

## CHAPTER 8

### INFRASTRUCTURE DEVELOPMENT

#### 8.1 ENERGY

##### 8.1.1 POWER

The Ninth Plan envisages a power generation target of 606.70 BKwh (Billion Kilowatt-hours) in utilities by the end of terminal year 2001-02, as against the energy generation of 394.5 BU at the end of Eighth plan.

2. A capacity addition of 40245 MW is envisaged during the Ninth Plan period comprising 11909 MW in the Central Sector, 10748 MW in the State Sector and the balance 17588 MW in the Private Sector. The proposed capacity addition from the Private Sector constitutes about 43.7 per cent of the total capacity addition during the Ninth Plan.

3. At the beginning of Ninth Plan (1997-2002), the energy deficit was 11.5 per cent and peak deficit was 18 per cent. With the targeted capacity addition of 40245 MW during the Ninth Plan period, the power supply position at the end of Ninth Plan, as assessed by CEA, indicates energy deficit of 1.4 per cent and peak deficit of 11.6 per cent. However, with the capacity addition of 11976 MW during first three years i.e. 1997-2000, the energy deficit was restricted to 6.2 per cent and peak deficit to 12.4 per cent. The improvement in the power supply position was partly due to the marked improvement in PLF, which was 55.3 per cent at the beginning of Eighth Plan in 1991-92 and increased to 67.3 per cent at the end of 1999-2000.

#### Review For 1999-2000

##### *Generation Of Electricity (Utilities)*

4. Against a target of 469 BKwh, actual generation during the year was 480.011 BKwh, representing a marginal improvement of 2.3 per cent. In the case of the hydel generation the achievement was 99.4 per cent. However, the nuclear and thermal generation exceeded the target by 20.5 per cent and 2.4 per cent respectively. The total generation during 1999-2000 was higher than that in 1998-99 by 7.1 per cent.

5. In addition to the above, about 1.33 Bkwh of electricity also became available from Chukha Hydel project in Bhutan.

6. The source-wise generation targets and achievements for 1999-2000 with actuals for 1998-99 and projections for 2000-2001 in respect of utilities are given in Table 8.1.1.

**TABLE 8.1.1**  
**Source-Wise Electricity Generation**

(Million Units)

	1998-99	1999-2000		2000-2001
	Actual	Target	Actual	Target
Hydro	82690	81000	80533	83407
Thermal	353662	377000	386226	402000
Nuclear	12015	11000	13252	13593
<b>Total</b>	<b>448367</b>	<b>469000</b>	<b>480011</b>	<b>499000</b>

7. The region-wise break-up of actual generation in 1999-2000 is given in Annexure 8.1.1.

8. During 1999-2000, the target for All India Plant Load Factor (PLF) was 63.8 per cent for thermal stations. The actual PLF achieved was 67.3 per cent. Table 8.1.2 gives the sectorwise break-up of PLFs for the year 1998-99 (Actual), 1999-2000 (Target) & (Actual) and 2000-2001 (Target). The target and achievement in regard to PLF for all State Electricity Boards, Central Power Organisations and Private Sector are indicated in Annexure 8.1.2.

**TABLE 8.1.2**  
**Sector-Wise Plant Load Factor (Per Cent)**

	1998-99	1999-2000		2000-2001
	Actual	Target	Achievement	Target
Central Sector	71.1	66.1	73.6	68.4
State Sector	60.7	62.7	63.7	65.8
Private Sector	68.3	62.2	68.9	67.0
All India	64.6	63.8	67.3	66.7

#### *Addition In Capacity*

9. The target for addition to generating capacity during 1999-2000 was 4685 MW against which the achievement was 4507.5 MW (96.2 per cent) as given in the Table 8.1.3. This includes a capacity of 623 MW which was advanced from 2000-01 and not included in the original programme.

**TABLE 8.1.3**  
**Addition In Capacity (MW)**

	1998-99	1999-2000		2000-2001
	Actual	Target	Achievement	Target
Hydel	542.50	1563.00	1371.50	1297.00
Thermal	3699.50	2682.00	2696.00	2263.30
Nuclear	--	440.00	440.00	440.00
<b>Total</b>	<b>4242.00</b>	<b>4685.00</b>	<b>4507.50</b>	<b>4000.30</b>

10. The project-wise details of achievements are given in Annexure 8.1.3. There were 19 number of generating units totalling 800.5 MW which has slipped from 1999-2000 generating capacity addition programme. This comprised 516.5 MW of hydro (11 generating units) and 284 MW of thermal (8 generating units). The complete list is at Annexure 8.1.4. The slippages were mainly due to delays in equipment supplies and delays in construction work.

*Transmission & Distribution*

11. The programme and achievement in respect of construction/energisation of HVDC/800 KV/400 KV/220 KV transmission lines is given in Table 8.1.4.

**TABLE 8.1.4**  
**Transmission Lines Additions**

	1998-99	1999-2000		2000-2001
	Actual	Target	Achievement	Target
HVDC	1132			
800 KV	318	416	416	335
400 KV	3262	3128	3336	1635
220 KV	3330	3553	3932	5466

(Ckt. kms)

*Renovation & Modernisation (R&M)*

12. In order to improve the performance of existing thermal power plants, the R&M (Phase I) Programme was started in 1984 for completion during the Seventh Plan period. The programme was anticipated to give an additional generation of 7000 MU per annum by improving the over all PLF of units. All the schemes under Phase-I have been completed. On an average, additional generation of about 10,000 MU per annum has been achieved which is equivalent to 1900 MW of additional capacity at 60 per cent PLF.

13. With the main objective to achieve optimum performance results from the old thermal units, the Phase-II of the R&M programme has been started in the year 1990-91. The total sanctioned cost of the R&M programme (Phase-II) covering 44 old thermal power stations comprising 198 generating units aggregating to 20869 MW is Rs.2383.00 crore. The implementation of scheme under Phase-II is in progress. The total expenditure incurred upto November 1999 is Rs.1147 crore. This includes Rs.207.67 crore through PFC loan, Rs.222.33 crore through World Bank/OECF loan and remaining Rs.717 crore under State Plan Own Resources. Out of a total 1629 activities, 914 (56.1 per cent) have been completed. The balance activities are proposed to be completed during the Ninth plan period. On completion of the Phase II programme, it is expected to get additional generation of 7864 MU/year which is equivalent to 1600 MW new capacity addition. In addition, it is expected to get life extension for another 24 nos. (1402 MW) by 15-20 years.

14. The CEA has also identified 55 hydro power stations with an aggregate capacity of 9653 MW (210 nos. generating units) for coverage under renovation, modernisation and uprating (RM&U) of Hydro Power Stations. The total estimated cost of the programme is Rs.1493 crore and expected benefit is 2531 MW/7181 MU. Out of 55 schemes, work on 24

schemes having an aggregate capacity of 5230 MW at an estimated cost of Rs.437 crore and an expected benefit of 1033 MW/1899 MU have been completed till 31.3.1999. There are 23 ongoing schemes with aggregate installed capacity of 3335 MW where RM&U works at an estimated cost of Rs.796 crore with an expected benefit of 951 MW/2694 MU are under different stages of implementation. It is expected that out of these 23 schemes, 11 schemes would be completed during the Ninth Plan.

### *Financial Performance Of SEBs*

15. The internal resources of the SEBs continued to be negative. As per the latest information available based on the resources discussion for the Annual Plan 2000-2001, the net internal resources of the SEBs which were Rs.(-)161.5 crore in 1992-93 increased to Rs.(-)7056.90 crore in 1998-99 (RE). In the year 1999-2000, it was expected to be Rs.(-)6479.70 crore. The commercial losses of the SEBs without subsidy increased from Rs.8474 crore during 1996-97 to Rs.(-)20706.6 crore at the end of the Annual Plan 1999-2000 (RE). The Rate of Return (ROR) on the net fixed assets of the SEBs was at the level of (-) 17.15 per cent in 1996-97. It was expected to be (-) 31.0 per cent in 1999-2000 (RE).

16. In case the SEBs are to achieve break-even rate of return, i.e. 0 per cent ROR in 1999-2000, they would have to raise average tariff on an All-India basis by 66.1 paise/unit over the current average tariff. This would yield additional revenue of as much as Rs.13816.6 crore. For achieving 3 per cent ROR, the average tariff on All-India basis has to be increased by 72.8 paise/unit and it would yield additional revenue of Rs.22709.9 crore. If the minimum rate of 50 paise/unit of agriculture tariff is levied by the SEBs, they could mobilise additional revenue of the order of Rs.2912.7 crore in 1999-2000.

### **Annual Plan 2000-2001**

#### *Generation Of Electricity (Utilities)*

17. The total electricity generation in utilities in 1999-2000 is estimated at 499 BKwh (Table 8.1.1). Region-wise details are given in Annexure 8.1.1.

18. The total generation envisaged for 2000-2001 is 6.4 per cent higher than the target for the preceding year. The overall Plant Load Factor envisaged is 66.7 per cent. Additional Energy of about 1.33 BKwh is also expected to become available from the Chukha hydel project in Bhutan.

#### *Addition In Capacity*

19. The target for addition to installed capacity during 2000-2001 is 4000.3 MW (Table 8.1.3). This includes the projects aggregating to 800.5 MW capacity slipped over from 1999-2000.

20. Of the total additional generating capacity targeted for 2000-2001, a capacity of 659 MW in the Central Sector, 2415 MW in the State Sector and 926.3 MW in the Private Sector is expected to be commissioned. The scheme-wise details of additions to installed capacity during 2000-2001 are indicated in Annexure 8.1.5.

*Plan Outlay*

21. The total expenditure in the power sector (including Rural Electrification) during 1999-2000 is estimated around Rs.21845.96 crore against the Approved outlay of Rs.26825 crore, as shown in Table 8.1.5.

**TABLE 8.1.5**  
**Annual Plan Outlays**

(Rs. crore)

	1998-99	1999-2000		2000-2001
	Revised Estimates	Approved Outlay	Revised Estimates	Approved Outlay
States & UTs @	13243.61	15594.09	12479.18	**
Central Sector @	*8157.08	11230.91	9366.78	11610.83
Total	21400.69	26825.00	21845.96	

@ The details are given in Annexure 8.1.6.

\* Actual

\*\* Yet to be finalised.

22. The utilisation of other provisions excluding Rural Electrification (RE) component, available for development programme in the power sector, is given in Table 8.1.6.

**TABLE 8.1.6**  
**Utilisation Of Other Provisions**

(Rs. crore)

	1998-99	1999-2000		2000-2001
	Revised Estimates	Approved Outlay	Revised Estimates	Approved Outlay
Power component of Special Area Programme of North Eastern Council (NEC)	N.A.	198.01	214.50	208.52*

\* Tentative

*Captive Power*

23. The addition to installed capacity in respect of Non-Utilities during 1997-98 was about 1087.6 MW. With this addition, the total installed capacity of such plants is estimated to have gone upto 13166 MW (including Railways) by the end of 1997-98. The generation from Non-Utilities in 1997-98 was placed at 44 BU (approx.).

*Externally Aided Power Projects*

24. The total amount of assistance during the Eighth Plan for power projects through bilateral and multilateral arrangements was Rs.16702.72 crore against which the actual utilisation has been only Rs.15493.52 crore i.e.92.8 per cent only. The year-wise allocation

and actual utilisation during the Eighth Plan, Annual Plans 1997-98, 1998-99 and 1999-2000 are indicated in Table 8.1.7.

**TABLE 8.1.7**  
**Year-Wise Allocation And Actual Utilisation During The Eighth Plan And Annual Plans 1997-98, 1998-99 & 1999-2000**

Year	Allocation	Utilisation	(Rs. crore) (per cent) utilisation
1992-93	2671.69	2530.72	94.72
1993-94	2532.47	2842.80	112.25
1994-95	3602.53	3338.82	92.67
1995-96	3078.18	2595.84	84.33
1996-97	4817.85	4185.34	86.00
Total (Ninth Plan)	16702.72	15493.52	92.76
<b>1997-98</b>			
Central Sector	2704.00	2309.14	85.40
State Sector	1363.58	1559.07	114.34
Total	4067.58	3868.21	95.10
<b>1998-99</b>			
Central Sector	2538.00	2179.64	85.88
State Sector	1859.06	1832.45	98.57
Total	4397.06	4012.09	91.24
<b>1999-2000</b>			
Central Sector	1724.69	1491.92	86.50
State Sector	1948.82	1751.05	89.85
Total	3673.51	3242.94	88.28

Some of the factors contributing to non-utilisation of external aid in the case of power projects are deficiency in project management and delays in construction work.

#### *Private Participation In Power Sector*

25. The policy for private Sector participation in Power was announced in October 1991 in order to bring in additionality of resources for the capacity addition programme. A number of incentives have been provided for private investment in Power Sector. The Indian Electricity Act, 1910 and the Electricity (Supply) Act, 1948 have been amended to bring about a new legal and financial environment for private enterprises in the electricity sector.

26. During Eighth Plan, 1430 MW has been added in the private sector by the existing licensees and new generating companies against the target of 2810 MW. With the capacity addition of 1217.5 MW in 1997-98, 1575 MW in 1998-99 and 563 MW in 1999-2000, the total capacity addition in private sector as on 31<sup>st</sup> March, 2000 works out to 4785.5 MW.

## **NEW AND RENEWABLE SOURCES OF ENERGY**

### **An Overview**

27. The Ministry of Non-Conventional Energy Sources (MNES) is promoting and developing various renewable energy technologies which include improved chulhas, biogas

plants, short rotation fuelwood tree species, biomass gasifiers, solar thermal and solar photovoltaic systems, wind farms, wind mills, biomass based cogeneration, small and micro hydel systems, energy recovery from urban, municipal and industrial wastes, hydrogen energy, ocean energy, fuel-cell, electravans and gasohol. In each of these areas, there are programmes of resource assessment, R&D, technology development and demonstration. A four-fold strategy is being pursued by the MNES to achieve its objectives which include providing budgetary support for the promotion of New and Renewable Sources of Energy (NRSE), promoting private investment in non-conventional energy through fiscal and financial incentives, mobilizing internal resources through IREDA and other institutions for promotion of NRSE, involving private industries and mobilizing resources from external agencies such as World Bank, ADB etc.

### **Review Of Annual Plan 1999-2000**

28. Under the National Project of Biogas Development (NPBD) a target to install 1.68 lakh family size biogas plants was set for 1999-2000 with a budget estimate of Rs.60.00 crore. Upto March, 2000, 1.65 lakh plants had already been installed and target is expected to be achieved. An amount of Rs.60.01 crore has been incurred as expenditure. During 1999-2000 against the target of 24 lakh improved chulhas, 18.00 lakh chulhas have been installed upto the end of February 2000 and the balance target is expected to be achieved during the year. An amount of Rs.19.60 crore has been incurred as expenditure under this programme during this year. Under Biomass Gasifier Programme 3.9 MW capacity has been installed during the year. Under the Solar Photovoltaic Lighting Programme 25341 home lights, 56,721 SPV lanterns and 3593 street lighting systems have been installed during 1999-2000. 22,692 sq.m. collector areas of solar water heating systems have been installed during the year. Under power generation programme, 125 MW of wind power, 33.52 MW of small hydro power and 51 MW of biomass power have been installed during the year. The achievements in the other programmes of MNES are also satisfactory. The physical and financial progress of the programmes were regularly reviewed in the quarterly review meetings held in the Ministry with the participation of Planning Commission, Ministry of Programme Implementation and other concerned Ministries. An expenditure of Rs.317.49 crore has been incurred against the revised Gross Budgetary Support of Rs.319.47 crore during 1999-2000, which constitute around 99 per cent of the revised estimate figures. The physical and financial progress during the year were consistent and also more than the achievements of the previous years.

### **Annual Plan 2000-2001**

29. The total outlay of MNES for 2000-2001 is approved for an amount of Rs.945.24 crore (Rs.440 crore of Gross Budgetary Support and Rs.505.24 crore of IEBR). The financial provision indicated above will cover the programmes of Rural Energy, Solar Energy, Power Generation from renewable sources of energy, energy from urban and industrial wastes and the equity support to IREDA, financial agency under MNES. Out of this, Rs.44.00 crore has been earmarked for the programmes to be implemented in north eastern region. It has been proposed to install 1.8 lakh family size biogas plants, 25 lakh improved chulhas, 70,000 solar lanterns, 50,000 home lighting systems, 3,000 street lighting systems, 700 SPV pumps, 200 MW of wind power, 60 MW of biomass power, 7 MW equivalent biomass gasifier systems, 40 MW small hydro power and 10 MW equivalent capacity of energy from urban and

industrial wastes. Approximate Renewable Energy Potential & Achievements are indicated in Table 8.1.8.

**TABLE 8.1.8**  
**Renewable Energy Potential & Achievements**

Source/System	Approximate Potential	Achievements (Upto 31.3.2000)
Biogas Plant (No.)	12 million	2.98 million
Improved Chulha (No.)	120 million	32.00 million
Biomass	17,000 MW	35.00 MW
Solar Photovoltaic	20 MW/sq.m.	50 MW
Solar Thermal Systems Solar Water Heating	30 million sq.m. collector area	0.47 million sq.m.
Wind power	20,000 MW	1167.00 MW
Small Hydro Power	10,000 MW	216.97 MW
Urban and Municipal Wastes	1700 MW	15.74 MW