

HARNESSING OF HYDRO POWER POTENTIAL IN UTTARANCHAL

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On 9th November, 2000 a new State Uttaranchal was carved out of the Uttar Pradesh with 13 of its north-west districts forming the new State. Geographically 8 districts of the new State are completely in the hilly region of this Himalayan Region with the remaining 4 districts are partly hilly and partly plain areas with tarai and Bhabar characteristics while one district Haridwar is completely in the plain area. This province is also having the origin of some of the ice-fed rivers like the Ganges, Yamuna, Bhagirathi, Alaknanda, Sarju, Tons, Kali and Gori. In the foothills the medium and large dams for collecting the water of rain fed rivers for irrigation and flood protection purposes have been built. Thus the availability of ice fed and rain fed rivers along with the natural incline make this province a State having a good hydro power potential and a future Energy State.

At present all the electric power being generated (except the captive power plants and diesel generators in the factories and commercial places) is only hydro power with some power from thermal and nuclear plants allocated from power stations situated outside the State. The present status of hydro power potential in the State is as follows:-

Identified potential	about 20,000 (plus) MW
Harnessed potential	1400 MW
Under Commissioning/Final Stage of Completion	1704 MW
Allocated (at various stages of development)	12784 MW

Developer wise position of the developed/under developed hydro power potential is being given here below:

Developed Potential	1400 MW
1. State sector under UJVNL-Uttaranchal Jal Vidyut Nigam Ltd.	1000 MW
2. Central sector under NHPC-National Hydroelectric Power Corpn. Ltd. (120 MW Tanakpur power plant is now being treated having capacity of 92 MW thus the capacity under Central Sector is 372 MW)	400 MW
3. Private sector	-Nil-
Under Commissioning/final stage of completion:	
1. State sector under UJVNL-Uttaranchal Jal Vidyut Nigam Ltd.	304 MW
2. Central sector under THDC-Tehri Hydroelectric Dev. Corpn. Ltd. (Tehri Dam Stage-I)	1000 MW
3. Private sector (Vishnuprayag Project)	400 MW

Allocated projects:

<u>Sl.</u>	<u>Developer</u>	<u>Allotment Procedure</u>	<u>Capacity</u>
1.	Central Sector (various CPSUs)	Through MOU (21)	8091 MW
2.	State Sector (UJVNL)	Direct Allotment (13)	2444 MW
3.	Private Sector	Through Bidding (07)	1245.50 MW

In Uttarakhand about 65% land is under forests out of which about 15% forest areas are either under National Parks or Sanctuaries/Biospheres. Some of the hydro power project sites are situated in these protected areas, thereby getting environmental clearances is one of the major issues in addition to the issues raised by local people with regard to employment, rights with regard to the use of water and land etc. Some of the projects are multipurpose dam based projects which attract R&R (Rehabilitation and Resettlement) issues. Some projects especially the Pacheshwar Dam (5000 MW) is to be situated in Indo-Nepal Border. Some time ago the Govt. of Uttarakhand has decided to give preference to run-of-the-river projects by even changing the nature of dam based projects to run-of-the-river type by having cascade of projects rather than one dam based project. One good example in this regard is the Kotli Bhel Project (1000 MW) which was earlier dam based and now three cascade based run-of-the-river projects with total estimated capacity of 1045 MW has been prepared through NHPC.

At the time of creation of Uttarakhand the following 04 projects were languishing at construction stage due to various reasons, mainly paucity of funds/failure of private sector to yield. However, after creation of new State these projects have now been showing good progress, one being at commissioning stage. The status of these projects is as follows :-

Sl.	Name	Developer	Status
1.	Vishnu Prayag (400 MW)	M/s JP Power Ventures Ltd.	3 units already commissioned.
2.	Srinagar (330 MW)	M/s Alaknanda Hydro Power Co.	Construction work restarted after about 14 yrs.
3.	Lakhwar Vyasi Multipurpose Projects (420 MW)	Allocated to NHPC for further implementation in 2003.	Cost sharing issue between beneficiary States for water component is to be settled.
4.	Maneri Bhali-II (304 MW)	State sector under UJVNL. Work restarted after a period of about 10 years.	Under final stage of completion.

SMALL HYDRO POWER POTENTIAL/PROJECTS

In addition to the large & medium identified hydro potential of about 20,000 MW. Uttarakhand State is also having about 1500 MW potential in the segment of Small Hydro projects upto 25 MW capacity, ranging even upto 1 MW also. The status of SHPs developed so far is being given here below :-

Sl.	Developers	No. of Projects	Total Capacity (in MW)
1.	State undertaking (UJVNL)	31	54.405
2.	State Agency (UREDA)	32	2.8875 (For Village Electrification)
3.	Private	02	6.60

While most of the SHP projects developed so far under state undertaking UJVNL and all under private sector are being fed to grid, the projects under UREDA (Uttaranchal Renewable Energy Development Agency) are mostly stand alone projects with electrification of remotest villages as its primary goal. Such stand alone projects are being managed by the local community for day to day operation and maintenance through a registered society with elected representatives among the consumers. Such stand alone projects were planned and constructed by the State's agency with 100 percent funding through Govt. grant.

The status of SHP projects allotted to/under construction by various developers is being given below :-

Sl.	Developer	Allotment Procedure	Nos.	Capacity (MW)
1.	Central Sector	-	Nil	Nil
2.	State Undertaking (UJVNL)	Allotment Order	16	82.30
3.	State's Agency (UREDA)	Allotment Order	18	1.82
4.	Private Sector	1. Earlier MOU route; 2. Now transparent bidding process.	32 8	218.55 100.10

ALLOTMENT PROCEDURE

The allotment of hydro project sites, whether large, medium or small to private parties was being done earlier during the time of erstwhile Uttar Pradesh through MOU route only. In case of SHPs such sites were even identified through self identification by the parties themselves. This process had its own merits and demerits. In such a case deciding for optimum size and site of projects and optimum utilization of streams may have raised some criticism. Now Uttaranchal Govt. has decided and put in place a mechanism and policy of transparent bidding process for allotment of identified projects to private sector. As DPRs are not ready and cost surprises even after having a good DPR may be there, hence tariff based bidding process has not so far been adopted by Govt. of Uttaranchal.

EVACUATION OF POWER

Evacuation of power from large, medium and small hydro power projects is also a major issue especially with regard to forest, environmental, rehabilitation and availability of space point of views as these constraints have to be dealt with effectively along with minimizing the cost. Govt. of Uttaranchal has prepared such integrated evacuation project to evacuate power from all new hydro power projects. A project of \$300 million has been sanctioned by Asian Development Bank for which final agreements have to be signed after approval from Govt. of India.

GENERAL EXPERIENCE

The pace of developing the allocated hydro power projects whether large, medium or small has not been encouraging so far. Various reasons may be quoted for delay in developing the projects ranging from preparing the DPR and getting clearance to actual implementation. In the Govt. Sector the paucity of funds and less attention to hydro power projects led to delays of some of the projects while Tehri Hydro Power Project faced a lot of issues ranging from lack of funds to R&R issues and R&R policy and even to religious/social and environmental issues. Now Tehri Stage-I (1000 MW) project is under commissioning stage. In case of private sector as well as central sector projects there were delays due to various reasons. In case of SHPs under state's undertaking as well as private sector the situation is the same and one can observe delays due to various reasons. At the time of erstwhile state of Uttar Pradesh as many as 22 SHPs under less than 5 MW category (upto 3 MW) and 12 SHPs between 5-25 MW have been allocated to private developers or parties through MOU route by allocating them a particular river or stream and asking them to identify upto 3 projects and prepare DPRs and then construct those projects. These allotments were made prior to 1997 and Agreement (MOU) for implementation with a time bound time schedule of commissioning were signed but only 2 projects under upto 3 MW category have so far completed while for others the new state of Uttaranchal has further given extended time schedule by signing a new Implementation Agreement.

COMMUNITY PARTICIPATION

In case of micro hydel schemes, especially for electrification of remote villages, stand alone projects have been allocated to UREDA (Uttaranchal Renewable Energy Development Agency). Earlier during the time of erstwhile state of Uttar Pradesh NEDA (Non-Conventional Energy Development Agency) have been given this mandate of implementing such stand alone schemes. Before the creation of the new state such schemes were constructed by NEDA and then by UREDA through funds from State & Central Govt. as grants and then handed over to the local community through their society to manage them for operation and maintenance. The tariff, operating hours, collection, operation and maintenance is being taken care by that society itself. After creation of the new State UREDA has made model byelaws and made these societies to register themselves under Societies Registration Act, thereby making them legal entities. UREDA played a role by helping these societies and the office bearers through their capacity building. Now a new role has been assigned to such societies. New schemes under this category are now being planned and executed by taking active participation of the community by involving these registered societies through 10% funding from the community and implement the schemes through such societies. Some of such schemes which are already under operation has been synchronized with the grid to enhance the PLF of such plants by feeding the electricity generated into the grid (even at 11 KV) when local demand is not there. Even import-export meters have been put for facilitating import and export of electricity. Such a mechanism is also envisaged under the Electricity Act, 2003 where in rural areas generation and distribution through such one or other way is allowed. The local communities has now learned and started to install electronic meters to each connection, using CFL to benefit more and more consumers out of limited capacity of the plant and charging per unit rate of electricity rather than per bulb rate or so. The need now is to utilize such stand alone schemes for development of local area/villages and linking such scheme to other economic activities of that area thereby raising the livelihood and standard of life of the rural people.

The details of such schemes is being given here below :-

Sl.	District	No. of scheme developed	under construction	Capacity	Nature
1.	Uttarakashi	2	1	320 KW	Village Electrification & Elect. of Gangotri Dham
2.	Bageshwar	14	8	2020 KW	Village Electrification
3.	Chamoli	7	6	1140 KW	Village Electrification
4.	Rudraprayag	1	0	100 KW	Electrification of Kedarnath Dham
5.	Nainital	1	0	100 KW	Village Electrification & Grid Feeding
6.	Pauri	4	0	250 KW	Village Electrification & Grid Feeding
7.	Tehri	2	1	127.5 KW	Village Electrification & Irrigation
8.	Pithoragarh	1	1	550 KW	Village Electrification & Grid Feeding
9.	Almora	-	1	100 KW	Village Electrification
	Total	32	18	4707.5 KW	

NEW INITIATIVE: GHARAT

A watermill is a machine constructed by connecting a waterwheel to a millstone. At present there are about 15,448 traditional water mills (functional as well as non-functional) in the state of Uttaranchal. Upgradation of these watermills would directly affect around **30000** people considering the employment opportunity of two persons per watermill.

Each watermill having an average 1.5 kW of capacity working on an average 8 hours a day shall generate about 4320 kWh / year and will compensate an equivalent of 6 tones of CO₂ which will get about Rs 3000 per year additional income under CDM process at present rate.

Up-gradation and production of new modern technologies specially designed for the grass root conditions of the area are being taken up in a big way so that the productivity of this important section of population gets increased and they get higher returns with lesser efforts. Upgradation of such traditional watermills can be great source of employment generation.

The up-graded watermills of this hilly region are an essential and important source of energy in remote areas. These watermills not only provide electricity to small areas but are also used for grinding grains. Up-graded watermill produces power up to 5 kW which is sufficient for electrification 20-25 families within the diameter of 500 meters. Horizontal Micro Turbines (Open and Closed Cross Flow Turbines) and vertical shafts are being used in up-gradation of watermills. Electronic Load Controller (ELC) is also being used for load controlling in electrical output watermills. There are 6 manufacturers, who have tested their turbine in AHEC, IIT, Roorkee, are providing all equipment to the water-millers in Uttaranchal. Small Scale Industry Department, Government of India has declared Watermill (Gharat) as Small Scale Industry and state government has exempted watermill parts and products free from VAT.