Country Paper- Nepal

Public Private Partnerships for Community Electricity

PACE

Ethiopia, Nepal, Sri Lanka, Uganda

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Overview of the Electricity Sector in Relation to Public Private Partnerships in NEPAL

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Table of Contents

1 Introduction

1.1 PACE Project Background

Access to affordable, safe electricity is a fundamental step in the transition from a poor community to one showing sustainable economic growth and social development. Energy for productive uses, particularly in the agro-processing sector, is a key driver in improving local economic and social opportunities. Grid extension to rural areas in many countries is happening very slowly and even where the grid is present, in urban or peri-urban areas, many businesses, communal services and households are still unable to access power due to high connection charges or discrimination (e.g., licensing, traditional housing type, tenant status, etc.).

A growing number of communities in many developing countries do not have access to electricity, as traditional monopoly utilities in most of these countries cannot keep up with increasing population growth, and increasing demand for electricity services for businesses, institutions and households. Increasing decentralisation of government to local regions in many countries provides opportunities for these bodies to become involved in supplying electricity services.

The Department for International Development of the United Kingdom (DFID) is funding a four-country programme to review and pilot alternative models for Public Private Partnerships for the delivery of electricity services to communities in developing countries. This report provides an overview of the country situation in Nepal.

1.2 Local Government Structure in Nepal

For administrative and electoral purposes Nepal is divided into 75 districts. Each district is subdivided into Village Development Committees (VDC) and municipalities (if any). The VDCs in turn are subdivided into 9 wards. Municipalities have at least 9 wards. They could have more if the population warrants it. There are a total of 3913 VDCs and 58 municipalities.

The VDC is the smallest political/administrative unit i.e. the smallest unit that is able to act as a legal entity. While wards, especially in municipal areas, carry out a lot of the functions of a VDC or municipality they are done on behalf of the VDC or municipality and not independently.

Each VDC elects a village council consisting of an elected chairman and vice chairman, ward chairman and members and 6 people nominated by the village council. The Village Development Committee (the executive committee) consists of the elected chairman and vice chairman and the ward chairman from each ward plus two nominated members. Municipalities also follow a similar pattern except that the leader gets called Mayor.

At the district level there is also a District Council and a District Committee (the executive). The Chair and vice chair of each VDC in the district is a member of the District Committee. Each district is also divided into areas which elect representatives to the District Committee. There are also two nominated members to the Committee.There is no direct election to the post of District Chairman and Vice chairman as with the VDCs The Chairman and Vice chairman are elected by the Committee.

Each district is also divided into one or more electoral areas to select members of parliament to the national parliament which then forms the national government.

Funding- Each VDC gets a direct grant from the central government of around Rs. 500,000 (Rs 78= 1US$). In addition VDCs are allowed to raise some revenues locally. For most VDCs locally collected revenue is not a significant amount.

The responsibility to electrify their respective areas by using locally available water resources or by other means is also one of the stated duties and responsibilities of the VDCs, DDCs and municipalities .

1.3 Energy Sector Overview

The first hydroelectric plant in Nepal was installed in 1911. This was a 500 kW plant and supplied power to Kathmandu, the capital city. The next plant was a 600 kW plant in 1936 and the next one was a 2400 kW plant built in 1965. Since then a steady stream of hydropower stations, both small and large has been built and today Nepal has an installed electricity capacity of 530 MW of hydro and 56 MW of thermal.

Despite these developments only 18% of the population has access to electricity of which only 5 % are in rural areas. There are plans to further increase electrification using a 50 million dollar loan from the Asian Development Bank. Once this is completed the electrification coverage will go up to 25 %.

Up to now electricity generation and distribution has been almost entirely done in the public sector and the public sector still accounts for the major bulk of the electricity business in the country.

In the mid seventies the government embarked on a policy of providing all district administrative centers with electricity. As most of these places were too far from the grid at the time the available options were microhydro and solar. The government thus embarked on a policy of building small hydro in district centers which provided a boost to the installation of small hydro plants. Three solar systems were also installed, all of them grant funded.

In addition microhydro was also encouraged and a large number of microhydro operated mills were installed in the eighties, with the number of installations peaking at around 1985. As the market for microhydro mills began to get saturated microhydro powered electrification gained popularity. The government encouraged this process with subsidies which continues today.

It is only in the last ten years that the private sector has been permitted to play a major role in the power sector in Nepal. Before this, the private sector was limited to power generation and distribution of a maximum of 100 kW and this too only as isolated systems.

In 1992 the Electricity Act was passed which laid out the basis for private sector involvement in the power sector. So far 3 projects have been completed under the new Act- the 60 MW Khimti, 36 MW Bhotekoshi and 7.5 MW Indrawati. There are also a large number of small hydro projects (less than 10 MW) in the pipeline.

Recently the government has adopted the "Water Resources Strategy, 2002". According to the Strategy, which embraces other aspects of water as well as hydropower, the following targets have been set:

By 2007:

a) 820 MW hydropower capacity developed to meet the demand including 70 MW for export
b) laws making national contractors/consultants mandatory
c) 20 % of households to be supplied with electricity

By 2017:

a) 2230 MW hydropower capacity developed to meet the demand including 400 MW for export
b) 38 % of households to be supplied with electricity

By 2027

a) 60 % of households to be supplied with electricity
b) substantial amount of electricity to be exported to earn national revenue

The government does not yet have a clear strategy of financing electrification- see appendix I for relevant policy issues. However, popular political pressure ensures that the government allocates money for electrification in its annual budget. This money is generally spent on an ad hoc basis since it forms part of the political bargaining process. Except for specific electrification programmes e.g. under the USD 50 million ADB loan, there are virtually no planned electrification programmes.[1]

Private sector involvement in extending electrification is very small and is almost exclusively limited to isolated microhydro (less than 100 kW). Currently microhydro receives a subsidy of USD 900 per installed kilowatt. The subsidy is financed by the government with help from DANIDA.

[1] With ADB support, the Government has taken a number of steps to improve the long-term financial sustainability of the power sector including adjusting power tariffs, introducing an annual automatic tariff increase to keep pace with inflation, passing legislation to limit electricity theft, and developing an action plan to reduce municipal arrears to Nepal Electricity Authority. The Government has included restructuring of the Nepal Electricity Authority as an official policy objective in the new Hydropower Policy and is working to create an enabling framework for a more commercially oriented, efficient sector.

Table 1: Country Statistics, Nepal

Population	23.1 million
Physical Area	147,181 sq. km.
GNP Per Capita	USD 210
Urban Population	15%
Rural Population	85%
Percentage Electrification of Households	18
Power Generation Installed Capacity	585 MW
Literacy Rate	53.7
Life Expectancy (years)	59.7

2 Renewable Energy and Energy Efficiency Developments

The main energy sources for Nepal are biomass, imported fossil fuels, hydroelectricity and a small amount of solar power. Traditional fuels (fuel wood, agriculture residues and animal waste) still account for 86 % of the used energy and commercial fuels (coal, petroleum products and electricity) only 14 %. Solar power is a new addition but it has still to make a significant contribution.

The Alternative Energy Promotion Centre (AEPC) is the main agency in Nepal responsible for the promotion of renewable energy technologies. The main areas of work are biomass, microhydro, solar, wind, improved cookstoves (ICS), wind and geothermal. Wind and geothermal are still in their infancy, while the rest have significant achievements.

In addition to the Nepali government the Energy Sector Assistance Programme (ESAP) of the Danish government is the main financial contributor to the programme.

Other agencies involved in promoting RETs are the Rural Energy Development Programme (REDP) and the Biogas Support Programme (BSP) supported by the Dutch and the German governements.

REDP, a UNDP funded programme, approaches energy development from a social mobilisation perspective in helping communities build microhydro plants. This building up of "social capital" is an integral part of its programme.

REDP works in collaboration with the DDCs where they work and assist the DDC in energy planning for the district. REDP has programmes in 15 districts.

The Biogas Support Programme (BSP) provides support to the biogas sector and is assisted by the Dutch and German Governments. They provide support to the sector by providing subsidies, setting and enforcing construction standards.

The Small Hydro Promotion Project (SHPP) is a GTZ funded project, whose aim is to encourage the entrepreneurs involved in small hydro and to assist in rural electrification.

The overall goal of the project is to increase the contribution of small-scale hydropower to social and economic development in rural areas and industrial sectors of Nepal. In order to do so it aims to encourage the private sector so that the market for mini and small hydropower development and rehabilitation is firmly established which will lead to investments in rural electrification and associated economic activities.

The current emphasis is on five main areas:

- the policy framework for hydropower based energy systems in the capacity range of 100 kW to 10 MW
- Institutional structure to support mini and small hydro development
- Financial services to enable investments in mini and small hydro
- Promotion of off-peak energy thus making additional revenue for the investor possible and potentially contributing to economic development in the rural areas.
- Encouraging hydro developers to make competent use of reliable, cost-effective mini and small hydro technologies.

2.1 Biogas

The Biogas Support Programme (BSP) has been in place since July 1992 with the support of the German and Dutch governments. By the end of 2002 there are expected to be around 100,000 families using biogas for their cooking needs. Around 25 % of these biogas plants are estimated to use them for lighting as well.

The size of the plants in the programme are 4, 6, 8 and 10 cubic metre. The most popular size is 6 cubic metre at a cost of approximately USD 300 per unit. A subsidy of around one third of the cost is given to the owner to install the plant, the rest coming from bank loans and the farmer's own investment. The programme works closely with local banks and has a well worked out system of placing orders, construction, payment, technical approval and acceptance.

The BSP uses its position as a subsidy provider to leverage high quality standards from the biogas suppliers. The design and capacity are fixed and so are the standards. Quality control systems are in place to ensure that the installations meet the required standards. Random checks of plants built in the previous three years, with penalties for installations not meeting the standards, also help to ensure that plants are built to the required quality standard.

2.2 Solar

Solar energy has traditionally been used for drying food grains, vegetables, fruits and other agriculture products. Solar water heaters came into use about 30 years ago and have been very popular, especially in urban areas. This has developed commercially without any subsidy or other support from the government. These solar water heaters are popular both at the domestic and commercial scales, especially for hotels which require large amounts of hot water for guests.

Sporadic efforts have been made to increase the efficiency of traditional sun drying by increasing efficiency and throughput. However, these efforts have been

small and no large scale programmes have been implemented to develop or promote this technology.
The main expansion of the solar sector has been with the introduction of solar PVs. The government started to provide subsidies for SHS in 1996 and is still provided. SHS have become popular because of their relatively low cost, convenience and because of the element of personal control and independence as compared to a microhydro or biogas system.

2.3 Micro Hydro

Microhydro has been the flagship of the RET sector in Nepal. This is perhaps understandable since the country is mostly mountainous and microhydro resources are plentiful. There is also a long tradition of using waterpower.

The prevailing wisdom that Nepal must harness its water resources in order to improve its economy probably has played its part. Although this is used as a slogan for large hydro projects, it also had its effect on small hydro. Efforts to utilize microhydro using modern turbines manufactured locally has been going on since the sixties.

The development of the locally manufactured crossflow turbine in the early seventies saw a rapid increase in microhydro installations, particularly for agroprocessing- mostly for husking, grinding and oil extraction. At about the same time the government implemented a policy of installing small hydro to provide electricity to remote district administrative centers. These two actions helped greatly in establishing a pool of expertise in microhydro and also a manufacturing base from which Nepal has been able to develop further its hydro sector.

The number of microhydro installations with mechanical power output used for agroprocessing has been on the decline since it reached its peak in the mid eighties. The number and extent of microhydro electrification has not risen in the same ratio as the decline in mechanical output microhydro but the trend is encouraging. With the new subsidy and technical support mechanisms gathering steam we can expect a rapid rise in microhydro electrification soon.

The last decade has also seen the rise in popularity of the "peltric set". These are combined pelton turbine/generator packages for generating power up to around 3 kW. These require very small amounts of water and provide lighting to a small number of houses.

2.4 Grid Connected Mini Hydro (100 kW to 10 MW)

The electricity Act of 1992 provided the legal framework for private investment in power sector but it was not until 1998 when the NEA announced a fixed buyback rate from small hydropower producers that there was a lot of interest to develop small hydropower. This announcement meant that developers could calculate the benefit of a proposed hydro project before they spent substantial amounts on feasibility studies. Knowing the income stream they could then work out the limits within which they needed to build the project in order to make it viable.

Under the fixed buyback rate system 14 PPAs have been signed so far and 18 projects are being studied. So far, in this range, the 180 kW Syange project and the 7.5 MW Indrawati project is the only one to be connected to the grid.

2.5 Efficient Cookstoves

Nepal is heavily dependent on its forest resources to meet its energy needs. Rural areas account for about 80% of total energy requirements of the country. Per capita annual fuel wood consumption is estimated to be approx. 1500-2000 kg.

The use of low grade biomass used in open hearths leads to high levels of indoor pollution. This leads to high rates of respiratory diseases.

The first ICS that were introduced in Nepal were in the 1950s. These were Indian models- the Hyderabad and Magan Chulo. Improved cook stoves are designed to consume less fuel and save cooking time, are more convenient in cooking and creates a smokeless environment in the kitchen compared with the traditional fuelwood stove.

Despite more than forty years of ICS programme development implementation and research, ICS programmes in rural Nepal have been of limited success. There has never been the enthusiasm to promote ICS in the same way as with microhydro, biogas or solar energy. However, ICS development has had a come back on the development agenda among NGOs in Nepal, and there is now consensus abut the importance of ICS and the need of a new innovative approach to ICS dissemination, among potential stakeholders. Generally, the attitude and approach to ICS implementation has changed over the years from a supply-oriented, quantitative 'hardware' oriented approach, to a more demand-oriented, qualitative 'software' –oriented approach.

There are no direct subsidies for ICS. There are some programmes to promote ICS, to generate awareness and to build capacity. These are mostly carried out through NGOs and CBOs.

2.6 Non-Profit Initiatives to Promote Renewable Energy

The non-profit sector has a very minor role in the promotion of renewable energy. ICS is promoted largely through the NGO sector and some solar PV initiatives have been spearheaded by NGOs.

3 Private Sector Involvement in Electricity Provision

3.1 Role of the Private Sector

The private sector is expected to play an increasingly greater role in the power sector in Nepal. It is accepted that relying solely on the public sector will not achieve the rates of electrification and power generation that is necessary to meet the demand for electricity.

The 1992 Electricity Act has generated a lot of private sector interest in the power sector. While this has been largely in power generation there is a small but growing interest in distribution as well.

3.2 Assessment of PPP models

In Nepal, public private partnership in electrification is broadly in the following forms:

1. Direct subsidy to private entrepreneurs (microhydro)
2. Formation of a private sector company to own manage the system after its construction by a public body
3. Independent Power Producer led electrification
4. Distribution systems leased to Consumer Co-operatives
5. Distribution systems leased to private sector companies (tried but not implemented)
6. Isolated small hydro leased to the private sector (both generation and production)
7. Subsidy for Solar Home Systems (SHS)

3.2.1 Direct subsidy to private entrepreneurs

Under this scheme, microhydro entrepreneurs or a community that wishes to install a microhydro for electrification can get a subsidy of at least USD 900 per installed kilowatt. In addition there is also a small transport subsidy for the more remote areas i.e. for areas that are more than two days walk from a motorable road.

The proposed project has to meet subsidy criteria and follow the guidelines set for constructing the project in order to qualify for subsidy. The criteria are set up to ensure that the project is technically and financially viable. Design and construction guidelines are established to make sure that the project is constructed to a minimum technical standard.

3.2.2 Formation of a private sector company to own manage the system after its construction

This method of PPP has evolved in order to set up a viable management system for electrification schemes built by donor governments. These plants have been built in places where there was an overriding reason to set up an electrification scheme and cost was not a major consideration. In Nepal two such schemes have been built. Both were built primarily to try and reduce pressure on forestry by replacing firewood with electricity. In Salleri a 400 kW plant was built with Swiss financial assistance mainly to reduce the amount of firewood required for wool dyeing. In Namche, a 600 kW plant was built with Austrian government assistance in order to meet the energy needs for the growing number of tourists visiting the area. In both cases the energy requirement was being met mostly by firewood and there was severe pressure on the forest resources.

Having built the plant, the question came up as to how the system should be managed. Normally it would have been handed over to the government (effectively the National Utility) which would continue to run it along with the rest of its operations. However, this was not considered a satisfactory situation since NEA, as a government owned utility, did not have a high reputation as good managers of small hydro. Thus new ownership and management structure had to be put in place. The structure chosen was that of a public limited company with the consumers being the major shareholders. NEA also has a small share in the companies.

The companies also have different tariff structures than the prevailing national tariff structure and have total freedom in how they manage the plants.

3.2.3 Independent Power Producer led electrification

Butwal Power Company, a private sector company, was established by the United Mission to Nepal, a missionary organization, in 1966. It initially built the 1000 kW Tinau hydro plant to supply electricity to Butwal and surrounding areas. Butwal is a regional town strategically located at the crossroad between the main East west highway and the north south highway. Based on the experience of building the Tinau plant the Andhi Khola Hydel and Rural Electrification Project (AHEREP) was started around 1981. The plan was to build a 5 MW hydro plant and also to undertake rural electrification and other development projects in the project area. The excess power from the powerplant would be sold to NEA which would provide the project with income for its development activities.

Following on from AHEREP the Jhimruk Hydel and Rural Electrification Project (JHEREP) was also started with assistance from the Norwegian government. This enatailed building a 12 MW plant and providing electrification as with the AHREP.

Although the above two projects were carried out with grant money the model is still valid for a regular IPP. IPPs could be obliged to provide electrification in the vicinity of their project area, or an equivalent area elsewhere in case there is little or no habitation in the project area.

3.2.4 Distribution systems leased to Consumer Co-operatives

This is another PPP format that has been tried. The Lamjung Electricity User's Association (LEUA) is the only example in operation. LEUA was set up in 1997 to manage electricity distribution in a part of Lamjung District. LEUA has 7000 customers and covers 30 Village Development Councils (VDC).

LEUA is registered as a non-profit organization and not as a co-operative- i.e it does not give out dividends. For practical purposes this is not much different to a co-operative. Annual sales of electricity is around 3 million kWh, an average of 35 kWh per customer which is similar to consumption in other parts of Nepal.

The ownership of the distribution system is with NEA and LEUA has a management contract with NEA to distribute electricity and collect revenue. It buys electricity from NEA at Rs. 3.50 and sells at an average price of Rs. 7.00. As no dividends are given out all profits are reinvested into the system. LEUA has used part of the money to expand its customer base.

All normal, regular repair and maintenance are the responsibility of LEUA. Major repairs (exceeding Rs. 1,000,000) are carried out by NEA.

Efforts are under way to emulate this in two other districts with assistance from DANIDA. The proposed structure is slightly different in that it will be done under a regular co-op structure and not as an non profit NGO.

NEA is in the process of formulating a policy such that these models would be replicated in other areas.The main purpose of the policy is to seek partial financiing from from the user groups as well as the operation and maintenance of the distribution system.

3.2.5 Distribution systems leased to private sector companies

Similar to the system of leasing out distribution to co-operatives, leasing out to private sector companies was also attempted. Bids were solicited for an urban area with high losses (largely pilferage) and low recovery. Although there was considerable interest in leasing the distribution it was eventually abandoned. The conditions of NEA were considered to be too stringent and

NEA and the bidders could not agree on the terms of the lease. This attempt hasn't been tried again but could be revived.

3.2.6 Isolated small hydro leased to the private sector

This mode of PPP has proven to be relatively successful. In Dec 1993 NEA leased out 5 of its isolated (non grid connected) small hydro plants in the 200-300 kW range with a total customer base of 4000 customers. Based on the success of these plants a further 7 plants were leased out in 1999.

The leased plants have been successful on many counts. In a situation where NEA was losing money every year it is now getting an income. The customers, on the whole, get a better service than when NEA was running the plants. In addition there are new enterprises which are running profitably.

There are, however, limitations to this system. The lessee's role is limited to keeping the plant running as well as possible. The size of the individual leases means that major improvements and expansion is difficult and unlikely under the present terms of contract.

3.2.7 Subsidy for Solar Home Systems

Subsidies for solar home systems (SHS) are given to individual households that want to install one. Currently there is a subsidy of Rs.8,000, Rs. 10,000 and Rs. 12,000 per system of 30 watts peak. The different subsidy levels account for the relative remoteness of the installation, with the more remote areas getting a higher subsidy. The total system costs around Rs. 30,000. There is also a loan facility available for those installing a SHS.

This has proved very popular and 24,000 SHS systems have been installed since 1995.

4 Conclusions

There is increasing acceptance and recognition that relying entirely on the government will not achieve the massive electrification that is required. The unwillingness of large lenders such as the World Bank and ADB to lend to the public sector has also meant that the government will increasingly have to cooperation with the private sector in its electrification efforts.

Electrification in Nepal is mostly hydro based due to the availability of large water resources. The private and non government sector has so far played a small but important role in electrification in Nepal. The development of the microhydro industry has been almost wholly led by the private sector. The private sector involvement in hydropower is increasing and will continue to increase its share of the power sector in Nepal.

An expanding and capable hydro sector means that the private sector will be able to respond positively to PPP initiatives that come up.

The small first steps made in the PPP process are encouraging. PPP models implemented so far have shown that there are benefits in terms of financial efficiency, better customer services.

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Appendix I - Public Private Partnership Model Types already tested in Nepal

	PPP TYPE								
	Direct subsidy to private entrepreneurs (including subsidy for PV SHS)	**Formation of a private sector company**, to own manage the system after its construction by a public body	**ESCO: Independent Utility Producer**/ Distributer-led electrification	**ESCO: Energy Manage-ment and Services**	**ESCO: Generator only (IPP) - (public or private owner-ship)**	**Distribution systems leased to Private or NGO-type or community-based organisations**	**Isolated grids leased to the private sector** (both generation and distribution)	**Construction by Private Sector:** BOOT, BOT BOO, BBO, DB, DBM, DBO, Turnkey	**Concession Model** - geographic
Number of schemes	1956 microhydro approx. 24,000 SHS	2	1 (Butwal Power Company)	Not applicable	Not applicable	1	11	4	Not applicable
Total Installed (MW)	13 MW microhydro approx 1 MW SHS	1	17	Not applicable	Not applicable	1.6^	2.255	103.7	Not applicable
Years of successful operation	18 for microhydro 8 for SHS	9 years Salleri. 7 years Namche	11	Not applicable	Not applicable	5 (transformer)	9	2	Not applicable
Financially viable (Y/N)	Y	Y (operating costs, not capital)	Y	Not applicable	Not applicable	Y	Y	Y	Not applicable

Who is served (Government, Institutions, Business, HH)	I/B/HH		G/I/B/HH	Not applicable	Not applicable	G/I/B/HH	G/I/B/HH	sale to grid	Not applicable
Who is excluded (Government, Institutions, Business, HH)	G	G		Not applicable	Not applicable				Not applicable
Replicable in-country (Y/N)	Y	Y	Y	Not applicable	Not applicable	Y	Y	Y	Not applicable
Primary use of electricity	Mainly H/H	H/H, industries, hotels	Normal Utility sales plus sale to grid	Not applicable	Not applicable	HH/industries, government offices,	HH/industries, government offices	sale to grid	Not applicable
Estimated Population served	600,000**	8500 directly, 30,000 indirectly	812,118 directly about 1 million indirectly	Not applicable	Not applicable	6600 directly, Additional 200,000 indirectly*	60,000 directly, Additional 180,000 indirectly*	Not applicable	Not applicable
Initiator (organisation/ agency)	AEPC	HMG/donor gov	HMG/Donors	Not applicable	Not applicable	HMG/donor gov	HMG	IPPs	Not applicable

Community Buy-in (Y/N)	N (normally privately owned and in some cases the utility is community owned)	Y	N	Not applicable	Not applicable	Y (NGO owned and operated with all customers being members of the NGO)	N	Not applicable	Not applicable

^ Transformer size (MW)
* Assumption: Indirectly served housholds are 3 times those directly served
** Assumption: 6000 kW available at 0.1 kW per household and 6 persons per household
^^ Includes 10,000 foreign tourists plus 10,000 more to serve the tourist trade
AEPC- Alternative Energy Promotion Centre
HMG - His Majesty's Government of Nepal