2. Development of Water Resources in Nepal

Energy is one of the most fundamental inputs for the economic development of any country. The role of hydropower generation in Nepal's energy demand and the current situation of its development are briefly presented in this Chapter. The development of Nepal depends a great deal on the development of the abundant water resources particularly in the area of hydropower generation.

According to WECS Report, 1994, total annual energy consumption in Nepal was about 6.5 million tons of oil equivalent in 1992/93, which corresponds to about 343 kg of oil equivalent per person. Traditional sources of energy such as fuelwood, agricultural residue and animal dung still occupy 92% of the total energy use in Nepal. The remaining 8 % is contributed to commercial energy sources such as electricity, petroleum products, coal, natural gas and other miscellaneous energy resources. All of the commercial energy sources except electricity are imported from other countries. It was reported that Nepal spends roughly one-third of her foreign currency earnings on the imports of petroleum products. Hydro-electricity is only available from Nepal's own natural resources.

His Majesty's Government (HMG) of Nepal has stressed the development of hydropower resources as this has been considered to be the prime mover of economic development. About 20 % of the national development expenditure is accounted for by the electricity sector.

Hydropower development was initiated in 1911 with the construction of the Pharping hydropower plant of 500 kW capacity ; By 1995 the total hydropower development amounted to 254 MW. The main hydropower plants in Nepal are shown in Table 1 (WECS Report, 1995). Current installed capacity is still only 0.6 % of the feasible hydropower potential estimated at 42,133 MW as previously mentioned. The annual hydropower generation of the Integrated Nepal Power Supply System in 1993/94 was 840 GWh. Recently the annual rate of increase of electricity demand is estimated at 11 %. If this trend continues, a shortage of electricity will cause serious problems because electricity is essential for civilized life and any kind of industrial and commercial production. In 1992 HMG Hydropower Development Policy made provisions to include and encourage the private sector for the generation and supply of hydropower. The government is implementing the construction of new hydropower projects, and also the consolidation, repair and rehabilitation of the existing hydropower stations : At present, Modi Hydro Project (14MW), Puwa Hydro Project (6.2 MW), Chilime Hydro Project (20MW), Kalikot (200KW) and Dolpa (140 kW) are under construction. As for the hydropower generation with the involvement of the private sector, licenses have been issued to Khimti hydropower Project (60MW), Middle Marsyangdi (43MW), Upper Marsyangdi (42MW), West Seti (360MW), Bhote Kosi (69MW) and Upper Bhote Kosi (36MW). The detailed design of Kali Gandaki-A Hydro Project, a detailed feasibility study of the Karnali(Chisapani) Multipurpose Project (10,800 MW) and also field investigations of Pancheswore Multipurpose Project have already been completed. The Arun 3 Project (402 MW) as well as the Budhi Gandaki Project (600 MW) are also high priority projects for future implementation.

Some of them, for example, Arun 3 Project site, are located near glacialized areas with

Table 1 : Development of hydro-electricity in Nepal.

	Plant Name	Installed Capacity (kw)	Year of Commerrical Operation
1	Sundarijal	640	1934
2	Panauti	2400	1965
3	Phewa	1000	1967
4	Trishuli	9000／12000	1967／1971
5	Sun Kosi	10500	1972
6	Dhankuta	240	1972
7	Tinau	1024	1972
8	Surkhet	345	1977
9	Gajuri	25	1978
10	Thansing	20	1978
11	Gandak	15000	1979
12	Baglung	175	1981
13	Doti	200	1981
14	Phidim	240	1982
15	Dhading	32	1982
16	Gorhe	64	1982
17	Kulekhani-1	60000	1982
18	Jomsom	240	1983
19	Jumla	200	1983
20	Cevighat	14100	1983
21	Syangja	80	1984
22	Seti	1500	1985
23	Helambu	50	1986
24	Selleri	200／200	1986／1994
25	Darchula	50／250	1986／1993
26	Kulekhani-11	32000	1986
27	Chame	45	1987
28	Manang	80	1988
29	Bhojpur	250	1989
30	Khandbari	250	1989
31	Chaurjari	150	1989
32	Taplejung	125	1989
33	Tehrathum	100	1989
34	Remechhap	75	1989
35	Marsyangdi	69000	1989
36	Serpodaha	200	1989
37	Bajhang	200	1989
38	Okhaldhunga	125	1990
39	Arughat	160	1990
40	Bajhang	200	1990
41	Rupalgad	100	1991
42	Surnayagad	200	1991
43	Audhi-Khola	5100	1991
44	Tatopani Myg	1000	1991
45	Jhimruk	12500	1994
	Total	251185	

potentially dangerous glacier lakes. If one of the glacier lakes were to burst after the construction of a hydropower station, the infrastructure could be severely damaged. Engineers and planners have come to realize that remediation of GLOF effects will remain an essential and unavoidable element of hydropower development in Nepal.