of rPlus Hydro and the CEO of rPlus Energies, is a visionary leader who provides oxygen to these renewable energy projects and brings them to life. I was inspired by their vision, and when I was offered a role at rPlus, it did not take too long for me to decide to accept.

Hydro Leader: Please tell us about your current role at rPlus Hydro.

Kamal Gautam: rPlus Hydro is a national leader in its industry with 7 gigawatts of pumped storage projects in development. We have more than 12 projects in our pumped storage hydro portfolio. As the director of engineering, my role is to create engineering strategies and direct engineering studies and investigations to prepare these projects for construction. I manage the engineering side of these projects, working internally with our cross-functional development team and externally with engineering firms such as Stantec, HDR, GEI, Mott MacDonald, SNC-Lavalin, and many others.

Hydro Leader: Is there anything you would like to add?

Kamal Gautam: I'm excited to continue working on pumped storage projects in my current role. Currently, we are completing engineering feasibility studies for three projects. One of our most advanced projects, which is now in its development stage, is the White Pine Pumped Storage Project, located near Ely, Nevada. This is a closed-loop project with static head of 2,100 feet and a capacity of 1,000 MW with 8 hours of storage capacity. The second-most-advanced project in our portfolio is the Seminoe Pumped Storage Project in Wyoming. Seminoe has a potential of 900 MW with 10 hours of storage capacity. It uses the existing Seminoe Reservoir as its lower pool. We have submitted Federal Energy Regulatory Commission draft license applications for both these projects. Currently, we are investigating subsurface geological conditions for these projects to obtain suitable design parameters and to characterize ground conditions for underground powerhouses, tunnels, shafts, and dam foundations. We aim to complete these feasibility studies midway through next year. A third project, the 500 MW Oquirrh project in Utah, is in the very early stages of engineering feasibility. We are also conducting due diligence and screening studies for nine other projects, advancing step-by-step toward full-fledged feasibility studies. We hope that the Inflation Reduction Act of 2022, which was just passed, will help these projects come to life even sooner.

Kamal Gautam is the director of engineering at rPlus. He can be contacted at kgautam@rplusenergies.com.

PHOTOS COURTESY OF RPLUS HYDRO.