Present Condition of Power Sector in Nepal

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Our country Nepal is widely known as very rich in water resources but we Kathmanduties are living with sever load shedding sometimes 16 hours a day. This power crisis has affected not only every activity of our life but also industrial production, commercial establishments & our national economic production too. To cover the minimum requirements in the daily life all most all families in Kathmandu have to use battery or solar cells with inverter that affect the expenses in energy sector as well. Actually the energy consumption in the family does not decrease as battery is needed to charge for power for the load shedding hours. At present solar panels are increasingly used to cover the demands in required hours.

The first hydropower plant in Asia, Pharping Hydropower station was made in Nepal. It inaugurated by the then king Prithvi Bir Bickram Shah Dev was commissioned in May 1911. The plant was erected with a grant from British Government at a cost of NRs.0.713 million. Most of the existing hydropower plants were built with grant from Nepal's friendly countries.

SNo.	Power Plant	Capacity	Commissioning Year	Built by
1	Sundarijal	640 KW	1934	British Gov.
2	Panauti	2.4 MW	1965	Gov. of Russia.
3	Trishuli	21 MW	1967	Gov. of India.
4	Sun Koshi	10.05 MW	1972	Gov. of China
5	Kulekhani-1	60 MW	1982	Gov.of Japan
6	Devighat	14.1MW	1984	Gov.of India
7	Kulekhani-2	32 MW	1986	Gov. of Japan

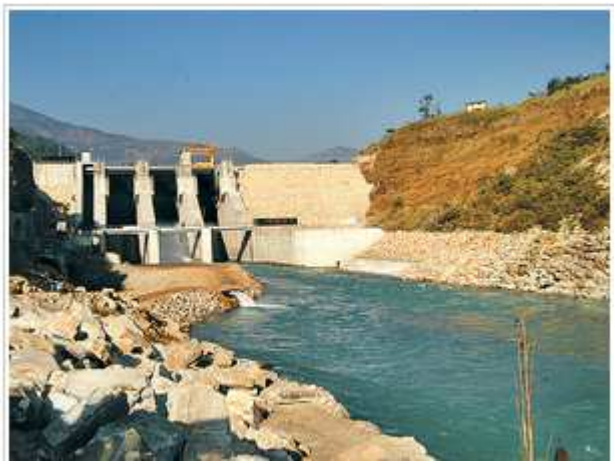
Lower Marsyangdi, 69 MW capacity was constructed under Marsyangdi Development Committee, Government of Nepal & then handed over to Nepal Electricity Authority for operation, maintenance, distribution services & revenue collection. At that time during Panchayati system small hydro plants were built under Small hydro development board in several districts of Nepal under rural electrification programs. At that time Nepal Electricity Corporation was responsible for distribution, operation, maintenance, consumer services & revenue collection only. Department of Electricity under Ministry of Water resources was responsible for investigation & generation. In year 1984 DOE & NEC were unified together to simplify the debt payment & loan agreement for the other hydropower projects in future. Thus the Nepal Electricity Authority with the additional mandate of survey, investigation, and engineering studies of hydropower projects is established.

Under Nepal Electricity Authority with the assistance of friendly counties intensive studies & investigation works in the River basins were carried to identify the feasible projects & prepared a data bank of the feasible hydropower projects in Nepal based on which the projects are being developed in different ways. First time the study of Karnali Project with field investigation was carried out & prefeasibility level reports were prepared in the year 1988. In year 1984 the prefeasibility level report was made for Budhi Gandaki Project, based on which the preparations for the feasibility & detail design with tender documents are going on. After completion in the year 1989 Lower Marsyangdi hydropower plant capacity 69 MW there was a long time gap with the materialization of any hydro project. During that time NEA was doing studies, investigation & tendering to develop Arun-3 hydropower project under the sponsorship of World Bank. Arun-3 HEP was designed for capacity 402 MW but it did not materialize. It created the power deficit in peak time during dry season sometime 4 hours a day.

After a long time the electricity tariff was increased. NEA developed Puwa Khola HEP, 6.2 MW & Modi Khola, 14 MW. Under the sponsorship of ADB & Japan 144 MW Kali Gandaki "A" HEP was executed under the NEA management. Kali Gandaki "A" Hydro Plant with peaking facilities was designed to store the Monsoon

water & use to generate the maximum power in peak hours in dry season. With the completion of the project in year 2002 it was felt the over production of energy in Monsoon season & attempts were done to sell the surplus

Kulekhani-1, Dam site.



Mid Marsyangdi Dam Site

energy to India. The construction of Mid Marsyangdi started with grant from Government of Germany under NEA management. It was during the peak Maoist insurgency & the construction had extended a very long. Not any big hydro plant was done from private producers during the time period. The power crisis continued & at present we have to live with the situation of very long load shedding hours. Also during these years we had political changes & instabilities. On daily tabloids the issue was discussed very regularly that the private investors were probably not entrusted with the political situations in Nepal for their huge investment in hydropower sector & with the promulgation of ongoing constitution the situation for foreign investment is expected to be much better.

Actually there were several efforts in last years from Government institutions, NEA & other private institutions to reduce the load shedding hours but still we have 12 hours at present. The import from India in this dry season has become an important part. Demand side management from NEA to use energy efficient CFL bulbs may have affected to reduce the demand in peak time. In private sphere too several projects have PPA with NEA & are under construction But still we have live with this power crisis for 2-3 years till the projects under construction are completed & will start to generate the power at full capacity, if the ongoing projects are completed as scheduled. Every year there are new line connections for different type of consumers. The consumers are demanding the power more & more for their increased uses of electric & electronic equipments in their daily lives.

The present power generation scenario is as follows:

1. Total hydro generation owned by NEA =477.93 MW.
2. Total hydro generation owned by IPPs = 230.589 MW.
3. Total thermal generation owned by NEA = 53.41 MW.
4. Total solar generation owned by NEA = 100 KW.
5. Total Installed Capacity (NEA & IPP) =762.00 MW.
6. Total Installed Capacity (NEA& IPP)-Grid =757.393 MW.

The maximum peak as noted at 18 hour is 1094.62 MW. At present the net deficit is around 340 MW. As the annual increment on demand side is estimated for 100 MW, it has become necessary to plan & develop the hydros on long term basis to solve the power crisis. The development of a hydropower project takes times & cannot be completed in 2-3 years since the construction itself takes several years from 3-4 years, if everything goes well as planned.

Except Kulekhani-1 Hydropower plant all the hydros owned by NEA are Run-off-the River (ROR) type. ROR plants generate energy as the flow conditions in the Rivers. In Monsoon time they generate at maximum capacity as the flow in the rivers are maximum. There are some projects developed by IPPs that were designed to generate the max .power in Monsoon time but gives very small power in dry season. The developer makes good business with such type of projects but there will be some problems in the power sector. The existing Khimti Hydro belongs to such type of plant, which has PPA in US$ for its payment. In winter time the flow decreases to minimum, correspondingly the generation will be minimum too. This is the reason why we have minimum or no load shedding hours in Monsoon time. According to the present scenario of load consumption a storage type of hydropower project has become the need of time. The storage type of hydro will store the flood water of Monsoon & can generate the max. power in required hours.

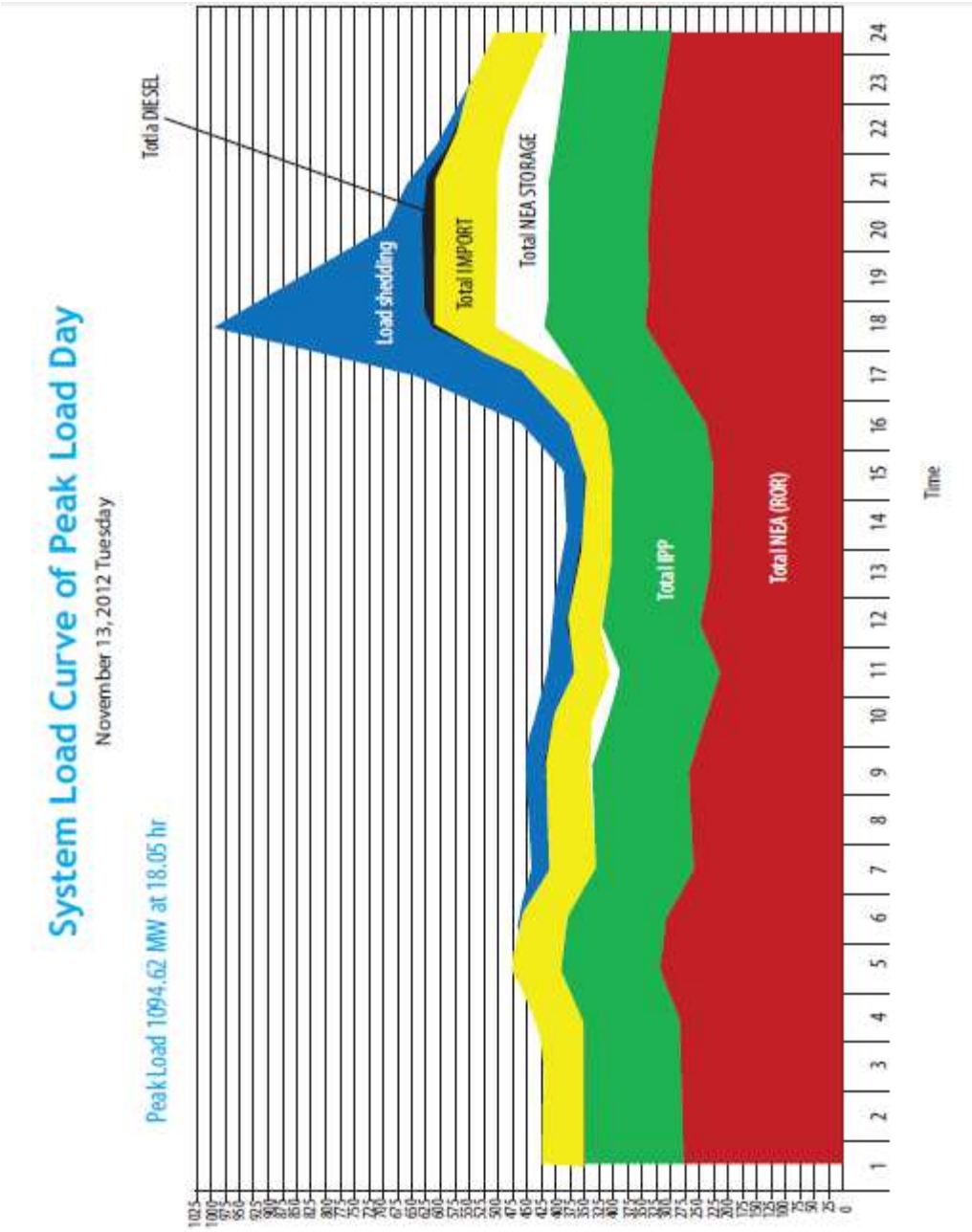
Last years the interesting development in hydropower project implementation is the new finance model of Public/Private partnership as subsidiary companies of NEA. Chilime Hydropower Company was the first attempt in this direction that built Chilime hydropower plant with 20 MW. NEA has 51 % share & others are covered by loan from Karmachari Sanchaya Kosh & shares distributed to NEA employees, Local people of project area & the public. With this model the remarkable development is the contribution in poverty alleviation especially in the project area as the poor people as shareholder are getting high dividends.

Upper Tamakoshi Hydropower project with its 456 MW capacity that is under construction is being executed by Tamakoshi Hydropower Company as NEA's subsidiary company with its 41% share. The rest is covered by Telecom, Citizen Investment Trust, and Employees Saving Fund, Shares to local people of project area & NEA & other company's employees. This model has contributed to develop the project very much in time because NEA got no problem to close PPA in NRS. Sanjen Hydropower Company, Rasuwagadhi Hydropower Company & Middle Bhote Koshi Hydropower Company are developing 42 MW capacity Sanjen Hydro projects, 111 MW capacity Rasuwagadhi Hydropower project & 103 MW Middle Bhote Koshi hydropower project respectively. And they all have already PPAs with NEA & are in construction.

Last years the exchange rate of US$ with NRs.has gone up very high. It created big problem for NEA as it need to pay to Khimti plant & Bhote Koshi in US$. The energy from them has become much costlier. In past NEA had shut down its own plants to take the whole generation from Khimti & Bhote Koshi at much higher rate. NEA wants to learn a lesson from its past! Bur for those IPPs that bring the investment in US$ they need to have PPA in US$. Now it is matter of policy to be determined from Government of Nepal. But for the projects that are being developed as NEA's subsidiary companies with Private/Public partnership model had no problems in closing PPA in NRS.

In 2-3 years the grid will have connected with the additional power generation about 986 MW as shown below:

DamSite,Fewa Lake Hydro Plant



(Source: NEA)

1. NEA owned Projects:

S.No.	Projects	Capacity	Tentative Completion Date
1	Trishuli-3A HEP	60 MW	June 2016.
2	Rahughat HEP	32 MW	June 2016.
3	Chameliya HEP	30 MW	June 2016.
4	Kulekhani-3 HEP	14 MW	Dec.2015
	Total	136MW	

2. Projects under NEA Subsidiary Companies:

S.No.	Projects	Capacity	Tentative Completion Date
1.	Upper Tamakoshi HEP	456 MW	June 2016
2.	Rasuwagadhi HEP	111 MW	June 2017
3.	Mid Bhotekoshi HEP	102 MW	June 2017
4.	Sanjen HEP	42 MW	Dec. 2015.

Total 711 MW

3. Projects under IPP:

S.No.	Projects	Capacity	Tentative Completion Date
1.	Mistri Khola HEP	42 MW	May 2016
2.	Dordi Khola HEP	27 MW	April 2016
3.	Khani Khola HEP	30 MW	April 2016
4.	Lower Solu HEP	24 MW	July 2018
5.	Small Hydros	40 MW	July 2014
	Total	139 MW	

The total Hydro generation till the End of year 2017 is estimated for 1740.00 MW.

Load forecast by NEA:

Fiscal Year	Energy(GWh)	System PEAK Load(MW)
2013-14	5859.90	1271.70
2014-15	6403.80	1387.20
2015-16	6984.10	1510.00
2016-17	7603.70	1640.80
2017-18	**8218.80**	**1770.20**
2018-19	8870.20	1906.90
2019-20	9562.9	2052.00
2020-21	10300.10	2206.00
2021-22	11053.60	2363.00
2022-23	11929.10	2545.60
2023-24	12870.20	2741.10
2024-25	13882.40	2951.10
2025-26	14971.2	3176.70
2026-27	16142.70	3418.90
2026-28	17403.60	3679.10

(Source:NEA)

If everything goes as per schedule, we will have no or only small load shedding in FY 2017-18.

Penstock Construction, Mid Marsyangdi Hydro Power Plant

In Monsoon time the generation will be higher than 1740 MW because the ROR plants will generate at full capacity & the demand will be less than 1740 MW, there are chances that there will be plenty of surplus energy. As most of the PPAs are "TAKE" or "PAY" model, NEA may need to shot its own plants & take the production from IPPs. This situation will affect the economic situation of NEA & finally may lead to increase the present tariff system.

Tariff Rates for domestic consumers:

(Effective since 17 August 2012)

	1.1	Low Voltage 400/220V		
	A	Minimum monthly Charge:		
		Meter Capacity:	Min.Charge(Rs.)	Exempt(KWh)
		Up to 5 Amperes	80.00	20
		15 Amperes	365.00	50
		30 Amperes	795.00	100
		60 Amperes	1765.00	200
		Three phase supply		
		Up to 10 kVA	4400.00	400
		Above 10 kVA to 25 kVA	6900.00	600
	B.	Energy Charge(Single phase)		
		Energy consumption block	Rates (Rs.per unit)	Billing method
		Up to 20 units	4	Minimum charge
		21-50 units	7.30	Up to 20 units Rs.4.00 per unit, For 21-30 units Rs.7.30 per unit. But for consumption above 30 units, consumption from unit itself shall be charged at Rs.7.30 per unit.
		51-150 units	8.60	RS.7.30/unit for units 0-50 Units & Rs.8.60/unit for 51-150.
		151-250 units	9.50	Rs.8.60/unit for units 0-150 & Rs.9.50/unit for 151-250 units
		Above 250 units	11.00	Rs.9.50/unit for units 0-250 &Rs.11.00/unit for units above 250

(Source:NEA)

NEA has projected that 3 billion units of electricity will go in waste during the rainy season after seven years. The timely completion of Dhalkebar-Muzzafurpur Transmission line is very important so that the power trade between Nepal & India considers these developments.

There are 28 Hydropower Projects with total capacity 927 MW that have concluded PPA with NEA & are under construction phase.

NEA has closed PPA with 86 hydropower projects with capacity totaling 673MW.

But for the economical prosperity of our nation we need to develop big projects that are capable of generating Thousands MW. If Nepal wants to be self-dependent in fertilizer production, the power demand for the industrial establishment will be in order of hundreds of MW depending on the capacity of production. Now the time has come that projects- Pancheshwar Multipurpose Project, Karnali Project & Koshi High Dam should move ahead.

Karnali Chisapani Multipurpose Project:

Salient Features:

Installed Capacity: 10800 MW

Firm Energy: 15007 GWh

Average Energy: 20842 GWh

Re-regulating Powerhouse: 86 MW

Capital Cost per KW: 453 US$ (Stand: 1984)

Sapta Koshi High Dam Multipurpose Project:

Surface Powerhouse: Installed Capacity: 3000 MW.

Annual Energy: 15732 GWh.

3 Canal Powerhouses: 3x100 MW.

Pancheswar Multipurpose Project:

Installed Capacity: 6480 MW

Average Energy Production: 10671 GWh.

Rupaligad Re-regulating Dam:

Capacity: 2x120 MW

Average Energy Production: 1650 GWh.

These are the preliminary information about the projects with which the prosperity of our nation is dependent. There are several hydropower plants in West Europe that were built & are in operation bilaterally across the borders according to the international water right. The time has come that our leaders with good homework & proper exercises talk with the Indian counterpart that we the Nepalese people need these projects & like to develop as early as possible. Talks are not to be limited only as regular meetings but should contribute to bring the projects ahead.

Headworks, Chilime Hydropower Plant.