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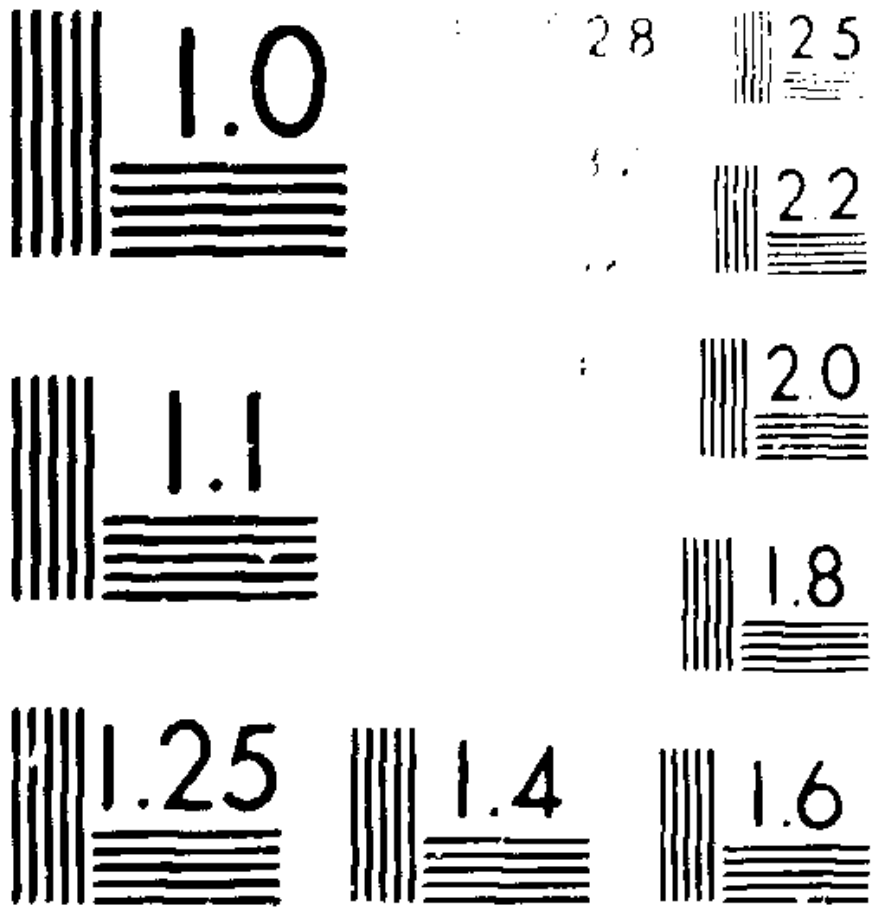
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SMALL HYDRO POWER DEVELOPMENT, The Kingdom of Nepal*,

by

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I. GENERAL

Nepal is essentially a mountainous country with a land area of 147,181 sq. km. It has about 15 million of population. There is still no evidence about the existance of commercially exploitable fossil fuel resources in the country; but the physical endowment of the country is such that it has immense of hydro-electric potential. However, the traditional source of energy being utilized in the country is the firewood. The excessive reliance on forest as primary source of energy may lead to much faster depletion, far beyond the regeneration capability of already dwindied forest resources of the country causing far reaching consequences such as irrepairable damage and destruction of water regime, soil and other basic elements of environment. Taking this fact into account and also having in mind that the utilization of hydro-electric potential will have to play in long-run very important role in the energy balance of the country, HMG has paid greater attention to hydropower development. However, upto-date position of the utilization of this resource as compared to the total theoretical hydro-power potential of 83000 MW is quite meagar-only 113 MW has been so far installed, i.e. 0.135% of the available potential. The electricity production from these installations hardly contributes to 2% of total energy requirements of the country. This indicates that Nepal has to go a long way in order to make easily available the services of hydro-electricity for all the Nepalese community.

Taking into account the facts mentioned above with regard to resource situation, with a view to pave ground for systematic development of hydropower, the following three broad classifications were being made:

i. Small/micro hydel plants (25 KW to 500 KW) for meeting the energy needs for remote and isolated mountainous regions, where the quantums of demand are too low, load centres are very much scattered and promising sites for micro-hydel developments are readily available;

ii. Medium scale plants (say, upto 100-200 MW) for meeting the energy need of urban areas and industrially prospective locations of midlands and southern Terai plain;

iii. Large scale plants for meeting the long-term energy need of the country and possibly for multipurpose use and for export of the energy to neighbouring countries.

Among these three catagories of hydro-electric development, "SMALL/MICRO HYDEL PLANTS" development has been given pricrity as a quick measure to provide energy.

II. BACKGROUND OF SMALL/MICRO HYDEL DEVELOPMENT

The utilizations of hydro-electric energy in Nepal dates back to 1911 A.D., when a hydro-electric plant of 500 KW appeared in the country. The plant of that capacity, of course, at that time, could not be considered as Small or Micro Hydel Plant. But, however, since then over seventy years have already past; Nepal has not yet been able to establish a national power supply system to connect different load centres located in various parts of the country. Still the situation is such that the quantum of energy requirement and pattern of probable load at individual locations do not justify their connection by transmission lines from the central power supply system. Under these circumstances, it was realised that if the supply of electricity to these isolated locations cound not

be provided at this stage by decentralised supply sources, neither the use of hydro-electricenergy could be promoted there, nor the objectives of social benefits and community development attainable from the use of hydro-electricity could be achieved at earliest possible date. As a result, concrete programme for development of small/micro hydel plants was developed. Under this programme, the number of isolated plants to be considered was large and due to geographic inaccessibility and also scattered nature of locations of the plants, the need of a separate organization was felt to provide special attention to the development of small/micro hydel development in Nepal. Accordingly, Small Hydel Development Board (SHDB)- an autonomous government Board was created in the year 1977 under the then Ministry of Water and Power. The Minister for Water Resources is the Chairman and the Chief Engineer of Electricity Department is the member secretary of the Board. The specific responsibility of the Board is planning, construction and operation and maintenance of small/micro hydroelectric power plants in the remote and backward hill and mountainous areas in the Northern part of the country.

The funding for its activities is obtained through government budget and bilateral and multilateral assistance. Currently there are more than thirty projects spread throughout the country either in the stage of completion or under constructions or under investigations and planning. The salient features and costs are indicated in Table I. The Board has plan to prepare feasibility studies and prepare detailed engineering design for another 10-15 projects within the next two to three years.

III. Decentralised Versus Centralised Development.

In the context of Small hydro development the centralised system is comparitively more advantageous than decentralised system for the following reasons.

1. The size of development is independent of local load requirement.
2. The reliability of the plant is not of major importance.
3. The frequency and voltage regulation of the plant is of minor importance. For this reasion asynchroneous generators can be used in small plants.
4. In a centralised system small and micro plants can be operated unattended, thereby lower operational costs.

For reasions stated above development of micro and small hydro projects in a centralised system can be cheaper than in an isolated system.

In the context of Nepal where the rural villages are geographically very scattered and the general economic level of the rural people is very low the extension of high voltage national grid transmission lines to the interiors of the country is only a vision for some future. Hence for many years to come majority of small hydro projects will have to be developed and operated as an isolated system. However, the introduction of electricity to these areas will not only improve the quality of life and create the necessary environment for stimulation of various economic activities but also help promote the growth of electric power demand which in course of time justify the development of bigger scale power projects and extension of grid lines to these areas.

IV. Major Impediments in the development of SHP in Nepal.

Nepal's case is a typical example of decentralised development of small hydro projects. Hence Nepal has to encounter with all the disadvantages associated with isolated system such as the requirement to maintain high standard in design, larger installed capacity to meet the peak demand and necessity of voltage and speed control gears. All these add to the cost of development.

Another aspect of problem which enormously affects the cost is the very difficult accessibility of the project sites.

The lack of adequate technical national capability in project preparation is another major impediment.

The unavailability of standard locally manufactured generating equipment is also a hurdle for effective execution of projects. There are one or two local manufacturers of turbine in Nepal but much efforts are required to attain certain degree of perfection is the design of the turbine specially with regard to efficiency and governing.

Presently Nepal has to import these generating equipments from various sources on a competitive bidding basis. As a result the equipment are of different type and make thereby adding to many operational difficulties and costly spares. Hence the development of SHP in a bigger scale demands the necessity for promoting the local manufacture of generating equipments.

V. Summary and Conclusion.

1. In the total picture of the consumption of energy in Nepal, domestic sector plays predominant role. The use percentage is above 90% of the total. The major energy consumed in domestic sector is in cooking, and for this purpose the source of energy is mainly firewood. This situation has alarmed the planners that if the present trend pattern of heavy reliance on one particular source of energy is continued, there may be no firewood in Nepal by the year 2000.

2. The present day energy requirement per capita of the country is of the order of 600 kwh electric energy equivalent, which gives the figure of annual total energy need as 9000 million KWH equivalent. This is less than 1.5% of the total theoretical hydro-electric potential of the country. This indicates the extreme importance of appropriate steps towards encouragement of hydro-electric development in Nepal.

3. The SHP will dominate for many years in the electrification programme of the hill rural areas.

4. The success of SHP development in Nepal will depends on

   a) building the national capability in project preparations.

   b) building technics to use local construction materials.

   c) local manufacture of generating equipments.

Table 1

PROJECT FEATURES AND COSTS OF COMPLETED PROJECTS

US $ 1 = Rs. 14.30 (N.C.)

S.No.	Project Name	Installed Capacity	Head M	Discharge l/sec	Water Conduct length m Canal	Penstock	Transmission length. Km.	Cost Rs(N.
1.	Baglung Small Hydel Project.	175		800	1800		5	5 Million
2.	Doti Small Hydel Project	200		500	700		9	10 "
3.	Fidim " " "	260	25	1350	392	30	5	65 "
4.	Jumla " " "	260	134	200	942	245	6	14.4 Million
5.	Jomsom " " "	260	23.5	500	952	235	20	13.3 "
6.	Gorkha " " "	64	22	200	750	50	5	2.5 "
7.	Dhading " " "	30		90	780	54