



Nepal Electricity Authority

FY 1998/99

A YEAR IN REVIEW



Bhadra 2056 (August 1999)
Durbar Marg, Kathmandu

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Cover Photo : Construction of dam at Kaligandaki 'A' HEP

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COMPLIMENTARY COPY

MESSAGE

From The Chairman



It gives me great pleasure to address this message through this year's issue of *NEA: A Year in Review*. I am happy to deliver this message in the capacity of the Chairman of the Government's largest undertaking and the country's largest corporate body. I am equally proud to be at the helm of this organisation in a period of history when the ruling party has won back the trust of the people with a sweeping mandate. I am also aware that I need to steer Nepal Electricity Authority (NEA) through contemporary times when the people are increasingly critical of what is delivered to them and assure that they receive what is rightfully entitled to them.

I believe that the power sector holds the key for balanced development of our economy. Electricity is power in a form that is now required in all avenues of modern life and indispensable to industries and services which form the backbone of our economy. The Government has maintained a policy that hydropower should form the resource from which we must generate our electricity. This follows from the simple reason that hydropower apart from being an economical form of power, is also environmental friendly and plentiful in our country. In fact, it is available immense quantities that far exceed our domestic consumption and we must seek buyers in neighbouring countries so we may benefit from a resource which nature has endowed us with.

The challenge ahead lies in dealing with prospects that involve not only with our nation but with the demands of the most populated regions of the world. It is evident that NEA, with its vast multi-disciplinary staff numbers, can play a major part here. I believe their participation in nation-building extends, not only in the daily operations of NEA, but also in applying their expertise to bring about the breakthrough in electricity production that is attractive and saleable in the regional

marketplace. I am tossing these thoughts into NEA's court because I fully realise that this is where the meaningful expertise exists but is sometimes shadowed by indifference.

My appeal transcends the narrow barriers of rigid bureaucracy. My appeal transcends political boundaries and extends to the needs of the human race and the aspirations of the generations to come. These are not far-fetched dreams that I refer to. We can achieve these dreams with a little effort, a little innovation and perhaps a little sacrifice.

In the domestic scene we must have dreams for NEA which are spontaneous to the needs of the nation and transparent in transaction. From these, we must form attitudes that guide us in undertaking projects and plans which aid the modest consumer in the hills and plains to undertake his simple chores for livelihood. It is only when this simple Nepali consumer signals his appreciation of NEA's services that we can breathe in satisfaction that services rendered are responsive to the nation.

I wish that this simple thinking composes the mindset of all at NEA. There is little more that I need to inculcate. We are continually faced with arguments centred on enormous figures of project cost and the machinations afoot to steer these to the benefit of those that hold the investment strings. Although, we cannot evade such debates, what I wish is that in the clamor, none in NEA lose his sense of fundamentals that underlie the essential scope of his profession.

I wish to thank all in NEA for their co-operation during the year that has past and anticipate to obtain continued co-operation in the years that lie ahead of us.

Govinda Raj Joshi

(Govinda Raj Joshi)

Minister for Water Resources and
Chairman, Nepal Electricity Authority

BOARD OF DIRECTORS



Chairman
Mr. Govinda R. Joshi
Minister for Water Resources



Mr. R.B. Bhattarai
Secretary
Ministry of Finance



Mr. B. N. Sapkota
Secretary
Ministry of Water Resources



Dr. B. G. Vaidya



Mr. B.K. Sharma
Deputy Governor
Nepal Rastra Bank



Mr. P. P. Dahal



Mr. P. K. Shrestha
President
FNCCI

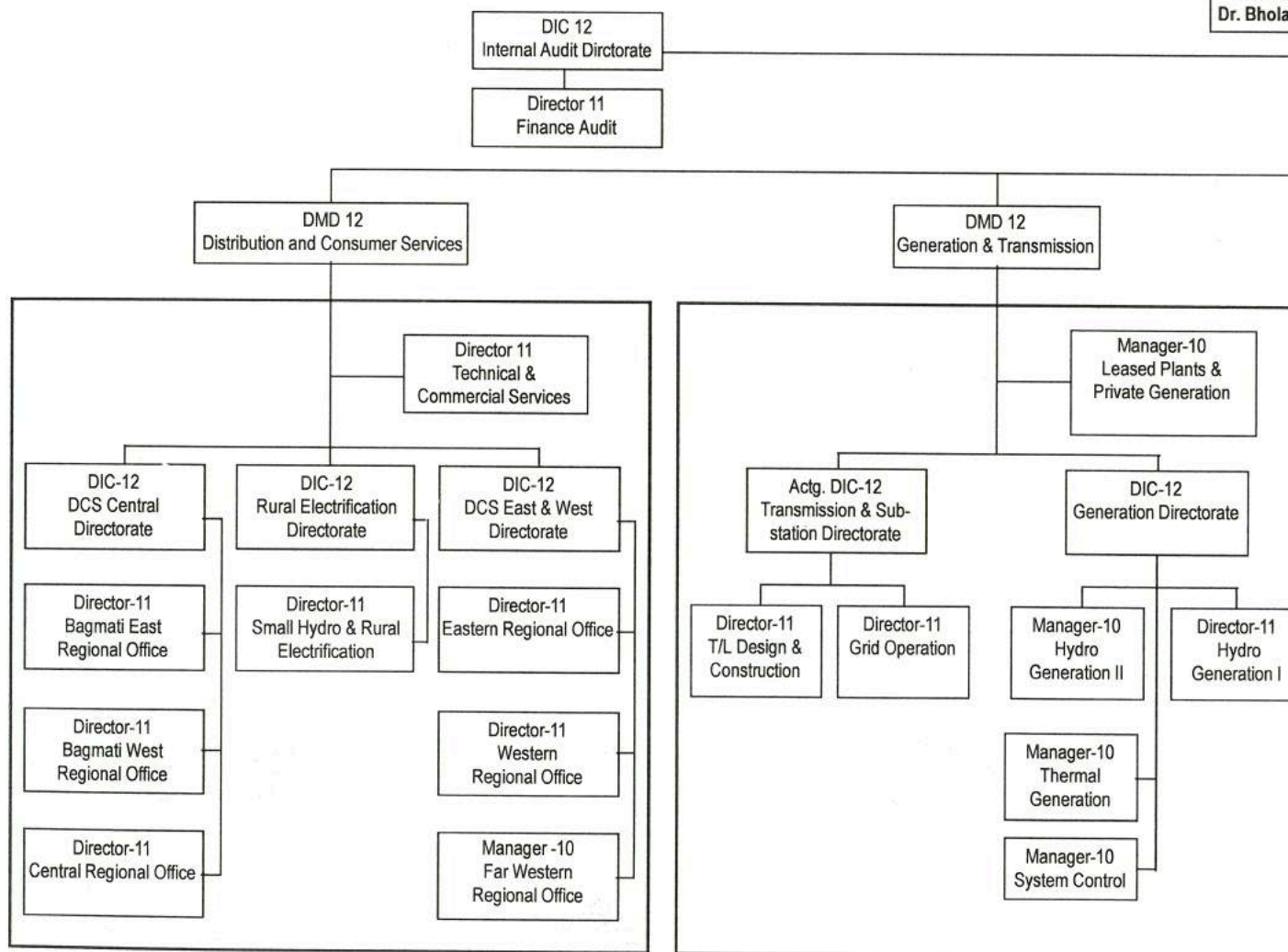


Member Secretary
Dr. Bholanath Chalise
Managing Director, NEA

NEPAL ELECT

BOARD

MANAG
Dr. Bholai



DISTRIBUTION & CONSUMER SERVICE

Responsible for design and construction of distribution system, distribution of electricity and consumer services.

GENERATION & TRANSMISSION

Responsible for design and construction of transmission line and sub-station, operation and maintenance of thermal plants and operation & maintenance of power stations and transmission systems. Implementation of power purchase and leasing activities.

Projects : Depending upon the nature and magnitude, projects will be implemented by the Project Managers reporting to appropriate levels as MD, DMD, DIC, Director, etc.

Note :

DMD = Deputy Managing Director
DIC = Director-in-Chief
DIR = Director

CITY AUTHORITY

DIRECTORS

DIRECTOR,
Chalise

DIC 12
Information Technology Directorate

Director 11
Management Information System

DMD 12
Development

DMD 12
Planning & General Management

DIC-12
Project Preparation &
Studies Directorate

DIC 12
Project Implementation
Directorate

Manager-10
Non Utility
Projects

Manager 10
Environmental
Studies

Director-11
Investigation &
Studies

Director-11
Project
Preparation

Director-11
Construction

Director-11
Design/Civil

Manager 10
Design/Electromechanical

DIC-12
Planning
Directorate

DIC-12
Assets & Material
Management
Directorate

DIC-12
Human
Resources &
Administration
Directorate

DIC-12
Finance &
Accounts
Directorate

Director-11
Monitoring &
Evaluation

Director-11
Procurement

Director-11
Human Resources

Director-11
Financial
Management

Manager 10
Assets
Management

Director
Corporate
Planning

Manager -10
Norms and
Specification

Director-11
Training Centre

Director-11
Accounts

Director
System
Planning

Manager -10
Inventory
Management

Director-11
General Services

Manager -10
Revenue

POWER DEVELOPMENT

Responsible for investigation, feasibility study, design and construction of Power Projects and environmental impact assessment of different projects.

The Project Implementation Directorate will be responsible for design and construction of all projects funded through NEA or foreign financiers.

Project Preparation and Studies Directorate will be responsible for approving design, cost estimate and construction schedule of Non Utility projects as well as assisting in PPAs with private investors.

PLANNING & GENERAL MANAGEMENT

Responsible for Planning, Assets & Material Management, Human Resources & Administration, Finance & Accounts and General Management.

CHIEF EXECUTIVES



Mr. R.S. Pandey
Deputy Managing Director
Development



Mr. R.B. Shrestha
Deputy Managing Director
Generation and Transmission



Dr. J. L. Karmacharya
Deputy Managing Director
Planning & General
Management



Mr. B.B. Dhungana
Deputy Managing Director
Distribution & Consumer
Services



Mr. K.B. Chand
Project Manager
Kaligandaki 'A' HEP



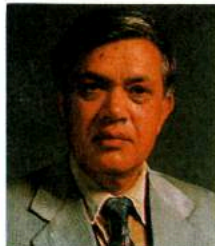
Mr. B.B. Malla
Director-in-Chief
Information Technology
Directorate



Mr. N.T. Bhutia
Director-in-Chief
Generation Directorate



Dr. M. R. Tuladhar
Director-in-Chief
Transmission & Substation
Directorate



Mr. G.M. Kadariya
Director-in-Chief
Distribution & Consumer
Services Central Directorate



Mr. Govinda K.C.
Director-in-Chief
Project Implementation
Directorate



Mr. D. B. Thapa
Director-in-chief
Project Preparation & Studies
Directorate



Mr. P.M.S. Pradhan
Director-in-Chief
Planning Directorate



Mr. M. R. Upadhyay
Director-in-Chief
Human Resources &
Administration Directorate



Mr. M. P. Pyakurel
Director-in-Chief
Assets & Material Management
Directorate



Mr. B. C. Thakuri
Director-in-Chief
Rural Electrification
Directorate



Mr. D. R. Bhattarai
Director-in-Chief
Middle Marsyangdi
HEP

DIRECTORS & DEPARTMENT CHIEFS



Dr. N. Kapali



Mr G. B. Shrestha



Mr O. M. S. Swar



Mr J. N. Nayak



Mr B. R. Shrestha



Mr J. K. Pradhan



Mr A. P. Rijal



Mr S. P. Upadhyay



Mr M. P. Upadhyay



Mr R. P. Shah



Mr S. B. Shrestha



Mr R. K. Bajracharya



Mr U. K. Shrestha



Mr A. B. Chhetri



Mr B. R. Regmi



Mr K.B. Shrestha



Mr J.R. Shrestha



Mr M. B. Kayastha



Mr S.P. Rana



Mr K. P. Upadhyay



Mr K.P. Koirala



Mr D.P. Bhattarai



Mr C.S. Jha



Mr L.M. Maskey



Dr. J. Jha



Mr D. P. Upadhyay



Mr G. P. Pokharel



Mr T. R. Pandey



Mr D. N. Singh

MANAGING DIRECTOR'S REPORT



I am very glad to be reporting the progress of Nepal Electricity Authority (NEA) over its fourteenth year of business operations. Though not a very long period of time for a public utility, the formative years behind NEA's history have culminated into an apex year for opinions and deliberations from all learned quarters on NEA's performance and its future.

Our efforts during the past year were generally aimed to establish NEA on to a firm platform capable of undertaking the challenges of development, and to provide to our customers electrical supply of adequate quality affordable to the average consumer. Though an immense amount of research and analysis has been devoted to predict what is best, I believe the best way for us to predict the future is to create it. It will take vision, commitment and performance to achieve NEA's mission for the future. Identifying and leveraging sustainable competitive advantage. Delivering results. Staying ahead of competition. Keeping focused. Being proactive. Anticipating, meeting and exceeding the expectations of our customers. These could aptly be our resolutions for the new millennium.

The Power Scenario

In the global scenario, we are told that concepts of competition and choice in the electricity business has evolved and consolidated in many industrialised nations. Entry of the generation technology affordable to the private sector seems to have been the key issue that has

made this transition possible and it is assuring to hear that tariff levels in some countries are, in effect, showing a downward trend. Concepts built on the recognition of the electrical system as the carrier, and electricity as the commodity to be traded, have revolutionised the electricity business and has made it possible for the consumer to choose between retailers and generators of electricity.

However, circumstances are not the same for least developed countries like ours where mobilisation of resources to undertake even the most modest development poses a formidable challenge. Here, in the face of predicted dwindling public finances, the private sector participation is more a means to bring in scarce resource to meet demand.

As a national utility with strong social obligations, NEA is dedicated to making electricity available to all at a price affordable to the average consumer in Nepal. In fact, faced with the challenges of managing a burgeoning organisation, NEA is introducing management techniques to streamline itself. Ideas such as internal privatisation and the *profit centre* could offer answers to NEA's pursuit towards accountability and self-sustenance. However, the long-term external vision for the power sector still continues in the shape of an *unbundled* hybrid institution with the incorporation of Independent Power Producers (IPP) to be sustainable in a situation of resource limitation and introduction of leasing to *get things done by others what is best done by them*.

To meet the demand that has been projected for the future, one major exercise a commercial organisation ought to undertake is to formulate the investment pattern in its development. Over the year, we spent considerable time and effort identifying the appropriate areas of investment that would provide financial returns for our own sustenance and to contribute to the national exchequer. In accordance to such plans, we then decided on a number of projects to add generation and transmission capacity, improve and extend distribution and consumer services and enhance management processes — projects that we must complete within stipulated time periods to recover optimum returns.

The Year's Major Events

Recapitulating the major events of the past year, of foremost importance to the nation was the overwhelming mandate given to the ruling Nepali Congress party by the country's third general elections. The political change in leadership in the country followed with the assumption of the position of Chairman, Nepal Electricity Authority, by the Minister of Water Resources, Mr. Govinda Raj Joshi. Subsequently, there were four new Members inducted into the eight-member NEA Board, namely, the new appointed Secretary of the Ministry of Water Resources, Mr. B.N. Sapkota, Chairman of the Federation of the Nepal Chamber of Commerce and Industry (FNCCI), Mr. Pradeep Kumar Shrestha, Dr. B. G. Vaidya, and Mr. P.P. Dahal.

One of the first activities conducted by the new management was the organisation of a public interaction program to discuss *NEA : Its Activities and Present Situation* on June 25, 1999. Chaired by the Minister for Water Resources, Mr. Govind Raj Joshi, the interaction program was attended by a large section of the power sector intelligentsia, including a number of Members of Parliament. The intentions of the interaction program were well taken by the media and the participants.

Opinions and viewpoints expressed by the participants were candid and transparent and provided valuable information for formulation of future strategic planning in NEA.

Meanwhile, NEA fared well financially despite the fact that it had not been allocated a tariff increase for the past three years. As the picture of NEA's investment in the total power sector development gained clarity, it became clear that corrective measures were inevitable for NEA to be capable to undertake the massive scale of investment. Even after diverting the development of several hydropower projects to the private sector, predicted financial indicators such as the rates of return and the capability to self-finance some portion of its investment indicated that NEA would be required to explore the possibilities of joint venture undertakings with private sector Promoters. NEA will also need to be more judicious in the choosing the source of loans and seriously consider the option of maximising loans from the domestic capital market.

Another important event that continued over the year was the formation of a high level Electricity Master Plan Review Committee co-ordinated by Dr. Rameshananda Vaidya, Member, National Planning Commission, and representatives from the Ministry of Water Resources (MOWR), Water and Energy Commission Secretariat (WECS), Electricity Development Centre (EDC) and NEA. The aim of the committee was to review, at the highest governmental level, the studies made by NEA on the subjects of load forecast, least cost generation planning, transmission line planning and long range marginal costs. The recommendations of the Committee were intended to provide a blend of national and utility level approaches to the important aspects of the nation's power system and introduce desirable flexibility in such inter-sectoral planning.

We made every effort to bring about improvement in NEA consumer services

by minimising *load shedding* as the last contingent measure. But faced with generation shortages, we were obliged to continue the unpopular step for another year. Apart from shortage of energy in the system during the severe dry season, we also faced capacity shortages necessitating short periods of *load shedding* during the evening peak hours even during the monsoon season when the reservoir level in Kulekhani indicated that energy in store was not the point of contention. With the anticipated coming on-line of some hydropower projects such as the Puwa, Modi and Khimti I and completion of the Lalpur-Gaddachowki connection to the Tanakpur power house in India, we hope to eliminate the recourse to *load shedding* from June 2000.

An important event to strengthen the aims of the India-Nepal Power Exchange Committee was the June 1998 meeting in Kathmandu of the sub-committee formed to study the prospects of power exchange enhancement to 150MW and the possibility of purchase of surplus power by India. Considerable seasonal generation surplus has been predicted in the NEA system once significant run-of-river (ROR) plants are added to the system in the near future. Contribution from the sale of such surplus to NEA's financial stability could be considerable. Such prospects make the upcoming talks with the Indian counterparts in the India-Nepal Power Exchange Committee important indeed.

On the subject of ROR deficiencies, we stressed the fact that introduction of private investment in hydro-generation inevitably lead to such plant design without any form of daily storage. This was a natural choice for low-cost design for a commercially motivated Promoter and will aggravate the skewed nature of energy availability in the system - energy spilled during the wet summer months when the demand is minimal and energy shortage during dry winter months when the demand is at the peak. The anomaly that such plants could bring to the NEA system reinforced the need to study storage plants

for incorporation in the NEA system. The divergent state of affairs will also demand that we adopt a tariff structure to account for the seasonal variation in energy demand and availability.

The principles of commercialisation state that we must build on our strengths. In application, we must nurture the engineering talent that lies latent in our human resources — the strength of NEA. However, the concentration of a large percent of this talent is skewed to areas requiring relatively low engineering capability. This seems paradoxical and distressing because I believe the appropriation of such expertise needs to be diverted to more challenging areas so that the expertise may be readily identified from outside and utilised to generate innovations in NEA's system and improve its overall performance. The *unbundling* of NEA's Distribution and Consumer Service functions could be viewed along this perspective.

In order to expose our senior staff to world trends and innovations, we arranged for the participation of our staff in events of international significance including the World Energy Conference, in Houston, Texas, and the World Power Conference in New York City. Our staff members also participated in a number of acclaimed training courses on environment and hydropower management in the International Centre for Hydropower in Trondheim, Norway.

Operational Performance

There were no new generation additions last year and we operated with a total installed capacity 301.074 MW of which approximately 81 percent was hydro-based and essentially of the run-of-river configuration. In terms of energy, hydropower projects within Nepal provided 70.95 percent, thermal projects, 8.05 percent, purchase from domestic private power companies, 5.24 percent, and imports from India, 15.76 percent of the total availability.

Over the financial year, the system peak of the interconnected system was recorded on January 12, 1999 at the level of 326.40 MW indicating a 3 percent increase over the last winter's figure.

During the past financial year, the electrical energy available for use within the NEA system totalled 1,475.00 GWh which was an increase of 101.83 GWh (7.42 percent) over the previous year's figure of 1,373.17 GWh. This comprised of 1,046.51 GWh obtained from NEA's hydro generation and 118.82 GWh from NEA's thermal generation. A total of 309.67 GWh was purchased from other utilities; comprising of 232.39 GWh imported from India through Power Exchange agreements and 77.28 GWh purchased from Butwal Power Co., the Nepalese private generator. This year again the energy availability was marginal and required careful planning in our Load Despatch Centre (LDC). In a period of generation deficiency, our generation plants performed well, and aided by efforts from grid maintenance, we managed to pull off with a fair degree of availability.

Electricity sales totalled 1112.886 GWh - an increase of about 61.457 GWh (5.80 percent) over last year's sales figure. Internal sales within Nepal increased to 1052.886 GWh and accounted for 94.61 percent of the total sales and registered an increase of 68.867 GWh (7.0 percent) over the last year's figures. Exports to India decreased slightly to 60 GWh largely because of energy constrained conditions in Nepal.

Over the past financial year, the number of consumers grew by an estimated 45,151 (or 7.85 percent) over the previous year's figure to reach a total of 620,000. The domestic category accounted for 95.31 percent of the total consumer numbers, 37.31 percent of the sales and contributed to 37.71 percent of the revenue. The industrial category formed only 2.45 percent of the total consumers, but accounted for 39.28 percent of sales and contributed to 37.80 percent of the revenue. Non-commercial

category constituted 1.24 percent of the consumers, accounted for 5.80 percent of the sales and 7.87 percent of the revenue. Likewise, the commercial category constituted 0.48 percent of the total consumers, accounted for 6.99 percent of the sales and provided 9.41 percent of the revenue.

Almost 85 percent of the country's populace still remains without an electrical supply essentially in the rural areas. The difficult terrain, inaccessibility and the scattered nature of settlements makes distribution expansion in rural areas a difficult and expensive proposition. The task of providing electricity to those still without electricity is thus an immense task ahead of NEA and calls for massive investment in terms of distribution extensions as well as generation and transmission additions. This, in turn, accounts for the tariff increases which NEA must apply for to make it possible for NEA to make such investments.

The financial picture remained encouraging for another year. NEA's total revenue net totalled NRs. 5,770.00 million, an increase of 6.21 percent over the figure for the previous year. NEA's net fixed assets increased to reach an estimated NRs. 30.988 Billion. With tariff increases deferred for the past three years, financial performance indicators were somewhat bleak. To improve our financial position, we made concerted efforts to improve receivables and even resorted to the unpopular extreme of terminating supply connections to government and semi-government consumers and taking stern action against those charged on cases of theft and misuse of our supplies. To keep expenditures down, we limited our costs in salaries and operation and maintenance. Such efforts on financial control will continue into the coming year.

Development Efforts

In a period when generation capacity has been our major system constraint, the 144 MW Kali Gandaki-A hydropower project remained the development venture

much-awaited to come on-line. But unpredictable geology, leading to tunnelling problems, has shifted the project delivery date to mid-2001. The progress of other hydropower projects which NEA steered along fast-track lines was encouraging. Puwa Khola (6.2MW) and Modi Khola (14 MW) are both in the final stages of construction and should commence generation within 1999. These projects, and a chain of projects undertaken by NEA and the private sector coming on subsequently, will virtually double NEA's generation capacity and eliminate the necessity for *load shedding* in the NEA system, which I had earlier alluded to.

An event of commercial calamity in NEA's own subsidiary, the Chilime Hydropower Co., was the consequential delay in Chilime hydropower project completion following from the termination of contract for civil works. The concept of undertaking the very attractive Chilime project entirely with indigenous resources (loans from the Sanchaya Kosh and even shares allocated to NEA staff) had set a very optimistic tone. Besides the contractual complexities, I believe a rational management of conflicting interests in the project could prevent such defaults in the future. We hope to remedy the damages and bring the project on-line in the year 2001.

A more optimistic note that for our generation planning was heading on schedule came with the signing of the grant assistance for the Middle Marsyangdi (61MW) hydropower project. Identified as the major medium hydropower project after Kali Gandaki A, the target for the project completion is the year, 2003/4. Earlier in the year, after a very keen process of selection, Consultants were selected for the detailed design of the Project.

In addition to these medium hydropower projects, which will integrate into the national grid, we have kept in mind our social obligations to provide relief to the hardship of life in the difficult, remote mountains of Nepal by

constructing small hydropower projects at Dolpa, Kalikot, Humla and Mugu. The first two of the projects ought to commence generation next year.

In the area of private generation, we signed the fifth Power Purchase Agreement (PPA) with the Chinese promoter registered in Nepal as GITEC (Nepal) Pvt. Ltd., for the development of the 14 MW Upper Modi Project. Other private sector projects now in the phase of implementation, but faltering in their completion dates, include the 60 MW Khimti I promoted by Himal Power Ltd. and the 36 MW Upper Bhote Koshi promoted by Bhote Koshi Power Co. Such delays in receiving the relatively expensive IPP power will greatly detract from their value to the NEA system.

To deliver and effectively use the additional generation from the projects now approaching completion, we continued to strengthen our transmission network by enhancing the capacity of existing circuits and sub-stations and planning higher voltages to meet future integrated demands. The *hot stringing* of the second circuit of the Kusaha-Dhalkebar 132 kV transmission line was a project which we completed. We also commenced discussion with authorities in India to construct three more exchange links so that the quantum of exchange could be enhanced to 150 MW. The Lalpur-Gaddachowki transmission line showed good progress and, by the end of 1999, should be ready to take in the *free power* of 70 M units per annum from the Tanakpur powerhouse in India as provided by the Tanakpur Treaty. We also undertook the construction of transmission lines to receive power expected from a number of IPP generation projects. The Khimti-Bhaktapur-Balaju transmission line project needs to be credited for duly adhering to its construction schedule in contrast to the IPP generation projects which remained stalled and unable to deliver as committed in the power purchase agreements (PPA). A project to provide state-of-art facilities to the Load Despatch Centre (LDC) to better manage

and control components in the NEA power systems was also on the anvil.

In the areas of distribution and rural electrification, the Seventh Power Project won a letter of Appreciation from the Asian Development Bank and is now set to complete the remaining portion of its works in 25 districts. Several sub-transmission line projects were continued to extend 33 kV lines from the 132 kV backbone to important economic centres in the mountain areas to the north such as Dhading, Khandbari, Ramechhap and Diktel and adjoining VDCs. The need for rapid extension of distribution schemes is essential to consume the energy that will be available after the coming on-line of approximately 300 MW of new generation within two years.

To enhance in-house management and control, we continued to push on with loss reduction activities. We also commenced work on application of GIS in consumer services and we hope to improvise on the adaptation of this methodology for loss reduction applications. Realising the gravity of the matter, the Y2K alarm was also researched by our IT Directorate.

Acknowledgements

In conclusion, although my affiliation with NEA is of a short duration, I cannot restrain from expressing my gratitude for the continued support I have received from all levels of staff here. I know of staff

members in NEA staff who have responded to the call of duty even in challenging times. My deep sense of respect for such sincere souls. I believe NEA has the latent talent, the energy and the devotion to move on but it is only the motivation and identification that may be lacking.

I also wish to thank His Majesty's Government for their co-operation in our activities and for their continued interest and investment in our enterprise. I also wish to express my sincerest thanks to the Chairman and Members of the NEA Board of Directors for steering NEA towards accountability and self-sustenance. To achieve such targets, I must thank the Donors and Lenders who have provided us the finances, assistance and advice in our development works and institutional strengthening.

Most importantly, I wish to thank our Customers for their proactive interest in NEA's activities and also for bearing with us during periods of difficulty. Their restraint will inspire us to work towards the day when we will be able to bring to all our customers an electrical supply that is reliable and adequate for their needs.



(Dr. Bholanath Chalise)

Managing Director
Nepal Electricity Authority

INTRODUCTION

This August (Bhadra 1, 2056) Nepal Electricity Authority (NEA) completes its 14th year as an utility responsible for Planning, Construction, Operation & Maintenance of Generation, Transmission and Distribution facilities throughout the Kingdom of Nepal.

Over these years, the objectives of NEA have remained consistent as an institution striving to be efficient, autonomous, accountable and capable of delivering its services to its customers at reasonable cost, while trying to satisfy the stringent conditions of donors and financing agencies. NEA maintains its status as the largest government undertaking in terms of human resources, capital investment and assets.

NEA has also seen substantial transformation from the time of its inception. Starting off as an oversized conglomeration of loosely tied entities, the initial years were spent in search of an unified identity. Then followed years dedicated to clinical analysis of its aims and strategy to improve its efficiency and productivity required to attain the capability of undertaking its investment that the growing demand for electricity calls for. Corporate strategy, manpower rationalization, human resource development, financial efficiency became pillars of policies and guide words for intense soul-searching, deliberations and assessments. Steadily from years in the red, NEA emerged as a consolidated, profit making institution with aims to diversify into a more extensive commercialized mode of operation in the future. Towards this goal NEA has recently set up fifteen of its consumer service divisions as "Profit Centers" with a view for improving its efficiency.

Due to global economic liberalization policy, competitive pressure from private sector and pressure from ever increasing domestic demand for electricity, NEA is looking ahead to meet the challenges by carefully planning its future activities in terms of commercialization, better management, information technology,

corporate planning and Power System Master Plan and investment planning. In this regard The Power System Master Plan was completed under the grant assistance from the Asian Development Bank. This Master Plan was under intense scrutiny from a high level committee under the leadership of the National Planning Commission. The committee has submitted its findings and recommendations. Also, with a view for disseminating information on its activities, NEA held a public interaction program which was well attended by distinguished people from all walks of life. The interaction program highlighted NEA's present situation and the challenges that it faces, useful suggestions were received from the guests.

The unprecedented long spell of seven months of no rainfall resulted in low generation capacities in hydropower plants and despite NEA's efforts to meet the demand by resorting to lots of import from India and pressing all its thermal plants into service as much as possible, it had to reluctantly carry out load shedding as the system capacity and energy were not sufficient. Strict measures are being adopted to keep the load shedding to a minimum, this situation is expected to improve with the commissioning of the under construction projects within an year.

In the following pages of this Annual Review, an attempt has been made to prepare an easily comprehensible overview of significant events and developments that have patterned the past fiscal year and how these events fit into NEA's overall strategy. It brings forth a birds eye view of major activities carried out by NEA and various operational data related to demand growth, generation, sales of electrical energy and financial performance. Also included are brief descriptions of projects and studies NEA has taken on and the outputs that they will have in NEA's operations. Schematics and graphical presentations have been included to give visual display of the year's achievements.

SECTORAL REVIEW

NEA BOARD AND MANAGEMENT MATTERS

After the general elections, following the formation of a majority government by the Nepali Congress, Minister of Water Resources Mr. Govinda Raj Joshi assumed the position of the Chairman of Board of Directors of Nepal Electricity Authority. On June 16, 1999 he presided over, for the first time, the 298th meeting of the Board of Directors. On June 11, 1999, Dr. Bholanath Chalise was appointed as the Managing Director of NEA for a period of two years.

Subsequently, there was a change in the members of the Board of Directors with four members, namely, B.R. Regmi, Mr. Himalaya S.J.B. Rana, Mr. Gauri N. Sharma, and Mr. Ananda R. Mulmi being replaced by Mr. B.N. Sapkota, Dr. B.G. Vaidya, Mr. P.P. Dahal and Mr. P.K. Shrestha.

In the fiscal year under review the organizational structure was modified with the addition of a new position of another Deputy Managing Director to look after the affairs of Planning and General Management. Dr. Janak Lal Karmacharya was appointed to this post.

INFORMATION TECHNOLOGY DIRECTORATE

The subcommittee for the establishment of Management Information System (MIS) constituted by the NEA board submitted a report in May 1997 and recommended to implement MIS in three phases. First Phase was to work out operational level reports and define information accessing and information flow pattern for generation of top level MIS reports on regular basis. The completed report was submitted in the FY 1998 (2055 Ashadh 10).

One of the main objective of the first phase is to establish a computerized network within NEA headquarters and link it with some offices of NEA outside Kathmandu Valley via telephone networking system. The second main objective is to develop customized application software for producing MIS reports for various levels. To achieve these objectives tendering has been done for supply, delivery and installation of computer hardware and proposals have been received for development of application software. The evaluation for

supply, delivery and installation of computer hardware and evaluation of proposal for development of application software are in the final stage.

To improve revenue performances in some of the branches under distribution and consumer services directorate, IT Directorate has undertaken to extend Computerized Billing System to five branches (Nepalgunj, Bhairahawa, Birgunj, Janakpur and Biratnagar). For this purpose tendering has been done for supply, delivery and installation of computer hardware and standard software. The evaluation of this tender is in the final stage.

FINANCE AND ACCOUNTS DIRECTORATE

Strengthening of NEA's financial management and accounting systems continued to obtain attention over the year, following this, the Finance and Accounts Directorate has been upgraded. Finance and accounts management function has been divided into two departments, the Central Accounts Department and the Financial Management Department.

NEA's financial performance remained encouraging for another year. NEA's total revenue increased by NRs. 337.3 million (6.21%) to reach a figure of NRs. 5770.0 million as compared to NRs. 5432.7 million in the previous year. NEA's revalued assets increased to 30,988.0 million as compared to NRs. 30,063.6 million in the previous year. Expenditure in operation and maintenance have increased by only 4.99% reaching a figure of NRs. 4,806.9 million as compared to NRs. 4,578.5 million in FY 98. Overall, NEA registered a net profit before tax of 550.9 million as compared to NRs. 391.7 million in FY 98.

In FY 99, NEA has invested NRs. 7566.6 million in capital works and projects, the funding of which comprised of NRs. 659.7 in equity, NRs. 5133.7 from borrowing and the rest from NEA's own resources. NEA also has invested NRs. 90 million in the Chilime hydroelectric project which is being developed by a subsidiary company. By the end of FY 99, NEA's total borrowing stood at NRs. 25,982.6 million and a total of NRs. 1595.2 million as debt service.

The financial audit for FY 1996/97 has been completed and the audit for FY 1997/98 has been submitted to the Board. The audit for the year 1997/98 was undertaken by auditors M/S S.R. Batliboi & Co., India, M.R. Sharma & Co., and B.K. Agrawal & Co. of Nepal. For the financial audit of FY 1998/99 auditors M/S Price Waterhouse, New Delhi and M/K Sharma & Co, Nepal have been appointed. Tax assessment for the FY 1993/94 is in process and the tax audit for FY 1994/95, 1995/96 and 1996/97 are currently being undertaken by the tax auditor M/S. M.K.Sharma.

INTERNAL AUDIT DIRECTORATE

In keeping with the modern concept, the scope of internal audit has been enhanced from traditional financial audit function to operational audit. Following the recent change in the organization structure, the Internal Audit Directorate now consist of three divisions: Financial Audit Department, Management Audit Division and Technical Audit Division. These divisions have been staffed with necessary administrative and technical personnel. In the FY 1998/99, 51 financial audits, 18 technical audits and 17 management audits were carried out.

ASSETS AND MATERIAL MANAGEMENT DIRECTORATE

The activities of Assets and Material Management Directorate are focused on the following areas:

- *Updating fixed assets records.* The process of collecting information on the legal status of land being used by various NEA offices has been initiated. Wherever NEA does not have ownership certificate of the land under its use, the process of securing the ownership certificates has been initiated. Already, land ownership certificate of the lands at Trishuli Power house, Birgunj and Hetauda offices have been secured. A task force has been set up to secure the land deeds of about 6,985 ropanis of

lands located at various NEA offices.

- *Making the inventory management efficient.* One of the major thrust areas has been the efficient management of inventory. The inventory of goods under its management has fallen significantly after the formation of this Directorate. In the FY 1997/98 the total inventory at central store at Hetauda, was worth NRs. 115.7 million, by the end of FY 1998/99 the outstanding inventory is worth NRs. 78.9 million, the total decrease in inventory over the period of one year being about 32%. In order to make this job more efficient, a computerized inventory management system is being installed in the year 99/00. Upon completion of this project, a centralized information on the inventory will be available, which will help in the effective management of inventory and in procurement decision making. Already, the inventory of all DCS branches has been compiled. Task force has been formed to carry out physical verification of the store inventory at all the budget centers, and also to identify the items to be auctioned. The task force shall submit the report by Aug 23, 1999. The findings of this report and the requirements sent in by various DCS offices shall form the basis for establishment of the quality of goods to be procured in this fiscal year.
- *Identification of the state of physical inventory and initiation of the process of auctions of old unusable assets.* In the fiscal year under review a total of 41 units of old vehicles were auctioned, and this will continue in the FY 99/00 year as well.
- *Preparation and updating of technical specification and tender conditions for various electrical goods.* In order to bring about uniformity in procurement process and in the specifications of similar goods procured by different DCS offices, standard tender conditions and the technical specifications for the distribution line materials have been made available for DCS Directorates. To strengthen this aspect of standardization of the technical specifications, publications of various international standardization organizations are being procured in the FY 99/00.
- *Procurement of various goods from the most competitive sources.* The central procurement of goods/equipment is done through competitive bidding. In respect of the local procurement, quotations from the suppliers from among the approved list of suppliers are invited. The quantity of centrally procured goods is established after examination of the existing inventory of goods in NEA stores in relation to quantity requirements sent by the DCS offices.
- *Management of Self-Insurance Fund.* The outflow of funds by way of annual premiums paid to the insurance companies in relations to the claims made by NEA has been found to be significantly high. To address this situation, NEA has established an insurance fund, which will be used to pay for the costs of damage to the NEA properties. A manual for the management of this fund is now under preparation.

HUMAN RESOURCES AND ADMINISTRATION DIRECTORATE

Personnel Administration

In the fiscal year under review, promotion was granted to a total of 957 employees, of whom 357 were technical staff members. A total of 133 employees were either retired, deceased or have resigned. At present out of the total available staff positions of 8970, 1209 positions are vacant. To fill up these vacant positions, written or practical examinations have already been conducted.

PERSONNEL STATUS FY 1998/99			
Service	Total Staff	Filled	Vacancy
Technical	5875	4957	918
Administration	3104	2813	291
Total	8979	7770	1209

RESIGNATIONS, RETIREMENT AND DEATH				
Level	Resignation	Retirement	Death	Total
11	-	1	-	1
9	-	1	-	1
8	-	1	-	1
7	-	11	1	12
6	-	4	1	5
5 ADM	-	2	1	3
TECH	-	8	1	9
4 ADM	1	1	1	3
TECH	-	10	5	15
3 ADM	-	3	1	4
TECH	1	8	9	18
2 ADM	1	4	2	7
TECH	-	14	8	22
1 ADM	-	8	5	13
TECH	-	8	11	19
TOTAL	3	84	46	133

Staff Promotions FY 1998/99		
Level	Non Technical	Technical
10	-	6
9	-	2
8	-	16
6	74	137
5	83	158
4	117	194
3	2	54
2	81	33
Total	357	600

Staff Training

With the objective of enhancing the professional competency, 190 staff members were provided with training's, seminars, workshops, inspections, conferences and academic studies at home or abroad as shown in table.

In-house training's were also conducted by the NEA Training Center which is continuing its human resource development program to provide the trained manpower at various levels. In the fiscal year 97/98, 42 training programs were conducted

by it in various fields and a total of 434 staff received training, of whom 136 were officer level. In addition to the training programs, the Training Center also conducted a one-day regional workshop programs on "Safety Practices in DCS" at Nepalgunj, Kathmandu, Hetauda and Biratnagar to identify the problems and practical difficulties in implementing the safety practices and to find solutions to the existing problems. NEA is currently constructing a modern training center at Khairipati, Bhaktapur.

PLANNING DIRECTORATE

The Power System Master Plan consisting of the Load Forecast, the Generation Expansion Plan, the Transmission System Master Plan and the Long Run Marginal Cost Reports were completed in August 1998.

These reports were prepared by Norconsult under the Asian Development Bank's Technical Assistance Grant. System Planning Department was closely involved in the preparation of these reports. The Master Plan identifies the projects that

would be required to meet the forecasted demand up to the end of FY 2016/17. The recommended plan based on the Base Case Medium Forecast is as follows:

Generation Expansion Plan	
2003/04	Middle Marsyangdi (61 MW)
2004/05	Khimti Khola - 2 (27 MW)
2005/06	Kulekhani - 3 (14 MW)
2006/07	Likhu - 4 (44 MW)
2007/08	Upper Karnali (300 MW)
2011/12	Arun -3 (402 MW)
2016/17	Chameliya (30 MW)

The Transmission System Master Plan has been prepared considering the above generation plan. The long run marginal costs have been calculated based on costs at the generation level. A very high level committee under the chairmanship of member of the National Planning Commission, with members from MOWR, WECS, EDC and NEA was formed to review these reports and this committee has already submitted its findings and given their recommendations. The generation expansion planning is a regular feature of System Planning Department and the revision of generation expansion plans are to be carried out with the updated data on available projects.

PROJECT PREPARATION AND STUDIES DIRECTORATE

Under its regular program, the Investigation and Studies Department carried out the desk studies of nine projects, reconnaissance of four projects and preliminary study of one project in the different development regions of Nepal. Out of the 9 desk studied projects the following 4 projects were studied to the reconnaissance level and out of the 4 projects 1 project Seti-Bajhang was studied to the preliminary level.

Project studies of Andhi Khola Storage Hydroelectric Project (180 MW), Tama Koshi- 3 Hydroelectric Project (330 MW), Upper Modi 'A'

Staff Training FY 1998/99	
A. Abroad	
1. Higher Studies	5
2. Seminars, Symposiums and Conferences, workshops etc.	15
3. Inspection	41
4. Training	57
Total	118
B. In-Country	
1. Higher Studies	9
2. Seminars, Symposiums and Conferences, workshops etc.	49
3. Inspection	-
4. Training	14
Total	72
Note : The above data do not include in-house training conducted by NEA Training Center	

Name of the Project	Capacity (MW)	District	Access Road	Level of Study
1. Seti-Bajhang	21	Bajhang	0	Rec. and Preliminary
2. Likhu- 5	21	Ramechhap	20	Reconnaissance
3. Rosi- 1	8	Kabre	0	Reconnaissance
4. Seti-Saraudi	17	Kaski	5	Reconnaissance

Hydroelectric Project (42 MW), Dordi Hydroelectric Project (9 MW) and Balephi Hydroelectric Project (15 MW) are being carried out by this directorate, these projects are dealt in more detail under the Project Studies chapter.

Environment Division

With a mandate for carrying out environmental studies and environmental monitoring works related to power generation, transmission and distribution projects, NEA - Environment Division (NEA-ED) conducted the following works in the Fiscal year 2055/56.

1. EIA Studies:

- Selection of Environmental Consultant for Middle Marsyangdi HEP. TAEC/NESS JV, the joint venture of two local consulting firms, was selected as the environmental consultant for carrying out the Tender Design Stage Environmental Impact Assessment and Monitoring of Mitigation Plan during Construction. In this regard, an agreement was signed with TAEC/NESS JV on June 24, 1999 and the work for stage I (EIA) is expected to be completed by July 15, 2000.
- Completed the EIA of Lalpur Gaddachauki 132 kV Transmission Line Project as per the environment Protection Regulation, 1997. The ACRP for this project was carried out by Soil, Rock & Concrete Laboratory, NEA.
- Coordinated and supervised the work of METCON Consultant for the Initial Environment Examination (IEE) of Janakpur - Yadukoha 33 kV sub transmission line project.

- Coordinated and supervised the work of GEOCE for carrying out the EIA of Modi - Pokhara 132 kV Transmission line project.

2. Mitigation Works:

- Coordinated and supervised the three-month long House Wiring Training for 16 project affected families from Ilam HEP. Cottage Industries Development Board, Kathmandu, provided this training.

3. Secondment:

- Deputed staff to Soil, Rock and Concrete Laboratory for carrying out various environmental studies.
- Deputed staff to Rural Electrification Directorate to carry out the IEE of Mujkot Small Hydroelectric Project in Jajarkot district.

4. Policy input:

- Provided input to the Ministry of Population and Environment in assessing the scoping and ToR documents related to various power generation and transmission projects.
- Provided input to Water and Energy Commission Secretariat by participating in two workshops for formulating Nepal Resettlement Policy and Practice.

5. Environment Day Celebration:

- NEA-ED participated in the environmental fair organized by Ministry of Population & Environment (MOPE) to celebrate the World Environment Day,

1999. The NEA's stall was visited by about 1000 people.

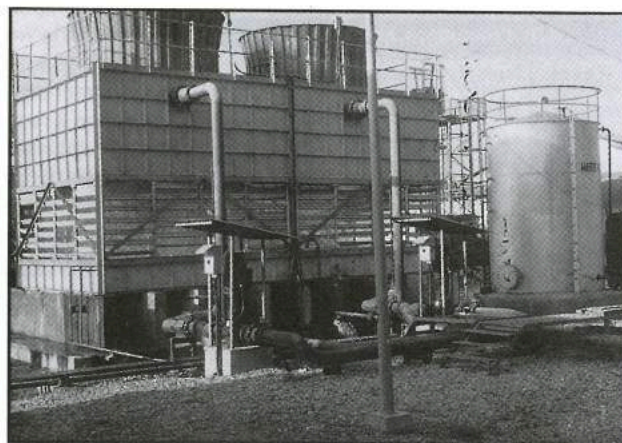
Sediment Monitoring of Kulekhani Reservoir

Since 1996, the Investigation and Studies Department has carried out the sediment monitoring programme of Indra Sarowar on regular basis. The sediment survey work of Kulekhani Reservoir was undertaken in November 1998 and a report has been published in 1999. According to the survey report, 0.56 Mm³ of sediment was deposited during the rainy season of 1998. Out of the original gross reservoir capacity of 85.3 Mm³, 22.67 Mm³ or 26.6% has been filled with sediment so far.

GENERATION DIRECTORATE

Thermal Generation

After the successful warranty operation of 13 MW Multifuel Power Plant Extension Project NEA has got substantial energy support from Thermal Plants during this fiscal year.



Out of a total INPS generation of 1475.00 GWh, contribution of Thermal Plants is 118.82 GWh, which is 8.06 % of the total generation.

During this fiscal year the Environmental Package Works of 26 MW (old) Multifuel Power Plant have been completed with the Financial Grant Assistance of 7 Million Finnish Marks from the Government of Finland and local expenses of about 6 million

NRs. of NEA. Project works have been completed by Wartsila NSD Finland as contractor. The public grievances of noise, air and sludge pollution, and also the temperature problem inside the power house have been solved successfully.

At the Hetauda Diesel Power Station, rehabilitation works of three English Electric Engines of 1.5 MW each have been completed with the Financial Grant Assistance of the British Government. UK based North-Linc Engineering Company has completed this job satisfactorily.

Hydro Generation

After the butterfly valve incident at Trishuli, all the units which were running under manual control were repaired and made automatic with the help of Chinese experts.

Repair and maintenance works have also been carried out at Devighat (Unit No.3), Sunkoshi (tailrace of unit 3). The two units (2&3) at Gandak which have been rehabilitated and overhauled are operating satisfactorily. Unit-1 is to be rehabilitated and overhauled under the supervision of Chinese experts in the coming year.

The overall performance of Kulekhani-I continued to be satisfactory. The generation in this fiscal year reached 195,737 MWh, the second highest since its operations. The notable maintenance works done are: (a) the repair of the leakage from the embedded jet brake pipe of unit no.1. The repair work was done with the installation of a new pipe system outside the concrete structure, (b) the cooling water pumps of unit no.1 which were on the verge of breakdown, were repaired locally. This year the hydrological and meteorological condition is so far favourable, and that the reservoir level reached 1522.35 meter on July 16, 1999 as compared to 1505.83 meter exactly an year ago. On April 4, 1999 a fire broke out in the near by forest and it almost reached the switchyard (near the control house) before it was controlled and extinguished with the

help of about 50 army men and one fire fighting equipment from Hetauda.

The performance of Kulekhani-II also was satisfactory. The generation in this fiscal year was 91,896 MWh, second highest within the last 13 years of its operation. Only normal maintenance on shaft seal, water supply pump, water control valve, power unit etc. were performed. The heavy rainfall of 119 to 212 mm on 1, 2 & 3 of July 1999 caused damages to the compound walls of workshop, and powerhouse tunnel and drain tunnel areas. Similarly, intake and Gabion protection works of drinking water supply were also washed away.

Since its commissioning in 1989, the Marsyangdi Hydroelectric Project has already generated over four billion units up to April 3, 1999. Despite the dry spell lasting for seven months from December 1999 to June 1999 without any rainfall, 472 GWh of energy was generated during the fiscal year 98/99, which is more than its design energy generation of 462 GWh. Unit No.1 turbine and its accessories after more than 65000 hours or over nearly 10 years of operation, revealed serious damages to the wearing rings caused by cavitation, corrosion and abrasion. Thus, for the first time since commissioning period of unit no.1 the bottom wearing ring was replaced by spare ones as were the head cover facing plates, and turbine upper and lower wearing rings. Vane no.13 of unit no.1 turbine runner was also repaired successfully. Repair works of weir gate no.1, 3 and 4 and sluice canal repair were also carried out.

Load Dispatch

This year was characterized by unprecedented dry spell compounded by the demand growing by more than 7% with no capacity additions made load dispatching difficult. However, prudent load management has resulted in a completely filled Kulekhani I reservoir. Due to the dry spell Kulekhani was used optimally with the result that this year the generation from Kulekhani I P/S was higher than what it is designed for. The

efforts in maximizing generation from run-of-river plants also bore fruit as Marsyangdi Power Station could be exploited to yield 472 GWh of energy as against its design value of 462 GWh.

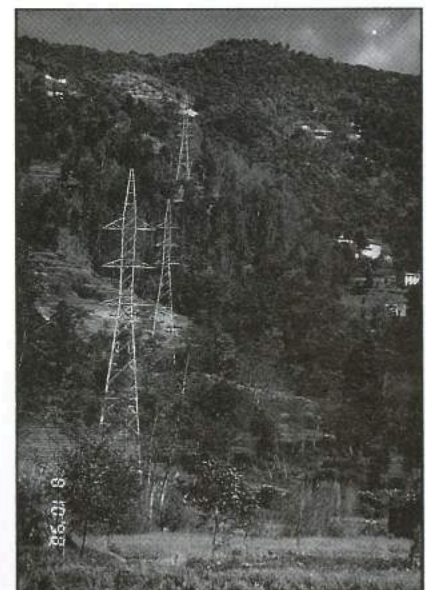
TRANSMISSION AND SUBSTATION DIRECTORATE

Transmission Lines

Construction of 132 kV lines connecting 1) Khimti Power House with Kathmandu Valley, 2) Kushaha with Dhalkebar substation and 3) Tanakpur (India) with the Mahendranagar substation will be completed within this year.

As recommended in the Transmission System Master Plan (2003-2007), NEA is determined to construct 150 km long 220 kV line from Bardaghat to Hetauda substation to evacuate power from the Kali Gandaki-A project. It is also going to construct a 132 kV ring main around Kathmandu valley and the Pathlaiya-Parwanipur 132 kV line to supplement the heavily loaded 66 kV lines.

Banepa-Panchkhal project will be started to improve the power distribution network in Banepa area and to construct the facilities for the evacuation of the power from Indrawati Hydro Project.



Discussions are underway with DANIDA, ADB and other donor/lending agencies to implement these projects.

Grid O & M

Amongst its O&M works, (1) rerouting of 2 km of the 132 kV transmission line damaged by heavy landslide in Nawalparasi was done, (2)



two damaged 132 kV towers in the Eastern Region were replaced by new towers, and (3) replacement of 11kV Oil Circuit Breakers with Vacuum Circuit Breakers were completed at New Chabel, Bharatpur, Simara and Parwanipur Substations. Regular maintenance of transformers were also carried out, along with testing and calibrations of energy meters in various substations in Eastern and Central regions. Four new energy meters were installed in Bagmati Division. All the relays of Eastern and Central Division were tested and the distance relay at Dhalkebar substation was replaced by a new one. Efforts are being made to improve system operation and maintenance for continuous and reliable power supply.

DISTRIBUTION AND CONSUMER SERVICES

Central and East & West Directorate

With only about 15% of the population having access to electricity, the challenge facing the DCS is enormous. The difficult terrain, inaccessible and scattered nature of

the settlement makes distribution system expansion in the rural areas expensive. In order to control the non-technical losses, DCS has forwarded the revised draft of Anti-pilferage Act to the Ministry of Water Resources after incorporating the suggestion from the consultants NRECA and reviewed by ADB. Moreover, the Electricity Theft Control Regulation 2050 and the Electricity Distribution Regulations

have already been implemented.

Electricity sales, which totaled 1112.886 GWh, was an increase of about 61.457 GWh (5.8%) over last year's sales figure. Internal sales within Nepal increased to 1052.886 GWh and accounted for 94.6 percent of the total sales and registered an increase of 68.867

GWh (7 percent) over the last year's figure. Exports for India decreased by 11 percent largely because of energy constrained conditions in Nepal.

Over the past financial year, the number of consumers grew by an estimated 45,151 (7.85 percent) over the previous year's figure to reach a total of 620,000. The domestic category accounted for 95.31 percent



of the total consumers, 37.31 percent of the total sales and contributed to 37.71 percent of the revenue. The industrial category formed only 2.45 percent of the total consumers, but accounted for 39.28 percent of sales and contributed to 37.80 percent of the revenue. Non-commercial category constituted 1.24 percent of the consumers, accounted for 5.8 percent of the sales and 7.87 percent of the revenue. Likewise, the commercial category constituted 0.48 percent of the total consumers, accounted for 6.99 percent of the sales and provided 9.4 percent of the revenue.

In the case of DCS East-West Directorate, there has been improvement in the collection of outstanding arrears and system loss situation. In the FY 1998/99, the total loss figure up to the month of March is 15.16% whereas the figure for the corresponding month in FY 1997/98 was 17.03%, thereby posting a reduction in system loss by 1.87 percentage point.

Profit Centers

In order to bring about efficiency in the operation of the distribution system the concept of profit center has been introduced. In the FY 98/99 a total of 15 DCS Division Offices were converted into profit centers. These are (1) Kathmandu Central, (2) Kathmandu West, (3) Kathmandu East, (4) Lalitpur, (5) Bhaktapur, (6) Birganj, (7) Biratnagar, (8) Janakpur, (9) Pokhara, (10) Nepalgunj, (11) Bhairahawa, (12) Butwal, (13) Bharatpur, (14) Heta and (15) Dharan. These 15 profit centers account for 64% of NEA's consumers and 81% of NEA's revenue. Based on the overall improvement in the operational efficiency, which is evaluated on such parameters as revenue collection, reduction in the cost of operation and losses in relation to the bench mark figures, there is a provision for reward and punishment. Over the last one year the major achievement of these profit centers has been in the area of establishing the precise amount of losses in their system. For this purpose, most of the Profit Centers have completed the installation of proper metering system



both for the establishment of energy balance in the system as well as to measure the internal consumption. As a result they are able to identify the losses precisely. In the process the areas of high losses have also been identified, and corrective measures initiated.

Rural Electrification and Distribution Improvement and Reinforcement

Recognizing the need to expand Nepal's central grid system to provide power to more people in both the urban and rural areas, particularly after the coming on line of the Kali Gandaki A, a number studies for the expansion and the reinforcement of the distribution system has been undertaken. Loan financing from the ADB will be directed to help expand and reinforce the distribution systems, to assist in agriculture production and cottage industries, to improve the quality and the reliability of power supply, and to reduce system losses. For the formulation of the project proposal under the proposed Eighth Power Project, ADB had appointed Worley International Ltd. of New Zealand to identify the feasible project areas. The consultants have already submitted the final report.

The Private Sector and Independent Power Producers

Two hydro power venture from the private sector along the BOT regime,

namely the Khmiti I and the Bhote Koshi HEP showed satisfactory progress in construction and are expected to commence operations in July 2000 and July 2001 respectively. In the case of Indrawati HEP being developed by National Hydro Power Company, the financial closure has been achieved and are now in the process of commencement of construction works.

Power Purchase Agreement (PPA) was signed on 2056/4/5 (July 21, 1999) with Nepal GITEC Pvt. Ltd. for the purchase of power from the 14 MW Upper Modi HEP. One notable aspect of the PPA is that the payment will be partially done in local currency. Ten percent of the total bill of the power purchase will be paid in the Nepalese rupees to begin with, which will progressively be increased to 30 percent in fifteenth year and remain at that level thereafter.

Nepal-India Power Exchange

The Indo-Nepal Power & Exchange sub-committee meeting was held in Kathmandu from May 17-21, 1999. The Indian delegation was led by Mr. S.K. Thakral, Director (SP&A), CEA, while the Nepalese delegation was led by Mr. P.M.S. Pradhan, Director-in-Chief, Planning Directorate, NEA. The two teams agreed to the three additional 132kV interconnection points and to expedite the implementation of these projects as soon as possible. Main objective of the meeting is to enhance the exchange of power with India from 50 MW to 150 MW. For



this purpose following three interconnections with India are to be undertaken : Butwal - Anand Nagar (India) 132 kV transmission line (30 km in Nepal). Birgunj- Motihari (India) 132 kV transmission line (25 km in Nepal), Dhalkebar - Sitamarhi (India) 132 kV transmission line (23 km in Nepal).

Detail route survey and Environmental Impact study of the transmission line will be started in the current fiscal year. The cost of the project, estimated at NRs. 232.2 million is to be borne by HMG/N and NEA. The project is scheduled for completion by the end of 2001.

Donors and Assistance

Both the bilateral and multilateral agencies have come forward with the proposals for grants and soft loans. The ADB has shown interest in the funding of Eighth Power Project which covers rural electrification and system reinforcement in the urban load centers. Similarly, DANIDA has shown interest in the grant assistance in the construction of Kailali-Kanchapur RE system and also for the construction of Hetauda-Bardaghat 220 kV transmission line. Recently, the German agency KfW has approved DM 250 million for the construction of 61 MW Middle Marsyangdi HEP, under German grant assistance.

Public Relations

NEA continued to interact with the public and the media to attain greater transparency in its activities. A public interaction was held on June 25, 1999 to appraise the media, businessmen, consumer and the general public about the activities of NEA in the power sector. Various MPs, and other distinguished guests voiced their opinions and gave their suggestions during this program.

PROJECT HIGHLIGHTS

Kali Gandáki 'A' Hydroelectric Project

Approximately 180 km west of Kathmandu, located on the southern edge of Middle Mountains on the Kali Gandaki River in Gandaki Zone, this project is a run of river type hydroelectric scheme, with an installed capacity of 144 MW. The project will generate 842 GWh of energy annually using a power tunnel of about 6.0 km length. The power generated from the project will be evacuated to the central grid through 132 kV transmission lines to Pokhara and Butwal. The total project cost is estimated to be US \$ 452 million.

All the construction work contracts such as civil works, hydraulic steel works, electrical and mechanical works and 132 kV transmission lines and substations are in place. The contract for civil works was awarded to Impregilo SpA of Italy, contract for hydraulic steel works to Noell Stahl of Germany, electrical works to Mitsui/Toshiba/Gegelec a joint venture company, mechanical works to Mitsui/Toshiba Joint Venture and 132 kV transmission lines and sub-stations to TATA/ Marubeni Joint Venture.

The critical activities such as River Diversion through uncompleted Desander Basin and Diversion of the River back to its Channel through uncompleted Diversion Dam were completed in time respectively on November 12, 1998 and June 13, 1999. Excavation of the remaining portion of the Desander Basin and

concreting work in the piers of the Diversion Dam are in progress. Excavation of the Headrace Tunnel and concreting works of the powerhouse are also in progress. The foundation work of Transmission line towers has been started. Similarly construction of substation at Lekhnath, Pokhara is in progress. Manufacturing and supply of hydraulic steel works and electromechanical works are going on smoothly.

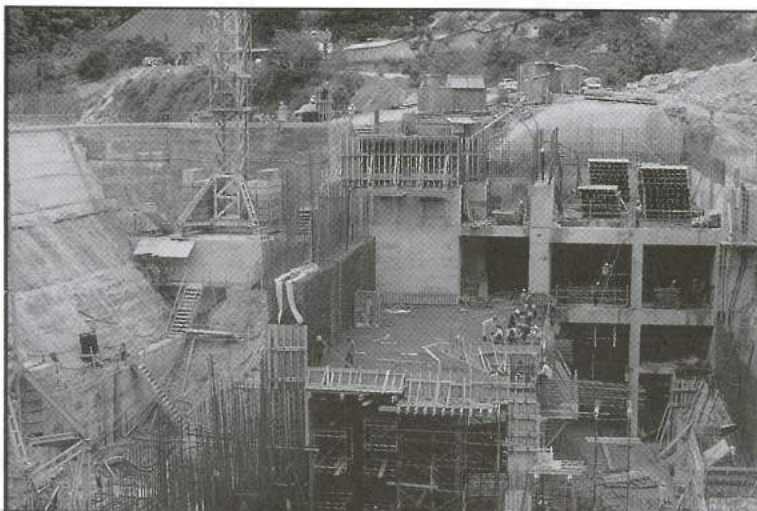
Ilam (Puwa Khola) Hydropower Project (IHPP)

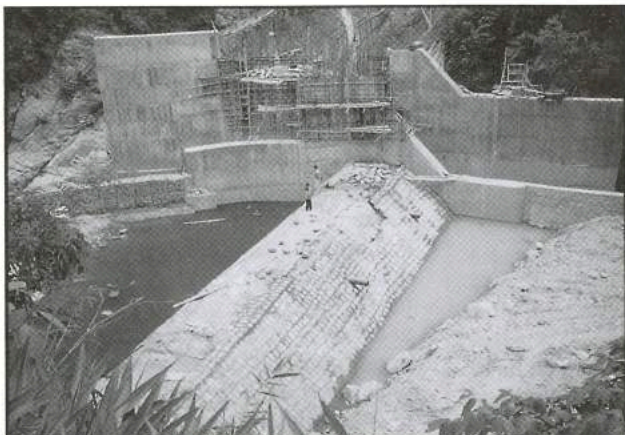
Implementation of the 6.2 MW first ever Medium Hydropower Project, undertaken with NEA's in-house capability commenced on September 1995. The feasibility study of the project was carried out with the assistance of JICA in 1993. Further studies and subsequent implementation have been carried out by NEA.

The construction of the main civil works commenced on October 1st 1995 after the signing of contract between IHPP/NEA and CWHEC-Laxmi J/V. Works mainly consist of the construction of 30 m long diversion weir & intake facilities, underground desanding basins, spillway and flushing arrangements, nearly 3400 m long head race tunnel, head tank, regulating pond (Capacity = 2000 m³), steel penstock (990 m length) and a powerhouse & switch yard located at the right bank of Mai Khola (Kankai River).

Two units of horizontal axis pelton turbines will be installed at the power house to generate 48 GWh of energy annually, which will be transmitted to Ilam sub-station through 3.5 km long 33 kV line.

So far the construction of diversion weir has been completed. More than 85% progress in the construction of undersluice/intake structures has similarly been achieved. Underground work constitute more than sixty percent of the total civil works volume. However, the Geological conditions prevailing at most of the underground works were found to be highly unfavourable. Geological conditions, have aggravated the delayed progress and cost overrun. Despite the difficulties, little less than 60 m tunnel (total 4400 m) excavation is left as of end July 1999. Head tank/ regulating pond, penstock and supports and power house civil





works are the major surface works under construction. The progress achieved so far in those structures vary between 60 (power house) to 95 percent (Regulating Pond).

Likewise, the contract for the Hydro-mechanical works and Electro-mechanical works have been awarded to Nepal Hydro & Electro Co. (NHE), Butwal and Dongfang Electric Co. (DEC), PR China respectively. NHE has so far installed more than 850 m of Penstock pipes. Further installation / erection of the penstock pipes and other accessories will commence soon.

Similarly, DEC has manufactured most of the Electro-mechanical equipment, plants and accessories at factories in China and the majority of the same have been delivered at site. The first lot of equipment include turbines, generators, grounding materials, OCT, steel structures and other ancillary parts. The second lot mainly comprises of rotor, stator, station transformer etc. Erection of the equipment will commence soon.

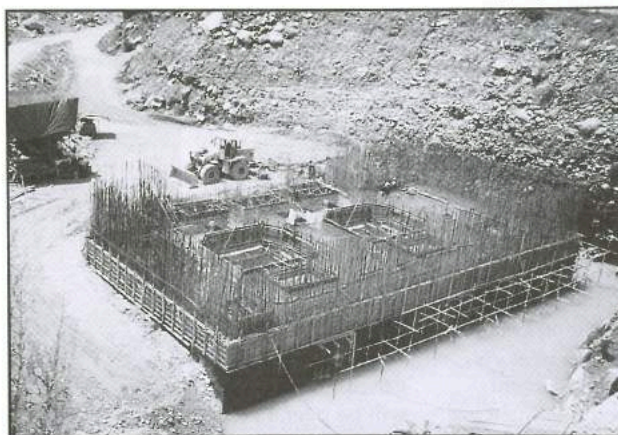
The revised cost estimate of the project is US\$ 15.5 million. With over 85% of the project's work already complete, power generation from the project is anticipated to begin by the end of 1999.

Modi Khola Hydroelectric Project

The construction of this 14 MW hydroelectric project was initiated in 1996. The Project is being imple-

mented in Deupur VDC of Parbat District on the Pokhara-Baglung Highway. Main features of the project includes a 7.5 m high, 33 m long diversion weir, which diverts water of Modi Khola into a 155 m long desanding basin through a 250 m long underground box

culvert. An open canal of 61m length conveys the water to a regulating pondage of 26,640 cu.m. capacity located on the right bank of Modi Khola. The semi-underground power house is connected to this pondage through a 1,507 m long headrace tunnel of 3.15 m diameter, 41 m long horizontal tunnel (below the surge tank) with 4.24 m diameter, 38 m high surge tank of 9 m diameter, vertical shaft of 51 m height with 4 m diameter, 123 m long pressure tunnel with 4 m diameter and a 328 m long underground penstock pipe with 3.2 – 3.5 m diameter. A 262 m long underground tailrace releases the water back into the Modi Khola. Two units of 7 MW capacity vertical shaft turbines will be installed. With a net head of 67 m and total installed capacity of 14 MW the plant will generate 91 GWh of energy annually. The generated power will be evacuated to the national grid through a 40 km long 132 kV transmission line to Pokhara.



Because of weak geological condition encountered during tunnel excavation, the length of steel penstock has been increased from 90m to 328m.

The estimated construction cost of the Project is US \$ 29.9 million. A loan agreement with the Government of Korea was signed on 10th November 1997 for an amount of 12,441 million Korean Won for funding the Electro-mechanical works, Transmission Line and Technical Assistance. HMG/N and NEA are funding the remaining cost.

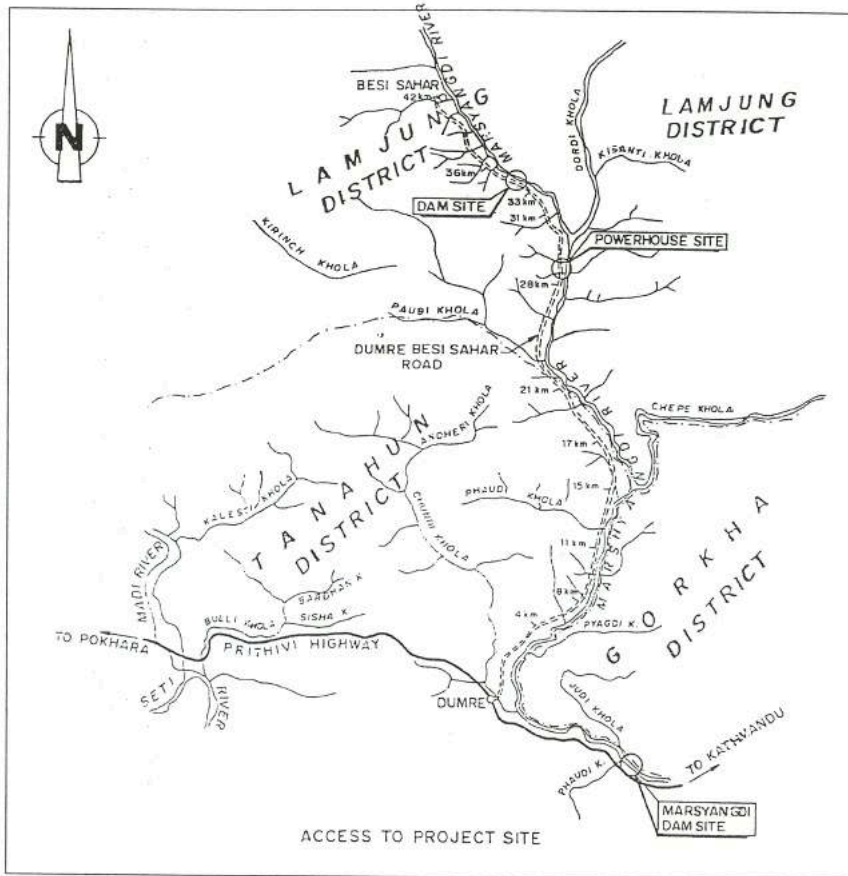
The current overall progress is about 80 percent and the Project is expected to be completed by the fiscal year 1999/00.

Middle Marsyangdi Hydroelectric Project

This project is located on Marsyangdi river in Lamjung District about 40 km. upstream of this existing Marsyangdi Powerhouse. The project is peaking run-of-river type with an installed capacity of 61.2 MW and an average annual energy generation of 364 GWh. It consists of a 46 m. high concrete dam with gated spillways, a vertical flushing surface desanding basin, a 5.4 m. diameter and 4.5 km. long concrete lined headrace tunnel, a surge shaft with restricted orifice, a high pressure shaft and an underground powerhouse equipped with two units of 30.6 MW Francis turbines. The power will be evacuated by a 41 km long single circuit 132 kV transmission line to the existing switchyard of Marsyangdi Power Plant. The total

estimated project cost is US\$ 149 million at 1997 price level. The construction of the project will start from March 2000, and is expected to be on line by August 2004.

With the completion of the Upgrading Feasibility Study, Hydraulic Model



Test and additional geotechnical investigation, the project has entered into the phase of Detailed Engineering Design and Tender Document Preparation. FICHTNER Joint Venture has been appointed for the Detailed Engineering Design and Tender Document Preparation as well as Construction Design and Supervision. The Consultant has already commenced its work, the land acquisition for construction including compensation and resettlement of the project affected families are also in the process. Similarly, Joint Venture of TAEC and NESS has been selected for the Detailed Environment Impact Assessment Study and Mitigation and Monitoring of Mitigation Plan. The project is to be financed as follows: (a) German Government (BMZ/ Kreditanstalt für Wiederaufbau (KfW) will provide 87% (130 Million US\$) of the project cost as a grant to HMG/N. Recently, the German Government and HMG/N have signed the financing

agreement of the grant of 250 million DM towards the foreign component of the project cost, (b) of the remaining 13% (19 million US\$) of the project cost, 25% will be borne by HMG/N and 75% will be borne by NEA.

Chilime Hydroelectric Project

The construction of Chilime Hydroelectric Project is being undertaken by Chilime Hydropower Company Limited with the major share of NEA. Located in Rasuwa district of the Central Development region, the project will have an installed capacity of 20 MW and the annual energy generation from it will be over 137

GWh. The contract for Civil Works Lot No. 2 was terminated in October 1998 due to slow progress of works by the contractor.

New contract agreement with two Nepali construction companies for the Civil Construction Works of the surface works has already been made and both the contractors have started the construction works. Negotiation on tender for Civil Engineering Construction Works for underground works is in progress and is expected to be finalized shortly. In the same way, the re-evaluation of tender for Electro-mechanical Works is completed. In order to gain the construction time, the critical elements of construction of underground civil works is continued on labour contract basis through Nepali contractors after the termination of previous contract. The construction of diversion weir and underesluice have been completed and excavation of 400 m length of headrace tunnel, 117 m construction adit, the tailrace tunnel, the main access tunnel, construction adits to penstock shaft, powerhouse crown and transformer cavern have been completed. Underground excavation work of powerhouse crown, transformer cavern, enlargement of surge shaft and the headrace tunnel is in progress. The construction of 66 kV transmission line for the evacuation of power from the Chilime Hydroelectric Project is also in progress.

For the financial closure of the project, the Chilime Hydropower Company is negotiating with the financial institutions of Nepal. Share



collections from the employees of NEA and the public will be launched within the next six months. The project is to be completed by April 2001 at an estimated cost of Rs. 2323 million.

Dolpa Small Hydropower Project

Undertaken with funding from HMG/N at an estimated cost of NRs. 67 million, the construction of Dolpa Small HEP started in FY 1993/94. The project with an installed capacity of 200 kW is located near Dunai, the district headquarters of Dolpa. The project utilizes the water of Jairo Khola through a 1100 metre long headrace canal. About 5000 people of Dunai, Shahartara and Jhupal will benefit from the project which will be served by some 30 km of 11 kV and 10 km of 400 V distribution lines. The project is slated for completion by FY 1999/00.

Kalikot Small Hydropower Project

Undertaken with funding from HMG/N at an estimated cost of NRs. 76 million, the construction of Kalikot Small HEP started in FY 1993/94. The project with an installed capacity of 500 kW utilizes the water of Sanigad river through a 1100 metre long headrace canal. About 12500 people of Khadachakra, Manma, Mehalmore, Mumra, Rakhu, Resilisipkam, Siuna and Phukhet will benefit from the project which will be served by some 50 km of 11 kV and 22 km of 400 V distribution lines. The project is slated for completion by FY 1999/00.

Gam Gad Small Hydropower Project

Necessary preparatory works for the implementation of Gam Gad Small HEP took off in FY 1998/99. The project with an installed capacity of 400 kW utilizes the water of Gam Gad river through a 1755 metre long headrace canal. Once the project is completed Shreenagar (Gamgadi), Karkibada, Ruga, Pina and Rara National Park would have access to electricity through some 20.5 km of 11 kV and 11.5 km of 400 V distribution lines. The estimated cost of the project

is NRs 132 million. The project is slated for completion by FY 2002/03.

Heldung Small Hydropower Project

Necessary preparatory works for the implementation of Heldung Small HEP took off in FY 1998/99. The project with an installed capacity of 500 kW utilizes the water of Ghatta Khola through a 838 metre long headrace canal. Once the project is completed Simikot, Baragaon (Thehe), Dandaphaya, Chhipra and Syada would have access to electricity through some 18.2 km of 11 kV and 12 km of 400 V distribution lines. The estimated cost of the project is NRs 103.5 million. The project is slated for completion by FY 2002/03.

Small Hydropower Master Plan Project

In order to carry out studies of potential small hydropower projects (100 kW to 5000 kW), the Small Hydropower Masterplan Project (SHMP) was initiated in 1990. It was initially supported by GTZ and after the phasing out of the project in 1993, HMG/N and NEA decided to continue the activities of the SMHP project. This project has so far identified 39 SHP schemes for grid connections and 32 SHP schemes for isolated development. Feasibility studies of eight SHP schemes and detailed engineering design of five SHP schemes have been completed.

During the FY 1998/99, inventory study of Kalanga Gad (8000 kW) in Doti, Manahari Khola (4000 kW) in Makwanpur, Sabha Khola (2000 kW) in Sankhuwasabha and Dordi Khola (2500 kW) in Lamjung were carried out. Also, the feasibility study of Sunaya Gad (4800 kW) in Baitadi started from FY 1997/98 has been completed in FY 1998/99. The field survey for detailed engineering design of Mujkot Khola SHP project has been completed and final design of this scheme is scheduled to be completed in the current FY 1999/00. The detailed engineering design of Phoi Gad (150 kW) in Dolpa which was

started in FY 1998/99 is also scheduled to be completed in FY 1999/00.

Devighat - Dhading 33 kV Transmission Line Project

The Devighat - Dhading 33 kV Transmission Line Project costing about NRs. 60 million is financed through a grant of Federal Republic of Germany and HMG/N's contribution. The project consists of building 19 km of 33 kV line, 40 km of 11 kV line, 100 km of 400/230 V line and one 1 MVA 33/11 kV sub-station. On completion, the project is expected to electrify Nilkantha, Sankos, Sunaulabazar, Muralivanjyang and Khalte VDC's and augment the electricity supply of Dhading Bazar which is currently being intermittently supplied through a 32 kW small hydro power plant.

The project started in April 1997, the construction of lines is nearing completion. The project is slated for completion by April 2001.

Sindhuwa - Khandbari 33 kV Transmission Line Project

The Sindhuwa - Khandbari 33 kV Transmission Line Project costing about NRs. 66.4 million is financed by HMG/N. The project consists of building 47 km of 33 kV line, 25 km of 11 kV and 400/230 V lines and one 1.5 MVA 33/11 kV sub-station. On completion, the project is expected to benefit 2300 households of Sankhuwasaba, Bhojpur and Tehrathum districts.

Started in FY 1997/98, the project is slated for completion by FY 2000/01.

Sindhuli - Ramechhap 33 kV Transmission Line Project

The Sindhuli - Ramechhap 33 kV Transmission Line Project costing about NRs. 39.5 million started in FY 1995/96. With an objective of electrifying Manthali, the headquarters of Ramechhap district, the project consists of building 30 km of 33 kV line, 28 km of 11 kV and 400/230 V

lines and one 33/11 kV sub-station. The construction of lines is complete and works on the 33/11 kV sub-station will commence during FY 1999/00.

Gaighat - Diktel 33 kV Transmission Line Project

The Gaighat - Diktel 33 kV Transmission Line Project costing about NRs. 57 million started in FY 1995/96. With an objective of electrifying Diktel, the headquarters of Khotang district, the project at the end of FY 1998/99 has constructed 69 km of 33 kV line and 16 km of 11 kV and 400/230 V lines.

Kusaha-Dhalkebar 132 kV Second Circuit Transmission Line Project :

This project is built to facilitate system power transfer and utilize the power import from India. It consists of a 120 km, 132 kV second circuit stringing on the existing transmission towers from Kusaha to Dhalkebar. Substation extensions at Kusaha, Lahan, Dhalkebar and Hetauda are also being carried out. This project financed by World Bank started in FY 1996/97 and is expected to be completed by October 1999 at an estimated cost of US\$ 4.4 million. Since the credit for PSEP has not been extended on its expiry on 31st December 1998, NEA is currently financing this project from its own resources.

The hot line stringing of Kusaha - Dhalkebar 132 kV second circuit is completed and the second circuit has been charged on July 23, 1999. Civil work of reinforcement and extension of Hetauda, Dhalkebar, Lahan and Kusaha substations has been completed and Equipment Erection work in all the substations is under progress.

Hetauda-Dhalkebar & Butwal-Bardaghat 132 kV Second Circuit Transmission Line Project :

This Project is part of the Hetauda-Biratnagar 132 kV Transmission Line 2nd Circuit stringing Project. With this line the power imported from India

can be utilized. Along with increasing the flexibility of power export/import when necessary, it serves to transfer power generated from Kali Gandaki to the eastern zone. It constitutes of 174 km, 2nd circuit stringing on existing transmission line towers from Butwal to Bardaghat and from Hetauda to Dhalkebar. The Project was initiated on the understanding that the World Bank would finance it under Credit-NEP 2347 (PSEP) [which expired on 31st December 1998] and the disbursement after the expiry of this credit was to be covered under Power Development Project (PDP, World Bank). The previous credit expired and the World Bank did not agree to extend its validity nor did the new credit agreement took place. In this situation the tender (i.e. re-tender) for transmission line construction was continued with NEA's own resources. The stringing of the 2nd circuit is estimated to cost US\$ 2.2 million.

Khimti-Bhaktapur-Balaju 132 kV Transmission Line Project :

To evacuate 60 MW power from Khimti Power House and 36 MW power from Upper-Bhotekoshi Hydro Power Plants, this 104 km long Khimti-Lamosangu-Bhaktapur-Balaju 132 kV Transmission Line is being constructed. Of the total length, 46 km Khimti-Lamosangu sector is single circuit and 58 km Lamosangu-

Bhaktapur-Balaju sector is double circuit. The project also includes one 132/66 kV, 3x16.5 MVA substation at Bhaktapur and one 132 kV switching substation at Lamosangu. Funded by the Govt. of Finland, Nordic Development Fund, HMG/N and NEA, the estimated total project cost is about NRs 1394 million.

Out of 310 towers, all foundation works have been completed, 95% of towers have been erected and 75% of conductor stringing works has been completed. Both the substations have already been completed.

The project is scheduled to be completed by October, 1999. Thus, the line will be ready to receive power prior to the commissioning of Khimti Hydro Power Plant.

Chilime-Trishuli-Devighat 66 kV Transmission Line Project :

To evacuate 20 MW of power from the Chilime Hydropower Project, NEA is presently constructing a 39 km long 66 kV single circuit line from the Chilime powerstation at Rasuwa to the existing Trishuli substation, which will also be linked with the Devighat substation thereby reinforcing the 66 kV network in that region.

About 50 percent of the total line length falls in Langtang National Reserve. To minimize environmental impact, the line is routed mostly along the Trishuli-Somdang road, incurring



an additional cost due to increased number of tension towers.

This is probably the first major transmission line project in Nepal which is not employing turnkey contractors. Conductors are supplied by local manufacturers whereas towers and insulators along with hardware are procured separately from two Indian manufacturers. Materials thus arrived at the project site are being installed by Nepalese line construction contractors. About 23% of total towers have been erected by July 15, 1999 and stringing of conductors will commence after the monsoon.

One of the challenges of this project is the construction of a 1340 m long span across the Trishuli River at Dhunche where heavy wind is encountered continuously throughout the year. Another special feature is that all project works relating to survey, design and construction supervision are done by NEA engineers without the help of any consultants.

The project is scheduled for completion by February 2000. Estimated to cost NRs. 202 million, it is jointly funded by HMG/N and NEA.

Lalpur-Gaddachowki 132 kV Transmission Line Project:

A 12 km long 132 kV transmission line from the existing 132 kV substation at Lalpur (Mahendranagar) to Gaddachowki located in Nepal near the Indo-Nepal border is being constructed by NEA. This is to receive 70 million units of energy into

Nepalese grid from the Tanakpur powerhouse in India under the Mahakali Treaty between His Majesty's Government of Nepal and the Government of India. The line will be interconnected with a 4 km long line being built by the Government of India from Tanakpur to Gaddachowki. After completion of this line, the Far Western Region of Nepal is expected to have a reliable power supply. Funded jointly by HMG/N and NEA, the project is estimated to cost NRs. 119 million.

Construction of the project inside Nepal has been awarded to the contractor Larsen & Toubro Limited of India. About eighty percent of construction and erection of the transmission line and substation extension works have been completed. The remaining transmission line works are expected to be completed by the end of 1999.

LDC and Balaju Substation Expansion Project

To enable evacuation of power from Khimti, Bhotekoshi and Chilime Power Stations that are currently being built, existing Balaju Substation is being expanded under LDC and Balaju Substation Extension Project. Under the same project, a new LDC is going to be built in Siuchatar. The important benefits once the new LDC come into operation are increased power system reliability with fewer and shorter system trippings, reduction in transmission losses, better planning

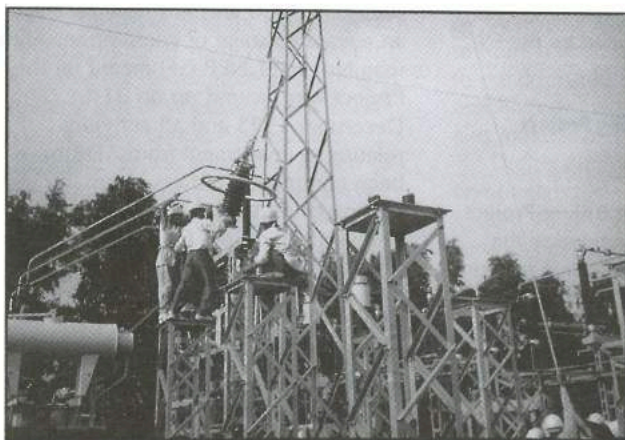
and supervision of the maintenance works, better data management and forecasting capabilities and enhanced quality of electricity supply. The new LDC will be equipped with SCADA system. The installation of a reliable, NEA owned and operated telecom-

munication system and telephone system between the LDC and all HV substations and major power plants is a priority of the project. The NEA owned and operated telecommunication system will comprise of PLCC, digital Fibre Optic link as well as UHF links. One indirect benefit out of this project will be the opening of new avenue of revenue generation for NEA by commercially exploiting abundance of channels in its telecommunication system.

Kulekhani Disaster Prevention Project II

The 60 MW Kulekhani-I and 32 MW Kulekhani-II hydropower stations together presently contribute about 30 percent of the power requirement of the country. Some important structures of Kulekhani Power Station were seriously damaged by the floods of July 1993. A sediment survey of the Kulekhani reservoir carried out in March 1993 revealed that about 7.71 million m³ of the reservoir was already filled with sediment. This meant about 66 percent of the dead storage was reduced in the last 13 years. Considering the urgent need of sediment control works in the reservoir and permanent restoration works of Kulekhani Power Stations, the Kulekhani Disaster Prevention Project (II) was implemented. The project commenced from Nov. 1996 and is scheduled for completion by June 2001.

The main features of the project include the construction of a sloping intake, check dams, project inspection road, Rapti outlet Tunnel, modification of Mandu head pond and the installation of telemetering equipment. The bell mouth intake of Kulekhani-I was converted into a sloping intake. The sloping intake is approximately 100 m long and concrete stoplogs can be lowered from the stoplog-lowering device at the top of the intake to prevent clogging due to sedimentation. Check dams were constructed on the upstream side of the reservoir and at the mouth of Darkot to mitigate sediment inflow into the reservoir. In



addition, the Check Dam No. 1 at the upstream edge of reservoir is being constructed to trap the sediment.

The construction of Mandu embedded head pond, Mandu submerged intake, Rapti pump up intake and outlet tunnel were also completed to avoid direct attack of debris flow, to take submerged water of Mandu river and to pump up water from Rapti river to the intake of Kulekhani-II power station. The construction of the Project Inspection Road between Bhimphe and Kulekhani (15 km) is being carried out and about 23% progress has been achieved as scheduled. The mobilization for installation of telemetering and other related systems has been started.

The estimated construction cost of the project is approximately 4060 million Japanese Yen. To meet the project cost a loan agreement between His Majesty's Government of Nepal and OECF for an amount of 3,484 million Japanese Yen was signed. HMG/N and NEA will fund the remaining cost.

Rural Electrification and Distribution Improvement Project

Rural Electrification and Distribution Improvement Project (REDIP) will be implemented by NEA to extend electrification into rural areas and also to reinforce existing distribution system in various parts of Nepal. The project will aid rural development as well as create demand to meet the twofold increase in the supply in the next few years. The funds for the project will be provided by loan assistance from ADB, HMG/N and NEA. The total cost is estimated to be US\$ 23.159 million. The rural electrification component features construction of 18 km of 33 kV lines, two 33 kV substations (4.5 MVA), 846 km of 11 kV lines, 419 km of composite lines, 1284 km of LV lines and 683 numbers of distribution transformer stations with a total capacity of 49 MVA. The project aims to provide connection to at least 165,800 houses within its planned period of ten years in 287 village development committees.

Loss Reduction Project

Financed by ADB as a component of loan to the Kali Gandaki-A project, the Loss Reduction Project is under implementation since FY 1996/97. The main activities of this project is to design and implement a program to reduce non-technical losses of NEA. NRECA International Ltd., USA was the consultant since March 1998 to (1) conduct a general review and prepare a plan for non-technical loss reduction, (2) design incentive and staff disciplinary schemes, (3) devise Vigilance and Energy Audit Procedures, (4) establish legal measures for prosecution of defaulters, (5) prepare Service Contact for Billing and Collection Operations, (6) segregate non-technical and technical losses, and (7) train NEA staff and recommend suitable computer software for Distribution System Planning.

Study tour programs have been completed with teams visiting electric utilities of Bangladesh, Thailand and Philippines to study techniques of controlling non-technical losses in their utilities.

The final report of consulting services has already been submitted by the consultant and has been reviewed by NEA management. The final action plan has been prepared and approved for implementation by the NEA Board.

The total cost of the project is about NRs. 203.5 million. Out of the total project cost ADB will finance US\$ 2.3 million, HMG/N NRs. 13.8 million and the remaining NRs. 41.2 million will be borne by NEA. The project is expected to be completed by the FY 1999/00.

Computerized Billing Project Phase - II

The Computerized Billing Project was conceived to computerize the customer billing and revenue accounting system of NEA with a view to maintaining accurate data of the consumers, aid loss reduction activities, improve revenue collection, provide an improved information

system to the management, provide improved quality and accuracy of bill and enable timely availability of information for preparation of year-end-accounts.

After the successful introduction of Phase I of a Pilot Computerized Billing System in Kathmandu West Branch, in March, 1997, Phase II was initiated to computerize the revenue billing system in the remaining 15 revenue collection centers spread throughout the Kathmandu Valley. This Phase II will cover about 38 percent of the total NEA consumers that contribute about 33% of the total revenue of NEA.

Prior to the extension of the computerized system used in Kathmandu West Branch to the remaining 15 collection centers in Kathmandu Valley, this pilot system was reviewed and necessary changes were subsequently adopted for Phase II. Specification and Tender Documents were accordingly finalized for the procurement of information system, equipment, software and services for a modified system. Preparation of a short list of consulting firms and establishment of prerequisites such as preparation of a consumer database for the implementation of Phase II is also complete. The project will go into the implementation phase once funding is finalized.

Seventh Power Project

The Seventh Power Project, jointly funded by the Asian Development Bank, HMG/N and NEA with revised estimate of US\$ 67.35 million was started in 1990 and has now reached an advanced stage of completion. ADB loan No. 1011 NEP (SF) meant for the Project was wound up on 31st. December 1998 and all activities relating to investment from ADB have been completed. However, small portion of remaining local construction works required for the rural electrification in Ilam, Jhapa, Morang, Sunsari, Siraha, Udaypur, Dhanusha, Mahottari, Sarlahi, Rautahat, Bara, Parsa, Chitwan, Dhading, Nuwakot, Tanahu, Sindhupalchok, Nawalparasi, Gulmi, Arghakhachi, Palpa, Kapilvastu,

Rupandehi, Banke and Surkhet through funding of HMG/N and NEA will continue and is expected to be completed by FY 1999/00.

To achieve the target to electrify 947 villages in those districts, the Project has implemented all activities under the program including reinforcement and rehabilitation of 11 nos. of existing 132 kV and 33 kV substations, construction of 15 nos. of new 33 kV substations, construction of 337 km, of 33 kV transmission lines, construction of 2,703 km, of 11 kV and 3,798 km, of 400 volt distribution lines, procurement of materials and equipment for rural electrification, procurement of office support equipment, procurement of vehicles and establishment of one pre-stressed concrete pole plant.

With the completion of the project about 1,74,470 houses of the 25 districts will receive electrical service connections, benefiting about 10,50,000 people. Physical progress of the Project till 15 July 1999 is estimated at 96.53 percent.

The total investment made by the Project till 15 July 1999 is US\$ 66.39 million. In view of the very satisfactory achievement of the Project, the Asian Development Bank awarded a Certificate of Appreciation to the Project in March 1999.

Training Centre

NEA is in the process of setting up a permanent modern and well equipped Training Centre at Kharipati Bhaktapur. The project was started in 1997 and is heading for completion in the current fiscal year. The project is intended for formulation of training strategy and development of a Training Master Plan, conceptualization, planning, design and construction of the required physical facilities (Academic Building, Auditorium, Workshop, Laboratories, Simulator Room, other infrastructure and amenities) and identification, procurement and installation of the required equipment.

The Training Centre Complex Master Plan and the Training Master

Plan have been prepared and finalized. The construction of the facilities is underway and shall be complete by January, 2000. The facilities under the Project include lecture rooms, seminar rooms, simulator rooms, accommodation for trainees, accommodation for warden, library, administrative block, and central dining. The necessary pedagogical equipment and aids for conducting various training programs have been identified and procured. These include Electrical Equipment and Tools, Heavy Mechanical Equipment and Tools, and Audio-Visual Equipment.

Data Based Digitized GIS Mapping System

As an introduction of GIS to NEA, a pilot project "Data Based Digitized GIS Mapping System" is being carried out in NEAs Kathmandu West Branch. This project is expected to develop analytical capability for calculating technical losses of our system. Data Based Digitized GIS Mapping System is going to build a data bank and GIS maps of all information of electrical parameters. The software to be utilized are ARC INFO, ARC VIEW and ORACLE. The project covers approximately 19000 consumers in urban and rural sectors of Kathmandu West. The information data bank consisting of distribution poles, consumer details, distribution transformers, transmission towers, sub-stations and power houses can be queried, searched and analyzed on a touch of a button. Maps can also be drawn instantly as per requirement. The main objectives are to build a data base using GIS in order to conduct studies on loss reduction and help in inventory management and maintenance of the system.

Digitization works have been completed in six feeders and approximately 9000 consumer household surveys have been completed. In total, nearly 60% of works have been completed. This project is being financed by NEA and is scheduled for completion by mid of December 1999.

Licensing and Tax Implication for Existing NEA System

(resume)

A. For Small Hydropower Projects 1000 kW or less

- ♦ no license required
- ♦ no royalty
- ♦ no corporate income tax

B. For Hydropower Plants greater than 1000 kW

♦ LICENSE

issued by MOWR March 20, 1995

license period 50 years

♦ ROYALTY

for first 15 years :

NRs 100/ kW installed capacity/annum

2% of energy sales

after first 15 years :

NRs 1000/kW installed capacity/annum

10% of energy sales

♦ CORPORATE INCOME TAX

15 year tax holiday thereon 10% less than normally levied

♦ IMPORT FACILITIES

(equipment, machinery, tools and spares)

1% customs duty on items not manufactured in Nepal;

import license fee and sales tax exempted

- ♦ effective from the date of commercial operation

PROJECT STUDIES

Kulekhani-III Hydroelectric Project

Kulekhani-III Hydroelectric Project is a peaking power station located 115-km southwest of Kathmandu. It lies at Bhainse VDC, Makawanpur district on the right bank of Rapti river which is situated near the Hetauda-Bhainse road.

Kulekhani-III HEP primarily utilizes the tailwater from Kulekhani-II HEP (13.5 m³/s). A discharge of 1.5 m³/s from Khanikhola shall be added to it. With the help of a 3.4 km long connecting tunnel a total discharge of 15 m³/s shall be conveyed to Yangrang Khola reservoir. In addition, Yangrang Khola river discharge (0.5 m³/s) shall be added to it by constructing a 45 m high regulating dam. All these discharges comprise a pondage of about 0.5 million m³ in the regulating reservoir. Afterward, this water shall be taken to underground powerhouse through a headrace tunnel of 550 m to generate 40 MW of power for 4 hours peaking. The water shall finally be discharged into the Rapti Khola through a 2100 m long tailrace tunnel. The annual energy generation of this project shall be 59.42 GWh.

For the investigation purpose various works have been completed. These works include

core drilling and seismic refraction survey at tailrace site, topographic survey of whole project area and test-adit (239 m) at different locations.

The estimated cost of the project is 57 million US\$. The Japanese government has been approached for the financing of this project.

Andhi Khola Storage Hydroelectric Project (180 MW)

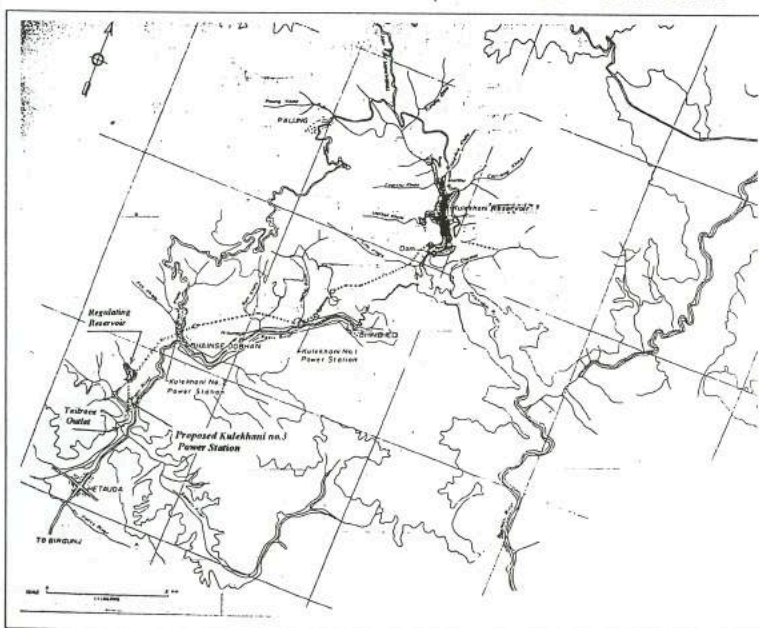
Andhi Khola HEP is a storage type project with an installed capacity of 180 MW and capable of generating 693 GWh including 394 GWh of firm energy annually. This project is located in Syangja district near Galyang bazar in the western development region. The cost of the project according to the 1998 price level is 374 million US\$. The benefit cost ratio is estimated to be 1.56 with an internal rate of return of 15.11 %.

According to the feasibility study, the salient features of the project includes a 157 m high concrete faced rock fill dam capable of storing 336.5 Mm³ of water, out of which 238.7 Mm³ is live storage. The water from the Andhi Khola reservoir will be conveyed by a 3395 m long headrace tunnel, 230 m high drop shaft and 1350 m underground penstock to a semi underground powerhouse equipped with three 60 MW Francis turbines and the water is to be discharged into the Kali Gandaki river through a 85m tailrace.

According to the updated Environmental Impact Assessment Study, the project will affect directly or indirectly about 1192 families (272 of them seriously) of 7 village development committees (Shree Krishna Gandaki, Nibuwa Kharka, Jagatradevi, Pelakot, Tulsu Bhanjyang, Tin Dobato and Thum Pokhara).

Tama Koshi-3 Hydroelectric Project (330 MW)

This is a storage type project on Tama Koshi river in Dolakha district of Central Development Region. The project site is located about 140 km east of Kathmandu. The dam site is located about 2.5 km upstream from Nayapul on the Lamosangu-Jiri road and the



powerhouse is located about 5 km downstream from Nayapul and 500 m upstream from the confluence of Dholi Khola with Tama Koshi. In the FY 1998/99 the Preliminary Investigation works and conceptual level design including dam height optimization of the project was carried out.

With a catchment area at the dam site of 2752 km², a 160 m high rock fill dam, a 7.5 km tunnel, gross head of 214.5 m, and with an installed capacity of 330 MW and a mean annual flow of 144.2 m³/s, it will generate about 1466 GWh of energy annually. It will have a storage capacity of 500 Mm³.

The Project cost according to 1999 price level is 584.44 MUS\$. The benefit cost ratio has been estimated to be 1.58 with an internal rate of return of 14.85%.

Upper Modi 'A' Hydroelectric Project (42 MW)

The Upper Modi 'A' HEP is a 42 MW run-of-river scheme located on Modi Khola in Kaski district of Gandaki Zone. It is situated just upstream of the Upper Modi HEP. The Feasibility Study Phase I of this project was carried out during the fiscal year 1998/99 under NEA financing.

The project has a catchment area of 330 km², mean annual flow 35.5 m³/s, design discharge of 16.71 m³/s, a headrace tunnel of 6300 m and a surface powerhouse with 3 Francis turbines of 14 MW each. The project is capable of generating 279.6 GWh of energy annually including 143.5 GWh of firm energy. NEA will carry out further study of the project in the fiscal year 1999/00.

Dordi Hydroelectric Project (9 MW)

Dordi HEP is a 9 MW run-of-river scheme located on Dordi Khola in Lamjung district of Gandaki Zone. It is about 170 km west of Kathmandu. The Pre-feasibility Study of this project was carried out during the fiscal year 1998/99 under NEA financing.

The project has a catchment area of 267 km², mean annual flow of 20.2

m³/s, design discharge of 8.3 m³/s, a headrace tunnel 3160 m long and a surface powerhouse with 2 Francis turbines of 4.5 MW each. The project is capable of generating 59 GWh of energy annually including 28.5 GWh of firm energy. The power will be evacuated by a 4-km long 132 kV single circuit transmission line up to the substation at Bhote Odar, the proposed powerhouse site of Middle Marsyangdi HEP.

Balephi Hydroelectric Project (15 MW)

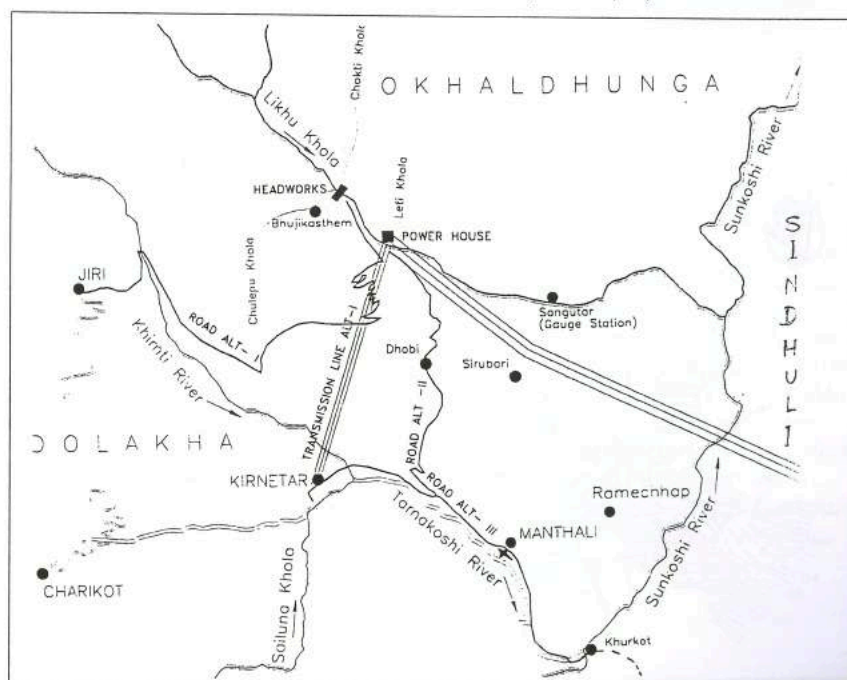
Balephi HEP is a 15 MW run-of-river scheme located on Balephi Khola about 5 km north of Jalbire Bazaar in Sindhupalchowk district of Bagmati Zone. The Pre-feasibility Study of this project was carried out during the fiscal year 1998/99 under NEA financing.

The project has a catchment area of 541 km², mean annual flow of 44.1 m³/s, design discharge of 23.5 m³/s, headrace tunnel 4400 m long and a surface powerhouse with 3 Francis turbines of 5 MW each. The project is capable of generating 95 GWh of energy annually including 46.6 GWh of firm energy.

The estimated project cost is 41.5 MUS\$ at 1999 price level. The benefit cost ratio and internal rate of return of this project are estimated to be 1.45 and 14.41% respectively.

Likhu - IV Hydroelectric Project

The project is located on Likhu Khola in Ramechhap and Okhaldhunga districts of central Nepal about 36 km. from Tilpu. The project is a peaking run-of-river scheme with an installed capacity of 40 MW. With a gross head of 247.2 m., it will generate annual and firm energies of 235 GWh and 179 GWh respectively. It consists of a 43 m high concrete dam with gated spillways, a double chamber 90 m long surface desanding basin, a 3.45 m diameter and 4.3 km long concrete lined headrace tunnel, a surge shaft with restricted orifice, a high pressure shaft and a surface powerhouse equipped with two units of 20 MW Francis turbines. The power will be evacuated by a 25 km long single circuit 132 kV transmission line connecting the central grid at the Khimti HEP. The total estimated project cost is US \$ 76 million at 1999 price level. According to the Formulation Report the project will start on



May 2001 and is expected to be on line by the end of 2006.

The feasibility study of this project was completed in 1998 under the Medium Hydro Study Project by Canadian Water and Energy Consultant with Joint Venture of ITECO Nepal, Shah Consult and Integrated Research Application and Development as the sub consultant. This feasibility study had recommended a power plant of 51 MW capacity with an average energy generation of 275 GWh. However, during the Detailed Engineering Study, the installed capacity has been optimized to be 40 MW based on the modified firm flows and pondage volume requirements and latest information on geology. A 36 km access road will be required for the construction of the project. Joint Venture of Silt Consult and Full Bright Consultancy has been selected for carrying out the Detail Engineering of the access road and the work is in progress.

The financing required for the implementation of this project has yet to be made. NEA is financing NRs. 16,42,480 for the Detailed Engineering of above access road.

Chameliya Hydroelectric Project

After the upgraded feasibility study carried out by NEA in 1996/97, detailed study of the project is being carried out in association with SRC Lab NEA. The present scheme is a peaking run of river type with an installed capacity of 30 MW. The project is expected to generate 196 GWh annually. The project is located in Darchula district about 18 km north-east of Gokuleswor on the Baitadi-Darchula road. The main features of the project with 3 units each of 10 MW vertical shaft Francis turbines and 265 m long box culvert type tailrace. Power will be evacuated by 127 km long 132 kV transmission lines from Chameliya switchyard to Atariya sub-station. Out of the total 18 km long access road, the earth work and the structural works of the 10 km portion has been completed by the end of FY 1998/99. Meanwhile the construction works for the 40 m span bridge on Chameliya river at Karkale has been initiated.

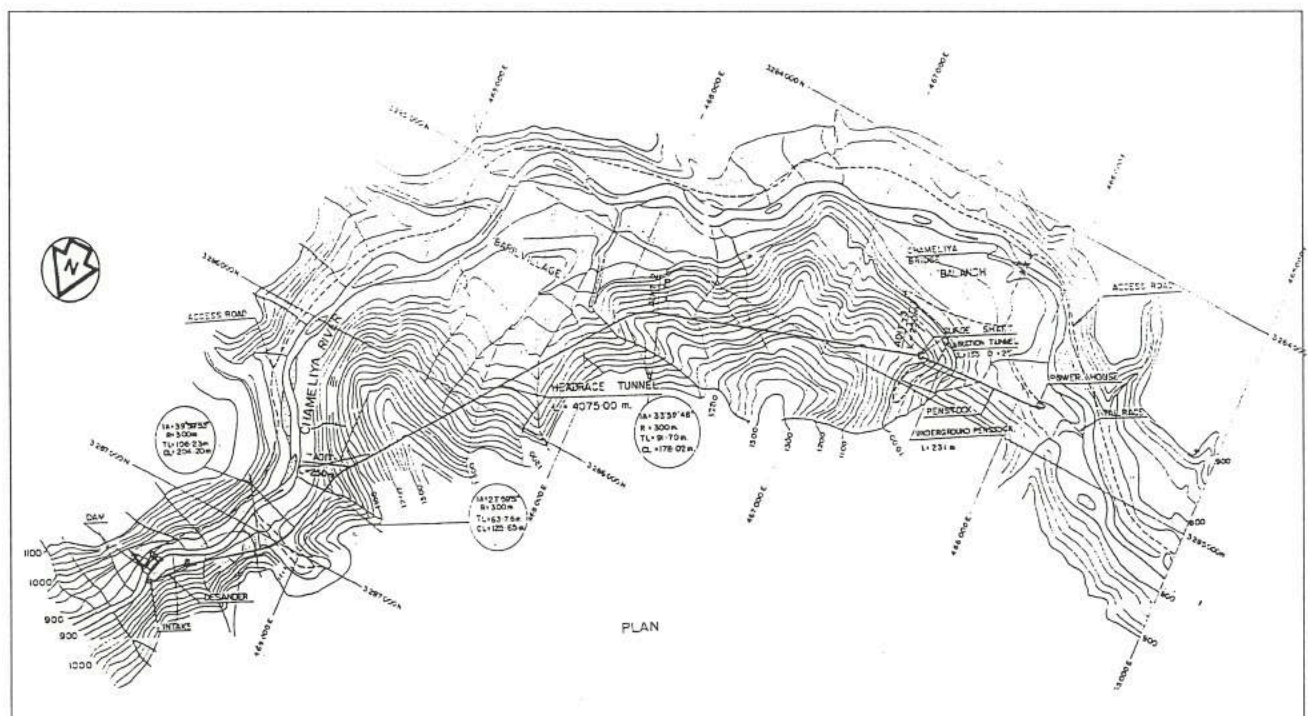
The survey licence of the project is jointly owned by NEA and Nepal Industrial Development Co-operation

(NIDC). The total cost of the project is estimated at US\$ 77 million.

Identification and Feasibility Study of Storage Project

NEA is planning to conduct a study on "identification and feasibility study of a storage project" within the next two years. Objective of this study is to identify storage project of medium size that can be taken up for implementation in the near future in order to augment the supply of regulated energy in the Nepalese power grid. The work plan are divided into three phases (i) coarse screening and ranking study, (ii) fine screening and ranking study and (iii) feasibility study. During the current fiscal year, the field investigation part such as survey, seismic, environmental, conceptual layout and 100 m exploratory drilling shall be completed.

The storage projects that have been studied up to feasibility study are Andhi Khola, Dudh Koshi, Kankai Multipurpose Project and Bagmati Multipurpose Project. In order to proceed with the study of the storage projects, the scope of work has been



outlined as follows : (a) preparing the list of storage project ranging from 10 MW to 300 MW, (b) new site identification for storage projects, (c) to see the possible conversion of listed ROR and PROR into storage project, (d) coarse screening and ranking study of those identified storage project and recommendation of good storage projects for fine screening. The total number of project shall be ten, (e) site visit of all the storage project thus screened and prefeasibility level study of all the projects, (f) fine screening and ranking study of projects and recommendation of better storage project/s for feasibility study. The total installed capacity should ranges up to 300 MW, (g) detail site investigation of one project that includes environmental study, geology and geotechnical study, hydro-sedimentological study and GLOF study if any, (h) detail feasibility study of one project.

Birgunj Corridor Reinforcement :

Birgunj corridor comprising of Simra, Parawanipur and Birgunj is one of the major industrial area in Nepal. The corridor's power demand is presently being supplied from Hetauda substation through a double circuit 66 kV transmission line. This overloaded line has created a serious low-voltage problem in the Corridor. At the same time, additional power for new industries is putting increasing pressure on the 66 kV system. To eliminate the existing power supply problems the proposed scheme for reinforcement of the corridor constitutes the construction of the following : (a) 132 kV, double circuit transmission line from Pathlaiya to Birgunj area, (b) 132 kV, switching station in Pathlaiya, (c) 132/11 kV substation in Parwanipur, (d) 132/33/11 kV substation in Chandranighapur and (e) substation reinforcement works in Hetauda and Dhalkebar.

The implementation of the project is expected to commence from 2000, and be completed by the end of 2002. The project is estimated to cost US\$ 18 million and is currently held up for lack of funds.

Hetauda-Bardaghat 220 kV Transmission Line Project :

This line is urgently required for the system stability, reliability and for evacuation of power generated by Kali Gandaki Hydro Electric Project. It constitutes of a 150 km, 220 kV double circuit transmission line from Hetauda to Bardaghat, and substations in Hetauda, Kawaswoti and Bardaghat. Initially it will be charged at 132 kV, later on it will constitute part of Integrated Nepal Power System (INPS) east-west 220 kV trunk transmission line. The project which should be ready by the commissioning time of Kali-Gandaki has not been able to take-off due to funding problem. The project is estimated to cost US\$ 32 million and was initiated on the assumption of being financed by the World Bank under the Power Development Project (PDP). As PDP is uncertain, talks are underway with the Danish Government for the implementation of this project.

Siuchatar-Chapagoan-Budhanilkantha 132 kV Transmission Line Project :

Main component of the project consists of a 45 km long double circuit 132 kV transmission line from existing Siuchatar Substation to Bhaktapur Substation along the southern outskirts of the Kathmandu Valley. The project scope includes the construction of 3 new substations in Thankot, Chapagoan and Chapali. The project will also take up the augmentation of transformer capacities at Bhaktapur substation. With the implementation of the project, more than 100 MVA transformer capacity will be added to the system along with 15 MVAR capacitor banks for power factor improvement.

The completion of the project will create the much needed 132 kV ring line, which will contribute substantially to improve the system stability, operational flexibility and reliability of power supply in Kathmandu Valley.

Environmental Impact Assessment study of the project will be completed

in the current fiscal year and the feasibility study of the project is being carried out by consultants under the Technical Assistance of ADB. The cost of the project, estimated at US\$ 22.5 million is under the active consideration to be borne jointly by ADB, HMG/N and NEA. The project is scheduled for completion by the end of 2001.

Banepa-Panchkhal Substation Project :

Construction of 10/12.5 MVA, 66/11 kV substation at Banepa and 3 MVA, 66/11 kV substation at Panchkhal are proposed under this Project. The Panchkhal substation is necessary to evacuate the energy from the 5 MW Indravati power station. The Banepa substation will improve the supply condition of Banepa, Dhulikhel and Panauti municipalities. It will reduce system losses and improve voltage regulation in that area. The cost of the Project is estimated to be Rs. 228 million. Government of Norway was requested for the funding of this project. At present NEA has initiated the project from its own resources.

Subtransmission and Distribution Network Development Project

The project has completed the techno-feasibility study for Rural Electrification and Distribution System Reinforcement (RE/DSR) schemes of 19 districts of Far Western, Mid Western, Western and Central Regions of Nepal. These districts are, Darchula, Baitadi, Dadeldhura, Doti, Achham, Dailekh, Surkhet, Bardia, Banke, Salyan, Rolpa, Dang and Pyuthan from the Mid and Far Western regions, Baglung, Parbat and Syangja from the Western region and Lalitpur, Bhaktapur and Kavre from the Central region. More in depth studies need to be carried for this project and most importantly, financial arrangements need to be made for implementing it.

BALANCE SHEET AS OF JULY 15

in million NRs

EQUITY AND LIABILITIES	1998*	1997	1996	1995	1994	1993	1992	1991	1990
Equity									
Share Capital	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0
Share Allotment Suspense	11,324.3	9952.6	8,231.6	7,122.9	5,796.7	5,190.6	3,956.8	3,916.8	3,146.4
Capital Reserve	158.6	158.8	158.6	147.9	137.6	120.9	88.3	67.6	56.8
Reserves & Surplus	1,382.0	1046.5	359.0	(319.5)	(346.0)	(444.6)	(550.8)	(500.3)	(75.6)
Revaluation Surplus	11,968.0	13421.4	14,799.3	14,286.1	14,238.3	13,988.0	13,421.7	12,369.4	12,065.3
Insurance Fund	140.0	120.00	100.0	80.0	0	0	0	0	0
Total Equity	25972.9	25699.3	24,648.5	22,317.4	20,826.6	19,854.9	17,916.0	16,853.5	16,192.9
Long-Term Liabilities									
Long-Term Loan	20,848.9	17403.2	14,900.4	13,367.2	12,880.6	11,649.5	10,070.4	8,812.3	2,422.8
Total Long-Term Liabilities	20,848.9	17403.2	14,900.4	13,367.2	12,880.6	11,649.5	10,070.4	8,812.3	2,422.8
Current Liabilities & Provisions									
Deposit from Customers	59.5	76.8	61.6	90.5	36.0	42.4	25.5	24.8	20.4
Other Deposit	677.5	407.7	359.3	235.0	183.2	84.5	42.5	21.3	14.7
Creditors for Goods	49.3	32.4	15.7	28.9	5.9	11.2	12.8	10.3	11.6
Other Creditors	201.6	429.1	26.1	22.6	31.1	16.8	40.3	59.4	36.3
Payable to Others for power purchase	377.6	4.3	6.6	8.3	11.6	4.6	18.4	106.6	136.8
Payable to HMG for Interest (Other)	877.1	647.6	319.0	407.8	270.0	224.5	21.4	192.7	198.9
Payable to HMG for Other (int)	1036.5	440.4	102	263.2	648.8	171.8	80.1	201.6	129.2
Royalty Payable	398.7	473.8	585.0	358.0	-	-	-	-	-
Provision for Bonus	41.1	38.1	31.5	16.6	11.9	6.4	2.4	2.4	3.3
Provision for Gratuity & Pension	140.3	140.3	140.3	140.3	140.3	140.3	140.3	140.3	140.3
Provision for Medical Facilities	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7
Provision for Accumulated Leave	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4
Provision for Wealth Tax	28.5	22.5	17.5	14.5	11.5	8.5	2.5	-	-
Provision for Income Tax	214.4	178.1	104.8	34.4	34.5	7.2	7.2	7.2	28.4
Total Current Liabilities & Provisions	4,136.2	2925.2	1803.7	1,654.2	1,416.9	752.3	427.5	800.7	754.0
Inter Unit Balance (Net)	-	-	-	-	34.9	52.7	71.7	19.0	28.4
TOTAL LIABILITIES AND EQUITY	50,958.0	46,027.7	41,352.5	37,338.8	35,124.1	32,291.6	28,466.6	26,538.2	19,388.7

* Subject to final audit

BALANCE SHEET AS OF JULY 15

in million NRs

ASSETS	1998*	1997	1996	1995	1994	1993	1992	1991	1990
Fixed assets									
Land	727.0	696.1	706.0	665.3	636.4	611.4	578.9	537.6	499.9
Buildings	885.5	789.7	798.8	755.1	646.4	601.3	573.7	535.0	451.7
Hydraulic Plant & Machinery	16,791.8	16180.3	16174.1	15,951.7	15,802.5	15,490.0	15,171.2	14,568.0	9,872.3
Internal Combustion P & M	594.1	651.0	708.0	716.9	737.2	752.0	175.6	178.4	177.6
Solar Power Plant	34.7	36.2	37.6	39.0	40.5	41.9	43.3	45.1	46.2
Transmission Line	2656.0	2837.9	3,057.3	3,024.9	2,704.6	1,815.0	1,825.8	1,797.6	1,696.4
Substation	2432.9	2651.5	2,901.0	2,959.5	3,038.4	2,414.2	2,436.4	2,404.5	2,408.4
Distribution Line	5630.6	4535.0	4,750.1	3,983.4	3,042.6	2,244.0	2,226.5	2,142.8	1,479.2
Meter & Metering Equipment	89.4	85.8	100.3	112.5	97.4	59.7	56.3	50.4	40.6
Consumer Service	25.6	31.2	37.0	42.8	48.4	50.3	52.7	52.9	51.9
Public Lighting	18.1	17.5	16.3	16.3	14.4	15.0	15.5	15.9	16.3
Tools and Instrument	20.2	17.0	13.3	12.4	7.6	5.2	5.4	5.3	5.4
Vehicles	80.5	55.8	92.4	85.4	37.9	10.8	8.9	18.9	26.9
Furniture & Office Equipment	76.0	46.3	43.4	46.4	39.8	14.8	13.9	14.0	12.3
Miscellaneous	1.2	2.1	3.0	2.0	0.4	0.2	0.3	0.3	0.2
Total Fixed Assets	30,063.6	28633.4	29,438.3	28,413.6	26,894.5	24,126.2	23,184.6	22,366.7	16,785.3
Other Assets									
Capital Works in Progress	14,655.2	11974.6	7,362.7	5,229.1	5,439.3	6,250.1	3,816.4	2,890.0	1,498.4
Investment in Securities	248.0	150.6	54.0	30.5	356.7	79.0	30.4	8.1	8.1
Total Other Assets	14903.2	12125.2	7416.7	5,259.6	5,796.0	6,329.1	3,846.8	2,898.1	1506.5
Deferred Expenditure	110.4	267.3	410.8	588.5	98.6	108.6	121.0	169.8	226.3
Intern Unit Balance (Net)	241.2	133.2	335.7	144.5	143.7	-	-	-	-
Current Assets									
Inventories	914.9	804.0	617.9	429.1	340.4	289.5	270.4	250.8	217.0
Accounts Receivable	1435.4	1209.1	1,040.0	682.6	569.9	474.8	576.0	556.1	357.0
Advances Recoverable	1709.6	1329.0	848.4	471.7	149.8	145.8	113.8	122.2	154.2
Cash & Bank	1579.6	1526.5	1244.7	1,349.2	1,131.2	817.6	354.0	174.5	142.4
Total Current Assets	5639.6	4868.6	3751.0	2,932.6	2,191.3	1,727.7	1,314.2	1,103.6	870.6
TOTAL ASSETS	50958.0	46027.7	41352.5	37,338.8	35,124.1	32,291.6	28,466.6	26,538.2	19,388.7

* Subject to final audit

PROFIT & LOSS FOR THE YEAR ENDED JULY 15

in million NRs

Particulars	1999**	1998*	1997	1996	1995	1994	1993	1992	1991	1990
A. Revenue										
Net Sale of Electricity	5420.6	5082.5	4767.3	3,728.9	3,218.5	2437.4	1,786.8	1,440.4	960.9	760.1
Income from Other Services	186.1	157.6	135.0	111.2	99.9	13.8	8.6	5.6	18.2	15.9
Interest & Other Income	163.3	192.6	181.3	172.0	145.1	160.5	109.0	68.2	13.5	9.4
Total-A	5770.0	5432.7	5083.6	4,012.1	3,463.5	2,611.7	1,904.4	1,514.2	992.6	785.4
B. Operation & Maintenance Expenditure										
Operation & Maintenance & General Expenses	1679.4	1554.5	1049.4	942.0	838.3	697.1	604.8	499.3	379.7	291.0
Power Purchase	897.1	845.6	659.5	359.6	340.0	214.1	162.1	111.3	50.5	171.5
Provision for Expenses	25.0	109.3	80.5	45.9	7.7	8.5	7.0	8.7	—	48.8
Bad debts written off	—	—	—	—	—	—	—	—	0.3	0.2
Royalty	396.7	348.9	268.8	227.0	186.8	—	—	—	—	0.3
Depreciation	1650.0	1544.9	1482.2	1,455.3	1,296.0	1,202.4	1,026.0	953.6	879.7	683.9
Deferred Expenditure Written off	158.7	175.3	188.7	204.4	162.0	66.5	53.6	45.1	56.6	56.6
Total-B	4806.9	4578.5	3729.1	3,234.2	2,830.8	2,188.6	1,853.5	1,618.0	1,366.5	1,252.1
C. Net Operating Surplus (Deficit) (A-B)	963.1	854.2	1354.5	777.9	632.7	423.1	50.9	(103.8)	(373.9)	(466.7)
Loss of Capital Assets	—	—	—	—	35.8	—	—	—	—	—
Interest on Long-Term Loans	(1312.2)	(1317.2)	(1207.5)	(813.5)	(797.0)	(716.6)	(625.5)	(632.2)	(635.1)	(129.0)
Profit and (Loss) before Prior Year's income & Expenses Adjustment	(349.1)	(463.0)	147.0	(35.5)	(164.2)	(329.3)	(574.6)	(736.0)	(1009.0)	(575.7)
Prior year Income / Expenses Adjustment	(50.0)	11.3	(176.6)	(99.0)	(397.0)	(411.7)	(48.8)	75.6	15.4	41.4
Profit & (Loss) after Prior Year Adjustment	(399.1)	(451.7)	(29.6)	(134.5)	(561.4)	(741.0)	(623.4)	(660.4)	(993.6)	(637.1)
Transfer from Revaluation Surplus	950.0	843.4	883.3	907.5	671.6	869.2	729.6	610.0	568.9	522.0
Excess Provision Corporate Tax written back (1993-94)	—	—	—	—	10.4	—	—	—	—	—
Net Profit (Loss) Before Tax	550.9	391.7	853.7	773.0	120.7	128.2	106.2	(50.4)	(424.7)	(115.1)
Interest Tax	—	5.0	5.0	7.7	3.9	2.4	—	—	—	—
Corporate Tax	167.1	31.1	141.3	66.7	10.4	27.2	—	—	—	—
Net Profit/(Loss) after Tax	383.8	355.6	707.4	698.6	106.4	98.6	106.2	(50.4)	(424.7)	(115.1)
Transfer to Insurance Fund	20.0	20.0	20.0	20.0	80.0	—	—	—	—	—
Net Profit/(Loss) after Appropriation	363.8	335.6	687.4	678.6	26.4	98.6	106.2	(50.4)	(424.7)	(115.1)

* Subject to final audit ** Provisional Figures

HIGHLIGHTS OF 1998/99

Description	1999**	1998*	Increase/Decrease	
			Amount	Percent
Total Revenue Net (M. NRs)	5770.0	5432.7	337.3	6.2
Net Sale of Electricity (M. NRs)	5420.6	5082.5	338.1	6.7
Income from Other Services (M. NRs)	349.4	350.2	(-)0.8	(-)0.2
Operating Expenses,				
Including Depreciation (M. NRs)	4806.9	4578.5	228.4	4.99
Depreciation (M. NRs) + +	1650.0	1544.9	105.1	6.8
Net Income, after interest before tax (M. NRs)	550.9	391.7	159.1	40.6
Interest on Long-Term Loans (M. NRs)	1312.2	1317.2	(-)5.0	(-)0.4
Long-Term Loans (M. NRs)	25982.6	20,848.9	5133.7	24.62
Net Fixed Assets (M. NRs)	30,988.0	30,063.6	924.4	3.1
Number of Customers	620,000	574,849	45,151	7.85
Total Sales Of Electricity (GWh)	1112.886	1051.429	61.457	5.8
Internal Sale (GWh)	1052.886	984.019	68.867	7.0
Average Consumer's Consumption (KWh) +	1698.2	1711.78	(-) 13.58	(-) 0.8
Average Price Of Electricity (NRs/KWh) +	5.07	5.05	0.02	0.4
Peak Load Interconnected System (MW)	326.4	317.0	9.4	3.0
Total Available Electric Energy (GWh)	1475.0	1373.17	101.83	7.42
Hydro Generation (GWh)	1046.51	971.96	74.55	7.67
Purchased Energy (GWh) India	232.39	210.29	22.1	10.51
BPC	77.28	83.47	(-)6.19	(-)7.42
Exported Energy (GWh)	60.00	67.41	(-)7.41	(-)10.99
Thermal Generation (GWh)	118.82	107.45	11.37	10.58
Net System Losses (Percentage)	22.95	23.40	(-)0.45	(-)1.92

Note:

- * Subject to final audit
- ** Provisional figures
- + Internal
- + + On revalued assets

TARIFF RATES

(effective from May 14, 1996)

CATEGORY A : DOMESTIC CONSUMERS					
A.1	Minimum Monthly Charge:	Minimum Charge		Exempt	
	METER CAPACITY	(NRs.)		(KWh)	
	Upto 5 ampere	60.00		20	
	6-30 ampere	160.00		40	
	31-60 ampere	360.00		80	
	Three phase supply	960.00		200	
A.2	Energy charge:				
	Upto 20 units	Rs. 3.99 per unit			
	21-250 units	Rs. 5.00 per unit			
	Over 251 units	Rs. 7.75 per unit			
CATEGORY B : TEMPLES					
	Energy charge	Rs. 3.60 per unit			
CATEGORY C : INDUSTRIAL					
	SUB-CATEGORY	Demand Charge (Rs/kVA)	Energy rates (Rs/unit)		
			Peak time*	Off-Peak	Average
C.1	Low voltage (400/230 volt)				
	Rural and cottage	20.00	-	-	4.00
	Small Industry	40.00	-	-	4.90
C.2	Medium voltage (11 & 33kV)	84.00	4.90	3.96	4.40
C.3	High voltage (66 kV and above)	76.00	3.90	3.15	3.50
CATEGORY D : COMMERCIAL					
D.1	Low voltage (400/230 volt)	100.00	-	-	5.80
D.2	Medium voltage (11 & 33 kV)	96.00	6.35	5.13	5.70
CATEGORY E : NON-COMMERCIAL					
E.1	Low voltage (400/230 volt)	68.00	-	-	5.80
E.2	Medium voltage (11 & 33 kV)	76.00	6.35	5.13	5.70
CATEGORY F : IRRIGATION **					
F.1	Low voltage (400/230 volt)				
	Upto 10 kVA	-	-	-	2.50
	Above 10 kVA	-	-	-	2.50
F.2	Medium voltage (11 & 33 kV)	20.00	2.79	2.25	2.50
CATEGORY G : WATER SUPPLY					
G.1	Low voltage (400/230 volt)	60.00	-	-	3.00
G.2	Medium voltage (11 & 33 kV)	64.00	3.29	2.65	2.95
CATEGORY H : TRANSPORTATION					
H.1	Medium voltage (11 & 33 kV)	76.00	3.45	2.79	3.10
CATEGORY I : STREET LIGHTS					
I.1	Street lights with meter	-	-	-	3.60
I.2	Without meter	1300.00	-	-	-
CATEGORY J : TEMPORARY SUPPLY					
J.1	With meter	-	-	-	9.3

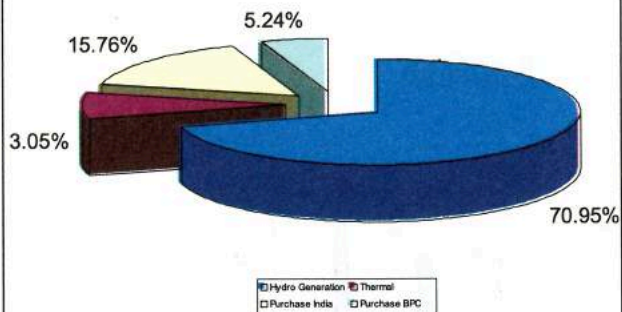
Note : If demand meter reads kilowatts (kW) then kVA = kW/0.8

* TOD Tariff is effective from November 17, 1998

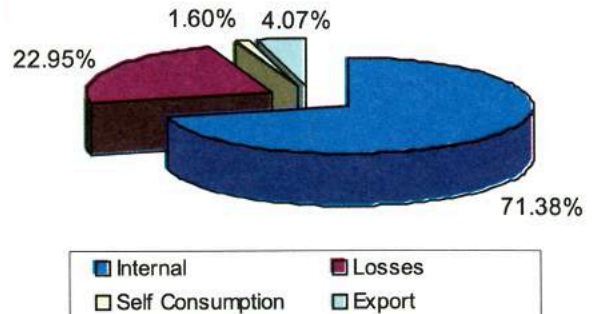
** Tariff for irrigation is effective from July 17, 1998

Peak time : 1800-2200 hrs; Off peak : 2200-0400 hrs; Normal : 0400-1800 hrs.

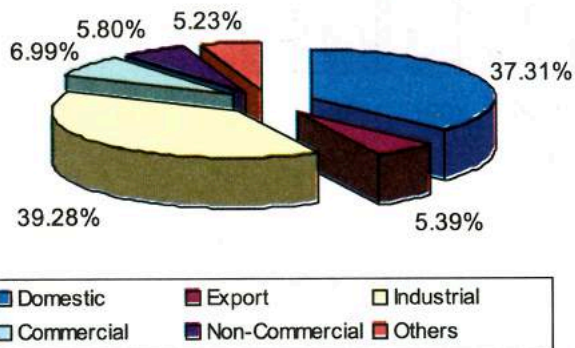
AVAILABILITY FY1999



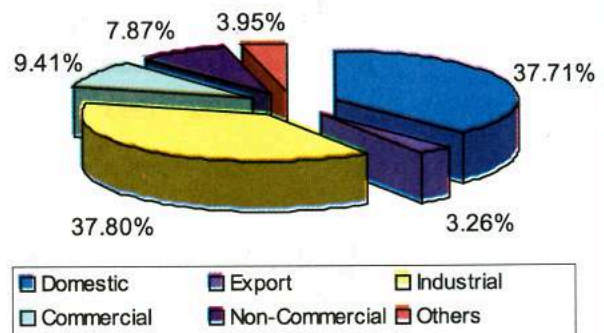
UTILIZATION FY1999



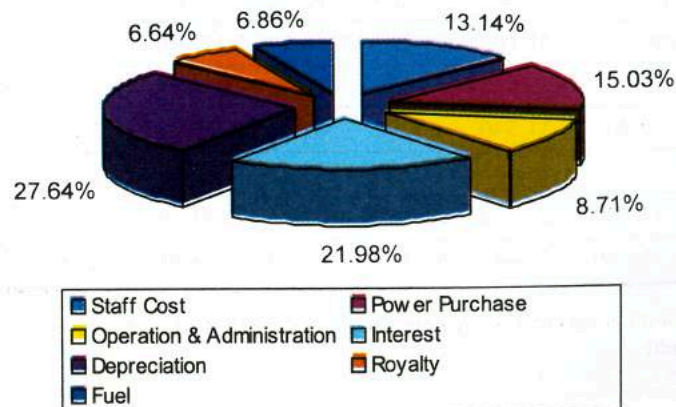
SALES FY1999



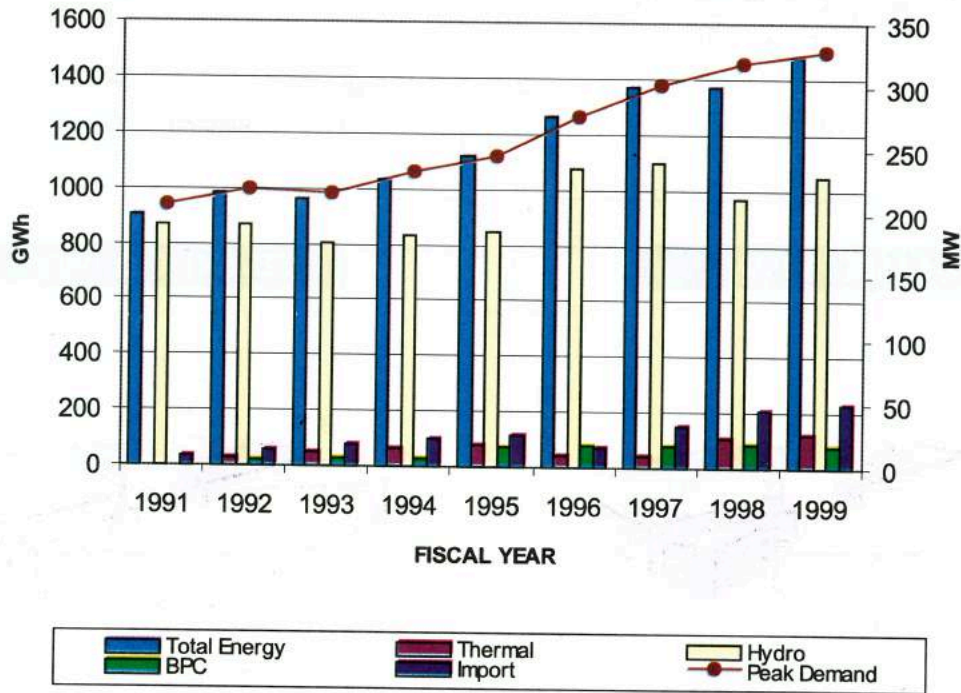
REVENUE FY1999



EXPENDITURE FY1999



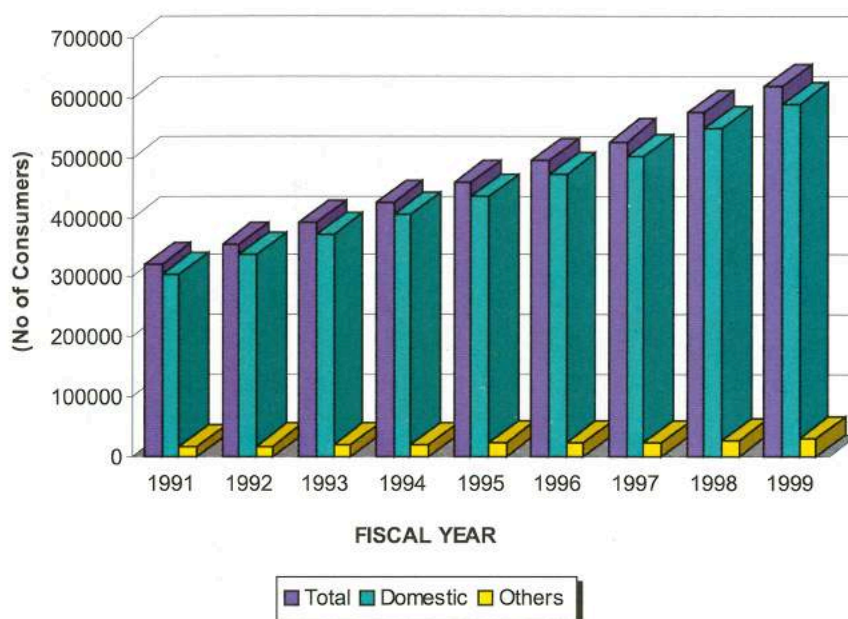
TOTAL ENERGY AVAILABLE AND PEAK DEMAND



Particulars	1991	1992	1993	1994	1995	1996	1997	1998*	1999**
Peak Demand (MW)*	204.000	216.000	214.04	231.0	244.0	275.0	300.11	317.00	326.4
Available Energy (GWh)	906.283	981.105	963.314	1030.89	1,117.46	1,261.96	1,368.58	1,373.17	1475.00
1. Hydro	870.203	869.980	804.050	835.48	848.74	1,072.75	1,096.64	971.96	1046.51
2. Diesel	0.800	31.540	47.290	62.20	80.92	36.64	39.73	107.45	118.82
3. Purchase from	35.280	79.585	111.974	133.21	187.80	153.57	232.21	293.76	309.67
(a) India	33.700	54.938	82.223	102.77	113.84	72.96	153.98	210.29	232.39
(b) Butwal Power Co.	1.580	24.647	29.7511	30.44	73.96	80.61	78.23	83.47	77.28

Note:- Peak demand is for all areas covered by integrated system including supply to India.
 * Subject to final audit
 ** Provisional figures

GROWTH OF CONSUMERS

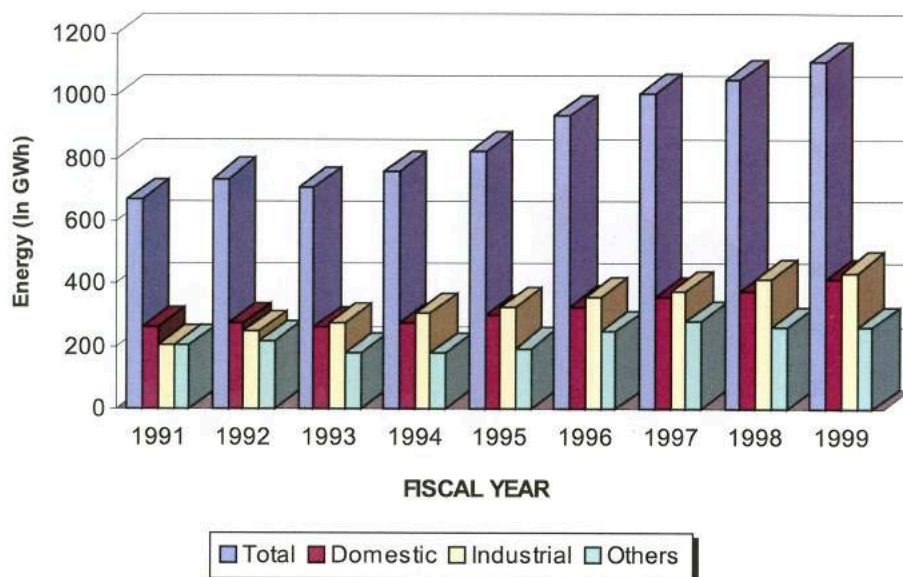


Particulars	1991	1992	1993	1994	1995	1996	1997	1998*	1999**
Domestic	3,04,480	3,37,715	3,71,975	4,04,452	4,36,631	4,71,599	503,330	548,110	590,920
Non-Commercial	5,633	6,065	6,340	6,321	6,369	6,548	6338	7,192	7,700
Commercial	1,827	1,378	1,536	1,848	2,008	2,162	2441	2,637	3,005
Industrial	8,382	9,113	9,595	10,737	11,480	12,329	12928	14,062	15,210
Water Supply	119	124	131	155	166	177	190	205	220
Irrigation	420	512	463	590	630	712	713	776	800
Street Light	532	547	367	375	420	456	482	683	772
Temporary Supply	136	191	183	188	189	187	155	175	200
Transport	9	8	8	15	8	8	8	12	8
Temple	247	335	398	525	698	782	867	992	1160
Total (Internal Sales)	3,21,785	3,55,988	3,90,996	4,25,206	4,58,599	4,94,960	527,452	574,844	619,995
Bulk Supply (India)	5	5	4	5	5	5	5	5	5
Grand Total	3,21,790	3,55,953	3,91,000	4,25,211	4,58,604	4,94,965	5,27,457	574,849	620,000

Note :- * Subject to final audit

** Provisional figures

ELECTRICITY SALES

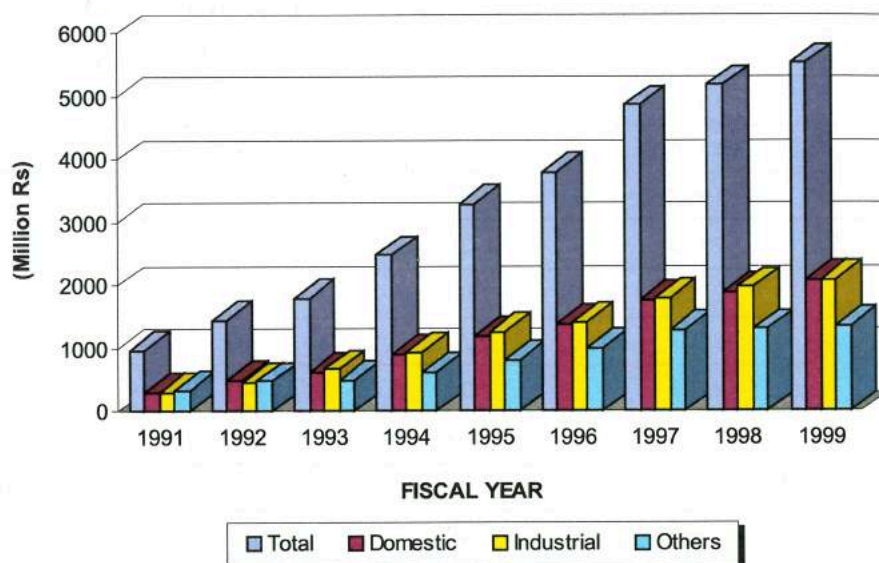


(in GWh)

Category	1991	1992	1993	1994	1995	1996	1997	1998*	1999**
Domestic	261.399	275.248	259.833	275.050	301.611	328.730	355.118	378.778	415.245
Non-Commercial	46.230	46.684	47.607	47.148	53.225	53.464	57.991	60.227	64.494
Commercial	36.640	45.200	47.607	48.988	58.574	62.916	67.606	71.471	77.788
Industrial	206.881	246.374	273.753	303.991	328.316	358.672	376.742	413.738	437.148
Water Supply & Irrigation	27.682	27.705	24.113	19.401	27.636	25.091	27.978	29.045	23.443
Street Light	7.308	7.802	8.068	8.857	12.173	16.720	20.929	26.585	29.725
Temporary Supply	0.428	1.003	0.924	0.561	1.225	1.154	0.844	0.711	0.700
Transport	1.825	1.506	1.395	1.338	1.455	1.432	1.483	1.663	2.242
Temple	0.369	0.419	0.460	0.658	0.892	1.503	1.691	1.801	2.101
Total (Internal Sales)	588.760	651.941	663.248	705.992	785.108	849.682	910.382	984.019	1052.886
Bulk Supply	80.640	85.411	46.137	50.514	39.479	87.014	100.218	67.410	60.000
Grand Total	669.400	737.352	709.385	756.506	824.587	936.696	1010.600	1051.429	1112.886

Note :- * Subject to final audit ** Provisional figures

REVENUE



(in million Rs)

Category	1991	1992	1993	1994	1995	1996	1997	1998*	1999**
Domestic	311.686	490.642	621.398	916.332	1,195.389	1,379.456	1769.839	1895.845	2080.375
Non-Commercial	91.708	140.909	181.076	219.807	284.478	307.246	386.359	405.142	434.043
Commercial	75.634	136.319	186.005	235.781	310.911	349.628	446.964	477.044	518.849
Industrial	307.005	473.082	669.244	936.901	1,260.125	1,406.731	1801.576	1973.372	2085.198
Water Supply & Irrigation	27.530	31.406	36.194	39.526	70.091	68.400	95.701	100.277	80.880
Street Light	8.767	15.629	16.949	27.625	41.835	53.042	80.111	101.977	114.145
Temporary Supply	1.483	3.980	4.880	3.699	6.886	11.840	7.991	7.170	6.514
Transport	2.138	2.429	2.118	2.985	3.993	4.198	6.090	6.511	8.790
Temple	0.182	0.441	0.693	1.480	3.320	4.556	6.208	6.711	7.838
Total (Internal Sales)	826.135	1,294.837	1,718.557	2,384.136	3,177.028	3,585.097	4600.839	4974.049	5336.632
Bulk Supply (India)	135.064	145.783	75.462	91.364	97.566	206.720	249.292	199.915	180.000
Gross Revenue	961.199	1,440.620	1,794.019	2,475.500	3,274.594	3,791.817	4850.131	5173.964	5516.632

Note :- * Subject to final audit

** Provisional figures

The Revenue figures do not include rebate and penalty

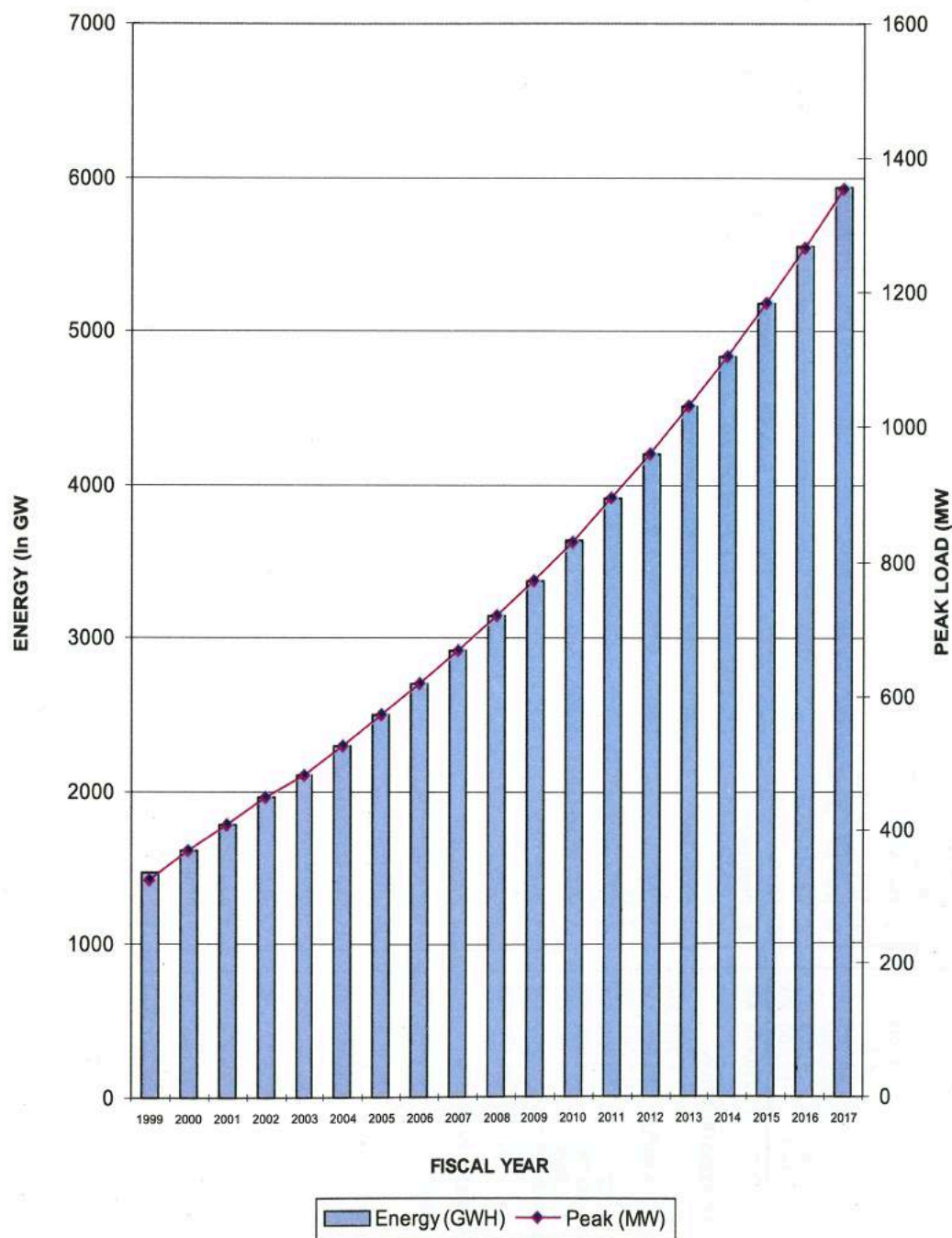
LOAD FORECAST

for Integrated Nepal Power System (INPS)

Year	Energy (GWH)	Growth (%)	Peak (MW)	Growth (%)
1999*	1475	-	326.4	-
2000	1617	9.63	369	13.05
2001	1788	10.58	408	10.57
2002	1967	10.01	449	10.05
2003	2110	7.27	482	7.35
2004	2300	9.00	525	8.92
2005	2502	8.78	571	8.76
2006	2702	7.99	617	8.06
2007	2922	8.14	667	8.10
2008	3150	7.80	719	7.80
2009	3377	7.20	771	7.23
2010	3637	7.70	830	7.65
2011	3914	7.62	894	7.71
2012	4205	7.43	960	7.38
2013	4514	7.35	1031	7.40
2014	4840	7.22	1105	7.18
2015	5185	7.13	1184	7.15
2016	5550	7.04	1267	7.01
2017	5937	6.97	1355	6.95
Average Growth		8.04		8.23

* Historical

LOAD FORECAST



MAJOR HYDRO PROJECT

EXISTING	
1. PANAUTI	2,400 KW
2. TRISULI	24,000 "
3. SUNKOSI	10,050 "
4. GANDAK	15,000 "
5. KULEKHANI NO. 1	60,000 "
6. DEVIGHAT	14,100 "
7. KULEKHANI NO. 2	32,000 "
8. MARSYANGDI	75,000 "
9. ANDHI KHOLA (BPC)	5,100 "
10. JHIMRUK PIUTHAN	12,300 KW
TOTAL	250,450 KW
UNDER CONSTRUCTION	
11. PUWA KHOLA	6,200 KW
12. KHIMTI KHOLA (HPL)*	60,000 KW
13. MODI KHOLA	14,000 KW
14. CHILIME (CPC)*	20,000 KW
15. KALI GANDAKI "A"	144,000 KW
16. BHOTEKOSHI(BKPC)*	36,000 KW
17. INDRAWATI (NHPC)*	5,000 KW
TOTAL	285,200 KW
PLANNED & PROPOSED	
18. MIDDLE MARSYANGDI	61,000 KW
19. SETI (WEST)	750,000 "
20. ARUN 3	402,000 "
21. BUDHI GANDAKI	600,000 "
22. KALI GANDAKI No 2	660,000 "
23. LOWER ARUN	308,000 "
24. UPPER ARUN	335,000 "
25. KARNALI (Chisapani)	10,800,000 "
26. UPPER KARNALI	300,000 "
27. CHAMELIA	30,000 "
28. PANCHESHWAR	6,480,000 "
29. THULO DUNGA	25,000 "
30. TAMURMEWA	100,000 "
31. Dudh LOSJI (Storage)	300,000 "
32. BUDHI GANGA	20,000 "
33. RAHUGHAT KHOLA	27,000 "
34. LIKHU-4	40,000 "
35. KABELI "A"	30,000 "
36. UPPER MARSYANGDI	121,000 "
37. UPPER MODI	14,000 "
38. KULEKHANI NO. 3	40,000 "
39. ANDHI KHOLA (Storage)	180,000 "
40. KHIMTI II	27,000 "
TOTAL	21,650,000 KW

SMALL HYDRO PROJECT

EXISTING		UNDER CONSTRUCTION	
1. PHARPING**	500 KW	37. MANMA KALIKOT	200 KW
2. SUNDARIJAL	640 "	38. DOLPA	140 "
3. PHEWA (Pokhara)	1,088 "	39. GAMDAI	200 "
4. DHANKUTA	240 "	40. HELDUNG	250 "
5. TINAU (BUTWAL)	1,024 "	TOTAL	1,110 KW
6. JHUPRA (Surkhet)	345 "		
7. BAGLUNG	200 "		
8. DOTI	200 "		
9. PHIDIM**	240 "		
10. GORKHE	64 "		
11. JOMSOM**	240 "		
12. JUMLA**	240 "		
13. DHADING	200 "		
14. SYANGHJA	32 "		
15. SETI (POKHARA)	80 "		
16. HELAMVU	1,500 "		
17. SALLERI (SCECO)	50 "		
18. DARCHULA (I) & (II)**	400 "		
19. CHAME	300 "		
20. TAPLE JUNG**	45 "		
21. MANANG	125 "		
22. CHAURIHARI**	80 "		
23. SYARPUDAHA**	150 "		
24. KHANDBARI **	200 "		
25. TERHA THUM**	250 "		
26. BHOJPUR **	100 "		
27. RAMECHHAP	250 "		
28. BAJURA	150 "		
29. BAIHANG**	200 "		
30. ARUGHAT GORKHA	200 "		
31. TATOPANI / MYAGDI (I+II)	150 "		
32. OKHALDHUNGA**	1,000 "		
33. RUPALGAD (Dadedhura)	125 "		
34. SURNAYAGAD	100 "		
35. NAMCHE*	200 "		
36. ACHHAM	600 "		
TOTAL	11,468 KW		

SOLAR POWER STATIONS

EXISTING	
1. SIMIKOT	50 KW
2. GAMGADHI	50 "
TOTAL	100 KW

TRANSMISSION LINE LENGTH

1. 132 K. V. Single Circuit	1119.60 KM
2. 132 K. V. Double Circuit	177.02 KM
3. 66 K. V. Single Circuit	179.00 KM
4. 66 K. V. Double Circuit	153.00 KM
5. 33 K.V. Single Circuit	1,348.70 KM

SUB-STATION CAPACITY

132/11	KVA	-	28.50 MVA
132/33	KVA	-	190.00 MVA
132/66	KVA	-	200.60 MVA
66/11	KVA	-	387.20 MVA
66/33	KVA	-	25.00 MVA
TOTAL			831.30 MVA

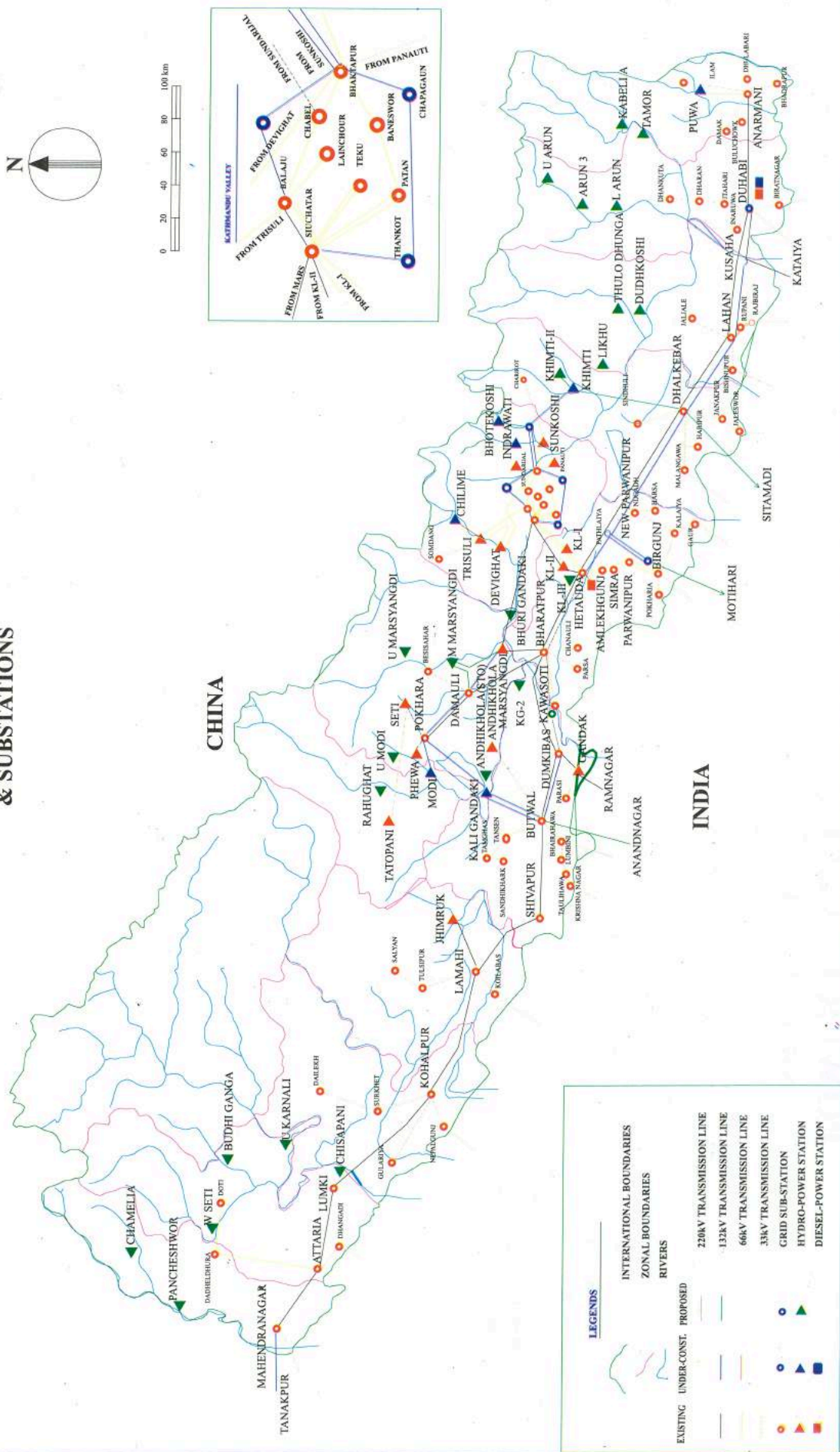
NOTE

- * Private & Others
- ** Leased to the private sector
- *** Not in normal operation

Installed Capacity in Nepal Electricity Authority : **319.074 MW** (including private & others)

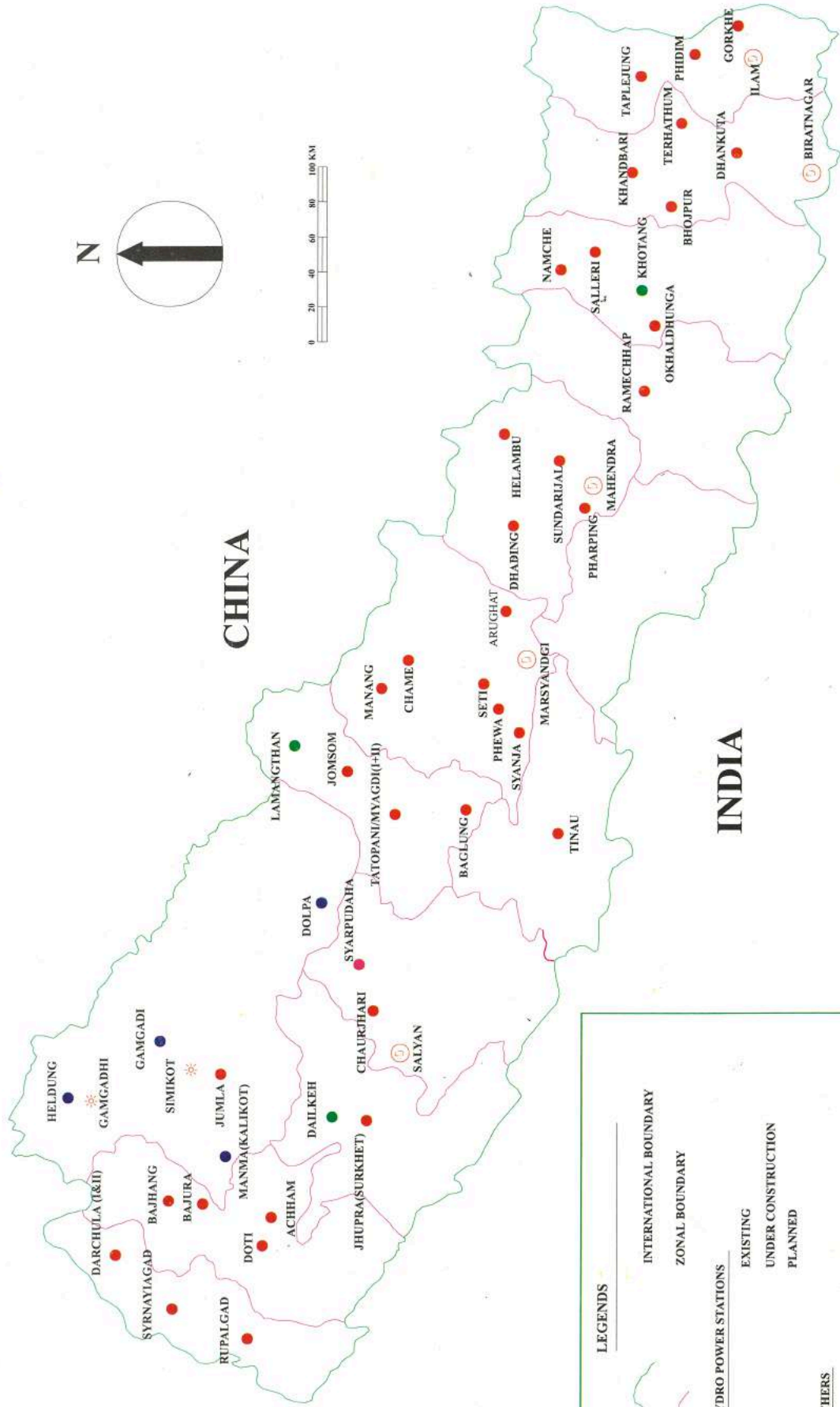
MAJOR HYDRO POWER STATIONS, TRANSMISSION LINES

& SUBSTITUTIONS



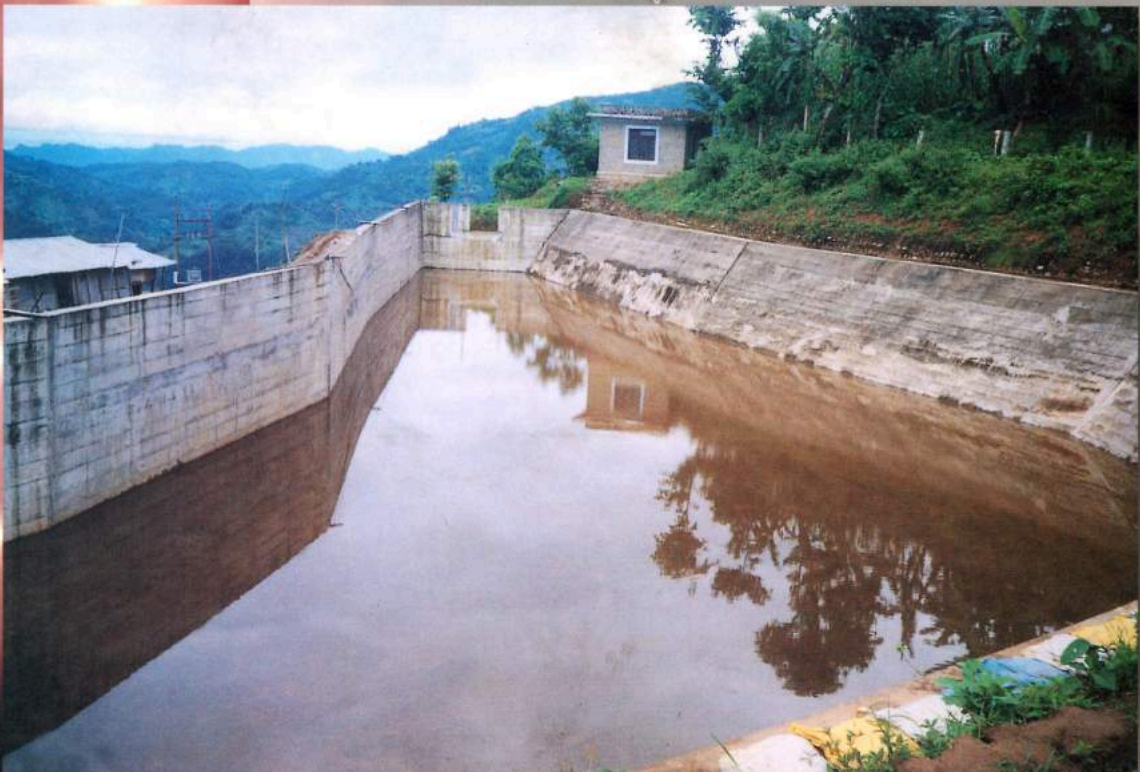
POWER DEVELOPMENT MAP OF NEPAL

SMALL HYDRO POWER STATIONS, ISOLATED SOLAR & DIESEL POWER STATIONS





132 KV Switching Station at Lamosangu



Daily Pondage at Ilam (Puwa) HEP