Power

9.7 Power generation in 2004-05 was anticipated to touch 583.8 billion Kwh, a growth of 4.6 per cent over the last year. The growth of power generation in April-December 2004 was 6.5 per cent as compared to 3.4 per cent in the corresponding period last year (Table 9.2). The data on power generation includes only generation by utilities and, hence, understate generation in the country by failing to capture captive production. Nevertheless, end-consumers of electricity continue to experience shortages in terms of reliable access to electricity. Effective enforcement of Electricity Act, 2003 is necessary for solving the problems of power generation, transmission and distribution.

9.8 During the period from 1992-2004 power generation capacity grew at an annual rate of 4.16 per cent while GDP grew at an annual rate of 6.4 per cent (Table 9.3). During the two years 2002-03 and 2003-04, generation capacity of 7,687 MW was installed. Capacity addition of 5245.5 MW is targeted for the current year, of which 3,100 MW have already been commissioned.

9.9 Public policy has consistently attempted to encourage hydel and wind energy sources which do not rely on fossil fuels and also avoid carbon emissions. Some success in this regard is evident, with power generation from

Table 9.2 : Trends in the power sector (utilities only)

	2002-03	2003-04	April-December* 2003-04	April-December* 2004-05	Change over previous year 2003-04	Change over previous year 2004-05@
		(Billion KWH)			(per cent)	
1 Power generation**	531.6	558.3	411.4	437.9	5.0	6.5
(i) Hydro-electric	63.8	73.8	57.6	67.7	15.7	17.6
(ii) Thermal	448.6	466.8	340.5	357.9	4.1	5.1
(iii) Nuclear	19.3	17.7	13.3	12.3	-8.3	-7.2
2 Plant load factor of thermal plants (per cent)	72.2	72.7	70.2^	72.8^	NA	NA

*** Provisional @April-December ^April-November NA : Not Applicable**

**** Excludes generation from captive and Non-Conventional power plants.**

Table 9.3 : Installed electricity generation capacity

(Megawatt)

Year	Thermal	Hydro +Wind	Nuclear	Total
1991-1992	48,086	19,194	1,785	69,065
1995-1996	60,083	20,985	2,225	83,293
1999-2000	70,493	25,012	2,680	98,185
2003-2004	77,974	31,995	2,720	112,682
Compound growth (per cent), over 1991-2004	**4.11**	**4.35**	**3.67**	**4.16**

Source : Ministry of Power.

such sources growing at a faster rate. India has an estimated unutilized hydro power potential of more than 150,000 MW. A study by the Central Electricity Authority (CEA) has identified 399 potential hydel projects with an aggregate capacity of 107,000 MW, which are yet to be developed. The study has focused on six major river systems, and projects have been categorised in categories A, B & C based on their commercial viability. Of these projects, the Ministry of Power and Central Electricity Authority have identified 162 most promising projects, spread across 16 States, with an aggregate capacity of 50,560 MW.

9.10 During the first nine months of the year 2004-05 investment approvals totaling Rs.6,100 crore were accorded in the Central Sector to power generation schemes of 600 MW and Transmission schemes of 4,806 Circuit Kilometer (ckm is the product of the number of lines and the length in kilometer).

9.11 The Plant Load Factor (PLF) of the overall system, an important measure of the operational efficiency of thermal power plants, has improved significantly from 64.6 percent in 1998-99 to 72.9 per cent in the period April - November 2004, implying a secular improvement in the efficiency of power generation. During April-November 2004, the PLF of central power plants was higher than that of State Electricity Boards (SEBs) put together; while PLF of private plants was higher (87 per cent) than that in the public sector (Table 9.4). A striking aspect of the PLF data is that from 2002-03 to 2004-05 the PLF of SEBs and the central sector has been roughly stagnant. Over the same period, the private sector PLF rose sharply from 78.9 to 86.9 per cent. However, the average for SEBs as a whole masks substantial variation across States. The PLF for the eastern states are

Table 9.4 : Thermal plant load factor								
	1999-00	2000-01	2001-02	2002-03	2003-04	2003-04 (Upto Nov. 2003)	2004-05 (upto Nov. 2004)
I. State Electricity Boards	64.3	64.3	67.0	68.7	68.4	65.9	68.1
II. Central Sector	72.5	72.2	74.3	77.1	78.7	75.6	78.8
III. Private Sector	68.9	76.4	74.7	78.9	80.5	83.2	86.9
Northern	71.0	72.0	75.1	75.4	76.3	73.5	75.7
Western	72.3	72.1	74.1	75.8	75.1	72.3	76.7
Southern	79.6	79.7	82.4	86.4	83.4	81.7	81.2
Eastern	46.1	47.0	48.7	52.1	56.9	54.5	58.0
North Eastern	18.3	18.2	16.7	14.8	14.0	13.3	14.4
All India	**67.3**	**67.7**	**69.9**	**72.2**	**72.7**	**70.2**	**72.8**

particularly low, the lowest being 3.2 per cent for Bihar SEB. If the PLF of the eastern region is brought on par with the rest of the country, it would induce additional generation of 47 billion kilowatt hours per year. The eastern and north eastern regions are also bestowed with immense potential for cheap coal and hydro potential, which can be harnessed for meeting the growing energy demands of the regions as well as the power needs of the other regions.

Securitisation of outstanding dues

9.12 Considerable progress has been made in the settlement of dues payable by SEBs to Central Public Sector Undertakings (CPSUs) and the Railways through a one-time settlement scheme. All 28 State Governments signed the Tripartite Agreement envisaged under the scheme, which was between the State Government, Reserve Bank of India and the Government of India. Out of these, 27 States have issued bonds amounting to Rs.29,883 crore. The Government of National Capital Territory of Delhi securitized its outstanding dues by converting the dues into long-term advances of Rs.3,316.28 crore payable to the CPSUs concerned separately under bi-partite Agreements, as they do not have the power to issue bonds.

9.13 The scheme has resulted in improvement in collection of dues of the power sector CPSUs (Table 9.5).

Table 9.5 : Collection of dues from SEBs by CPSUs				
CPSU	2001-2002	2002-2003	2003-2004	2004-2005 (Apl.-Dec.)
NTPC	76.74	92.30	100.70	100.00
NHPC	69.03	94.44	97.06	100.00
PGCIL	88.92	95.16	98.30	99.40
NEEPCO	74.78	71.49	87.50	94.61
DVC	100.00	91.92	93.28	93.20

9.14 The rate of return of SEBs in 2004-05 works out to –28 per cent as against –38 per cent in 2003-04 (Table 9.6). The resource flow arising out of such poor return is very large. The direct transfers from State Governments to SEBs in 2004-05 amounted to Rs.9,825 crore. In addition, there was an uncovered subsidy of Rs.17,520 crore. Thus reforms in the electricity sector have the potential of making a considerable impact on the fiscal problems of States.

9.15 The Electricity Act, 2003 has helped enhance investment in the power sector. Eleven Independent Power Projects (IPPs) of more than 4000 MW capacity, involving investment of about Rs.13,700 crore, achieved financial closure in January-September, 2004. Eight IPPs of about 10,000 MW capacity with proposed investment of Rs.33,000 crore are being examined by investment bankers. These projects may achieve financial closure by February 2005.

Table 9.6 : Financial performance of the State power sector

(Rs. Crore)

		1991-92	2003-04(P)	2004-05 (RE)	2005-06 (AP)
A.	**Gross Subsidy involved**				
	(i) On account of sale of electricty to				
	(a) Agriculture	5,938	23,346	23,806	25,377
	(b) Domestic	1,310	8,885	9,639	10,033
	(c) Inter-State Sales	201	923	866	591
	Total	**7,449**	**33,154**	**34,311**	**36,002**
	(ii) Subventions Received from State Govts.	2,045	11,081	9,825	9,831
	(iii) Net Subsidy	5,404	22,073	24,486	26,170
	(iv) Surplus Generated by sale to other sectors	2,173	6,133	6,967	8,640
	(v) Uncovered Subsidy	3,231	15,941	17,520	17,530
B.	**Commercial Losses**				
	i) Commercial Losses (excluding subsidy)@	4,117	20,379	20,715	22,013
	ii) Commercial Losses (including subsidy)	NA	9,298	10,890	12,182
C.	**Rate of Return (ROR %) #**	**-12.70**	**-28.32**	**-27.97**	**-28.13**
D.	**Revenue Mobilisation**				
	Additional Revenue Mobilisation from achieving				
	(a) 3% ROR	4,959	22,538	22,936	24,362
	(b) From introducing 50 paise per unit from Agriculture/Irrigation	2,176	540	755	773

RE : Revised Estimates *** Provisional**
AP : Annual Plan Projection **# for losses without subsidy.**
@ Commercial losses are different from uncovered subsidy because they include financial results of other activities undertaken by the SEBs.

Note : 1 The information regarding commercial losses in case of Orissa an Delhi pertains to GRIDCO of Orissa and Transmission Company of Delhi only.

2 Information in case of Andhra Pradesh, Haryana, Rajasthan, Uttar Pradesh, Uttaranchal and Karnataka states is relating to transmission and distribution companies set up after the reforms. In case of other states, the information pertians to SEBs.

Source : Planning Commission.

Box 9.1 : Electricity tariff for 2004-09

CERC has emphasized that all future projects and new investment in generation, transmission and distribution, both by public sector utilities as well as independent power producers(IPPs) should be structured through a tariff based transparent competitive bidding process. This would be an improvement over the existing framework of detailed regulation based on a 'cost plus' approach, which leads to inefficiencies and lack of incentive for cost minimisation.

During the period of transition to a competitive bidding regime, CERC proposes that tariff regulation should move away from the cost plus actuals approach, to style of light handed regulation based on normative parameters. This would incentivise efficiency and streamline tariffs. These parameters include:

- In the new terms and conditions for regulating the tariff of projects set up on cost plus basis, CERC will adopt a normative debt equity ratio of 70:30 for all generation and transmission projects.
- The return on equity shall be 14 per cent post tax, uniformly applicable to CPSUs and IPPs.
- Advance against depreciation shall be allowed to meet debt service obligations by considering the repayment period of loan as 10 years. The development surcharge has been discontinued.
- The performance benchmarks of plant availability for hydro and thermal generating stations have been raised.
- Efficiency benchmarks for coal, lignite and gas based thermal generating stations have been raised.
- The norms for specific oil fuel consumption and auxiliary energy consumption within the power stations have been tightened.
- Normative benchmarks have been set for operation and maintenance expense payable to thermal generating stations and transmission licensees.
- The frequency linked unscheduled interchange (UI) rates for deviation from the generating or energy drawal schedules have been revised upward.

Power Trading

9.16 A central policy goal in the field of electricity is that of shifting to a competitive market framework, where electricity is bought and sold across an ecosystem of producers, consumers and intermediaries. This framework emphasizes choice by consumers, and competition amongst producers. Under this framework, patterns of energy conservation, investments in generation, and time-of-day characteristics of consumption would be shaped by price-based incentives.

9.17 A milestone in this evolution is the introduction of the "Availability Based Tariff", which is a stepping stone to a spot market for electricity. The Central Electricity Regulatory Commission (CERC) has implemented Availability Based Tariff (ABT) in all the five electrical regions of the country at the inter-State level. The price for `unscheduled inter-changes' (UI) of energy has been related to the grid frequency. Since the grid frequency drops below 50 hertz when demand exceeds supply and vice versa, this generates incentives for grid discipline, and for reduced demand and additional supply when there are shortages. As a consequence, grid discipline has improved remarkably; the grid frequency now stays much closer to 50 hertz as compared with the situation prior to the ABT. Among other things, this has helped reduce the damage to capital equipment caused by fluctuations in the frequency.

9.18 These developments have taken the market for electricity closer to other normal markets in the economy. While the ABT contains many elements of a spot market for electricity, it is still inhibited by major barriers to entry. The removal of these entry barriers will take this market closer to competitive conditions, and induce improvements in efficiency.

9.19 The Electricity Act, 2003 made considerable progress in terms of giving buyers and sellers of electricity flexibility to transact with each other. It emphasised the role of traders in serving the power needs of the country. Distribution, trading and transmission have now become licensed activities, while thermal generation has been de-licensed. The distribution licensee does not require a separate trading license. Apart from increased competition over the long term, the near-term impact of these measures will be that of making the owner-trader and distributor-trader business models a reality. Market development has been enabled by many other policy initiatives, including inter-regional link lines of roughly 9 GW capacity and online real-time information dissemination from the five Regional Load Dispatch Centres (RLDCs).

9.20 The typical participant in the market today is a state power utility, although some private generators and distribution licensees have also participated. Captive generators and high tension (HT) consumers are yet to participate in these transactions. A power utility essentially performs two functions to serve its customers - managing loads (the load serving side) and managing a portfolio of power generation facilities (the generation side). In matching these two sides of the business, it discovers mismatches on the supply and demand sides, and therefore needs to either procure more power or sell any power that is surplus. At the same time, a counterpart utility has a matching surplus or deficit positions, and this matching positions of counterpart utilities create an opportunity to buy and sell power - what has now come to be defined in the Electricity Act as 'trading' or purchase for resale. As of yet, this is a highly illiquid market; the trading volume of 11 billion kilowatt hours in 2003-04 was roughly only 3 per cent of electricity generation in that year.

Scheme for Rural Electricity Infrastructure and Household Electrification

9.21 Earlier, a village was defined as being electrified if at least one connection existed. In 2003-04, the definition of an electrified village was amended to require linking at least 10 percent of the households in the village, to require that electricity is provided to public places like schools, panchayat office, health centers, dispensaries and community centers, and to require that distribution transformers and distribution lines are provided in the

inhabited locality as well as a Dalit Basti/hamlet if it exists. Using this new definition, out of the total number of villages as of the 1991 census of 5,87,556, there were 1,12,401 villages where electrification had not been done.

9.22 The NCMP envisages electrifying all these villages over a five year period. The strategy through which this is sought to be achieved consists of the following elements:

(i) Creation of Rural Electricity Distribution Backbone (REDB) of 33/11 KV substations, with one such substation in each block appropriately networked and linked to the State transmission system.

(ii) Creation of Village Electricity Infrastructure (VEI) by providing Distribution Transformer(s) with at least one such transformer in every village.

(iii) Rural Households Electrification of unelectrified households from village distribution transformer(s).

(iv) Decentralized distributed generation system for such villages where grid connectivity is either not feasible or not cost effective.

Distribution reforms

9.23 Achieving sound policies on distribution is widely understood to be the key constraint in the power sector. There has been an effort to sign Memoranda of Understanding with State governments, under which they were to undertake distribution reforms in a time-bound manner, including setting up of a State Electricity Regulatory Commission (SERC), unbundling of State Power Utilities, metering of feeders and consumers, starting energy accounting and auditing, securitisation of outstanding dues of CPSUs, and grid discipline being promoted to improve both the quantity and quality of power supply. This approach has yielded significant results. As of date, 24 States have constituted SERCs and 18 have issued tariff orders in the direction of rationalizing the tariffs. 12 States have unbundled/corporatised their power utilities, and 10 others are expected to replicate this shortly. Distribution has been privatised in Orissa and Delhi, and Uttar Pradesh has invited Expressions of Interest for privatization of distribution. The 2002 privatization experience of Delhi has been encouraging so far (Box 9.2).

9.24 Continued progress is reported on metering. Metering at the feeder level rose from 81 per cent of States in 2000 to 96 per cent in 2004. Similarly, 77.6 per cent of States were

Box 9.2 : Privatization experience in Delhi

Electricity distribution was privatised in Delhi in July 2002. The transaction structure was focused on reduction of theft. Prior to privatization, the Aggregate Technical and Commercial (AT&C) loss level was 50.7 per cent. A loss reduction path of 17 percentage points was charted for the private distribution companies over a period of five years. These private companies have strong incentives to outperform these targets, since the loss reduction would be equally shared between consumers and the distribution companies. The energy shortage in Delhi has declined from 1.9 per cent in 2002-03 to 1.4 per cent in 2003-04. The index of power availability has also improved

Parameter	As on July 2002			2003-04			2004-05 (*)		
	BRPL	BYPL	NDPL	BRPL	BYPL	NDPL	BRPL	BYPL	NDP
Reliability Index (%)	96.98	96.46	98.5	N.A	N.A	99.57	98.84	98.64	99.64

(*) – Till Oct. 2004

Abbreviations :

BRPL : BSES Rajdhani Power Ltd.

BYPL : BSES Yamuna Power Ltd.

NDPL : North Delhi Power Ltd.

metering all consumers in 2000, which rose to 87 per cent in 2004.

9.25 The Central Electricity Authority has reported that the States of Arunachal Pradesh, Assam, Bihar, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Mizoram, Orissa, Rajasthan, Uttar Pradesh, Uttaranchal & West Bengal have shown reduction in Transmission and Distribution Losses (T&D) during 2002-03 in comparison to the previous year. On a national basis, the T&D loss dropped from 33.98 per cent in 2001-02 to 32.54 per cent in 2002-03.

9.26 Power Finance Corporation (PFC) conducted a study on the financial health of State Utilities. Based on data made available by 16 States, the study found that operating losses of State Power Utilities which were Rs.25,207 crore in 2001-02 had dropped to Rs.17,593 crore in 2002-03. The gap between Average Cost of Supply (ACS) and Average Revenue Realised (ARR), which was 110 paise per KWH during the year 2001-02, had dropped to approximately 63 paise per KWH during the year 2002-03 in these 16 states.

Accelerated Power Development Reforms Programme

9.27 With a view to giving a fillip to State Governments, SEBs and utilities to take adequate steps towards reduction of transmission, distribution and commercial losses, the Government is implementing the Accelerated Power Development and Reforms Programme (APDRP). Funds are released as Additional Central Plan Assistance to State Electricity Boards (SEBs)/Utilities for upgradation and strengthening of the sub-transmission and distribution system with the objective of reducing Aggregate Technical and Commercial (AT&C) losses, improving quality of supply of power, increasing revenue collection and improving consumer satisfaction. APDRP is also an instrument to leverage distribution reforms in the States. The Government has allocated Rs.3500 crore for APDRP in 2004-05: Rs.1,750 crore under the investment component and Rs.1,750 crore under the incentive component

9.28 Under the investment component, so far, 499 projects amounting to Rs.17,619 crore have been sanctioned in 29 States during the triennium ending in 2004-05. The disbursement for the year 2002-03 was Rs.17,55.51 crore and for 2003-04 was Rs.2,356.51 crore. APDRP provides incentives for achievement of loss reduction: so far six States have qualified and received the incentive payments (Table 9.7).

Table 9.7 : Releases under APDRP

(Rs. in crore)

State	Cash Loss Reduction	Incentive released
Gujarat	472.74	236.38
Maharashtra	275.78	137.89
Haryana	210.98	105.49
Rajasthan	275.42	137.71
Andhra Pradesh	530.22	265.11
West Bengal	146.00	73.00
Total	**1911.14**	**955.58**

9.29 The Government has announced recently the National Electricity Policy as envisaged in the Electricity Act, 2003 enunciating the Government's resolve to make available electricity to all households in five years and to fully meet the power demand by 2012 (Box 9.3). However, a continued focus on questions of open access, as enshrined in the Electricity Act, 2003 and a level playing field, for all present or future participants in the electricity sector, is required in order to obtain competitive conditions.