

ENERGY COMMUNIQUE

EDITORIAL

BARRIERS TO SMALL DISTRIBUTED RENEWABLE ENERGY SYSTEMS — PART I

Nepal's energy situation has taken a U-turn in the last one and half years. We have come a long way from long hours of load shedding to a completely reliable supply through national grid. Though we still import up to 30% of our electricity from India, we have managed to build proper infrastructure to do so in more efficient manner. This dry season, though expected, we did not face any load shedding, especially in the urban area. Does this mean that we are energy self-sufficient now? Our energy demand is estimated to rise to 18,000 MW in the next 20 years. We have great potential in hydro, however, now is also the time to think about diversifying our energy mix to achieve reliable, efficient and lower cost energy supply.

The developed world is moving away from centralized generation

to distributed generation system.

Nepal should start moving towards the same direction. US energy mix now consists of 10% renewables and is expected to constantly grow. China targets to go 100% renewable energy by 2050. India has set a goal of 100 GW by 2022 out of which 40 GW is expected to be injected from distributed renewable energy generators (DREG) or rooftop solar. Nepal's urban area is an ideal location for DREG. One good aspect of rampant urbanization is the availability of roof space to generate enough renewable energy to manage higher demand of big cities during day time. With cost of grid electricity price ever rising, prospect of DREGs seems better than at any point of time. So, what are the barriers which are or can impede the scalability of DREGs?



Mr. Aashish Chalise
CEO
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An EDC Member Organization

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CAPEX or Capital Cost

The upfront investment for installing small scale renewable energy solution is high. Per KW cost of these systems is anywhere from 1.5 Lakhs to 2 Lakhs depending on the size. The price per KW does go down as the system size increases. During the long hour of load shedding days, customers had no choice but to install the solar battery back-up solution. They did not care much about the cost. But now, the grid supply is reliable. To invest large amount to save energy cost on a long run is a hard prospect to sell. Anyone who is investing, especially in Nepal wants a quick return; comparable to real estate investment or high interest-bearing account.

Delay in implementation of net metering

It has been almost a year since Nepal Electricity Authority first came out with a policy to drive net metering systems. Net metering is a process of managing your electricity bill by producing electricity in your own premise by DREGs and exporting excess energy which is

not utilized by captive load back to the grid. The energy imported and exported are netted thus your electricity bill reduces. Ministry of Energy has brought forward several policies. However, there seems to be a major lack of coordination between the ministry and Nepal Electricity Authority (NEA) regarding net metering. Two contradicting policies have come out from them that has added to the confusion. The contradiction is not limited to minor details. Fundamentals of their policies do not match at all. This further delays the implementation of net metering. It seems that the ministry and NEA are working independently without consultation. Apart from the policy level issues, NEA is missing the most important device necessary for net metering, the net meter, which is still in the process of procurement. The customers who were excited a year ago have already lost interest by now.

Availability of affordable and reliable Financing

The only way we see DREGs net metering system scaling is with

affordable easy financing. Though there have been many schemes for solar financing in the past, none have been effective. The subsidized interest rate often seems to keep rising as the bank's base interest rate increases. For example, most recent interest subsidy for solar started at 2.5% per annum where the government covered the gap between the bank rate and solar interest rate (2.5%). But as the liquidity crisis deepened, banks raised their interest rates. With the rising interest rates the 2.5% interest rate soon became 7%. There was no mechanism to cap the solar interest rate at 2.5%. Customers who expected their solar EMIs at a certain amount, saw it rising every month. Now, it will be twice as hard to convince solar users to access "soft" loans for their system. Banks also seem very reluctant to finance small scale systems. Even if they do; a collateral is required. Pure energy financing is a distant concept in Nepal and we highly doubt it will be a part of main stream banking system anytime soon.

The solar legacy

Customers have had a poor experience with solar in urban areas of Nepal. Whether because of the high cost or lack of service provided by solar companies. So much so that customers seem to turn their heads away when they hear solar. We have visited many households and institution who have installed solar, the feedback has been the same everywhere. Managing the batteries have been a nightmare. Inverters getting shot occasionally is another common problem that customers have faced. There are grievances related to price and performance of the system as well. The service provided (or lack of it) has been appalling. Changing customers perception that the new form of solar (grid tied) is different from old battery backup system is a major challenge.

Lack of innovative incentive schemes

As mentioned above, the existing interest subsidy schemes have not

been very effective. Capital subsidy schemes have also failed. The problem with capital subsidy is with delivery and fraud.

In many parts of the world innovative incentive schemes has played a big role in scaling of DREGs. In the US, incentive is given as Investment Tax Credit (ITC). Consumers can offset up to 30% of their tax liability under the scheme. It has been very effective. Whereas in India an upfront 15% capital subsidy is offered, which has not been very effective. Policy makers need to treat solar electricity producers same as hydro electricity producers. To scale DREGs, Renewable Energy Service Companies (RESCOs) must play the role of aggregators of DREGs. If RESCOs can access similar incentive to that of hydro developers, DREGs have a great future. Subsidies must be fair, effective and contribute to adoption of the renewable energy by the masses. DREGs help the utilities the most, if the incentive is driven by the utilities, it will have a sustainable impact.

Lack of RESCOs

There are many solar companies in Nepal, but they are all operating on a trader model rather than a RESCO model. The opportunistic selling of solar is in the history books now. Companies that are limited to traditional model have already or soon inevitably close shop. We need more innovative companies, operating on pure RESCO model. Companies that can think outside the box, take risk and deliver. I see the lack of it as the foremost and the biggest barrier in scaling DREGs. We need a lot of RESCOs to scale DREGs and renewable energy in Nepal.

EDC ACTIVITIES

EDC signed MoU with Investment Corporation of Dubai



INVESTMENT
CORPORATION OF
DUBAI

On 26th March 2018, EDC entered into an exclusive agreement with Investment Corporation of Dubai, an organisation of United Arab Emirates, the principal investment arm of the Government of Dubai whose mandate is to consolidate and manage the government of Dubai's portfolio of commercial companies and investment of UAE.

ICD has a rich portfolio of assets, both locally and internationally, across a broad spectrum of the sectors (finance & investments, transportation, energy & industrial, construction etc.) that form the blueprint of Dubai's dynamic economy. It has built a strong foundation of key indigenous companies from multiple sectors that Dubai has worked strategically over four decades to achieve dominance in. ICD is now furthering Dubai's presence and expertise by expanding globally, pursuing an ambitious investment strategy that is disciplined, sustainable, and provides synergy with its existing portfolio.

EDC delegation visits the H.E Ambassador of UAE to Nepal



On 26th March 2018, EDC delegation led by Mr. Sujit Acharya visited Honorable Ambassador of UAE to Nepal, His Excellency Mr. Saeed Hamdau Al Nagei. The meeting paved way for robust cooperation on clean energy, infrastructure and drinking water between Nepal & UAE.

EDC ACTIVITIES

Invitation to participate in Himalayan Consensus Summit 2018



Mr. Acharya was invited to be the panellist in the Himalayan Consensus Summit 2018, 22nd March 2018, Hotel Himalaya. He was invited to be the panellist for the session “Mainstreaming Clean Energy” along with Mr. Govind Raj Pokharel (Former Executive Director, AEPC), Mr. Kulman Ghising (MD, NEA), Mr. Ramesh Anand Vaidya (Senior Advisor—Water & Air, ICIMOD). The session was moderated by Ms. Claudia Hiepe (Deputy of Mission and Head—German Development Cooperation Nepal). Ms. Itnuma Subba and Mr. Kushal Gurung from EDC were also invited to the event.



EDC ACTIVITIES

The tender notice for the month of March

HARATI is an IT company, working in several technologies based products, services and provides online service portal (tendernotice.com.np). Following is a list of tender notice provided by HARATI for the month of March;

TenderNotice.com.np

Tender, Bids and Notices related to Hydro and Energy segments in Nepal

Date : March 2018

S.No.	Notice Publisher	Description	Published Date	Notice Category	Product Service
1	Nepal Electricity Authority, Engineering Services Directorate, Dudhkoshi Storage Hydroelectric Project, Durbar Marg, Kathmandu	Supply and Delivery of Computers, Printers and Telephones, Supply and Delivery of Fitting of Furniture and Miscellaneous	3/29/2018	Quotation	Other Product/ Services
2	Raghuganga Hydropower Limited, Beni, Myagdi	सुरक्षा सेवा करारमा	3/28/2018	Quotation	Construction/ Building
3	SJVN Arun-3 Power Development Company (P) Ltd., Khandbari, Nepal	Amendment Notice	3/27/2018	Amendment Notice	Other Product/ Services
4	Ministry of Energy, Water Resources and Irrigation, Department of Electricity Development, Budhiganga Hydroelectric Project, Kalikasthan, Kathmandu	Construction of Access Road, Irrigation Systems and Micro-Hydro Construction	3/23/2018	Quotation	Construction/ Building
5	Ministry of Energy, Water Resources and Irrigation, Department of Hydrology and Meteorology, Naxal, Kathmandu	Supply and Delivery of Manual Meteorological Instruments	3/22/2018	Tender	Other Product/ Services
6	Ministry of Population and Environment, Alternative Energy Promotion Center (AEPIC), South Asia Sub Regional Economic Corporation Power System Expansion Project	Construction and Completion of Hydro Subproject	3/20/2018	Tender	Construction/ Building
7	Ministry of Population and Environment, Alternative Energy Promotion Center (AEPIC), National Rural and Renewable Energy Programme (NRREP), Khumaltar Height, Lalitpur	Consulting Services for Conducting Batch Micro Hydro Management Training	3/20/2018	Proposal	Consulting
8	Nepal Electricity Authority, Kulekhani III Hydroelectricity Project, Makawanpur	Supply and Construction of Prefab Building	3/19/2018	Tender	Construction/ Building

EDC ACTIVITIES

9	Upper Tamakoshi Hydropower Limited, Upper Tamakoshi Hydroelectric Project, Gyaneshwor, Kathmandu	Construction of Police Station Building	3/12/2018	Tender	Construction/ Building
10	Ministry of Water Resources and Energy, Department of Hydrology and Meteorology, Naxal, Kathmandu	Construction of Access Road and Office Building	3/12/2018	Tender	Construction/ Building
11	Ministry of Population and Environment, Alternative Energy Promotion Center (AEPIC), National Rural and Renewable Energy Programme (NRREP), Khumaltar Height, Lalitpur	Supply, Delivery, Installation, Testing and Commissioning of Electro-Mechanical Equipment of Hydropower Project	3/11/2018	Tender	Electronics/ Electric Utilities
12	Nepal Electricity Authority, Engineering Services Directorate, Dudhkoshi Storage Hydroelectric Project, Durbarmarg, Kathmandu	Construction of NEA Corporate Office Building	3/4/2018	Tender	Construction/ Building

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TenderNotice

MEDIA COVERAGE

CHINADAILY

KEY TO AN INTERCONNECTED WORLD

Key to an interconnected world

Energy sector leader says China is bringing Asian countries closer together by fostering direct engagement

Q&A | SUJIT ACHARYA

What three words best describe the past 40 years of reform and opening-up in China?

Historic poverty alleviation.

How did the influences and contributions of China's 40 years of reform and opening-up impact the country's development?

The key contribution is that the largest poverty alleviation goal in the history of mankind has been achieved by the reform measures adopted by the Communist Party of China.

Besides this, China's reform has catapulted the nation to becoming a global power, fostered innovation and instilled a sense of much deserved confidence and pride among its citizens.

How has China influenced and contributed to the world's development during this time?

Poverty is the worst disease (albeit man-made) a human being can suffer from — and China seems to have found a cure. Hence this reform influences other nations to also emulate such a successful reform model envisioned by China. Additionally, China's reform is currently creating the most interconnected world ever seen (through its Belt and Road Initiative).

How have China's achievements over the last four decades influenced and contributed to the common man around the world?

The key overlooked contribution of China's reform to the common man is its first-time access to daily necessities at an affordable price. The common man in the devel-



Sujit Acharya, founder, IDS Energy and IDS Solar; chairperson, Energy Development Council (Nepal).

oping world would not be able to afford daily amenities for survival, and increased life expectancy would not have occurred without 'Made in China' products. For example, an affordable electric blanket or a warm

feather jacket to an elderly or sick man in a cold developing country would not have been accessible to him if such items were not made in China.

Who and what have you paid the most attention to during China's 40 years of reform and opening-up?

I pay most attention to the Chinese Communist Party's unique drive over four decades to ensure reform was and is being achieved. Their ability to repeatedly implement projects on or before schedule makes them the most successful government in the world.

What do you want to know most about China's achievements over the last 40 years?

I am most interested to know how such a large government is able to

ensure timely implementation of projects.

In what ways have China's reform and opening-up promoted China-Asia relations?

China-Asia relations have been promoted by the major projects of interconnectivity that China has envisioned — mainly the Belt and Road Initiative. This interconnectivity will foster direct engagement between not only Asian countries and China, but also between various Asian countries themselves. Therefore this deeper engagement will bring Asian countries closer to each other and reduce the chances of misunderstanding. Additionally, other Asian countries now understand that Asia is the center of the world in terms of culture, market and innovation.

Source: China Daily Asia Weekly

The Himalayan

OVERCOMING BARRIERS IN HYDROPOWER DEVELOPMENT

Overcoming barriers in hydropower development

NEPAL NEEDS REBRANDING TO SHOW INVESTORS THAT THE COUNTRY IS READY FOR HYDROPOWER PROJECTS

Sushil Pokharel
Kathmandu

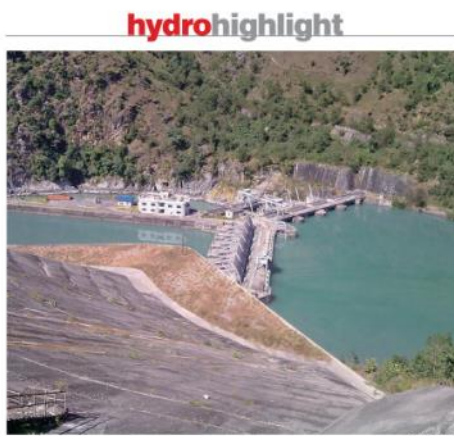
While the history of hydropower development dates back to 1911 in Nepal, the country is still struggling to harness hydropower potential to its minimum requirement. It has been told over and over again that Nepal's economically feasible hydropower generation capacity is one of the highest in the world. However, this huge potential remains untapped.

Nepal is blessed with abundant hydro resources, thanks to the country's major rivers and their small tributaries. With the potential to generate over 90,000 MW, nearly 50,000 MW power has been said to be economically and technically viable.

As a result of proper management, Nepal Electricity Authority, has been able to slash the power cut to a few hours a week. It is definitely a relief to Nepali consumers who

were suffering long hours of load shedding in the past. But what is equally important to understand is that nearly half of our population have no access to grid-connected power because of which, many people are forced to rely on alternative sources like firewood and imported fossil fuel. It is also important to highlight that the power demand is also increasing day by day. The government estimates that at least 8,000 MW of additional power will be needed to fulfil the demand of Nepal alone by 2030. This suggests that investment in hydropower can be beneficial to hydropower developers as well as consumers.

Although Department of Electricity has issued about 13,000 MW of survey license, only a small fraction of those issued has been initiated for construction. A lack of political stability and good governance are some of the factors hindering hydropower development. The lack of inter-govern-



hydrohighlight

mental agency co-ordination and prolonged processes for environmental clearances from the government are also often cited as other barriers by the developers. Lack of proper coordination with the locals and their unreasonable demands are also challenging factors in

hydropower development. Besides these socio-political challenges, there are other natural risks like earthquakes and landslides. The little discharge of Nepali rivers in the dry season is also another issue often pointed out by hydropower experts.

SILVER LINING

Despite all the above cited problems, it is important to focus that a conducive environment has been created for developers and investors. Although there are some challenges to identify the barriers to the development of hydropower resources, a lot of progress has been made.

At present more than 12 major hydropower projects are under construction. Although many of these projects' completion have been a setback because of the devastating earthquake in 2015, the government is firm in the reduction of energy crisis. The government has declared a National Energy Crisis Reduction and Electricity Development Decade (2016-2026) with the aim to end the existing energy crisis of the country and to develop hydropower projects.

Political turmoil has long been blamed as a major barrier for hydropower development, particularly to attract FDI. With recently held local and parliamentary elections, it can be at least assured that political situation in the country is stable. In order to address the issue with locals, many hydropower projects have started involving the locals within the projects in different ways.

Similarly, with the objective to help investors develop their projects rapidly, the government is establishing a coordination committee which will work with

the investors. The committee will also work towards simplifying administrative procedures.

Another barrier is the requirement of huge capital in investment and financing. However, this problem is also being addressed with the concept of project financing and increasing interest of foreign investors as well as Nepalis residing abroad and within the country. Now, the country needs rebranding to assure the investors that the country is ready for hydropower projects.

UNLEASHING 40,000 MW IN 10 YEARS

Energy Development Council, an umbrella organisation representing the entire energy sector organised a three-day conference with the target of knowledge-sharing on investment in Nepal. The event featured renowned speakers and provides a platform for investors, developers and financiers worldwide to seal the deal in the energy sector.

The event provided an opportunity for the investors to come and feel the sense of optimism that is growing in the country with political stability. The event brought the stakeholders of hydropower so that the risks and benefits of hydropower projects could be analysed from the perspective of different participants. The summit targeted to bring an investment worth US \$80 billion to Nepal.

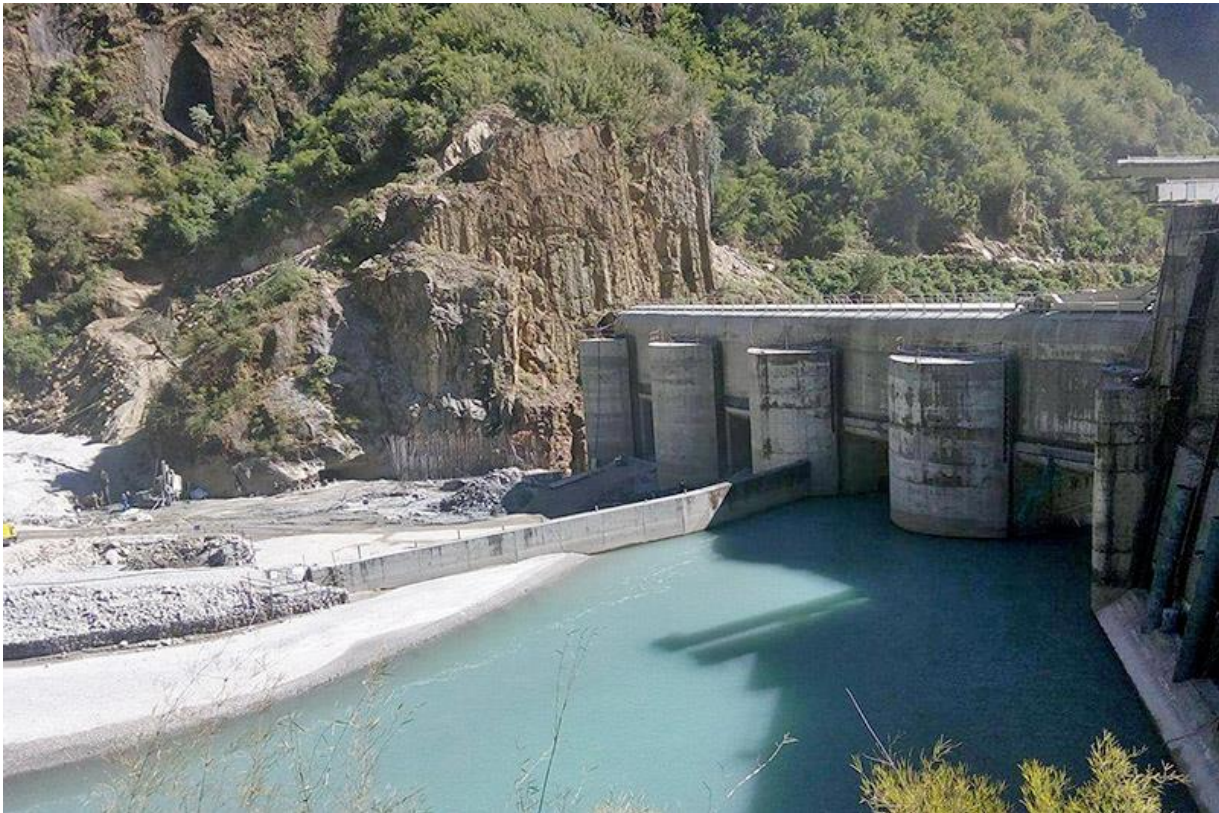


The author is Executive Chairman at Sushil Energy Pvt Ltd, an EDC member organisation

Source: <http://epaper.thehimalayantimes.com/index.php?mod=1&pgnum=22&edcode=71&pagedate=2018-03-11&type=#>

NEPAL'S SCENARIO

NEA to produce 800 MW power within one and half year



File: One of the national pride projects Upper Tamakoshi Hydro Power Project's dam in Dolakha district, the project would be generating 456 megawatt electricity. Photo: RSS

Nepal Electricity Authority (NEA) and the companies it has been looking after are set to produce 800 MW power within the next 18 months.

Based on the work plan prepared by the NEA, the hydropower companies such as Upper Tamakoshi, Kulekhani III, Upper Trishuli A, Sanjen Rasuwagadhi would produce such volume of hydropower. The NEA believes that the country would be self-reliant after produc-

ing ample energy within some years.

The Upper Sanjen will generate 14.8 MW, while the Sanjen will produce 14.5 MW, said Chief of the company, Kiran Shrestha, adding that both projects have completed 70 percent of the works.

Spokesperson at Energy Ministry, Dr Ganesh Neupane, said the Upper Tamakoshi hydropower project would be completed by coming

mid-November. The government has provided every sort of assistance for the timely completion of the project.

According to NEA Executive Director Kulman Ghising, the project of some 1,000 MW would be linked to the national grid in coming three years.

Meanwhile, the private sector too has planned to complete the projects of some 1500 MW in one

a n d h a l f y e a r s . ciation Nepal Chairman Shailendra 3,500 MW capacity, 70 percent are in
Independent Energy Producers' Asso- Guragain said among the projects of construction phase.

Source: <https://thehimalayantimes.com/nepal/nea-to-produce-800-mw-power-within-one-and-half-year/>

Plan to trade power with China, B'desh

Nepal and China have proposed to ink a memorandum of understanding to have a power trade agreement during the next high-level political meeting between the two countries.

Nepal has already signed a power trade pact with India which has facilitated the purchase of power between the two countries.

Nepal has also proposed a similar PTA with Bangladesh. "The purpose of PTA with China and Bangladesh is to facilitate exchange of power among the three countries as is happening between Nepal and India" Spokesperson for the Ministry of Energy, Water Resources and Irrigation Dinesh Ghimire told *THT*.

According to the ministry, the aim

of the proposal is to sell Nepal's surplus power to its neighbours. Nepal expects to have surplus power in a few years. Nepal has been buying more energy from India during winter but selling less amount of energy to India in the summer when it has surplus power.

As per the energy assessment of MoEWRI, Nepal will have surplus energy within a few years. "We have already finalised MoU between Nepal and Bangladesh. It will be signed at an appropriate time," Ghimire said. "We can sell surplus power to three countries and buy from them when we need it."

China had agreed to provide technical assistance to Nepal on feasibility study of Rasuwagadhi-Kerung 400 KV cross border trans-

mission line when Prime Minister KP Sharma Oli visited China during his first tenure as PM.

Nepal's private sector has been pressing the government to sign a PTA with China on the lines of its agreement with India.

According to Ghimire, the cross border transmission line could be built from Rasuwagadhi in Rasuwa, Kimathanka in Sankhuwasabha, Tatopani in Sindhupalchowk and Korala in Mustang on the Nepali side.

The MoEWRI has already finalised the MoU after consulting the Chinese government and it has sent it to the Ministry of Foreign Affairs, said Ghimire. "It will be signed during a high-level visit from China or Nepal," Ghimire said. "The draft MoU was exchanged between authorities of both countries before finalising it."

Nepal and China have agreed to form a joint steering committee led by MoEWRI secretary and his Chinese counterpart. Both sides have also drafted MoU to form a Joint Working Group led by joint secretaries of both countries. "Working group will provide technical support to the steering committee," Ghimire said.

According to Ghimire, both committees will work to expedite hydropower development and trade in both countries after an MoU is signed with China. According to the draft MoU, Nepali civil servants can visit China to observe its hydropower development and Chinese authorities can also visit Nepal.

China has shown interest in building Rasuwagadhi-Galchhi transmission line. It will help build the 12MW Budhigandaki Hydropower Project on time and get surplus energy.

Foreign Minister Pradeep Kumar Gyawali said on Saturday that Chinese President Xi Jinping will visit Nepal in 2018.

Source: <https://thehimalayantimes.com/nepal/plan-to-trade-power-with-china-bangladesh/>

Hydro-powered dreams

Significant investment in infrastructure needed to meet development challenges

Economic growth and investment on infrastructure are inseparable. Infrastructure contributes to economic growth. Development of infrastructure is not possible without investment. Infrastructure helps to reduce poverty and sustain the well-being of human society. There is a positive correlation between the human development index and per capita electricity use. Low levels of electricity generation not only limit economic growth but also limit social development. Therefore, significant investment in electricity infrastruc-

ture is needed to meet development challenges.

Nepal has, so far, been able to generate around 1,000 MW. According to the Nepal Electricity Authority (NEA), there are 88 hydropower plants in operation with a total generating capacity of 967.85 MW, of which 60 hydropower plants belong to independent power producers that contribute 441 MW. There are 113 hydropower plants in the construction stage with a total generating capacity of 3,090 MW. Most of the hydropower plants are run-of-the river. As a result, electricity genera-

tion is highly seasonal and fluctuates. Apart from these hydropower plants, there are two thermal plants with a combined capacity of 53.4 MW.

The total Circuit Length of the transmission system is 3,465.76km, and an additional 3,205km is under construction. There are 2.79 (out of 5.4) million households connected to the NEA power system. However, due to the diversity in geography and development, there are a number of inequalities in terms of energy infrastructures in the seven federal states in Nepal.

Nepal is gearing up for a major socio-economic transformation. Sustainable development is built into Nepal's socio-economic development agenda. Nepal needs to increase its supply of electricity in order to achieve its overall national goals and meet the targets of economic development.

Investment for electricity infrastructure comes from a variety of sources. The main sources for investments are (i) Government Budget, (ii) Bank and Financial Institutions, (iii) Employee Provident Fund, (iv) Citizen Investment Trust, (v) Private Sector Equity, (vi) Individual Public Offering, and (vii) Others, such as Hydroelectricity Investment and Development Company Limited. The government budget, generally, is comprised of funds from its own sources, foreign loans, and foreign grants. The government has budgeted around one percent to seven percent of the total government budget to energy for the last five years. Investment in the energy sector from the banking sector is also gradually increasing. The banking sector has invested about one to three percent of

the total investments in this sector. The Employee Provident Fund (EPF) has the largest funds with around \$2 billion. EPF has provided credit to a few hydropower projects, notably Upper Tamakoshi (456 MW) and the four hydropower projects equivalent to 272 MW that belong to Chilime Hydropower Company. The Citizen Investment Trust (CIT) has funds of around \$0.6 billion, and it provides credit to priority sector projects including hydropower. It invested \$11.76 million in the hydropower sector in 2014/15 and has planned to gradually increase investment. The Government has established the Hydroelectricity Investment and Development Company Limited as a special purpose vehicle to invest in hydropower development. It was established in July 2011 with a paid up capital of \$98 million. It has committed an investment of \$62 million for 13 projects. Looking into these institutions and their investment trends, Nepal can invest around \$1 billion annually in the hydropower sector.

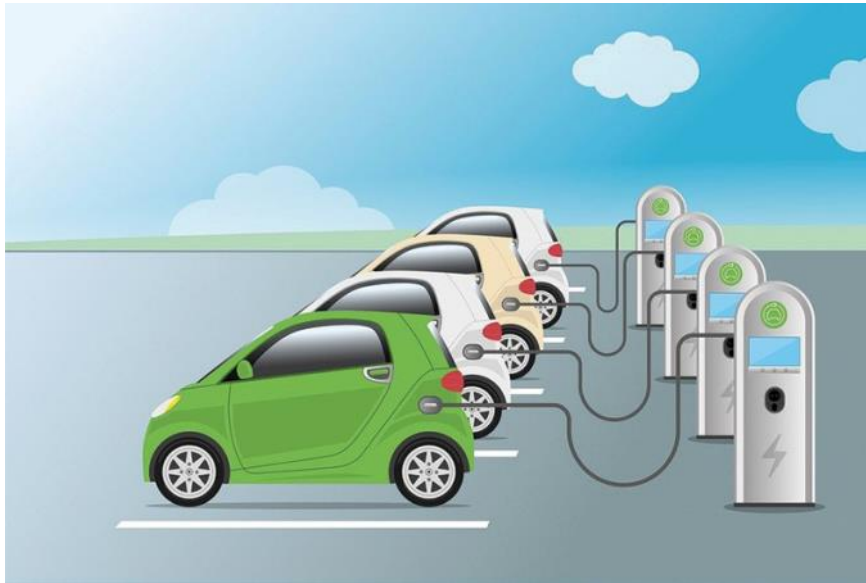
The country needs to focus on strengthening its transmission and

distribution capacities, increasing generation capacity, reducing its dependence on energy imports, and improving its system efficiency.

In order to reach a 15,000 MW generating capacity by 2030, Nepal may need around \$22.94 billion to \$38.21 billion. The investment costs will be on the higher side if we plan to have more storage hydropower plants. It is a challenging task to meet the required investment amount, therefore, the main thrust of the policy change should focus on stimulating private sector investment in the energy sector development. Pro-active investment policies such as tax incentives, risk mitigation provisions and eliminating administrative hurdles encourage private sector financing. Furthermore, through its regulatory measures, Nepal Rastra Bank can encourage the banking sector to increase its investment portfolio in the hydropower sector.

Adhikari is an energy economist

The End of an Era



“Internal combustion engines had a great run over the years, but now they are being outstripped by electric vehicles”

Human inventiveness has not yet found a mechanical method to replace horses as a way of propulsion for carts,” claimed the French journal *Le Petit* in 1894. It was also during this period that a 126 km long motor race was organised. In the race were motors powered by steam, petrol, electricity, pneumatic, and hydraulics. Out of 102 competitors, only 25 machines were picked as being capable of completing a 50 km trial race. At the end, an Internal Combustion (IC) engine powered by petrol secured the first position. A century later, and the IC engine has changed the face of the transportation system. However, developments over the past couple of decades have put the IC engine’s fu-

ture in jeopardy, as batteries and electric motors have emerged as strong competitors to overshadow the IC engine.

Constantly improving

The 19th century electric vehicles (EVs) used to need power stations every 25 to 30 kms, but rapid development in the technology of lithium ion batteries (Li-cells) have presented these batteries as a possible replacement of ICs. The Chevy Bolt manufactured by Chevrolet has a capacity to run up to 383 kms once fully charged. The vehicle by Tesla has an even better battery capacity, enabling it to run about 1000 kms on a single charge. Electric cars like the

Chinese NEVI and the Indian REVA have become popular in Nepal and can travel up to 120 kms on a single charge. The charging duration has also diminished remarkably along with increments in durability and battery life.

India and China are planning to fully replace IC motors with electric vehicles by 2030, and as Nepal almost (fully) relies upon India and China when it comes to importing vehicles, this will likely have a deep and direct impact in Nepal as well. The most popular vehicle brands in Nepal such as Tata, Mahindra, Maruti Suzuki, Hyundai, Kia, and Nissan have also started manufacturing EVs.

The competition among these companies is likely to increase, resulting in a sharp fall in the price of EV's. Recently, Maruti, Suzuki and Toyota have formulated terms to work together for research and development and plan to launch their first EV by 2020 in India. The Union Bank of Switzerland (USB), a Swiss global financial company, predicts that the EVs will make up about 14 percent of global cars by 2025, up from 1 percent today. By 2040, Bloomberg New Energy Finance (BNEF) expects that 55 percent of the IC engines will be replaced by EVs.

Hulas, the lone motoring company in Nepal, brought the eco-friendly e-rickshaw onto the roads in 2014. Besides Hulas, there are other companies who have also recently started assembling such rickshaws. These vehicles are seen plying the roads of the Tarai region and are popularly known as City Safaris. Hulas is currently undergoing testing programs of another electric vehicle in various parts of the country. The vehicle is

reported to cost around Rs 1.4 million to 1.5 million and is known as 'Da Vinci'.

Feasibility in Nepal

To foster EVs in Nepal, the government has reduced the tax on EVs to 10 percent and 1 percent for private and public EVs. This is a significant drop from the 40 percent tax previously imposed. This attempt will definitely encourage and attract users as well as entrepreneurs in the future. According to research, there were 12 million EVs on the road last year, which shows a 60 percent increase from the numbers in 2015. Electric tempos were introduced in Nepal in 1996 and are still seen on the roads of Kathmandu. A few older tempos are still in operation, and another 1,200 such tempos have been added to their ranks. Trolley buses were also in operation in the Capital for some times but lack of proper management, corruption and political instability hit the buses hard. With appropriate management and government support in the

near future the trolley can also be brought back into operation.

The cost per KWH of electricity was about \$1,000 in 2010 and has declined to \$130-200 now; the cost is likely to decrease further in the future. Even the cost of Li-cells has fallen by 73 percent since 2010 and is expected to go down further since it has been proved that old and damaged cells can be recycled and reused. Nepal has the potential of generating around 40,000 MW of electricity as per the Department of Electricity (DDE). Though only about 850 MW is being generated currently, the generation of electricity will certainly increase considering those hydro projects that are currently either planned or already under construction. The Government hopes to produce up to 10,000 MW and 20,000 MW in the 2020s and 2030s respectively.

(To view the full article, please visit the link below.)■

GLOBAL PERSPECTIVE

Energy 4 Impact, a trailblazer for mini-grid development and ownership

Energy 4 Impact is pursuing a new approach that involves community members in the development and operation of mini-grids in Rwanda.

Under the Sida-funded **Scaling Off-Grid Energy in Rwanda (SOGER)** programme, community-owned cooperatives will join forces with mini-grid developers to construct pico-hydro grids at 10 sites across Rwanda, providing clean energy access to about 7,500 people.

In a statement, the energy advisor explained that under a Special Purpose Vehicle (SPV), community members, through cooperative societies, and mini-grid developers are jointly involved in the design, financing, development and operation of mini-grids to deliver renewable energy in remote areas for household and productive use.

Community Benefits

This approach increases the level



of community buy-in for the project and helps to raise the required funding. This in turn increases the projects' chances of implementation and long term success.

"Energy 4 Impact has put in place the necessary mechanisms, including hiring of a legal firm to facilitate the establishment of the relationship between the community and the developers.

"We have ensured the agreements are legally binding and that the benefits generated by the grant-funded pico-hydro plants over their life cycle benefit the community," says Victor Hakuzwumuremyi, SOGER programme manager at

Energy 4 Impact.

As part of this plan, the energy advisor has so far engaged local authorities and community members in two regions, where work on the projects is beginning, to create and register the community cooperatives.

They highlighted that these are Umucyo Cooperative in Mudasomwa, Nyaruguru District and Kodukaru Cooperative in Mpanga Sector (Nyankorogoma Site) Kirehe District. Kodukaru Cooperative holds 44.3% shares in the SPV whilst Nyankorogoma Hydropower Ltd, the developer, holds the remaining 55.7%.

In Mudasomwa, Umucyo Cooperative has a 35.4% stake while the developer, Hobuka Ltd, holds 64.6% of the shares in the mini-grid.

Pico-hydro projects

Mudasomwa is a 34kW pico-hydro with a cost of around \$107,000. The community and the developer in Mudasomwa will raise 10% and 25% of the capital expenditure respectively.

The community members will offer their contribution in cash or by working on the project during construction. Energy 4 Impact will offer part of funding through a grant provided by the Swedish International Development Cooperation Agency. The remaining 15% will be raised through debt raised by the developer.

Initially, the mini-grid will connect 300 households, six grocery stores, three churches, two schools, a healthcare facility and an office to the power before expanding with time.

It will also supply power to three

cassava mills, six shopping centres and seven bars and restaurants and other commercial enterprises or activities that are expected to emerge with the availability of the clean, reliable power.

Construction of the pico-hydro plant in Nyankorogoma will cost around \$86,000. Again, Energy 4 Impact will provide part of the funding as a grant through the SOGER programme. The developer will raise 10% of the cost, while community members will raise 7% through a cash contribution or by working on the project during construction. The outstanding 13% will be raised through debt by the developer.

Upon completion, the 11kW pico-hydro power in Nyankorogoma will connect 141 households, 17 commercial centres, three churches and one grain milling machine. Since the community exports unprocessed maize, sorghum and cassava only to import back in processed form, it is expected the newly available power will create a platform for value added processing activities, as well as attracting new businesses to the ar-

ea. [Read more: Energy 4 Impact granted \\$1m to boost solar irrigation in Rwanda](#)

Sustained Business

To ensure micro businesses profit from the power supply, Energy 4 Impact will provide support for productive use activities, empowering community members to engage in entrepreneurial activities that make use of the power.

The support includes advice on markets and supply chains, on the economics of their business case and accessing capital to acquire electrically powered equipment. With the productive use support, demand for electricity is expected to grow, thus enhancing each project's commercial viability and sustainability.

The SOGER programme has a strong focus on gender and is implementing gender sensitisation activities across the productive use and pico-hydro sectors. "60% of the productive use businesses supported will be owned and operated by women.

(To view the full article, please visit the link below.)■

Lithium Seen as Lifeline for Oil Majors in Clean Energy Future



Lithium could be a lifeline for oil majors as the energy industry shifts toward lower-polluting alternatives to fossil fuels, said Jeff McDermott of Greentech Capital Advisors LLC.

“Their specialty is resource extraction,” McDermott, managing partner of the New York-based boutique investment bank advising energy companies and investors, said in an interview in London. “They should buy lithium miners, get involved in the upstream of core battery technology.”

This suggestion marks out one solution to the existential question some of the world’s biggest energy companies are facing about how to survive as governments clamp

down on the fuels they produce. As the curbs on carbon emissions tighten, a key issue for fossil fuel producers are how much oil and gas demand is at risk.

Lithium is a key ingredient in rechargeable batteries that are prevalent in electronics from mobile phones to electric cars. The metal is part of the cathode, which houses the electric charge. Demand for the mineral is projected to rise 38-fold by 2030 to 7,845 metric tons per year from 200 metric tons in 2016, according to Bloomberg New Energy Finance.

Big oil companies have the capital to deploy and expertise in developing large projects that could help the lithium industry expand.

Oil majors have been dabbling in clean energy for decades, but it doesn’t make up a significant percent of any of their businesses. This is beginning to change, with the industry seeking new revenue streams and to keep themselves at the center of the energy busi-

ness.

Total SA bought the battery maker Saft Groupe SA for 950 million euros in 2016. Royal Dutch Shell Plc recently made tracks into electricity, buying First Utility Ltd. in the U.K. in December. BP Plc has taken a 43 percent stake in British solar developer Lightsource Renewable Energy Ltd. for \$200 million.

McDermott also sees opportunities for oil majors in offshore wind and integrated systems for autonomous vehicles. Shell and Statoil ASA of Norway have made recent moves into the wind industry, capitalizing on their experience in drilling for oil and gas in the sea. Shell is a part of the consortium building the Borssele III & IV wind farms in Dutch waters.

Hydropower is still the cheapest source of electricity



The 260kW Thrybergh project is one of two hydro projects to have been co-located with a 1.2MW/1.2MWh battery. Image: Barn Energy.

Battery energy storage is now being used at two of the largest river hydro projects to deliver a range of grid services, load shifting and energy trading, with a third planned for later this year by Barn Energy.

The company deployed the two 1.2MW/1.2MWh batteries at the 260kW Thrybergh project, on the River Don near Rotherham, and at Knottingley (500kW), on the River Aire near Wakefield in mid-January.

It is thought this is the first time that battery storage units have been deployed in the UK in combi-

nation with low-head river hydro schemes.

Barn Energy worked with its sister company Eelpower to deliver the projects, with the BYD batteries installed by Anesco. Each is currently delivering on a two-year contract to deliver Firm Frequency Response (FFR) for the National Grid and were in place to export during the last two Triad periods on 5 and 26 February.

This multiplied Thrybergh's output by five times its original capacity and Knottingley's by two and half times.

Mark Simon, chief executive of both Barn Energy and Eelpower,

said: "By co-locating the battery units with hydropower, 60-70% of the battery consumption (when performing grid balancing services such as FFR) is provided for by hydropower and the rest comes from the grid. This is a significant benefit for the economics of our battery, and of our hydropower station."

Aggregator Limejump picked up the contract to remotely control the batteries through its virtual power plant and when not performing FFR or TRIAD services, will use the batteries load shifting and trading to maximise the revenues at each site.

Erik Nygard, chief executive of Limejump, explained: “Partnering with innovative companies, like Barn Energy and Eelpower, that are committed to developing sustainable energy infrastructure is a cornerstone of the Limejump vision.

“Opening up market access to these renewable installations and using our Virtual Power Plant platform to maximise value will help deliver a fully sustainable energy future.”

Both batteries were also pre-qualified for the recent Capacity Market auctions but a decision was made not to take the T-4 exit price. However, both took up T-1 contracts for delivery this coming winter.

According to Simon, a similarly diverse ‘stack’ to that secured by these projects - FFR, Triad avoidance, Capacity Market, load shifting and energy trading – is the se-

cret to making battery projects a success, particularly when placed with hydropower.

"You have to make them all work, that is your aspiration. The nature of a battery is that it is like a Swiss army knife, it allows you to do a number of things. The business model is being developed by people like us, and hydropower is a great place to have it," he told *Clean Energy News*.

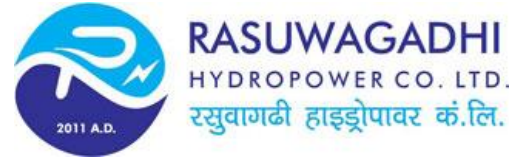
"Shifting solar to make money at peak red periods has been a very good story. That said, hydropower is even better...around 64% [of supply of electricity to a battery comes from the hydro]. Rivers run all the time and that's been a real economic eye opener to us because that electricity is much more economic to us.

“As long as batteries stand behind the meter alongside a generator it’s a very good place to be alongside a hydropower station on a

weir that's low on the river catchment.”

Barn Energy is currently developing a third project in Wakefield and Simon is considering approaching third parties with hydro assets to negotiate further battery projects.

[EDC MEMBERS]



[EDC MEMBERS]



[PARTNERSHIP]



Investment Board of Nepal
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