Rural Electrification

1. Introduction

The lack of electrification of the rural areas has been considered as one of the major hindrances to rural development. A very large area of rural Nepal is still without electricity. At present only about 7% of the people living in rural areas have been getting electricity services. The major challenges to Nepal's development of the rural electrification (RE) sector are poor infrastructure, lack of capital and coordination with the agricultural and rural development programs. RE schemes, especially in isolated and remote areas of Nepal, are considered unprofitable because of low consumption per household, high connection cost, and low initial consumer connection ratio.

RE in Nepal is basically divided into two sub-sectors, viz. the grid-based (on-grid) and the isolated (off-grid). Grid-based electrification is carried out through the extension of the national grid while the isolated (local) grids are supplied by mini, micro and small hydro plants. The former is under the mandate of the Ministry of Water Resources (MoWR), which executes through the Nepal Electricity Authority (NEA). The latter is under the mandate of the Ministry of Science and Technology (MoST) which implements through the Alternative Energy Promotion Centre (AEPC). Several Independent Power Producers (IPPs) and NGOs are engaged in rural electrification with assistance from donors.

2. HMG's Policies, Strategies and Plans in RE

2.1 Hydropower Development Policy 2001

This is the most relevant policy paper in existence for the RE sector. It emphasizes the tying of up electrification with economic activities. The following policies and provisions outlined in the document are important for the RE and rural development sectors.

- Electrification of remote rural areas shall be encouraged by operating small and mini hydropower projects at local levels.
- The existing public sector institutions shall be restructured.
- Communities, cooperative institutions, local bodies and the private sector will be encouraged in the generation, transmission and distribution of hydropower.
- Appropriate arrangement to undertake RE shall be made while granting electricity distribution licenses
- RE shall be encouraged in the rural areas directly affected by the electricity generation projects. Energy royalty on the electric energy consumed shall be exempted in such areas. Such exemption will be allowed for the first fifteen years from the date of commercial operation of the projects.
- One percent (1%) of the royalty received by the government from hydroelectric projects will be provided to those VDCs that are directly affected by the structures of such projects. This amount shall only be utilized for rural electrification in the project area.
- A RE fund shall be established for the development of micro hydro and RE by pooling in a certain percentage of the amount received as royalty from hydroelectric projects.
- **The government will provide grants through AEPC to the domestic private sector to generate and distribute electricity by building projects of up to 100 kW capacity at the rural level. Moreover, such projects shall be included in the prioritized loan sector, and facilities will be provided to such schemes accordingly.**

2.2 Water Resources Strategy 2002

The strategy recognizes the fact that providing electricity to rural populations is a major challenge in Nepal due to the scattered nature of the population in those areas. A combination of grid extension, isolated generation (small and micro hydro) and reliance on alternative approaches is therefore envisaged. The strategy emphasizes active participation of rural communities and private entrepreneurs. It aims at electrifying 43%, 60%, and 80% of the nation's households

respectively by the end of years 2007, 2017 and 2027. To meet these targets, a National Water Plan is presently being drafted. An investment requirement to the tune of Rs. 95 billion has been estimated to meet the demands of rural electrification by grid connection or isolated energy systems over the 25-year period of the strategy. Since much of the RE investments will have to be subsidized, it is recognized that the targets in RE can only be met with donor support.

2.3 Tenth Five-Year Plan

The Tenth Plan emphasizes RE for the development of Nepal's rural economy. Of the total outlay for transmission and distribution of electricity during the plan period, 96% has been allocated for RE. Out of this 65% has been allocated for developments in the Eastern, Mid-Western and Far-Western regions which are relatively poor in receiving electricity services. Among other things, the Plan stresses upon community mobilization, demand side management, end-use diversification, institutional reforms, and improved subsidy administration. The major quantitative targets of the Tenth Plan in the Electricity Sector that pertain to RE are as follows.

- **To extend grid-electrification to an additional 10% of the country's population. An additional 14 districts will thus be connected to the national grid during the plan period. An additional 5% of the total population (12% of the rural population) is to receive electricity from alternative energy sources.**
- **To install electricity generating capacity equivalent to 10 MW from micro hydro in 47 districts.**
- **To generate 3.7 MW equivalent of electric energy from 52000 solar systems in 52 districts.**

During the plan period, fifty (50) micro hydro projects, whose feasibility studies have been completed, will be implemented through the Alternative Energy Promotion Centre (AEPC) with active participation by VDCs, IPPs, community based cooperatives etc. Identification of new projects will be carried out and implemented. The major grid-extension projects to be implemented in this period are the Kailali-Kanchanpur Rural Electrification Project (under construction) and the Mid and Far Western Rural Electrification Project (covering 8 districts). Apart from that there are small budget rural electrification programs in various districts. Twenty-two 33 kV transmission lines and forty-six 33/11 kV substations are to be constructed during this plan period.

In order to finance the investments, a substantial amount of foreign assistance in the form of grants and loans would be required. Annex-I gives an overview of RE-related investment-allocations for the next two years in the second Mid Term Expenditure Framework (MTEF) of the 10th Plan.

3. Present Scenario

3.1 RE under NEA

Altogether 31 small hydro schemes totalling a capacity of 5.51 MW and two solar photovoltaic schemes totalling 100 kW have been constructed by NEA. Eleven (11) schemes have been leased out to the private sector. At present two small hydro schemes totalling 900 kW are under construction. The Small *Hydropower Master Plan* (SHMP) Project has been conducting inventory, feasibility and detail design of small hydro projects. Several transmission line and substation projects are presently under construction. Techno-feasibility studies for rural electrification and distribution system reinforcement (RE/DSR) in 26 districts of Far Western, Mid Western, Western and Central Development Regions have been completed under NEA's *Distribution Network Development Project*. The *Kailali-Kanchanpur Rural Electrification Project*, financed through a Danish grant, will connect 30,000 new households in 34 VDCs of Kailali and Kanchanpur districts by 2005/06. Investments on the ongoing projects, for the next two years of the 2nd MTEF, are indicated in Annex-I.

3.2 Micro-hydro and Alternative Energy

The Agricultural Development Bank, rural communities and entrepreneurs, and a number of national and international NGOs have supported micro-hydro projects in Nepal. About 240 micro hydro schemes generating 4 MW of electricity and about 880 peltric schemes generating 1.5 MW have been implemented since 1990. A population of about 400,000 has been served by these schemes. Subsidy covers typically 65 to 80% of the cost of such schemes. Development of the sector gained momentum from the 1990s with the establishment of the AEPC and the UNDP-sponsored *Rural Energy Development Program (REDP).* The DANIDA-supported Energy Sector Assistance Project (ESAP) has been instrumental in supporting AEPC. AEPC promotes micro hydro and solar energy projects by providing technical support for project development as well as end-use development. AEPC's mandate at present covers micro-hydro schemes up to 100 kW. Besides loan financing available through commercial banks there is a provision of financial subsidy for these projects. An *Interim Rural Energy Fund (IREF)* administers the subsidy. The IREF has committed subsidies to the tune of Rs. 3 Billion. This will ultimately benefit about 38200 households with a generation of about 1700 kW from micro-hydro systems and about 870 kW from solar home systems.

3.3 RE under the Private Sector

Private sector RE has its origin in various small hydro schemes. Most of these were implemented with donor assistance and the involvement of NEA between 1978 and 1992. These were basically developed for off-grid RE in areas away from the existing grid lines. Except for some labour input

by the beneficiaries and the payment (in some cases) of connection fees, the schemes were largely financed through grants. In later years, privatization of these schemes took place. Two Independent Power Producers (IPPs) are presently engaged in donor assisted RE. The *Butwal Power Company (BPC)* has built three small hydro schemes so far – the Tinau Khola (1MW), now owned by NEA, the Andhi Khola (5 MW) and the Jhimruk (12 MW). BPC owns and operates the latter two, sells power to NEA and is engaged in RE in the districts in the vicinity of the generation plants. The *Himal Power Limited (HPL)*, which has built, owned and operated the 60MW Khimti scheme, is now engaged in the Jhankre Rural Electrification and Development Project (JREPD). More than 5000 households are to be electrified under the project.

4. Future Programs

4.1 Programs under NEA

NEA has adopted a new strategy whereby it intends to sell power in bulk to rural electricity consumer groups after putting up the distribution infrastructure. Under this program, consumer associations typically in the form of cooperatives will take the responsibility of managing, maintaining, and expanding the rural distribution of electricity. Communities may raise 20% of the investment cost for grid extension to their area and 80% of the funds is provided by HMG. It is expected that this will reduce costs of distribution and also pilferage of electricity. NEA has received numerous applications from rural communities for consideration. Several of those have been processed and approved for implementation.

The *Rural Electrification and Distribution System Reinforcement Project*, aided by the Asian Development Bank's loan assistance will connect 123,382 rural households of 277 VDCs in 22 districts of central, eastern and western Nepal. The project is to be completed at a cost of 53 million US$, out of which about 25 million US$ is allocated to RE. Land acquisition work has been completed at some places while the initial environmental examination (IEE) has been completed for all the districts under the project.

The Swedish Government has conveyed its commitment to provide a concessionary credit of about US$ 20 million for the *Mid and Far Western Rural Electrification Project*. This will electrify 145 VDCs in eight districts with a target of 17,200 new connections.

4.2 Programs under AEPC

The second phase of DANIDA-supported Energy Sector Assistance Project, which is to start in October this year (2004) and to continue until June 2010, is expected to play a very important role in the RE sector. The project is to focus on (i) institutional strengthening of the RE sector, (ii) strengthening the IREF and realizing it into a REF with the participation of NORAD and other donors, (iii) identification and preparation of mini-grid (mini/ micro hydro) schemes for electrification of 100,000 rural households, (iv) development of the delivery mechanism in rural grid electrification by promoting the participation of cooperatives, user groups, the private sector and local governments. The third and fourth components also support the development of productive end-use applications and integration of RE with other rural development programs. Two other project components are in the solar energy and biomass energy sub-sectors.

His Majesty's Government and the World Bank signed an agreement in July 2003 for the implementation of the ***Power Development Project (PDP)***. Among the three components of the PDP, the second component of $ 5.5 million is for the promotion of micro-hydro electrification program in the villages. An aggregate capacity of about 3MW is to be developed under the program through community mobilization. The REDP will be responsible

for the day-to-day management and implementation, and AEPC shall be responsible for the overall implementation, guidance and supervision of the program. In addition the Power Development Fund (PDF) established under the first component of the project has a provision of financing for rural power systems licensed by DoED.

4. Issues and Challenges

The following issues and challenges have been identified in the RE sector.

- ?? Bringing coherence/ harmonization in the policies and strategies related to RE.
- ?? Establishment of a separate autonomous entity for RE that will synchronize the programs in the on-grid and off-grid RE sub-sectors improve coordination with other rural development efforts and attract donor funds.
- ?? Monitoring and review of RE programs.
- ?? Power sector reform and reforms in the existing Acts and regulations to encourage private sector involvement in RE.
- ?? Productive end-use promotion and demand side management (increased power consumption during off-peak hours.)
- ?? Integration of rural electrification programs into the plans of the DDCs. (Decentralization in program implementation)
- ?? Efficient management and administration of funding (subsidies and credits) to be made available to the cooperatives while stressing upon transparency.
- ?? Institutional development support to the cooperatives so that they can establish suitable systems for efficient and effective management, operation and maintenance of the schemes. (Community mobilization)
- ?? Providing a technical support system for the preparation of schemes (Preparation of guidelines for the planning and financial assessment of the schemes.)
- ?? Quality control and technological advancement.
- ?? Government and donor coordination in securing funds for subsidy/ credit and the overall planning and implementation of RE programs.

HMG has recognized most of these issues and challenges and is committed to making reforms. This commitment is reflected in its strategies, policies and plans, which among other things, give emphasis to the integration of RE with other rural development activities, development of productive-end uses of RE, and strengthening of AEPC. HMG has recently initiated a process of reform in the power sector with the involvement of the Asian Development Bank. A study began for this purpose from December 2003 and is expected to be completed by September 2004. In addition the Japan Bank for International Cooperation (JBIC) will conduct a 5-month study of the power sector this year (2004). In the RE sector the study will suggest action plans for the development of the sector, suggest possible measures to better position RE for addressing poverty reduction issues, and recommend measures to improve donor coordination.

5. Expected Donor Support

The government has set rather ambitious targets for the long-term development of RE. A major share of the programs will have to be financed through foreign aid. The role of the donors is therefore crucial for Nepal's RE development. The following are the expectations of HMG from the donor community for the development of the RE sector.

- ?? Continued support to HMG in fulfilling the short-term and long-term financial commitments.
- ?? Assistance in further strengthening AEPC and bringing all the scattered projects under its umbrella.
- ?? Financial assistance to the IREF/ REF.

Annex-I

Rural Electrification Related Investments for next two years of the 2nd MTEF

RE-related Projects under NEA

RE-related projects under NEA	Budget Estimates ('000 Rs.)	
	2004/05	2005/06
Heldung (Humla) Small Hydro	68426	0
RE and Dist. System Improvement	1925000	1120000
Other RE	300000	1267000
Kailali Kanchanpur RE	428000	205149
Small Hydro Master Plan	5500	6000
Gamgad (Mugu) SHP	49623	80000
Western Hill Area RE	5000	10000
Koshi, Sagarmatha Hill Area RE	0	5000
Mechi RE	0	5000
Rapti, Bheri RE	0	5000
Mid and Far Western RE	560300	752000
RE Transmission and Distribution	31500	5000
Sindhu-Dolakha Dist. Line Expansion	91200	43500

Note: (1) Substation Projects are not indicated in this table. (2) Four out of the above projects have substantial foreign aid components. These are (i) RE and Distribution System Improvement (ADB Loan), (ii) Kailali Kanchanpur RE (Danish Grant), (iii) Mid and Far Western RE (SIDA Grant), and (iv) RE Transmission and Distribution (ADB Loan).

NEA 33 kV Transmission Line Projects Contributing to RE

Transmission Line Projects Financed from HMG and NEA Resources	Budget Estimates ('000 Rs.)	
	2004/05	2005/06
Sitalpati-Musikot (Rukum)	20000	20000
Ilam-Phidim-Taplejung	30500	38000
Chinchu-Rakam-Jajarkot	20400	22500
Ghorahi-Holeri (Rolpa)	10000	91500
Udipur-Besisahar-Manang	10000	10000
Piluwa-Bhojpur	5000	10000
Dailekh-Kalikot-Jumla	5000	10000
Okhaldhunga-Salleri	0	5000
Buipa-Okhaldhunga	38800	39690

RE-related Programs under MoST

RE-related Programs under MoST (HMG Financed with donor aid)	Budget Estimates ('000 Rs.)	
	2004/05	2005/06
Alternative Energy Promotion	248395	259365
Micro Hydro and Alternative Energy	180000	220000
Renewable Energy	200000	200000