



POWER

7.1 BACKGROUND

Power is an important aspect of the physical infrastructure that requires planning in advance, development and management for improved quality of life, productivity and economic activities.

The status of power supply in the National Capital Region has not kept pace with the increasing population and the growth of economic activities such as industries, trade, commerce, offices etc. There is an overall shortage of power in the Northern Grid, from where the region draws its power and hence, power cuts have become a routine affair, disturbing daily life as well as affecting economic productivity. The situation is even worse in the rural areas where the quantity and quality of power supply is very poor. Although augmentation of generating capacities of power and improvement in transmission and distribution system is a gigantic task requiring substantial resources, yet it is essentially required to be taken up for the balanced and harmonized development of the region.

It was proposed in the Regional Plan-2001 for an uninterrupted supply of power in adequate quantity and quality and priority in making additional power available to NCR. As part of the Functional Plan in NCR, various strategies were suggested for adequate supply of power for various industrial, economic and business activities in the Priority Towns, which may be at least at par, if not better than Delhi Metropolis.

In the review of Regional Plan-2001, it was observed that one of the major constraints in the process of planned development and growth of economic activities in the National Capital Region was inadequate availability of electric power. The power supply deficit within the NCR States at the end of the 8th Plan (1996-1997) was 31.1% in NCT-Delhi, 50% in Haryana, 49.6% in Rajasthan and 37.7% in U.P.

7.2 EXISTING SITUATION AND ISSUES

7.2.1 Existing Availability and Future Demand

District wise data collected from the region for the last three years with regard to energy received and peak demand is given in Table 7.1. Based on the existing data and considering future development programmes in the region, the Sub-region wise energy requirements and peak loads for the entire NCR have been worked out in Table 7.2.

Projections made by Central Electricity Authority (CEA) have revealed the requirement of huge additional generation of power for the region. Table 7.3 reveals that additional capacity required by the year 2006-2007 is 4,513 MW and by the end of year 2020-2021 it will be 23,345 MW. The total additional installed capacity requirements by the year 2020-2021 is expected to be 4,862 MW in Haryana Sub-region, 1,690 MW in Rajasthan Sub-region, 9,195 MW in UP Sub-region and about 7,597 MW in NCT-Delhi Sub-region. These projections have been worked out by assuming that there will be an

addition in the power generation capacity of 2,764 MW from the year 2002 to 2007 and 2,922 MW from the year 2007 to 2012.

Table 7.1: Sub-region wise Energy Received and Peak Load for NCR

Sub-region/ Region	Energy Received (Mkwh)			Peak Load (MW)		
	1988-1999	1990-2000	2000-2001	1998-1999	1999-2000	2000-2001
	ACTUALS					
1	2	3	4	5	6	7
NCT-Delhi	16,257	17,452	18,432	2,484	2,930	3,094
Haryana	6,153	6,609	6,983	1,154	1,103	1,143
Rajasthan	1,199	1,221	1,072	365	361	326
Uttar Pradesh	5,462	5,353	5,323	1,406	1,480	1,595
Total NCR	29,071	30,635	31,810	5,410	5,874	6,158

Source: Central Electricity Authority

Table 7.2: Sub-region wise Energy Requirement and Peak Load in NCR

Sub-region/ Region	2000-2001 (Actual)	2001-2002	2006-2007	2011-2012	2016-2017	2020-2021
1	2	3	4	5	6	7
NCT-Delhi						
Energy Requirement (MU)	18,432	19,454	25,672	34,762	46,849	59,258
Growth Rate (%)	--	5.54	5.70	6.25	6.15	6.05
Load Factor (%)	68.00	68.00	68.00	68.00	68.00	68.00
Peak Load (MW)	3,094	3,266	4,310	5,836	7,865	9,948
Haryana						
Energy Requirement (MU)	6,983	7,579	11,002	16,735	25,338	35,179.2
Growth Rate (%)	--	8.54	7.74	8.75	8.65	8.55
Load Factor (%)	69.76	70.00	70.00	70.00	70.00	70.00
Peak Load (MW)	1,143	1,236	1,794	2,729	4,132	5,737
Rajasthan						
Energy Requirement (MU)	1,072	1,265	1,738	2,554	3,735	5,043.72
Growth Rate (%)	--	18.00	6.56	8.00	7.90	7.80
Load Factor (%)	37.54	40.00	42.50	43.00	44.00	45.00
Peak Load (MW)	326	361	467	678	969	1,279
Uttar Pradesh						
Energy Requirement (MU)	5,323	5,837	8,456	13,011	19,927	27,922
Growth Rate (%)	--	9.66	7.69	9.00	8.90	8.80
Load Factor (%)	38.09	39.02	41.76	42.80	43.80	44.60
Peak Load (MW)	1,595	1,707	2,312	3,470	5,193	7,147
Total NCR						
Energy Requirement (MU)	31,810	34,135	46,868	67,062	95,849	127,403
Growth Rate (%)	--	7.31	6.61	7.43	7.40	7.37
Load Factor (%)	58.97	59.31	60.23	60.22	60.25	60.32
Peak Load (MW)	6,158	6,570	8,883	12,713	18,159	24,111

Source: Central Electricity Authority

According to CEA, there are no plans for additional capacity generation beyond 2012. In fact, this capacity addition also includes allocation from the central sector projects that are proposed to be commissioned by the end of 10th and 11th Plans. An important point to consider is that the average energy consumption pattern in the concerned Sub-regions during the period 1998 to 2001 was 42.80% of the total consumption in Haryana State, 5.00% of the total consumption in Rajasthan State and 15.00% in case of the State of Uttar Pradesh. In view of this, the distribution of allocations from central sector projects to respective Sub-regions has been made in the similar proportions.

This would not only entail huge investment but also need meticulous planning and implementation of power development programmes in the region.

This projection of demand for power does not include the load requirements for MRTS and RRTS. Since these services require adequate and uninterrupted power supply, it is assumed that this aspect will be adequately ensured and planned by the relevant authorities while formulating the MRTS and RRTS Projects.

7.2.2 NCR as Non-Priority Area

At present, the power supply to various States/Sub-regions of the NCR is regulated through the Regional Grid system. The power supply system of the NCR States namely Haryana, Rajasthan, Uttar Pradesh and NCT-Delhi forms part of the Northern Grid. The Northern Grid, which is overseen by the Northern Regional Electricity Board (NREB), gets power through various Central and State generating stations and in turn supplies power to the constituent States. Although the overall control and monitoring of the Northern Regional Grid operation is done by the NREB, the basic management and control of the power supply system in the States is done by the State Governments through their respective Power Authorities/Corporations. Power Authority/Corporations of the constituent States are not giving any priority to NCR in the matter of supply of electricity. There is no separate power station or Sub-grid primarily for NCR in the Northern Grid system and there is huge demand-supply gap which needs to be narrowed down to attain the requisite level of regional economic development.

7.2.3 Lack of Inter-Agency Coordination

Basic management and control of the power supply system in the constituent States was through their respective Electricity Boards, which is now being done by different companies/corporations in different areas due to unbundling of the Electricity Boards. These agencies will have to coordinate with NTPC, NHPC, CEA, NREB etc. Earlier, even the Electricity Boards were having poor coordination, and now with more of these agencies created by their disintegration, the problems are likely to multiply.

7.2.4 Transmission and Distribution Losses

The transmission and distribution losses in all the Sub-regions are enormous and are mainly due to following reasons:

- Fraudulent extraction of energy from metered supply by the customers including industrial and commercial establishments.
- Drawing electricity without legal connection in the electrified colonies.
- Illegal direct tapping from the mains by the residents of JJ clusters and unauthorized colonies.
- Misuse and thefts by industries and commercial establishments in non-conforming areas and un-metered supply.
- Drawing load in excess of the sanctioned limit or tampering with meters.
- Technical losses, due to inadequate distribution systems.

7.2.5 Lack of Load Management

No efforts are being made by the Distributing Agencies to reduce the peak demand to manageable limits vis-à-vis availability of power in the Grid, by adopting modern techniques, which can flatten the load curve.

7.2.6 NCR as Sub-Grid of Northern Grid

Emphasis has to be given to have a Sub-grid for NCR in the Northern Grid, for better management of the load in the region. This, along with the provision for Supervisory Control and Data Acquisition System (SCADA), was proposed in the Functional Plan on Power as well as during the review as this could have resulted in better management of power supply in the region.

7.2.7 Other Issues

Other issues that are hampering effective management of generation, transmission and distribution of the power supply in the region include:

- Lack of commercial approach by the electricity departments.
- Environmental pollution caused due to disposal of slurry/fly-ash on riverbank and other disposal sites, air/noise pollution in and around thermal power plants.
- Lack of safety measures being adopted by electricity departments.
- Lack of enthusiasm towards the promotion of non-conventional energy sources in the region.

7.3 POLICIES AND PROPOSALS

In order to improve the overall power situation in the National Capital Region for the perspective year 2021 for the harmonized and balanced development of the region, following strategies and policies have been proposed:

7.3.1 Future Demand and Augmentation of Power

CEA has projected the total power requirement for the region to be 34,444 MW by the year 2020-2021 (refer Table 7.3).

Table 7.3: Additional Generating Capacity Required (in MW)

Sub-region/ Region	IC at the beginning of Plan	Capacity Addition including CS Share of Plan	Total IC at the end of the Plan (2+3)	IC Required	Additional Capacity Required (5-4)
1	2	3	4	5	6
NCT-Delhi					
2002-2007	3,098	1,614	4,712	6,157	1,445
2007-2012	4,712	1,902	6,614	8,337	1,723
2012-2017	6,614	Not available	6,614	11,236	4,622
2017-2021	6,614	Not available	6,614	14,211	7,597
Haryana					
2002-2007	1,815	819	2,634	2,563	(-) 71
2007-2012	2,634	700	3,334	3,899	565
2012-2017	3,334	Not available	3,334	5,903	2,569
2017-2021	3,334	Not available	3,334	8,196	4,862
Rajasthan					
2002-2007	42	44	86	667	581
2007-2012	86	51	137	969	832
2012-2017	137	Not available	137	1,384	1,247
2017-2021	137	Not available	137	1,827	1,690
Uttar Pradesh					
2002-2007	459	287	746	3,303	2,557
2007-2012	746	269	1,015	4,956	3,941
2012-2017	1,015	Not available	1,015	7,418	6,403
2017-2021	1,015	Not available	1,015	10,210	9,195
Total NCR					
2002-2007	5,414	2,764	8,177	12,690	4,513
2007-2012	8,177	2,922	11,099	18,161	7,062
2012-2017	11,099	Not available	11,099	25,941	14,842
2017-2021	11,099	Not available	11,099	34,444	23,345

Note: IC: Installed Capacity CS: Central Sector IC required= peak load requirement/0.7
Source: Central Electricity Authority, Government of India

Table 7.3 shows that the Sub-region wise power requirement by the year 2021 would be 8,196 MW for Haryana, 1,827 MW for Rajasthan, 10,210 MW for Uttar Pradesh and 14,211 MW for NCT-Delhi.

Further, CEA has projected 23,344 MW requirement of additional installed capacity by the year 2021 in the region. Sub-region wise projections include 4,862 MW for Haryana, 1,690 MW for Rajasthan, 9,195 MW for Uttar Pradesh and 7,597 MW for NCT-Delhi.

The projections given below have been worked out by CEA considering the actual power available at present and the power plants that are likely to be commissioned in NCR during 10th and 11th Plan periods.

In order to meet this additional demand, there is a need to have new power plants in the region and/or to have share for NCR in allocation of power expected to be generated by the newly proposed power plants under the Central sector power projects including mega-projects. Central Government/State Governments should take initiative to improve the power situation in their respective Sub-regions by establishing new power plants under the public and private sectors and for getting additional power allocation from the 15% unallocated quota of Central sector projects. Central sector power plants/mega-projects are listed in Tables 7.4 and 7.5, from where the share allocation for NCR can be made by Ministry of Power and Central Electricity Authority.

Power plants, proposed by the State Governments to improve the power generation in their respective Sub-regions, are listed in Table 7.6.

It can be seen from Table 7.6 that Haryana has planned for 1,500 MW, however, as per the Tenth Plan Document of Ministry of Power, only TDL Thermal Power Plant, Panipat, Bawana and Apollo (with a capacity of 500 MW) is targeted for completion in the Tenth Plan. Similarly for Delhi 1,200 MW has been planned but only 225.78 MW has been commissioned so far during the Tenth Plan. All other plants are still at a very nascent stage of planning.

Table 7.4: List of Power Projects during 10th Plan in the Northern Region

Plant Name	Status	Fuel Type	Sector	Capacity (MW)	
1	2	3	4	5	
Central Sector					
NHPC	Chamera II	SOG	Hydro	C	300
	Dulhasti	SOG	Hydro	C	390
	Dhaulti Ganga	SOG	Hydro	C	280
	Sewa II	CEA	Hydro	C	120
	Sub-Total (NHPC)				1,090
NJPC	Nathpa Jhakri	SOG	Hydro	C	1,500
	Rampur	NEW	Hydro	C	400
	Sub-total (NJPC)				1,900
NTPC	Rihand II	SOG	Coal	C	1,000
	Unchahar III	New	Coal	C	210
	Dadri II	New	Coal	C	490
	Sub-Total (NTPC)				1,700
THDC	Tehri I	SOG	Hydro	C	1,000
	Koteshwar	SOG	Hydro	C	400
	Tehri PSS	New	PSTOR	C	1,000
	Sub-Total (THDC)				2,400
NLC	Barsingsar	New	Lignite	C	500
Total					7,590

Source: Central Electricity Authority, Government of India

Table 7.5: List of Mega-Projects proposed to be commissioned during 10th Plan and beyond

Name of Project	I/C (MW)	Benefits (MW)	
		10th Plan	Beyond 10th Plan
1	2	3	4
Kahaigaon-II	1,320	660	660
N.Karanpura	1,980	660	1,320
Barh	1,980	660	1,320
Maithon RBC	1,000	1,000	-
Teesta V	510	510	-
Sipat-I	1,980	1,980	-
Sipat-II	660	660	-
Pipavav	2,000	-	2,000
Hirma	4,320	-	4,320
Cuddalore	1,320	-	1,320
Koel Karo	710	-	710
Koldam	800	-	800
Parvati II	800	-	800
Cheyyur	1,320	-	1,320
Krishnapatnam	1,320	-	1,320
Narmada	1,000	-	1,000
Anta II&III	1,300	-	1,300
Auriya II&III	1,300	-	1,300
Kawas II&III	1,300	-	1,300
Gandhar II&III	1,300	-	1,300

Source: CEA

Table 7.6: Power Plants under the State Sector

Sub-region wise Power Plant	Capacity (MW)	Remarks
1	2	3
Haryana		
TDL Thermal Power Plant, Panipat	2x250	Unit 7 and 8 (Targeted in 10 th Plan)
Thermal Power Plant, Palwal	2x250	546 acres of land selected near village Chandhut and cleared by CEA
Thermal Power Plant, Rohtak	2x250	Site identified
Uttar Pradesh		
Captive Power Plant, Tronica City	11.45	Site identified. Project approved in March 2002 by PSMG-I, NCRPB
NCT-Delhi		
Pragati Power Plant	300	225.78 MW commissioned up to June 2003
Indraprastha Replacement Project	300	
Bawana Phase I and II	600	
Apollo Inter Generation	300	

Source: Study Group Report on Utility service infrastructure including power, water, sewerage, solid waste, drainage, irrigation etc.

There is need to plan for generating/obtaining additional power of 23,345 MW required for the region by the year 2021 and recommendations for the same are as follows:

- Allocation of power from the new Central sector/mega-projects should be made by the Ministry of Power.
- Ministry of Power should consider allocation of power from the 15% unallocated quota from the central sector projects.
- State Governments should allocate power to their Sub-region from their new state sector projects
- State Governments should ensure the allocated quota to their respective Sub-regions from the present allocation/generation of power.
- State Governments should enter Memorandum of Understanding (MOU) with the power generation companies in order to ensure requisite allocation of power to the Sub-region simultaneously and expeditiously.

- A dedicated power generation plant for the region should be provided in a phased manner in order to meet the gap if any, after obtaining power from the sources referred above.
- Efficient and clean technology based power plants should be encouraged/adopted to meet the growing power demand in order to reduce the levels of the greenhouse gases (GHG) levels.

7.3.2 Load Management

Modern techniques for Load Management must be adopted to flatten the load curve and reduce the peak demand in the system to a manageable proportion, vis-à-vis the availability in the grid, through a control room by starting ripple generators, so that breakdown of generation is minimized. This will save investment on additional generation of power for peak demand. Similarly, street lighting on national highways/state highways within NCR can have centrally controlled system through operation of ripple generator. Energy efficient housing should be promoted and the concept of 66 KV underground cable ring main system should be planned and executed in new townships to provide uninterrupted power supply.

It is also proposed that an Islanding Scheme for NCR as second level of Island after NDMC/Delhi will be prepared by CEA and the State power utilities concerned after revisiting the scheme which will be implemented by the concerned power utility companies for better load management.

7.3.3 Improvement in Transmission and Distribution

Transmission and distribution system in the region should be improved keeping in view the increased demand of power by properly designing the L.T. distribution system viz., service line and service mains by providing transformers with adequate capacities, electronic meters, LT/HT breakers conforming to IE rules & specifications and by promoting communications (automation) in power supply system.

State Governments will also carry out periodic audit for identification of technical and commercial losses which will help in improving the transmission and distribution system on a regular basis.

7.3.4 Sub-group within Northern Region Electricity Board

Sub-group within Northern Region Electricity Board should be created for NCR by the Ministry of Power to oversee the power supply and periodically discuss the power issues in NCR and make recommendations regarding quality and reliability of power supply in the region.

7.3.5 Sectoral Plans for Power

Concerned State Governments will prepare Sectoral Plans for power and incorporate/integrate them in their respective Sub-regional Plans in order to improve the quality of power supply.

7.3.6 Promotion for Non-Conventional Energy Resources

Emphasis should be given for promoting non-conventional energy resources such as solar energy plants on roof top etc. in big hotels, institutions, commercial buildings, group housing etc., to meet a part of the power demand.

7.3.7 Public-Private Partnership

Keeping in view the huge investment required, which amounts to approximately Rs. 93,380 crores for the power generation and Rs. 58,000 crores for transmission and distribution till 2021, there is need to promote public-private partnership. Commercial approach and simplified procedures for the release of new connections, upgradation of demand load etc. should be adopted by these companies.

7.3.8 Review of Policies and Strategies for Power

In view of the reforms at the national level and technological advancements that are taking place, the review of the Power Sector strategies and policies for NCR should be done at least every five years.

7.4 PLAN OF ACTION AND PHASING OF IMPLEMENTATION OF STRATEGIES/POLICIES/PROPOSALS

In order to implement the policies on Power in the region, it is imperative to have a detailed 'Plan of Action' along with phasing, so that the implementation of policies and proposals in the Regional Plan can be dovetailed with the five-year plans. Keeping this in view, each recommendation has been phased on the basis of five-year plan, where certain activities are to be completed within first five-year plan while other activities may span from second to fourth five- year Plans. Activities which need to be completed in the first five-year are: (a) formation of Sub-group within Northern Region Electricity Board by the Ministry of Power to oversee the power supply and periodically discuss the power issues in NCR and make recommendations regarding quality and reliability of power supply in the region, (b) concerned State Governments to prepare Sectoral Plans for power and incorporate/integrate the same in their respective Sub-regions and (c) to carry out audit for identification of technical and commercial losses to help in improving the transmission and distribution system, etc. Whereas the recommendations on load management, augmentation of power, promotion for non-conventional energy etc., involving long-term planning, will spread in all the plans, improvement in transmission and distribution has been recommended to be completed by the end of the 11th Plan for better management.

Phased programme and plan of action have been worked out to give effect to the proposal and implementation thereof, which is at Annexure 7/I.

7.5 INVESTMENT PLAN

Power requirement in the region would be 23,345 MW by the year 2021 and accordingly there will be need to generate this additional power and strengthen/expand the transmission and distribution lines. Total investment required for the generation of power by the year 2021 will be Rs.93,380 crores and for strengthening/expansion of transmission and distribution system, it will be Rs.58,362 crores. However, block year-wise fund requirement for the region has been given in the following table:

Table 7.7: Phase wise Fund Requirement for the Region (Rs. in Crores)

Plan Period	Additional capacity required in MW	Cost of power generation (@ Rs. 4 crores/MW)	Cost of transmission/ distribution (@ Rs. 2.5 crores/MW)	Total cost
1	2	3	4	5
2002-2007	4,513	18,052.00	11,282.50	29,335.00
2007-2012	2,549	10,196.00	6,372.50	16,569.00
2012-2017	7,780	31,120.00	19,450.00	50,570.00
2017-2021	8,503	34,012.00	21,257.00	55,269.00
Total	23,345	93,380.00	58,362.00	1,51,742.00

It is not necessary that the investment of Rs.93,380 crores in the power generation sector should be done by the State Governments. They can have MOU with the power generating companies to purchase the required power.