POWER DEVELOPMENT IN BIHAR:

INSTALLED CAPACITY:

Power development in India has assumed great importance in view of its role in rapid development of industry and agriculture. As a matter of fact it has now become a critical infrastructure for development in almost all core sectors. Installed capacity in the country which was only 2300 MW in 1951 has since been increased to 71,015 MW in March 1993. This means about 31 developments has not taken place in Bihar. Installed capacity of 150 MW in 1951 has increased to 1542.7 MW by 1993, that is, only ten times against thirty one times in the country as a whole. Even accounting for Bihar's share in Central schemes, the total installed capacity is only 1724.24 MW; and with this the corresponding increase is just over eleven times. Details of installed capacity by sources under Bihar State Electricity Board are given in Table – 2.1.

Table 2.1
Plant wise Installed Capacity of BSEB
(As on 31.03.1992)

Sl. No.	Name of the Plant	Installed Capacity	Year of Commissioning
1.	2.	3.	4.
A.	**HYDEL :**		
1.	Kosi Hydel Power Station 4 x 4.8 MW	19.2 MW	Between November 70 and October, 78.
2.	Subernarekha Hydel Project (Getalsud) 2 x 65 MW	130.0 MW	Between October, 77 and October, 80.
	Sub-Total	149.20 MW	
B.	**THERMAL:**		
3.	Patratu TPS 4 x 50 MW + 2 x 100 MW + 4x 110 MW	840.0 MW	Between October, 69 and March, 83
4.	Barauni TPS 2 x 50 MW + 2 x 110 MW	320.0 MW	Between October, 69 and March, 83
5.	Muzaffarpur (Kanti) TPS		

	2 x 110 MW	220.0 MW	Between 1985 and 1987
6.	Karbighia TPS 2 x 1.50 MW + 1 x 3.0 MW + 1 x 7.5 MW	13.50 MW	Between 1930 and 1950
	Sub-Total	1393.50MW	
	Total of A & B		1542.70 MW

The State in having one of the lowest per capita installed capacity in the country. Against the total installed capacity of 63,627.33 MW Bihar's Share in only 1542.7 MW whereas Andhra Pradesh's share in 4064.84 MW. Gujarat's 4208.22 MW. Population of Bihar as per 1991 Census is 86.33 million which is about 11.6% of the country's population of 844.32 million but installed capacity of electrical power in the country.

2.1.1 Per Capita Installed Capacity :

Bihar is having one of the lowest per capita installed capacity in the country. As per 1991 Census, the population of Bihar is 86.33 million and the installed capacity including Bihar's share in Central Scheme is 1724.24 MW, and hence per capita installed capacity works out to just about 20 watts against the all India average of 75.36 Watts.

2.2 DEMAND ANALYSIS :

2.2.1 Demand Projection :

Bihar State Electricity Board has prepared a Note on "Detailed Demand Forecast up to the year 2000 AD and perspective Demand up to the year 2012 AD. Details of Demand Projection – Energy Consumption, Energy requirement and Peak loan generally based on the XIVth Annual Power Survey conducted by the Central Electricity Authority are shown in Table – 2.2 and Table – 2.3. The abstracts are given in Table – 2.4.

Table – 2.4

Power Demand Projection

Sl.	Particulars	**Y E A R**			
		Actual	Estimate	Estimate	Perspective Demand
		of	for 94-95	for 1999-2000	in year 2011-12
1	2	3	4	5	6
1.	Energy made				

	available/requirement in MK WH	7277.39	8346	13,227	34,327
2.	Annual load factor	67%	48.4%	47.59%	50%
3.	Peak loan in MW	1239.92	1974	3,185	7,837

perspective demand for energy consumption during the period 200-01 to 2011-12 has also been projected by taking annual growth rate of 10%, 9.5%, 9.0%, 9.0%, 8.5%, 8.0%, 7.5% and 7.5% per annum respectively, the preceding year being the base year. The energy requirement at the generating station bus bar has been arrived at by adding the T & D losses of 15% and the peak load by applying an annual load factor of 50%.

2.2.2 Installed Capacity Required By Year 1999-2000 AD:

Based on the demand analysis presented above, the requirement of additional generating capacity of Bihar's Power System by the turn of the century will be as under:

I.	Peak load demand in the year 1992-2000	3185 MW
II.	Installed capacity required to meet the Peak loan demand in serial-I assuming PLF of 60%	5308.0 MW
III.	Peaking capacity available in 1999-2000 (equal to the existing and on-going projects)	
	a) Available from BSEB generation	1542.7 MW
	b) To be available from Tenughat TPS	1050.0 MW
	c) Share in Central Assistance Schemes (estimated)	818.0 MW
	d) On-going Schemes of BHPC	58.0
	Sub - Total	**3468.7 MW**
IV.	Shortage in installed capacity (5308.0 – 3468.7)	1839.3 MW

Considering that the period of execution and gestation lag it would be prudent to plan for year 2011-12 and in that case the additional installed capacity will be as per assessment made hereunder:

I.	Peak load demand in the year 2011-12	7637.0 MW
II.	Installed capacity required to meet the Peak loan demand in Serial-I assuming PLF of 60%	13052 MW
III.	Peaking capacity available upto 1999-2000 (equal to the existing plus on-going schemes)	(-) 3468.7 MW
IV.	Shortage in Installed Capacity	9593.3 MW

In this connection it is also worth taking note of the fact that the peak load demand of 1974 MW of Bihar Power System (excluding DVC Area) as estimated by the 14th Annual Power Survey conducted by CEA for the year 1994-95; and which has formed the base for demand projection in subsequent years is not realistic. Presumably the present poor availability of Power in the State has caused suppression in the load demand.

The connected load in the power system as at present is 5208 MW. assuming a diversity factor of 3 (three) for the connected load, the peak demand on the system would be 2083 MW (1736 MW + 20% of 1736 MW). thus the present peak demand exceeds the forecast demand of 1974 MW in the year 1994-95. Since the power demand in Bihar has so far remained student and suppressed on account of inadequacy in generating capacity as well as transmission and distribution system, a larger than normal growth of load should be expected. Viewed in this background, the demand, projection as also the prespective demand it would not be too optimistic to expect it well before that.

2.3 IMPRATIVE NEED FOR FILL UP TO HYDRO-ELECTRIC POWER DEVELOPMENT IN BIHAR:

2.3.1. IMPORTANCE OF HYDRO-POWER:

Development of hydropower deserves overriding priority over thermal power to the extent practicable from the viewpoints of resource availability/in (and techno-economic feasibility) view of the following important consideration:

(i) Hydropower is a non-polluting resource with high conversion efficiency : it does not contribute to Green House effect :

(ii) When developed as an integral part of a multipurpose water resources project, it adds to the net benefits of the project;

(iii) It is comparatively more reliable source of energy with relatively longer life of equipment;

(iv) Cost of operation and maintenance of hydropower stations is relatively lower;

(v) The cost of hydro energy is fairly stable and is free from inflationary pressures of economy;

(vi) Hydro-power stations because of their ability for quick stop-start operation, are ideally suited for peaking operations and play a crucial role in enhancing system reliability;

(vii) Hydro-power technology is well development and proven with overall efficiencies of about 90% compared to 35% for thermal station; 32 to 34% for gasturbine; and 42 to 44% for combined cycle plants;

(viii) Imbalance in hydro-thermal mix generally recommended as 40:60 results in higher cost of power generation from thermal power stations which have to be operated to meet daily variations in the loads, in which case the thermal stations have to vary their generation or have to back down during off-peak times;

(ix) Non availability of adequate hydropower needed to meet peak demand invariably leads to load-Shedding resulting in sub-optimal use of industrial capacities and agricultural resources besides causing inconvenience and avoidable cost on support devices to the users.

In spite of such and so many glaring advantages of hydro-power generation, its share in overall electricity generation in the country has been going down progressively; it is neither because of non-availability of utilizable water resources nor because of lack of proven technology.

2.3.2 STATUS OF HYDROPOWER POTENTIAL DEVELOPMENT :

The status of hydropower potential development in the four regions of the country is shown in figure 2.11. it is evident that the ultimate power potential assessed at 60% L.F. is the lowest in the Eastern region comprising Orissa, Bihar, West Bengal and Sikkim though this region is very thickly populated (with about 22 percent of country's population) and endowed with rich mines and minerals besides fertile agricultural land. Hence, the need for maximum possible development of hydropower in this region could hardly be overemphasized. So far Bihar in particular is concerned the potential assessed at 60% L.F. is only 538 MW out of 5,590 MW of the whole Eastern region. It is thus lowest among the States of Eastern region (Bihar 9.6%; Orissa 35.5%; West Bengal 31.9% and Sikkim 23.0%).

2.3.3 URGENCY AND IMPRTANCE OF HYDRO-POWER IN BIHAR :

It is not only the overall shortage in the quantum of energy generation (assessed at about 20%) that is constraining socio-economic development of this region, more so of Bihar. Inadequacy of hydropower with peaking of capabilities is the most dominant factor causing inefficiency and instability in the electric system largely dependent on coal fired power stations. Inspite of the repeated emphasis laid on improving the hydro-thermal mix to a desirable level of 40:60, more thermal capacity has been getting the end of the VIth plan was about 34 percent hydro and 66 percent thermal (including nuclear), which by the end of the VIIth Plan went down to 29.5 percent hydro and 70.5 percent thermal. (Rise and Decline of hydro-power share since 1947 is shown in figure 2.2). during the VIIIth Plan there is proposal for adding about 38,000 MW comprising 28,000 MW of thermal, 9,000 MW of hydro and 705 MW of Nuclear Power Stations. It is thus obvious that even the proposal for the current FYP are not planned for the desirable thermal – hydro mix of 60:40 what to speak of correcting the endemic imbalance progressively increasing since last two decades. So far Eastern region comprising Orissa, Bihar, West Bengal and Sikkim states is concerned, it was having an already a low thermal to hydro ratio of about 84:16 against 52:48 in Southern region and 69:31 in Northern region at the end of March 1992

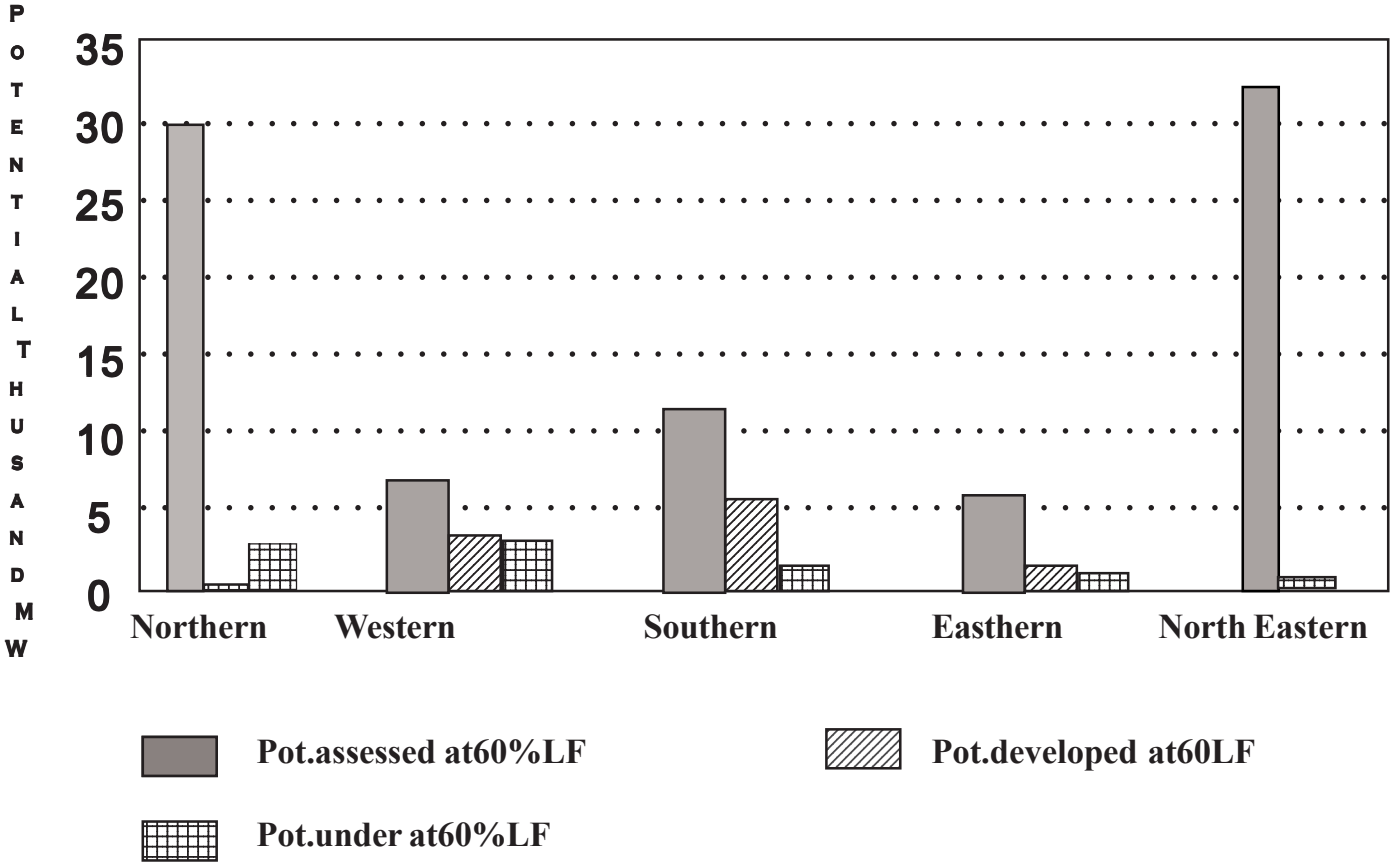
and it will decrease further to 85:15 ratio by end of the VIIIth Plan as revealed through figures in Table – 2.5.

Project (2x 65 MW), the Kosi H.E. Power Station (4 x 5 MW) and the Sone Western Canal H.E. project (4 x 1.65 MW) are the only hydel power stations operating in Bihar. The B.H.P.C. is striving hard to install a number of hydel power stations including mini and micro ones, but their combined strength would not exceed 50 MW or so. Thus, the picture is gloomy and hence it is of urgent importance that as many hydro-power project as are found viable from techno-economic considerations are taken up for implementation without further delay : and while evaluating the economics the projects due weightage to removal of regional disparity and mis-match in hydro-thermal mix is called for.

2.4 THE KHADWAN HYDRO-ELECTRIC POWER PROJECT :

The Sone River Commission set up by the Government of India in the Ministry of Water Resources recommended a number of sites on the Sone River and its tributaries for hydro-power development in the three co-basin states of Madhya Pradesh, Uttar Pradesh and Bihar. Among them, the Kadhwan site on Sone river was recommended for construction of a major reservoir for multiple use, viz, irrigation, hydro-power generation and flood control. Accordingly the Government of Bihar has prepared a detailed project report and estimate of kadhwan Reservoir Project. The Bihar Hydro-Electric, Power Corporation had carried out detailed Feasibility studies of the project from hydro-power generation point of view, and has prepared this report and estimate for the Kadhwan Hydro-Power Project which envisaged installed capacity of 450 M (6 units of 75 MW each). Implementation of this project assumes great importance in view of existing acute shortage of hydro-power in the state as also limitations in hardnessing the international rivers, like the Kosi, the Kamla, the Bagmati and the Gandak which do have immense power potential but all potential dam-sites are outside the country.

Sri Narasimhan, Member (HE) and Shri Rajendra Singh, Chief Engineer in their joint paper titled HYDRO-ELECTRICITY DEVELOPMENT – INDIAN SCENARION have stated that hydropower potential of Bihar assessed at 60% L.F. is only 538 MW. The perspective requirement of electricity being of the order of 5420 MW it becomes obligatory to plan the hydropower projects at much lower Lord Factor. As a matter of fact, even if this hydropower potential is developed at 12.5% L.F., the ultimate demand of peaking will not be met fully from Bihar's own hydropower resources. Thus, there is need for exploiting all possible resources, both through exclusive and multi-purpose water resources projects in the State.


POTENTIAL THOUSAND MW
35
30
25
20
15
10
5
0
Northern
Western
Southern
Easthern
North Eastern
Pot.assessed at60%LF
Pot.developed at60LF
Pot.under at60%LF