His Majesty's Government of Nepal

Kathmandu Valley Transmission and Distribution Network Project Feasibility Report

January 1979

Japan International Cooperation Agency

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PREFACE

The Government of Japan, in response to a request of the Government of the Kingdom of Nepal, agreed to conduct a feasibility study on the Kulekhani No.2 Hydro-Power Station Project and a study on the Kathmandu Transmission and Distribution System Project. The Government of Japan entrusted to conduct these studies the Japan International Cooperation Agency (JICA).

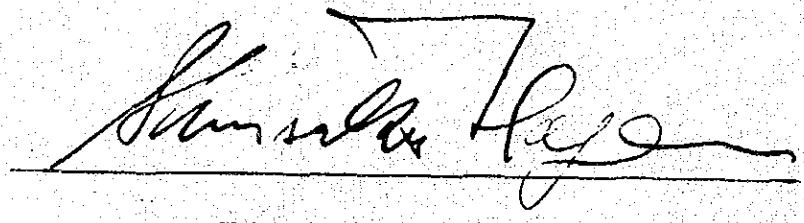
The JICA, recognizing the importance of these projects in the Social and Economic Development Plan of the country, dispatched a 14 member survey team headed by Mr. Masahiro Fuchimoto (Nippon Koei Co., Ltd.) to Nepal to carry out the studies from November 18, 1977 to March 24, 1978.

A report on these studies has now been completed after further work in Tokyo for submission to the Government of the Kingdom of Nepal.

I hope this report will prove to be useful for the electric power development and electrification of Kathmandu valley in the Kingdom of Nepal.

I wish to express my sincere thanks to the persons concerned of His Majesty's Government and the Nepal Electric Corporation (NEC), for their cooperation so kindly extended to the Japanese survey team.

January 1979



Shinsaku Hogen
PRESIDENT
JAPAN INTERNATIONAL COOPERATION AGENCY

January, 1979

Mr. Shinsaku Hogen
President
Japan International Cooperation Agency
Tokyo, Japan

Dear Mr. Hogen,

LETTER OF TRANSMITTAL

We are pleased to submit to you the feasibility report on the Kathmandu Valley Distribution Network Project in the Central Region of Nepal. In the report are fully incorporated the advices and suggestions of the authorities concerned of the Government of Japan and your Agency as well for the formulation of the above-mentioned Project, and also the comments raised by the Ministry of Water and Power of His Majesty's Government of Nepal during the technical discussions on the draft report held at Kathmandu in November and, subsequently, at Tokyo in December 1978, for its finalization.

The Central Nepal Power System covers Kathmandu Valley, Hetauda-Birganj corridor and their surrounding areas in which most of the power demand in Nepal is concentrated. And, Kathmandu Valley is inter-alia, the largest power consuming center in the country. In this Valley, the pent-up demand has been continuously expanded and the shortage of power supply has become more serious in the recent few years. In this light, it is most essential and desirous that the existing power distribution network in the Valley be reinforced and improved in parallel with the increase of the system's power generating facilities as scheduled in order to fully meet the future growing power demand of the Valley as forecasted in this report.

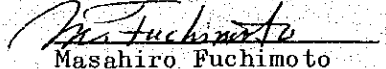
In the report, we have planned out the stepwise development, i.e. the first and second stage schemes. The first stage scheme contemplates to meet the future demand of the Valley in and after 1985/86 and the second stage in and after 1990/91. The estimated investment cost will be US$1,200.6 x 10^3 equivalent in the first stage scheme and US$1,992.2 x 10^3 equivalent in the second stage scheme including the respective 20 percent contingency on August 1978 price level.

According to our economic study, the average energy rate at the consumers' end after realization of the Project would be US mill 49.3 equivalent, which is rather higher as compared with the present average power tariff of the Central Nepal Power System. It is, however, still far lower than those energy rates generally accepted in the other south-east asian countries. The actual power tariff should be decided taking due consideration of fare return for the combined power supply and distribution system of both the existing and new power systems.

In view of the importance and urgency of the Project for the power development in the Central Nepal, as well as for socio-economic development of the country as a whole, we recommend that His Majesty's Government of Nepal would consider to take up the Project for implementation with top priority.

We wish to take this opportunity to express our sincere gratitude to your Agency, the Ministry of Foreign Affairs and the Ministry of International Trade and Industry, the Embassy of Japan in Nepal. We also wish to express our heartfelt gratitude to the Ministry of Water and Power and other authorities concerned of His Majesty's Government of Nepal for their close cooperation and assistance extended to us during our investigations and study.

Very truly yours,



Masahiro Fuchimoto
Team Leader
Nippon Koei Co., Ltd.

HIS MAJESTY'S GOVERNMENT OF NEPAL

KATHMANDU VALLEY TRANSMISSION AND DISTRIBUTION

NETWORK PROJECT FEASIBILITY REPORT

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SUMMARY

SUMMARY

1. The Central Nepal Power System (CNPS) covers Kathmandu valley, the Hetauda-Birganj corridor and their surrounding areas where most of the power demand of Nepal is concentrated. The Kathmandu valley has a concentrated population of about 640 thousand in 1975/76 and such is the most important area in the country from the viewpoint of administration and economy. It is reported that an annual population growth rate in the valley is about 3.5 % compared with about 2.2 % for the whole of Nepal. Thus, it is clear that this area is growing much faster than the other areas.

2. The area covered by the CNPS has been electrified to a higher degree than the other areas, but it still has large numbers of unelectrified domestic households as well as waiting industrial and commercial consumers. Seventy-four (74) per cent of the energy demand in the whole of Nepal was consumed by the CNPS in 1975/76, and the consumption in the CNPS has been increasing at an annual growth rate of 22.4 % on the average during the last ten years from 1966/67 through 1975/76. The Kathmandu valley occupies about 85 % of the total energy consumption of the CNPS. In the CNPS, about 60 % of energy used is by doemstic consumers and about 20 % by industrial consumers in 1974/75 and 1975/76. The number of domestic consumers in the CNPS has been increasing at an annual rate of 15.6 % on the average during the last ten years from 1966/67 through 1975/76.

3. The energy for the CNPS is produced and distributed by the Nepal Electricity Corporation (NEC) which is a governmental corporation. The total capacity of the current generating facilities of CNPS operated by the NEC 43,586 kW in 1976/77. It consists of 34,590 kW of hydro power plants and 8,996 kW of diesel power plants. In addition, the Electricity Department of the Nepalese Government other private factories operated the generating plants of aggregate 5,325 kW consisting of 30 kW of a hydro plant and 5,295 kW of diesel and steam plants.

4. New power connections have been decreased by NEC due to the shortage of the power supply capacity, including both the generating facilities and distribution systems during the recent few years.

5. The energy loss in the transmission and distribution systems had been considerably high level. It was about 30% in 1975/1976. Such high energy loss is supposed due to such physical losses as small sized conductors, an inaccurate metering system and also illegal use of the energy.

6. The power demand forecast up to 1990/1991 has been worked out in the following four categories: i) domestic ii) industrial iii) commercial and iv) others.

The future power demand for the Kathmandu valley is forecast based on the detailed analysis of the past power records, industrialization plan and of trend projection in view of social and economic situation.

The total power demand of all categories has been forecasted and summarized hereunder.

DEMAND FORECAST

Year	Peak Load-(kw)	Energy Demand (MWh)
1976/77	31,370	86,570
78/79	38,480	108,530
80/81	47,110	138,670
82/83	54,660	179,570
84/85	64,870	239,340
86/87	79,350	313,160
88/89	101,230	399,480
90/91	126,640	499,760

7. To meet the increasing demand, the Kulekhani No.1 power station is now under construction with the target completion set in 1980/1981. In addition, the Kulekhani No.2 power station is planned to be completed in 1985/1986 for increasing the power supply capacity to meet the future growing demand.

In regard to these power development programs, the implementation programs for the extension and reinforcement of the existing distribution systems in the Kathmandu valley is scheduled in two stages,

that is, the first stage is planned to meet the demand for the Kulekhani No.1 power station and 1985/86 and the second stage for the demand upto 1990/91.

The proposed plan of the project is summarized as follows:

1) First Stage

a) Transmission line

11 kV line	3 km

b) Distribution system

New and renewed 11 kV lines	185 km
Distribution transformers	72,000 kVA
New and renewed 400/230 V lines	180 km

2) Second Stage

a) Transmission lines

New 66 kV lines	13 km

b) Improvement of load dispatching system 1

c) Substations

New substations	2
Extension of substations	2

d) Distribution system

New and renewed 11 kV lines	220 km
Distribution transformers	83,000 kVA
New and renewed 400/230 V lines	220 km

8. The construction schedule of the proposed systems will take about two years from the award of the contract for the first stage and three years for the second stage.

The completion of the works is expected as follows.

First stage	end of 1982
Second stage	end of 1985

9. The construction cost of the project is estimated at US$12.006 million for the first stage and at US$19.922 million for the second stage in the price level of August 1978 as summarized hereunder.

(US$1,000)

	First Stage		Second Stage	
	Foreign Currency	Local Currency	Foreign Currency	Local Currency
T/L system	183	10	928	107
Substations	-	-	2,242	457
D/L system	7,622	965	8,906	1,115
Engineering	1,310	164	1,389	193
Contingency	390	49	600	84
Escalation	1,137	176	3,382	519
Total:	10,642	1,364	17,447	2,475

10. The evaluated average power rate at the consumer end, on the assumption that the power for the planned distribution system be supplied from the Kulekhani No.1 and No.2 power stations, is US$0.0493/kWh. This value is higher than the current average power tariff but is lower compared with the generally accepted power tariff in the South-Eastern Asian countries, being US$0.05 to 0.07 per kWh. Thus, this project is economically feasible.

SECTION 1

INTRODUCTION

SECTION 1

INTRODUCTION

The Kathmandu Valley (Kathmandu city and its surrounding area), having a population of about 640 thousand in 1975/76, is the most important area in the country from the viewpoints of administration and economy and such as this area has been electrified to a higher degree than the rest of the country. The power system in the Kathmandu Valley is a part of the Central Nepal Power System (CNPS) which is the most important power system in the Kingdom of Nepal, consuming CNPS consumes about 74% of the energy produced throughout the whole of Nepal and the Kathmandu Valley occupies about 85% of CNPS. Though the Kathmandu Valley is the most electrified area in the country, there are still large numbers of un-electrified households and waiting industrial and commercial consumers.

The electric power in CNPS is generated and distributed by the Nepal Electricity Corporation (NEC). NEC prepared a "10 Year System Reinforcement Plan" in 1972/73 and has executed part of the reinforcement works with its internal funds. But so far, no remarkable progress has been made mainly because an adequate amount of funds are not available.

According to recent information, the energy demand in the Kathmandu Valley has been suppressed due to the shortage of the power supply capacity and the capacity of distribution facilities. It is also reported that the energy loss in the valley is more than 30%, which is very high.

The potential energy demand in the valley is continuously increasing at a high rate. The demand forecasts listed in Section 4 reflect the past tendency of the demand increase by various consumer categories and take into account the expected demand of the potential consumers.

To meet such evergrowing demand, the Kulekhani No.1 power station now under construction is to be completed by 1980/81 and the Kulekhani No.2 power station located downstream of the No.1 power station is in the planning stages. These two power stations will relieve the present shortage of power supply and save high priced fuel cost for the existing diesel generators.

However, the above power development plan does not involve any project for expanding the distribution facilities and without the implementation of such as a distribution project, the energy of the Kulekhani power station cannot be utilized to meet the increasing demand.

Under such circumstances, the improvement and extension of the distribution network in the valley is urgently needed to be implemented before the completion of the Kulekhani No.1 power station.

This report explains the existing distribution network as well as the demand forecast and recommends the distribution network to be implemented.

SECTION 2

GENERAL CIRCUMSTANCES

SECTION 2

GENERAL CIRCUMSTANCES

2.1 Land and Population

The Kingdom of Nepal lies along the southern slopes of the Himalaya Ranges. The country extends from North-West to South-East, being sandwiched between India and the Tibetan Plateau of China. Its rectangular-shaped land covers an area of 140,797 km^2 with an 800 km length from East to West and a 130 km to 240 km width from North so South. The land is situated between the latitudes of $26^{\circ}30'$ N and $30^{\circ}15'$ N and the longitudes of 80° E to $88^{\circ}15'$ E.

Nepal is administratively divided into 14 zones and 75 districts. On the other hand, it is also divided into the following four (4) regions from the viewpoint of the balanced regional development, as seen in Dwg. KD-1.

(1) The Central Development Region (Kathmandu Development Region)

(2) The Eastern Development Region (Dankuta Development Region)

(3) The Western Development Region (Pokhara Development Region)

(4) The Far Western Development Region (Surkhet Development Region)

Each region covers land of 28,186 km^2, 27,804 km^2, 33,191 km^2 and 51,616 km^2 respectively.

The total population of Nepal is 12.9 million (1976), consisting of various races and tribes which derive their origins from the Indo-Aryan group, the Tibeto-Burmese group, and the pure Tibetan group. While the respective subgroups of the people have their own languages and dialects, Nepali (Gurkhali) is the national language spoken throughout the country. The population is growing at a rate of about 2.2 % per annum, while the increase rate in the Kathmandu valley is about 3.5 %. One-third of the population lives in the Terai plain and two-thirds live in the hilly areas. About 640 thousand inhabitants (5.3 % of Nepal's total population) live in the Kathmandu valley, of which 60 % are concentrated in the towns of Kathmandu, Patan and Bhaktapur.

2.2 Economy

A wide variety of climate ranging from frigid to tropical zones is experienced due to Nepal having the world's largest altitude variation. The Himalaya region is higher than 5,000 meter in altitude and has continuous snowfall, while the lowland of Terai has a tropical climate has the highest temperature of 44°C in summer and no freezing temperature even in winter.

Agriculture is the mainstay of the Nepalese economy. About 93 % of the population are engaged in agriculture and agro-based industries. The GNP and GDP of Nepal in 1975, at market price, was Rs.14,802 million and Rs. 15,740 million respectively. The GNP per capita was about U.S.$110 in 1975. In the Fifth Five-Year Plan (1976-80), agricultural development commanded high priority envisaging an annual growth rate of 3.6 %.

This country abounds in water resources and proper utilization of such water resources would bring about an economic development through energy production as well as an agricultural development. The hydro-power potential is estimated at 83,000 MW of which less than 0.1 % are at present utilized. The three perennial rivers, the Karnali, Sapt Kosi and Sapt Gandaki, hold some 90 % of the total theoretical hydropower potential of the country. The magnificent scenery which is found most everywhere in the country, culminating in the Himalayas, would also provide great potentialities for the tourism industry, the development of which would bring a great contribution to the national economy.

Tourism continued to play a significant role in Nepalese economy. In 1976, Nepal earned Rs. 189.9 million (about U.S.$16 million equivalent) from tourism.

Some deposits of minerals have been identified in Nepal including magnesite and iron ore. Iron ore has been located in the hills to the south of the Kathmandu Valley and the feasibility of steel production from this deposit is at present being investigated. Sizeable limestone deposits have also been found. But since most of the identified minerals lie in remote and inaccessible areas, the level of exploitation is low.

With improved access to the hilly areas, exploitation will no doubt increase rapidly. Although only a small number of these mineral deposits are identified, it is hoped that it will make contribution to the economy of Nepal in future.

Forests cover an area of 5 million hectares and over 40 % of this total area is estimated to be commercially exploitable. Since forestation is now being promoted by the Ministry of Forestry, timber and forest resources will be another important part of Nepal's economy, after the development of a timber industry has been established.

The road system in Nepal was in quite a poor condition until the early 1960's. But, at present, the total length of motorable roads has reached about 3,500 km, 40 % of which are metalled. A noteworthy construction is a highway from Kathmandu to Kodari at the border of Nepal and the Tibetan Plateau of China, a highway from Kathmandu to India via Birganj which further connects to Calcutta. The East-West Highway which connects the eastern and western part of the Terai Plain of Nepal is now under construction. Also construction of a 28 km ring road which connects the three major cities of Kathmandu, Lalitpur and Bhaktapur has already been completed and is now operating an electric trolly bus service. The completion of the 105 km Lamosangu-Jiri highway, 52 km Dharan-Dhankuta highway, 406 km Pokhara-Surkhet highway, and Dhanagadi-Dadheldhure highway are expected to boost the entire economy of Nepal. The completed Kathmandu-Pokhara highway and Pokhara-Bhairahawa road have turned the Pokhara area into one of the main tourist centers in Nepal.

Airway transportation is another important mean of domestic travel in Nepal. The Royal Nepal Airlines Corporation operates 15 commercial airports in Nepal. The Tribhuwan Airport in Kathmandu is the only international airport in Nepal.

Almost all major towns are linked with a wireless network operated by the Government. A microwave network covering the whole country is now under construction in Nepal.

The financial status of Nepal had been sound as indicated by a steady increase of foreign exchange holdings amounting to U.S.$140 million equivalent in January 1977. The balance of international trade was a deficit by U.S.$73 million in 1976/1977 and U.S.$58 million in the previous year. During the Fiscal year 1976/77, exports totalled RS.1,168.9 million (U.S.$93.9 million equivalent) and imports Rs.1,987.2 million (U.S.$166.9 million equivalent). The main export products were rice, maiz, oil seeds, jute, tea and dairy products. Compared with 1975/76, total exports dropped by 1.4 %, while imports increased 0.3 %.

2.3 Power Supply Systems

2.3.1 Regional power supply systems

The production of electricity in Nepal started in 1912 by Pharping hydroelectric power station having a capacity of 500 kW. In 1975/76, total energy production in Nepal reached to 141 GWH with total installed capacity of 63,000 kW, in addition energy of 25.390 MWH was imported from India.

The composition of generating facilities in the whole of Nepal in 1976/77 is roughly 58 % for hydro, 36 % for diesel and 6 % for steam units.

The power supply system in Nepal is analyzed in four development regions stated in Clause 2.1 for convenience. Total installed capacity of the power stations and the energy production and consumption in each region are shown in detail in Tables 2.1 to 2.3. Following is a discussion of each region.

(a) Central development region

The central development region is composed of Janakpur, Bagmati and Narayani zones. Kathmandu, the capital of Nepal, is in Bagmati zone and the Kathmandu-Hetauda-Birganj corridor is the center of the nation's economic activity.

Seventy-four (74) percent of energy consumed in the whole of Nepal is used by this region and its consumption has been increasing at an annual growth rate of 22 % on the average during a period from 1966/67 through 1975/76. Such energy is supplied by Nepal Electricity Corporation, by privately-owned generating facilities and from India through 66 kV and 11 kV line systems.

Total installed generating facilities in this region amount to 48,910 kW in 1976/77 comprising 76 % of the total generating facilities of 64,244 kW in the whole of Nepal.

Most of the energy supplied to this region is consumed by Kathmandu valley and although it still has a large potential demand increase, according to information for the year of 1976/77 the demand had to be suppressed due to the low power supply capacity.

To improve the present situation, new hydro power stations are under construction as follows:

Gandaki power station: with 15 MW capacity which will supply energy to Kathmandu area through a new 132 kV transmission line via Bharatpur and Hetauda.

Kulekhani No.1 power station: with 60 MW capacity which is to be supplied by the existing 66 kV double circuits line.

Devigat power station: with 14.4 MW capacity near Trisuli.

However, since the demand growth in this region is very rapid, a shortage of energy supply will occur again in the near future even after starting operation of the above new power stations.

(b) Eastern development region

In the eastern development region, there are administratively three zones, i.e., Mechi, Kosi and Sagarmatha. The power for these zones is divided into the following four systems.

(1) Biratnagar, Daran and Rajbiraj system

(2) Bhadrapur and Sanischare system

(3) Dhankuta system

(4) Ilam system

Total installed generating capacity in this region is 8,800 kW in 1976/77 including private facilities, but this is not enough to meet the present demand. Such shortage is made up by import from the Indian grid through Sirha, Rajbiraj, Biratnagar and Bhadrapur.

Dhankuta system is supplied by a micro hydro power station of 240 kW capacity, while, the Ilam system is supplied energy by small diesel plants. In order to meet increasing power demand and to save cost of high priced fuel for diesel generators, the Kankai hydro- and Mulghat hydro-power stations are expected to be developed to meet the regional demand and for supply to the central region through a new interconnecting transmission line.

(c) Western development region

The western development region is composed of Dhaulagiri, Gandaki and Lumbini zones.

Energy to Pokhara area is supplied by the Pokhara hydro power station of 1,000 kW installation while energy to Tansen, Bhairahawa, Taulihara, Bahadurganj and Krishnagar is supplied by small diesel generators. In addition, power is being imported from India through Krishnagar and Bhairahawa.

Total consumed energy in this region in 1975/76 was 7,790 MWH, with a peak demand of 3,060 kW. Seventy-five (75) percent of total consumption was supplied by generating facilities installed in the region and the remaining twenty-five (25) percent was imported from India.

(d) Far western development region

There are five zones in the far western region, i.e., Rapti, Bheri, Seti, Karnali and Mahakali.

Nepalganj was the first town electrified in this region in 1965 by the Bagishowari Electric Works. The supply was discontinued due to engine trouble in 1968 but was resumed in 1972 by installation of 2 x 250 kW diesel generators obtained from the Kathmandu valley. Mahendranagar, Dhangarhi and Koilabas are receiving the required amounts of energy from India. Although these twons have small diesel generators in total capacity of 780 kW, those generators are kept as stand-by facilities. A micro hydro power station with a capacity of 345 kW was completed in the Birendranagar area by the Electricity Department.

Energy consumed in this region totalled 3,190 MWH in 1975/76, with a peak demand of 1,200 kW.

2.3.2 Organization of Electric Utilities

Planning and construction power facilities and supply of energy in Nepal are managed by the undermentioned organizations.

About 80 % of the total generating facilities in the whole of Nepal are now operated by the following utilities, the capacities of which are shown in Table 2.2. The remaining 20 % of the facilities are owned by private organizations.

(a) Nepal Electricity Corporation (NEC)

NEC is a governmental corporation supplying electricity to the central development region. The electric power system covered by NEC is the Central Nepal Power System (CNPS). NEC has a total generating capacity of 42,754 kW consisting of 34,590 kW of hydro power and 8,164 kW of diesel power as of 1976/77. The generating facilities owned and energy supplied by NEC totalled 67 % in 1976/77 and 74 % in 1975/76 of the whole of Nepal. These percentages, decreased in 1976/77 due to the shortage of power supply capacity.

(b) Electricity Department of Government (E D)

The Electricity Department in the Ministry of Water and Power is responsible for planning and implementation of the electric power development in Nepal.

Normally, E D hands over the developed facilities, after commissioning, to NEC or EEC (Eastern Electricity Corporation). However, some facilities are still retained to be managed by ED. In 1976/77, ED operated 5,471 kW facilities of hydro and diesel power stations.

(c) Eastern Electricity Corporation (E E C)

EEC is a public corporation established in 1974 and is managing the Biratnagar power system with diesel generators totalling 3,146 kW as of 1976/77, and also importing power from India.

(d) Butwal Power Company (BPC)

BPC is a private company partnered by ED, originally being established to construct a 1,000 kW hydro-power plant at Tinau Khola. At present, BPC is supplying energy to Butwal area with its hydro-power plant of 1,200 kW capacity.

2.3.3 Power Exchange with India

Power systems in the following towns on the border are connected to the Indian power grid and exchange of power has been made between India and Nepal under the agreement between both countries.

Eastern region	:	Bhadrapur, Biratnagar & Sihra
Central region	:	Jaleskwar, Malangwa, Gaur & Birganj
Western region	:	Bhairahawa & Krishnanagar
Far western region	:	Koilabas, Nepalganj, Dhangadi & Mahendranagar

Exchanged energy through those towns are summarized below.

(MWH)

			1971/72	72/73	73/74	74/75	75/76
Imported Energy	Eastern Region	Rajbiraj	-	224	323	-	-
		Bhadrapur	-	-	-	95	418
		Biratnagar	1,829	4,591	6,262	10,188	17,368
		Sirha	-	-	-	101	314
		Total	1,829	4,815	6,585	10,384	18,100
	Central Region	Janakpur - Jaleswar	-	11	112	386	1,263
		Gaur	-	28	159	203	282
		Malangawa	-	1	20	146	156
		Total	-	40	291	735	1,701
	Western Region	Krishnagar	-	-	147	331	647
		Bairahawa	-	188	843	1,191	1,730
		Total	-	188	990	1,522	2,377
	Far Western Region	Koilabas	-	-	-	52	125
		Nepalganj	-	159	788	1,648	2,315
		Dhangarhi	-	-	-	93	375
		Mahendranagar	-	-	107	217	360
		Total	-	159	895	2,010	3,175
	Grand Total		1,829	5,202	8,761	14,651	25,353
Export from Birganj			-	2,324	3,702	4,621	5,940

As seen in the table, imported energy is growing at a very high rate of 93 % per annum on the average, while exported energy is also growing at the rate of 37 % per annum.

The agreement for power exchange restricts import to Nepal to be 13,000 kW and export to India to be 5,000 kW at maximum.

TABLE 2.1 INSTALLED CAPACITY OF POWER STATIONS IN NEPAL (kW)

Year	Eastern Region	Central Region	Western Region	Far Western Region	Total
1970/71	6,747.98	36,118.12	2,164.74	703.45	45,734.24
71/72	6,586.93	37,114.12	3,205.74	723.45	47,630.24
72/73	6,826.93	47,428.12	3,300.74	763.45	58,319.24
73/74	6,826.93	47,928.12	4,141.74	763.45	59,660.24
74/75	7,224.13	47,808.60	4,027.00	1,069.00	60,128.73
75/76	8,782.03	48,318.55	5,125.49	782.15	63,008.22
76/77	8,806.93	48,910.55	5,400.49	1,127.15	64,245.12

TABLE 2.2 CLASSIFIED INSTALLATIONS IN 1976/77 (kW)

Classification	Region	Eastern Region	Central Region	Western Region	Far Western Region	Total
ED	Hydro	240	30	1,024	345	1,639
	Diesel	446	832	1,994	560	3,832
	Steam	-	-	-	-	-
NEC	Hydro	-	34,590	-	-	34,590
	Diesel	-	8,164	-	-	8,164
	Steam	-	-	-	-	-
EEC	Hydro	-	-	-	-	-
	Diesel	3,146	-	-	-	3,146
	Steam	-	-	-	-	-
BPC	Hydro	-	-	1,200	-	1,200
	Diesel	-	-	-	-	-
	Steam	-	-	-	-	-
OTHERS	Hydro	-	-	-	-	-
	Diesel	3,574.93	3,694.55	432.49	222.15	7,924.12
	Steam	1,400	1,600	750	-	3,750
TOTAL	Hydro	240	34,620	2,224	345	37,429
	Diesel	7,166.93	12,690.55	2,426.49	782.15	23,066.12
	Steam	1,400	1,600	750	-	3,750
Grand-total		8,806.93	48,910.55	5,400.49	1,127.15	64,245.12

NOTE: ED : Electricity Department
NEC : Nepal Electricity Corporation
EEC : Eastern Electricity Corporation
BPC : Butwal Power Company

TABLE 2.3 ENERGY PRODUCTION AND CONSUMPTION REGIONALLY CLASSIFIED (kWh)

Year	Energy Produced and Imported			Energy Consumed	Peak Demand (kW)
	Produced	Imported	Total		
Eastern Region					
1970/71	13,530,093	-	13,530,093	12,474,519	3,360
71/72	12,311,486	1,829,042	14,140,528	12,920,718	3,397
72/73	11,282,142	4,814,980	16,097,122	14,503,244	3,822
73/74	10,230,441	6,585,725	16,816,166	15,065,634	4,242
74/75	7,493,694	10,384,429	17,878,123	15,875,414	5,605
75/76	4,750,254	18,099,160	22,849,414	19,581,928	6,040
Central Region					
1970/71	61,385,502	-	61,385,502	43,547,562	16,510
71/72	69,311,756	-	69,311,756	50,097,231	19,715
72/73	86,101,787	-2,285,052	83,816,235	59,448,923	24,743
73/74	101,372,834	-3,411,612	97,961,222	76,573,369	28,165
74/75	115,064,777	-3,886,107	111,178,670	82,358,055	33,445
75/76	128,749,462	-4,239,403	124,510,059	87,217,579	35,699
Western Region					
1970/71	1,193,642	-	1,193,642	827,260	500
71/72	2,647,956	-	2,647,956	2,138,651	1,220
72/73	3,558,981	187,900	3,746,881	2,779,467	1,765
73/74	4,248,659	990,097	5,238,756	4,275,526	2,045
74/75	4,995,485	1,522,502	6,517,987	5,358,797	2,589
75/76	7,434,688	2,418,701	9,853,389	7,790,796	3,060
Far-Western Region					
1970/71	176,000	-	176,000	154,880	100
71/72	228,000	-	228,000	200,640	130
72/73	342,950	159,005	501,955	425,603	359
73/74	605,568	895,170	1,500,738	1,247,753	543
74/75	686,199	2,010,882	2,697,081	2,226,207	1,052
75/76	628,170	3,174,855	3,803,025	3,190,652	1,214
Whole of Nepal					
1970/71	76,285,237	-	76,285,237	57,004,221	20,470
71/72	84,499,198	1,829,042	86,328,240	65,357,240	24,462
72/73	101,285,860	5,200,833	106,486,693	77,157,297	30,689
73/74	116,457,502	8,761,380	125,218,882	97,162,282	34,995
74/75	128,240,155	14,652,706	142,892,861	105,818,473	42,691
75/76	141,562,574	25,393,313	166,955,887	117,780,955	46,013

(-) indicates exported energy