Small Hydro Power: A viable option with special reference to Birthi Fall, Burthing Purdam and Phulibagar Kwiti Scheme, District Pithoragarh, Uttarakhand

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Extended Abstract

Utilization of running surface water is imperative in the present scenario. Water flowing in rivers, streams and streamlets that are blessed with appreciable discharge and hydraulic head carry enormous potential to generate hydropower, the demand for which has grown manifold over the years. With the plethora of problems associated with setting up of big hydropower projects in present times, the need for micro, mini and small schemes has increased substantially. Such schemes have low gestation period, low submergence problems, and practically no rehabilitation issues. Small and mini hydel projects have the potential to provide energy in remote and hilly areas where extension of an electrical transmission grid system is uneconomical besides other advantages.

The problems related with setting up of huge projects namely submergence of populated lands, issues of rehabilitation, loss of precious forest flora and fauna, environmental degradation, environmental impact assessment and related issues have limited the growth of mega projects. The infamous Tehri Dam has been commissioned for hydro power generation but not without its share of unprecedented problems that came its way.

Small hydro (< 25 MW) potential in India is equal to 15000 MW with installed capacity of 1423 MW in total 420 schemes. A further 187 schemes with a total installed capacity of 512 MW are under construction; and 4096 additional schemes are planned (Hydropower & Dams 2004) in addition to the existing 420 schemes. On a global scale, India stands fifth in terms of total hydroelectric potential (power generation capacity) but a majority of the country's potential is yet to be tapped (about 88%). Northeastern region accounts for more than a third of the total hydro potential in the country but only 2% has been developed so far. Around 4,233 potential sites with an aggregate capacity of 10,071 MW for projects up to 25 MW capacities have been

identified. In the last 10-12 years, the capacity of Small hydro projects up to 3MW has increased 4 fold from 63 MW to 240 MW.

With the economic liberalization, the Indian government also opened up the doors in 1991 to private companies for the setting up of hydropower projects. The government also came in favour of growth of more affordable schemes which could be developed with low gestation period and having lesser hindrances. Instead of promoting isolated or stand alone hydro power schemes, the emphasis was for a Total Integrated Watershed Development of natural resources on micro watershed basis with preference for Run of the River hydro power schemes. Promotion of such scheme would lead to lower geoenvironmental stresses and management costs, less socio-economic stresses and opposition, less time overruns and better returns.

The strategy is particularly applicable in Himalayan terrain, where there is immense power potential with a lot of hydro energy still to be tapped. The idea is to identify potential segments conducive to head and discharge utilization for hydro power. Small and mini hydel projects have the potential to provide energy in remote and hilly areas where extension of an electrical transmission grid system is cumbersome and uneconomical.

Based at the interfringe of Middle – Higher Himalayas are three important examples of small hydro power schemes namely Birthi Fall, Burthing-Purdam and Phulibagar -Kwiti HE Scheme which after having been identified, conceived and geologically and techno economically evaluated and investigated, are likely to be taken up for construction.

The **Birthi Fall HE Scheme** envisages construction of a trench weir across Bhelchhin Nala, a small tributary of Jakula Nadi. The scheme is proposed to divert water (0.96 cumec) through a 1.2 Km long steel piped/ open channel water conductor system to a surface power house near village Burthing to generate 1.0 MW (2x 0.5MW) of power by utilizing an available gross head of 156.2m. Geologically, the area exposes schists and gneisses of Central Crystalline Group. The Main Central Thrust (MCT) separates the rocks of Central Crystalline Group towards north with the rocks of Garhwal Group towards south. The appurtenant structures include trench weir, desilting tank, WCS, forebay, and a surface power house designed for overburden.

The **Burthing- Purdam HE Scheme** located just downstream of Birthi Fall scheme is another run of the river scheme across Jakula Nadi. This scheme is partly within Central Crystalline Group of rocks represented by gneisses and schists and partly within carbonate rocks (limestone, dolomite etc.) of Garhwal Group. The zone of MCT (?) cuts across the region slightly downstream of the weir site location. The scheme envisages construction of a trench weir near village Burthing to divert water (4.92 cumec) through a 1.4 Km long water conductor system to a surface powerhouse near village Purdam. The proposed scheme would generate 6.5 MW (2x 3.25MW) of power by utilizing an available gross head of 195m. Two layouts viz. Alt I and Alt.-II are under consideration. The trench weir site locations for two alternatives vary. Alt.-II, however, appears to be more feasible, considering the site constraints. The appurtenant structures include trench weir, desilting tank, water conductor system (steel pipe and open channel), forebay, penstock and surface powerhouse, designed for overburden.

The **Phulibagar Kwiti HE Scheme** is located downstream of Burthing Purdam HE scheme across Jakula Nadi. The site is occupied by Garhwal Group of rocks represented by carbonates. The scheme envisages construction of a trench weir near village Phulibagar to divert water (7.68 cumec) through a 1.3 Km long water conductor system to a surface powerhouse near Kwiti. The scheme would generate 5.0 MW (2x2.5 MW) of power by utilizing an available gross head of 98.0m. The appurtenant structures include trench weir, desilting tank, water conductor system (steel pipe and open channel), forebay, penstock and a surface powerhouse, designed for overburden.

This paper deals with the pertinent need to set up small hydroelectric schemes with emphasis on detailed case studies of three such schemes in the Kumaon Himalayas wherein despite site constraints, geological investigations have helped arrive at the best possible layout. In addition, surface water has been utilized to optimum advantage and the tail scheme has benefited from the discharge of the feeder scheme.