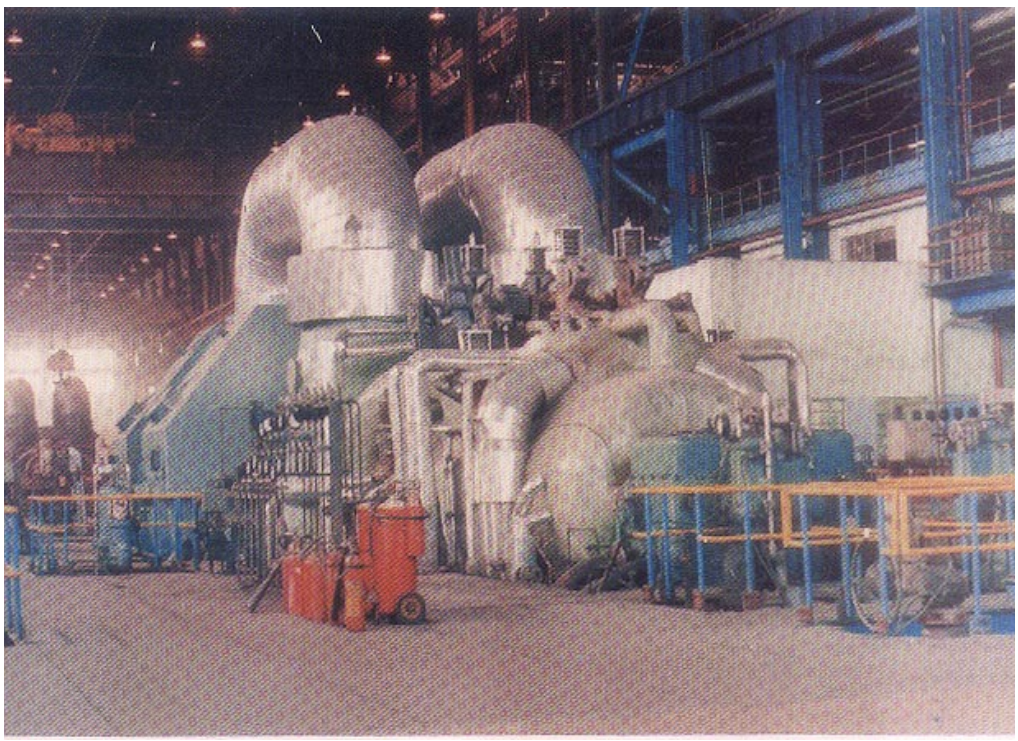


SAVE ENERGY

DEPARTMENT OF POWER

Annual Report 1990-91

MINISTRY OF ENERGY
GOVERNMENT OF INDIA
NEW DELHI



Bokaro 'B' Thermal Power Station Turbo-generators - Unit-I & II

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NHPC- Chamera Project-Concrete Dam under construction

DEPARTMENT OF POWER

ORGANISATION

1.1.1 The Ministry of Energy comprised the Departments of Power, Coal and Non-Conventional Energy-Sources. During 1990-91 (April '90 to March '91), Shri Arif Mohammed Khan was the Minister of Energy upto November 9, 1990. During the remaining period of the year under report, Shri Kalyan Singh Kalvi and Shri Babanrao Dhakne were the Minister of Energy and the Minister of State for Energy respectively.

1.1.2. Shri S. Rajgopal is the Secretary of the Department of Power. He is assisted by a Special Secretary and six Joint Secretaries, including the Financial Adviser.

1.1.3 There are six wings in the Department of Power, each headed by a Joint Secretary. They are:

i) Energy Management & Administration Wing;
ii) Planning & Coordination Wing;
iii) Thermal Wing;
iv) Hydel Wing;
v) Systems & Operation Wing; and
vi) Finance Wing.

1.1.4 The Central Electricity Authority (CEA), constituted under the Electricity (Supply) Act, 1948, advises the Department of Power on technical and economic matters. The construction and operation of generation and transmission projects in the Central Sector are entrusted to Central Sector Power Corporations, namely, the National Thermal Power Corporation (NTPC), the National Hydroelectric Power Corporation (NHPC), the North Eastern Electric Power Corporation (NEEPCO) and the National Power Transmission Corporation (NPTC). The NPTC which was incorporated on the 23rd october, 1989 will henceforth be responsible for all the existing and future transmission projects in the Central Sector and also for the formation of the National Power Grid. Apart from the above organisations, there are two joint venture Power Corporations under the administrative control of the Department of Power, namely, the Nathpa Jhakri Power Corporation and the Tehri Hydro Development Corporation which are responsible for the execution of the Nathpa Jhakri Power Project and projects of the Tehri Hydro Power Complex respectively. The Damodar Valley Corporation (DVC) constituted under the DVC Act, 1948, and the Bhakra Beas Management Board (BBMB) constituted under the Punjab Reorganisation Act, 1966 are also under the administrative control of the Department of Power. The Department of Power also administers the Beas Construction Board (BCB), which is a construction agency. Further, the Central Power Research Institute (CPRI), the Power Engineers Training Society (PETS) and the Energy Management Centre are under the administrative control of the Department of Power. Programmes of rural electrification are within the purview of the Rural Electrification Corporation (REC). The Power Finance Corporation (PFC) provides term-finance to the projects in the power sector.

FUNCTIONS

1.2.1 The primary responsibility of the Department of Power pertains to the development of electrical energy in the country. The Department is concerned with perspective planning, policy formulation, processing of projects for investment decision, monitoring of the projects, training and manpower development and the administration and enactment of legislation in regard to power generation, transmission and distribution. The Department of Power is also responsible for the administration of the Electricity (Supply) Act, 1948 and the Indian Electricity Act, 1910 and to undertake such amendments to these Acts, as may be necessary from time to time, in conformity with the Government's policy objectives.

ENERGY POLICY

1.3.1. The Energy Policy of the Government of India aims at ensuring adequate energy supplies at a minimum cost, achieving self-sufficiency in energy supplies and protecting the environment from the adverse impact of utilising energy resources in an injudicious manner. The main elements of the Energy policy are:

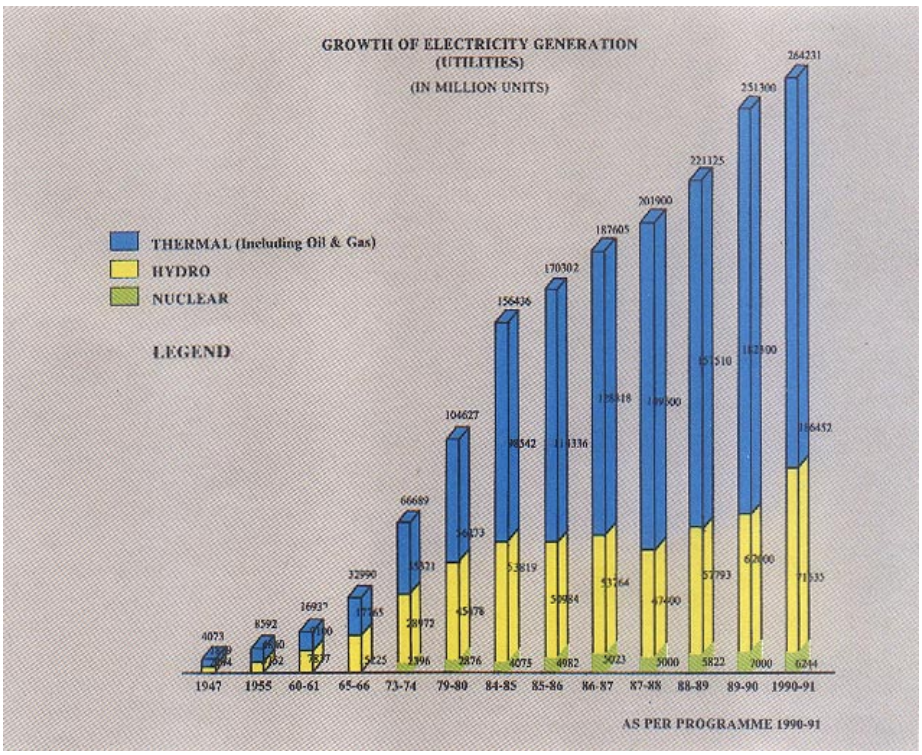
- Accelerated exploitation of domestic conventional energy sources, viz. coal, hydel, oil and nuclear power.
- Management of demand for oil and other forms of energy.
- Energy Conservation and Management, with a view to increase energy productivity.
- Optimising the utilisation of existing capacity in the country.
- Development and exploitation of renewable sources of energy to meet the energy requirement of rural communities.
- Intensification of research and development activities in the field of new and renewable energy sources.
- Organisation of training for the personnel engaged at various levels in the energy sector.

THE YEAR UNDER REVIEW

2.1.1 During the year 1990-91, the National Thermal Power Corporation (NTPC) commissioned its targeted generating capacity of 312 MW, raising its total installed capacity to 10125 MW. The generation from the NTPC power stations during 1990-91 at 46879 million units exceeded the target of 46475 million units. As against the target of 1880 Ckt. Km. for the year 1990-91, the NTPC completed 2213 Ckt. Km. of transmission lines, exceeding the target by 17%. A Memorandum of Understanding (MOU) for the year 1990-91 signed between the NTPC and the Department of Power, clearly identified the performance targets to be achieved by the NTPC during the year with respect to power generation, additional new capacity and construction of transmission lines, apart from laying down the actions to be taken by the Government to enable the achievement of these targets.

2.1.2. The NTPC stations at Singrauli and Ramagundam qualified for the meritorious productivity award for the year 1990 for achieving high standards of performance. This is the fifth year in succession that the Singrauli project has won this award. Four employees of the Ramagundam STPP were awarded the Prime Minister's Shram Bhushan Award in 1990 for their outstanding and meritorious work performance. The NTPC has also won the Prime Minister's MOU Award for excellence in performance, instituted by the Ministry of Programme Implementation for the year 1989-90.

2.1.3. As per the provisional estimates, the NTPC earned a net profit of Rs. 605.47 crores during 1990-91 as compared to Rs. 536.56 crores during the earlier year.



2.1.4. The performance of the National Hydroelectric Power Corporation was also commendable during 1990-91. The Corporation which is responsible for the operation and maintenance of Baira Siul, Loktak and Salal Stage-I projects generated 3617.46 million units in 1990-91 which was 13% more than the targeted generation. The performance of the NHPC's transmission system also exceeded the target during the year under review. Its Jeypore-Talchar transmission system transmitted 304.68 million units of power as compared to the target of 225.0 million units during 1990-91.

POWER GENERATION

2.2.1 The total energy generation in the country during 1989-90 was 245 BUs, showing an increase of 10.8% over the generation in 1988-89. The increase in thermal generation during 1989-90 over the previous year was 13.3%. The hydro generation registered an increase of 7.2% during 1989-90 over the earlier year because of favourable monsoon.

2.2.2 For the year 1990-91, a generation target of 271.3 BUs was fixed, comprising 201.4 BUs thermal, 6.9 BUs nuclear and 63 BUs hydro power. This envisaged an increase of about 10.7% over the generation achieved during 1989-90.

2.2.3 During the period April, 1990 to March, 1991 the hydro generation was about 8.5 BUs more than the target. This was mainly due to favourable monsoon. The thermal generation was however 14.91 BUs less than the programme because of backing down due to low system demand, delay in commissioning and stabilisation of certain units and non availability of requisite quantity of quality coal. The total generation during 1990-91 was 264.14 BUs which was 7.8% more than the generation during the previous year. The actual generation during the period April, 1990 to March, 1991, as compared with the target is given below:-

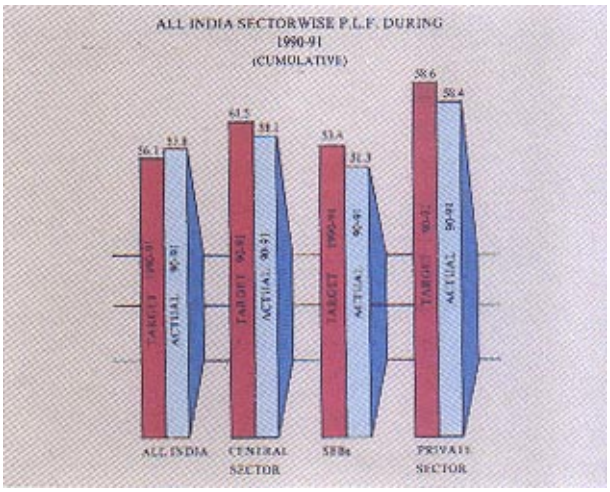
(Figures in MU)

(Period April-March, 91)

Type	Target	Actual	% age of programme	% age of last year
Thermal	201400	186434	92.6	104.4
Nuclear	6850	6214	90.7	134.4
Hydro	63000	71496	113.5	115.3
	271250	264144	97.4	107.8

PLANT LOAD FACTOR OF THERMAL STATIONS

2.2.4 Thermal capacity, at present, constitutes about 68.70% of the total installed capacity in the country, and contributes



about 72.82% of the total power generation. At the beginning of the 6th Five Year Plan, the performance of the thermal power stations was unsatisfactory with the Plant Load Factor of 44.3% only. To improve their performance a number of measures were taken to achieve the optimum utilisation of the existing thermal units. At the beginning of 7th Five Year Plan i.e. 1985-86, the PLF improved to 52.4% and further increased to 53.2 in 1986-87. During 1987-88, the PLF increased to 56.5% which was the highest achieved in any year. During 1988-89 the PLF was 55%. The decrease in PLF during 1988-89 over the previous year was mainly due to favourable monsoon and consequent reduction in demand, particularly, in Agricultural Sector, resulting in low thermal generation. During the year 1989-90, the PLF was 56.4%. During the period April, 1990 to March, 1991 the PLF was 53.8%.

2.2.5 During the period April, 1990 to March, 1991, the following State Electricity Boards/Corporations achieved PLF higher than the All-India average of 53.8%.

Sl.	SEBs/Corporations	PLF(%)
1.	Gujarat	57.7
2.	Maharashtra	58.2
3.	Andhra Pradesh	65.8
4.	Tamil Nadu	58.3
5.	Karnataka Power Corpn.	76.3
6.	WestBengal Power Development Corporation	57.1
7.	N.T.P.C.	60.9
8.	Neyveli	69.6
9.	A.E.Co.	67.4
10.	Trombay	54.7
11.	C.E.S.C.	60.9

2.2.6 Vijayawada Thermal Power Station of APSEB achieved the highest plant Load Factor of 83.8% during April, 1990 to

March, 1991. In the private sector, Ahmedabad Electric Co. achieved the highest Plant Load Factor of 67.4% during the period. In the central sector, Singrauli Super Thermal Power Station of the NTPC achieved the highest PLF of 68.6% during this period.

MERITORIOUS PRODUCTIVITY AWARD SCHEME

2.2.7 The Meritorious Productivity Award Scheme for better performance of thermal power stations, which was started in 1983-84, is being continued. The objective of the Scheme is to maximise thermal generation by motivating the employees working in various thermal power stations by providing cash awards to them, for significant increase in thermal generation. For the Calendar year 1989 the following power stations received the awards under this Scheme:-

1. Tuticorin TPS (TN)
2. Vijayawada TPS (AP)
3. Singrauli STPS (NTPC)
4. Neyveli-I TPS (NLC)
5. Raichur TPS (Karnataka)
6. Ramagundam STPS (NTPC)
7. Bhatinda TPS (Punjab)
8. Ukai TPS (Gujarat)
9. Kota TPS (Rajasthan)
10. Vindhyachal STPS (NTPC)
11. Anpara TPS (UP)
12. Indraprastha TPS (DESU)
13. Bandel TPS (West Bengal)
14. Korba East (TPS) (M.P)
15. Wanakbori TPS (Gujarat)
16. Chandrapur TPS(Maharashtra)
17. Koradi TPS (Maharashtra)

RENOVATION AND MODERNISATION OF THERMAL POWER STATIONS

R&M PROGRAMME-PHASE-I

2.2.8 With a view to improve the performance of the existing thermal power stations, a massive renovation and modernisation programme has been launched all over the country.

2.2.9 The scheme covers 34 selected stations comprising 162 thermal units aggregating to a capacity of 13475.5 MW. The total sanctioned cost of various renovation schemes is Rs. 1083 crores. Of this, Rs.455 crores is being provided under Central Loan Assistance and Rs. 628 crores will have to be financed by the States under State plan/Own Resources. In so far as the Central Assistance is concerned, the Government of India had approved an amount of Rs. 500 crores in 1984, for providing Central Loan Assistance to various State Electricity Boards/Organisations to supplement their efforts.

2.2.10 The Power Finance Corporation have started financing the scheme from the year 1988-89. The details of budget provisions and release of funds/expenditure in the various years including the year under report are given in Annexure-I.

2.2.11 The CEA has been doing overall coordination and extensive monitoring of the implementation of physical and financial progress of the R & M programme. Some of the thermal units where substantial portion of R & M works have been carried out have shown marked improvement in their performances as can be seen from Annexure-II.

PROPOSED R&M PROGRAMME-PHASE-II

2.2.12 Keeping in view the benefits being accrued out of the phase-I of the R & M programme during the VII plan period, it has been proposed to launch its Second phase during 8th plan period with the main objective to achieve optimum performance results from the old thermal units. The total tentative cost of the proposed R & M programme (Phase-II) covering 46 old thermal power stations comprising 201 generating units aggregating to a total capacity of 19980.9 MW, as per broad assessment recently made, comes to Rs. 1265 crores. Of the total proposed 46 schemes of the TPS, 39 schemes covering 172 units aggregating to a capacity of 18486 MW at a total estimated cost of Rs. 1123 crores have been cleared by the CEA and the balance 7 numbers of schemes covering 29 units aggregating to a capacity of 1494.9MW at a total tentative cost of Rs. 142 crores are under examination.

ANNEXURE-I

DETAILS OF BUDGET PROVISIONS AND RELEASE OF FUNDS UNDER CENTRAL LOAN ASSISTANCE/EXPENDITURE UNDER STATES PLAN/OWN RESOURCES.

As on: 31.3.1991

(Rs. in Crores)

Year	Budget/release under CLA & Expenditure under SP/OR	Under CLA	Under SP/OR	Total
1984-85	Budget	9.48	106.34	115.82
	Release/Expenditure	9.48	106.34	115.82
1985-86	Budget	90.26	88.72	178.98
	Release/expenditure	90.26	39.50	129.76
1986-87	Budget	83.56	116.61	200.17
	Release/Expenditure	83.56	59.02	142.58
1987-88	Budget	100.00	142.65	242.65
	Release/Expenditure	60.61	80.17	140.78
1988-89	Budget	65.13	138.57	203.70
	Release/Expenditure	46.09	70.75	116.84
1989-90	Budget	42.47	134.20	176.67
	Release/Expenditure	30.00	82.91	112.91
1990-91	Budget	27.83	133.44	161.27
	Release/Expenditure	19.79	40.71	60.50
Total	Budget	418.73	860.53	1279.26
	Release/Expenditure339.79 (Cumulative)	479.40	819.19	

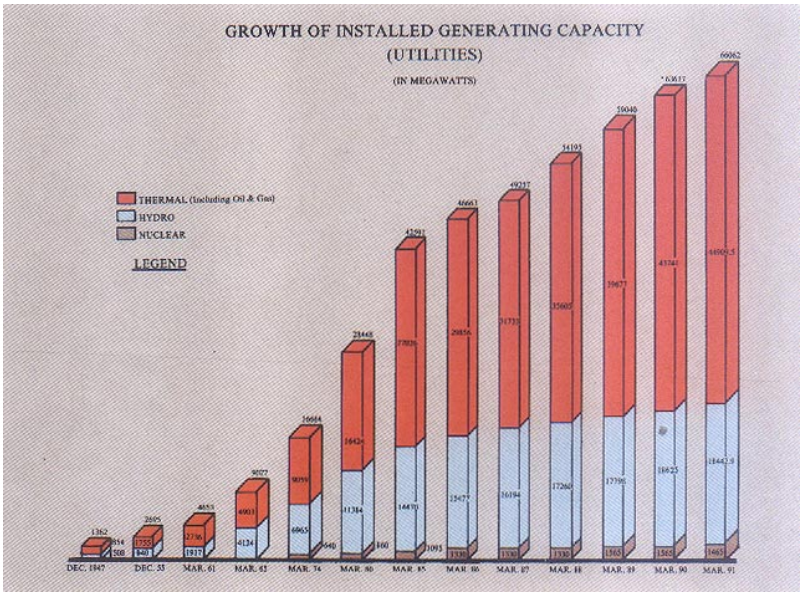
ANNEXURE-II

STATEMENT SHOWING IMPROVEMENT IN PLF OF THERMAL UNITS WHERE SUBSTANTIAL R&M WORKS HAVE BEEN CARRIED OUT.

(As on: 1.4.1991)

Sl. No.	Name of TPS	UNITS PARTICULARS No.	Rated Cap.	Derated Cap., if any	PLF BEFORE RENO: Based on rated Cap.	Based on derated Cap. if any	PLF AFTER SUBSTANTIAL renovation based on rated cap. (or) derated cap. wherever applicable (April-March, 91)
			(MW)	(MW)	(%)	(%)	(%)
1.	2.	3.	4.	5.	6.	7.	8.
1.	BADARPUR	1	100	95	45.7	48.1	78.1
		3	100	95	57.2	60.2	66.5
		4	210	-	44.2	-	73.5
		5	210	-	37.0	-	66.8
2.	I.P.	2	62.5	-	47.9	-	57.9
		3	62.5	-	53.5	-	57.7
		5	60	-	50.3	-	73.1
3.	FARIDABAD	1	60	55	28.8	31.4	78.7
		3	60	55	21.1	23.0	47.3
4.	BHATINDA	1	110	-	48.0	-	60.8
		3	110	-	45.7	-	58.2
		4	110	-	52.6	-	59.9
5.	PANKI	4	110	105	43.4	45.5	53.1

1.	2.	3.	4.	5.	6.	7.	8.
6	OBRA	2	50	40	45.7	57.1	71.6
		6	100	94	37.9	40.3	56.0
		7	100	94	39.2	41.7	52.9
		9	200	-	33.3	-	72.0
		10	200	-	31.4	-	66.7
		11	200	-	28.4	-	58.9
		12	200	-	40.2	-	74.8
		13	200	-	35.1	-	73.8
7.	HARDUAGANJ (B&C)	6	60	-	38.1	-43.6	
8.	KORBA-II	1	50	40	61.0	76.3	78.8
		3	50	40	62.6	78.3	80.5
		4	50	40	52.5	65.6	71.6
9.	KORBA-III	1	120	-	41.4	-	47.7
		2	120	-	56.4	-	60.5
10.	SATPURA	1	62.5	-	51.5	-	59.0
11.	GANDHINAGAR	2	120	-	48.2	-	62.8
12.	UKAI	2	120	-	38.7	-65.5	
13.	KORADI	4	120	115	38.9	40.6	56.4
14.	KOTHAGUDAM	1	60	-	40.0	-58.4	
		4	60	-	54.9	-	62.6
		5	110	105	27.6	28.9	44.4
		6	110	105	23.2	24.3	55.0
		7	110	-	17.3	-	50.4
		8	110	-	34.2	-	47.0
15.	RAMAGUNDAM	1	62.5	-	70.4	-	73.2
16.	ENNORE	1	60	-	51.0	-68.1	
		2	60	-	48.1	-	63.2
		4	110	-	25.2	-	50.3
		5	110	-	26.4	-	55.0
17.	TUTICORIN	1	210	-	46.0	-	66.5
		2	210	-	47.0	-	65.1
		3	210	-	40.4	-	82.7
18.	NEYVELI	3	50	-	71.1	-	80.6
		6	50	-	78.3	-	83.8
		8	100	-	68.2	-	84.7
		9	100	95	66.3	69.8	79.2
19.	TALCHER	1	62.5	60	33.7	35.1	65.6
20.	PATRATU	1	50	40	32.8	41.0	51.4
		2	50	40	25.2	31.5	62.8
		6	100	90	44.3	49.2	51.0
21.	SANTALDIH	4	120	-	34.1	-	56.2
22.	DPL	3	70	-	00.0	-	22.2



ADDITION TO GENERATING CAPACITY
PROGRAMME & ACHIEVEMENT DURING 1990-91

2.3.1 Based on the programme of construction of various ongoing projects, a revised programme of commissioning of 70 units with capacity aggregating to 4212*MW was fixed for the year 1990-91. The sectoral break up of the programme and achievement during 1990-91 by type of generation is as under:-

	Programme during 1990-91(MW)			Achievement During 1990-91(MW)		
	Central Sector	State Sector	Total All-India	Central Sector	State Sector	Total All-India
Hydro	-	1006.5	1006.5	-	445.5	445.5
Thermal	732	2238.5	2970.5	732	1599.0	2331.0
Nuclear	235	-	235	-	-	-
Total	967	3245	4212	732	2044.5	2776.5**

* Excludes 144 MW capacity of GIP CL-OCGT plant at Baroda, GIP CL being a non utility and 15.5 MW mini-micro hydel capacity being monitored by DNES.

**Excludes a non-utility GIP CL Unit-I of 33MW commissioned in February, 1991.

2.3.2 The details of units commissioned or rolled during 1990-91 are given in the following statement.

DETAILS OF UNITS COMMISSIONED/ROLLED DURING 1990-91

Sl. No.	Name of the Project	Unit No.	State/ Orgn.	Capacity (MW)	Schedule date of Commissioning	Actual date of Rolling	Actual date of Commissioning
	HYDRO						
	Central Sector	Nil					
	State Sector						
1.	Lower Bhawani	2	Tamil Nadu	2	4/90	-	14.04.90
2.	Lower Bhawani	1	Tamil Nadu	2	6/90	-	21.05.90
3.	Kadana PSS	2	Gujarat	60	6/90	27.08.90	01.09.90
4.	Hirakund St. III	1	Orissa	37.5	6/90	-	10.09.90
5.	Varahi	2	Karnataka	115	7/90	24.09.90	12.11.90
6.	Bansagar Tons	1	M.P	105	7/90	08.11.90	-
7.	Bansagar Tons	2	M.P	105	9/90	03.03.91	-
8.	Bhatsa	1	Maharashtra	15	6/90	12.01.91	-
9.	Kanher	1	Maharashtra	4	12/90	20.03.91	-
	Sub-total (S)			445.5			
	Total (H)			445.5			
	THERMAL						
	Central Sector						
1.	Auraiya ST	2	UP/NTPC	102	6/90	-	12.06.90
2.	Bokaro 'B'	2	DVC	210	7/90	-	07.11.90
3.	Vindhyachal	6	MP/NTPC	210	12/90	-	01.02.91
4.	Neyveli	4	TN/NLC	210	10/90	-	30.3.91
	Sub-total (C)			732			
	State Sector						
1.	VijjeswaramGT	1	A.P.	33	6/90	-	31.08.90
2.	CESE	1	W.B.	67.5	7/90	09.08.90	12.08.90
3.	Kolaghat	1	W.B.	210	7/90	07.08.90	13.08.90
4.	DG set at Imphal	1	Manipur	1	6/90	-	30.09.90
5.	DG set at Imphal	2	Manipur	1	6/90	-	30.09.90
6.	Rokhia GT	2	Tripura	8	5/90	-	26.11.90
7.	Vatwa CCGT	1	Gujarat	33	5/90	-	29.12.90
8.	Kutch Lignite	2	Gujarat	70	12/90	-	25.03.91
9.	Chandrapur	5	Maharashtra	500	3/91		22.03.91
10.	VijjeshwaramGT	2	A.P.	33	9/90	-	02.03.91
11.	Raichur	3	Karnataka	210	1/91	-	30.03.91
12.	Tuticorin	5	Tamil Nadu	210	2/91	-	31.03.91
13.	Kolaghat	5	W. Bengal	210	8/90	-	19.03.91
14.	Chatham DG set	1	A&N Islands	2.5	5/90	-	18.10.90
15.	Chatham DG set	2	A&N Islands	2.5	6/90	-	10.90
16.	DG Sets at Chatham	3	A&N Islands	2.5	9/90	-	24.02.91
17.	DG Sets at Chatham	4	A&N Islands	2.5	11/90	-	24.02.91
18.	DG Sets at Chatham	5	A&N Islands	2.5	12/90	-	30.03.91
	Sub-total (S)			1599			
	TOTAL (T)			2331			
	TOTAL (H+T)			2776.5*			

* Excludes a non-unity GIPCL unit-I of 33MW Commissioned in Feb, 91

TRANSMISSION

2.4.1 Transmission line projects continue to be accorded a high priority in the context of the need to evacuate power from the Central Generating Stations to the beneficiary states. The programme for 1990-91 included construction of 3240 Ckt. Km. of 400KV lines and 3030 Ckt. Km. of 220 KV lines alongwith the associated sub-stations.

2.4.2 The progress achieved during the year 1990-91 in the construction of transmission lines and substations is summarised below:-

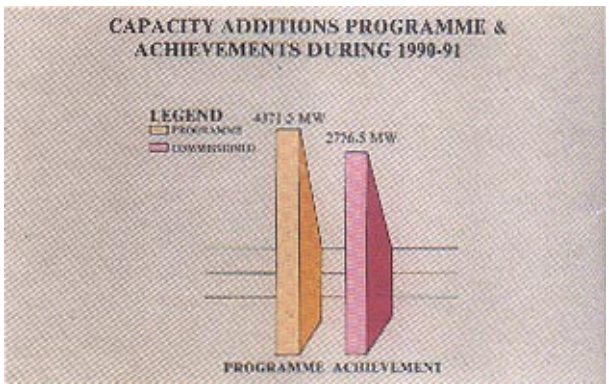
400KV	-4725 Ckt. Km.
220KV	-2489 Ckt. Km.
400 KV Sub-station	-1260 MVA.
220 KV Sub-Station	-4300 MVA.

CENTRAL SECTOR TRANSMISSION SYSTEMS

2.5.1 Central Sector Transmission lines and substations completed during the year 1990-91 are listed in the following table:

Transmission Lines	Executing Agency	Length Ckt. km.	Total
Transmission Lines.			
400KV			
1. Dadri-Ballabgarh, D/C	NTPC	107	
2. Rihand-Dadri (HVDC)	NTPC	817	
3. Dadri-Mandaula D/C	NTPC	92	
4. Jabalpur-Itarsi, D/C	NTPC	464	
5. Ramagundam-Chandrapur, D/C	NTPC	360	
6. Nagarjunasagar-Gooty, S/C	NTPC	298	
7. Farakka-Bhagalpur, D/C	NTPC	260	
8. Bhagalpur-Biharsharif, D/C	NTPC	332	
9. Kahalgaon-Maithon, D/C	NTPC	334	
10. Salem-Udumalpet	NLC	152	
11. Neyveli-Salem, S/C	NLC	179	3395
220KV			
1. Kawas-Bharuch D/C	NTPC	162	162
Sub-Stations			
400KV			
1. Rangali (2nd transformer)	NTPC	315	
2. Malda	NTPC	315	
3. Mandaula	NTPC	315	
4. Udumalpat	NLC	315	1260
220KV			
1. Jamshedpur	DVC	150	
2. Lalmatia	NTPC	100	250

2.5.2 The National Thermal Power Corporation (NTPC) is executing the 220 KV and 400 KV transmission projects associated with their Super Thermal Power Stations in the various regions. The NTPC has also established the HVDC back-to-back link between Vindhyachal and Singrauli Super Thermal Power Stations as well as the first $ 500KV HVDC bipole line from Rihand to Dadri. The schemes for providing a 1000MV HVDC back-to-back tie between Chandrapur (in western Region) and Ramagundam (in Southern Region) has been accorded the approval of the PIB. Besides, an experimental HVDC project between Lower Sileru in Andhra Pradesh and Barsur in Madhya Pradesh for the conversion of one circuit of the existing 220 KV/D/C line into a direct current link has also been commissioned by the BHEL.



2.5.3 The National Hydroelectric Power Corporation (NHPC) is constructing the 220 KV and 400 KV transmission projects associated with the generation projects undertaken by it. NHPC has constructed the 400 KV Jeypore-Talcher line in Orissa. Besides this, a scheme for providing a 500 MW HVDC back-to-back tie between Jeypore (in Eastern Region) and Gazuwaka (in Southern Region) is under process for investment approval.

2.5.4 To facilitate the exchange of power between the States and Regions, Inter-State and Inter-Regional transmission lines are being constructed under a Centrally Sponsored Scheme which was introduced in 1969. During the year 1990-91 stringing of second circuit of 220 KV inter-State line from Kolhapur (Maharashtra) to Ponda (Goa) was completed.

TRANSMISSION AND DISTRIBUTION LOSSES

2.6.1 The average All-India transmission and distribution losses for the year 1989-90 was provisionally estimated at about 23%.

2.6.2 The Government of India have launched a scheme for incentive payments for the reduction of transmission and distribution (T&D) losses. Under the scheme, the SEBs/

Electricity Departments and their Distribution Divisions which achieve a prescribed minimum reduction in T&D losses are given awards. In addition they are given shields on the basis of their performance in the reduction in energy losses and Chairmen/Heads of the concerned Electricity Boards/Departments are given Gold Medals. Individuals as well as institutions and organisations, who develop scientific devices or put forward practical suggestions for reduction of T&D losses also qualify for cash awards.

During the year 1990-91 Gold Medals and shields for the year 1988-89 were awarded to State Electricity Boards/Departments of Gujarat, Punjab, Chandigarh and Manipur. In addition cash awards were given to Chandigarh and thirteen Distribution Divisions of GEB and a shield to the BAVLA (O&M) Distribution Division of GEB.

INTEGRATED OPERATION

2.6.3 The Regional Power Grids in the Northern, Western, Southern and Eastern Regions facilitate the flow of power from surplus areas to deficit areas and assist in the optimum utilisation of the power available in the country.

2.6.4 The inter regional transfers of power effected during the year 1990-91 are given below:-

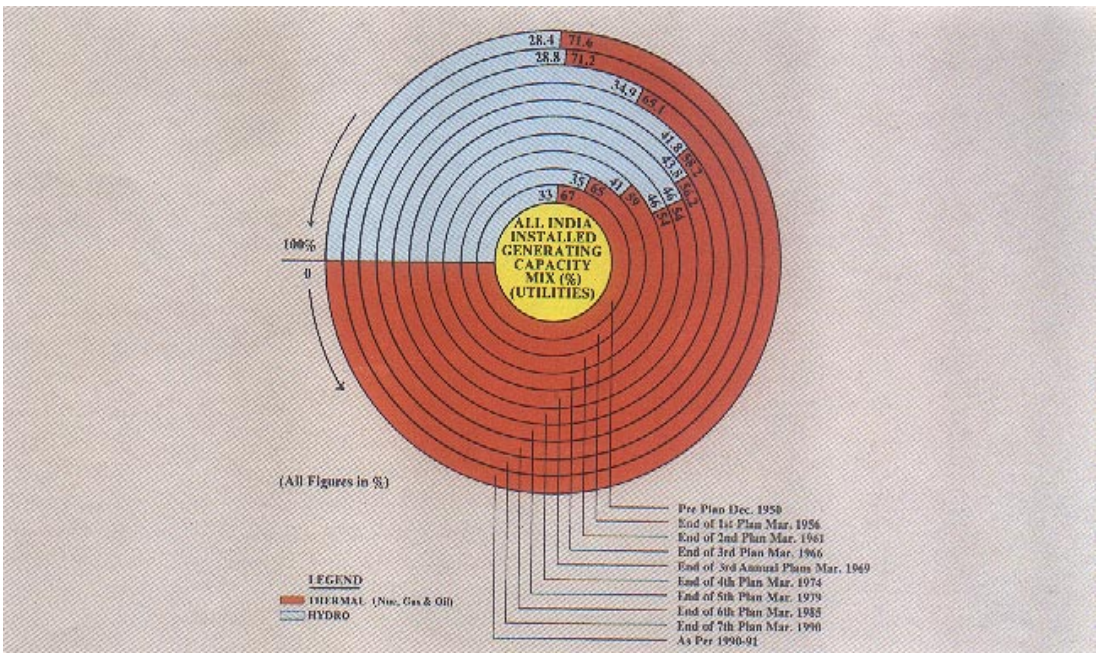
Inter-Regional transfer of power during April, 1990 to March, 1991

(figures in MUs)

Supplied from	To				
	Northern	Western	Southern	Eastern	Total
Northern	-	105.8	-	741.4	847.2
Western	303.0	-	371.7	182.1	856.8
Southern	-	6.3	-	-	6.3
Eastern	-	-	-	-	-
Total	303.0	112.1	371.7	923.5	1710.3

DEVELOPMENT OF A NATIONAL POWER GRID

2.6.5 The setting up of a National Power Grid is an evolutionary process. To achieve this objective, the strengthening and the improvement of the Regional power Grids and their progressive integration through the setting up of inter-State transmission lines and Central Sector transmission projects which cut across State boundaries was continued during the year. These projects, alongwith the 400 KV and 220 KV transmission systems being constructed by the National Thermal Power Corporation, the National Hydro-electric Power Corporation, the Neyveli Lignite Corporation and the North Eastern Electric Power Corporation are expected to constitute the basic structure of the National Power Grid. In order to accelerate the process of



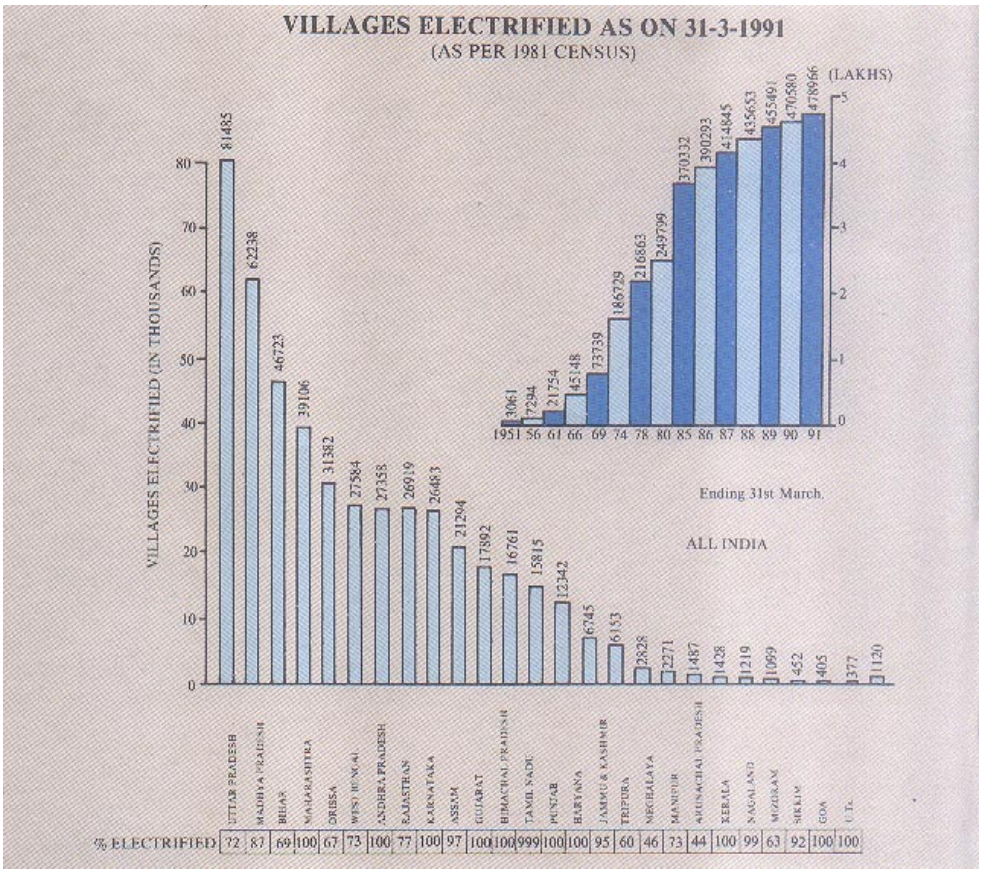
the formation of the Grid, a Corporation under the Department of Power viz. the National Power Transmission Corporation has been set up which will take over the construction, ownership, operation and maintenance of the existing HV transmission lines in the country to ensure a better integrated grid-operation and delivery of power from the central generating stations to the respective beneficiary States.

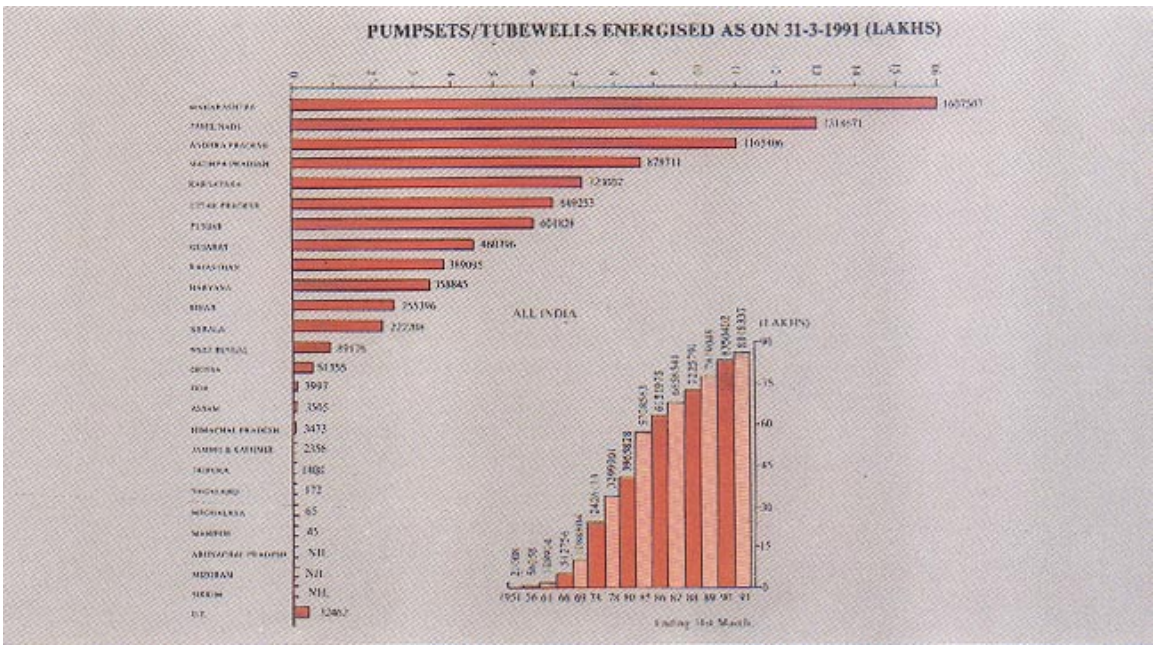
REGIONAL ELECTRICITY BOARDS AND REGIONAL LOAD DESPATCH CENTRES

2.6.6 In order to promote the integrated operation of the power systems, the country has been divided into five regions namely North, West, East and North-East. Regional Electricity Boards have been set up in each of these regions.

2.6.7 To coordinate the operations of the grids of the constituent power systems and to optimise utilisation of the existing generation capacity, Regional Load Despatch Centres have been set up in each region which function under the Regional Electricity Boards. The Central Electricity Authority exercises over-all supervision over the Regional Load Despatch Centres (RLDCs)

2.6.8 In the Northern, Western and Eastern regions, permanent Regional Load Despatch Centres equipped with computer based telemetry and data acquisition systems have been established. The existing facilities in the Southern Region are proposed to be modernised for which M/S EDF International, France, have been appointed as consultant under the World Bank funding. The consultants have submitted a detailed project report and





technical specifications. In the North-Eastern region, an interim load despatch centre is operating. It is proposed to set up a permanent RLDC with modernised facilities in the North-Eastern region during the VIII plan period for which a project proposal is under consideration. Also it is proposed to take up a unified scheme for the establishment of fullfledged SLDCs and augmentation of RLDC in the Northern Region.

MASTER TELECOM PLAN FOR INDIAN POWER SECTOR

2.6.9 The work of preparing a Master Telecom Plan for the Indian power Sector covering all power utilities, Regional Electricity Boards, Central Power Sector and National Level was awarded to M/s. Merz & Mclellan, U.K. in association with M/s. Bharat Electronics Limited, India in November, 1987. The Report of the Consultants has been made available to CEA in three phases and the same has been sent to the concerned utilities to initiate the process of implementation. The project reports for the independent dedicated telecom system for the State Electricity Boards of Punjab (phase-I), Kerala, Gujarat, Madhya Pradesh and Maharashtra (phase-I) have already been appraised by the CEA. Department of Telecommunications has been requested by CEA on behalf of the power utilities to accord their clearance for the dedicated multi-channel link by the power utilities. The have already approved the optical fibre scheme of Punjab state Electricity Board.

UPGRADING OF TECHNOLOGY

Next Higher AC Transmission Voltage

2.6.10 The adoption of 800 KV class as the next higher AC transmission voltage in the country had been accepted by the Govt. of India in October, 1988. The decision had been conveyed to all State Electricity Boards/Power Utilities, etc. With a view to bring uniformity in the development of future 800KV systems in the country, the Standing EHV Committee had constituted 10 Working Groups with representatives from Electricity Boards/Undertakings, CPRI, Industry and CEA to take up the work of standardisation of 800 KV class equipment/transmission line material. Based on the studies carried out by the Working Groups and the detailed discussions held by them, a report on Standard parameters of 800KV transmission system in India had been brought out by CEA in September, 1990. This report has been circulated to all the Electricity Boards and Power Utilities etc. for their guidance and adoption of recommended parameters.

NATIONAL HVDC PROJECT

2.6.11 Under the national HVDC project one circuit of the existing double circuit 220 KV AC line from Lower Sileru (Andhra Pradesh) to Barsoor (M.P.) is being converted into +200 KV 200 MW DC link. The project is being implemented in two phases. The first phase envisaged the conversion of one

circuit to +100 KV 100 MW link. The link was commissioned in September, 1989. Full rated Power flow of 100 MW at 100 KV DC was transmitted on 20th August, 1990 over this link. However, due to operational problems on AC side, the operation was discontinued after running for a short time. However, from the end of April'91 Power flow of the order of 60-70 MW has been resumed. In the second phase, which has already been approved by the HVDC hardware development committee, the link will be uprated to 200 KV and 200 MW. The second 220 KV AC circuit will continue to be operated as AC link.

HVDC LINKS

Vindhyachal HVDC back-to-back project

2.6.12 Vindhyachal back-to-back project linking the Northern and Western regions was commissioned in March, 1989 and is now under commercial operation with full capacity utilisation of 500 MW. The project was executed by M/S ASEA, Sweden, and the commissioning of this project is a quantum jump in HVDC technology in the country. This link enables controlled power flow between the two regions.

Rihand-Delhi HDVC transmission+500 KV 1500MW Bipole

2.6.13 Rihand-Delhi HVDC transmission system was put into trial operation with one pole in December, 1990. The restoration work of the other pole damaged due to fire incident is in progress.

RURAL ELECTRIFICATION PROGRAMME

2.7.1 Rural Electrification programmes are financed by the State Governments and the Rural Electrification Corporation.

2.7.2 By the end of the Sixth Five Year Plan, 3.70 lakh villages had been electrified and about 57 lakh pump sets energised. By the end of the Sixth Plan period about 64% of the villages were electrified. During the Seventh Plan period (1985-90) 100494 villages were electrified and 2641837 pumpsets energised. The targets for village electrification and energisation of pumpsets for the year 1990-91 were 9962 villages and 336760 pumpsets, against which, the actual achievements were the electrification of 8386 villages and energisation of 467935 pumpsets/

2.7.3 The electrification of tribal villages and Harijan Bastis continued to receive special attention. Out of 1.11 lakh tribal villages, 72344 had been electrified upto March, 1991. The number of villages in which street lighting facilities were extended to Harijan Bastis was 238927 up to October, 1990.

SEVENTH FIVE YEAR PLAN

2.8.1 The salient features of the approved power programmes during the Seventh Five Year Plan (1985-90) were:

i) Induction of additional generating capacity of 22,245 MW as follows:-

Thermal	15,999MW
Hydro	5,541 MW
Nuclear	705MW
Total	22,245 MW

ii) Construction of associated transmission and distribution facilities corresponding to the addition of 22,245 MW generating capacity.

iii) Electrification of 1.18 lakhs villages and energisation of 23.9 lakh Pumpsets.

iv) Implementation of programmes of renovation and moder -nisation, research and development, energy conservation etc.

2.8.2 The achievement of the Seventh Plan Power Programme has been impressive. An additional generating capacity of 21,401 MW comprising 17,104 MW of thermal, 3827 MW of hydro and 470 MW of Nuclear, was installed, achievement being 96.2% of the target fixed for the Seventh Plan. A 250 MW back to back HVDC line was established at Vindhyachal. About 13,800 Ckt. Kms of 400 KV and 13,600 Ckt. Kms of 220 KV lines were added to the transmission and distribution network in the country. Electrification of 1,00,494 villages and energisation of 20.41 lakhs of pumpsets were completed during the Seventh Plan.

A total allocation of Rs.34273 crores was made in the Seventh Plan for the power sector against which the expenditure was Rs.37201 crores, the details of which are given below:-

(Rs. in Crores)

	Approved outlay	Expenditure (Tentative)
States	22,784	20,757
U.Ts	437	929
Centre	11,052	15,515
Total	34,273	37,201

FOURTEENTH POWER SURVEY COMMITTEE

2.9.1 The Fourteenth Power Survey Committee was set up in February, 1989, under the Chairmanship of Chairman, CEA to review demand projections in detail keeping in view the Eighth Plan proposals and to project the perspective demand in the country up to 2009-10.

INDO-SOVIET WORKING GROUP ON POWER

2.10.1 The thirteenth meeting of the Indo-Soviet Working Group on power was held in Moscow from 18th to 25th September, 1990. The Soviet side was let by Mr. A.P. Poddubsky, Deputy Minister for Power & Electrification, USSR, and the Indian side was led by Shri S. Rajgopal, Secretary, Department of Power.

2.10.2 The Working Group reviewed the progress the Soviet assisted thermal power projects in India viz., Vindhyachal-Kahalgaon, Kayamkulam, Maithon Right Bank. Mangalore, Bakreswar and hydro projects viz., Tehri and Kol Dam. The Working Group also reviewed the progress of transmission lines such as Dulhasti-Kishenpur-Srinagar, Vindhyachal-Bina-Nagda and Vindhyachal-Jabalpur-Itarsi. Both the sides identified measures to remove the bottlenecks and difficulties, which are encountered in the project implementation, within the stipulated time schedules.

2.10.3 The other areas in the field of Indo-Soviet co-operation considered by the Working Group included maintenance, repair and modernisation of the Soviet made equipment installed at power stations in India, scientific and technical co-operation, training programmes, supply of BHEL equipment/services to Soviet assisted projects in India/third countries, consultancy in tidal power development and energy management.

PARTICIPATION IN PROJECTS OUTSIDE INDIA CHUKHA HYDEL PROJECT, BHUTAN

2.11.1 From the Chukha Hydel project, the Royal Government of Bhutan had earned a revenue of over Rs.127 crores by February, 1991 which is about half of the cost of the project. Encouraged by the successful operation of the project, a Memorandum of Understanding was signed between Government of India and the Royal Government of Bhutan for taking up survey and investigation for Chukha Hydroelectric project Stage-II and Stage-III. The Projects, when taken up, would benefit the two countries. While India would be able to get much needed peaking power for its Eastern Region, Bhutan, on the other hand, would be able to earn substantial revenue by sale of power to India.

FOREIGN EXCHANGE

2.12.1 The Department of Power is responsible for the release of foreign exchange for the import of equipment and spare parts required for the operation and maintenance of power stations in the country. It also assesses the need to engage foreign experts for power utilities, both in the public and private sector. Foreign Exchange equivalent to Rs. 69.23 crores under free resources and Rs. 0.645 crores under Rupee payment Arrangement was released up to 31st March, 1991 for import of equipment and spares and also for engaging foreign experts. Foreign Exchange equivalent to Rs. 3.93 crores was also released to power utilities for the import of emergency spares.

2.12.2 Under various lines of credit, foreign exchange equivalent to Rs.881.55 crores, as detailed below, was released for import of equipment during the year, upto March 31, 1991.

Sl. No.	Project	Foreign Exchange released (Rs. in Crores)	Line of Credit.
1.	West Yamuna Canal Hydro Electric project (Haryana) (8MW Bulb Type Hydro Gernerating Units).	0.10	OECF Loan No. IDP-7
2.	Sharavathi Tail Hydro Electric Project-KPCL.	1.53	World Bank Loan No.2938-IN
3.	Karnataka Electricity Board-Capacitor Bank, Capacitor Switches & Auto Reclosure Units.	0.08	World Bank Loan No. IBRD 2165-IN.
4.	K.P.C.L.Gerusoppa Power House (Two numbers of 125T. ECT Cranes).	0.71	World Bank Loan No.2938-IN
5.	K.P.C.L. IO Sets of Micro-Processor based electronic governor	3.45	World Bank Loan No.2827-IN.
6.	K.P.C.L. (Talakalal Dam Leakage case).	0.02	World Bank Loan No. 2827-IN.
7.	Raichur Thermal Power Station (RKPCL) State-II Unit-IV.	89.90	OECF Loan No. IDP-52.
8.	Orissa State Electricity Board-Import of 13 Nos. Generators & Transformers and one number of mobile insulating oil purifier.	0.25	World Bank Loan No.1356-IN 1356-IN
9.	Orissa State Electricity Board-Import of 13 Nos. and one number of mobile insulating oil purifier.	7.36	World Bank Loan No.2278-IN and Generators & Transformers 1356-IN.
10.	Tamil Nadu Electricity Board (Pykara, Lower Bhavani)	0.02	OECF Loan No: IDP.23.
11.	Tata's (Electric Testing equipment for Trombay Thermal. Generating Station)	0.45	IBRD Loan No. 2452-IN.
12.	Orissa Govt. (Boiler quality Steel Plates for upper Indravati).	1.26	IBRD Loan No. 2452-IN
13.	Maharashtra State Electricity Board (Waste heat Recovery project at Uran)	298.69	KFW Credit.
14.	Farakka Super Thermal Power project.	1.64	IBRD Loan No. 2442-IN.
15.	Ramagundam super Thermal Power Project.	0.10	IBRD Loan No. 2076-IN.
16.	Vindhyachal Super Thermal Power Project.	18.08	Russian Credit

17. Singrauli Super Thermal Power Project	0.16	IDA Credit No. 1027-IN.
18. Korba Super Thermal Power Project	5.94	IDA Credit No. 1172-IN.
19. Rihand Delhi HVDC Bipole Project	1.05	Inder Norwegian Grant-in-aid.
20. Dadri G.B.C.C.P.	418.65	KFW Loan of DM 424.9 Millions
21. CTP-I	1.56	IBRD Loan No.2283-IN
22. Talcher Super Thermal Power Project	5.73	French Credit of F.F.612 Million World Bank Credit of US$ 375 Million
23. NCPP Dadri	0.37	IBRD Loan No. 2844-IN.
24. NCPP Dadri for G.T.I.	24.45	KFW Loan of DM 424.9 Million
Total	**881.55**	

2.12.3. Sanctions for engaging a total of 43 foreign experts (6 by NTPC and 37 by CEA) for various projects were also issued during this period.

ENERGY CONSERVATION

2.13.1 In the context of the increasing energy shortage on the one hand and scarcity of resources on the other, the most cost effective option available to the country for bridging the gap between the demand and the supply of the energy is the Energy Demand Management and Conservation. Energy Conservation has accordingly been identified by the Department of Power as one of the thrust areas for the Eighth Five Year Plan. It is aimed to improve the efficiency of the existing supply base and reduce the energy consumption in the energy intensive units through various measures. The Department of Power functions as the nodal point for facilitating the implementation of a coordinated strategy on energy conservation. Energy Management Centre acts as its executive agency.

2.13.2 The strategy being followed is the promotion of energy conservation in energy intensive sectors by assessing the efficiency of energy use through energy audits, evolving action plans for reducing the level of energy consumption per unit of production, and monitoring the targets. Measures taken in the industrial and other core sectors of the economy include the promotion of energy savings through introduction of efficient technologies, demonstration projects, fiscal incentives and standardisation of electrical equipment. Studies have been undertaken to evaluate specific technical and policy options, training of professionals to create a cadre of energy managers and auditors and educating consumers through publicity campaign.

2.13.3 During the Eighth Plan, the strategy proposed is to make the energy conservation a mass movement, encourage consumers to undertake energy audits and to start demonstration projects, besides intensifying the other connected activities.

ENERGY CONSERVATION TARGETS

2.13.4 It is intended to achieve 15% reduction in the specific energy consumption by the year 1994-95 vis-a-vis the energy consumption level for 1987-88.

AWARENESS PROGRAMME

2.13.5 As a part of awareness programme, the 14th December was dedicated as the national Energy Conservation Day with a view to make the energy conservation a people's movement, a part of their daily discipline and as a way of life. For dedication ceremony, a function presided over by the Finance Minister was organised. Simultaneously, an intensive awareness campaign was also undertaken through media.

NATIONAL AWARD TO INDUSTRIAL UNITS

2.13.6 With a view to motivate competitiveness, improved energy efficiency and performance in the various industries, the Department of Power has instituted a National Award Scheme for the industrial units showing excellent performance in efficient utilisation and conservation of energy. The scheme is open to the industrial units in the Steel. Aluminium, Coal, Chemicals, Petrochemicals, Refineries, Textiles, Fertiliser, Paper and Pulp, Glass, Pottery, Ceramics, Refractory, foundry, Chroralkali and Cement sectors. For the cement units, the scheme is operated in collaboration with the National Council for Cement and Building Materials.

ENERGY AUDITS

2.13.7 Energy Audits were completed in about 200 industrial units. Energy Audits of Commercial/residential buildings in Andhra Pradesh, Ashoka Hotel, New Delhi, Jaslok Hospital, Bombay were also completed. The implementation of various recommendations are likely to result in substantial savings in the energy consumption.

DEMONSTRATION PROJECTS

2.13.8 Agricultural sector has been targeted as one of the major target sectors for demonstration projects by taking up rectification of agricultural pumpsets on large scale. A rectification programme of 75,000 agricultural pumpsets in different states

was completed by Rural Electrification Corp. during 1990-91. The savings in energy is expected to be about 30% on an average. In additions, another programme for the replacement of footvalves for 10,000 agricultural pumpsets in Tamil Nadu has been undertaken.

2.13.9 Model Demonstration Project in Nayagaon Cement Plant, construction of fuel efficient aerodynamic bus bodies in State Transport Undertakings and Energy Conservation scheme in electrical network in Meerut Distt., were other important demonstration projects whose execution commenced during this year.

2.13.10 On the basis of recommendations of the Task Force constituted by the Department of Power, demonstration projects on energy efficient lightings in residential, commercial, street lighting etc. has also been taken up.

WORKING GROUP ON FLY-ASH UTILISATION

2.13.11 The Department of Power constituted a Working Group on 'Utilisation of Fly Ash" to study and propose effective solution for proper utilisation of fly ash produced by the thermal stations in the country. The group submitted its report in October 1990. The methodology to implement the recommendations of the report with the necessary changes is under active consideration of the Govt.

TRAINING PROGRAMME

2.13.12 A Training Programme for conservation of energy in agricultural sector for conducting 30 training courses covering 600 officers from Banks, SEBs and other concerned organisations has been entrusted to Central Institute of Rural Electrification, Hyderabad.

A Project for preparation of a document on education and training in the energy Sector was completed.

A Project on training module for energy conservation in Indian Railways, sponsored by Department of Power, was completed.

STUDIES

2.13.13 The following studies were undertaken during the year

(1) Planning of energy efficient desert coolers-a technoeconomic study.

(2) Evaluation of various energy conservation programmes in agriculture sector.

(3) Study for development of energy consumption norms in Textile (Synthetics) sector.

(4) Study for optimisation technique for power system.

INTERNATIONAL COOPERATION IN ENERGY CONSERVATION

2.13.14 Department of Power has taken up Energy Conservation Projects with multinational and bilateral external assistance. Four Energy Buses have been acquired under the UNDP programme. The EEC also assisted the acquisition of three Energy Buses under the Energy Audit Programme. These Energy Buses would conduct on the spot Energy Audit of Industrial, Manufacturing, Commercial and Transport sub-sector. Phase-II of the SIDA (Swedish Agency) assisted projects, in the energy conservation field has been undertaken & is in its final stages.

An Industrial Energy Efficiency Project is proposed to be implemented with the assistance of the Would Bank. The World Bank Team completed the appraisal of the Project and the project is under advanced stage of discussion. The implementation of the project is likely to promote substantial savings in the consumption of the energy.

2.13.15 India is also an active member of the Regional Energy Development Programme of ESCAP/UNDP. An International workshop on Energy Conservation in medium & small scale industries was organised in March 1991.

ENERGY MANAGEMENT CENTRE

2.13.16 The Energy Management Centre was established with EEC cooperation on 10.4.89 under the Department of Power, and registered as an autonomous body under the Societies Registration Act 1860. It is established with the objectives of providing a core group of energy sector professionals to carry out/organize training in energy management, establish and manage a database on energy efficiency performance, undertake policy studies and analysis aimed at improved energy efficiency performance in the country, and assist the Government in coordinating energy conservation activities throughout the country.

2.13.17 Since its inception, the EMC has organised useful activities and has been identified as a focal point for implementing a number of international cooperation programmes viz. the UNDP Energy Efficiency Project, the EEC-India Energy Bus Project, the Regional UNDP/ESCAP TCDC Working Group on Energy conservation and the proposed World Bank assisted International Energy Efficiency Technical Assistance Programme.

During the Year 1990-91, the EMC took up various studies on energy demand management aspect. It organised energy audits,

demonstration projects, and launched awareness campaign on a national level.

CONSULTATIVE COMMITTEE OF MEMBERS OF PARLIAMENT

2.14.1 The Consultative Committee of the Members of Parliament for the Ministry of Energy covered all the three Departments of the Ministry viz. the Department of Power, Coal, and Non-Conventional Energy Sources.

2.14.2 The Department of Power coordinated and organised five meetings of the consultative Committee during the year (1990-91). At these meetings, the Committee discussed matters relating to the Power Scenario and the Review of eighth Plan power project, as also subjects relating to the Department of Coal and the Neyveli Lignite Corporation.

2.14.3 As per decision taken at the Consultative Committee meeting held on 24th May, 1990, six Sub-committee of Consultative Committee of the Ministry of Energy in the Department of Power were constituted by the Ministry of Parliamentary Affairs in July, 1990, for physical verification of Rural Electrification programme of some areas of a state in each region. In the year under Report, one of the Sub-Committees visited Andhra Pradesh is September, 1990, and made site visits of some Rural Electrification Projects.

AUDIT OBSERVATIONS

2.15.1 The Organisation-wise break-up of Audit Observations and inspection reports/audit paras pending as on 31.3.1991 were as under:-

AUDIT OBJECTIONS AS ON 31.3.1991

Sl. No.	Organisations	Inspection Reports	Inspection Reports Paras
1.	Deptt. of power	6	30
2.	CEA and its Subordinate offices	13	37
3.	CWC's subordinate offices	26	127
4.	BTPP	6	51
5.	BTPS	8	130
6.	NHPC	95	358
7.	PETS	8	67
8.	Pay & Accounts Office		
	a) PAO (CEA), New Delhi.	1	17
	b) PAO (BMCC), N. Delhi	1	2
	c) PAO (Sectt.) N. Delhi	1	6
	d) PAO (Hydel)	1	1
	e) Pr.A.O.	1	14
	f) PAC, CEA, Bangalore	1	8
9.	Beas Project	113	257
10.	BBMB	51	115
	TOTAL	332	1220

IMPLEMENTATION OF OFFICIAL LANGUAGE POLICY

2.16.1 Measures to promote the progressive use of Hindi in official work were continued by the Department of Power, its attached and subordinate offices and Public Sector Undertakings under its administrative control during the year under review. In conformity with the requirements of the Official Language Act, 1963, all documents required to be issued bilingually are being issued by the Department of Power.

2.16.2 In order to popularise the use of Hindi, the cash award schemes which were formulated by the Department of Official Language, were implemented in the Department of Power, its attached and subordinate offices as well as the Public Sector Undertaking under administrative control. These schemes are yielding fruitful results and have been widely accepted by the staff and officers of the Department and other organisations. In addition to the above, incentive schemes for originating notes/drafts in Hindi in official work were also introduced during the year 1990-91.

2.16.3 For according incentives to write original books in Hindi on power subjects, a new prize scheme is being framed to be introduced in the Department in the next financial year under the title "Vidyut Sahitya Puraskar" which will cover the entire country. This scheme will be an incentive to technical experts, who write in Hindi on power subjects.

2.16.4 Meetings of the Official Language Implementation Committee of the Department of Power were convened regularly during the year 1990-91. The Sub-Committee of the Committee of the Parliament on Official Language visited the NTPC, a Public Sector Undertaking under the administrative control of the Department of Power on the 9th July, 1990 to assess the progress made in the implementation of the various instructions/orders issued by the Government in regard to official language policy from time to time.

2.16.5 Hindi workshops were also organised for encouraging the employees and the officers to do work in Hindi. 65 employees/officers of the Department were given training through Hindi Workshop.

2.16.6 To encourage the employees to acquire proficiency in Hindi, the Department of Power had also nominated them for Prabodh, Praveen and Pragya Classes conducted under the auspices of the Hindi Teaching Scheme. Similarly, employees were also deputed for learning stenography and Hindi Typing.

VIGILANCE/DISCIPLINARY CASES

2.17.1 At the beginning of the year 1990, there were five

vigilance/disciplinary cases. Subsequently, one more disciplinary case was added.

2.17.2 One case in which sanction for prosecution was conveyed, has been closed due to the demise of the charged officer. One case is under correspondence for locating the whereabouts of the accused person. In another case, the UPSC have advised removal of the official from service and the case is under process. In one case, the sanction of the competent authority for prosecution has been conveyed, while departmental proceedings are being taken in the remaining two cases.

INTERNAL WORK STUDY UNIT

2.18.1 Including 25 grievances received during 1990-91 and 33 already pending action was to be taken on 58 grievances. These grievances were received through Cabinet Secretariat (PG), Department of Administrative Reforms, Prime Minister's Office and Department of Pension and P.W. All these grievances relate to the service matters and non-settlement of pension cases of the employees/ex-employees of the Public Sector Undertakings under the control of the Department of Power.

2.18.2 Out of 58 grievances, 37 have been settled. Action on the remaining 21 is in hand with the respective organisations under the department.

PRIME MINISTER'S 15 POINT PROGRAMME ON WELFARE OF THE MINORITIES

2.19.1 The Prime Minister's 15-Point Programme on welfare of Minorities is being implemented in the Department of Power. It has been ensured that in case of direct recruitment to Group "C" and "D" posts, a member of the minority community is included in the Selection Committee. Quarterly returns in respect of scheduled castes and scheduled tribes and minorities from Public Sector Undertakings are being regularly monitored in accordance with the guidelines on the subject.

REPRESENTATION OF SCHEDULED CASTES AND TRIBES

2.20.1 A statement incorporating the total number of Government Servants employed in the Ministry of Energy, Department of Power, including the number of scheduled castes and scheduled tribes is given below:-

S.No. Name of Office	Group A			Group B			Group C			Group D		
	Total	SC	ST	Total	SC	ST	Total	SC	ST	Total	SC	ST
1. Department of Power	35	6	1	80	10	-	120	21	2	68	34	4
2. Controller of Accts. (Department of Power)	2	1	-	17	3	-	69	7	1	9	5	-
3. Central Electricity Authority	608	64	6	362	45	1	1081	169	17	387	115	11

CENTRAL ELECTRICITY AUTHORITY FUNCTIONS:

3.1.1 The Central Electricity Authority is a statutory organisation constituted under the Electricity (Supply) Act. 1948. The main functions of the Authority are:

1. to formulate short-term and perspective plans for Power Development

2. to collect data concerning generation, distribution and utilisation of power, study of cost efficiency, losses, benefits, publication of reports and investigations.

3. to advise the State Government, Electricity Boards, generation companies or any other agency engaged in the generation or supply of electricity on such matters as would improve the operation and maintenance of their system in an efficient and coordinated manner.

4. to Promote and assist in the timely completion of projects sanctioned in the power sector and to constantly monitor their implementation.

5. to make arrangements for advancing the skills of persons in the generation and distribution of electricity.

6. to promote research in matters affecting the generation, transmission and distribution of electricity.

7. to advise the Central Government on any matter on which its advice is sought or to make recommendations which would help in improving the generation, distribution and utilisation of electricity.

3.1.2 In addition, the Electricity Rules 1977 make it incumbent on the Central Electricity Authority to: a) to formulate the financial performance of the State Electricity Boards and

undertake studies concerning the economic and commercial aspects of the power industry as well as analysis of the tariff structure and b) promote inter-state and joint sector power projects.

EIGHTH FIVE YEAR PLAN (1990-95)

3.2.1 The Planning Commission set up a working Group on power for formulation of a programme for power development during the Eighth Five Year Plan. The Working Group under the Chairmanship of Secretary Department of Power, submitted its report to the planning Commission in December, 1989. The Working Group has recommended a capacity addition programme of 38,369 MW for the Eighth Plan period, the details of which are as under:-

Type	Central Sector	State Sector	Private Sector	Total (MW)
Hydro	1630	5654	150	7434
Thermal	15067	14426	737	30230*
Nuclear	705	-	-	705
Total	17402	20080	887	38369

(* includes 7745 MW Gas based capacity)

The Working Group recommended an outlay of Rs. 1,27,558 crores for the Eight Plan power programmes. The broad breakup is as follows:

(Rs. in crores)

Generation	T&D	Total	
States	44,492	26,189	70,681
Union Territories	221	762	983
Central Sector	42,924	9,515	52,439
Miscellaneous	-	-	3,455
Total	87,637	36,466	1,27,558

The Eighth plan is under finalisation in the Planing Commission.

Techno-economic Appraisal

3.2.2 The Central Electricity Authority is responsible for the identification of schemes for thermal as well as hydro power stations for benefits during the plan periods. The CEA is associated with the inspection of sites proposed for power projects, tieing up of necessary inputs like coal, water, transport facilities, environmental clearance and civil aviation clearance.

The CEA is also responsible for establishing the need for captive power projects and to recommend the same whenever required. During the year 1990-91 (upto 31st March, 1991) 26 thermal schemes were cleared from the techno-economic angle. The details are given below:-

Type of Scheme	Total capacity (MW)	No. of schemes	Estimated cost (Rs. lakhs)
Utilities	7863.5	17	1226683
Revised Estimates	1266.5	3	181537
R&M	-	2	2668
Captive Power	217.5	4	36509

Details of hydro power projects cleared by CEA during 1990-91 are given below:-

Type of scheme	Installed capacity (MW)	No. of projects	Estimated Cost (Rs. lakhs)
New Schemes	2137.5	6	277424
Revised Estimates	355.5	2	58758
R&M	1367.0	4	21793

TRAINING ORGANISATIONS OF THE CENTRAL ELECTRICITY AUTHORITY

1. POWER SYSTEM TRAINING INSTITUTE, BANGALORE

3.3.1 The Power System Training Institute, Bangalore, imparts training in protection, communication in power systems, computer application and power telecommunication coordination. Since the inception of the Institute in 1972, 3015 engineers had been trained upto the end of 1989-90. During the year 1990-91, 237 more engineers were trained at the Institute upto 31st March, 1991.

3.3.2 A scheme for augmentation of training facilities at PSTI which was approved by the Government in February, 1989 at an estimated cost of Rs.323.38 Lakhs is presently under implementation.

3.3.3 The Institute has recently acquired a Despatcher Training Simulator (DTS) and a set of educational video-tapes alongwith a video projection system as part of UNDP aid. These facilities have also been integrated into the training programmes being conducted by PSTI.

2. HOT LINE TRAINING CENTRE AT BANGALORE

3.3.4 In order to reduce to the barest minimum the outages of transmission lines during maintenance, Hot Line Maintenance Techniques are being introduced. A Hot Line Training Centre to train personnel in Hot Line Maintenance Techniques upto 220

KV was set up at Bangalore in 1975. 617 personnel were trained by the Centre upto the end of 1989-90. 20 personnel have been trained during 1990-91.

3.3.5 A scheme for augmentation of training facilities at an approved cost of Rs.479.48 lakhs is under implementation. Under this scheme, tools and equipment required for training using hot stick and bare hand techniques upto 400KV Voltage level have been procured and also about 57 acres of land has been acquired at Somanahalli near Bangalore for setting up a permanent Training Centre along with hostel, staff quarters etc. Civil works have been entrusted to CPWD. The construction of 400 KV/220 KV experimental lines entrusted to NTPC have been completed. The construction of 11 to 110 KV experimental lines along with power supply has been entrusted to KEB and the work is in progress.

3. UNDP-AIDED PROJECT

3.4.1 The Central Electricity Authority is implementing a UNDP-aided project relating to modernisation of training facilities at PSTI, Bangalore and the development of expertise in system operation and load despatch technique. The project took off in April, 1987 and almost all the activities have been completed by now. Installation and commissioning of a Despatcher Training Simulator (DTS) which constitutes the main component of the project was completed in February, 1990, and the equipment was accepted in May, 1990 after a 60 days working availability test run. The system has also been integrated into the different training programmes being conducted at PSTI, Bangalore.

PUBLIC SECTOR UNDERTAKINGS AND OTHER ORGANISATIONS

NATIONAL THERMAL POWER CORPORATION LTD.

4.1.1 The National thermal Power Corporation Ltd. (NTPC) was incorporated in November, 1975 as a Central Generating Company with the objective of planning, promoting and organising the integrated development of thermal power generation and execution of thermal power projects and associated transmission lines.

4.1.2 The authorised share capital of the Corporation is Rs.8000 crores. As on March, 1991, the paid-up capital of the NTPC was Rs.6355.11 crores, which is wholly subscribed by the government of India.

4.1.3 During 1989-90, the NTPC earned a net profit of Rs.563.56 crores. The return on capital employed and return on net worth were 10.21% and 10.74% respectively (excluding prior period income). As per the provisional estimates, NTPC earned a net profit of Rs.605.47 crores during the year 1990-91.

4.1.4 The NTPC is presently engaged in the execution of nine Super Thermal Power Projects with an aggregate approved capacity of 13240 MW and four gas based combined cycle projects with approved capacity of 2527 MW. The NTPC has also undertaken the construction of transmission lines with a total length of about 20200 ckt. kms. of high voltage lines including about 816 ckt. kms. of HVDC transmission line and 85 substations/sub-station extension. The total approved cost of the NTPC projects including associated transmission system is Rs.18439.09 crores.

4.1.5 The details of the projects of the NTPC under implementation are given below:

DETAILS OF NTPC PROJECTS

NAME OF PROJECT	THE REGION/STATE	INSTALLED CAPACITY (MW) ULTIMATE	APPROVED	ACTUAL/EXPECTED DATE OF COMMISSIONING	APPROVED COST INCLUDING ASSOCIATED TRANSMISSION SYSTEM (RS. IN CRORES)
SINGRAULI STPP	NORTHERN (UTTAR PRADESH)	2000	2000	UNIT-1 (200) FEB.82 UNIT-2 (200)N0V.82 UNIT-3 (200) MAR.83 UNIT-4 (200) NOV.83 UNIT-5 (200) FEB.84 UNIT-6 (500) DEC.86 UNIT-7 (500) NOV.87	1374.93

NAME OF THE PROJECT	THE REGION/STATE	INSTALLED CAPACITY (MW) ULTIMATE	APPROVED	ACTUAL/EXPECTED DATE OF COMMISSIONING	APPROVED COST INCLUDING ASSOCIATED TRANSMISSION SYSTEM (RS. IN CRORES)
KORBA STPP	WESTERN (MADHYA PRADESH)	2100 STAGE-1 (3x200 +1x500=1100) STAGE-II (2x500=1000)	2100	UNIT-1 (200) MAR.83 UNIT-2 (200) OCT.83 UNIT-3 (200) MAR.84 UNIT-4 (200) MAY.87 UNIT-5 (500) MAR.88 UNIT-6 (500) FEB.89	1873.79
RAMAGUNDAM STPP	SOUTHERN (ANDHRA PRADESH)	2100 STAGE-1 (3x200 +1x500=1100) STAGE-II (2x500=1000)	2100	UNIT-1 (200) OCT.83 UNIT-2 (200) MAY.84 UNIT-3 (200) DEC.84 UNIT-4 (500) JUN.88 UNIT-5 (500) MAR.89 UNIT-6 (500) OCT.89	1985.12
FARAKKA STPP	EASTERN (WEST BENGAL)	2100 STAGE-1 (3x200=600) STAGE-II (2x500=1000) STAGE-III (1x500=500)	2100	UNIT-1 (200) JAN.86 UNIT-2 (200) DEC.86 UNIT-3 (200) AUG.87 UNIT-4 (500) DEC.91 UNIT-5 (500) DEC.92 UNIT-6 (500) DEC.96	2366.69
VINDHYACHAL STPP	WESTERN (MAHDYA PRADESH)	2260 STAGE-I (6x210=1260)	1260	UNIT-1 (210) OCT.87 UNIT-2 (210) JUL.88 UNIT-3 (210) FEB.89 UNIT-4 (210) DEC.89 UNIT-5 (210) MAR.90 UNIT-6 (210) FEB.91	1773.29
RIHAND STPP	NORTHERN (UTTAR PRADESH)	3000 STAGE-1 (2x500=1000)	1000	UNIT-1 (500) MAR.88 UNIT-2 (500) JUL.89	1688.17
KAHALGAON STPP	EASTERN (BIHAR)	2840 STAGE-1 (4x210=840)	840	UNIT-1 (210) DEC.91 UNIT-2 (210) JUN.92 UNIT-3 (210) DEC.92 UNIT-4 (210) JUN.93	1058.64
NATIONAL CAPITAL THERMAL POWER PROJECT (DADRI)	NORTHERN (UTTAR PRADESH)	840 STAGE-1 (4x210=840)	840	UNIT- (210) NOV.91 UNIT-2 (210) MAY.92 UNIT-3 (210) NOV.92 UNIT-4 (210) MAY.93	1063.57
TALCHER STPP	EASTERN (ORISSA)	3000 STAGE-1 (2x500=1000)	1000	UNIT-1 (500) APR.94 UNIT-2 (500) MAR.95	1480.85
	GAS PROJECTS				
KAWAS GBPP	WESTERN (GUJARAT)	1295	600 NOMINAL 645 ACTUAL	GAS TURBINE UNIT-1 (103) MAR.92 UNIT-2 (103) MAY.92 UNIT-3 (103) JUL.92 UNIT-4 (103) SEP.92 STEAM TURBINE UNIT-5 (110) MAR.93 UNIT-6 (110) JUL.93	410.84
AURAIYA GBPP	NORTHERN (UTTAR PRADESH)	1304	600 NOMINAL 652 ACTUAL	GAS TURBINE UNIT-1 (112) MAR.89 UNIT-3 (112) AUG.89	472.28

				UNIT-4 (112) SEP. 89 STEAM TURBINE UNIT-5 (102) DEC. 89 UNIT-6 (102) JUN. 90	
ANTA GBPP	NORTHERN (RAJASTHAN)	843	430 NOMINAL 413 ACTUAL	GAS TURBINE UNIT-1 (88) JAN.89 UNIT-2 (88) MAR.89 UNIT-3 (88) MAY.89 STEAM TURBINE UNIT-4 (149) MAR.90	316.74
DADRI GBPP	NORTHERN (UTTAR PRADESH)	1225	817	GAS TURBINE UNIT-1 (131) NOV/DEC.91 UNIT-2 (131) JAN/FEB.92 UNIT-3 (131) APR.92 UNIT-4 (131) JUN.92 STEAM TURBINE UNIT-5 (1465) SEP.92 UNIT-6 (1465) JAN.93	783.44
CENTRAL TRANSMISSION PROJECT-I		1655 CKT.KM.	400 KV		388.05
RIHAND POWER TRANSMISSION PROJECT		1691 KM 814.5 KM	400 KV A/C 500 KV HVDC		1063.00
VINDHYACHAL ADDITIONAL TL		1930 KM	400 KV		339.69
TOTAL APPROVED			15767 MW		18439.09

4.1.6 During the year 1990-91, the NTPC commissioned its targeted generating capacity of 312 MW, raising its total installed capacity to 10125 MW.

4.1.7 As against the target of 1880 ckt. kms. for the year 1990-91, the NTPC completed 2213 ckt. kms. of transmission lines exceeding the target by 17%.

4.1.8 The following transmission lines have been fully completed during the year 1990-91.

1.	Rihand-Dadri	500KV HVDC
2.	Ballabhgarh-Dadri	400 KV DC
3.	Dadri-Mandola	400 KV DC
4.	Jabalpur-Itarsi	400 KV DC
5.	Kawas-Bharuch	200 KV DC
6.	Ramagundam-Chandrapur	400 KV DC
7.	Farakka-Bhagalpur	400 KV DC
8.	Kahalgaon-Maithon	400 KV DC
9	N'Sagar-Gooty	400 KV DC
10.	Bhagalpur-Biharshriff	400 KV DC

4.1.9 The generation from NTPC stations for the year 1990-91 was 46879 MUs against the target of 46475 MUs. The generation during the previous year was 40,893 MUs.

4.1.10 The units under commercial operation generated 43966 MUs at Plant Load Factor of 61.68% during 1990-91 compared to 38128 at a PLF of 68% during the previous year. During 1990-91, the units under commercial operation at Singrauli, Korba, Ramagundam, Farakka, Vindhyachal, Rihand, Anta (Gas) and Auraiya operated at a PLF of 70.44%, 60.01%, 51.85%, 56.12%, 62.19%, 55.93%, 55.41%, and 48.35% respectively.

4.1.11 17 of the 19 units with the capacity of 200/210 MW, 8 of the 9 units with a capacity of 500 MW and 10 Gas/Steam units which are presently under commercial operation at the NTPC stations, have achieved very high levels of performance during the year 1990-91. Units with Plant Load Factor in excess of 70% are as per details given below:

Sl. No.	Station	Capacity (MW)	Unit No.	PLF (%)
1.	Singrauli	200	1	72.88
2.	Singrauli	200	2	71.09
3.	Singrauli	200	5	80.39
4.	Singrauli	500	6	75.40
5.	Singrauli	500	7	76.21
6.	Korba	200	2	79.62
7.	Korba	500	3	73.29
8.	Farakka	200	1	72.30
9.	Anta	88	3	70.78

4.1.12 The NTPC's Singrauli and Ramagundam projects qualified for the Meritorious Productivity Awards for 1990 for achieving high standards of performance. This is the 5th year in succession that Singrauli has won this award.

4.1.13 Four employees of the Ramagundam STPP have been awarded the Prime Minister's Shram Bhushan Award in 1990 for their outstanding and meritorious work performance.

4.1.14 The NTPC has also won the Prime Minister's MOU award for excellence in performance instituted by the Ministry of Programme Implementation for the year 1989-90.

4.1.15 The total amount raised upto 31st March, 1990 from the three public issues and two private placements of the NTPC power bond was Rs.1682 crores. In addition, a sum of about Rs.400 crores was raised through private placement on banks, financial institutions etc. during 1990-91, thus increasing the cumulative amount collected through bonds to Rs.2082 crores.

4.1.16 A Memorandum of Understanding (MOU) for the year 1990-91 was signed between the NTPC and the Department of Power on 12th July, 1990. The MOU clearly identifies the performance targets to be achieved by the NTPC during the year with respect to power generation, addition of new capacity, construction of transmission lines, apart from laying down the actions to be taken by the Government to enable achievement of these targets.

4.1.17 NTPC exceeded all the target of generation, sales and profits set for it in the MOU. The details of targets Vs achievements for the year 1990-91 are given below:

MOU Performance 1990-91

	MOU Target	Achievement
1. Capacity Addition (MW)	312	312
2. Generation (MOUs)	46475	46879
3. Transmission (EHV) lines Construction (Ckt. Kms.)	1880	2213
4. Turnover (Rs. Crores)	2429	2431
5. Profits (Rs. Crores)	257	605

BADARPUR THERMAL POWER STATION

4.1.18 The Badarpur Thermal Power Station (720 MW) is being managed by National Thermal Power Corporation on behalf of Government of India since 1st April, 1978. During the period April '1990 to January, 1991, the station generated a total of 3503 MUs at a PLF of 67%.

4.1.19 The generation target and PLF for the year 1990-91 are 3800 MUs and 61.53% respectively which are expected to be exceeded during the financial year 1990-91. The station generated 4200 MUs at PLF of 68.01% during the Calendar year 1990, which is the highest generation recorded at BTPS since inception in any Calendar year.

4.1.20 Additional ESPs in 3x100 MW Units have been commissioned at BTPS under Renovation and Modernisation programme for the station bringing down the particulate emmission from these units within the permissible limits thus providing a cleaner environment to the National Capital. While approving the Project Renovation & Modernisation scheme of BTPS at an estimated cost of Rs.28.706 Crores in October, 1986, it was envisaged that plant load factor (PLF) of BTPS will improve from 45.3% to 55%.

4.1.21 The Revised Cost of Renovation & Modernisation programme is estimated at Rs.36.97 crores.

NATIONAL HYDROELECTRIC POWER CORPORATION LIMITED

4.2.1 The National Hydroelectric Power Corporation (NHPC) was incorporated in 1975 under the Companies Act, 1956. The main objectives of the Corporation are to plan, promote and organise the integrated development of hydro-electric power in the country. The authorised Share Capital of the Corporation which stood at Rs.1300 crores as on 31.3.1990 was raised to Rs.2500 crores w.e.f. 28th Sept., 1990. The paid up capital as on 31.3.1991 is Rs.1691.30 crores. The anticipated profit during 1990-91 is Rs.52.71 crores.

4.2.2 NHPC is responsible for operation and maintenance of the Baira Siul, Loktak and Salal Stage-I Power Stations located in H.P., Manipur and J&K respectively. The generation achieved during the year 1990-91 in the above power stations is 3617.46 M.U. which is 113% of targeted generation of 3198 M.U.

4.2.3 In addition to the generation in its own power stations, NHPC imported during 1990-91, 1391.49 MUs against a target of 1374 MUs from the Chukha Hydel Project, Bhutan. It also transmitted 304.68 MUs of power against a target of 225.00 MUs during 1990-91 through its Jeypore-Talcher Transmission System in Orissa.

4.2.4 During the year, the NHPC was engaged in the construction of the following Projects.

Sl No.	Name of the Project	State	(Installed Capacity in MWs)
1.	Chamera HE project (Stage-I)	H.P.	(3x180 MW)
2.	Tanakpur HE Project	U.P.	(3x40 MW)
3.	Dul Hasti HE Project	J&K	(3x130 MW)
4.	Uri HE Project	J&K	4x120 MW)
5.	Salal HE Project (Stage-II)	J&K	(3x115 MW)
6.	Rangit HE Project	Sikkim	(3x20 MW)
7.	Dhauliganga HE Project	U.P.	(4x70 MW)

CHAMERA H.E. PROJECT (STAGE-I)

4.2.5 The works on the various components of the project like main Dam, power Tunnel, Tail Race Tunnel etc, progressed satisfactorily during the year.

4.2.6 Against a target of 5.31 lakhs cum., 5.63 lakhs cum. concreting was achieved in the Dam during the year. Of the 6.4 Km long Power Tunnel, heading has been completed in 6 Kms. The balance length of 443 Mtrs. is expected to be completed shortly. Installation of Generating Unit No. 1 has been started and is expected to be completed by Dec., 1991.

4.2.7 Efforts are being made to achieve the commissioning of the project by December, 1992.

TANAKPUR H.E. PROJECT

4.2.8 The project is in an advanced stage of construction and the work is proceeding in full swing. The civil work of Barrage and Head Regulator has been completed excepting for installation of 4 gates of Barrage. The Power House structure has been completed. Unit-I has been boxed up and work on Unit-II and III is in progress. The project is expected to be completed as per schedule i.e. by March, 1992.

DUL HASTI H.E. PROJECT

4.2.9 Work on the Project commenced during the year 1989-90. Land for construction of various components has been acquired. Most of the additional investigations like collection of topographical, geophysical and seismological data as well as the Design Review are under finalisation. The development of the infrastructure has been completed. Most of the underground works have been taken up. Access tunnel to Power House is in an advanced stage of completion. Diversion channel and coffer dam works for the Ist stage have been completed and the river has been diverted on 17th March, 1991. The project is expected to be completed within the stipulated period of 57 months viz. by July, 1994.



Dul Hasti Project - River diversion works in progress

URI H.E. PROJECT

4.2.10 The work on additional field investigations is nearing completion and the work on development of the infrastructural facilities by the Consortium is in an advanced stage. The main project works execution is scheduled to be taken up during the current year. The Consortium has submitted project layout reports including the various design studies which are under review and finalisation. The project is scheduled to be completed within a period of 72 months viz. by November, 1995.

SALAL H.E. PROJECT (STAGE-II)

4.2.11 Work on Power House and Tail Race Tunnel at this project is going as per schedule. Orders have been placed on M/S BHEL for manufacture, supply & installation of turbines and generating equipment. The project is scheduled for completion by September, 1993.

RANGIT H.E. PROJECT

4.2.12 The approval for execution of the project was accorded during the year. Land acquisition has been completed. Infrastructure works and work on construction of Diversion Tunnel and Head Race Tunnel are in progress. Implementation of Compensatory Afforestation Programme is also in progress. The Environmental Action Plan for the project has been submitted to Ministry of Environment and Forests in March, 1991. Work on the Diversion Tunnel, adit to Head Race tunnel (down stream) and Surge Shaft excavation has been started.

DHAULIGANGA H.E. PROJECT (STAGE-I)

4.2.13 The project was approved for implementation by the Government in March, 1991. The scheduled date of commissioning is September, 1998.

NEW PROJECTS

4.2.14 NHPC proposes to take up, in near future, the execution of the following new projects, which are under various stages of clearance:-

1. Chamera H.E. project (Stage-II) (300 MW), H.P.
2. Koel Karo H.E. project (710 MW), Bihar
3. Baglihar H.E. project (450 MW), J&K
4. Sawalkot H.E. project (600 MW), J&K
5. Teesta H.E. project (1200 MW), Sikkim
6. Kachchh tidal power project (900 MW), Gujarat.

PROJECTS UNDER INVESTIGATION

4.2.15 The investigation works on Dhauliganga Intermediate Stage (200 MW), Goriganga Stage-I (60 MW) and Goriganga Stage-II (120 MW) in Uttar Pradesh and Kishenganga project (330 MW) in J&K have been completed by NHPC and the Detailed project reports for the first three schemes have been submitted to the Central Electricity Authority for technoeconomic clearance. DPR for Kishenganga H.E. project is under preparation. The investigations on Goriganga Stage-III are in progress.

TRANSMISSION SYSTEMS

4.2.16 The 400 KV Jeypore-Talchar Transmission System has been completed and put to commercial use.

The 400 KV Malda Sub-station was also completed and the Station was Commissioned on 9th July, 1990.

Work on the construction of the following Transmission lines and Substations were in progress during the year:-

1. 400 KV Chamera-Moga Transmission Line
2. 400 KV Moga-Bhiwani Transmission Line
3. 400 KV D/C Dul Hasti-Kishenpur Transmission Line
4. 400 KV D/C Kishenpur-Wagoora Transmission Line
5. 132 KV S/C Bongaigaon-Gaylephug Transmission Line
6. 220 KV Tanakpur-Bareilly Transmission Line
7. 220 KV Salal Stage-II Transmission System
8. 400/220 KV Substation at Moga
9. 400/220 KV Substation at Hissar
10. 400/220 KV Substation at Kishenpur
11. 400/220 KV Substation at Wagoora (Srinagar)
12. 132/66 KV Substation at Gaylephug (Bhutan)
13. 220/132 KV Substation at Bongaigaon

4.2.17 Execution of the following Transmission Lines has also been entrusted to NHPC:-

1. Uri Transmission System
2. Northern Region Transmission System
3. Sawalkot Transmission System
4. Baglihar Transmission System
5. 400 KV Chamera Stage-II Transmission System
6. Rangit Transmission System
7. 220 KV Dasuya-Jalandhar-Ludhiana Transmission System

4.2.18 While the World Bank has approved a loan of US $ 430m for the Northern Region Transmission System and the Loan Agreement has become effective from 10th Jan., 1991, clearance of the various agencies in respect of the other Transmission Lines is being obtained.

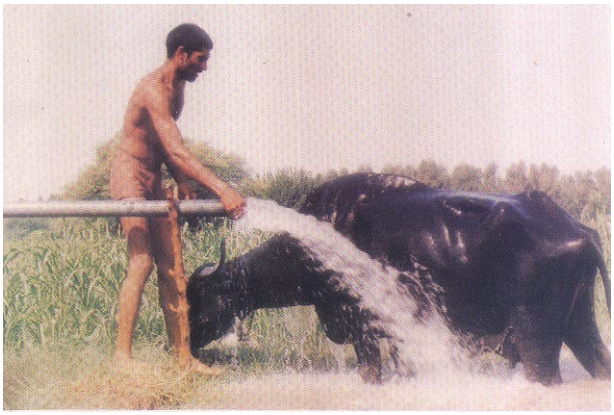
ISSUE OF BONDS

4.2.19 To meet its increased capital requirement, NHPC has so far raised a total sum of Rs. 1008 crores till 1990-91 through issue of bonds:-

RURAL ELECTRIFICATION CORPORATION

4.3.1 The Rural Electrification Corporation (REC) was set up in 1969 with the primary objective of providing financial assistance for rural electrification programmes in the country. Rural electrification programmes undertaken by the REC cover electrification of villages, including tribal villages and Harijan bastis, energisation of pump sets, provision of power for small and agro-based rural industries, lighting of rural households and street lighting. The Corporation also Provides assistance to the State Electricity Boards for taking up Systems Improvement projects for strengthening and improving of sub-transmission and distribution system and improved reliability of supply.

4.3.2 The paid up capital of the REC upto the year 1989-90 stood at Rs.282.60 crores. During 1990-91, the Central Govt. have contributed Rs.40 crores towards the share capital of the Corporation, thus increasing its equity capital base to Rs. 322.60 crores. The authorised share capital of the Corporation has been increased from Rs. 300 crores to Rs. 400 crores during the year 1990-91.



Energisation of Pumpsets

4.3.3 Loans advanced by the REC to the State Electricity Boards (SEBs), State Government and Rural Electric Cooperative Societies during the year 1989-90 touched an all-time new high of Rs. 724.06 crores. The total loan amount advanced to these three categories of organisations upto the end of 1989-90 aggregated to Rs. 5133.25 crores. During the current year, 1990-91, the REC has advanced Rs.707.50 crores as loans.

4.3.4 During the year 1989-90 the REC approved 2316 new projects involving a loan assistance of Rs. 984.85 crores. Cumulatively upto March, 1991 the REC sanctioned 23068* rural electrification projects, with the provision of financial assistance aggregating to Rs. 7905* crores.

4.3.5 During the year 1989-90, against the target of electrification of 11900 villages and energisation of 4.00 lakh pumpsets. 14414 (121.1%) villages were electrified and 5.2 (130%) lakh pumpsets energised. During the period 1990-91, 10108 villages have been electrified and 5.18 lakh pumpsets energised.

During 1990-91, one more major state, viz Sikkim achieved cent percent electrification.

4.3.6 Under a special drive launched by the REC, over one million domestic connections were released to rural house holds during 1989-90. These connections included single point light connections provided to the households below the poverty line free of cost under Kutir Jyoti programme. This is unprecedented in the annals of India's rural electrification programme.

4.3. During the year 1989-90, the REC earned a net profit of Rs. 56.48 crores against Rs. 41.13 crores in the previous year.

NORTH EASTERN ELECTRIC POWER CORPORATION LIMITED

4.4.1 The North Eastern Electric Power Corporation was constituted in 1976, under the Companies Act, with the aim of developing the large electric power potential of the N.E. Region. The region has large water resources, gas and oil reserves and coal deposits, all of which can be developed for power generation. The Corporation made a modest beginning with the implementation of the 150 MW Kopili Hydro Electric project, which has since been commissioned fully. The associated 220 KV and 132 KV Transmission Lines for supplying bulk power to the different States of the region have

also been completed. The Corporation has also undertaken investigation of various schemes with a view to prepare a shelf of projects to be implemented according to the demand for power and availability of resources. The various projects taken up by the Corporation are as follows:-

PROJECTS COMPLETED

KOPILI HYDRO ELECTRIC PROJECT

4.4.2 The project is located in the N.C. Hills District of Assam, and was commissioned in July, 1988. It is a twin project, consisting of two Dams and two water conductor systems leading from the Kopili reservoir to the Khandong Power House (2x25 MW) and from the Umrong reservoir to the Kopili Power House (2x50 MW). The Khandong Power Station was commissioned in March/April, 1984. This project has already generated over 2294 million units of power till March, 1991 and has earned a revenue of about Rs. 154 crores in terms of sale of power.

KOPILI TRANSMISSION LINE SCHEME

4.4.3 This line has three sectors. One is the 220 KV double circuit transmission line of 110 Km. length, linking the Kopili Power station with the Samaguri Grid Sub-Station in Assam. The second is the 132 KV single-circuit transmission line of 10 Km. length, connecting Kopili and Khandong Power Stations and the third is the 132 KV single-circuit transmission line of 54 Km. length connecting Khandong Power station with the Khliehriat Grid Sub-station in Meghalaya. All these lines have been commissioned.

ADDITIONAL TRANSMISSION LINE PROJECT

4.4.4 This consists of one 465 Km. long, 132 KV single circuit transmission line for the supply of power from the Kopili Hydro Electric project to Haflong in Assam, Jiribam in Manipur, Aizawl in Mizoram and Kumarghat in Tripura. This project has also been completed.

GOHPUR-ITANAGAR TRANSMISSION SCHEME

4.4.5 This scheme envisages the construction of one 132 KV S/C line from Gohpur to Itanagar and has been completed.

PROJECTS UNDER EXECUTION

DOYANG HYDRO ELECTRIC PROJECT

4.4.6 This project is located in the Wokha District of Nagaland and has a provision for installing 3 units of 25 MW each. Works of infrastructure development are nearing completion and the main works have also been taken up. The project is scheduled for commissioning in June, 1995.

RANGANADI HYDRO ELECTRIC PROJECT

4.4.7 This project is located in the lower Subansiri District of Arunachal Pradesh and has a provision for installing 3 units of 135 MW each. Preliminary works on this project are in an advanced stage and the critical item, i.e., the main tunnel, has already been taken up. The project is scheduled for commissioning in March, 1997.

RANGANADI TRANSMISSION PROJECT

4.4.8 This project envisages the construction of a 400 KV D/C line from Ranganadi to Balipara in Assam for evacuating power from the Ranganadi Hydro Electric Project. Survery works are in progress, and the line is expected to be commissioned by March, 1995.

DOYANG TRANSMISSION PROJECT

4.4.9 This project envisages the construction of:-

(a) 132 KV D/C line from Doyang to Dimapur -98 Kms.

(b) 132 KV D/C line from Dimapur to Imphal -188 Kms.

(c) 220 KV D/C line from Dimapur to Misa - 112 Kms.

for evacuating power from the Doyang Hydro Electric project and connecting the Central Sector projects, i.e., Kopili, Loktak and Doyang. The works are in progress, and the lines are scheduled to he commissioned by March, 1992.

ASSAM GAS BASED COMBINED - CYCLE POWER PROJECT

4.4.10 The project envisages installation of 6 Nos. of 30-40 MW Gas Turbines and 3 Nos. of 30-40 MW Waste Heat Recovery units working in combined cycle mode, at Kathalguri, Assam for utilising the natural gas from the Assam oil fields. At current prices the project is estimated to cost Rs. 550 crores.

4.4.11 Land has been acquired and infrastructure is under development. The project is scheduled to be commissioned fully by January, 1994.

400 KV TRANSMISSION LINE PROJECT ASSOCIATED WITH ASSAM GAS BASED COMBINED CYCLE POWER PROJECT.

4.4.12 The project envisages the evacuation of power from the Kathalguri Gas Turbine Station and inter connection of North Eastern India with the rest of the Country, with a 400 KV/DC transmission network spanning from Kathalguri upto Malda in West Bengal via Mariani, Misa, Balipara and Bongaigaon. The project is scheduled to be commissioned by November, 1993. The cost of the project is estimated at Rs. 565.41 crores at current prices.

INVESTIGATION SCHEMES

4.4.13 Investigations of the following schemes have been taken up by the Corporation with a view to prepare a shelf of hydro-electric projects. All these schemes are located in Arunachal Pradesh.

1.	Rangandi	HE	Project (Stage-II)	:	100 MW
2.	Damwe	HE	Project	:	500 MW
3.	Dikrong	HE	Project	:	100 MW
4.	Papumpam	HE	Project	:	100 MW
5.	Kopili in Assam	HE	Project (Stage-II)	:	25 MW

FINANCIAL

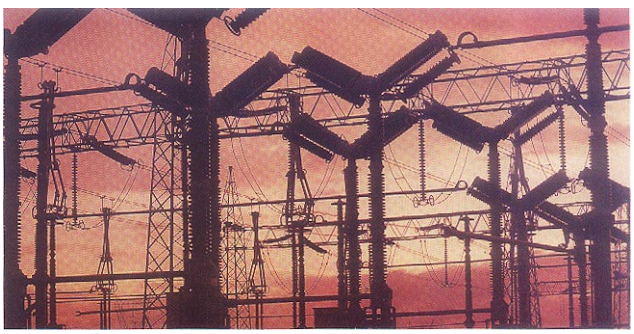
4.4.14 The authorised capital of the Corporation is Rs.500 Crores as on date. The pattern of Investment for financing the project under execution by the Corporation is generally in the ratio of 1:1 for equity and loan. The share capital and loan on 31st march, 1991 stood at Rs. 298.91 crores and Rs. 254.17 crores (provisional) respectively including interest during construction.

PERSONNEL

4.4.15 The Corporation has manpower strength of 475 in the executive cadre and 3385 in the non-executive cadre. Continuous efforts are being made to strengthen the organisational structure of the Corporation to enable it to take up the various works in an expeditious manner.

POWER FINANCE CORPORATION LIMITED

4.5.1 The Power Finance Corporation (PFC) was incorporated in July, 1986 as a Public Sector Undertaking under the administrative control of the Department of Power. It started its operation in 1987-88. It provides term finance for power projects (thermal and hydel) transmission and distribution, system improvement, urban distribution, renovation and modernisation, survey and investigation and the training of personnel engaged in the power development programme. The



View of Switch Yard (Vindhyachal STPP)

funds are provided mainly to the State Electricity Boards (SEBs) and State Power Generation Corporations (SPGCs). The projects are formulated and implemented by these bodies. The funds provided for the projects are in the nature of additionality to the annual plans approved by the Planning Commission to the State Sector Projects.

4.5.2 The Corporation adopted a strategy to maximise availability of power in the short-term and to guide the development of the power sector along the optimal path in the long-term. The implementation of R&M work will result in improved efficiency in power stations and generation of additional power. The installation of Capacitors will result in the improvement in the quality of supply and also a reduction of transmission and distribution losses. The implementation of the Transmission & Distribution projects, including Urban Distribution, will result in savings in T&D losses besides increased utilisation of the existing capacity. Priority accorded to accelerated completion of the projects which is expected to yield benefit within the next 2-3 years will result in timely availability of additional power.

4.5.3 The authorised share capital of the Corporation is Rs. 2000 crores. The paid-up Capital is Rs. 850.45 crores which is subscribed entirely be the Central Government. To augment its resources, PFC has so far borrowed funds by the issue of Bonds of Rs. 1460 crores. It has also raised Rs. 110.62 crores foreign currency loans during the year.

4.5.4 During 1990-91, the Corporation has approved loans aggregating Rs. 1395.39 crores for 169 proposals. These include Rs. 150.50 crores for 20 proposals of Renovation and Modernisation of Thermal Power Plants, Rs. 49.59 crores for 7 proposals of Renovation and Uprating of Hydro Power Plants, Rs. 384.21 crores for 61 proposals of Transmission and Distribution, Rs. 40.28 crores for 9 proposals of System Improvement, Rs. 133.30 crores for 46 proposals of Urban Distribution, Rs. 596.26 crores for 16 proposals of Thermal Power Projects including Rs. 210.67 crores foreign currency loan for 2 such projects and Rs. 41.38 crores for 10 proposals of hydro power projects. The disbursements during the same period amounted to Rs. 896.11 crores against the proposal to disburse Rs. 1000 crores. The disbursements during the year included Rs. 110.62 crores, under foreign currency loans. The total cumulative loans sanctioned and disbursed upto 31st March, 1991 aggregated to Rs. 3363.76 crores for 352 proposals and Rs. 2192.28 crores respectively.

4.5.5 The Corporation has helped the SEBs and the SPGCs to address their problems of low operational and financial efficiency. The Corporation has also laid great stress on improvement in overall performance of the SEBs. Operational Financial Action plans to improve their performance have been formulated in the case of Andhra Pradesh, Punjab, Madhya Pradesh, Gujarat, Haryana and Orissa SEBs and other SEBs are expected to formulate OFAPs by end of June, 1991.

4.5.6 During 1990-91, the Corporation signed Agreements with French Banks under the French Protocol for Buyer's Credit of FRF 305.39 million for a Power project in Karnataka. Agreement has also been signed with ADB for a Commercial Loan of $ 60 million and JPY 7500 million under the ADB's Complementary Financing Scheme (CFS) for 2 power projects in Andhra Pradesh and Tamil Nadu. Negotiations have been concluded with World Bank for a loan of $ 265 million. Discussions are also in progress with ADB for a direct loan of $ 250 million.

4.5.7 The profit after tax during the year Rs. 70 crores (provisional) against Rs. 30.40 crores in 1989-90.

NATIONAL POWER TRANSMISSION CORPORATION

4.6.1 The National Power Transmission Corporation Limited (NPTC) was incorporated on 23rd October, 1989 with an authorised share capital of Rs. 5000 crores, under the Companies Act, 1956 to undertake the massive programme of laying the Extra High Voltage (EHV)/High Voltage Direct Current (HVDC) transmission system and associated sub-stations as well as constructing load despatch and communication facilities in a coordinated and efficient manner with a view to move large blocks of power from various generating sources under the Central Sector to the load centres within the region as well as across the regions with reliability, security and ecomomy. The registered office of the Corporation would be situated at New Delhi.

4.6.2 Its Regional offices will be opened in phases in different regions of the country on a need basis. The setting up of the Corporation would:

i) help in pooling all the expertise in this field under one Central organisation and keeping abreast of the latest technology development.

ii) bring about economies of scale in the design, construction, maintenance and operation of EHV lines.

iii) ensure timely and economical implementation of the massive programme of transmission line construction in the 8th and 9th plan,

iv) provide the institutional mechanism for creation of a

communication network in the power sector and the computer hardware and software for load despatch, automatic generation control, etc. (As this involves considerable system expertise, the NPTC will be able to take up such schemes in a cost effective manner which will lead to more efficient control of the grid operation.),

v) provide missing links which will strengthen the grid and facilitate grid operations with greater security and reliability,

vi) would facilitate the growth of the economic exchange of power by taking up construction of the inter-regional links. (This would ultimately lead to the formation of the National Power Grid and ensure better utilisation of the available generation resources.),

vii) ensure delivery of the entitled share of power from the central generation,

viii) release the central generation companies of the load of construction of the transmission lines, enabling them to concentrate on the massive new capacity additions programme in the 8th plan and bring up the same in the prescribed time schedule.

4.6.3 In the first phase, the NPTC would take over transmission works from the Central/Centre-State Joint Venture organisation. The organisations are NTPC, NHPC, NEEPCO, NLC, DVC, BBMB, THDC, NJPC, CEA, etc. In the second phase, the existing Electricity Boards and regional load despatch centers together with the associated communication facilities would be transferred to NPTC for integrated operation of the regional grid systems and overall coordination between the constituent system.

4.6.4 In the third phase, NPTC would be made responsible for buying power from the Central Generating Organisation as well as surplus power from the State Electricity Boards and other utilities, pool it and then sell it to different states in the country.

FOLLOW UP ACTION FOR TRANSFER WORK

4.6.5 By its very constitution, the NPTC has to work in very close collaboration and cooperation with Central Power Sector Organisations and also with the State Electricity Boards, REBS and Central Electricity Authority. Transfer work will involve the take over of huge assets for a value of about Rs. 3,900 - crores including the related staff with a view to ensure smooth change for work. NPTC proposes to implement the transfer in stages from one Organisation at a time. Approach paper and draft MOUs for transfer of transmission works and related manpower have been forwarded to all the concerned organisations. Discussion regarding finalisation of various modalities involved in such transfers from NTPC, NHPC etc. are at advanced stage.

4.6.6 During the year 1990-91 Director (Finance) and Chairman and Managing Director were appointed in September' 1990 and November' 1990 respectively. The corporate office at Hemkunt Chambers, Nehru Place, has commenced functioning since January, 1991. For this purpose essential staff for corporate set up has been inducted. Certificate to commence business under the Companies Act, 1956 was also obtained from the Registrar of Companies on 08.11.1990. The Company has become operational with effect from 01.04.91.

TEHRI HYDRO DEVELOPMENT CORPORATION LIMITED

4.7.1 The Tehri Hydro Development Corporation (THDC) was incorporated on 12th July, 1988, as a joint venture of the Govt. of India and Govt. of U.P, to execute the Tehri Hydro Power Complex, in the Garhwal Distt. of U.P. The Tehri Hydro Power Complex, the largest multipurpose development venture in the country, will provide both irrigation and power benefits and usher in an era of rapid development in Uttar Pradesh. The project is being executed with technical and financial assistance of the Soviet Union. The Corporation has an authorised share capital of Rs. 1200 crores.

SALIENT FEATURES

4.7.2 A 260.5 meters high earth and rockfill dam, across the river Bhagirathi at Tehri, just after its confluence with river Bhilangana for creating a storage reservoir to generate power and provide irrigation facilities.

An underground power house of 1000 MW (4x250 MW) capacity with conventional turbine-generating sets under Stage-I at Tehri.

Second underground power house of 1000 MW (4x250 MW) capacity with reversible pump turbine sets under Stage-II at Tehri (Pump Storage Plant).

A 103.5 metre high concrete dam (which will provide a balancing reservoir) with a surface power house of 400 MW (4x100 MW) capacity at Koteshwar, 22 Km, downstream of Tehri dam site across the river Bhagirathi.

Transmission system for evacuation of power generated at Tehri and Koteshwar projects, through two single circuits of 765 KV lines to Meerut for further utilisation in Northern region.

4.7.3 The estimated cost of the entire Tehri Hydro Power Complex is Rs. 3465 crores, and the project is scheduled to be completed by June, 1966. An expenditure of about Rs. 597.41 crores has been incurred till March, 1991 on the project.

(Rs in Crores)

PROJECT COSTS AND COMMISSIONING SCHEDULE

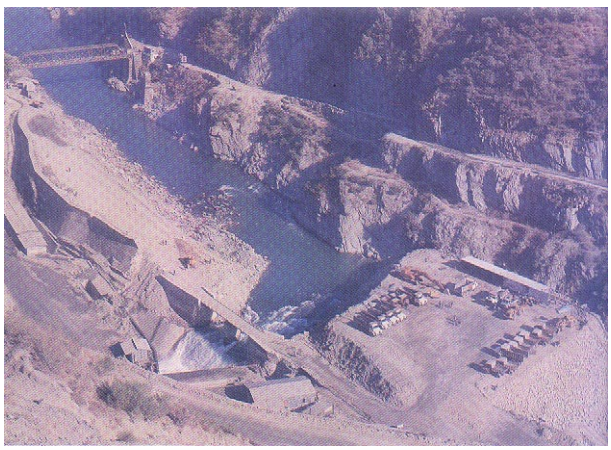
PROJECT	ESTIMATED COST (AT MARCH,'90 PRICE LEVEL)	COMMISSIONING SCHEDULE (PLANNED)
i) Tehri Dam & HPP (4x250 MW)	1762	June, 1996
ii) Koteshwar Dam & HPP (4x100 MW)	389	June, 1996
iii) Tehri Pump Storage Plant (4x250 MW)	709	June, 1996
iv) Associated Transmission System (800 KV)	605	March, 1996
TOTAL	3465	

NATHPA JHAKRI HYDROELECTRIC PROJECT

4.8.1 India has an estimated Hydroelectric potential of about 84, 000 MW with Himanchal Pradesh's share at about 20,000 MW out of which river Satluj has the highest potential of over 8960 MW. Nathpa Jhakri Hydroelectric Project (NJP) identified in Satluj Basin has the largest quantum of power i.e. 1500 MW having relatively easy accessibility and as such it is the most attractive project in the basin.

4.8.2 The generation component of this gigantic project, one of the biggest in Asia is being executed as a joint venture between the Govt. of India and Govt. of Himachal Pradesh.

4.8.3 The project which is proposed to be completed in seven years, including 1 1/2 years for preconstruction works, is estimated to cost Rs. 1678.02 crore (at September, 1988 price level) for its generation component including Rs. 206.02 crores as interest during construction (IDC). The transmission component



View of Bhagirathi River diversion For Dam Construction

of the project, inclusive of IDC of Rs. 95.59 Crores, is estimated to cost Rs. 889.95 crores. The total cost of the project including IDC at September. 1988 price level, is Rs. 2567.97 crores.

4.8.4 The project will generate 7447 million units of energy at a cot of 24.66p per unit at bus bar, providing peaking benefits to the Northern region. Besides direct benefits from the project by sale of power, the indirect benefits to the region by way of increase in agricultural and industrial production will also be substantial.

FORMATION OF THE CORPORATION

4.8.5 Nathpa Jhakri Power Corporation Limited was incorporated under the Companies Act, 1956 on 24th May, 1988 with the main object of executing the Nathpa Jhakri Hydroelectric Project under the overall supervision of the Board of Directors comprising of whole-time Directors and the part-time Directors representing various Departments of Government of India.

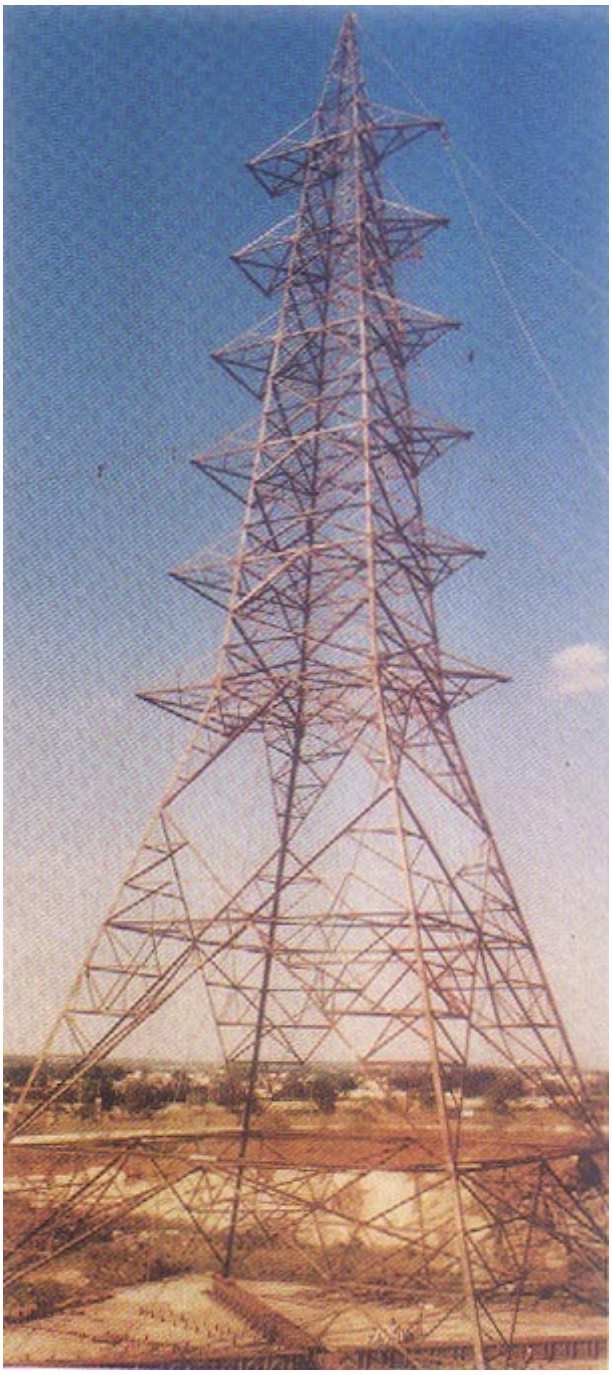
FINANCIAL ASSISTANCE FOR THE PROJECT

4.8.6 The World Bank has approved a loan equivalent to US$ 437 millions towards part-financing of the Project and the same has become effective w.e.f., 30th January, 1990. Besides Plan funds co-lateral financing from other sources shall be required to meet the total cost of the project.

APPOINTMENT OF EXPERTS AND CONSULTANTS

4.8.7 In order to obtain advice on different technical issues, from time to time, in the implementation of the Project, a roster and a permanent panel of experts has been constituted.

4.8.8 Central Electricity Authority (CEA) and Central Water Commission (CWC) have been appointed as the Principal Consultants while the joint-venture comprising of M/s. Nippon Koei Company Limited, Japan, M/s. Water and Power Consultancy Services (India) Limited, India and M/s Electrowatt Engineering Services Limited, Switzerland have been appointed as the retainer consultants to render advice during project execution and commissioning.



220 KV, Four Circuit tower, tested at CPRI for the first time in India.

MAJOR CIVIL WORKS OF THE PROJECT

4.8.9 For executing the Major Civil Works of the Project internationally renowned contractors have already been prequalified and the Bidding Documents for the purposes of

tendering for the works are in the process of being issued to the pre-qualified contractors.

ELECTRICAL-MECHANICAL EQUIPMENTS FOR THE PROJECT

4.8.10 For the Electrical-Mechanical Equipments for the project, the bid document has been issued inviting applications for prequalification of contractors for the same. A preliminary evaluation of the bids received has been completed and detailed specifications forming part of the Bid Documents have been finalised in consultation with the retainer consultants.

INFRASTRUCTURAL WORKS AND INVESTIGATION

4.8.11 The works relating to the basic infrastructural requirements of the project in terms of construction of Road, Buildings, Construction Power and other allied facilities are in progress. These facilities would be made available also to the contractors for the major civil works. For carrying out the underground construction, work on 4 Adits has already been started, while contracts for 3 more Adits have been awarded. Construction of 37397 Sqm. of buildings, 47.4 Kms. of roads has been completed and availability of construction power at various Adits has already been established.

4.8.12 Pre-construction investigations, like drilling, drifting, geological Survey and topographical Survey are being conducted as per the requirement and the activities are progressing well in conformity with the schedule. Model studies for various permanent features of the project have been taken up with assistance of CWPRS, Pune, and UPIRI, Roorkee Suitability of construction material is being confirmed with the help of CSMRS, New Delhi.

LAND ACQUISITION AND RESETTLEMENT

4.8.13 The work of land acquisition for the project is in progress. The acquisition has been completed for 76 ha., the process is close to being completed for further 475 ha. and is well underway for the remaining 150 ha. Very limited resettlement is required in the project involving 73 families only A meagre 118 ha. of forest land is being acquired for project needs and necessary compensatory afforestation is being implemented.

KOL DAM HYDROELECTRIC PROJECT

4.8.14 The Kol Dam Hydroelectric project which is located on Satluj river in Bilaspur district of Himachal Pradesh envisages utilisation of a drop of about 140 mtrs. by constructing a 163 mtrs. high rockfill Dam and a Power Station with an installed capacity of 800 MW at the toe of the dam. The project is estimated to cost Rs. 1050.52 crores at December, 1989 price level. The cost of energy generation works out to 34 paise per Kwh. The project is proposed to be completed in a period of 6.1/2 years. The Central Electricity Authority, Govt. of India, accorded technical approval to this project in August, 1988. The project has received clearance from environmental angle for use of forest land. PIB clearance for final investment decision is under consideration. The expert appraisal of the project is being done by Soviet Experts, who apart from submitting two preliminary reports, have submitted the final Appraisal Report, indicating the feasibility of the project.

DAMODAR VALLEY CORPORATION

4.9.1 The Damodar Valley Corporation was established in July, 1948 under the Damodar Valley Corporation Act. The Corporation has a full time Chairman and two part time Members. The part-time Members represent the States of Bihar and West Bengal.

The Functions of the Corporation include:

* the promotion and operation of schemes for irrigation, water supply and drainage;
* the promotion and operation of schemes for the generation, transmission and distribution of energy, both hydro-electric and thermal;
* the promotion and operation of schemes for flood control in the Damodar river and its tributaries and the channels excavated by the Corporation for the improvement of flow conditions in the Hooghly river;
* the promotion and control of Navigation in the Damodar river and its tributaries and channels, if any;
* the promotion of afforestation and control of soil erosion in the Damodar Valley; and
* the promotion of public health and the agricultural, industrial, economic and general well-being in the Damodar Valley and its area of operation.

4.9.2 The Corporation has so far constructed four multipurpose dams at Tilaiya, Konar, Maithon and Panchet.

The irrigation system comprises a barrage over river Damodar at Durgapur and the canal system of 2495 Kms. which includes 137 Kms. along irrigation-cum-navigation canal on the left bank of the river Damodar. The management of irrigation system excluding the navigation canal was transferred to the Government of West Bengal in 1964.

4.9.3 The Damodar Valley Corporation constitutes the major power infrastructure in the power sector for the Coal Mines, Steel Plants, Railways and Copper Mines located in the Eastern Region. The other beneficiaries are the West Bengal and Bihar State Electricity Boards and Calcutta Electric Supply Corporation. Power generation in the DVC system is shared between Bihar and West Bengal regions approximately in the proportion of 65% and 35% respectively.

4.9.4 The installed capacity (derated) and generation of power during the year 1990-91 upto November, 1990 were as follows:-

Sl. No.	Name of Station.	Installed capacity (MW)		Generation MU upto 31st March, 1991.
1	Thermal Bokaro	3x50 = 150 *1X40 = 40	190	617.63
2.	BOKARO 'B'	1x210 = 210	210	880.52 +2.51
3.	C.T.P.S.	3x140 = 420 3x120 = 360	780	1913.59
4.	D.T.P.S.	1x140 = 140 1x210 = 210	350	1054.75 4469.00
5.	Gas Turbine at Maithon Hydel	3x27.5 = 82.5	82.5	40.48
6.	Tilaiya	2x2 = 4	15.35	
** 7.	Panchet	1x40 = 40	40	172.52
8.	Maithon	3x20 = 60	60	249.77 437.64

* BTPS A - Unit-4 de-rated to 40 MW from January, 1990.

** Panchet Unit-2 synchronised on 5-3-91 and generated 3.734 MU upto 31-3-91

4.9.5 The position relating to the on going generation and transmission projects of the Corporation is given in the following table:-

Work under progress	Capacity		Target date for completion
a) Generation project			
1) Bokaro 'B' Stage-II	2x210 MW	420 MW	Unit-II Synchronised on 7.11.90. Unit-III, December, 1991, subject to revision of dates due to external constratints.
2) Panchet unit Reversible pump turbine	1x40 MW	40 MW	First synchronised on 5-3-1991.
3) Mejia Thermal power project	3x210 MW	630 MW	Unit-I December,'92 Unit-II, June,'93. Unit-III, December'93
4) Maithon Right Bank Thermal Power Station.	4x210 MW	840 MW	Unit-I February'95
5) Maithon Gas Turbine	3x27.5 MW	82.5 MW	After sucessful synchronisation and completion of trial run and performance test of all the units, the DVC has since taken over and put to commercial operation.
b) Transmission projects			
1. 220 K V Bokaro 'B'-Jamshedpur Line.			Target-June, 1991.
2. 220 KV Kalyaneswari-Kalipahari Mejia Line.			Target-December, 1991.
3. 220 KV CTPC-DTPS-Mejia Line.			Target-June, 1991 (Phase-I)
4. 132 KV Sindri-Pradhan Khanta Line			Completed in January, 1991
5. 33 KV West Bokaro-Kelda Line			88% work completed.
6. 33 KV Ramgarh-West Bokaro Line			89% work completed.
7. 33 KV line for supply of power to Karo special (CCL).			40% work completed.
8. 220 KV CTPS switchyard (3rd 150 MVA Auto Transformer).			Target-September, 1991.
9. 220 KV Jamshedpur Substation (phase-II)			2nd 150 MVA commissioned on 28-12-90.
10. 22 KV DTPS switchyard (3rd 150 MVA Auto Transformer).			Target-September, 1991.

Tail Pool Dam Project

4.9.6 Work of Tail Pool Dam on the left bank side has not yet started. On the right bank side, earth work is in progress for the approach road and the position of earth dam extending to that side. Pending completion of the Tail Pool Dam, Panchet Hill Unit-2 (reversible pump turbine type), which is presently under advanced stage of construction, will run as conventional unit during the monsoon period only.

Training

4.9.7 The DVC introduced modern training methods in collaboration with PETS and a Training Institute has been set up at Chandrapura Thermal Power Station to impart training to Graduate Engineers (Trainee) of all disciplines and operatives. In addition, officers of different disciplines are sponsored for training in different institutions under Execution Development Scheme from time to time. DVC has also a scheme to sponsor officers for foreign training under Colombo Plan etc, on need basis.

4.9.8. The capital expenditure of DVC is met from its internal resources and is supplemented by market borrowing.

BHAKRA BEAS MANAGEMENT BOARD AND BEAS CONSTRUCTION BOARD

4.10.1 Under the Punjab Reorganisation Act, 1966 the management of the Bhakra Nangal project and construction of the Beas project were vested in the Bhakra Beas Management Board and the Beas Construction and Board respectively. In conformity with the Act, works of the Beas project, on completion, were transferred to the Bhakra Beas Management Board. The Bhakra Beas Management Board (BBMB) manages, inter-alia, the following hydro-electric power stations of the Bhakra system:-

	Power House	Installed Capacity (MW)
1.	Bhakra (Right Bank)	5x312 = 660
2.	Bhakra (Left Bank)	5x108 = 540
3.	Ganguwal + 1x29 = 77	2x24
4.	Kotla + 1x29 = 77	2x24
5.	Dehar Stage I Dehar Stage II	4x165 + 2x165 = 990
6.	Pong Stage I Pong Stage II	4x60 + 2x60 = 360
	TOTAL	= 2704

4.10.2 The Bhakra Beas Management Board also manages the operations of the 260 ckt. Kms of 400 KV lines and the 2950 ckt. Kms of the 220 KV lines and 15 grid sub-stations.

4.10.3 The work on the construction of the 400 KV transmission line from Dehar to Bhiwani has been completed and necessary Notification transferring the line alongwith various components to the Bhakra Beas Management Board has also been issued.

4.10.4 The generation of the Bhakra Beas system during April to December, 1990 was 13048 MU, against the target of 11160 MU during 1990-91. The generation during the previous year was 11450 MU.

POWER ENGINEERS TRAINING SOCIETY (PETS)

4.11.1 The Power Engineers Training Society (PETS) was established by the Government of India in 1980 to function as national apex body for meeting the training needs of the power sector. The existing four Thermal Power Station Personnel Training Institutes at Neyveli, Durgapur, Badarpur and Nagpur were set up by the Government of India in 1965, 1968, 1974 and 1975, respectively under the overall control of the Central Electricity Authority (CEA). These Institutions were engaged in the training of engineers and operators of thermal power stations. To achieve better coordination of training activities, PETS was formed in 1980 as an autonomous body and all the four Institutes were transferred to PETS. The Power Engineers Training Society has since been organising training programmes for power engineers, operators and technicians in its Institutes.

4.11.2 The training courses conducted at the four Regional Institutes of PETS include the following:

- Induction level regular courses (52 weeks) for Graduate Engineers in operation and maintenance of thermal stations.
- Condensed courses (26 weeks) for Graduate Engineers.
- Induction level operator's courses (22 weeks) for diploma holders.
- Induction level courses for Graduate Engineers in Transmission and Distribution (26 weeks)
- Short term and sponsored courses.
- Maintenance courses for the upgradation of skills of technicians.
- On-plant training for in-service operators.
- PETS/BHEL courses on operation of 210 MW thermal units.
- Simulator courses.

4.11.3 The number of persons trained in the different courses at the Institutes during 1990-91 is as follows:

Sl.	Courses	No. of trainees
1.	Regular course for engineers.	122
2.	Condensed course for engineers	174
3.	Operators course	180
4.	Short-term courses for engineers	1165
5.	Maintenance courses for technicians	899
6.	On plant/on-site courses	558
7.	PETS/BHEL course on 210 MW TPS operation	33
8.	Simulator course	276
	TOTAL	3407

4.11.4 The simulator for 210 MW units installed with UNDP assistance at the Badarpur Institute in 1983, has provided training to more than 2150 Engineers as on 31st March, 1991.

4.11.5 The following short tern courses/workshops have been organised or are planned to be organised by PETS in collaboration with BEI, UK.

Sl. No.	Title of course/	Course/ workshop	Institute workshop	Duration
1.	Computer application for power plant management	Course	Badarpur	22-10-90 to 26-10-90
		Workshop	Badarpur	14-11-90
2.	Environmental management	Course	Nagpur	19-11-90 to 23-11-90

3.	Power plant chemistry Course	Neyveli	04-02-91 to 08-02-91
4.	Maintenance planning Workshop CESE, Course	Calcutta Durgapur	12-02-91 04-02-91 to 08-02-91
	Workshop	Badarpur	14-02-91

4.11.6 In the current year (Upto 31-3-91) the Department of Power has sanctioned Rs. 185.57 lakhs as plan and Rs. 183.00 lakhs as Non-plan grant-in-aid to PETS. The training fee during 1990-91 fetched a revenue of Rs. 59.03 lakhs.

4.11.7 During 1990-91, the Government has sanctioned schemes for installation of 210 MW Simulator at TPS PTI, Nagpur and 500 MW Simulator at TPS PTI, Badarpur. The other Regional Power Training Institutes are proposed to be augmented during the Ninth plan period.

4.11.8 As per the recommendations of the Committee on Training, the existing four Institutes of PETS are proposed to be converted into Regional Power Training Institutes (RPTIs). and the PETS HQ, into a National Power Training Institute (NPTI). After identifying the requirements of various facilities (men and materials for the proposed National Power Training Institute), the Institute for Advanced Learning and Management Studies (INALEAS), will be set up. The scheme for the setting up of NPTI and the Institute for Advanced Learning and Management Studies has been approved in February, 1991 by the Government.

CENTRAL POWER RESEARCH INSTITUTE

4.12.1 The Central Power Research Institute (CPRI) was established in 1960 by the Government of India, to serve as a national laboratory for applied research in electrical power engineering and also to function as an independent authority for testing and certification of electrical equipments manufactured in the country. CPRI was recorgnized into an autonomous society in 1978 under the Ministry of Energy (Department of Power), Government of India.

4.12.2 The Institute has its main laboratories and corporate office at Bangalore and a unit at Bhopal for testing and development of switchgears. A research facility in UHV AC transmission technology is coming up fast near Hyderabad. One Thermal Power Research Centre at Koradi near Nagpur and the Regional Testing Laboratory a Muradnagar have been sanctioned. Work on these projects has just been started. A Fly Ash Utilization Demonstration Centre has been commissioned at Raichur Thermal Power Station, Raichur.

4.12.3 The Institute has identified many R&D problems for investigation which are of importance and relevance to the electric power sector. A number of technical problems faced by power utilities and manufacturing industries are also referred to the Institute for investigation and finding solutions in the form of sponsored research projects.

4.12.4 As a result of its R&D efforts, the Institute has been able to develop a number of new products and processes useful in the power sector. They are found to be of great importance in energy saving, power system improvement, profitable utilization of waste products, curtailing distribution losses, etc. Many of these products & processes are transferred to entrepreneurs for commercial exploitation.

4.12.5 With a view to expose the engineers & scientists to the latest developments in the professional field, the Institute organises seminars/workshops on different subjects. During the year the Institute had organized five national seminars/ workshops. A large number of technical papers were presented and discussed at these seminars/workshops.

4.12.6 Thirty technical reports were issued upto 31st March 1991 bringing out the results of R&D investigations carried out. The engineers and scientists of the Institute presented/ published a large number of research papers during the year in various symposia/technical journals in India and abroad.

4.12.7 The CPRI provides testing and consultancy services to electricity supply utilities, manufacturing industries and other organizations for new product development and quality assurance. It has also helped towards import substitution.

4.12.8 The Institute is fully equipped for development testing of switchgear and fusegear, transformers, power cables, capacitors, solid insulating materials, insulation oils and varnishes, transmission line towers etc. For effective quality control, facilities are available for testing impulse and power frequency of power equipment, short circuit testing of switchgear and fusegear, transformers, CTs and other power system apparatus and evaluation testing of power cables, capacitors solid insulating materials, insulating oils and varnishes etc., in accordance with various standards. New testing facilities are being set-up by the Institute to cater to the increasing testing needs from time to time.

4.12.9 Upto 31st March 1991 the Institute has tested 6228 samples and 1512 organizations have availed themselves of the testing and certification facilities during the year.

4.12.10 The revenue realised by the Institute during the last three years is as follows:

1988-89	1989-90	1990-91
Rs.396 lakhs	Rs.477 lakhs	Rs.522 lakhs

4.12.11 During 1988-89, 1989-90 and 1990-91 the Institute had earned adequate revenue to meet its non-plan expenditure. No grant-in-aid was therefore availed from the Government during these years to meet the non-plan expenditure. The Institute was self-sufficient during 1990-91 also in so far as non-plan expenditure is concerned.

4.12.12 The following major capital projects continued to be under various stages of execution by the Institute during the year:

1.	2500 MV A High Power Testing station	Rs. 9744.00 lakhs
2.	UHVAC Research Laboratory, Hyderabad	Rs. 1705.53 lakhs
3.	Thermal Power Research Centre, Koradi (Nagpur)	Rs. 1718.17 lakhs
4.	Regional Testing Laboratory, Muradnagar (UP)	Rs. 636.00 lakhs
5.	Second Short Circuit Alternator for STDS, (Bhopal)	Rs. 1938.95 lakhs

4.12.13 Under Phase I of the long term R&D co-operation programme with CESI, Italy, engineers and scientists of CPRI and CESI have jointly worked on many projects concerning topics and problems of current interest.

4.12.14 During the year CPRI engineers received recognition by way of award by NRDC for the development of a corrosion resistant coating for conductors.

4.12.15 Training programmes for middle level officers to give exposure to Research & Development work as well as testing facilities at CPRI were conducted.

4.12.16 Several software developed by CPRI in the field of distribution planning, transmission tower design analysis, load forecasting, load scheduling etc., have found favour with utilities who are approaching CPRI for using the software.

ENERGY MANAGEMENT CENTRE

4.13.1 Energy Management Centre was established by the Government of India in April 1989 to act as a focal point for exchange of experience among energy institutes within India and a Centre for information, research and training activities in the energy field based on cooperation between India and the European Communities.

Executive Agency

4.13.2 The institutional structure for determining and directing energy efficiency policies is a two-tiered one. The energy Conservation Cell in the Department of Power, Ministry of Energy, formulates policy, designs the energy management programme and ensures effective co-ordination between interested Ministries and other entities. The Energy Management Centre is the executive agency under this policy function, designed to implement and monitor the Energy Conservation programme.

Role as Coordinator

4.13.3 The institutions active in the field of energy management today are doing highly competent and effective work. However, their efforts are fragmented and lack co-ordination.

4.13.4 The need now is for all overall strategic vision supported by quantitative analysis of what is required to be done to improve energy efficiency in the country.

4.13.5 This is where the energy Management Centre steps in as a centre of excellence for research, training and information in energy policy and management. EMC is also the focal point of an institutional network between India and the European Community.

Organization of the Centre

4.13.6 EMC has been registered as a Society under the Registration of Societies Act 1860, so that it functions as an independent and autonomous body. This gives it the responsibility and required flexibility to make its operations more dynamic.

4.13.7 Its Operational HQ is in Delhi while the Training HQ is at Nagpur.

Activities of the Centre

4.13.8 The activities of EMC are as follows:

- develop a National Energy database by collecting and analyzing data on energy supply, demand and information on prices,
- identify barriers for improving energy efficiency and propose appropriate incentives and other measures to overcome them. These would include recommendations for assistance with capital investment, taxes, duties and other financial incentives.
- review laws and regulations that have an impact on energy consumption and propose modifications and formulate suitable policies and actions,
- suggest introduction of standards and labels and setting of consumption targets,
- provide planning assistance to government agencies,

- organize public information and promotional campaigns on an on-going basis,
- organize sector specific promotional campaigns for the main energy consuming sectors (industry, transport, agriculture, commercial and government buildings). Also provide technical assistance in the field of energy efficiency to these sectors,
- promote energy audits in enterprises and provide recommendations to improve energy, efficiency and fuel substitution,
- monitor progress made in energy conservation and fuel substitution and initiate follow-up actions where needed,
- organize training for energy managers and equipment operators,
- implement multilateral and bilateral aided conservation projects.

International Cooperation Projects

4.13.9 EMC is implementing the following projects:

(i) UNDP-Energy Bus Project

(ii) EEC-India Energy Bus Programme

(iii) ESCAP regional TCDC Working Group on Energy Conservation

(iv) World Bank Industrial Energy Efficiency Project

Expenditure during the year 1989-90 and Budget Estimates for the year 1990-91:

4.13.10 Total expenditure incurred by EMC during the year 1989-90 was Rs. 97.00 lacs including that on Agency projects. The Budget estimates for the year 1990-91, as approved, are Rs. 189.69, lacs, against which an expenditure of Rs. 154.38 lacs has been incurred upto 31st march, 1991.

ACC BABCOCK LIMITED

4.14.1 ACC Babcock Limited (ABL) is engaged in the manufacturing of Steam Generators, Cement Machinery, Electrostatic precipitators and allied machinery. ABL has two manufacturing units, one at Durgapur in West Bengal and the other at Shahabad in Karnataka. The Company has a subsidiary named Babcock Wilcox of India Ltd. registered at Calcutta with accumulated expertise in erection, commissioning and servicing and overhauling of boilers.

4.14.2 With over a quarter of a century of proven experience, ABL is one of the largest heavy engineering companies in India with a wealth of expertise garnered from the renowned promoters and other well-known organisations through technical collaboration.

4.14.3 ABL has gone through a difficult period in the recent past. It ceased its operation for a period of about 20 months. Since the company faced a difficult situation due to lack of orders and continued to incur losses it applied for voluntary winding up in October, 86 when the operations of the company came to a stand still.

4.14.4 With the active support of the Government the company has been revived and it has resumed its operations in June, 1988. It is now a Government supervised company under the Department of Power. The revival package, prepared by IDBI and approved by BIFR inter alia includes long term interest free loan (with an option to convert into equity) of Rs. 26 crores by the Department of Power and Department of Atomic Energy and term loans from various financial institutions. Major orders booked during the period under review include 2x15 and 1x30 MW boiler for TISCO and Marine Boilers for Garden Ship Builders.

4.14.5 The Company after a revival has successfully commissioned Kolaghat (1x210 MW), Bokaro (1x200 MW) thermal power projects, Khamanan heavy water plant and fludized bed boiler for the Bhadrachalam paper board project. All these units are working satisfactorily.

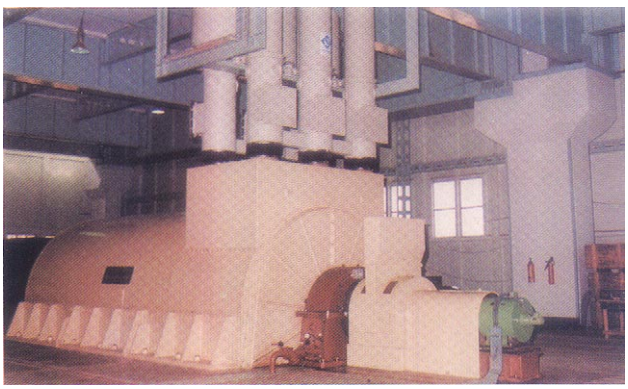
4.14.6 Working on the revival plan, an improved order book position and identification of new opportunities for diversification, ABL is expected to contribute its mite in the Power Sector as a reputed manufacturer of Boilers.

ELECTRICITY STATISTICS AT A GLANCE
ELECTRICITY-INSTALLED CAPACITY, GENERATION & CONSUMPTION

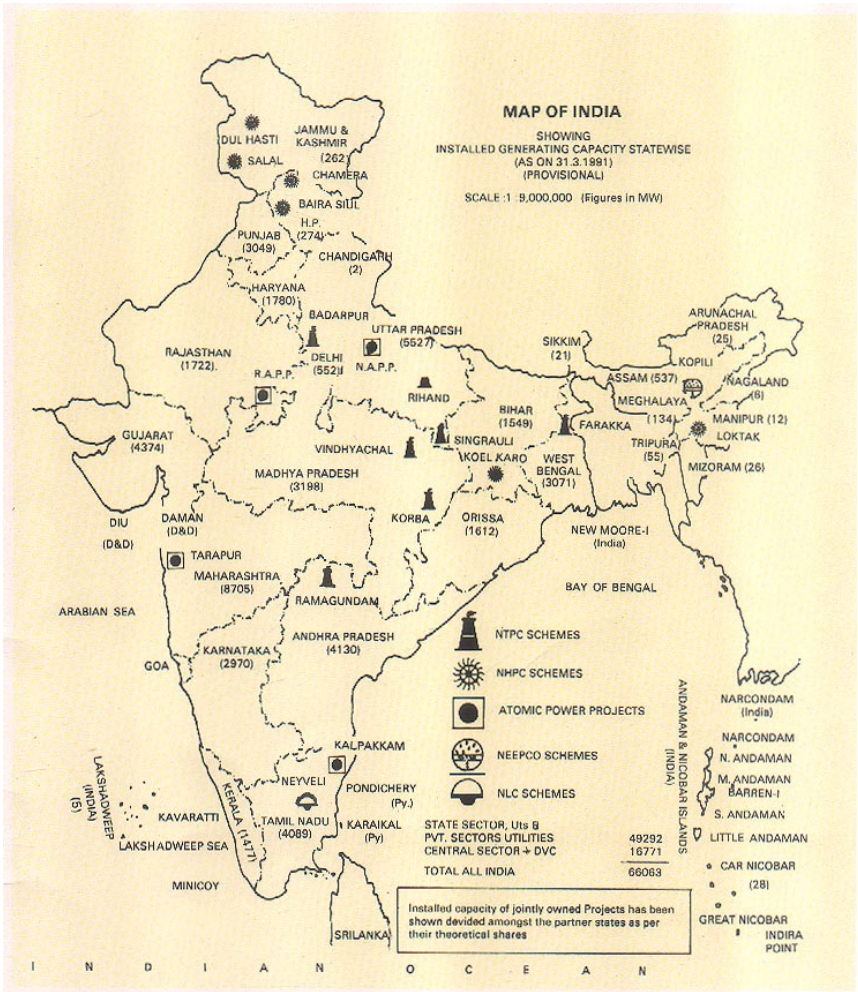
	Unit	1970-71	71-75	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89*	89-90*
Installed Capacity														
Utilities+Non-Utilities	MW	16271	20345	31307	33316	35781	39235	43706	47705	52273	54980	60500	65560	70501
Utilities	MW	14709	18317	28148	30214	32345	35363	39339	42585	46769	49266	54155	59040	63627
Hydro	MW	6383	7529	11384	11791	12173	13056	13856	14460	15472	16196	17265	17798	18308
Nuclear	MW	420	640	640	860	860	860	1095	1095	1330	1330	1330	1565	1565
Thermal (Coal)	MW	7508	9753	15991	17128	18695	20712	23648	26311	28809	30394	34237	37943	41510
Oil & Gas	MW	398	395	433	440	617	735	740	719	1158	1346	1323	1734	2244
Non-Utilities	MW	1562	2028	2859	3102	3436	3872	4367	5120	5504	5714	6345	6520	6874
Generation(U+NU)	BU	61.21	76.68	112.82	119.26	131.12	140.30	150.99	169.21	183.39	201.28	218.98	240.35	266.20
Utilities	BU	55.83	70.20	140.63	110.84	122.10	130.26	140.18	156.86	170.35	187.71	202.09	221.38	245.40
Hydro	BU	25.25	27.88	45.48	46.54	49.56	48.37	49.95	53.95	51.02	53.84	47.44	57.87	62.05
Nuclear	BU	2.42	2.21	2.88	3.00	3.02	2.02	3.55	4.07	4.98	5.02	5.04	5.82	4.63
Thermal (Coal)	BU	27.80	39.50	55.72	60.71	68.75	77.91	84.44	96.96	112.54	125.45	145.81	154.87	172.68
Oil & Gas	BU	0.36	0.57	0.55	0.59	0.77	1.96	2.24	1.88	1.81	3.40	3.80	2.82	6.04
Non-Utilities	BU	5.38	6.48	8.19	8.42	9.02	10.04	10.81	12.35	13.04	13.57	16.89	18.97	20.80
Auxiliary consumption (U+NU)	BU	3.44	4.86	7.35	8.20	9.38	10.21	11.41	13.28	14.84	15.96	18.20	19.46	22.66
T&D Losses	BU	9.31	13.56	20.06	21.32	23.59	25.64	27.69	31.21	34.19	37.78	42.23	44.51	52.21
Consumption(U+NU)	BU	43.46	58.26	85.39	89.74	98.15	104.45	111.89	124.72	134.36	147.84	158.55	176.38	191.33
Industrial	BU	34.33	38.31	53.24	55.40	60.89	61.75	66.55	73.56	79.44	81.95	82.94	92.68	98.19
Transport	BU	1.37	1.53	2.30	2.27	2.50	2.83	2.71	2.88	3.08	3.26	3.65	4.07	4.18
Agriculture	BU	4.47	7.76	13.45	14.49	15.0	17.82	18.23	20.96	23.42	29.44	35.27	38.85	43.64
Domestic, Commercial and Services	BU	8.29	10.66	16.40	17.58	19.56	22.25	24.40	27.32	28.42	32.89	36.69	40.78	45.32

Includes net energy exported to neighbouring countries.

*-Provisional



2000 MVA High Power Short Circuit Generator at CPRI



The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.
The boundary of Meghalaya shown on this map is as interpreted from the north eastern areas (reorganisation) Act, 1971, but has yet to be verified.
The responsibility for the correctness of internal details rests with the publisher.
The administrative Head-Quarters of Chandigarh Haryana & Punjab are at Chandigarh.
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