Annual Report on the Working of

State Electricity Boards

&

Electricity Department

(Power & Energy Division)
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Contents

Foreward 1

Acronyms 2

Definitions..... 4

List of Annexure..... 5

Chap-1 An Overview 9

Chap-2 Power Sector Outlay and General Issues..... 15

Chap-3 Physical Performance..... 21

Chap-4 Financial Performance..... 30

Chap-5 Reforms & Restructuring of SEB 41

Foreword

This report, brought out every year by Power and Energy Division of the Planning Commission, is the Twelfth in the series that updates and analyses the data on the working of the State Electricity Boards in the country. Most of the data contained in this document have been obtained from the State Electricity Boards(SEBs) and Electricity Departments (EDs) of the States/UTs, in connection with the discussions held to estimate the financial resources for the Annual Plan 1999-2000. A brief analysis covers the performance of the power utilities during the 8th Plan period and thereafter. Information for the earlier years is also provided in respect of some important parameters.

Chapter 1 of the report presents an Overview of the Indian Electricity Sector indicating the major issues concerning power sector for the country as a whole. Chapter 2 focuses on the plan outlays and expenditure on power sector by the States/UTs. It also briefly gives the power balances from 1980-81 to 1996-97 and the relationship between electricity and GDP through elasticity. In Chapter 3, physical performance of the SEBs and EDs is reviewed. It covers details regarding installed capacity and its mix, generation, capacity utilisation, viz. plant load factor, forced outages, auxiliary consumption and other indicators like power purchased from other agencies, T&D losses, sales to consumers etc. Chapter 4 gives an account of financial parameters such as cost of supply and its components, average tariff realised, average and consumer category-wise tariff realised and other indicators such as commercial profits and losses, rate of return on capital employed, subsidies and cross-subsidisation, net internal resources arrears, outstanding dues etc. for the SEBs and EDs. Chapter 5 has been introduced for the first time in the Report and gives details about the status of reforms in various States. Relevant annexures have been given at the end of each chapter.

It may be noted that the information provided in the report is not always based on audited reports of the SEBs as the accounts of many SEBs are audited with a considerable time lag. In view of this, the information based on the un-audited accounts for certain years may undergo some modifications as and when the financial statements of the SEBs are audited and updated.

It has been the continuous endeavour of the Power and Energy Division to make this report more useful as a source of reference. Any suggestions for improvement in the content and presentation of this report are therefore welcome.

The report has been revised and updated by Shri I.A. Khan, Deputy Adviser (Power) and with the help of other officers of the Division under the guidance of Shri L.P. Sonkar, Joint Adviser (Power). Shri R.K. Kaul helped in updating the write-up, particularly Chapter 5. S/Shri Surender Singh, Amar Singh and Smt.H. Phulwaria updated most of the statistical tables. Shri B. Srinivasan also provided valuable assistance. I am thankful to all of them. I would like to acknowledge the help and support provided by Ministry of Power, Central Electricity Authority and State Power Utilities and thank them for their help and cooperation.

(**M.L. Majumdar**)
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ACRONYMS

AECO	Ahmedabad Electric Company Limited
APGPC	Andhra Pradesh GAs Power Corporation
BBMB	Bhakra Beas Management Board
BKWH	Billion Kilowatt Hours = Terawatt Hours
BTPS	Badarpur Thermal Power Station
CESC	Calcutta Electric Supply Corporaton Ltd.
CEA	Central Electricity Authority
DAE	Department of Atomic Energy
DPL	Durgapur Projects Limited
DVB	Delhi Vidyut Board
DVC	Damodar valley Corporation
ED	Electricity Departments
GIPCL	Gujarat Industrial Power Corporation Ltd.
KPC	Karnataka Power Corporation
KW	Kilowatt=1000 watt
MKWH	Million Kilowatt Hour= Gigawatt Hours
MW	Megawatt=1000 KW
NEEPCO	North Eastern Electric Power Corporation
NHPC	National Hydro Electric Power Corporation
NLC	Neyveli Lignite Corporation
NTPC	National Thermal Power Corporation

PLF	Plant Load Factor
PSUs	Public Sector Undertakings
RE	Revised Estimate/Rural Electrification
R & M	Renovation & Modernisation
ROR	Rate of Return
SEB	State Electricity Board
SED	State Electricity Duty
STPS	Super Thermal Power Station
T & D	Transmission and Distribution
TECO	Tata Electric Company
UT	Union Territories
WBPDC	West Bengal Power Development Corporation

DEFINITIONS

CAPACITY : Station Capacity as indicated by Central Electricity Authority.

GROSS OPERATING SURPLUS/DEFICIT : Operating surplus or deficit (Gross) before providing for depreciation and interest to the institutions and to the State Government i.e. Revenue Receipts less Operating expenses.

RETAINED REVENUE SURPLUS/DEFICIT : Gross operating surplus minus depreciation minus interest to institutional creditors. If there is still surplus, then interest to State Government will be deducted to the extent of surplus available. If there is a deficit, then no interest to State Government is deducted.

INTERNAL RESOURCES : Retailed revenue surplus or deficit plus depreciation and miscellaneous capital receipts minus repayment of loans.

OPERATING RATIO : Working expenses (including depreciation) as a proportion to revenue from sale of electricity.

COMMERCIAL PROFIT/LOSS : Net surplus/deficit i.e. gross operating surplus or deficit less depreciation, interest due to institutional creditors and to the State Governments, i.e. total revenue minus total cost.

ARM : Additional resources mobilised through tariff revision and in some cases revenue from fuel surcharge is also shown as ARM.

CAPITAL BASE : Orignal costs of fixed assets in service reduced by cumulative depreciation and consumer's contribution for service lines at the beginning of the year*. It is also known as net fixed assets at the beginning of the year.*

AVERAGE TARIFF : Average rate of realisation of revenue from sale of energy *i.e*. revenue from sale divided by units sold.

REVENUE RECEIPTS : Revenue from sale of energy plus miscellaneous revenue receipts, like subsidy/subvention and other receipts.

AVERAGE COST : Total cost **i.e.** revenue expenditure plus depreciation and interest due , divided by total electricity sold.

EFFECTIVE SUBSIDY : The amount actually lost by the SEBs on account of sale of electricity at less than average cost to a sector *i.e* average cost minus average tariff times the number of units sold to a given sector.

RATE OF RETURN : Ratio of commercial profits/losses to net fixed assets, expressed as percentage.

List of Annexures

CHAPTER - 2

Annexure 2.1 Planwise Outlays and Expenditures for Power Sector

Annexure 2.2 Power Sector Outlay and Expenditure(7th Plan 1985-90)

Annexure 2.3 Power Sector Outlay and Total Outlay(8th Plan 1992-97)

Annexure 2.3a Power Sector Outlay for 9th Plan & Annual Plans 1997-98,1998-99 & 1999-2000

Annexure 2.4 Share of Power Sector in Total Outlay 8th Plan & Annual Plans 1997-98, 1998-99 and 1999-2000

Annexure 2.5 Outlay on Renovation and Modernisation of Power Sector

Annexure 2.6 Outlay on Transmission and Distribution

Annexure 2.7 Distribution of Power Sector Outlay (1992-93)

Annexure 2.8 Distribution of Power Sector Outlay (1993-94)

Annexure 2.9 Distribution of Power Sector Outlay (1994-95)

Annexure 2.10 Distribution of Power Sector Outlay (1995-96)

Annexure 2.11 Distribution of Power Sector Outlay (1997-98)

Annexure 2.12 Distribution of Power Sector Outlay (1998-99)

CHAPTER - 3

Annexure 3.1 Installed Capacity As on 31-3-1995 Annexure 3.1 (Contd.)

Annexure 3.2 Installed Capacity As on 31-3-1996 Annexure 3.2 (Contd.)

Annexure 3.3 Installed Capacity As on 31-3-1997 Annexure 3.3 (Contd.)

Annexure 3.4 Installed Capacity As on 31-3-1998 Annexure 3.4 (Contd.)

Annexure 3.5 Installed Capacity As on 31-3-1999 Annexure 3.5 (Contd.)

Annexure 3.6 Additions to Installed Capacity Annexure 3.6 (Contd.)

Annexure 3.7 Plant Availability (1991-92 to 1997-99)

Annexure 3.8 Forced Outages of Thermal Stations

Annexure 3.9 Annual Plant Load Factor of Thermal Stations

Annexure 3.10 Gross Generation (1992-93)

Annexure 3.11 Gross Generation (1993-94)

Annexure 3.12 Gross Generation (1994-95)

Annexure 3.13 Gross Generation (1995-96)

Annexure 3.14 Gross Generation (1996-97)

Annexure 3.15 Gross Generation (1997-98)

Annexure 3.15(a) Gross Generation (1998-99)

Annexure 3.16 Auxiliary Consumption

Annexure 3.17 Net Generation of Electricity

Annexure 3.18 Purchase of Power (Gross)

Annexure 3.19 Purchase of Power (Net)

Annexure 3.20 Purchase of Power by Major Sources
Annexure 3.21 Share of Purchase in Total Sales
Annexure 3.22 Purchase of Power from Cent. Sector as % of Total Purchase
Annexure 3.23 Purchase of Power from Cent. Sector as % of Availability
Annexure 3.24 Transmission and Distribution Losses
Annexure 3.25 T & D Losses as % of Availability
Annexure 3.26 Sales of Power
Annexure 3.27 Consumer Category-wise Sale of Power, 1992-93
Annexure 3.28 Consumer Categorywise Sale of Power, 1993-94
Annexure 3.29 Consumer Categorywise Sale of Power, 1994-95
Annexure 3.30 Consumer Categorywise Sale of Power, 1995-96
Annexure 3.31 Consumer Categorywise Sale of Power, 1996-97
Annexure 3.32 Consumer Categorywise Sale of Power, 1997-98
Annexure 3.33 Consumer Categorywise Sale of Power, 1998-99
Annexure 3.33(a) Consumer Categorywise Sale of Power, 1999-2000
Annexure 3.34 Share of Agriculture in Total Sales
Annexure 3.35 Share of Revenue from Agriculture in Total Sales Revenue
Annexure 3.36 Share of Revenue from Domestic Sector In Total Sales Revenue
Annexure 3.37 Share of Industry in Total Sales of Power
Annexure 3.38 Per Capita Consumption of Electricity
Annexure 3.39 Power Supply Position in India
Annexure 3.40 Number of Villages Electrified
Annexure 3.41 Energisation of Pump-Sets

CHAPTER - 4

Annexure 4.1 Unit Cost of Power Supply, 1974-75 to 1979-80, 1980-81 to 1984-85
1985-86 to 1989-90, 1990-91 to 1994-95 , 1995-96 to 1999-2000
Annexure 4.2 Cost of Structure of SEBs 1992-93
Annexure 4.3 Cost of Structure of SEBs 1993-94
Annexure 4.4 Cost of Structure of SEBs 1994-95
Annexure 4.5 Cost of Structure of SEBs 1995-96
Annexure 4.6 Cost of Structure of SEBs 1996-97
Annexure 4.7 Cost of Structure of SEBs 1997-98
Annexure 4.8 Cost of Structure of SEBs 1998-99
Annexure 4.8a Cost of Structure of SEBs 1999-2000
Annexure 4.9 Fuel Consumption by Coal Based Thermal Units
Annexure 4.10 Secondary Oil Consumption in Coal Based Thermal Units
Annexure 4.11 Cost of Coal per Unit of Generation
Annexure 4.12 Cost of Oil per Unit of Generation
Annexure 4.13 Total Cost of Purchase of Power

Annexure 4.14 Rate of Purchase of Power
Annexure 4.15 Share of Operation and Maintenance in Total Cost
Annexure 4.16 Share of Estt./Admn. In Total Cost
Annexure 4.17 Number of Employees
Annexure 4.18 Number of Employees per Mkwh of Electricity Sold
Annexure 4.19 Number of Consumers of Electricity
Annexure 4.20 Number of Employees per Thousand Consumers
Annexure 4.21 Share of Depreciation in Total Cost
Annexure 4.22 Share of Interest in Total Cost
Annexure 4.23 Average Tariff for Sale of Electricity 1974-75 to 1979-80, 1980-81 to 1984-85, 1985-86 to 1989-90, 1990-91 to 1994-95 , 1995-96 to 1999-2000
Annexure 4.24 Consumer Categorywise Average Tariff, 1992-93
Annexure 4.25 Consumer Categorywise Average Tariff, 1993-94
Annexure 4.26 Consumer Categorywise Average Tariff, 1994-95
Annexure 4.27 Consumer Categorywise Average Tariff, 1995-96
Annexure 4.28 Consumer Categorywise Average Tariff, 1996-97
Annexure 4.29 Consumer Categorywise Average Tariff, 1997-98
Annexure 4.30 Consumer Categorywise Average Tariff, 1998-99
Annexure 4.30a Consumer Categorywise Average Tariff, 1999-2000
Annexure 4.31 Average Tariff for Agriculture
Annexure 4.32 Average Tariff for Industry
Annexure 4.33 Sales Revenue as a Ratio of Cost
Annexure 4.34 Commercial Profit/Loss(with subsidy)
Annexure 4.35 Commercial Profit/Loss (without subsidy)
Annexure 4.36 Effective Subsidy for Agricultural Consumers
Annexure 4.37 Subsidy for Agricultural Sales after Introduction of 50 paise/kwh
Annexure 4.38 Subsidy received from State Government
Annexure 4.39 Subsidy for Domestic Consumers
Annexure 4.40 Subsidy to Sales Revenue Ratio (with Cross Subsidisation)
Annexure 4.41 Subsidy to Sales Revenue Ratio (without Cross Subsidisation)
Annexure 4.42 Cross Subsidy from Other Users
Annexure 4.43 Additional Resource Mobilisation (ARM)
Annexure 4.44 Net Internal Resources
Annexure 4.45 Rate of Return on Capital (with Subsidy)
Annexure 4.46 Rate of Return on Capital (without Subsidy)
Annexure 4.47 Rate of Return on Capital (with 50 p/u for Agrigulture)
Annexure 4.48 ARM from 0% of ROR
Annexure 4.49 ARM from 3% of ROR
Annexure 4.50 ARM from Introducing 50 p/u for Agriculture

Annexure 4.51 Tariff Increase Required to Achieve 0% ROR
Annexure 4.52 Tariff Increase Required to Achieve 3% ROR
Annexure 4.53 Revenue Arrears Receivable by SEBs
Annexure 4.54 State Electricity Duty Collection (SED)
Annexure 4.55 Incidence of "SED" on Sale of Electricity
Annexure 4.56 "SED" as Proportion of Average Tariff
Annexure 4.57 Financial Working of EDs (Gross Operating Surplus)
Annexure 4.58 Outstanding Dues of the Central Sector Undertakings

CHAPTER 1 : AN OVERVIEW

1.1 Introduction

The Report comprises of 5 chapters. In the first chapter some of the important parameters, highlighting the crucial issues, are briefly analysed. This analysis is done for the country as a whole, as subsequent chapters bring out large variations in the performance of SEBs and EDs. Chapter 2 focuses on the plan outlays and expenditure in the power sector, distribution of power sector outlay between various activities viz. generation, transmission & distribution (T&D), renovation and modernisation etc. and also gives the power balances as well as the elasticity of electricity generation and consumption with respect to the GDP. In Chapter 3, physical performance of the SEBs and EDs is reviewed. It covers details regarding installed capacity and its mix, parameters regarding capacity utilisation viz. Plant load factor (PLF), forced outages, plant availability, auxiliary consumption and - other indicators like power purchased from other agencies, T&D losses, sales to consumers, etc. Chapter 4 gives a comprehensive account of parameters such as cost of supply and its components, average and consumer category-wise tariff realised and other financial indicators such as commercial profits and losses, rate of return on capital employed, cross subsidisation, net internal resources, revenue arrears, outstanding dues etc. Chapter 5 gives details about status of reforms in various States.

1.2 Plan Outlay and its Composition

With the exception of the Second and the Third Five Year Plans, the share of electricity sector in the total plan outlay has been over 15%. From the Fifth Five Year Plan, till the Seventh Plan this share has been around 19-20%. During the Eighth Plan the share has declined to 18.3%. In the Ninth Plan the share of Power Sector outlay in percentage terms further declined to 14.49% of all sector outlay. As against his, the share of Power Sector outlay in the total outlay for Annual Plans 1997-98 & 1998-99 has been 13.4% and 13.85% respectively. There is a need to allocate higher outlays to T&D system and renovation and modernisation (R&M) programmes. It has been observed that inadequate investments in the T&D system is one of the major reasons for poor quality of supply of electricity (voltage fluctuations and break-downs). Investments in renovation and modernisation (R&M) of existing generation plants have distinct cost advantage over investment in new generation capacity. Figure 1.1 gives the distribution of power sector outlay for major sub- activities viz. generation, transmission, etc. for the Ninth Five Year Plan as indicated by the State Governments.

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It is observed from Figure 1.1 that the share of outlay in the total power sector outlay during the Ninth Plan for generation is 40%, for T&D 44.6%, R&M 5%, R.E 8% and others 2.4%.

1.3 The Elasticity of Consumption of Electricity

Table 1.1
Elasticity of Electricity Consumption w.r.t. GDP

First Plan	3.14
Second Plan	3.38
Third Plan	5.04
Fourth Plan	1.85
Fifth Plan	1.88
Sixth Plan	1.39
Seventh Plan	1.50
Eighth Plan	0.97

The elasticity of electricity consumption with respect to GDP during 1980-81 to 1997-98 works out to 1.14. This implies that an increase in GDP by 1% was accompanied by 1.14% increase in electricity consumption. If one looks at various Five Year Plans, the elasticity has declined from over 3 in the First and the Second Five Year Plans to nearly 1.5 during the Seventh Plan and further to 0.97 in Eighth Plan as can be seen from Table 1.1.

1.4 Installed Capacity

The total installed generation capacity on 31st March, 1999 was 93253 MW. The share of hydel capacity was 24.07%, Steam 62.06%, Gas 9.75%, Nuclear 2.39% and the balance being diesel and wind. During the Eighth Plan (1992-93 to 1996-97), 16422.6 MW have been added to the installed capacity as against the target of 30538 MW i.e. the achievement has been only 53.8% of the target. The achievement in hydel sector has been only 26.1% of the target as compared to 67.2% in thermal sector. Figure 1.2 gives the installed capacity in power sector (thermal includes capacity from gas, diesel, wind and nuclear) from 1990-91 to 1998-99.

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1.5 Plant Load Factor

There has been a marked improvement in the all-India average PLF in recent years, though considerable inter-State variations persist. The PLF in Eastern and North Eastern regions has been consistently lower compared to Northern, Western and Southern regions. The low PLF in some cases could be attributed to inappropriate quality of coal, age and size of units, equipment deficiency and failure or backing down of the units due to low load. Figure 1.3 gives the trend of PLF (all-India) from 1990-91 to 1998-99. The PLF till about early 1990s remained in the range of 54-57%. It was only from 1993-94, that the PLF started showing a distinct improvement to above 60% performance level. It was 63% in 1995-96, and 64.7% in 1997-98 and 64.6% in 1998-99. Figure 1.3 gives the PLF in different regions.

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1.6 Transmission and Distribution Losses

The T&D losses are quite large in India compared to many other countries. In 1980-81 such losses accounted for nearly 20.6% of the total electricity available. These further increased to 21.8% in 1985-86 and to 23.3% in 1989-90. Since then there was a decline and in 1992-93 it was 21.8%. However, since 1995-96, the losses again started rising. The T&D losses for the years 1995-96, 1996-97 and 1997-98 are reported to be 22.3%, 24.53% & 24.44% respectively. It may be noted that the losses reported here are as per the General Review carried out by the CEA and are different from losses reported by the SEBs for the Planning Commission discussions. A significant proportion of these T&D losses is attributed to pilferage.

Notwithstanding the general improvement in the overall PLF in the country during the Eighth Plan period , the low level of PLF in a number of stations and generally higher T&D losses obviously reflected sub-optimum utilisation of existing assets. An improvement in PLF and reduction in T&D losses would help in reducing the requirement for adding new power generation capacity.

1.7 Energy Sales

The pattern of sales to various sectors has undergone significant changes in the last few years. Figure 1.4 shows the sectoral consumption patterns for the years 1984-85, 1989-90 and 1997-98. The share of domestic and agriculture sectors in the total sales increased from 27.4% in 1984-85 to nearly 50% in 1998-99 while that of industry declined from over 50% to about 32% over the years. This has adversely affected the profitability of the SEBs because the tariff charged from agriculture and domestic sectors is lower than the cost of supply of electricity. The per capita electricity consumption increased from 178 Kwh in 1985-86 to 334 Kwh in 1996-97 i.e. an increase of about 90% in a decade.

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1.8 Energy Shortage

At the beginning of the Eighth Plan, the energy shortage was 7.8% and peak deficit was 18.8%. The energy deficit increased to 11.5 % and peak deficit to 18% by the end of the Eighth Plan. The major reason for increase in the shortage has been failure to achieve the targeted capacity addition. The actual power supply position as on March 1999 indicates energy deficit of 5.9% and peak deficit of 13.9%. This improvement is partly due to a marked improvement in PLF of thermal plants.

1.9 Average Cost

The average cost had increased from 42 paise per unit in 1980-81 to 109 paise per unit a decade later. In 1999-2000, it is estimated to be 281 paise per unit. The cost of power purchased from outside agencies, fuel cost and the interest cost are the major components of this cost. The increase in cost of supply is mainly because of the escalation of prices of inputs.

However, the maximum increase is in power purchase component, which has increased from 36 paise/kwh (28%) in 1992-93 to around 106 paise/kwh (37%) in 1998-99 (RE). There are wide inter-State variations. The details can be seen in Chapter 4.

1.10 Average Tariff

The average tariff has increased from 32 paise/kwh in 1980-81 to about 82 paise/kwh in 1990-91 and further to 193 paise/kwh in 1998-99 (RE). It is estimated to be 208 paise/kwh during 1999-2000. The ratio of tariff to cost was 77% in 1980-81. It has shown wide year to year fluctuation being 77% in 1995-96, 79.5% in 1998-99 (RE) and expected to be 74% in 1999-2000. The burden of tariff is unequal. Whereas the average tariff for agriculture and domestic sectors works out to 22 paise/Kwh and 141 paise/Kwh respectively for the year 1998-99 (RE), the industrial sector on an average paid 339 paise/Kwh. This has resulted in disproportionately lower contribution by agriculture and domestic sectors to the revenue of SEBs vis-a-vis the sales by the SEBs to these two sectors. The agriculture sector accounted for only 3-4% of total sales revenue of the SEBs as against around 30% of their total sales. The domestic sector accounted for 11-14% share in sales revenue as against 16-17% sales of the SEBs. This resulted in the escalation in the commercial losses of the SEBs, as the cross subsidies and the subsidies provided by the State Governments are not sufficient to make up for the losses on account of sales to agriculture and domestic sectors besides pushing up cost of industrial production.

1.11 Commercial Losses

The annual commercial losses (without subsidies) of the SEBs in the country have increased from Rs.1565 crore in 1985-86 to Rs.13430.6 crore in 1998-99 (RE). The trends are shown in Figure 1.5.

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1.12 Subsidy

The effective subsidy (difference between the cost of supply and the revenue realisation) to agriculture and domestic sectors worked out to Rs.5651 crore in 1990-91. In 1998-99 (RE), it increased to Rs.27227 crore. However, cross subsidisation (mainly from commercial and industrial sectors) also increased from Rs.1296 crore, representing 22.9% of the subsidy to agriculture and domestic sectors in 1990-91 to Rs.10120 crore in 1998-99 (RE) representing about 37% of the subsidy provided to these sectors.

1.13 Rate of Return

The trend showing SEB's rate of return (without subsidy) in the last 5 years is presented below.

Year	ROR (%)
1992-93	(-)12.7
1993-94	(-)12.3
1994-95	(-)13.1
1995-96	(-)16.4
1996-97	(-)14.7
1997-98	(-)16.8
1998-99 (RE)	(-)20.7

It is estimated that for the year 1999-2000 in order to break even/achieve a ROR of 3%, as stipulated in the Indian Electricity Supply Act (1948), the SEBs would have to raise the average tariff by 66 paise/73 paise per KWh respectively.

It is evident from the above that the high levels of commercial losses and the negative rates of return even at PLF of 64% and above are mainly on account of absence of rational tariff structure, whereby large subsidies are provided to certain sectors, without corresponding recovery from other sectors. Reduction in T&D losses, auxiliary losses as well as in secondary oil consumption, provide further avenues for improvement. The unsatisfactory and deteriorating financial health of the State Electricity Boards has acted as a constraint not only for adding new capacity, improving the transmission and distribution system, carrying out renovation and modernisation programmes, but also for carrying out much needed reforms in the electricity utilities. One of the main hurdles to private sector participation gaining momentum is the perceived reservations about the capacity of SEBs to pay for power in view of their generally poor financial performance. The process of the reforms has already been initiated in some States. Three states viz. Orissa, Haryana and Andhra Pradesh have already gone for restructuring and reforms and unbundled the SEBs. 14 states have so far set up State Electricity Regulatory Commissions. However, there is a need to increase the pace of reforms. Details about status of reforms in various states are given in Chapter 5.

CHAPTER 2 : POWER SECTOR OUTLAY AND GENERAL ISSUES

2.1 Introduction

The previous chapter dealt with some important parameters of electricity sector at the aggregate (all-India) level. This chapter reviews the investment pattern in terms of plan outlays and actual expenditure by the power utilities, particularly State Electricity Boards (SEBs), and the Electricity Departments (EDs). Power balances are also presented from 1980-81 to 1996-97. The elasticities of electricity generation and consumption with respect to GDP have also been worked out for the period 1980-81 to 1996-97.

2.2 Scope and Coverage

Information is provided for 19 State power utilities. In addition, 8 EDs of smaller States and Union Territories are also covered. The data presented is actuals for 1992-93, 1993-94, 1994-95, 1995-96, 1996-97, 1997-98, revised estimates for 1998-99 and Annual Plan projections (AP) for 1999-2000. In some cases viz average tariff and cost of supply, information is presented from as early a year as 1974-75.

2.3 Power Sector Plan Outlay and Expenditure

Annexure 2.1 gives the outlays and expenditure in the power sector and the total outlay and expenditure since the First Five Year Plan for the country as a whole. The State-wise information is given in Annexures 2.2 to 2.12.

2.3.1 Planwise Trends

In the First Five Year Plan (1951-56), 19.02% of the total Plan outlay was provided for the power sector. Even though, the power sector outlay has steadily increased since then in absolute terms, its percentage share in the all sector outlay declined until the Fifth Five Year Plan (1974-79). Thereafter, the share of power sector outlay in the total Plan outlay again increased to 19.09% in the Annual Plan (1979-80), 20.13% in the 6th Plan, 19.09% in the 7th Plan, 19.28% in the Annual Plan 1990-91, 18.91% in the Annual Plan 1991-92 and 18.33% in the 8th Plan. The power sector expenditure for the Eighth Plan is 15.79% of Total Plan Expenditure. In the Ninth Plan the Power Sector outlay accounted for 14.49% of the total Plan outlay. In percentage terms, the share of power sector has decreased as compared to the provision of 18.33% in Eighth Plan. As against this, the share of power sector outlay in the total outlay for the Annual Plans 1997-98, 1998-99 and 1999-2000 is 13.36%, 13.84% and 13.95% respectively. This may be partly due to the policy of the Government to encourage private sector participation in the development of power sector. The Ninth Plan capacity addition programme of 40245 MW includes 17588.5 MW capacity addition from private sector, which is quite significant. This works out to about 0.78 MW of capacity addition for every 1 MW capacity added in the public sector.

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2.3.2 Share of Power Sector in Total Plan Outlay

Table 2.1 shows the relative share of power sector in total outlay both at the All India and the State levels from 1990-91 to 1999-2000.

Table 2.1

Share of Power Sector Outlay in Total Plan Outlay		
Plan Period	All India	States
1990-91	18.91	31.55
1991-92	18.33	26.09
1992-93	18.50	27.19
1993-94	17.15	26.24
1994-95	16.45	23.77
1995-96	15.26	23.48
1996-97	13.38	19.14

9th Plan	14.49	19.26
1997-98	13.36	19.30
1998-99	13.85	18.50
1999-2000	13.95	17.57

There has been a gradual decline in the share of power sector in the total Plan outlay since 1992-93. The share was 18.5% in 1992-93 and it declined to 13.95% in 1999-2000. The share of power sector in the total outlays by the States declined from 27.2% in 1992-93 to 17.57% in 1999-2000. Added to that, there are wide inter-State as well as yearly variations in the allocation of outlays to the power sector. For example, in 1999-2000 the share of power sector in total outlay was over 30% in Orissa and West Bengal. On the other hand, the share of power sector in total outlay was only 2.8% in Nagaland, 2.9% in Bihar, 6.3% in Manipur and Tripura .

2.4 Activity wise Distribution of Power Sector Outlay

Table 2.2 gives activity-wise distribution of power sector outlays in the 8th Plan, Annual Plans from 1992-93 to 1995-96, Ninth Plan and Annual Plans 1997-98 and 1998-99. Figure 2.2 gives a graphical view of distribution of power sector outlay in these years.

Table 2.2

Distribution of Power Sector Outlay(%)								
Activity	1992-97	1992-93	1993-94	1994-95	1995-96	9th Plan	1997-98	1998-99
Generation	62.0	69.3	67.2	62.90	56.40	40.00	46.99	40.30
R&M	2.0	2.4	2.3	2.50	2.50	5.00	4.55	4.24
T&D	28.0	22.5	24.9	26.60	30.70	44.60	37.06	43.20
R.E.	5.0	4.7	3.4	3.90	6.00	8.00	9.00	7.84
Misc.	3.0	1.1	2.2	4.10	4.40	2.40	2.40	4.42

Note : Distribution of outlay for 1996-97 is not available.

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The outlay on the generation component in the total power sector outlay used to be much higher than the corresponding share in R&M and T&D components. However, there has been some change in this trend during the Eighth Plan. Generation component which was about 69% in 1992-93 declined to 40.3% in 1998-99. The outlay on T&D increased to 43.2% in 1998-99 from 22.5% in 1992-93. Investments on T&D schemes, however, continue to be lower in some states than what is considered desirable from the operational point of view. This is one of the major reasons that has resulted in high T&D losses and poor quality of electricity supply to the consumers in almost all States. These operational deficiencies have also adversely affected the financial position of the SEBs.

2.5 Power Balance

The total quantum of electricity available for sale with a utility is its own generation net of auxiliary consumption plus net purchase minus T&D losses. Table below gives the position (power balance) from 1980-81 to 1997-98 for the utilities in the country.

It is observed that the auxiliary consumption has varied between 6.5% and 8.1% during this period. It was highest in 1987-88 and thereafter has improved marginally. In 1997-98, it has been around 7.26% of the gross generation. T&D losses are higher than the desirable levels

In 1997-98, T&D losses have been around 24.44% as against 21.8% in 1992-93. These losses were about 20.6% in 1980-81 and 22.9% in 1990-91.

Table 2.3

Power Balance						
Year	Gross Generation (MKwh)	Auxiliary Consum-ption (MKwh)	Net Generation (MKwh)	Purchase From Outside *(MKwh)	T&D Losses (MKwh)	Total Consumption (MKwh)
1980-81	110844	7230	103614	78	21325	82367
1981-82	122101	8288	113813	30	23598	90245
1982-83	130624	9029	121235	-2	25644	95589
1983-84	140177	10142	130035	-2	27689	102344
1984-85	156859	11650	145209	73	31214	114068
1985-86	170350	13157	157193	1	34195	122999
1986-87	187714	14324	173390	346	38144	135592
1987-88	202093	16317	185776	2067	42230	145613
1988-89	221396	17363	204033	2196	46033	160196
1989-90	245438	18674	226764	1915	53260	175419
1990-91	264329	19603	244726	2153	56522	190357
1991-92	287029	21011	266018	3066	61439	207645
1992-93	301362	22060	279302	2937	61565	220674
1993-94	324050	23670	300380	3200	65010	238570
1994-95	350490	24795	325695	3560	69569	259686
1995-96	379877	27221	352657	3785	79363	277079
1996-97	395889	28804	367085	1493	91105	277473
1997-98	421832	30639	391193	1385	96785	295793

* Purchases from Bhutan + Nepal

2.6 Elasticity of Electricity Generation and Consumption w.r.t. GDP

Table 2.4 gives the plan-wise elasticity of electricity generation and consumption with respect to GDP.

Table 2.4

Elasticity of Electricity Generation and Consumption w.r.t. GDP

	Generation	Consumption
First Plan	3.06	3.14
Second Plan	3.45	3.38
Third Plan	5.11	5.04
Fourth Plan	2.15	1.85
Fifth Plan	1.88	1.88
Sixth Plan	1.47	1.39
Seventh Plan	1.57	1.50
Eighth Plan	1.02	0.97

The elasticity of electricity generation and its consumption vis-a-vis GDP has declined over time after an increase till the Third Plan. The elasticity of electricity generation and consumption with respect to GDP for the period 1980-81 to 1996-97 works out to 1.50 and 1.48 respectively. This implies that if the GDP increased by 1%, electricity generation and consumption increased by 1.50% and 1.48% respectively, during this period.

It is seen from the analysis above that the share of power sector in the total outlay declined during the Eighth Plan and so did the share of the sector in total expenditure. Inadequate funding is one of the main reasons why the capacity addition fell short of the target during the Eighth Plan. However, the gross generation increased much faster, aided to a great extent by an improvement in the PLF in the Central as well as State sectors. This along with some of the other physical parameters are considered in the next Chapter.

CHAPTER 3 : PHYSICAL PERFORMANCE

3.1 Introduction

This Chapter reviews the physical performance of the electricity sector in the country, particularly that of the SEBs and the EDs. The parameters considered here are, installed capacity, addition to installed capacity, plant availability and capacity utilisation, generation and sales, auxiliary consumption, T&D losses, power purchased from other agencies, sector-wise sales of electricity, per capita consumption, progress in rural electrification, etc.

3.2 Capacity Mix and Capacity Utilisation

Annexures 3.1 to 3.9 give details of installed capacity, capacity addition, unit size-wise distribution of thermal capacity, plant availability, forced outages and plant load factor (PLF) of the thermal units.

3.3 Installed Generation Capacity

The total installed capacity of the electricity supply undertakings in the country increased from 89090 MW at the end of March, 1998 to 93253 MW as on 31st March, 1999. Out of the total installed capacity, 24.07% was hydel, 72.45% thermal (including steam, gas and Diesel), 1.09% wind and the balance2.39% nuclear. Table 3.1 shows the position regarding ownership and mix of installed capacity. Out of the total installed generation capacity, 60.98% is owned by the States, 30.42% by the Centre and 8.6% by the private sector. This can be seen from Figure 3.1.

Table 3.1

Ownership and Mode-wise Pattern of Installed Capacity (MW)

As on 31-3-1999

Ownership/Mode	Hydel	Steam	Gas	Diesel	Wind	Nuclear	Total
State	19478.28	34820.58	2182.9	358.29	25.19	0.0	56865.24
Central	2509.00	19767.50	3869.6	0.00	0.0	2225.0	28371.10
Private	456.00	3281.40	3038.4	242.09	98.81	0.0	8016.70
Total	22443.28	57869.48	9090.9	600.38	1024	2225.0	93253.04
% of Installed Capacity	24.07	62.06	9.75	0.64	1.09	2.39	100.0

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3.4 Capacity Addition

As against the target of addition of 30538 MW during the Eighth Plan, the addition to the capacity during this period was 16422.4 MW i.e. the achievement has been only 53.8% of the target. The average capacity addition achieved during 8th Plan works out to 3284.5 MW per annum as against the target of 6107.6 MW. About 14.8% of the total capacity addition in the Eighth Plan is accounted for by the hydel stations and the remaining by thermal units (including nuclear). Nearly, 51% of the addition in the capacity took place in the Central Sector, 41.2% in the State Sector and the rest in the private sector. The Central sector has achieved 65.2% of the Eighth Plan target. The corresponding figures for the State and private sectors are 45.8% and 45% respectively. It is obvious that the actual achievements have fallen well short of target in all the sectors.

Table 3.2

Addition to Installed Capacity (MW)

	8th Plan Target	8th Plan Actual	9th Plan Target	1997-98 Actual	1998-99 Actual	1999-2000 Target
I. Mode-wise						
Hydel	9282	2427.6	9819.7	233.0	542.5	1563.0
Thermal	20156	13554.8	29545.5	2993.5	3699.5	4682.0
Nuclear	1100	440.0	880.0	0.0	0.0	440.0
Total	30538	16422.4	40245.2	3226.5	4242.0	4685.0
II. Ownership						
State	14780	6773.0	10747.7	1676.0	1675.4	2506.6
Central	12858	8387.0	11909.0	333.0	991.6	1625.4
Private	2810	1262.4	17588.5	1217.5	1575.0	553.0
Total	30538	16422.4	40245.2	3226.5	4242.0	4685.0

The Ninth Plan envisages a capacity addition of 40245.2 MW which comprises 24.4% of hydro capacity and the balance 75.6 thermal capacity addition including nuclear power. Likely contribution from State sector, Central sector and Private sector is 26.7%, 29.6% and 43.7% respectively. The average capacity addition target per year works out to 8049 MW. As against this, the achievement during 1997-98 and 1998-99 was 3226.5 MW and 4242 MW respectively and the likely achievement during 1999-2000 is 4685 MW.

3.5 Plant Availability and Capacity Utilisation (PLF)

The all-India plant availability of thermal units has varied between 72.8% and 79.4% during 1991-92 to 1998-99. Table 3.3 gives the plant availability for 1991-92 to 1997-98.

Table 3.3

Plant Availability

1991-92	72.8
1992-93	74.7
1993-94	78.0
1994-95	76.6
1995-96	77.8
1996-97	79.0
1997-98	79.4
1998-99	78.7

While the plant availability has remained 75-79% in the Eighth Plan, the average PLF of the thermal plants has shown a distinct improvement in this period. The average PLF increased from 55.3% in 1991-92 to 64.6% in 1998-99. There are wide variations in the PLF in various States. Table 3.4 gives the PLF for different regions and by ownership groups.

Table 3.4

PLF of Thermal Power Plants

	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99
I.Ownership								
State	50.6	54.1	56.6	55.0	58.1	60.3	60.9	60.7
Central	64.5	62.7	69.8	69.2	71.0	71.1	70.4	71.1

Private	56.7	58.8	57.0	65.8	72.3	71.2	71.2	68.0
II. Region								
Northern	58.0	62.0	63.9	59.1	62.1	64.8	66.7	67.2
Western	59.6	59.7	63.4	63.8	68.1	70.2	70.3	70.7
Southern	60.8	62.6	68.3	69.1	74.7	75.8	77.0	75.4
Eastern	37.3	39.8	44.8	43.7	42.7	42.2	43.0	44.1
N Eastern	24.6	24.3	19.9	26.8	28.6	27.1	21.3	18.8
All-India	55.3	57.1	61.0	60.0	63.0	64.4	64.7	64.6

It is clear from the above Table that while the average PLF for the Central and private sectors has been higher than that of the State sector, it is the State sector that has registered maximum improvement in the PLF since 1991-92. Western and Southern regions generally continued to have higher PLF as compared to the All-India average. The Eastern and the North Eastern regions had much lower PLF. The region-wise PLF for 1991-92 and 1998-99 are shown in Figure 3.2

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3.6 Generation and Sales

Annexures 3.10 to 3.37 present a detailed account of generation, sales and related data in respect of the SEBs and EDs from 1992-93 to 1998-99 and projections for 1999-2000. Table 3.5 brings out some of the salient features on the basis of information from different SEBs and EDs in the country.

Table 3.5

Details of Generation and Sales of SEBs and EDs

	1992-93 (Actual)	1993-94 (Actual)	1994-95 (Actual)	1995-96 (Actual)	1996-97 (Actual)	1997-98 (Prov.)	1998-99 (RE)
Gross Generation (Mkwh)	205850	216960	236628	247021	257015	258534	275530
Share of Thermal(%)	68.3	69.7	68.2	73.6	75.5	79.2	79.2
Auxiliary Consumption(%)	6.91	6.96	7.44	7.11	7.86	7.23	7.13
Power Purchase(Mkwh)	108514	112594	131049	149720	154920	174015	185223
Net Availability at Busbar(Mkwh)	280061	291849	306962	350737	388217	395083	417016
T & D Losses(%)	19.8	20.2	20.3	22.2	24.5	23.9	23.2
Sales(Mkwh)	212722	221276	245688	263173	275081	283293	303292

As can be seen from Table 3.5, of the total electricity generated, nearly 27-31% is used for auxiliary consumption and lost in the T&D process. These T&D losses also include losses due to theft. Also in the absence of adequate metering arrangements, **these figures have an implicit element of inaccuracy**. As a result of these losses, the SEBs and EDs are deprived of much needed revenue.

3.7 Auxiliary Consumption

The auxiliary consumption reported here is a weighted average of thermal and hydel plants for all the State sector. In the Eighth Plan period, it has remained in the range of around 7-8%. The auxiliary consumption in the State of Bihar, Orissa and West Bengal is higher than the national average. These are also the States where the share of coal based thermal generation in the total electricity generation is larger.

3.8 Power Purchase

Power purchases are from Public sector undertakings (PSUs) in the Central sector, private generators (wherever such agencies exist) and from neighboring States. The purchase of power as a proportion of total sales of all the utilities taken together was 51% in 1992-93,

61.43% in 1997-98, 61.87 in 1998-99(R.E) and estimated at 62.3% in 1999-2000. The details of power purchase in this report (Annexures 3.18 to 3.23) include total purchases from Central sector and other sources, purchase as a percentage of total sales, purchase of power from Central sector as a percentage of total purchase and purchase from Central sector as percentage of total power availability. The results are summarised in Table 3.6.

Table 3.6

Details of Purchase of Power

	Purchase as a percentage of Availability	Purchase from Central Sector as % of	
		Total Purchase	Total Availability
1992-93	38.7	77.3	29.5
1993-94	38.6	74.9	30.4
1994-95	43.1	76.1	32.9
1995-96	42.7	77.1	34.5
1996-97	43.0	76.5	35.1
1997-98	44.0	74.4	34.3
1998-99	43.3	70.9	32.7

As can be seen from the Table above, the share of power purchased in total availability of power with the SEBs has increased over the years. All the SEBs and EDs depend upon other sources to meet their total requirements. The EDs of Goa and Pondicherry do not have their own generation and, therefore, rely totally on purchased power. Nearly three-fourth of the electricity purchased by the SEBs and the EDs was drawn from the Central PSUs till 1996-97. In 1997-98 and 1998-99, the share of Central sector in the total purchases of SEBs and EDs has started declining. One of the reasons for this may be because of their own better generation, improvement in PLF and to some extent due to the commissioning of private sector projects in few states.

3.9. T & D Losses

Nearly 90 billion Kwh of electricity was lost in Transmission & Distribution in various States in 1997-98. The T&D losses increased from 19.8% in 1992-93 to 24.53% in 1996-97. The provisional estimates for 1997-98 indicate these losses as 23.9% and are expected to decline to 23.2% in 1998-99 (RE). There are considerable inter-State variations. J&K has the highest T&D losses in the country with 47.5%. The T&D losses in Jammu & Kashmir, Orissa, Delhi and Haryana during 1997-98 were 47.5%, 46.0%, 42.31% and 33.37% respectively. On the other hand, the losses in Himachal Pradesh, Kerala, Madhya Pradesh, Maharashtra, Punjab and Tamil Nadu are lower.

3.10 Electricity Sales

The sales of electricity increased from 213 Bkwh in 1992-93 to 303.65 Bkwh in 1998-99 (R.E) representing annual growth rate of 6.6%. Table 3.7 shows the share of various categories of consumers in total sales by the SEBs and EDs from 1992-93 to 1998-99.

Table 3.7

Consumer Category-wise Sales of Electricity (%)

Category	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99
Domestic	16.4	15.5	18.1	18.3	19.3	17.8	19.5
Commercial	4.0	4.4	6.1	6.0	6.0	4.7	4.8
Agriculture	29.9	31.2	30.2	30.5	30.5	31.8	31.0
Industry	35.5	34.8	37.9	37.0	35.0	30.8	31.7
Traction	1.8	2.1	2.2	2.2	2.2	2.1	2.2
Outside State	2.1	1.9	1.6	1.9	1.6	2.7	2.7
Others	10.3	10.1	3.9	4.1	5.4	10.2	8.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note : The total for 1997-98 and 1998-99 may not add upto 100 as break-up in respect of Delhi state is not available.

It is evident from the above that industry and agriculture account for over 62% of the total sales of electricity. The domestic sector accounted for nearly one-fifth of the total sales of electricity. In the States of Rajasthan, Punjab, Maharashtra, Andhra Pradesh, Madhya Pradesh, Gujarat, Haryana and Karnataka 32-44% of the electricity is sold to the agriculture sector during 1998-99(RE). Details of consumer category-wise sales are given in annexures 3.28 to 3.34

3.11 Sales Revenue Realised from Different Sectors

While the agriculture sector accounts for nearly one-third of the sales of the SEBs and the EDs, the sales revenue realised from this sector has been only 3.6% of the total revenue realisation during 1998-99(RE) because of the subsidised tariff. Due to such subsidised tariff, the domestic and agriculture sectors taken together accounted for nearly 50% of the total sales of the SEBs and only about one-sixth of the revenue realised. On the other hand, industry and commercial sectors accounted for around 80% sale revenue whereas sales to these sectors have been in the range of 30-35%. Share of revenue realisation from agriculture and domestic sectors are given at annexure 3.35 and 3.36.

3.12 Per Capita Consumption

The per capita consumption of electricity in India increased from 178 Kwh in 1985-86 to 334 Kwh in 1996-97 registering an annual growth rate of 6.5%. There are large inter-State and inter-regional variations in the per capita electricity consumption. The inter-regional variations are shown in Table 3.8. The State-wise information can been seen from Annexure 3.38.

Table 3.8

Per Capita Electricity Consumption by Region

	Northern	Western	Southern	Eastern	N.Eastern	All-India
1985-86	173	259	186	115	50	178
1986-87	192	275	202	119	50	191
1987-88	202	297	205	125	62	201
1988-89	217	314	229	135	63	217
1989-90	241	334	249	129	76	236
1990-91	249	367	272	150	89	253
1991-92	265	391	286	156	88	268
1992-93	282	406	312	162	93	283
1993-94	286	437	335	174	94	299
1994-95	302	468	369	182	96	320
1995-96	308	513	377	195	99	336
1996-97	306	522	366	188	104	334

As against the all-India per capita electricity consumption of 334 Kwh in 1996-97, the per capita electricity consumption in the Eastern and North Eastern region has been only 188 Kwh and 104 Kwh respectively. On the other hand, Western, Southern and Northern regions have per capita electricity consumption of 522 Kwh, 366 Kwh and 306 kwh respectively. The inter-State trends show greater disparities between the States. States like Punjab and Delhi have per capita electricity consumption of 792 Kwh and 577 Kwh, whereas it is only 80-88 Kwh in States like Nagaland , Tripura and Arunachal Pradesh and about 138 Kwh in Bihar.The inter-regional variations in per capita consumption of electricity are indicated in figure 3.3.

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3.13 Power Supply Position

The overall deficit in electricity supply (energy) deteriorated from 7.8% at the begining of the Eighth Plan to 11.5% at the end of Eighth Plan. The power supply position at the end of Ninth Plan (based on the capacity addition programme of 40245 MW) as assessed by CEA indicates peak deficit of 11.6% and energy deficit of 1.4%. As against this the actual power supply position as on March'1999 indicated peak deficit of 13.9% and energy deficit of 5.9%. The peak deficit has been minimal in case of Meghalaya and Himachal Pradesh and fairly large in the States of J&K, U.P., Madhya Pradesh, Maharashtra, Gujarat and Bihar as can be seen from Annexure 3.39.

3.14 Rural Electrification

Over 5 lakh villages out of more than 6 lakh villages in India have been electrified so far. As per the notification issued by Ministry of Power dated 28th October, 1997, “A village is deemed to be electrified if electricity is used in the inhabitated locality within the revenue boundary of the village for any purpose whatsoever”. The data given in this Report is as per the earlier definition which was, “a village should be classified as electrified if electricity is being used within its revenue area for any purpose whatsoever”. According to the information available, 13 States in the country have completed 100% village electrification. As per the latest estimates, the pump-sets potential in the country is 19.5 million. As on March' 1999 around 12.21 million pumps-sets have been energised, leaving a balance of 7.3 million pump-sets yet to be energised. State-wise details are given in Annexures 3.40 and 3.41.

It is clear that the physical performance of the SEBs and EDs, as indicated by some of the parameters has shown improvement during the period 1992-93 to 1999-2000. The PLF has improved, the secondary oil consumption has declined. However, it is the deterioration of their financial performance, in spite of the better physical performance, which is a matter of concern. The financial health of the SEBs is discussed in the following chapter.

Chapter 4 : Financial Performance

4.1 Introduction

As indicated in the previous chapter while the physical performance of the SEBs and EDs has shown improvement, there has been no commensurate improvement in the financial performance. In fact, it has deteriorated in many respects. In this chapter, various financial indicators of the SEBs are discussed. These indicators are the unit cost of supply of power and its various components, average tariff and revenue realisation of SEBs (including consumer category-wise tariff), unit cost- revenue comparison, commercial profits and losses, subsidies and cross subsidisation, net internal resources, additional resource mobilisation (ARM), rate of return, revenue arrears and outstanding dues of the SEBs.

4.2 Unit Cost of Power Supply

The unit cost of supply of electricity for all the SEBs was 22.5 paise per kwh in 1974-75. It increased to 41.9 paise/kwh in 1980-81 and further to 108.6 paise/kwh in 1990-91. In the 1990s, the unit cost of supply of electricity increased more steeply, i.e. from 116.8 paise/kwh in 1991-92, 242.3 paise/kwh in 1998-99 (RE). It is expected to increase to 281 Paise/kwh in 1999-2000 (AP). The increase in the total cost of supply is mainly due to the increase in the cost of fuel and the cost of power purchase. The fuel cost has increased from 33 paise in 1992-93 to 64 paise per unit in 1999-2000 (AP). Cost of power purchase also increased from 36 paise in 1992-93 to 106 paise per unit in 1999-2000. Annexure 4.1 presents the trends for the different SEBs. Revised estimates for 1998-99 indicate that Kerala and Himachal Pradesh have lower cost of supply per KWh than other States as these States are totally dependent on hydro-electricity.

4.3 Components of Cost

The major components of cost of supply of electricity are (i) the revenue expenditure which includes expenditure on fuel, power purchase, O&M, Establishment & Administration and other miscellaneous expenditure, and (ii) the fixed costs, mainly comprising depreciation and interest payable to institutional creditors and the concerned State Governments. Table 4.1 presents the share of each of these components in the unit cost of supply for all the SEBs from 1992-93 to 1999-2000. Annexures 4.2 to 4.8 gives the details regarding components of cost of supply for each of the SEB.

Table 4.1

Structure of Unit Cost of Supply (%)								
	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-2000
F Fuel	25.8	26.1	24.8	24.5	24.5	24.1	23.2	22.7
Power Purchase	27.9	29.3	28.4	32.2	32.8	35.1	34.8	37.6
O & M	4.7	4.9	4.9	4.8	4.1	4.0	3.9	3.8
E Esst.& Admn.	15.2	14.8	14.1	12.9	13.9	13.7	15.1	13.4
Miscell- i aneous	1.3	1.5	3.2	2.0	2.0	1.9	1.7	1.5
Depreciation	7.6	6.9	9.2	8.8	8.6	7.9	7.5	7.6
I Interest	17.5	16.5	15.4	14.8	14.1	13.3	13.8	13.4

4.4 Expenditure on Fuel

The proportion of expenditure on fuel in the total cost of supply of electricity has declined from 25.8% in 1992-93 to 23.2% during 1998-99 (RE). Fuel cost constitutes an important element in the cost structure of SEBs, particularly those that rely substantially on thermal generation. Fuel cost is dependent, apart from other things, on the specific consumption of coal and oil and the transportation costs for these fuels. Annexures 4.9 to 4.12 give the trends regarding fuel consumption and fuel costs for the different States. Table 4.2 gives the summarised results.

Table 4.2

Consumption and Cost of Fuel in Coal Based Thermal Generation				
	Fuel Consumption per kwh		Fuel Cost per kwh	
	Coal (kg.)	Oil (ml)	Coal (paise)	Oil (paise)
1992-93	0.75	7.8	53.4	3.7
1993-94	0.77	5.6	64.2	3.5
1994-95	0.77	6.6	66.6	4.0
1995-96	0.76	10.8	70.1	6.8
1996-97	0.76	5.6	81.8	4.6
1997-98	0.76	4.3	92.0	4.1
1998-99	0.77	5.4	95.3	4.8
1999-2000	0.78	6.0	102.6	5.3

The specific coal consumption per Kwh in the thermal plants of the SEBs has been around 0.75 Kg to 0.78 Kg since 1992-93. There are, however, large inter-State variations. The specific secondary oil consumption in the coal based thermal units increased sharply from 7.8 ml/kwh in 1992-93 to10.8 ml/kwh in 1995-96 and then decreased to 5.4 ml/Kwh during 1998-99 (RE). It is expected to be 6.0 ml/Kwh in 1999-2000. The situation is much better compared to what it was in late 1970s and early 1980s when the secondary oil consumption was over 12 ml/Kwh. The average specific oil consumption in Bihar, Delhi, Hayrana and Assam is higher than that of all-utilities average. On the other hand, Andhra Pradesh, Karnataka Power Corporation, Tamil Nadu, Maharashtra, Rajasthan and Punjab have lower consumption. Madhya Pradesh has achieved a significant reduction in its secondary oil consumption in the last 5 years. The cost of coal per unit of generation of power has increased from 53.4 paise/Kwh in 1992-93 to 95.3 paise/Kwh in 1998-99. It is likely to increase further to 102.6 paise/Kwh in 1999-2000. The States like Gujarat, Haryana, Delhi, Punjab, Rajasthan and Tamil Nadu, located farther away from coal-fields have to bear a higher cost of coal/Kwh of generation. The main reason lies in higher transport cost for carrying coal to these States. The cost of secondary oil increased from 3.7 paise/Kwh in 1992-93 to 6.8 paise/Kwh in 1995-96 and then declined to 4.83 paise/Kwh in 1998-99.

4.5 Expenditure on Power Purchase

In the recent years, payments towards purchase of power constitute the largest component in total cost of supply of electricity. The cost of power purchase as a proportion of the average unit cost increased from 27.9% in 1992-93 to nearly 34.8% in 1998-99. The average rate of payment for purchase of power from various sources steadily increased from 76 paise/kwh in 1992-93 to 154 paise/kwh in 1998-99 (RE). It was expected to increase to 172 paise/Kwh in 1999-2000. The inter-State variations can be seen from Annexure 4.14.

4.6 Expenditure on O&M Works

The share of O&M in the average unit cost of supply of electricity in case of 19 utilities has shown a downward trend from 4.7% in 1992-93 to 3.9% in 1998-99 (RE). The States of Himachal Pradesh and Meghalaya have a fairly high share of O&M in the total cost. On the other hand, the share of O&M expenses in total cost is low in Jammu & Kashmir, Tamil Nadu, Karnataka, Punjab, Assam and Gujarat. The state-wise details are in Annexure 4.15.

4.7 Expenditure on Establishment and Administration

Establishment and Administration charges comprise mainly the wages and salaries of staff. Its share in unit cost of supply of electricity has declined from 15.2% in 1992-93 to 12.9% in 1995-96 and then increased to 15 % during 1998-99(RE). This increase may be partly due to the revision of pay scales after the Fifth Pay Commission Award. The number of employees in the State utilities and EDs has been about 9.8 lakh in the last few years. However, the number of employees per million units of electricity sold declined in practically all the SEBs and EDs. The average of all SEBs and EDs declined from 4.6 employees per MKwh in 1992-93 to 3.20 in 1998-99 (RE). The number of consumers increased from 73 million in 1992-92 to 92.7 million in 1997-98. The number of employees per thousand consumers also declined to 9.87 in 1998-99 as against 13.3 in 1992-93. Kerala, Andhra Pradesh, Gujarat, Karnataka, and Tamil Nadu have lower number of employees per thousand consumers.

4.8 Nature of Fixed Costs

The share of fixed costs, viz., depreciation and interest payments in average cost declined from 25% in 1992-93 to 17.7% in 1998-99 (RE). The share of depreciation in the cost of supply which was 9.2% in 1994-95 declined to 6.2% in 1998-99 (RE). The share of interest cost, i.e. interest payable to the financial institutions and the State Governments has also come down to about 11% in the last couple of years from a level of 17.5% in 1992-93. There are, however, considerable inter-State variations.

4.9 Average Tariff and Revenue Realisation

Annexures 4.23 gives the average tariff from 1974-75 to 1999-2000 (AP). Consumer category-wise tariff is presented in Annexures 4.24 to 4.30 for the years 1992-93 to 1999-2000 (AP). The overall average tariff for sale of electricity by the SEBs was 18.8 paise/kwh in 1974-75, 32.3 paise/kwh in 1980-81. It increased to 105.4 paise/kwh in 1992-93 and to 193 in paise/kwh in 1998-99 (RE). It is likely to be 208 paise in 1999-2000. There are large inter-State variations as is evident from Annexure 4.23.

4.10 Consumer Category-wise Average Tariff

Table 4.3 gives the consumer category-wise average tariff for electricity sale from 1992-93 to 1999-2000 (AP).

Table 4.3

Consumer Category-wise Average Tariff (Paise/Kwh)								
	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-2000
Domestic	77.3	84.3	92.8	85.0	96.0	127.1	141.0	149.1
Commercial	165.3	186.3	208.0	172.8	207.6	316.7	337.3	353.6
Agriculture	16.1	17.9	18.8	19.0	20.9	20.5	22.1	24.9
Industry	171.5	198.2	221.1	219.5	260.3	324.6	338.5	350.5
Traction	206.8	216.4	261.4	282.5	320.7	394.4	410.9	410.6
Outside State	91.0	84.5	111.8	93.5	127.5	83.8	100.2	121.1
Overall	105.4	116.7	128.0	139.0	161.1	181.4	192.6	207.6

It is clear from the above that

(i) Average unit revenue realised from agricultural sector and domestic lighting is significantly lower compared to the overall average unit revenue realised.

(ii) Electricity for commercial users, industry and railway traction is charged at significantly higher rates than the average tariff.

(iii) The unit average revenue realisation for all the consumer categories (including the tariff charged from agricultural consumers) has increased, though at varying rates. The increase has been small for agricultural sector and fairly substantial for commercial and industrial consumers. It has already been indicated in the previous chapter that on account of the low tariff prevailing in the agricultural and domestic sectors, sales revenue realised from these two sectors has been very low. While the sales to these two sectors accounted for nearly one-half of the total sales, the revenue realised from them has been only about one-sixth of the total revenue of the SEBs in the recent years.

4.11 Financial Performance of SEBs

Annexures 4.33 to 4.48 provide details of cost-revenue comparison and other financial performance indicators, namely commercial profit and losses, cross subsidisation, additional revenue mobilisation, net internal resources and the rate of return on capital of the SEBs.

4.12 Unit cost-revenue comparison

The recovery of cost through revenue is crucial for the health of any organisation. The percentage of sales revenue realised to cost incurred has declined from 82.2% in 1992-93 to 74.3% in 1998-99 (RE). The recovery of cost through tariff is likely to be 74% of total cost of supply during 1999-2000. Table 4.4 indicates average recovery of cost through tariff.

Table 4.4

Recovery of Cost Through Tariff			
	Average Cost (Paise/kwh)	Average Tariff (Paise/kwh)	Recovery as percentage Of Cost
1992-93	128.2	105.4	82.2
1993-94	149.1	116.7	78.3
1994-95	163.4	128.0	78.3
1995-96	179.6	139.0	77.4
1996-97	208.4	161.1	77.3
1997-98	223.4	181.4	81.2
1998-99	242.3	192.6	79.5
1999-2000	280.9	207.6	73.9

There are wide inter-State variations in the ratio of average revenue realised to the average cost of supply as can be seen from Annexure 4.33. It was particularly low for Jammu & Kashmir, and below average in a number of other States namely, Andhra Pradesh, Assam, Bihar, Haryana, Punjab and Uttar Prasdesh in 1998-99 (RE). Figure 4.1 depicts the average cost and average revenue realised per Kwh since 1985-86.

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4.13 Commercial Profit/Loss

The commercial losses (without subsidy) of the SEBs increased from Rs.4560 crore in 1992-93 to Rs.14458 crore in 1998-99 (RE). These are projected to increase to Rs.14913 crore in 1999-2000 (AP). The details of the individual SEBs can bee seen in Annexure 4.35. The level of commercial loss of the SEBs depends on the extent to which effective subsidies provided to agriculture and domestic sectors are not neutralised through cross subsidisation and State Governments subsidy payments to SEBs. This is analysed in the following paragraphs.

4.14 Effective Subsidy and Cross Subsidisation

Annexures 4.36 to 4.39 give subsidy for agricultural and domestic sectors, subsidy that will remain after the introduction of the proposed minimum agricultural tariff of 50 paise/kwh, subsidy/subvention provided by the State Government. Table 4.5 summarises these findings.

Table 4.5

Subsidy for Agriculture and Domestic Sectors (Rs. crore)				
Year	Effective Subsidy for Agriculture	Subsidy for Agri. With 50 paise per Unit tariff	Effective Subsidy for Domestic Sector	Subsidy Given by State Governments
1992-93	7335.0	5143.4	2034.9	3182.0
1993-94	8965.6	6744.2	2130.8	2354.3
1994-95	10941.0	8536.3	2536.8	5127.1
1995-96	13606.0	10984.9	3224.4	7592.0
1996-97	15487.3	13061.1	4509.5	5179.8
1997-98	19063.5	16340.4	5266.6	4450.2
1998-99 (RE)	20232.4	19122.4	6994.9	2214.1
1999-2000 (AP)	22703.1	21608.8	8082.6	2135.0

"Net subsidy" on account of sale of electricity to agricultural and domestic consumers was Rs. 5404 crore in 1991-92 which works out to 46% of Central Plan Assistance (Rs. 11749 crore) to States in that year. The effective subsidy is likely to increase to Rs.26982 crore in 1999-2000 (AP), which works out to 85% of Central Plan Assistance (Rs. 31918) to States. Introduction of the national minimum agricultural tariff of 50 paise/kwh would still leave a substantial gap uncovered. For example, in 1997-98 this gap was of the order of nearly Rs.17156.8 crore taking into consideration Rs. 4450.2 crore subsidy received from State Governments. While some State Governments partly compensate the SEBs for the subsidised sales of electricity to agricultural and domestic sectors others do not provide any compensation at all. In 1998-99 (RE), the State Governments had proposed to give subvention to their SEBs, totaling a sum of Rs.2214 crore, which works out to 8.3% of the effective subsidy that the SEBs had to bear at the estimated tariffs for these two sectors. Some of the State Governments also write off the interest payable to them in lieu of subsidised sales to agricultural and domestic sectors.

Table 4.6

Cross Subsidy from Other Sectors		
	Cross Subsidy (Rs. crore)	Cross Subsidy as % of subsidy for Agriculture & Domestic Sectors
1992-93	3911.0	41.7
1993-94	4522.5	40.8
1994-95	5379.2	39.9
1995-96	6333.7	37.6
1996-97	8260.1	41.3
1997-98	10176.3	41.8
1998-99 (RE)	10119.9	37.2
1999-2000 (AP)	12434.3	40.4

A part of the subsidy provided to the agricultural and domestic consumers is recovered by the SEBs through cross subsidisation of tariff on the users of other sectors (mainly industrial and commercial) as indicated in Table 4.6. The cross subsidy from commercial and industrial sectors (as a percentage of effective subsidy to domestic and agricultural consumers) was 41.7% in 1992-93 declined to 37.6% by 1995-96 and increased to about 41% in 1997-98. It is expected to be 40.4 in 1999-2000. It is worth-noting that the cross subsidy from other sectors was only 22.9% in 1990-91. There is, however, a limit to such cross subsidisation as greater burden on industry and commercial sectors can affect the competitiveness of these sectors and also encourage them to set up their own captive generation.

4.15 Rate of Return

In terms of Section 59 of the Electricity (Supply) Act, 1948, the SEBs are required to earn a minimum rate of return (ROR) of 3% on their net fixed assets in service after providing for depreciation and interest charge. The State Governments could prescribe a higher return if considered necessary. However, most of the SEBs are yet to comply with this statutory stipulation. Revenue realisation from the sale of electricity in some cases does not even cover their revenue expenditure requirements. Annexures 4.45 to 4.47 give respectively the ROR with subsidy, without subsidy and with 50 paise/kwh for agricultural sales. The position is summarised in Table 4.7.

Table 4.7

Rate of Return on Capital (%)			
Year	With Subsidy	Without Subsidy	With 50 Paise per Unit Agriculture Tariff
1992-93	(-) 7.6	(-) 12.7	(-) 6.6
1993-94	(-) 6.6	(-) 12.3	(-) 6.9
1994-95	(-) 5.7	(-) 13.1	(-) 8.1
1995-96	(-) 2.2	(-) 16.4	(-) 8.5
1996-97	(-) 5.7	(-) 14.7	(-) 7.4
1997-98	(-) 9.5	(-) 16.8	(-) 9.4
1998-99 (RE)	(-) 17.3	(-) 20.7	(-) 13.5
1999-2000 (AP)	(-) 16.0	(-) 19.0	(-) 12.2

There has been, in general, a deterioration in the ROR of the SEBs from (-)12.7% in 1992-93 to (-)20.7% in 1998-99 (RE). Though subvention from the State Governments has improved the ROR, it still remains negative. If the suggested national minimum agricultural tariff of 50 paise/kwh has been implemented by all SEBs, the ROR would still have been (-)13.5% in 1998-99 (RE). If the SEBs are required to financially break-even, they would have to mobilise substantial revenue. Table 4.8 brings out the additional revenue of SEBs in case they achieve break-even ROR, 3% ROR or adopt the all-India minimum agricultural tariff of 50 paise/kwh for the agricultural sector.

Table 4.8

Additional Revenue Mobilisation (Rs. crore)			
Year	With 0% ROR	With 3% ROR	With 50 Paise per Unit Agriculture Tariff
1992-93	4723.0	5642.5	2191.5
1993-94	4248.9	6310.2	2217.3
1994-95	6611.9	7863.2	2412.2
1995-96	8277.8	9822.9	2621.1
1996-97	8473.8	10206.7	2426.2
1997-98	10253.1	12085.6	2723.1
1998-99 (RE)	13430.6	15381.5	2652.2
1999-2000 (AP)	13816.6	16000.8	2651.2

If all the utilities are able to adopt a tariff of 50 paise/kwh for agricultural sales, they would be able to mobilise additional revenues to the tune of Rs.2651 crore in 1999-2000 (AP). Their resources could improve to over Rs.13817 crore, at 0% ROR and over Rs.16000 crore, at 3% ROR. The additional revenues would provide them with much needed funds for capacity expansion and improving the performance of the existing assets. These would also reduce the burden of State Governments providing the SEBs with subvention. It is evident from Annexures 4.51 and 4.52 that on an average at the all-India level, the SEBs would have to raise the tariff by about 66 paise/kwh for achieving 0% ROR, and by about 73 paise/kwh for achieving 3% ROR in 1999-2000 over and above the average tariff proposed for 1999-2000. The increase required (for achieving 0% ROR) is as high as 163 paise for Assam, 162 for Haryana and 110 paise/kwh for Jammu & Kashmir. As against this the tariff increase required for Himachal Pradesh is only 7 paise per unit only.

4.16 Net Internal Resources

The net internal resource (IR) refers to the surplus left with the SEBs after meeting the revenue expenditure and loan repayment obligations. It includes depreciation and the subvention provided by the State Government. If the SEBs function on commercial lines, as is statutorily required, the IR would have been positive in the normal course. However, in practice IR have been negative in all the years except in 1995-96. The net IR was (-) Rs.161.5 crore in 1992-93 and (-) Rs. 7057 crore in 1998-99 (RE). The position varies from one SEB to another.

4.17 Other Information

Annexures 4.51 to 4.56 present the picture regarding unrecovered revenue arrears outstanding in the case of the SEBs, the dues payable by the SEBs to the Central sector undertakings, the revenue accruals from State electricity duty and the financial working results of the EDs.

4.18 Revenue Arrears and Outstanding Dues

The uncovered revenue arrears of the various State utilities outstanding against various consumers was of the order of Rs.6720 crore in 1992-93, Rs.8490 crore in 1993-94, Rs.9014 crore in 1994-95, Rs.13501 crore in 1995-96, Rs. 13636 crore in 1996-97 and Rs. 17236 crore in 1997-98. These arrears work out to about 30-36% of the annual sales turnover. In other words, this is equivalent to locking up of nearly 4 months' revenue with the consumers at any point of time. Also there are wide inter-State variations. States like Meghalaya and Jammu & Kashmir have outstanding dues of more than 144% and 143% of their annual sales turnover (more than 12 months revenue) for 1997-98 whereas it is 1.9% in Tamil Nadu. The outstanding dues (with surcharge) to be paid by the SEBs to the major Central Sector undertakings like NTPC, NHPC, DVC, NEEPCO, PFC, PGCIL, etc. as on Nov. 30, 1999 are reported to be over Rs.21497 crore. The dues are particularly large in the case of certain SEBs e.g. Uttar Pradesh (over Rs.4356 crore), Bihar (over Rs.4366 crore), West Bengal (over Rs. 2916 crore) and Delhi (over Rs. 2895 crore). The receivables of certain Central Sector undertakings are quite substantial. These are NTPC - Rs.11887 crore, NHPC - nearly Rs.3438 crore, REC - nearly Rs.1898 crore and DVC Rs. 1998.8 crore.

4.19 State Electricity Duty

The State Electricity Duty (SED) constitutes an important source of revenue in some States. The SED is collected by the SEBs and is generally passed on to the respective State Exchequers. The SED collections increased from Rs.1131 crore in 1992-93 to about Rs.2545 crore in 1998-99 (RE). Gujarat accounts for 37.5% of the total SED collection in 1998-99 (RE). The average incidence of electricity duty on the sale of electricity has been about 8.5 paise per kwh in 1998-99 (RE) or about 4-5% of the estimated overall tariff for electricity sales.

4.20 Financial Working of EDs

The financial statements of EDs are not strictly comparable to those of the SEBs, particularly as the depreciation and interest payments of the EDs are not shown separately. In view of this, their financial working has not been analysed in the same detail as that of SEBs. Only the gross operating surpluses or deficits of the EDs are reported. The gross operating surplus is defined as the revenue receipts minus the operating expenses. The gross deficit of these EDs was of the order of Rs.37 crore in 1992-93. It increased to Rs. 208.2 crore in 1998-99 (RE). It is likely to increase to Rs. 224 crore in 1999-2000.

It is thus observed from the above analysis that the financial position of the SEBs has deteriorated over the years. In order to enable the SEBs to meet the power demand efficiently, they need to become autonomous, professional and commercially viable entities. The process of bringing about reforms in the functioning has already been initiated in a number of States. However, the pace of these reforms should increase. The progress of reforms in various states has been discussed in the next chapter.

Chapter 5 : Reforms and Restructuring of State Electricity Boards

5.1 Introduction

The objectives of power sector reforms is to generate electricity at an economic cost, provide a reliable and high quality service to the consumers, and ensure that the sector is financially viable and also provides an attractive environment to bring in private investment. Focus of reforms so far has been on promoting private investment in generation, improving regulatory environment both at the federal level and the state level and re-structuring/unbundling of State Electricity Boards into separate generation/transmission and distribution entities. Unbundling the SEBs and separating generation, transmission & distribution into separate Corporations makes it possible to monitor efficiency levels in each activity and also to create appropriate incentives for efficiency in each area. Un-bundling also makes it easier to allow entry of private sector operators in each area in a suitable manner which ensures competitive environment. Accordingly several States have initiated power sector reforms along these lines. However, the progress in this respect continues to be very slow. Some State Governments have taken concrete steps towards power sector reforms. The remaining states are also taking initiative in this regard.

5.2 Initiatives Taken by State Governments

The following States have made substantial progress on this line:-

Orissa

Orissa was the first State to initiate reform of the Power Sector w.e.f April 1,1996. The reform envisaged setting up of separate generating as well as Transmission and Distribution (T& D) agencies. Accordingly, the Orissa SEB has been split into three entities viz. *Orissa Power Generation Corporation* (OPGC- for thermal power), *Orissa Hydro Power Corporation* (OHPC - for hydel power) and *Grid Corporation of Orissa* (GRIDCO - for transmission and distribution network). A Separate Regulatory Commission has been constituted as a statutory and autonomous institution to regulate and co-ordinate the activities of all these corporations. The State has already been divided into four zones for distribution by four subsidiaries of GRIDCO in the joint sector, namely North-Eastern (NESCO) , Western (WESCO), Central (CESCO) and Southern (SOUTHCO). While 51% share of three companies namely WESCO, NESCO, SOUTHCO have been given to BSES; the fourth subsidiary company namley CESCO has been offered to AES Corporation of USA.

Haryana

The State Electricity Board was converted into two separate entities on August 14, 1998. It has set up corporations namely *Haryana Power Generation Corporation* (HPGC) for generation and *Haryana Vidyut Prasaran Nigam* (HVPNL) for transmission of power. On the lines of the Orissa model, the State has constituted a Regulatory Commission. It has also appointed a Consultant to advise it on the privatisation of distribution. There are plans to limit

the distribution zones into two due to the wide variations in load across the state viz. Uttar Haryana Bijili Vitaran Nigam Ltd. (UHBVNL) and Dakshin Haryana Bijili Vitaran Nigam Ltd. (DHBVNL).

Andhra Pradesh

The Andhra Pradesh Electricity Reform Act, 1998 has been notified on 29th October, 1998. APSEB has been unbundled into two separate companies namely, *Andhra Pradesh Power Generation Corporation* (APGENCO) for generation and *Andhra Pradesh Transmission Corporation* (APTRANSCO) for transmission of power. Proposal is to form a number of distribution companies.

Uttar Pradesh

Reforms Bill passed and SERC constituted. UPSEB is proposed to be split into three separate entities namely UP Thermal Generation Corporationfor thermal generation, UP Hydro Generation Corporation for hydro power generation and UP Power Corporation Ltd for transmission and distribution of power. The State has approached the World Bank for APL of US $ 1 billion for reform and restructuring of power sector in the State.

5.3 Independent Regulatory Commissions for Power

Reform of the Power Sector would be greatly aided by the establishment of Independent regulatory agencies responsible for setting tariffs and regulating power purchase agreements. Accordingly, the Government of India has enacted Electricity Regulatory Commission Act, 1998 for setting up of Independent regulatory bodies viz. The Central Electricity Regulatory Commission (CERC) and the State Electricity Regulatory Commissions (SERCs) at the Central level and State level respectively. These regulatory bodies would primarily look into all aspects of tariff fixation and matters incidental thereto.

Central Electricity Regulatory Commission (CERC)

CERC was constituted on 2-7-1998 at the Central level and conduct of Business Regulation notified on 26-4-1999. CERC is in operation. They have issued the note for Bill Power Tariff and draft availability tariff has also been issued.

State Electricity Regulatory Commissions (SERCs)

There are 14 states which have set up their respective SERCs. While the States of Orissa, Andhra Pradesh and Haryana have set up SERC under their own Act , the other States viz. UP, MP, Punjab, NCT Delhi, West Bengal, Gujarat, Rajasthan, Tamil Nadu, Maharashtra and Karnataka have set up under the Central ERC Act.

The status of reforms in various states is given below.

5.4 Status of reforms in various States

State	Status
1. Orissa	- Reforms Act, passed and OERC set up in 1996.
	- SEB unbundled into OPGC,OHPC and GRIDCO with four subsidiary distribution companies , OPGC, disinvested.
	- Distribution companies privatised- 51% share of 3 companies WESCO, NESCO, SOUTHCO given to BSES and of the fourth (CESCO) to AES Corpn. of USA.
	- World Bank loan - US $ 350 million, DFID assistance, 64.5 million Pounds
2. Haryana	- Reforms Act notified in March,98 and HERC set up on 17.8.98.
	- HSEB unbundled in Aug.98) into HVPN (Haryana Vidyut Prasaran Nigam Ltd), A power transmission company and HPGC (Haryana Power Generation Corpn. Ltd) a generation company.
	- Two distribution companies viz UHBVNL(Uttar Haryana Bijli Vitran Nigam Ltd) and DHBVNL(Dakshin Haryana Bijli Vitran Nigam Ltd) established
	- Loan assitance of US $ 600 million for power sector reforms programme committed by World Bank for 10 years. DFID 15000 UK Pound.
	- Financial Restructuring Study and Asset Evaluation Study by M/s ricewatterhouse Coopers . M/s Auther Andersen Consultants engaged as Reforms Consultants for Corporatisation, commercialisation and privatisation of distribution.
3. Gujarat	- SERC constituted.
	- Reforms/restructuring with ADB assistance. ASCI appointed to conduct Study on restructuring of GEB.
4.Maharashtra	-SERC constituted. Commitment to reforms with technical and financial Assistance from PFC.
	-SERC constituted. Commitment to reforms with technical and financial Assistance from PFC.
5.Andhra Pradesh	- APERC Act 1998 enacted and SERC set up
	- APSEB unbundled into Transmission Corporation of Andhra Pradesh Ltd (APTRANSCO)and Andhra Pradesh Power Generation Ltd. (APGENCO)
	- Loan of US $ 790 million committed by World Bank. APL 1 of US $ of 210 million $ released. Supplementary technical cooperation Grant of UK Pound 28 million approved by DFID.
6. Rajsthan	- Reforms Bill drafted. The selection Committee for selecting Chairman/ Members of SERC constituted.
	- Task Force headed Chairman, RSEB constituted,with 8 working

	Groups to implement reforms.
7..Karnataka	- Electricity Reforms Ordinance Promulgated. Reform studies through ASCI, SERC, constituted on 6.19.99. SEB has been unbundled.
8. TamilNadu	- SERC set up. Commitment to reforms with technical and financial assistance of PFC.
	- Ernst and Young appointed consultants for reform s study.
9. Madhya Pradesh	- SERC set up. London Economics and Ian Pope appointed consultants to suggest Reforms models.
10. U.P	- Reforms Bill passed and SERC constituted.
	- UPSEB to be split into UP Thermal Generation Corporation. UP Hydro Generation Corporation and UP Power Corporation Ltd.
	- Negotiations with World Bank for APL of US $ 1 billion. APL of US $ 150 Million for system improvement being considered by World Bank.
11.Goa	- The selection Committee constituted. Commitment to reforms with technical and financial assistance of PFC
12.W.B	- SERC set up. Reform action plan to be formulated on acceptance of recommendations of State level reorganisation Committee
	- Tariff rationalisation study on . PFC assisting GOWB/WBSEB/WBPDCL in Securitisation of WBPDCL receivables from WBSEB.
13.Assam	- ASCI report on reforms and restructuring submitted.
	- Tariff rationalisation study on.
14.Kerala	- CIDA assistance to KSEB for conducting the restructuring study of state Power sector. Four task forces formed.
15.Punjab	- Commitment to carry out reforms with assitance of PFC. SERC notified.
	- Tariff rationalisation study on.
16.Meghalaya	-The SEB of Meghalaya has commissioned studies for capital restructuring and assets evaluation with an eye on reforms.
17.H.P	PFC discussions with State Government reg. Restructuring of power sector.
18. J&K	- The state Govt has drafted its own Electricity Regulatory Commission Bill in consultation with ASCI.
19.Ar.Pradesh	- SERC constituted.
20.Delhi	- On recommendations of a strategy paper major restructuring programme is being initiated.
	-The objective is to unbundle and corporatise the generation, transmission and Distribution.SERC has been set up and if functional.

Status of unbundling of SEBs and formation of transmission, distribution and generation Companies.

- Orissa SEB unbundled into Orissa Power Generating Corporation, Orissa Hydro Power Corporation and Grid Corporation of Orissa(GRIDCO)
- GRIDCO had initially four subsidiary companies all of which have been privatised recently.
- 51% share of above three companies namely WESCO, NESCO and SOUTHCO have been given to BSEB. 51% share of the fourth subsidiary company namely CESCO has been to AES Corpn of USA
- Haryana SEB unbundled into Haryana Vidyut Prasaran Nigam Ltd and Haryana Power Generation Company Ltd.
- Two distribution companies namely Uttar Haryana Bijli Vitran Nigam Ltd and Dakshin HaryanaBijli Vitran Nigam Ltd have been established.
- Andhra Pradesh SEB unbundled into Transmission Corporation of Andhra Pradesh Lt d and Andhra Pradesh Power Generation Corporation Ltd.
- The unbundling of SEBs in Orissa Haryana and A.P took place only after the respective State Govts enacted their power reforms bills

In the State of U.P and Karnataka Power reform bill have recently been enacted. The Ministry of Power has given no objection to Rajsthan Reform Bill. In these acts/ bills ,there are provision of unbundling of these states.