

Table 9.4 : Percentage Transformation, Transmission & Distribution losses (including energy unaccounted for) in States/UTs

(Per cent)

Rank	State	1992-93	2001-02
1	Daman & Diu	15.67	7.52
2	Lakshadweep	18.72	10.94
3	Pondicherry	15.31	12.00
4	Tamil Nadu	17.3	16.06
5	Meghalaya	11.62	22.66
6	Chandigarh	26.21	24.97
7	Goa	21.85	25.18
8	Himachal Pradesh	19.98	25.55
9	Jharkhand	-	26.39
10	Andhra Pradesh	20.65	26.81
11	Gujarat	22.2	26.87
12	D&N Haveli	17.98	27.22
13	Punjab	19.61	27.70
14	A&N Island	23.62	29.20
15	West Bengal	17.53	31.67
16	Sikkim	22.55	31.73
17	Kerala	22.77	32.21
18	Uttaranchal	-	32.39
19	Chhattisgarh	-	33.75
All India		21.8	33.98
20	Karnataka	19.62	33.83
21	Maharashtra	18.51	37.28
22	Uttar Pradesh	24.68	37.62
23	Haryana	26.78	39.22
24	Tripura	30.64	40.38
25	Assam	21.41	42.78
26	Rajasthan	22.71	43.06
27	Delhi	24.02	43.97
28	Madhya Pradesh	22.52	44.55
29	Orissa	25.87	47.34
30	Jammu & Kashmir	48.13	48.85
31	Mizoram	29.04	49.77
32	Bihar	17.15	51.70
33	Nagaland	27.26	52.32
34	Arunachal Pradesh	32.32	53.58
35	Manipur	22.35	62.35

Source :- DMLF Division, CEA (General Review)

Transmission

9.6 The eastern region of the country has strengths in coal-fired generation and the north-eastern region has strengths in hydel generation. On the other hand there is strong demand for electricity in the northern, western and southern regions. These 'gains from trade' are being harnessed by strengthening inter-regional trade in electricity. The Electricity Act has already created the legislative framework through which buyers and sellers of electricity anywhere in the system can be brought together.

9.7 The national power grid has been strengthened to facilitate transfer the electricity from the surplus regions to the customers elsewhere in the country. From March 2003 onwards, the eastern region and north-eastern region are working in synchronized mode with the Western Regional Grid. Upto 1,500 MW flows into the Western Regional Grid. The present total Inter Regional Transmission capacity available across all regions is 8,100 MW. Another 2,500 MW capacity is under construction. As buyers and sellers of electricity fully exploit the opportunities that have unfolded after the Electricity Act, there will be heightened demand for transactions that span large distances.

Distribution

9.8 Transmission and distribution (T&D) losses in 2001-02 were as much as 34 per cent of generation (Table 9.4) for the country as a whole. Among major States, T&D losses were lowest in Tamil Nadu (16.1 per cent) and highest in Bihar (51.7) per cent. The level of all-India T&D losses in 1992-93 of 21.8 per cent gives the impression that such losses went up in the 1990s. However any such comparison should factor in the fact that the processes of measurement of T&D losses have improved over time and the earlier estimates are considered to be biased downwards. Nevertheless, the high T&D loss figures clearly indicate the enormous scope for improvements in transmission.

9.9 Along with T&D losses, one of the central problems faced in the electricity sector is the

poor cost recovery in distribution (Table 9.5). Cost recovery across States, measured by expressing revenues as per cent of costs, shows that in all States, revenues from selling electricity fell short of the cost of buying or producing it both in 1993 and 2003, the only exception being Chattisgarh in 2003. While this shortfall, which gets charged to the State exchequer, as a proportion of expenditure, narrowed in some States between 1993 and 2003, it widened in several others. The rate of return of SEBs in 2003-04 worked out to -31 per cent. The resource flow owing to this problem is extremely large. For example, in 2003-04, the direct transfers from state

governments to SEBs amounted to Rs. 11,427 crore. In addition, there was an uncovered subsidy of Rs.14,846 crore. These magnitudes suggest that modernizing the electricity sector alone could make a considerable impact upon the fiscal problems of State governments (Table 9.6).

9.10 Early attempts at the introduction of private generation companies into India's electricity sector faced difficulties because of the poor financial health of the distribution monopolies owned by the States. Private companies embarking on power generation faced credit risk, i.e. fear of non-payment by SEBs. With SEBs as the sole transmission and distribution companies, Independent power producers, perceived some credit risk, for these reasons not enough private sector investments in independent power plants were forthcoming. The Electricity Act 2003 was partly a response in order to fill this important lacunae.

Electricity Act, 2003

9.11 The Electricity Act 2003 was enacted with the main objectives of providing a liberal and progressive framework for growth of power sector by introducing competition in different segments of generation, trading and distribution of electricity. It has removed barriers to entry of private sectors in these segments. This new legislation brings into effect many measures to ensure protection of interests of the consumers in terms of quality of service, price regulation, right to get service on demand and redressal of grievances. The Act also provides appropriate institutional mechanisms for achieving the goal of supply of electricity to all areas. It also lays down the framework for reorganisation of the State Electricity Boards in a time frame to be decided by the State Government with consent of the Central Government. The National Common Minimum Programme of the UPA Government envisages a review of the Electricity Act 2003 in view of the concern expressed by a number of States. The mandatory date for unbundling and replacing the State Electricity Boards will be extended.

9.12 Under the new statutory regime, generation of power is completely delicensed and captive power generation is freely allowed. It allows open access to transmission network under regulatory supervision. Any generating company is now free to seek distribution license and vice versa. The present opaque

Table 9.5 : Cost recovery in sale of electricity

Rank	States	Revenue/ Expen diture (%) 1993	Revenue/ Expen diture (%) 2003	Change
1	Chattisgarh	NA	104.3	NA
2	Karnataka	96.5	99.9	3.4
3	Haryana (HPGC)	53.4	99.9	46.5
4	Rajasthan (RRVNP)	NA	98.2	NA
5	West Bengal (WBPGDCL)	NA	79.5	NA
6	Haryana (HVPN)	NA	85	NA
7	Meghalaya	81.3	79.9	-1.4
8	West Bengal (WBSEB)	71.5	79.5	8.0
9	Tamil Nadu	86.0	78.5	-7.5
10	Haryana (DHBN)	NA	77.6	NA
11	Rajasthan (JVVNL)	NA	77.2	NA
12	Jharkhand	NA	76.6	NA
13	Rajasthan (AVVNL)	NA	75	NA
14	Himachal Pradesh	88.4	73.4	-15.0
15	Gujarat	68.4	72.8	4.4
16	Rajasthan (JDVVNL)	NA	71.1	NA
17	Punjab	57.6	67.5	9.9
18	Madhya Pradesh	84.1	66.9	-17.2
19	Kerala	84.8	63.4	-21.4
20	Orissa (GRIDCO)	78.1	62.9	-15.2
21	Assam	47.4	61.8	14.4
22	Bihar	63.8	52.1	-11.7
23	Jammu & Kashmir	21.3	25.3	4.0
24	Andhra Pradesh	94.2	NA	NA
25	Delhi	81.7	NA	NA
26	Maharashtra	98.5	NA	NA
27	Uttar Pradesh (UPPCL)	70.7	NA	NA
28	Uttranchal	NA	NA	NA

* Included in the undivided States, NA: Not available
Sources: Financial Resources for Annual Plan.

Table 9.6 : Financial performance of the State power sector*(Rs. Crore)*

	1991-92	2002-03*	2003-04 (RE)	2004-05 (AP)
A. Gross Subsidy involved				
(i) On account of sale of electricity to				
(a) Agriculture	5,938	21,845	22,793	24,012
(b) Domestic	1,310	8,534	8,210	8,967
(c) Inter-State Sales	201	189	938	818
Total	7,449	30,568	31,941	33,797
(ii) Subventions Received from State Govts.	2,045	12,996	11,427	11,141
(iii) Net Subsidy	5,404	17,572	20,514	22,656
(iv) Surplus Generated by sale to other sectors	2,173	4,797	5,668	6,424
(v) Uncovered Subsidy	3,231	12,775	14,846	16,232
B. Commercial Losses				
i) Commercial Losses (excluding subsidy)@	4,117	21,382	21,517	21,698
ii) Commercial Losses (including subsidy)	NA	8,386	10,090	10,556
C. Rate of Return (ROR %) #	-12.70	-31.64	-30.86	-28.80
D. Revenue Mobilisation				
Additional Revenue Mobilisation from achieving				
(a) 3% ROR	4,959	23,410	23,609	23,744
(b) From introducing 50 paise per unit from Agriculture/Irrigation	2,176	456	250	533

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 relating to the subsidy for Agriculture, Domestic and Inter-state sales for the years 2002-03, 2003-04 and 2004-05 in respect of Orissa and Delhi is not available, as the distribution is entrusted to the Private Companies. The information regarding commercial losses pertains to GRIDCO of Orissa and Transmission Company of Delhi only.

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

3 The estimates for next fixed assets in respect of Uttaranchal Power Corporation have not been furnished and hence the over all ROR calculated for all the SEBs may not reflect the correct picture.

Source : Planning Commission.

cross subsidies would be slowly phased out, and replaced by a transparent and explicit subsidy to meet the social objectives prioritized by the State Government. For rural and inaccessible areas, stand alone systems involving generation and distribution are allowed without the requirement of license, and decentralized system of local distribution would be allowed through Panchayats, user associations, cooperatives or franchises. In this liberalized framework, multiple players in generation, supply and trading will compete in the marketplace under the oversight of the regulator.

9.13 A major consequence of the Electricity Act 2003 is a rise in trading in electricity. The Central Electricity Regulatory Commission (CERC) has implemented a key provision of the Act, and by issuing regulations for open access in inter-state transmission, heralded

a new chapter in the electricity sector. The open access regulations enable generation companies, distribution companies, electricity traders and captive plant owners to access transmission networks across the country for the purpose of transporting electricity.

9.14 The CERC has implemented Availability Based Tariff (ABT) in all the five electrical regions of the country at the inter-state level. The ABT facilitates merit order dispatch of various generating stations having different variable costs. The ABT has the unique feature of flexibility to cater to fluctuations in demand of power in the electricity grid through a commercial pricing mechanism known as the unscheduled energy inter-change rate (UI rate). The price for unscheduled inter-changes of energy is related to grid frequency in a manner to encourage grid discipline. As a result, the grid frequency has improved

remarkably after the implementation of ABT in the country. The UI mechanism facilitates the spot sale or purchase of electricity into or out of the electricity grid and does not require the services of a trader. As UI mechanism is an alternative to formal trading, it provides a sort of benchmark price for the trading of electricity and does not allow the price of traded electricity to shoot up.

9.15 These developments take the market for electricity closer to other normal markets in the economy, such as markets for (say) garments or footwear, in that there is competition between multiple producers, and customers have choices. CERC is the regulator and licensing authority for firms that seek to engage in power trading. CERC issued regulations governing licensing for power trading in January 2004.

9.16 Power Trading Corporation (PTC) and Vidyut Vyapar Nigam (of NTPC) have been important players in this nascent area. The creation of inter-regional link lines of nearly 4,300 MW capacity, and online information available through five Regional Load Dispatch Centre (RLDCs), have also played a part. These initiatives have resulted in trading of 11 billion units of electricity, or roughly 2 per cent of the generation in the country.

9.17 As is the case with markets for other products, an extensive growth of trading will lead to a better utilisation of the country's energy production. Liquid and efficient markets for electricity will tend to link up the marginal unit of electricity generated at some location in the country, to a consumer located elsewhere in the country with the highest incremental output from this electricity.

9.18 A highly beneficial aspect of this new paradigm is the onset of price flexibility, i.e. the commencement of *price volatility*. Fluctuations in price in this market for electricity are required, to induce rational responses on the part of producers and consumers. For example, when electricity prices are high, a supply response would be induced in the form of captive plant owners switching on their generation equipment in order to sell to consumers, and a demand response would be induced in the form of reduced consumption. These dynamic responses were stifled in the erstwhile policy framework, where the policy framework

prevented volatility in the price of electricity. This marks a milestone in the steady progress that has been made in India in moving towards price flexibility in the full range of markets.

9.19 A logical extension of the spot market for electricity is markets for futures and options on electricity, which will allow buyers and sellers to make contracts governing future dates, and to do risk management. These markets exist in several countries abroad. There is a possibility of some kinds of electricity derivatives coming about in India in 2004-05.

9.20 A key issue related, to the question of electricity trading, is that of a policy framework for tariffs. CERC has come out with a New Tariff Policy, covering the period 2004-2009. The main features of this policy are summarized in Box 9.2.

Accelerated Power Development Reforms Program (APDRP)

9.21 In addition to the Electricity Act, the central government created the Accelerated Power Development Reforms Program (APDRP). The budgetary allocation for 2003-04 for APDRP was Rs.3,500 crore. This offers fiscal support to State governments which undertake a reforms program which would bring down the aggregate technical and commercial (AT&C) losses from the conventional levels of around 50 per cent to a target of 15 per cent. APDRP, and other similar incentive-linked programs, are part of a new strategy of linking fiscal transfers from the centre to the States, to institutional reform programs at the State level. So far, investment projects amounting to Rs.15,642 crore have been sanctioned under APDRP covering 466 towns in the country. An amount of Rs.882.5 crore has been released under the incentive component to the states of Gujarat, Haryana, Maharashtra, Andhra Pradesh and Rajasthan in the first two years.

Recent experiences in State-level reforms

9.22 **Orissa:** Orissa was the first State which embarked on structural reforms in the electricity sector. The reforms law was enacted in 1996. The SEB was replaced by four distribution companies in 1998. These companies were privatized in 1999, when a 51 per cent stake was sold by the government. Three of the four companies are controlled by

Box 9.2 : New Tariff Policy of Central Electricity Regulatory Commission (CERC) 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 IPPs should be structured through a tariff-based transparent competitive bidding process. This should also obviate the need for detailed regulation based on the existing cost plus approach which leads to inefficiencies and lack of initiative for better performance.

During the period of transition to a competitive bidding regime, tariff regulation as far as practical, should move away from the cost plus actuals approach, to a new regime of light-handed regulation based on normative parameters. This would incentivise efficiency and streamline tariffs. The change-over from intrusive regulation involving detailed scrutiny of actual costs to a lighter regime of normative parameters is the distinctive feature of the new tariff regulation.

- 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 has 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.

The Electricity Act prescribes that the State Electricity Regulatory Commissions shall be guided by the principles and methodologies prescribed by CERC. Accordingly, the new tariff regulations of CERC would lead to greater harmonization, uniformity and certainty in electricity regulation across the States. The new terms and conditions of tariff finalized by CERC are likely to result in reduction in bulk electricity tariff, since the norms for servicing capital investment have been fine tuned with the current financing scenario and the benchmarks of efficiency have been raised. It would enable the SERCs, who determine the retail electricity tariffs, to pass on the benefit to the ultimate consumer.

BSES, and the fourth was by AES, which later abandoned this effort. The State Thermal Power Corporation was also privatised, with AES taking up a 49 per cent stake and adopting management control.

Andhra Pradesh: The AP Electricity Reforms Bill was passed in April 1998 and became effective in February 1999. The AP SEB was unbundled into two companies in February 1999. In April 2000, the distribution business was segregated from the transmission business, and four distribution companies were setup. Through these reforms, the power sector losses have dropped from 2.1 per cent of the State domestic product in 1999 to a level of 1.16 per cent in 2003.

Delhi: Electricity distribution was privatised in Delhi in July 2002. The focus in the transaction structure was a set of targets for reduction in theft. Prior to privatisation, the AT&C loss level was 50.7 per cent. A loss reduction path of 17 percentage points has

been charted for the private distribution companies over a period of five years. These private companies have strong incentives to outperform these targets, since the revenue gains beyond the targeted loss reduction would be equally shared between consumers and the distribution companies. Early statistics about the impact of these reforms will be seen in 2004-05.

9.23 The Plant Load Factor (PLF) is an important metric of the operational efficiency of thermal power plants. The PLF of the overall system has improved significantly from 64.6 per cent in 1998-99 to 72.7 per cent in 2003-04, implying a secular improvement in the efficiency of generation. This table 9.7 shows two systematic regularities. The PLF of central power plants was higher than that of SEBs, put together and the PLF of private plants is higher (80.4 per cent) than that in the public sector. The average for SEBs as a whole masks substantial variation across States. If

	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04*
I State Electricity Boards	60.7	64.3	64.3	67.0	68.7	68.4
II Central Sector	71.1	72.5	72.2	74.3	77.1	78.7
III Private Sector	68.3	68.9	76.4	74.7	78.9	80.4
IV Region						
Northern	67.2	71.0	72.0	75.1	75.4	76.3
Western	70.5	72.3	72.1	74.1	75.8	75.1
Southern	75.4	79.6	79.7	82.4	86.4	83.4
Eastern	44.3	46.1	47.0	48.7	52.1	56.9
North Eastern	18.7	18.3	18.2	16.8	14.8	14
All India	64.6	67.3	67.7	69.9	72.2	72.7
* Provisional	Source Ministry of Power					

the eastern States are excluded, the PLF of SEBs is not substantially different from that of central utilities.

Hydel and wind power

9.24 Hydel and wind generation are both particularly attractive renewable and non-polluting forms of electricity generation. These two technologies now account for 30 per cent of the total generation capacity. Significant progress has been made in hydel projects during 2003-04. Satej Jal Vidyut Nigam Limited (SJVNL) is a central sector undertaking in charge of a 1,500 MW hydel project on the Sutlej river in Himachal Pradesh. This project features some remarkable engineering achievements, including the longest power tunnel (27 km.) in the world. In 2003-04, SJVNL commissioned 500 MW of capacity. NHPC also commissioned a 300 MW hydel plant at Chamer on the Ravi river in Himachal Pradesh.

Rural electrification

9.25 During the year 2003-04, 4,267 inhabited villages were electrified and 1.9 lakh pumpsets/ tubewells were energised. Cumulatively 4.9 lakh villages have been electrified, and 140 lakh irrigation pumpsets have been energised as on March 31, 2004. As regards the electrification of tribal villages, 82,976 villages are reported to have been electrified as on March 31, 2004. Similarly, 3 lakh Harijan bastis have been electrified as of the same date.

9.26 The Government has recently decided to amend the definition of an electrified village

to the village where the number of households electrified is at least 10 per cent of the total number of households in the village, electricity is provided to public places like schools, panchayat office, health centres, dispensaries, and community centres, and basic infrastructure such as distribution transformer and distribution lines are provided in the inhabited locality as well as the Dalit Basti/hamlet where it exists. Earlier, a village was considered to be electrified if the electricity is being used within its revenue area for any purpose whatsoever which could include a single electric connection also. Using this new definition, apart from electrifying 1.4 to 1.5 lakh of un-electrified villages, a few more with less than 10 per cent intensity of household connection will have to be connected for improvement of supply.

9.27 Recently, the government has approved a new scheme for "Accelerated Electrification of One Lakh villages and One Crore Households". This new scheme replaces the existing Accelerated Rural Electrification Programme (AREP) and Kutir Jyoti Programme being administered by the Ministry of Power. According to the scheme, electrification of the un-electrified villages as on March 31, 2004 will be taken up. In addition, de-electrified villages are also to be taken upon on a case-to-case basis. In the already electrified, use and intensity of household electric connection will be improved to at least 10 per cent of the total households, where it is lower than the threshold, apart from electrifying important public places of the village.