CRITICAL ANALYSIS OF SOME ISSUES IN PRIVATISATION OF HYDROPOWER PROJECTS

A DISSERTATION

submitted in partial fulfilment of the
requirements for the award of the degree
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MASTER OF TECHNOLOGY
in
WATER RESOURCES DEVELOPMENT

By

PURUSOTAM ACHARYA

WATER RESOURCES DEVELOPMENT TRAINING CENTRE
INDIAN INSTITUTE OF TECHNOLOGY, ROORKEE
ROORKEE - 247 667 (INDIA)

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CANDIDATE'S DECLARATION

I hereby certify that the work which is being presented in the dissertation entitled, **"CRITICAL ANALYSIS OF SOME ISSUES IN PRIVATISATION OF HYDROPOWER PROJECTS"** in partial fulfilment of the requiremnet for the award of Degree of Masters of Technology in WRD submitted in WRDTC, Indian Institute of Technology (IIT), Roorkee is an authentic record of my own work carried out during the period from July 2001 to February 2002 under the supervision of **Prof. Devadutta Das**, Professor, WRDTC, IIT, Roorkee.

The matter embodied in this dissertation has not been submitted by me for the award of any other degree.

Place : Roorkee
Dated : February 28, 2002

(PURUSOTAM ACHARYA)

This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

Place : Roorkee
Dated : February 28, 2002

Devadutta Das

(PROF. DEVADUTTA DAS)
Professor,
W.R.D.T.C.
I.I.T, Roorkee - 247667
(INDIA)

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PURUSOTAM ACHARYA

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LIST OF ABBREVIATION

ADB	:	Asian Development Bank.
AHREC	:	Andhi Khola Hydro-electric and Rural Electrification Centre
BOO	:	Build, Own, and Operate.
BOOT	:	Build, Own, Operate and Transfer.
BPC	:	Butwal Power Company.
BS	:	Bickram Sambat
CEA	:	Central Electricity Authority.
DOED	:	Department of Electricity Development.
EIA	:	Environmental Impact Assessment.
FIFB	:	Foreign Investment Promotion Board.
HMGN	:	His Majesty's Government of Nepal
HP	:	Hydropower.
HPB	:	High Power Board.
HPL	:	Himal Power Limited.
IEE	:	Initial Environmental Examination.
IFC	:	International Finance Corporation.
INPS	:	Integrated Nepal Power System.
IPC	:	Investment Promotion Cell.
JHREC	:	Jhimruk Hydroelectric and Rural Electrification Centre
KBC	:	Khumbu Beguli Company
KW	:	Kilowatt.
kWh	:	KiloWatt-Hour.

LEUA	:	Lamjung Electricity User's Association
MARR	:	Marginal Rate of Return
MOU	:	Memorandum of Understanding
MOWR	:	Ministry of Water Resources.
MW	:	Mega Watt.
NEA	:	Nepal Electricity Authority.
NPC	:	National Planning Commission.
NRs	:	Nepali Rupees
PA	:	Project Agreement.
PLF	:	Plant Load Factor.
PPA	:	Power Purchase agreement.
RE	:	Rural Electrification
ROR	:	Run off River
Rs	:	Indian Rupees
SCECO	:	Salleri Chialsa Electricity Company
SPC	:	State Planning Commission.
TEC	:	Techno Economic Clearance.
TFC	:	Tariff Fixation Commission.
UO	:	User's Organizations
US$	:	United State Dollar
USSR	:	Union of Soviet Socialist of Russia
WB	:	World Bank
WECS	:	Water Energy Commission Secretariat.
WR	:	Water Resources.
WRD	:	Water Resources Development.

SYNOPSIS

In this dissertation, an attempt is made to study and analyse the issues involving privatisation of hydropower projects. The effects of the issues as a whole in privatisation itself and on socioeconomic development of the people and the nation have been viewed thoroughly.

The developing countries are facing difficulties in developing infrastructure to provide minimum requirements to the people and to expedite economic development. His Majesty's Government of Nepal has given high priority to develop its indigenous hydropower to meet the present day need and export hydro energy. Due to inadequate fund, technical and managerial skill to develop hydropower projects, BOOT process of privatization is being practiced.

To reach the sustainable level of privatization of hydropower projects, all the issues related directly or indirectly need to be balanced in proper way. There should be detail knowledge and planning vision to handle issues connected to the financing business and the social business.

For achieving the sustainability, the objective of the dissertation are:

- To study the development trend of privatization of hydropower projects in Nepal.
- To study and analyze the consequences of privatization in national economy and social life.
- To conclude the facts and to suggest the recommendations for the future development.

With the above mentioned facts, study in this dissertation is centered to various issues related to privatisation of hydropower development. Some of the issues studied are economic, market, financial and tariff which basically deal with commerciality of the project investment. And the other issues are socio-economic, crisis management and capability building, which deal with the social and security factors.

From the study and analysis of above mentioned issues, and the case study of Khimti Hydroelectric Project, Nepal privatization of medium hydro projects (1-10 MW) for meeting the national demand by mobilizing domestic resources in generation is found appropriate in case of developing economy like Nepal. Also, the involvement of user's organization and to increase efficiency and public inspiration. Thus energy self sufficiency and energy export should start with the expertise in medium hydro power development, for the long term sustainability.

CHAPTER - 1

INTRODUCTION

1.1 GENERAL

In the 1990s, the world witnessed emergence of open market economic system with associated emphasis towards globalization and privatisation of industrial sectors.

The developing countries were indirectly forced to adopt privatisation of power sector, as funds were not made available by international funding agencies and banks to public sector electric utilities due to poor financial performance and profitability leading to inability to pay back the loan (4).

The privatisation of hydropower projects including other infrastructures, Build, Own, Operate and Transfer (BOOT) is becoming most popular financing practice. In this practice, financier gets right to build, own and operate the project for a certain period of time. Within the period licensee collects revenues to meet the repayment of the loan on capital account with profits at a reasonable level. At the end of the licensing period the project is transferred back to the client. This BOOT practice is being adopted in Nepal.

In this dissertation, studies and analysis carried out is essentially in the context of practices prevailing in Nepal in connection with privatisation of hydropower projects. This is due to the fact that the relevant data required for the study were readily available in Nepal. Moreover, the author being from the Department of Electricity Development, Nepal was more acquainted with the practices followed there and the benefits out of this. Also the author has an appreciable experience that he has gathered by the way of working in the

above-mentioned field. It may not be out of context to mention here that the privatisation practices adopted in Nepal are also almost in the similar lines as adopted elsewhere.

1.2 PRIVATIZATION

Privatization means effectively separating the government trading activities (marketing goods and services) and changing ownership by putting them in the hands of private operators, either through the sale of existing assets, allowing new private operator to enter to the market or by contracting certain services to private parties.

Privatization of hydropower development is relatively a new phenomenon. By law, water resources are state property and the state has the exclusive right to develop it for the shake of providing benefit to the society through own investment or through contracting to private investor. However, the water resource is directly related to the people's livelihood living in the watershed and nation as a whole and so also the ecology and environment. These essential factors need consideration while developing water resources projects especially through the private sector due to their limited objectives and goals.

Nepal Government has given priority to agricultural development, tourism, hydropower and transportation to reduce social and regional disparity. The efficient and effective use of available water resources to reduce dependability on foreign aid by adopting open market economy and increasing private participation along with public investment in development. For inviting private investor to hydropower industry the hydropower policy, electricity acts and other related rules and regulations have been framed.

1.3 OBJECTIVES

The main objectives of the dissertation are:

- To study the development trend of privatization of hydropower projects in Nepal

- To study and analyze the consequences of privatisation in the national economy and social life.
- To conclude the facts and to suggest the recommendation for the future development.

1.4 SCOPE OF STUDY

The scope of study is to review and analyze the major issues involved in privatization of hydropower (HP) projects and conclude whether it is beneficial or not in a systematic manner through the following chapters.

Chapter 1: Introduction

Covers the general background and how the country has adopted the privatization policy in hydropower, including collection of data and information.

Chapter 2: Literature review

This chapter covers the theoretical background, practices, experiences, the rules and regulations, energy planning, projections and other relevant issues behind the privatization of hydropower projects.

Chapter 3: Process of privatisation of hydropower projects

This chapter describes the process of entry of private sector in the power industry. The power purchase agreement (PPA) and Project agreement (PA) between developer and utility, and developer and government respectively in which, the relation, incentives, obligations and duties of either parties are explained.

Chapter 4: Some critical issues in hydropower development

In this chapter, the economic issues related to development of hydropower project and other influencing factors are analyzed .The main area of discussion are cost of

construction, power market condition, financing issues, tariff structure and socio-economic issues.

Chapter 5: Privatisation of hydropower projects:

In this chapter, the international funding policies and issues to finance hydropower projects, privatisation of hydropower generation and distribution are described in brief.

Chapter 6: Critical analysis of cost of hydropower development.

In this chapter analysis of cost structure, cost reduction areas in hydropower project construction are carried out. The effect of system losses, load factor in electricity generation cost and comparative study of private and public tariff rates have been done.

Chapter 7: Case study of Khimti Hydroelectric Project Nepal has been discussed and analyzed.

Chapter 8: In this chapter, conclusions have been drawn on the basis of studies and analysis made in the earlier chapters and recommendations have been proposed for a viable and pro-active policy which can satisfy the national goals and perspectives as well as the aspirations of the people and the Nepalese society as a whole.

1.5 DATA COLLECTION

The data available on experiences and information from relevant government offices, utilities, some private companies, environmental organizations and public and individuals have been collected. Legal provisions regarding the privatization of HP projects, relevant publications in journals, literatures, conference proceedings, bulletins etc. have been also collected for use in this study.

CHAPTER - 2

LITERATURE REVIEW

2.1 GENERAL

The literature dealing with privatisation of hydropower is extensive. It mainly relates to technical, economical and environmental issues as well as political philosophy of the country.

With global liberalisation of economic policies, privatisation of hydropower projects has attracted attention. Earlier to 1990's, the international funding agencies (money market) were involved in the development directly through public enterprises in the developing countries. Subsequently they have changed their business style searching new business operations overseas and have encouraged private investors so as to secure their investment and return on the same. Their investments are changing from development motive to the investment motive in infrastructure development, business and management sector.

The developing nations need huge amount of money to invest in power projects and therefore have to attract the private investors to invest in the country. The need of the developing country and the interest of the private investor to invest in the hydropower projects demand equitable social and economical development with safe guaranteed and risk free investment environment. As every hydropower project is likely to affect the livelihood of the people living in the basin, there is a great interest of professionals (engineers, lawyers, environmental economists etc.) and politicians has been generated universally.

The study covers a critical analysis of practices, strategies, legal provisions, organizational structure, experiences and issues involving economy and sustainability.

2.2 NEPALESE LEGAL PROVISIONS FOR HYDRPOWER DEVELOPMENT

To meet the national objectives like the acceleration of economic growth rate, alleviation of poverty, reduction of social inequalities and creation of employment opportunities, His Majesty's Government of Nepal (HMGN) has promulgated new legal provisions to facilitate participation of private sector, both domestic and foreign, in hydropower development. The main policies, acts and regulations are briefly stated below:

1. Hydropower Development Policy 1992 with amendments of 2001.
2. Public Infrastructure Construction, Operation, and Transfer Policy, 2001.
3. Industrial Policy 1992.
4. Foreign Investment and One-Window Policy 1992.
5. National Environment Impact Assessment guidelines 1993.
6. Electricity Act-1992 with Regulations-1993.
7. Industrial Enterprises Act-1992.
8. Environment Conservation Act-1996 with Regulation-1997.
9. Foreign investment and Technology Transfer Act-1992 with amendments.

2.2.1 Transparent and Time Bound Legal Framework

Transparent and time bound legal frameworks are enacted to make administrative process transparent and well functioning.

- Survey License issued within 30 days
- Survey period up to 5 years
- Project License issued within 120 days
- Project License period upto 30 years

- ❖ Public consultation before issuance of project Licenses
- ❖ Exclusive water rights
- ❖ Availability of government land on lease.

2.2.2 Investment Opportunities in Hydropower Sector

To make conducive environment to private investors several incentives, concessions and guarantees are available as given below.

2.2.2.1 Investments attractions

The main attractions are:

- ❖ Time bound and transparent legal frame works
- ❖ Well established environmental procedures
- ❖ Upto 100% foreign ownership of project
- ❖ Availability of risk insurance.
- ❖ Transparent dispute resolution process
- ❖ Liberalized investment climate.

2.2.2.2. One-Window policy

Under one-window policy following services and assistance are available to the private developer from Department of Electricity Development under Ministry of Water Resources.

- ❖ Issuance of Survey and Project License
- ❖ Provision of tax concessions and incentives
- ❖ Assistance in importing equipment
- ❖ Assistance in obtaining land.
- ❖ Assistance in obtaining necessary permits and approvals etc.

❖ Regulation and monitoring of projects.

2.2.2.3 Facility of foreign exchange

The facilities concerning exchange of foreign currency shall be provided to foreign individual, firm or company and private sector who invests in construction of HP projects at prevailing market rates for:

i) Principal and interest on debt

ii) Return on equity

iii) Sale of share equity

iv) Profit from sale of electricity in the country or outside the country.

2.2.2.4 Income tax

No income tax to private investor in generation and distribution of electricity upto 1 MW capacity shall be levied. The income tax exemption for a period of 15 years, for contracts for privately owned generation, 10 year for transmission, distribution, substations and operation and 5 years for maintenance shall be provided. No tax on interests earned to foreign lenders and no tax on dividends to equity investors shall be levied. After tax holiday period, 10% point less than prevailing tax rate shall be applied.

2.2.2.5 Royalty payments

No royalty is levied on hydropower generated by plant upto 1 MW capacity. For plant capacities more than 1 MW, the producer is to pay NRs 100 per KW per year and 2% of average sale price of per KWh as royalty upto concession period of 15 years from date of commissioning, and NRs 1000 KW/year, 10% of average sale price/kWh onwards

2.2.2.6 Import concessions

Only 1% of customs duty shall be levied on import of goods not produced in the country and no import license fee, sale tax etc. shall be levied.

2.2.2.7 Export opportunities

The existing Power Trade Agreement between HMGN and India has opened up opportunities for power export. Huge power deficit in India and attractive power project in Nepal with existing interconnection facilities with India create a favourable environment to the private investors.

The main features of Power Trade Agreement are:

- Any party (government, Semi government or private) in any country may enter into Power Trade Agreement
- Parties themselves determine the agreement parameters (including quantum of power and tariff)
- Parties will be offered all assistance to implement agreements in accordance with existing laws and regulations.
- Parties will be granted all incentives and concessions of their respective countries.

2.2.2.8 Guarantees and facilities

Non nationalization of utility, exclusive water rights and open access to the grid facility is specified.

2.3 NEPALESE POWER SECTOR AGENCIES

2.3.1 National Planning Commission (NPC)

NPC works as the Secretariat to National Development Council for co-ordination of multi-sector development plans. It prepares HMG/N'S five-year plan and participates in

policy formulation, project review, and monitoring. NPC has a member responsible for policy planning and co-ordination in the energy sector. It has key role to formulate development planning by taking into account multi-sector interest.

2.3.2 Ministry of Water Resources (MOWR)

This is a line ministry responsible for water resource development including power sector. It is responsible for formulating policy, developing plans, and for the development through mobilizing public and private investments. It is also a licensing authority. It frames regulations required for power sector affair. Monitoring and evaluation, policy and planning, and administrative are the three divisions of MOWR.

2.3.3 Water and Energy Commission Secretariat (WECS)

The main responsibilities of WECS is to provide policy advice to HMG, on technical, legal, environmental, financial and institutional dimensions of water and energy development. The main functions of WECS are:

- To conduct or cause to conduct research & investigation of water and energy resources.
- To prepare short term and long term water and energy planning.
- To formulate short term and long term policy and laws on water and energy development.
- To provide suggestion on environmental, social and financial aspects of water and energy projects.
- Conduct studies for power demand & supply and project ranking.

WECS has four directorates through which it performs its functions.

(h) Water resources

(ii) Energy

(iii) Legal and institutional

(iv) Social, economic and environment.

2.3.4 Tariff Fixation Commission (TFC)

The function of TFC is to review and approve consumer tariff levels and structures. The TFC is mandated with sole authority on deciding the tariff levels, balancing commercial and financial viability of Nepal electricity authority (NEA) with social considerations. It does not have jurisdiction on electricity sales of isolated grids and, bulk power sales from private generator to NEA.

It is headed by a Chairman and at least five members appointed by HMG/N from HMG service and professionals.

2.3.5 Department of Electricity Development (DOED)

DOED has following mandates.

(i) Implementation of power regularity process. It makes recommendations to MOWR on issues of licenses as a one-window policy.

(ii) Promotion of independent power producer (IPP) and private investment in the power sector.

(iii) Technical support on a range of multipurpose and bilateral projects matters.

2.3.6 Nepal Electricity Authority (NEA)

NEA is responsible for generation, transmission and distribution of electric power in Nepal. NEA is greatly involved in the development of electricity power supply efficiently and economically and making the same accessible at reasonable price to its consumers. NEA

is an autonomous and corporate body. It is governed by a board. It executes its functions, through managing director. NEA has three departments.

(i) Power development (design construction and study)

(ii) Generation and transmission (O&M)

(iii) Distribution (distribution and consumer service).

The main functions of NEA are:

- To plan for generation, transmission and distribution. Programme.
- To recommend short and long term policy to be adopted for electricity supply.
- To carry research work in the field of generation, transmission and distribution.
- Import and export of electric energy.
- Purchase electricity from private producer
- To collect the charge for electricity and service from consumers etc.

2.4 PRIVATIZATION PRACTICES IN OTHER COUNTRIES

Harnessing water resources through HP projects is becoming the most popular programme as a renewable energy with substantial undeveloped potential and non-polluting, high conversion efficiency. Developments of HP projects are on top priority of the country's economic policies. The transition from governmental and other traditional sources of funding HP project to global liberalization of economic policies evolved, privatisation of HP projects. Hence the developing countries are compelled to follow the open market economy; the HP policies are made more liberalised and attractive to the private investors to enter into power industry.

2.4.1 India

Government of India (GOI) has announced a new policy in 1991 to encourage greater private sector participation in Indian Power Sector. This policy created significant interest in the financial and industrial circles. The salient features of the new power policy (1991) are:

- The Indian Electricity Act, 1910 and electricity supply act 1948 have been amended to bring about a new legal, administrative and financial environment for private enterprises in electricity sector.
- Private sector can set power project of any size as gas, coal, wind, solar, hydel.
- Project not exceeding NRs. 400 crores need not be submitted to the Central Electricity Authority for concurrence.
- All private sector can set up enterprise, either licensees or companies should have at least 11% contribution of its own with debt equity ratio upto 4:1 and minimum 60 percent cost come from sources other than public financing institutions.
- 100 percent foreign equity project financing by foreign private investors can be permitted.
- Liberal depreciation rates on assets.
- Import of power project equipment can be permitted when foreign supplier or agencies extend concessional credit.
- Custom duty on import of power equipment reduced to 20% and reduced excise duty.
- A five-year tax holiday is allowed.
- Upto 16% return on foreign equity included in the tariff can be provided in the respective foreign currency.

- Fixed costs can be recovered at 68.5% plant load factor (PLF) and attractive incentives are prescribed for performance beyond this PLF.
- Tariff can be fixed in deviation to norms stipulated but does not exceed the per unit tariff worked out on the basis of norms.

Other Specific Incentives

- Generating company provided 16% return on equity at 68.5% PLF and upto 0.7% return on each incremental 1% PLF.
- Generating company can sell power to state electricity board (SEB) on basis of 2-part tariff according to norms, agreed by SEB, and the generating company.
- Licenses of 30 years duration in the first time and subsequent renewals of 20 years.
- Capitalization of interest during construction at actual cost.

Although some private investors like Jai Parkash Hydropower Ltd. (Baspa II, 300 MW), Vishnu Prayag Hydroelectric project (400 MW) and Srinager HP (300 MW) have come up for developing the power projects, the experiences are not so encouraging.

Enron was the first project where power purchase agreement (PPA) for Dabhol power project was signed. Project has resulted in high cost and tariff leading to exorbitant profit to the producer. The renegotiations to bring down capital cost per MW and per unit energy tariff have been succeeded. Thus inspite of various incentives provided by the government, the response from IPPs for development of HP project has been very encouraging. Now new medium / major HP Project has not been taken up, after the introduction of bidding process for selection of IPP.

2.4.2 China.

China also, is involving in open market economy gradually. The laws, regulations governing foreign investment are made liberal to attract the foreign investors.

Ministry of foreign trade & economic cooperation (MCFTEC) on July 20, 1995, divided the Chinese industries into 3 categories then foreign investment is encouraged restricted and prohibited accordingly.

"The construction and operation of infrastructure facilities is encouraged" by

1. Equity joint venture (EJV)
2. Cooperative joint venture (CJV))
3. Wholly foreign – owned enterprise (WFOE)

Favourable conditions for foreign investment in infrastructure

Reforms on tax rates, incentives, exemption on import duties and foreign exchanges facilities have been made available. The rate of return on foreign investment is allowed up to 15%.

The privatisation of HP projects with installed capacity upto 250 MW can be developed on BOT basis in China.

Despite, the above reforms, foreign investors are not showing much interest in Hydropower sector as compared to other infrastructure development such as bridges, tunnels, highways etc. But the local financing agencies are funding more and more in small scale HP in China. The joint ventures of local agencies with foreign agencies are also coming forward. This joint venture financing is getting momentum due to the following reasons.

1. Current shortage of US $ funding

2. Chinese Government's promotions of the use of local equipment for major project has resulted in reduced availability of export credit agencies (ECA) backed financing.
3. Majority of revenues of most projects in local currency.
4. China's protection and building up of foreign exchange reserve increasing the complexity of legal and administration framework for off shore borrowings.
5. A more aggressive approach adopted by Chinese lenders concerning lending to domestic projects.
6. Increasing attraction of public institutions in equity funding as compared to foreign funding with a margin of interest and other dept handling expenses.

Thus Chinese are gaining expertise in small hydro with lowest specific cost of project of US $ 1000/KW [37].

2.4.3 Pakistan

The privatisation of hydropower projects in Pakistan was followed by the hydropower policy in 1995. In Pakistan private investors are permitted to build ROR or daily poundage hydropower projects up to capacity 300MW. The storage projects are excluded from the private sector.

For private sector, hydropower projects between 21-300 MW the bulk tariff have been fixed at 6 US cents/kWh for first ten years period. Besides the debt servicing, O&M, insurance charges and return on equity up to 18% are available to private developers with exemption in income tax and corporate taxes etc. The project development generally in joint venture is preferred in Pakistan.

Comparison of concessions provided to private developers in this region is presented in Table 2.1.

Table: 2.1 CONCESSIONS TO FOREIGN INVESTORS IN DIFFERENT COUNTRIES

CONCESSIONS	INDIA	CHINA	NEPAL	PAKISTAN
Ownership	Upto 100% foreign equity allowed	Upto 100% foreign equity allowed	Upto 100% foreign equity allowed	Joint ventures preferred
Tariff	Two part	Two part : 50% in foreign currency	Fixed cost + percentage	Two part
Taxation	5 Years tax holiday	Lower rates	15 Year tax holiday	Exempt from income tax no corporate taxes
Rate of Return	16%	15%	-	18%
Exchange cover on equity return	On case by case basis	Borne by government	Borne by government	Covered by government
Clearance	By high power board, 17 clearances	Case by case	About 10 clearances	By Private power cell
Project capacity	Any size	Upto 250 MW	Any size	Upto 300 MW

The comparison chart shows that tax holiday period is most attractive and rate on return is also more liberal in Nepal compared to other neighboring countries. Also environmental, dispute resolution and other processes are transparent and favourable to private investors.

PROCESSES IN PRIVATIZATION OF HYDROPOWER PROJECTS

3.1 GENERAL

Independent Power Producers (IPPs) play significant role in the development of HP sector in the country, as the government lacks fund. So to attract foreign IPPs and to test the functioning and workability of the regularity framework, HMGN has allowed solicited and unsolicited path to enter into this sector. Projects smaller than 1 MW can be developed just by giving the notice to the government, and for projects larger than 1 MW for development transmission and distribution of electricity needs permission of the government. Privatisation of hydropower project is done in any one of the following ways.

3.2 *SOLICITED BIDDING*

In solicited bidding, the government before calling for bids prepares the comprehensive pre-feasibility report, which covers the following features.

(a) Assessment of Capacity & Energy

The seasonal requirement of capacity and energy for peak period and wheeling excess capacity is assessed.

(b) Operational Characteristics

The type of plant, as base load, peaking load with suitable operation schedule with changing conditions is determined.

(c) Fuel

The sources, cost and transportation of fuel required for construction of the project are identified.

(d) Transmission System

The cost and capacity of inter connection lines and existing transmission lines and substations are estimated.

(e) The capital cost of the project, O&M costs, interest during construction, engineering costs, running costs also estimated.

(f) Environmental Assessment

Environmental Impact Assessment (EIA) is assessed according to govt. regulations.

Bidding may be done through structured request for proposals (RFPs) or through unstructured request for proposals (RFPs).

The structured RFPs is done in many ways as the govt. decides either limited to renowned companies or through international competitive bidding procedures, according to World Bank (WB) guidelines. In which the bid selection criteria based on the experiences, financial, technical, commercial and manpower of the developer. In this process, the developers are required to submit the proposals in response to the technical and financial criteria.

In unstructured RFPs system, the parameters of the project are not specified to the developer, only the capacity of the project and the condition of Power Purchase Agreement (PPA) are supplied. This is closest to the market driven approach. The choice of technology, size, location, time period are left to be decided by the developer. The complicacy in evaluation process is higher.

3.3 UNSOLICITED BIDDING

In this type of bidding, the proposal is prepared and submitted solely by the interested party to develop the project without any response to RFPs for survey or survey and

development both. The decision is made on first come first basis. Agreements are made on the basis of negotiation between the parties. The benchmark for evaluation is the per kWh cost compared with existing cost of supply.

The proposal should contain the information regarding the ownership, project location, name, time schedule, required cost and other necessary information as per the prescribed format provided.

When there is serious power shortage (time constraints) and the sponsor has access to unique site, this method is generally accepted.

This process seriously undermines the success of competitive solicitations. Although both solicited and unsolicited bidding systems but the solicited competitive bidding is being adopted.

3.4 POWER PURCHASE AGREEMENT (PPA)

The power market is the important factor, which is to be closely considered by the investors before planning for investment in HP projects. Without assured power market private investors will not invest their financial resources. To guarantee the power market, investors will come up to have a good PPA with the govt. or power utility or potential consumer. Only then IPP or investors will consider, investing in power sector.

In PPA, the main risks to the developer, buyer and lenders in power projects are commercial, regulatory and force majeure. There is a tendency to assign risks to the party that can take care with less difficulty. The ability of the parties to agree on how risks will be shared is one of the conditions required for a successful agreement. Buyer and seller identify risks and issues, and results and effects in different cases in their side.

Duration of agreement, construction and O&M, delivery and tariff of energy, payment of the demand charges, billing procedures, security of payment, deemed generations, force majeure events, insurance, dispute resolutions processes etc are defined in PPA so that IPPs or investors enjoy guaranteed, risk free, assured profit on their investment.

3.5 PROJECT AGREEMENT (PA)

IPPs and lenders having PPA signed further seek sovereign guarantee from the government on risks free return on their investment in HP projects.

Project agreement defines the relationship between the govt. and IPPs concerning the guidelines, incentives and guarantees that affect the long-term operation of the project.

The guidelines define the process to be followed by the parties involved in the agreement in performing projected related works such as construction and O & M during the period of project agreement.

The incentives given to the IPPs such as tax exemptions, foreign exchange facilities, "one windows" system to receive assistance, insurance of the project and other concessions are incorporated.

Sovereign guarantee on the PPA, covers, the utility to perform the obligations of PPA, repatriation of foreign exchange, political force majeure risks such as non nationalization of project, change-in-law and economic risks of hyper-inflation or economic collapse etc. The provision of political insurance, buyout of equity capital and other insurance and guarantee are assured to IPPs, so that IPP should not face any risks.

The project agreement and PPA define the requirements, which the developer, IPP has to meet before obtaining the license. Then IPP starts the negotiations with potential lenders, and turnkey contractors. After receiving the commitment from the investors, the

developer applies for project license as per prescribed format providing necessary information.

3.6 AWARD OF LICENSE

On evaluation and checking of the application document, a 35 days public notice is published to receive the comment on adverse impact due to the project in the project area from peoples, professionals, and institutions. After evaluating the received comments, project license is awarded as per application or with some modifications. The license is issued for electricity generation, transmission or distribution for a period of 30 years maximum.

CHAPTER -4

SOME CRITICAL ISSUES IN HYDROPOWER DEVELOPMENT

4.1 GENERAL

Economic development is accomplished by shifting from lower to higher quality and quantity of energy. As Ninth Five Year Plan (1998-2002) has target to achieve an economic growth of 6.5% per annum and gradual in crease to 8% over next 20 years period. To meet the targeted economic growth about 3000 MW of hydropower need to be developed up to 2017. A huge amount of capital needs to be invested, to play important role in economic growth through industrial and commercial growth.

The energy consumption by commercial consumer was 37 GWh in 1991, which doubled to 78 GWh in 1999, similarly industrial consumption also increased from 207 GWh to 437 GWh in the same period. The commercial and industrial consumption constitutes about 50% of the total electricity sale.

Now a day, electricity is being the basic need in urban life, industry and commerce. Supply of power to meet the power demand is the key success of economic development planning. Lag between demand and supply of energy that hampers the socio-economic development. Till 2000 country faced load-shedding problem due to delay in project implementation. The recorded peak demand on 20 Jan 2000, reached 352 MW, this was managed by peaking 245 MW, import from India 39MW and load shedding of 58 MW. After the completion of Kali Gandaki-A project at the end of 2001, there will be peaking surplus energy for some years.

Although at present, the consumption in transport sector is low, electricity based transport system such as electrical train; trolley bus and ropeways has to play important role in future. The development of energy intensive industries like fertilizer, cement, mining etc in the future has high potential. The role of hydropower in irrigation, in agro-processing, in rural electrification, in communication etc is very crucial for socio-economic development. For all these development, the cost of power should be more attractive than any other energy alternatives.

4.2 COST OF HYDROPOWER DEVELOPMENT

The major issues in hydropower development is economic one, the revenues generated from the project itself must recover the cost of development, operation and maintenance.

Nepal power system is hydro based. The rate of electricity tariff is considerably affected by the cost of hydropower generation, transmission and distribution. Poor infrastructure development, limited transmission and distribution network, poor geology, very small industrial base, electricity consumption dominated by domestic use, which has caused electricity tariff rise. The other causes of high tariff are due to reliance on foreign financing, foreign consulting services and electromechanical equipment import.

High electricity transmission and distribution losses and low load factor are responsible to a some extent.

4.2.1 Generation

The cost / kW and cost / kWh mainly affected by the cost of hydropower generation. The specific cost of some hydropower projects is given below (Table 4.1, 4.2).

Table 4.1 Specific Cost of Hydropower Projects

S. No.	Project Name	Capacity MW	Cost / kW installed US$ / kW	Average Cost USC/ kWh
1.	Khimti Khola II	27	2582	5.0
2.	Chameliya	30	2651	4.5
3.	Budhi Ganga	16	4357	6.5
4.	Thulo Dhunga	25	2970	4.6
5.	Kabeli -A	35	2573	6.3
6.	Upper Modi	14	2804	5.6
7.	Likhu -4	44	2030	3.7
8.	Mewa MW - 0	18	2295	8.9
9.	Rahughat RH-0	18	2295	8.9
10.	Bhote Koshi V	46	2716	4.4
11.	Lower Bhote Koshi	96	1637	2.6
12.	Middle Marsyangdi	61	2733	5.2
13.	Tama Koshi II	207	1495	3.4
14.	Upper Marsyangdi -III	121	1408	2.6
15.	Seti III	107	1833	3.6
16.	Simbuwa Khola	53	1830	3.8
17.	Tila-II	203	1802	4.3
18.	Bheri-Babai	83	2873	3.7
19.	Upper Arun	335	2022	2.8
20.	Upper Karnali	300	2122	3.3
21.	Arun-III	402	2047	3.0
22.	Lower Arun	308	2175	3.2
	AVERAGE (≤)		**2200**	**4.5**
23.	Dudh Koshi Storage	300	2686	5.2
24.	Kulekhani III	42	2296	8.7
25.	Kali Gandaki-II Storage	660	1755	4.2
26.	Budhi Gandaki Storage	600	1881	4.8
	AVERAGE (≥)		**2100**	**5.7**

Source: Water resource strategy Nepal, 2000.

Note: Costs include up front cost, generation and transmission cost and interest during construction.

Table 4.2 Specific cost of Medium hydro-project (1-10 MW)

Project Name	Capacity (MW)	Specific Project Cost US$/KW
1. Langtang Khola I	4.6	2328
2. Langtang Khola II	2.4	3207
3. Indrawati I	5.1	2004
4. Indrawati II	4.3	1676
5. Tap Khola	1.3	2222
6. Kabeli	11.4	2741
7. Solu Khola	5.0	2003
8. Puwa Khola	6.2	2123
9. Piluwa Khola	3.0	1233
Average Cost per kW		2300

Source: Water resource strategy Nepal, 2000.
The cost includes generation, transmission costs, and interest during construction.

It is obvious from the tables that: the specific cost per kw of medium size runoff river projects which is an average of US$ 2200/kW, and for storage hydropower project is US$ 2100/kW which is slightly lower than runoff river projects. These are single purpose projects.

In case of medium hydropower projects 1 to 10 MW, the average specific cost per kW is 2300, which is slightly higher than medium size projects.

The case of micro hydro projects smaller than 1MW generally not connected to grid, the specific cost per kW is very high due transpiration cost. The average specific cost of micro hydro projects is about US$ 3600 / kW and in some cases it goes beyond US$ 8000/ kW.

4.2.2 Transmission

Nepal transmission system comprises of 132 kV and 66kv lines. 132 kV lines are the national grids from Anarmani in the east to Mahendranagar in the west. The length of single circuit line is 1120 km. The total length of NEA grid at present is 3200-km interconnecting substation capacity of 813 MVA.

Table 4.3 NEA Grid

S. N.	Voltage kv	Type of circuit	Length in km
1.	132	Single	1172
2.	132	Double	198
3.	66	Single	166
4.	66	Double	161
5.	66 &132	Double	22
6.	66	Four	2
7.	33	Single	1505
		Total	**3226**

Source: Water resource strategy Nepal, 2000.

As the Transmission system has to designed and constructed in accordance with generation voltage, which also, needs an appreciable investment. As such this factor too should be taken into account before financing on a hydropower project.

The transmission system Master Plan estimates cost of developing transmission line to evacuate power from projects identified for least cost generation plan as US$ 395 million over the period of 1999-2016; which is based on international cost of transmission line construction.

The substation losses and uses are near to 2% and the transmission losses are about 2% and estimated to reach 3.7% in 2017.

4.2.3 Distribution

The distribution of electricity is the responsibility of NEA mainly with involvement of few private companies in some areas. At present, only 15% of the population have access to electricity that is also concentrated mainly in urban areas, in semi-urban and rural areas surrounding to grid which is approaching to saturation point. New electrification is to take place in rural areas not densely populated with low electricity consumption. The average

monthly energy consumption per consumer is 58 kwh/month while in urban area it is 146 kwh/month and in rural area it is about 40 kwh/month. So it requires the high investment with less revenue generation in rural electrification work. The electricity consumption pattern and consumer growth is given in the table 4.4.

Table 4.4 Electricity consumption and consumer growth

Consumer category	Nos. of consumer		Energy consumption GWh		Growth rate %		kWh / capita/ year	
	1991	1999	1991	1999	Consumer	Energy USE	1991	1999
Domestic	304480	590920	261	415	94	59	857	702
Non commercial	5633	7700	46	65	59	41	8166	8441
Commercial	1827	3005	37	78	37	110	20251	25967
Industrial	8382	15210	207	437	81	111	24696	28731
Water supply / irrigation	539	1020	28	23	89	(2)	51448	22549
Street light	532	772	7	7	41	-	13158	9067
Bulk supply	5	5	81	60	-	-		
Other	392	1368	3	5	249	67		

From the table 4.4, per capita energy consumption in year 1991 was 858 kWh/capita/year and in the year 1999 was 702 kWh/capita/year, which declined by 2.45% per annum while growth of consumer is nearly doubled.

Irrigation energy use declined by 2% while consumer increased by 89% during 1991 to 1999. Commercial consumers increased by 37%, energy consumption doubled in that period. While industrial consumers increased by 81% and energy use doubled in that period. The energy consumption per industry has not increased reasonably.

Distribution of electricity in rural area i.e., rural electrification is not commercially viable which needs subsidies. In existing NEA's RE Program, economic up-front investment per household is around US$ 500 to make RE affordable for most of the rural consumers.

Some private companies in association with co-operatives local contribution in distribution system during construction, meter reading, collection of revenues and local

support to reduce initial and O&M costs. Thus, the tariff rate supplied by private companies are lower compared to the public supply in grid connected rural electrification.

4.3 POWER MARKET

For development of economically feasible 44000 MW hydropower out of total potential of 83000 MW of Nepal, power market is the most important factor, which should be closely considered before planning to invest in hydropower project. It is necessary to have an assured power market within or outside the country.

4.3.1 Domestic Demand:

As the industrial base is weak, so power market is small within the country. Industries, transportation, agricultural and irrigation development need more power which has to be developed. At present NEA is the main electricity-distributing agency in the country with some private and cooperative agencies involved in rural electrification in small scale. Its annual energy generation in 1999-2000 was 1700 GWh with 670 000 consumers.

To predict the future demand of electric power and energy is difficult. However Integrated Nepal Power System (INPS) for base case scenario to achieve gross domestic product growth of 5.5% per annum, the energy forecast is at 7.9%. For moderate and high growth rate considerations, the energy forecast is based on 8.6% and 11.3%. The demand projection for the period of 1997-2017 is given in the table (4.5). The present demand is 449 MW and growth rate is about 10%. The projected power demand for the year 2017 is 1355 MW, 1815 MW and 2373 MW for base, moderate and high growth scenario respectively.

Table 4.5 Load Forecast for Integrated Nepal Power System (INPS)

Years	Base case		Moderate Growth		High Growth	
	Energy GWh	Power MW	Energy GWh	Power MW	Energy GWh	Power MW
1998	1349	308	-	-	-	-
1999	1478	337	-	-	-	-
2000	1617	369	-	-	-	-
2001	1788	408	-	-	-	-
2002	1967	449	2062	471	2062	471
2003	2110	482	2242	512	2318	529
2004	2300	525	2469	564	2649	605
2005	2502	571	272	622	3042	695
2006	2702	617	2984	681	3544	809
2007	2922	667	3270	747	3863	882
2008	3150	719	3578	817	4235	967
2009	3377	771	3894	889	4618	1054
2010	3637	830	4266	974	5072	1158
2011	3914	894	4678	1068	5578	1274
2012	4205	960	5134	1172	6141	1402
2013	4514	1031	5642	1288	6806	1554
2014	4840	1105	6210	1418	7552	1724
2015	5185	1184	6848	1563	8390	1916
2016	5550	1267	7377	1684	9333	2131
2017	5937	1355	7951	1815	10394	2373

Source: Water Resource Strategy, Nepal 2000.

For moderate growth rate and high growth rate, the energy 2062 GWh and peak load 471 MW for the year 2002 has been taken.

For base case scenario, to meet the domestic demand the project implementation plan for NEA is as per the Table (4.6)

Table 4.6 Project Implementation Plan for Base Case Scenario

Year of commissioning	Installed capacity	Projects
2004	61	Middle Marsyangdi
2005	27	Khimti -2
2006	12	Kulekhani -3
2007	44	Likhu -4
2008	300	Upper Karnali
2009	-	-
2010	-	-
2011	-	-
2012	402	Arun 3
2013	-	-
2014	-	-
2015	-	-
2016	-	
2017	30	Chameliya

Source: Water Resource Strategy, Nepal 2000.

According to the project implementation plan given in table 4.6, the projects committed for development are middle Marsyangdi (61 MW), Upper Karnali (300 MW) by NEA, Likhi-4, (44 MW) by foreign private and other some small projects by domestic private developer to meet the forecasted demand for base case scenario. In the case of moderate and high growth scenario project implementation plan and power demand should match through development of industries, rural industrialization, transportation, irrigation energy supply should be managed in harmony.

For the base case, capacity and energy demand foecast and supply according to projects implementation plan is given in he table 4.7

Table 4.7 Capacity and Energy Balance of INPS for year 1998-2017

	Power (MW)		Energy (GWh)	
Years	Demand	Supply	Demand	Supply
1998	308	274	1349	1278
1999	337	294	1491	1398
2000	369	337	1617	1848
2001	408	522	1788	2926
2002	449	522	1967	2926
2003	482	522	2110	2926
2004	525	583	2300	3319
2005	571	610	2502	3477
2006	617	622	2702	3526
2007	667	666	2922	3797
2008	719	966	3150	5930
2009	771	966	3377	5930
2010	830	966	3637	5930
2011	894	966	3914	5930
2012	960	1368	4205	8960
2013	1031	1368	4514	8960
2014	1105	1368	4840	8960
2015	1184	1368	5185	8960
2016	1267	1368	5550	8960
2017	1355	1398	5937	9155

The capacity balance and energy balance of INPS for 20 year planning period for base case are shown in figure 4.1 and 4.2 respectively.

Fig. 4.1 CAPACITY BALANCE OF INTEGRATED NEPAL POWER SYSTEM FOR YEARS 1998-2017

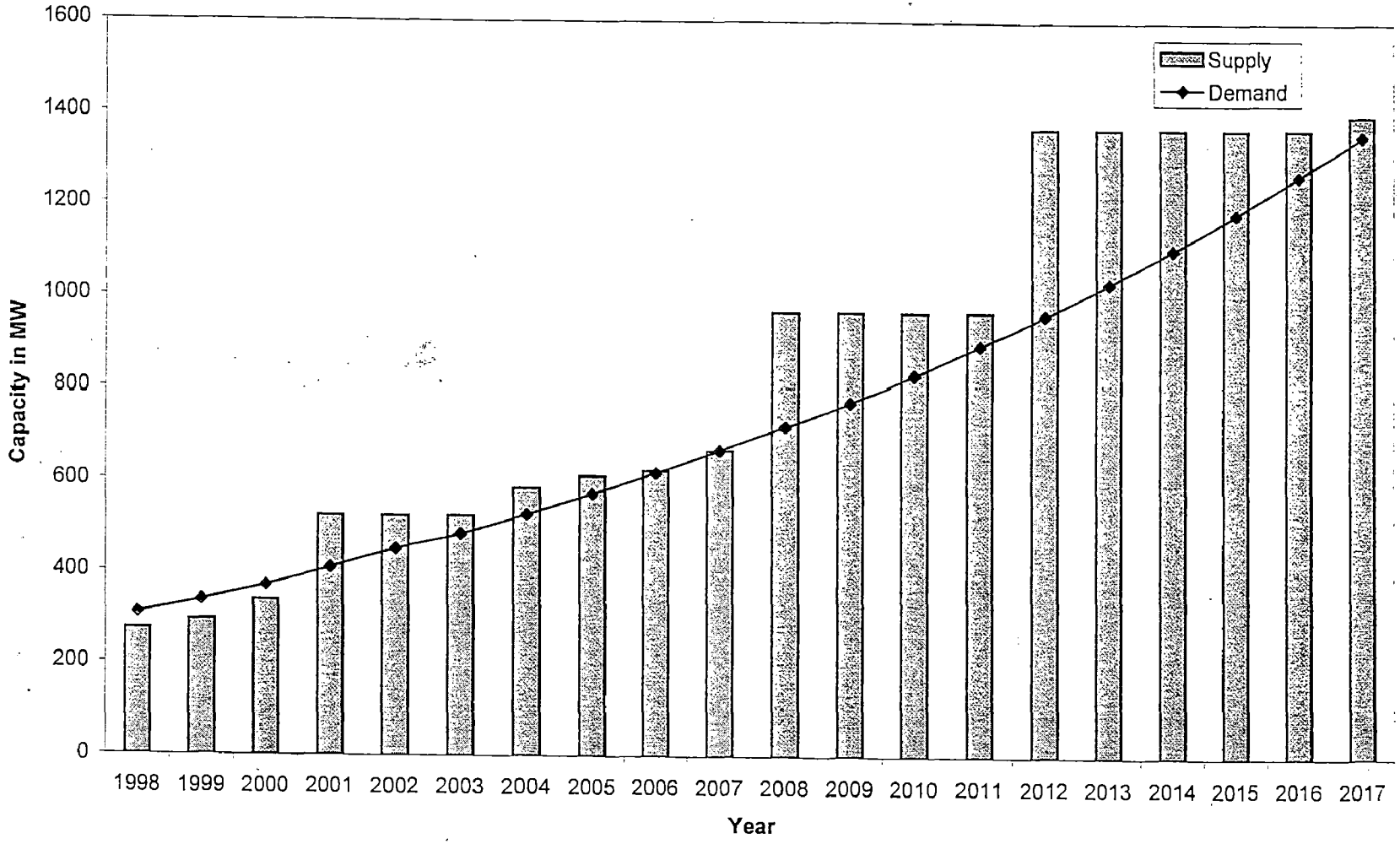
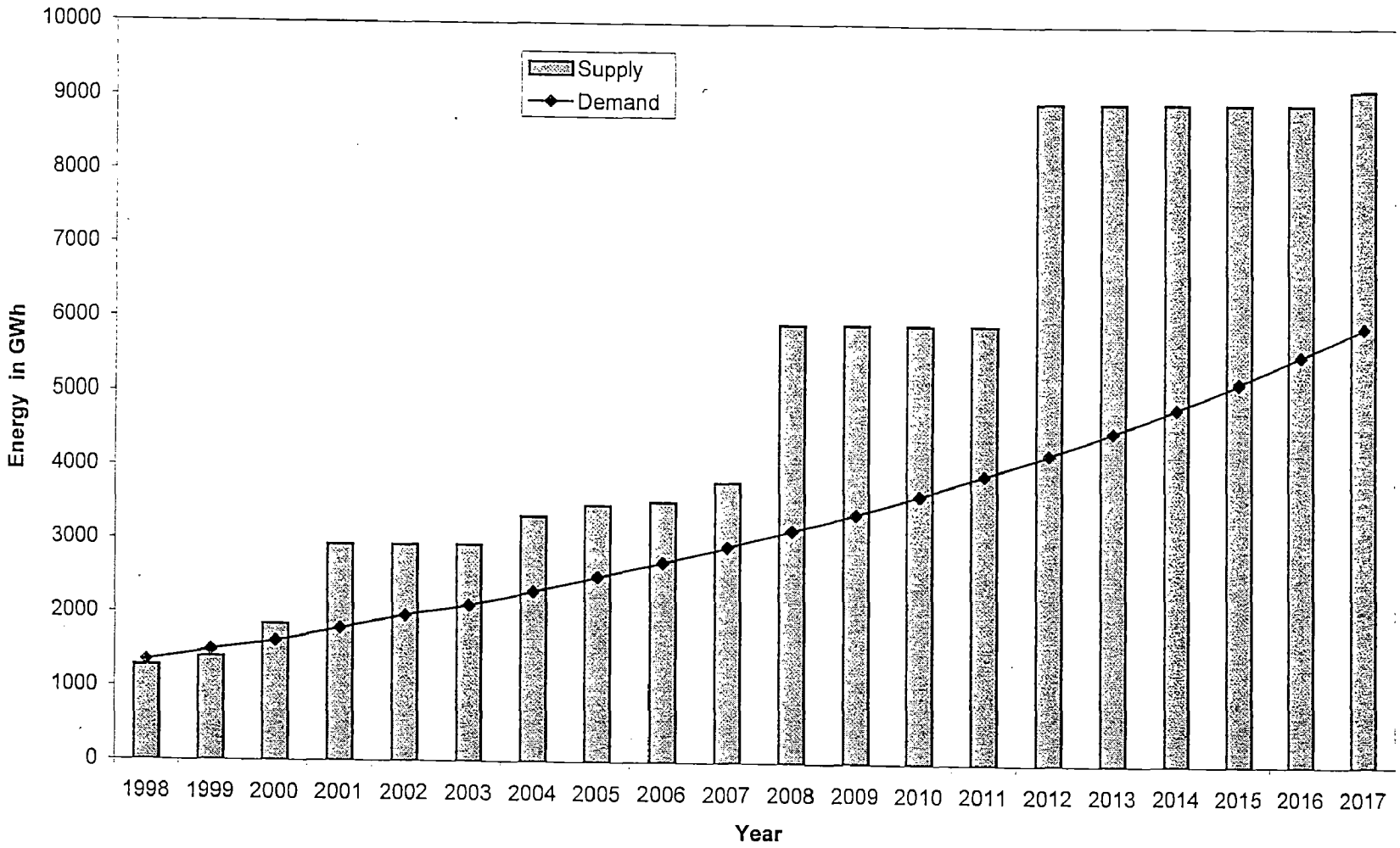


Fig. 4.2 ENERGY BALANCE OF INTEGRATED NEPAL POWER SYSTEM FOR YEARS 1998-2017



4.3.2 Power Market outside the country

Power export to China could not be feasible due to high cost of long transmission line to Chinese load centres.

Power export to Pakistan and Bangladesh could only be arranged through India's power grid. It would be essential to reach the political and business understanding among dispatcher, wheeler and receiving countries. As natural gas in these countries are relatively cheaper than Nepalese hydropower so, it may not be commercially feasible option.

The Power Trade Agreement between Nepal and India has created the good environment for power trade. Both the governments have agreed to provide assistance to the parties (government, semi-government or private), that ever enters power trade.

The power deficit in North India could be a large power market for Nepalese hydropower projects in the future. A huge power market in North India is the economically feasible market for Nepal Hydropower Development. Because of the proximity of Nepalese hydropower sites to the North Indian load centres could be competitive for Nepalese hydropower projects. The projected power demand and supply for North India is presented in the table 4.8.

Table 4.8: Power Balance-Northern India

Year	Demand MW	Supply MW	Deficit MW
2000	30300	20700	-9600
2005	42800	27900	-14900
2010	58200	37400	-20800

Source: Based on power demand projection, India

4.4 FINANCING IN HYDROPOWER PROJECTS:

Development of HP project is a very capital-intensive business. It takes long gestation period and construction period and needs high initial investment cost. To maintain GDP growth of 6.5 per annum, the capital investment for hydro generation till 2017 will need about USD 4 billion at 2000 price level [34]. Extra fund will be required for transmission and distribution network also.

Some of the possible sources of capital are described below.

1 Power plant refurbishment

2 Improvement in the exiting resource mobilization

3 Mobilization of other internal resources

4 Mobilization of funds from private national and international finances agencies

4.4.1 Power Plant Refurbishment

Renovation and Modernization (RM) of generating equipment is carried out to increase the capacity, life and efficiency of existing plant so that more revenue is generated.

Other concept is "Renovation-Operation and Transfer (ROT)". Under this scheme private party is invited for the purpose of rehabilitation, operation of the plant for contract period to payback the investment by selling energy generated. At the end of the contract period the project is transferred to the owner.

4.4.2 Improvement in the Existing Resource Mobilization

These resources are government loans, loans from financial institutions and market borrowings, reduction of interest rates on loans etc.

Other contributions are international sources, which are security deposit from consumer, consumers contribution for service connection increase in tariff rates, depreciation fund and profit. Tariff and service charges are raised for this purposes.

4.4.3 Other Sources of Internal Resource Mobilization

Some of the important sources are

i. Availability of baking loans for inventory to finance procurement for machines and spare parts in electricity power supply industry also.

ii. Leasing method of financing capital equipment under which the leasee selects the equipment aquires and uses the equipment during lease period on predetermined lease rent.

iii. Public Deposit and Bonds:

The public sector companies are allowed to float fixed deposits, debentures share to create fund for investment.

iv. Joint Sector Projects and Co-generation:

This reduces the burden on individual power supply utilities, the finance required to implement the project.

4.4.4 Funding from Private National & International Agencies

For funding in capital intensive hydropower projects, the private national and foreign funding agencies are the main sources of capital. Mobilization of adequate finances form private sector for the investment is crucial. For this, the favourable environment for investment with incentives and concessions are necessary to encourage private sector participation in power development. The response from national and international private investors has increased for financing and developing hydropower projects in Nepal.

Out of the various sources of funds discussed above that can be generated for construction of hydropower projects. Fund generation generally is managed through private investors and by increasing tariff rates.

4.5 TARIFF

Basic elements of electricity tariff are fixed charge and variable charge. The fixed charge is derived from the gross capital cost of the generating station, depreciation of capital assets, rate of return in equity, interest on loan and interest on working capital etc. Thus, annual fixed charge per kW is determined. Variable costs are cost of fuel if any and annual operation and maintenance cost per kWh is calculated. In hydro generation, availability of discharge is not under control. Although energy pricing for hydro are generally fixed cost tariff some incremental energy cost pricing is in practice in hydro energy tariff also.

In Nepal, the present tariff rate is determined by two financial convenients (i) self financing ratio (SFR) aimed at financing a significant portion of future capacity expansion and (ii) rate of return (ROR) which is calculated after the taxes, revalued assets with inflation in domestic and US$ components. At present NEA tariff is fixed at SFR of 23% and ROR of 6%. From the table 4.9 the average electricity in Nepal is higher compared to the average tariff of other countries in the region where per capita income is lowest. The comparison of of average tariff is given in table 4.9.

NEA tariff rates are given in the table 4.10. Which shows that, for domestic supply the average increase in tariff in demand charge and energy charge per annum are 37% and 6% respectively.

Table: 4.9 Comparison of Average Electricity Tariff, 1999.

Countries	Average Tariff USC / KWh
Nepal *	10.00
Sri Lanka	7.90
Bangladesh	8.53
Philippines	11.40
Malaysia	11.10
Hong Kong	9.80
Singapore	8.10
Thailand	7.70
Indonesia	7.40
Pakistan	6.50
India*	6.00
Bolivia	7.67
El Salvador	6.27
Honduras	5.39
Guatemala	9.87
Panama	11.20

Source: Water Resource Strategy, Nepal
* Tariff rates of 2001

Table 4.10 NEA Tariff Rates

A. Domestic Consumer

A_1 Minimum monthly charge (meter capacity)	Charge (NRS)		
	15 July 2001	17 Nov. 1999	15 May 1996
Upto 5 Amp.	80	78	60
15 Amp.	299	-	-
30 Amp.	664	208	160
60 Amp.	1394	468	360
Three phase supply	3244	1248	960
Average increase			37%
A_2 Energy Charges			
Upto 20 Units	4.00	3.90	3.00
20 to 250 units	7.30	6.50	5.00
Above 250	9.90	9.25	7.75
Average increase			6%
B. Temple			
Low voltage			
Energy charge	5.10	4.65	3.60
Average increase			7%
C. Road			
(i) Metered	5.1	4.65	3.60
(ii) Non metered per kVA/ month	1860.0	1690.0	1300.0
Average increase			7%
D. Temporary			
Low voltage			
Energy charge	13.50	12.00	9.30
Average increase			8%
E. Community			
Bulk supply per unit	3.5	-	-

F. Industry

Type	Monthly Demand charge NRs/kVA			Energy charge NRs/ unit		
	2001	1999	1996	2001	1999	1996
1. Low voltage						
a) Cottage	45.00	25.0	20.0	5.45	5.0	4.0
b) Small	90.00	50.0	40.0	6.60	6.10	4.90
2. 11 KV supply	190.00	-	-	5.90	-	-
3. 33 KV supply	190.00	105	84.0	5.80	5.50	4.40
4. High voltage	175.0	95.0	76	4.60	4.35	3.50
G. Commercial						
i) Low voltage	225.0	125.0	100.0	7.70	7.25	5.80
ii) 11 KV	216.0			7.60		
iii) 33 KV	216.0	120.0	96.0	7.40	7.10	5.70
H. Non-commercial						
i) Low voltage	160.0	88.0	68.0	8.25	7.50	5.80
ii) 11 KV	180.0			7.90		
iii) 33 KV	180.0	98.0	76.0	7.80	7.40	5.70
I. Irrigation						
i) Low voltage	-	-	14.0	3.60	3.25	2.90
ii) 11 KV	47.0			3.50		
iii) 33 KV	47.0	26.0	20.0	3.45	3.25	3.05
J. Water supply						
i) Low voltage	140.0	78.0	60.0	4.30	3.90	3.0
ii) 11 KV	150.0			4.15		
iii) 33KV	150.0	83.0	64.0	4.00	3.80	2.95
K. Transportation						
i) 11 KV	180.0			4.30		
ii) 33 KV	180.0	98.9	76.0	4.25	4.0	3.10

Average increase in demand charge = 22% and Energy charge = 6%
Source: Tariff Fixation Commission, Nepal

The causes to increase tariff in 1996 are:

To provide reliable energy to more people, to manage domestic and foreign fund for Kali Gandaki-A hydroelectric project and other projects construction, the electricity tariff was increased. The tariff shall be made stable as far as possible. And it was to control electricity theft and to increase the efficiency of NEA.

The causes to increase tariff in 1999:

To provide reliable energy to more people, to manage external internal fund for electricity generation, transmission and distribution, the tariff was increased. It was to control

electricity loss and to increase efficiency of NEA. The tariff shall be made stable as far as possible.

The causes to increase tariff in 2001 are:

To meet the electricity demand, to carry rural electrification, to provide reliable electricity to the consumers, to manage internal and external funds for generation T & D work, it has become necessary to raise the tariff. Tariff shall be made stable as far as possible, efficiency of NEA shall be increased to control electricity losses, collection of receivables and for organizational and financial improvement.

In the private sector, some companies and user's groups are distributing electricity in rural hill areas by own generation and on lease basis. Few of them are Salleri Chialsa Electricity Company (SCECO), Salleri, Solukhumbu; Andhi Khola Hydroelectric and Rural Electrification Centre (AHREC), Galyang Sayanja; Jhimruk Hydroelectric and Rural Electrification (JHREC), Ramdi, Pyuthan; Lamjung Electricity User's Association (LEUA) Besishahar, Lamjung.

Generally in these systems, majorities of consumers have loads 50 W to 500 W is a lighting load. Those low load consumer consume 50% of the connected load, so excessive peak loads occurs at the evening. All these organization use their tariff system that minimizes the cost for the least affluent sections of the community.

The comparison of cost of electricity distribution organisations are given in the Table 4.11.

Table 4.11 Cost comparison of electricity distribution organizations

Description	SCECO	AHREC	LEUA	KBC
Number of staff	11	51	26	15
Number of consumers	902	11,749	6300	632
Consumers served by one staff	82	230	242	42
Peak load (KW)	340	3500	1240	540
Energy delivered (kWh)	1,047,721	5,773,608	2,139,730	1,650,940
Energy consumed/consumer/month	96	41	28	226
Income from sales of electricity	4,147,085	14,338,284	9,980,974	4,970,086
Personnel/salaries	1,473,550	4,410,643	1,492,821	1,709,157
Administration	563,145	3,322,784	781,179	266,303
Repair and maintenance	544,061	996,412	350,150	367,593
Other	167,294	-	14,434	0
Total Operating cost (NRs)	2,748,050	8,729,839	2,638,584	2,343,053
Depreciation provision	2,161,576	3,787,168	0	0
Power Purchased (NRs)	0	0	6,153,154	0
Cost of deliver before depreciation (per kWh) (NRs)	2.62	1.51	1.23	1.42
Cost of deliver after depreciation (per kWh) (NRs)	4.69	2.17	4.11	1.42
Cost per consumer per month after depreciation (NRs)	454	89	116	321
Average tariff (per kWh) (NRs)	5.42	2.48	4.66	3.46
Income per consumer/month (NRs)	525	102	132	782

From the table 4.9 it is found that: (i) cost per consumer is higher in isolated system as more service staff required in case of KBC and SCECO.

In KBC and SCECO energy consumption more than grid connected ones, because these site lies on popular trekking routes and also do not have cheaper alternative energy resources.

LEUA purchases energy from NEA in bulk at NRs 2.88/kwh and sells at NRs 4.66/KWh to consumers.

The tariff rates of JHREC and AHREC are same. In JHREC, NEA & JHREC tariff system are applicable, where consumer can choose one of the any tariff systems. About 40%

watt consumers cut out system with that tariff are used. Where as the NEA tariff rates are metered and same for rural and urban consumers in the country.

High project cost and of about 2% per annum and average 6% per annum in tariff indexed in US dollar and NRs respectively is added in bulk power purchase from IPPs which is to be adjusted in the tariff. The tariff is also increased to manage domestic and foreign fund to invest in new generation, transmission and distribution projects. This is an inconvenient commercial approach of increasing tariff rate. The capital for the new projects can be raised in formal manner by floating shares from public or debt-from financial institutions.

4.6 CRISIS MANAGEMENT ISSUES

The crisis management issue is concerned with the view of energy security at the perspective of the country. Each government must perceive its country secure in the world community. By nature's gift, several countries import some types of fuel and export other types of fuel for security.

Nepal is the fuel importing country. And nation's transportation, industry, commerce and agriculture is dependent on imported fossil fuel. Thus major economic activities are dependent on the imported fuel. So it is always in the energy security risk. It is an embrace instituted by foreign supplier or supplier's group for political reasons. Interruption or unusual price rises of fuel can takes place by one or both of them. The energy supply interruption damages the economic and social activities of the country.

Nepal, being land locked country, the energy crisis causes more severe impacts. During 1989, supply interruption for a period of about 3 month due to delay in extension of trade and transit treaty between India and Nepal. The impacts of energy crisis have national or international, depending the country is developing one or developed one. So indigenous

hydro energy should extend to transportation, industries agro-processing irrigation and other sectors to some extent by enhancing energy security through increasing energy self sufficiency and export.

4.7 CAPABILITY BUILDING ISSUES

Sustainability of hydropower development mainly depends on the capability and capacity of planning, design, implementation and operation and maintenance work done by knowledgeable, well-trained and motivated individuals which are the backbone of the nation. While the outside experts and aid organizations can provide temporary assistance. On the long run, nation must depend on its own professionals to provide know how and experience required for WRD and management. Hence training and education become key input in building capability.

Planners and designers, contractors, manufactures and skilled persons for planning, design, construction, operations and maintenance are the core groups in hydropower development. Mobilization of the existing capacity to the maximum with outside assistance to the extent required is must necessary to increase the capability.

At present national utility, NEA has main responsibility of generation transmission and distribution of electricity in the country. Some private companies are also entering in power business. Some manufacturers are manufacturing electro-mechanical equipment for small hydropower projects, and civil contractors, national consulting firms, institutions and individuals are working in hydropower development. NEA posses in built leadership quality, institutional strength, experienced professionals. It has conducted and completed feasibility study of medium size hydropower projects successfully, implementation of Puwa Khola (6.2MW), Chilime (20MW), Upper Marsyangdi (42MW),

Middle Marsyangdi (43MW), Modi Khola (14MW), Kali Gandaki – A (144MW) and many small hydropower projects are completed with its in house experts.

Butwal power company and other private companies are working in this sector, also possess the experienced designers planners skilled manpower involved in project design, construction and operation and maintenance work of medium size projects like Tinau (1MW), Andhi Khola (5MW), Jhimruk (12MW), Khimti (60 MW), Piluwa, (3 MW), Daram Khola (5 MW) etc.

Some local contractors and manufacturing companies in private sector such as Balaju Yantra Shala, Nepal Hydro and Electro, Himal Hydro, Kathmandu Metal and others have technological skill in small hydro in the country. Mobilization of the existing capabilities in the power development industry in efficient way to update and to improve their skills for larger projects is very important. This can be achieved by public & private joint venture development practice where existing expertise, institutional capability and private capital are mobilized in shared manner. For this the role of government and international institutions like World Bank, ADB and their donors should maintain fare, proper balance between private and public companies. This should be motivated by the national interest provided reasonable profits on the investment.

Building capability is a continuous process within a company, among the companies and in the country, which should be empowered by the mission of providing cheap and reliable electricity supply.

4.8 SOCIO-ECONOMIC ISSUES

Government of the developing countries are welfare governments having the objective of equitable social development (poverty alleviation, employment generation) by sharing the

benefits of the project in fair, equitable and sustainable manner to meet the needs of today to the stable and higher level of living of the people. On the other hand the adoption of open market system of economy is to mobilize foreign investment in the infrastructure development to support the economic development of the country through privatization does not take care of equitable development. The distribution of wealth and income tend to vary under different property regimes. Market solutions under private property regime do not make any provision for equitable distribution of income within society, because, of the inequitable income and wealth distribution effects market solutions are not necessarily the socially preferred allocation of resources especially natural resources.

Water resources development activity is the public sector activity. The livelihood of the people living in the watershed is related to direct and indirect use of water produced in the basin. Including the basin interest, the regional and national issues relating to water use are also getting more importance in relation to social, economic and environmental concerns.

Hydropower development being a potential natural resource has to be developed to sustain modern way of life and economic activities in the country. At the same time due to construction of dam, submergence due to reservoir, resettlement of the displaced families, compensation measures to the project affected families in the project site; downstream water demand and ecological impacts due to reduced downstream discharge are the hot issues, which need to be solved. On the other hand construction of hydropower project enhances the better accessibility to the project area, the employment during construction; the commercial and economic activity increases to some extent. Thus hydropower project as an infrastructure opens many, business, industry, tourism and research possibilities in the area. The economic

activities relating to supply and distribution of goods, marketing and employment generation take place.

On the other hand, as the per capita income of the people is low, the purchasing power of the people is also low. So, per capita electrical energy consumption has reduced from 857 kWh /capita/year in 1991 to 702 kWh/capita / year in 1999 (Table 4.4). It is in decreasing trend as tariff rate has been raised in Dec. 1999 and in 2001. The number of industrial and commercial customers have been increased but the amount of energy consumption has not increased considerably. The use of alternative energy resources as LPG and kerosene in domestic purpose and petroleum products in the industrial sector has increased instead of electrical energy.

From the Table 4.4, the energy consumption in domestic customers and industrial consume 37% and 39% of the total energy generated respectively. The use of electrical energy as commodity in the production industry, which produces value-added products, is less.

The integration of hydropower development with other development program is not the function of the project developer alone, it needs to be coordinated in higher level. For the feasibility of industry, the cost of energy input should be cheaper than alternative source of energy available to be competitive in the open market economy.

The major sustainability issue in water resources project is financial one. Whether the system is public or private, unless the cost of providing the services required for any water resources system are recoverable, such systems can not be sustainable. Further, the project may be financially justified but economically nonviable if social costs are more than social values. EIA studies in hydropower project include the social issues.

Social sustainability is the human patterns of social organization are crucial in devising viable options for achieving sustainable development. Indeed it is well known that failure to pay sufficient attention to social factors in WRD processes can seriously jeopardize the effectiveness of development projects. Because the ultimate goal of any development project including hydropower projects are aimed at the better quality of life of the people of the project area and the country as a whole.

To achieve central social objective "quality of life far all" in sustainable WR system needs empowerment, participation, social mobility, social cohesion, cultural identity and institutional development.

Economic point of view social objectives are equity and poverty reduction, considering the entire mix of resources (environment, human knowledge, capital etc.) as social capital possess some perceptional difference.

Benefit / cost analysis of economic development of alternatives are incomplete unless environmental and ecosystem impacts are included in the analysis. Because evaluation of benefits / cost of these impacts in monetary terms is difficult. Logical experiences and planning vision for decision making should be applied.

The public empowerment, participation, mobility, cohesion, cultural integrity and institutional development activities can be achieved by integrated development planning approach in WR Projects. The objective of integrated planning is to meet the needs of the present population; WR Projects should be implemented maintaining accepted level of environment, impact in ecology of the nature and economy of the human society.

The socio-economic condition of people can be judged by the change in the economic activities, as increase of buying capacity, per capita energy consumption, growth of industries and other social and economic activities after implementation of the project, which should be in higher level.

PRIVATISATION OF HYDROPOWER PROJECTS

5.1 GENERAL

After Restoration of democracy in 1990 on wards, the energy demand was increasing, no project were in pipeline. So the country was facing load-shedding problem. The government and the public utility lacked fund to invest in the new hydropower project. Generally hydropower project were donor funded as a grant or loan. As multilateral and bilateral funding in hydropower projects through public or government agencies were reduced and financing is being through private investors started.

Although in future, the hydropower development from bilateral or multilateral funding can not be written off completely, the role of private sector in hydropower development has been strongly realized. In view of such situation, hydropower policies are made more liberal and attractive for the entry of private investors in to the power market along with the public sector.

Some of the major issues of private investors and others concerned institutions are guaranteed electricity market, payment, insurance, risk sharing, reasonable electricity tariff etc to be provided by the government. Unless the conditions are met, privatization could not materialised.

The general policy to the unbundle the hydropower sector, the existing transmission infrastructure keeping under autonomous public utility to provide open access to private

producer or to distributor. Open access accommodates the requirements of the requesting agency identifying the starting and terminating points and dates of delivery subject its technical and reliability considerations. Open access tariff for existing and new expansion by utility or private developer will be based on sound market principles.

As only 15 percent population in Nepal have access to electricity out of this 10% are urban consumers and remaining 5% consumer are also from densely populated semi urban areas. A vast sector of population (85%) who live in rural area need to be electrified.

The future electrification is to expand the distribution lines to the rural area, where the infrastructure, socio-economic activities, which are not so developed. Hence distribution system is one of the main infrastructure to be developed in rural areas for socio-economic upliftment of the people. Growing demand of electricity and addition of generation capacity in the country, expansion of the distribution facilities has been necessary to match the generation with the distribution.

Due to rugged topography sparsely scattered settlements, low load density settlement and inadequate infrastructure, expansion of distribution system requires huge investment, which the government lacking fund, needs the support of donor countries or go through privatization.

5.2 MAJOR ISSUES OF PRIVATE INVESTORS

The hydropower developer being extremely capital intensive and involving long gestation period provides benefit in the later period of time. National financial institutions / banks not being able to provide fund to private sector, need to seek funds from foreign financial institutions and investors / lenders. Private sector independent power producers (IPPs) have to satisfy foreign lenders / investors that they would receive payments regularly

from selling power produced to public sector utilities, which should be secured in power purchase agreement. Since PSUs themselves, not financially strong, sovereign guarantee from the government needs to be provided to them.

The governments have huge debt burdens to fulfill expenses in some vital area like health, education etc. and to import essential goods and commodities. This huge public debt along with the deficit financing may cause higher inflation and leading to reduction in return on investment. The major concerns of private investors are:

5.2.1 Technical Risk

Himalayan region, consisting of fragile geology, high seismic zone makes the underground structure and tunneling difficult. The high sediment load in Himalayan River makes the design difficult and added safety factor for this causes the rise in project cost.

5.2.2 Construction Completion Risk

HP projects need longer construction period and leading to delays in schedules and so cost over runs is more common. These risks are mitigated by managing contingent standby equity, insurance or by turnkey fixed contracts, which need stronger financial condition.

5.2.3 Environmental Risk

HP is renewable form of energy and is not responsible for green house gases and global warming but the adverse impact on ecology, environment, resettlement, submergence etc. Due to construction activities attracts the general public, media, environmentalists and NGOs. The social discontent, some times become more intense which should be mitigated by transparent and fair compensations, adequate environmental impact studies, public participation, awareness and by proper public disclosure. Run of river scheme also may be the solution for development priority.

5.2.4 Payment Risk

The power produced is sold to public sector utility (PSU). The ability to make payment to IPP depends on the financial strength of the PSU or any bulk power purchaser. The payment risk can be mitigated by selecting creditworthy purchaser and provided or government guarantee for repayment. The other option is to rise the electricity tariff by posing the burden to the consumer.

5.2.5 Rate and Availability of Foreign Exchange Risk

Due to weak financial condition of the country, escalation of local currency is higher. The effect of escalation on the realization of benefit would be seriously affected. Also the availability of foreign exchange for repayment of debt is a major risk. As foreign exchange reserve reduces due to imbalance of foreign trade, the more severe is the risk. To mitigate this risk, private investors are interested to have tariff indexed to US dollar, and government guarantee to provide foreign exchange to repatriate foreign debt and the profit. The macro-economic indicator of a country can be examined by the amount of foreign exchange reserve. The ability to generate foreign exchange i.e. export is greater than import increases the foreign exchange reserve to pay foreign debts and to reduce foreign risk.

5.2.6 Political Force Majeure and Country Risk

The change in the government of the country, which is pro or against the privatization of project affects the policy adopted by the previous government. The policy adopted by the new government may hamper the repayment of the loan. The country risk based on assessment of foreign policies like trade embargoes; war or terrorism may stop repayment. Private investors want these risks mitigated through the buyout provisions or through political insurance. This risk is judged clearly by track record or political stability, legal

infrastructure, the repatriation rights, economic freedom, the bureaucratic delays / corruption and the transparency of the process etc. These risks are guaranteed and insured to attract foreign private investment in the country. The guarantees, counter guarantees, insurance etc insure more secured safety to the private investors which increases project cost and electricity tariff to the consumers. Hence the government should provided guarantee for all these risk to motivate foreign private investors.

5.3 GENERATION

5.3.1 Induction of Private Developer in Hydropower

Due to the continued deficit in peak load & energy in the supply system, load shedding was continuous which was affecting the social life and economic activities. To over come such situation government decided to request private companies to develop the first private hydropower project (Khimti 60MW) through memorandum of understanding in 1993, and the financial closing occurred in June 1996. A long time was taken in the negotiation for financial, legal and administrative process to arrive at the agreed solution.

After this agreement, some other private companies entered in the power industry through solicited and unsolicited bidding are given in the table (5.1).

Table 5.1 Independent Hydropower Projects

S. No.	Project Name	Developer	Capacity
1	Khimti-I Foreign	Himal Power limited	60 MW
2	Bhote Koshi Foreign	Bhote Koshi Power limited	36 MW
3	Chilime Local	Chilime Hydropower Company	20 MW
4	Upper Bhote Koshi	GITEC	14 MW
5	Indrawati Local	National Hydropower Company	5 MW
6	Daram Khola	Gorkha Hydropower Company	5 MW
7	Piluwa Khola Local	Arun Valley Hydropower	3 MW
Total			**143 MW**

The details of some Power Purchase Agreements signed between IPPs and public utility are given in the table (5.2).

Table: 5.2 The power purchase agreement signed with different developers:

S. No.	Name of Project	Name of Developer	Date of signing	Energy price		
				Unit, Date	Price	%
1.	Khimti Khola (60MW)	Himal Power limited	Jan 16,1996	USC/kWh , Jan 1, 95	5.94	2%
2.	Bhote Koshi (36MW)	Bhote Koshi Power Company	Jun 21,1996	USC/kWh Jan 1,95	6.0	2
3.	Andhi Khola (MW)	Butwal Power Company	Revised 1997	NRs/kWh 1995/1996	1.47	7.85-11.56
4.	Jhimruk (12MW)	Butwal Power Company	1997	NRs/kWh 1995/1996	2.18	4-8.33
5.	Indrawati (5MW)	National Hydropower Company	Dec 1997	USC/kWh July 15 1997	5.88	3% up to 12 years
6.	Chilime (20MW)	Chilime Hydropower Company	Jun 1997	NRs/kWh July 1996	3.0	8% for 12 years
7.	Upper Modi (14MW)	GITEC Nepal Pvt. Ltd.	July 21, 1999	USC/kWh From Signing date	5.4	2% for years
8.	Daram Khola (5MW)	The Gorkha Hydropower (P) Ltd.	Jan 2000	NRs/kWh Nov. 1998	Dry ; 3.0 Wet; 4.25	6% for years
9.	Piluwa Khola (3MW)	Arun Valley Hydropower Development Company	Jan 2000	NRs/kWh Nov. 1998	Dry ; 3.0 Wet; 4.25	6% for years

Source: Tariff Fixation Commission, Nepal.
NRs: Nepal Rupees
USC: US Cents
1 US$ = 75 NRs

Khimti project (60MW) being the first BOOT project took long time for financial closing including international legal negotiations which were costly than the case of other projects like Bhote Koshi, Upper Modi projects, but the energy price has been fixed at same level. In the case of Indrawati (5MW) (local private developer), the tariff is also indexed in dollar and with higher escalation rate for using foreign capital.

Andhi Khola (5.1MW) and Jhimruk (12MW) have lower unit price indexed local currency. Chilime (20MW), Daram Khola (5MW) and Piluwa Khola (3MW) developed by Nepali developer with local funding. For Daram Khola & Piluwa Khola projects, tariff rates are as per declared tariff for promoting small hydro projects.

5.3.2 Small Hydro Projects

Small and large hydro projects are complementary to each other in the hydropower development planning. The contribution of small hydro in building local capability in engineering, contracting, manufacturing, financing is vital. Building local capability is necessary to lower the cost of expatriate consultant, foreign exchange costs and other costs to recover risk mitigation measures.

To promote the domestic private investment in hydropower development, the purchase price and quantity (MW) from private developer, has been announced by HMGN. The prices announced were NRs 4.25/KWh, for four months of dry season (January to April) and NRs 3.0 /KWh for rest of the months wet season with 6% escalation per year. The power purchase will be up to 5MW capacity and up to 15 MW from year 2003 on wards.

This announcement has increased the enthusiasm of local developers. These local developers are satisfied with these payback rates in Nepal Rupees (NRs) and they do not ask for government guarantee for payment. Several companies have secured licenses for the survey and development of small hydropower projects up to 15 MW capacity.

Table 5.3 Number of licenses provided to private sector

Total number of Licenses : 62	
Installed capacity Smaller than 15 MW : 25	40%
Installed capacity Larger than 15 MW : 37	60%

Source: Department of Electricity Development, Nepal.

Some projects like Indrawati III (1.5MW), Daram Khola (5MW), Piluwa (3MW), Khudi etc are under construction. Hydropower project size smaller than 10 MW are complementary with medium or large hydro projects to meet the national energy demand. Which is a good symptom in this regard and needs to effective mobilization of domestic resources to develop the national capability. The development of medium (10-50MW) and large hydro projects (larger than 50MW) are necessary for meeting domestic need and for export.

5.3.3 Competitive Bidding

The projects built were all on the basis of solicited biddings through memorandum of understanding (MOU) or unsolicited basis where the bidding was not competitive. HMGN decided to develop HP projects in competitive manner, inviting private investors to build 11 project on competitive bidding basis. (Table 5.4).

Table: 5.4 List of projects for competitive bidding

S. No.	Name of Projects	Type	Capacity (MW)	Generation (GWh)
1.	Chameliya	PROR	30	197
2.	Budhi Ganga	PROR	20	112
3.	Kabeli –A	PROR	35	148
4.	Likhu – 4	PROR	44	277
5.	Tamur / Mewa	ROR	83/18	484/54
6.	Rahughat	ROR	24	123
7.	Andhi Khola	Storage	176	663
8.	Arun III	PROR	402	2890
9.	Dudh Koshi	Storage	300	1661
10.	Upper Arun	PROR	335	2050
11.	Kankai	Storage/Multipurpose	60	200

Source: Water Resource Strategy, Nepal, 2000.
PROR : Pondage Run off River.
ROR : Run off River

In this competitive bidding total 23 bidder expressed their interest. For Rahughat (24MW), Kabeli-A (35MW) Likhu 4 (44MW) and Budhi Ganga (20MW) more than six bidder took part in bidding and for storage projects there were one bidder for each.

This shows that the capacity range for which greater number of bidder submitted for 50MW, which is the suitable size in the domestic demand, and the interest to invest in the larger project found less. In the second stage biding, only one bidder had submitted the bid for Likhu-4 (44MW) project only. This shows that in international competitive bidding the interest of private investors is not encouraging, which may be concluded that the effect of the power market, socioeconomic, political, foreign exchange and other risks that has to be scrutinized for the future course of action. Because without competitive bidding, privatization of hydropower can not be successful.

5.4 DISTRIBUTION

To promote the private sector in electricity distribution, open access facility to the national grid, non-issuance of other guarantees, insurance and incentives as for generation licensee are available.

Even though, as a part of environment mitigation measures, electricity distribution to the project affected area are being carried out by private developers.

RE as such in not a commercially viable area of investment, which needs the subsidy from government, from international financing institutions or from other sources.

In isolated areas from grid and in small scale RE Programs are operated by private companies, cooperatives, communities. These institutions have right to fix tariff and other terms and condition in operation and maintenance work.

The privatisation of distribution of electricity is not encouraging so far. Only two licenses have been issued to Butwal Power Company Limited (Developer of Andhi Khola and Jhimruk Projects) for rural electrification in Andhi Khola hydropower Project area Syanja and Palpa distributes and Jhimruk hydropower project area (Pyuthan and Arghakhanchi districts)

USAID grant assistance was provided to BPC for the RE programme. The unique feature of the RE is the involvement of the local community through user's organisation (UO) in electricity distribution system. The main objective of involving UO is to attain the following advantages:

(j) To reduce the costs of distribution system construction

(ii) To reduce the administrative burden on O&M works

(iii) To strengthen the community unity and commitment to the project

For cost reduction informal UOs were formed in the community where RE programs where required. UO from the community, interested to recieve electricity requests for RE with commitment to provide local materials voluntary labour and material transportation for RE work. Other materials and equipment are supplied by RE project in unit cost basis to bring down the construction cost. Thus the average cost of distribution system per household is NRs 10000.0, which is cheaper than in NEA system.

O&M cost reduction was achieved through the following efforts:

* UO's commitments to collect fees from consumers.
* Commitments of UOs to take responsibility of routine control and maintenance of the distribution system within the UO's area.

* Commitments of UOs to serve communication link between community and project in case of fault and major maintenance work.

Tariff structure:

Adoption of flat rate tariff and metered tariff rates to suit the varieties of customers' choice were available for domestic load. The tariff structure to cut off peaks, were current cut outs for unmetered consumers and two tier energy meter in which energy consumption below subscribed demand is registered in lower counter at NRs 1.75/KWh and above subscribed demand is registered in upper counter at NRs 5.20/KWh. Peak and off peak tariff rates are adopted for industrial load. The use of compact fluorescent lamps, which are five time efficient as incandescent bulbs are in practices. Which can reduced the lighting peak load in the system. The rates are given in the table 5.5, 5.6, & 5.7.

Table 5.5 Tariff rates for unmetered customers, (2000/01)

Max power demand in watts	Demand charge per month (NRs)
25	19
50	39
100	66
250	116
400	176

Source: Study for Promotion of Electricity distribution by Cooperatives, BPC, Nepal.

Table 5.6 Tariff rates for metered customers, (2000/01)

Max power demand in watts	Demand charge per month (NRs)
500	89
600	107
700	125
800	142
1000	178
1500	267
2000	356
2500	445
4000	712

Source: Study for Promotion of Electricity distribution by Cooperatives, BPC, Nepal.
Energy charge limited to demand = 1.75 NRs/kWh
Energy charge of over - demand = 5.20 NRs /kWh

Table 5.7 Industrial tariff

Demand (kVA)	Peak time tariff		Off Peak time tariff	
	Demand Charge (NRs/kVA/month)	Energy Charge (NRs/kWh)	Demand Charge (NRs/kVA/month)	Energy Charge (NRs/kWh)
0-5	135	1.75	75	1.70
6-15	135	1.75	90	1.70
Above 15	135	1.75	100	1.70

Source: Study for Promotion of Electricity distribution by Cooperatives, BPC, Nepal.

Distribution system includes 0.4 kV and 1kV distribution system. 1kV distribution system has been implemented in the remote areas. The advantage of 1 kV system is that it can be extended upto 5 km from distribution transformer as compared to 0.4 kV system, which can be extended only 1.5 km from the transformer.

Losses

The estimated technical loss in distribution system is only 6% and no loss by the pilferage is recorded where as, NEA system it is upto 8%. Reduction of pilferage loss is a big problem in NEA system, which is greatly reduced through the UOs [4].

Thus, privatisation of distribution system in rural electrification with participation of UO/communities, NGOs, village committees in reducing construction cost and assisting operation and maintenance costs, theft losses improving the end-uses of electricity has helped to reduce the electricity tariff. Which is found suitable and affordable to the people and can be adopted in other rural areas. This model of privatization in existing and new distribution system should be encouraged.

CRITICAL ANALYSIS OF COST OF HYDROPOWER DEVELOPMENT

6.1 GENERAL

Historically the hydropower development in Nepal is donor funded. Depending upon the funding agency, the fund is allocated to HMG N and then, with fund mix of 80:20 external and internal component used to finance the projects through NEA except for 100% grant projects. The detail of financing is given in the table 6.1.

Table 6.1 Financing of Hydro Projects

S. NO.	Name of Projects	Financing Agency	Financing Mode
1	Panauti	Government of USSR	100% Grant
2	Trishuli-Devighat	Government of India	100% Grant
3	Sun Koshi	Government of China	100% Grant
4	Gandak	Government of India	100% Grant
5	Kulekhani-I	Government of Japan + World Bank	Loan
6	Kulekhani-II	Government of Japan	Loan
7	Marsyangdi	Government of Germany + World Bank	Grant and Loan
8	Andhi Khola	United Mission to Nepal	Grant
9	Jhimruk	Government of Norway	Grant
10	Puwa Khola	HMGN + NEA	Self Financing
11	Modi Khola	HMGN + NEA + Government of South Korea	Self Financing +loan
12	Kali Gandaki "A"	ADB + JBIC	Loan

Source: Water Resource Strategy Formulation, Nepal.

Private developer (Butwal Power Company) through the grant assistance constructed two projects Andhi Khola and Jhimruk. From the second half of 1990s, the private sector entered the hydropower market. More than nine Power Purchase Agreements have been signed with private developer. In the beginning private power developers, came through

MOU route or from unsolicited bidding process, which lacked transparency and competitive bidding.

The technical design standards, norms for rate analysis and unit rates required for the design and construction of hydropower projects have not been prepared. Every developer followed their own rates and standards. In absence of standards it is difficult to evaluate cost of the project, even though project, planning site condition and other factors affect the project cost.

6.2 PROJECT COST

With the induction of private sector in power sector, the public utility is also oriented to commercial - organisation like private sector utilities. As the hydropower developers do not receive intangible benefits, so the hydropower projects are analysed for financial feasibility for public utility and private investment both. The main component of the project cost is the generation cost which influences the electricity cost. On the other hand the rate of depreciation, interest and inflation greatly effects the cost of project, which depends upon the capital invested and amount of loan. And due to administrative, legal, lack of competitive bedding and other debt and handling charges in foreign funded projects, cost of hydropower becomes quite expensive in Nepal.

The selection of discounting procedure affects the present value of the project adversely. If higher discount rate is considered, the benefit contribution at the later years of life of projects accounts negligibly. So discount rate and planning horizon are important parameters. The effect of these factors can be identified from the example given below.

Example:

For example two alternatives say project A of life 15 years first cost $ 200000 and annual O&M cost is $ 30000 having benefit $ 60000/year. Project B. has same cost and benefit of $ 54000/year and life 30 years. Project-A will have no benefit and costs after 15 years.

Taking MARR 8% and 30 years planning horizon is adopted:

Project-A, (B-C) (8%) = 60000 (P/A,8, 15) – 30000 (P/A,8,15) – 200000.

= $ 56785

Project-B (B-C) (8%) = 54000 (P/A, 8,30) – 30,000 (P/A, 8,30) – 200000

= $ 70187

Alternative Project B is better option.

Now, assuming MARR = 12%

Project A, (B-C)(12%) = 60,000 (P/A 12,15) – 30000 (P/A, 12, 15) – 200000

= $ 4327

Project B, (B-C) (12%) = 54000 (P/A 12,30) – 30,000 (P/A, 12, 30) – 200000

= -$ 6675

At the higher interest rate, Project-A is more favorable because of the increased emphasis on early year net benefit. That opposed to heavily discounted net benefits during later year of the planning horizon. High interest rate in open market, the adjustment of inflation, the net present benefit is even reduced. In the case of hydropower projects with longer project life, the effect of high initial cost, high interest and high inflation rate (in developing countries) in even severe. So to make the project financially feasible, the tariff rates are forced to rise with escalation also.

The cost of the project is also depends upon the site condition. Depending on site conditions, the attractive project would be a high head, sound geology, less variation of discharge, nearer to load centre and accessibility to the site. Run of river project would be more environment friendly than storage projects.

From planning and development consideration, engineering study of large number of projects of different sizes is helpful to identify the least cost development plan. The cost of the candidate projects is one of the important factors for a cost effective investment plan. The investment costs of the hydropower projects vary with the installed capacity of the projects. The analysis of the cost of number of planned projects excluding transmission; access roads and interest during cost are presented in the table 6.2.

Table 6.2 Average Specific Cost of Planned Projects

Installed capacity MW	Average specific energy cost (US cent/KWh)	Average specific project cost (US$/KW)
Small Hydropower projects* < 1 MW	19	3064
Medium projects** 1-10 MW	3.7	1661
Medium projects** 11-100 MW	4.3	1998
Medium projects** 101-200 MW	4.2	1992
Medium projects** 201-300 MW	2.9	1932

Source: Based on Small Hydropower Master Plan, Nepal*, NEA**

The table 6.2 shows that the cost of small hydropower projects (smaller than 1 MW) is highest of all sizes, which is due to remoteness of the site, higher cost of electromechanical equipment and transportation.

Projects of size 201 to 300 MW have the benefit of economy of scale and generate energy at relatively cheaper cost. Medium projects of installed capacity 1-10 MW are lowest

project cost due to simplicity in design, minimum environmental impacts, use of local technology and local fund. In the study of the project cost it is necessary to analyze the cost from different aspects. The cost structure, bedding, process, management cost, system losses and demand side management aspects need to be analysed carefully.

6.3 ANALYSIS OF COST STRUCTURE OF HYDROPOWER PROJECTS

To identify the areas where the costs of the project can be reduced by applying technical, administrative and legislative approaches requires in depth analysis. In analyzing the cost of hydropower can be split into civil, electromechanical, transmission and substation costs. Apart from these costs other costs are engineering, environmental mitigation and contingency costs. The cost structure of some proposed medium hydropower projects and micro hydro projects is presented in table 6.3 and 6.4.

Table 6.3 Cost Structure of Medium Scale Hydropower Project

S.N	Cost components	Kabeli-A 36 MW	Likhu-4 51 MW	Rahughat* 27 MW	Mewa 18 MW	Tamur 83 MW	Tamur Mewa 101 MW	Ave-rage
1.	Access road	5.6	16.2	7.6	-	4.4	3.7	5
2.	Environmental	2.0	1.7	1.5	-	2.3	1.9	2
3.	Civil works	49.2	43.4	44.8	56.6	41.0	43.7	45
4.	Electromechanical	29.5	29.7	34.1	35.8	28.4	29.7	30
5.	Transmission & substation	9.7	2.6	-	1.9	11.3	9.7	10
6.	Camp site facilities	8.0	6.3	12.0	5.7	12.5	11.3	8
7.	Subtotal base cost %	100	100	100	100	100	100	100
8.	Contingencies	11.1	9.1	11.1	11.4	10.9	10.9	10
9.	Engineering & Administration	7.9	7.7	7.9	8.4	7.8	7.8	8
10.	Preparatory cost	2.0	1.9	2.0	2.0	2.0	2	2
11.	Total cost	121.0	118.7	121.0	121.8	120.7	120.8	120

Source: Water Resource Strategy Nepal.

*** Cost of transmission lines not considered.**

Table 6.4 Cost Structure of Some Micro hydro projects

S.N.	Cost components	Barpak 200 KW	Purang 240 KW	Yangar 140 KW	Siklis	Morbang 150 KW	Average
1.	Mechanical	34.9	30.9	24.0	25.6	37.8	30.6
2.	Electrical	52.2	34.5	34.0	42.5	31.2	38.9
3.	Civil	6.2	16.8	7.4	24.1	21.4	15.2
4.	Transportation	5.7	16.6	29.1	6.3	6.3	12.8
5.	Preparatory	1.0	1.2	5.6	1.5	3.3.	2.5
6.	Total cost	100	100	100	100	100	100

Source: Water Resource Strategy Nepal.

The analysis shows that for medium hydropower project civil cost is the largest cost item with an average of 45% and in case of micro hydro it is only 15%. Similarly the electromechanical cost is around 30 on average and for micro it is upto 70%. Transmission and substation cost varies widely; on average cost is 10%. The campsite facility cost varies from 6 to 12% on average is 8%. The contingencies and engineering costs are 10% and 8% of the base cost of the project. Average cost for access road is 5%.

The transmission costs and access road costs depend on the nearness of the project site from the grid and road head respectively. Department of Road carries out the planning and construction of access road. The coordination in planning with Department of Road, access road cost can be reduced. From the tables 6.3 and 6.4 it is observed that the main objective lies on the reduction of cost of civil and electromechanical component.

Form the cost structure analysis, it is found that for the medium hydro projects, the cost of civil works and electromechanical works both bears considerable amount of total cost and in micro hydro projects electromechanical cost covers most of the project cost. Hence these cost areas are critical cost areas including other cost areas.

Most of HP projects have been built by bilateral and multilateral financing. Such funding comes with some conditions especially with respect to the bidding and necessity to employ foreign consultant. Usually bidding for civil and electromechanical works are either limited or tied. The compulsion to use expatriate consultant has hiked the project cost.

In view of the above facts, the cost reduction is possible, if appropriate policy and rules are formulated. The area and magnitude of the cost reduction could be [34, p 88]

i. In civil works and camp facilities, if Nepalese contractors allowed participating in Joint Venture or sub contractor a 5% and 3% cost reduction can be realized respectively.

ii. If international competitive bidding (ICB) is open for electromechanical works price reduction in total project cost would be in the vicinity of 10 %

iii. If Nepalese consultants are to participate in engineering a 4% cost reduction can be realized.

Thus total cost reduction upto 22% can be realized and the average specific project cost of medium HP projects reduces form US$ 2000/kw to US$ 1500/kw is comparable with India and other developing countries average cost US$ 1350 per kW.

In this regard, establishment of techno-economic clearance mechanism to check the soundness of project design, unit rates is realistic and construction schedule is realistic has become essential. Techno-economic standards can be useful tool for comparing and evaluating different hydropower projects

Standard Power Purchase Agreement should be developed to eliminate the need of protracted negotiation with developer. For smoothening the procedural works in EIA study, clear and transparent price fixing mechanism, risk sharing and resettlement works including the aspiration and support from general public is also important factor.

If the improvements in bidding process, loss reductions, transparencies and smooth procedural works are established, the project cost and electricity tariff can be reduced. The reduced energy tariff will result competitive industrial produce and other benefits lead to economic growth in macro and micro level. On the other hand, the profitability to the investor will be greatly reduced. As the private investors from the beginning of privatisation

are getting attractive benefits so, new private investment may not be attracted any more. Unless domestics expertise, domestics equity fund and technology are encouraged to attain expertise in hydropower as the Chinese experience.

6.4 SYSTEM LOSSES

The high system losses about 22% (technical 14% and pilferage 8%), if it is reduced, tariff can also be reduced or power saved as of added capacity. The effect of low load factor is also considerable in generation cost/kWh.

Losses in energy generation, transmission and distribution are of two types. There are technical and non-technical losses. Losses directly reduce the benefit of the project. Even the construction cost is least, if the losses are high; the benefit can not be maximized. Energy loss can be taken as reduced production. Or in other words reduction in loss is same as new power plant built. The energy loss reduction is related to technical efficiencies in the production and distribution system and in the management system. If losses can not be brought down, the tariff increases.

The technical loss can be reduced through rehabilitation and reinforcement of generation and distribution network, substation and metering system. The non-technical on the other hand should be tackled through, legislative provisions and social as well as administrative efforts.

The present electricity system loss is about 22% in Nepal power system. Its break down is given in the table 6.5.

Table: 6.5 System Losses in Nepal Power System (2001)

S.No.	Type of losses	Losses in %
1.	High voltage transmission	3.96
2.	Step down transformer	1.34
3.	Distribution transformer	2.74
4.	Distribution and service line	6.00
	Total technical losses	14.00
5.	Pilferage (Non-technical loss)	8.00
	Total system losses	22.00

Source: Water Resource Strategy, Nepal, 2000.

The system losses in private distribution system, distributed by AHREC and SCECO systems, the total technical losses are only 6% and 7% respectively and no pilferage loss has been observed.

Table: 6.6: System losses in private RE system

S. No.	Type of losses	Losses in %
1.	High voltage transmission	-
2.	Step down transformer	-
3.	Distribution transformer	
4.	Distribution and service line	
	Total technical losses	7
5.	Pilferage (Non-technical loss)	0
	Total system losses	7

Source: AHREC

In RE system, operated by private companies with local communities and user's organization, the pilferage loss has not been recorded. Thus AHREC's RE system is found to be suitable in Nepalese rural economic condition for reducing non-technical loss and O&M costs.

6.5 LOAD FACTOR

Load factor is the ratio of average load to the peak load. When the variation of peak demand and off peak demand is large , the load factor reduces. Actually the low load factors are mainly due to:

(i) Hydrological variation in the year, the plant can not run to its capacity.

(ii) Load variations, the demand reduces in off-peak hours.

(iii) Lack of industrial load, the domestic load peaks occur in the evening.

The efforts to increase the off peak demand by the development of industries and other commercial end-use are quite essential. In fact, supply of electricity only to an area is not sufficient to cause development but electricity is must for the development. And in the same time it should be cheapest also. For the overall development, the creation of appropriate conditions for successful electrification is an important factor so that the energy consumption can be raised. The creation of suitable condition is not only the function of developer but also it should be a coordinated approach of developer, government and social institutions.

To evaluate the effect of load factor in the generation cost / kWh of a sample project is calculated as:

Total investment Rs (assumed)	= 25000
Useful life of the project year	= 35
Interest rate per annum %	= 10
Load factor %	= 40
Annual O&M cost on investment at the rate of	= 2 %
Annual energy generated kWh	= 35000

(At 40% load factor)

Annual fixed cost

a) Debt service Rs. = 25000 x 0.1037

= 2593

b) Operation and maintenance cost Rs. = 500

Total annual fixed cost = 3093.

Cost of generation Rs/ kWh at 40% L.F = 3093/3500

= 0.88

For different load factor conditions, the generation cost per kWh is shown in the Table 6.7.

Table no. 6.7 Effect of load factor on generation cost

Load factor %	Generation cost Rs/kw	% decrease
20	1.77	-
30	1.18	33
40	0.88	25
50	0.71	19
60	0.59	17
70	0.5	15

From the table it is clear that the increase in load factor has reduced the generation cost. When the load factor is increased from 20% to 30% levels, that is increase in load factor by 10% has reduced the generation cost by 33% and as load factor increases from 40 to 50% reduction in generation cost is achieved by 19%.

The load factor in NEA distribution system is 50% that of India is 60%. Further increase in load factor to 60%, there is area to reduce the generation cost of hydro energy at the rate of 19% on existing rate. To increase the load factor, the approach should be both integrated and decentralized. Integrated approach should be considered at project design stage, and written in from the start so that they can be taken in to account in the estimate of demand and future projections. At Salleri Chialsa Hydro – Project, the potential end uses were investigated at the planning stage in the isolated generation and distribution system. It has load factor of 41%.

The decentralized approach, requires networking of many different organization involved in different field of research, credit, marketing and community development. So the electrification can be linked to the economic development.

6.6 COMPARISON OF TARIFF RATES

Nepal Electricity Authority's tariff rates for domestic consumers effective from July 2001 are given in table 6.8.

Table 6.8 NEA Tariff for Domestic Consumers

Demand Charge

Power demand	Minimum Monthly charge (NRs)	Exemption Unit
Upto 1000 watt	80.0	20
1000 to 3000 watt	299.0	50
3000 to 6000 watt	664.0	100

Energy charge:

Energy	Per unit charge (NRs)
Upto 20 unit	4.0
20 to 250 unit	7.30
Above 250 unit	9.90

Source: Electricity Tariff Fixation Commission, Nepal

The BPC Tariff rates for domestic consumer for 2000/01 are given in table 6.9 and 6.10.

Table 6.9 BPC Tariff for Domestic unmetered Consumers

Max. Power demand	Demand charge per month NRs
25 watt	19
50 watt	39
100 watt	66
250 watt	116
400 watt	176

Source: Butwal Power Company, Nepal

Table 6.10 BPC Tariff for domestic metered consumers

Power demand	Monthly charge (NRs/month)
500 watt	89.0
600 watt	107
700 watt	125
800 watt	142
1000 watt	178
1500 watt	267
2000 watt	356
2500 watt	445
4000 watt	712

Source: Butwal Power Company, Nepal

Energy charge limited to demand = NRs 1.75/kWh

Energy charge of over-demand = NRs 5.20/kWh

The monthly demand charges of private company are slightly above the public utility. But in case of energy charges of private company that are far less than the energy charges of public utility also the energy charge is fixed whatever the amount of energy consumed.

The tariff rates of electricity vary in wide range in the case of private company as flat tariff charges at very low level seems to be suitable for low load rural consumer. .

BPC's energy charges are fixed whatever the amount of energy consumed, in case of over-demand energy meter registers at the higher rate of NRs 5.20/kWh for the period of consumption. At present the tariff rates of BPC are cheaper than NEA tariff rates.

If 1000 watt consumer consumes 100 units of energy per month he/she will have to pay NRs [80+(100-20) x 7.3] = NRs 664 in case of public utility and NRs [178+100 x 1.75] = NRs 353 in case of private company.

Table 6.11. SCECO Tariff Structure for 2000-01

Max power demand kW	Fixed charge per month NRs/month	Exemption kWh	Price per NRs/kWh
0.1	110	-	-
0.5	290	-	-
1.0	350	70	5.0
2.0	460	70	5.0
4.0	670	75	5.0
8.0	1030	75	5.0

Salleri Chialsa Electricity Company, which is small hydro-projects operating in isolated grid in remote area. Its monthly demand for lighting loads upto 0.5 kW . which is unmetered is NRs 290. From energy use consideration is cheaper than NEA tariff. Other metered consumers having demand more than 0.5 KW pay slightly higher monthly demand charge than NEA rates but the energy charge at flat rate NRs 5.0/KWh which is much lesser than NEA energy charge of NRs 7.30/KWh for energy consumption of 21 to 250 units.

The tariff rates for public and private in case of industrial customer are given in the table 6.12 & 6.13.

Table 6.12 NEA Industrial Tariff since 2001

Voltage kV	Demand charge NRs/kVA/Month	Energy charge NRs/Unit	
		Peak time	Off peak
33 kV	190	6.55	4.0
11 kV	190	6.7	4.1

Source: Electricity Tariff Fixation Commission, Nepal

Table 6.13 BPC Industrial Tariff Since 2000-2001.

Demand kVA	Peak time tariff		Off peak time tariff	
	Demand NRs/kVA/mo.	Energy NRs/ kWh	Demand NRs/KVA/Mo.	Energy NRs / kWh
0-5	135	1.75	75	1.7
6-15	135	1.75	90	1.7
>16	135	1.75	100	1.7

Source: Butwal Power Company, Nepal

From the table 6.12 and 6.13, it is evident that the monthly demand charge and energy charge in peak and off peak hour for industrial customer in case of private distribution is far less than NEA's tariffed rates.

Thus from the above table, even in the case of micro hydro project for which the specific project cost are fairly high, but the energy tariffs are cheaper than grid connected NEA tariff.

From above comparison for different electricity tariff rates of public and private distribution in isolated and grids system, the tariff rates of private companies have been found cheaper.

CASE STUDY OF KHIMTI HYDROPOWER PROJECT IN NEPAL

7.1 INTRODUCTION

Butwal Power Company (BPC), a private company in hydropower sector, had implemented Tinau (1.0MW), Andhi Khola (5.1MW) and Jhimruk (12MW) hydropower projects including project design construction, operation and maintenance work. BPC is leading private company in the private sector with expertise and experience.

Nepal required meeting the power shortage had to build new project, which was beyond the economic capacity of NEA and HMGN both. At the same time concept of privatization of HP project was to start. HMGN requested BPC to undertake a medium sized project and BPC selected the 60MW Khimti Project (US $ 89 M) from the feasibility list of HP project prepared by NEA. BPC and Norwegian Agency for Development Co-operation (NORAD) agreed to prepare project report jointly to finance the project at bankable feasibility. The preparation of feasibility study report of the project was on the process.

To develop Khimti HEP on BOOT basis, Himal Power Limited (HPL) was formed in 1993, a joint venture company between foreign sponsors (Statkraft, ADB, Kvaerner) and BPC in Nepal with NORPOWER a Norwegian firm of Consulting Engineers. This project is the first project of this kind in the world when BOOT process was in formulation stage.

7.2 PROJECT AGREEMENT, POWER PURCHASE AGREEMENT AND PROJECT LICENSE

After the incorporation of HPL, the signing of the Project Agreement with HMGN and signing of the Power Purchase Agreement with NEA all of which were accomplished within the originally estimated time schedule between HMGN, the sponsors kept the banks informed of the developments in Nepal.

7.3 MULTILATERAL BANKS INTRODUCED

Loan application were made to both IFC and ADB and with the inclusion of ABB and KEN as sponsor Eksportfinans, the Norwegian Export Credit Agency, was also introduced. The foreign sponsors, primarily Statkraft SF, were responsible to raise the finance for the project and preferred to deal with lenders having previous experience of working in Nepal and thus initially contacted IFC and were later approached by ADB. These Banks responded positively and relatively quickly. Preliminary negotiation therefore, was started with them. The debt/equity ration in agreement with the lenders was stated as 70:30.

However, both appeared to be very enthusiastic to support Nepal and the Khimti I Hydropower Project. IFC stated that once their representative had visited the site to appraise the project then the internal procedure within the bank would be a matter of just a few months before first disbursement, on the other hand ADB stated that they had longer procedural requirements.

ADB arranged for a fact finding mission to visit Nepal, appraised the project, reviewed the project cost, revised it upwards from US$ 89 million to US$ 125 million and then talked to the Government at various levels. Soon after the completion of their fact finding Mission, they advised HPL a few conditions that would have to be satisfied in order to obtain the necessary approval for the financing of the project by the Bank.

7.4 PROJECT AGREEMENT AND THE POWER PURCHASE AGREEMENT

One of the problems that HPL faced, was the fact that none of the players on the scene had negotiated either of the two types of agreement before, so an international lawyer was introduced to the team, HPL allowed to use his eloquence to influence the negotiations. On reflection, both NEA and HMGN acted most professionally during these negotiations, obtaining some concessions from HPL not originally envisaged. An example for the same is that HPL takes the hydrological risk. However HPL believes that, due to the lack of previous experience, there are several aspects within the agreements that would be worded rather differently if both parties were in a position to start all over again.

7.5 LAND ACQUISITION

The detail feasibility study and financial closing are to take place in parallel in this project due to time constraints. So land required for the project have to be obtained as earlier as possible. Compared with other countries the land acquisition process in Nepal is relatively simple and in general can be executed relatively quickly, provided that it is possible to generate a good relationship with the local people. Himal Power limited only had to use the compulsory purchase procedure in a very few cases and all but one of these was because the owner was not traceable. The key here was the early involvement of the project with the local communities.

7.6 NEGOTIATION WITH LENDERS

How and where does one start the negotiation, with the Lenders or with HMGN and the Purchaser? HPL suffered from the fact that, dealing with each of lenders both separately and collectively. This was time consuming and extremely expensive especially the use of Lawyers, as the borrower has to bear the cost of the lawyers of both the sides. A lead Bank is

essential for the future. As the various terms and conditions emerged from the Multilateral Banks, HPL realized that the Project Cost that was used to calculate the tariff during the negotiations for the Power Purchase agreement was too low, and that for the project proceed a higher level of tariff was required. Initially the project cost including transmission was US$ 89M and with interest during construction was US$ 100M and energy cost USC 4 /KWh 1992 year [5].

7.7 REVISION OF THE ENERGY TARIFF, PROJECT AGREEMENT AND POWER PURCHASE AGREEMENT

After the induction of multilateral banks for funding the project, the cost of project increased due to lengthy and costly negotiations and various terms and condition. So revision of tariff, PPA and PA was realized.

This was tough phase for the Project and for the Himal Power Limited Nepal team in particular, as there were for a short period very strong differences between the Nepali Sponsors and those from Norway. The negotiations with HMGN ended in deadlock and Statkraft SF pulled their staff out of Nepal without notice.

For a while it appeared as if Khimti project could not be developed as far as the situation was concerned. Lastly ADB coordinated all the parties and called the parties together for discussions in Manila in June 1995. The result of these discussions was an agreed restructuring of the apportionment of some of the Project Costs. A reduction in the sponsor's return on capital invested, a reduction in the interest rate applied by ADB and a number of other items all adding up to a new tariff of USC 5.94 /KWh for base year 1995 with escalation of 2% per annum. Which was USC1.94 /KWh higher than previous tariff.

7.8 CONSTRUCTION PHASE

Construction was already under way and certain training of staff had been done in the months before the date of financial closing occurred.

On 10th July 1996 there was a Public Demonstration at the Head works site which stopped the work. HMGN had worked on the problem and was solved in time.

Interpretation of Custom and Duty to be charged for Import of equipment and materials for the Khimti I Hydropower Project caused difficulty, which was solved although took time. In general, the efforts were directed to solve problems. HMGN created a satisfactory environment for the investors.

One window policy is not functioning in proper way, DOED as one window has less power to encourage investors. Even the efforts of HMG/N to create a satisfactory environment for the smooth procedural work for private investors in Nepal were continuous.

7.9 CONCLUSION

Khimti HEP 60 MW was the first project developed by private company on BOOT basis, so due to lack of adequate rules regulations and experiences, government, IPPs and lenders faced difficulties in the smooth functioning of the related works.

One of the tragic things in this project was that bearing the cost of international lawyer in negotiations was extremely expensive and time consuming. Various terms and conditions from the multilateral banks which has hiked the project cost from US$ 89 M to US$ 125 M with tariff rise from USC 4.0/ kWh to USC 5.94 / kWh.

A large increase in the project costs were administrative and legal negotiation process and other terms and conditions. These costs were passed on consumers as high tariff

through utility. Hence, IPPs and Lenders could not satisfy public utility and public to such dealing.

It is now, wide spread consensus, that this type of lending or borrowing is profoundly unjust, that is dominated almost entirely by creditors. The transforming relation between rich creditors and poor debtors in the international financial system are not found fair.

CONCLUSION AND RECOMMENDATION

8.1 CONCLUSIONS

In the foregoing chapters, a study has been made for privatisation of hydropower projects in respects of the issues on which its sustainability depends. From the literature review, study of some critical issues in hydropower development, privatisation practices, critical analysis of cost related issues and case study the following conclusions are drawn.

- To overcome the continued load shedding in Nepal during first half of the 90s, it was of utmost importance to develop indigenous hydro energy by mobilizing any fund from government budget, NEA, domestic or foreign private capital.
- To attract private investors, appropriate legal and institutional framework was established. In the conducive financing environment with better incentives to the private developers, some private companies entered in the power market. The risks in financing hydropower projects due to technical uncertainties, environmental, payment, exchange political conditions and with conditionalities in bidding, resulted in high project cost and tariff rise.
- Anticipated high economic growth by supply of electrical energy to weak rural agro-based economy could not be achieved due to high electricity tariff. The possibility of power export to neighboring large power market was badly affected due to high-energy tariff, the main reason being commercial.

- From the analysis, it is found that there are possibilities of reducing costs by formulating appropriate policies in bidding procedures, and by maximum use of local resources. The involvement of co-operatives and communities by private companies in construction, operation and maintenance in rural electrification programs is found appropriate. Through which cost of distribution system, O&M cost have been reduced and the theft of electricity has been controlled effectively.
- The load factor greatly affects the cost of generation. Electricity end use, which affects the load factor, depends on the industrial base, agro-processing, and other economic development activities and tariff rates. Experience of Salleri Chiasla Electricity Company can be applied in other projects for investigation and integration of potential end uses to increase load factor.
- Form the comparative study of different issues in privatisation of hydropower projects, it is concluded as:

  (i) From, power market consideration, for domestic purpose, medium projects complementary with small projects are found to be appropriate. And for export purpose large, high head ROR hydropower project with foreign investment is found necessary.

  (ii) From analysis of cost structure, the projects of 1 to 10 MW capacity excluding access road and transmission line costs have cheapest specific cost and cheaper per unit energy cost as compared to small and large hydropower projects.

(iii) From the view point of financial consideration, the use of local expertise, domestic capital market and technology to develop medium size hydropower projects are found cheaper than foreign funded projects.

(iv) From tariff comparison tables the tariff rates of NEA for the domestic and industrial consumer are (NRs 4/kwh to NRs 9.9 kWh) which are much higher than private distributor BPC rates (NRs 1.75/kwh limited to demand and NRs 5.2/kwh of over demand). Even in the case of isolated micro hydropower project built in remote area, whose tariff rate is NRs 5.0 / kWh is also lesser than NEA tariff rate.

(v) Reduction of construction cost, non-technical losses and tariff in privately distributed RE project is found successful by involving UOs, communities etc.

In view of the above facts, privatisation of medium hydro project (1-10 MW) by domestic investors in generation and involvement of UOs in RE with integrated rural development approach is found to be most appropriate for hydropower development in developing economy like Nepal.

8.2 RECOMMENDATIONS

The main objective of any development is to uplift social and economic life of the people to the higher and comfortable level.

Water resources development has diversified role in every side of social and economic development of the country. The sustainability of hydropower can not be single purpose objective only. Energy has intrinsic role in each and every aspect of life. And also unless the electricity generated is not cheapest one, it can not play significant role in the economic development. At present, the energy price produced by foreign IPP are found

higher, which is sold to NEA. Again NEA tariff is fixed with the purpose to collect capital for future investment, which is not the fair practice of funding new projects.

Privatisation must start from the existing base including whatever mistakes have been made in the past. To attain sustainability, the privatisation of medium hydropower project by involving domestic investors should be encouraged. So that the technical expertise and skill required for larger projects can be developed within the countries which will place an important role in case of export oriented larger projects taken in association with foreign developers in the years to come. Which would ultimately inhance the participation of local developer leading to self-sufficiency and strong technological base. And in this way, the present void will disappear gradually. Further this would add to the asset of the country.

Hence, for successful privatization of HP projects, some recommendation suggested for the future are:

(a) Establish - Techno-Economic Review Committee

Techno-economic review committee consisting of experts, professionals to check the soundness of project design, rationality of unit rates, construction schedule, on professional ethics and practices which ensures standardization and transparency.

(b) Ensure Competition, Transparency and Accountability

The life of privatization lies on competition. The competition in privatization should have strong under current to destroy monopoly to reach least cost generation and distribution with high efficiency. This is ensured by transparency in decision making process making accountability through: laws and enforcing in to the practice:

i. Right to Information Act

ii. Anti- Corruption Act

iii. Scrutinizing the Charges, issues raised by projected affected families, societies, local bodies, environmental groups, independent exports, media reports etc.

iv. Assets of political members and bureaucrats making open.

(c) Peoples Participation

People participation in project planning and in sharing of costs and benefits, impacts and opportunities to the public in advance can significantly increases the benefits and cooperation in impact mitigation process. Provided that environment impact mitigation, resettlement and developments are the responsibility of the government and the developer, and guarantee of meeting the committed mitigation measures in every stage of planning development and operation.

(d) Implement Integrated Energy Development Planning

Integrated energy planning increase the load factor due to increased efficiency for same type and effectiveness of different alternative sources through optimum mix provided for productive needs of the area.

The intensive development planning is suitable for developing countries. Intensive way of development is mainly based on mobilization proper use of national scientists, specialists and natural resources with minimum foreign support.

Integration of integrated energy planning with intensive development planning is essential for rapid growth of economy to reach sustainability at the local level and to the national level. So that citizen can expect that the development be in right way that tomorrow will better than today and each can feel richer and happier socially.

(e) Project Implementation

Project implementation should be directed to self sufficiency and to export purpose through:

(i) Develop small and medium projects which are accessible, run off river, to meet domestic demand through mobilizing domestic resources to achieve expertise in small and medium hydro.

(ii) On the base of domestic skill of medium hydro projects and with foreign joint venture, develop medium / major hydro projects for domestic and export purpose.

(iii) At the third stage, develop medium and large reservoir projects with matured and wise manner so that the nation can receive maximum benefit.

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