CHAPTER 7

ENERGY DEVELOPMENT

India has a total installed capacity of 1,08,207 MW which includes 76,607MW from thermal, 27010 MW from Hydro and 2720 MW from nuclear sources. The share of hydro-electric power in India has been declining steadily since 1963. The hydro share declined from 44 per cent in 1970 to about 29 per cent in 2003. Prime Minister launched "50,000 MW hydro- power feasibility initiative" on 24th May 2003.

Status of Power System in Southern States

7.2 A comparison of key factors depicting the status of power system in Southern States is given in Table 7.1.

7.3 It will be seen from the above table that the distinctive features of Kerala's power sector are:

- Low per capita consumption over-all
- Very high percentage of domestic consumers with low tariff
- High percentage of consumption by power intensive Industries
- Very low consumption by Agriculture.

Growth of Power System in Kerala

7.4 The growth of Power System in Kerala during last few decades has been remarkable as could be seen from selected growth parameters in Table 7.2.

Table 7.1
Status of Power System in Southern States

Sl. No.	Particulars	Units	Kerala	Tamil Nadu	Karnataka	A.P.
1	Population 2001 census	Million	32	62	53	76
2	Per capita GDP (at current prices) Year	Rupees	19463	19889	18041	16373
3	Generation Capacity (owned)	MW	2038	5221	4292	5628
4	Total available capacity	MW	2608	7488	4817	7979
5	Peak demand met	MW	2347	6360	4571	7143
6	Energy available	Mu	12806	41764	27700	44497
7	T&D Loss	%	30	20	36	33
8	Energy Consumption	Mu	8752	33418	17844	29769
9	Energy Consumption per capita	Units	392	484	387	391
10	Villages electrified	%	100	100	99	100
11	Houses electrified (approximate)	%	86	70	70	60
12	No. of irrigation pumsets	Lakhs	4	18	13	19
13	Domestic Consumption/Total Cons.	%	43	19	23	21
14	Ind(LT+HT) Consumption/Total Cons.	%	38	36	22	24
15	Agri Consumption/Total Cons.	%	2	27	37	40
16	Agri Cons+Domestic Cons.(Total Energy Cons	%	45	46	59	61

Source: KSEB

Table 7.2
Growth of Kerala Power System

Particulars	1951	1961	1980	1995	2000	2001	2002	2003
Installed capacityMW	38	133	1012	1491.50	2350.68	2420.68	2601.62	2608*
Annual sales MU	140	518	4318	7027.69	9812.88	10319	8667.32	8752
PerCapita consumption KWh	13	30	96	231	300.54	311.67	395	392
EHT lines – Circuit KM	911	1900	4404	6099.21	7598.97	8955.18	9021.13	10071
EHT S/S – (Nos)	12	22	86	130	178	190	194	221
HT lines – Circuit KM	1067	5449	13348	24509	28672	30035.67	30371.19	31406
LT lines – Circuit KM	992	8899	47606	125390	180499	187169.69	191930.80	204947
Distribution Transformers (Nos.)	324	2898	10821	22478	29551	31329	32585	33114
Annual Revenue in Rs.crore	0.58	3.11	91.25	625.19	1669.24	1811.12	1945.99	2480.69

**As on October 2003*
Source: KSEB

Generation

7.5 During the early stages of development, focus was on tapping hydropower potential in the State. Hydro-Power is renewable, non-polluting and economic. From an installed capacity of 38 MW in 1951, power system in Kerala touched 2608 MW in 2003 with a generation potential of 11521 MU (refer Table 7.2&3) The lion's- share of energy requirement of the State was being met, till recent past, by generation from the 20 hydel power plants of the Kerala State Electricity Board. After the promulgation of Forest Conservation Act 1980, taking up new hydel projects has been affected. Though Kerala has a total hydel generation potential of about 4333 MW, only 1834 MW could be harnessed so far.

7.6 While industrial growth remained stagnant there has been phenomenal growth in domestic consumption especially due to the extensive rural electrification works taken up by the Board under the directions of state and central Governments and the rise in standard of living especially due to remittances. As the State could not keep pace with increasing demand for energy by implementing more hydel projects, it was forced to depend more and more on thermal energy either through import or from generation within the state. Due to the high transportation cost of coal and the environmental problems, coal based thermal power

Table 7.3
Capacity of Generation

Type	Particulars	Nos.	Installed Capacity (mw)	Energy Capacity mu
Hydel	KSEB owned	20	1802	6636
	Captive Power Plants	2	33	116
Wind		1	2	5
Thermal	KSEB (KDPP & BDPP)	2	234	1431
	IPP (BSES & KPCL)	2	177	1239
	NTPC Kayamkulam	1	360	2094
	Sub Total	28	2608	11521
	Import	-	781	6832
	Total	28	3389	18353

Source: KSEB

plants did not come up in the State., Kerala State Electricity Board had to establish two diesel power plants one at Brahmapuram near Kochi (106.6 MW) and the other at Kozhikode (128 MW). Government permitted establishment of Naphta based thermal power plants at Kayamkulam by NTPC (360 MW), at Kochi by BKPL (157 MW) and at Kasargode by M/s. KPCL (20 MW). The State was also forced to purchase more power from the Central Generating Stations. The hydel - thermal energy mix, which was 67:33 in 1998-99, is now estimated at 34:66 as could be seen from Table 7.4.

7.7 Due to shortfall of rain, in some years, even the optimum generation capacity could not be fully exploited. The storage at reservoirs as on 1st November 2003 is only 51.6% of the storage capacity. The reservoir storage details are given in table 7.5.

7.8 The energy availability in the State during 2002-

Table - 7.4
Hydro- Thermal Mix

Year	Hydel (MU)	Thermal (MU)	Import* (MU)	Total (MU)	Hydel (%)	Thermal (%)	Cost at sale point (Rs./kwh)	Effective realisation (Rs./kwh)
1998-99	7305	567	3085	10957	67	33	1.68	1.40
1999-00	7038	1859	2879	11776	60	40	2.08	1.76
2000-01	6167	2897	3399	12463	49	51	3.04	1.80
2001-02	6712	2133	3748	12593	53	47	3.87	2.39
2002-03	4819	3156	4470	12445	39	61	4.26	2.96
2003.04 (Estimate)	4314	2567	5734	12615	34	66	3.99	2.96

Source: KSEB. *Share from Central Generating Stations (C G S) only included

Table - 7.5
Reservoir Details

Project	Installed Capacity (mw)	Reservoir	Design Potential (mu)	Maximum Storage Capacity (mu)	Present Storage (as on 1.11.2003)	
					(MU)	(%)
Idukki	780	Idukki	2398	2147.9	980.1	45.6
Sabarigiri	300	Pamba	1338	59.5	9.2	15.50
		Kakki		856.5	501.7	58.6
Kuttiadi	125	Kuttadi	343	41.5	25.9	62.5
Idamalayar	75	Idamalayar	380	254.5	146.3	57.5
Sholayar	54	Sholayar	233	152.2	138.1	90.7
Peringalkuthu	48	Peringal	245	10.7	8.4	78.3
Pallivassal	37.5	Kundala	284	22.7	18.5	81.4
		Mattupatty		161.2	65.0	40.3
Sengulam	48	Sengulam	182	0.7	0.7	98.6
Panniar	30	Anayirankal	158	65.6	28.6	43.6
		Ponmudi		63.5	54.2	85.3
Neria-Mangalam	45	Kallarkutty	237	4.8	4.5	93.6
Lower Periyar	180	Lower Periyar	498	2.1	0.9	41.6
Kakkad	50	Moozhiyar	262	0.4	0.4	100.0
		Veluthodu		0.2	0.2	98.8
Others	58.2		209			
Total	1830.70		6767	3844	1982.70	51.6

Source: KSEB

03 is given in Table 7.6 .

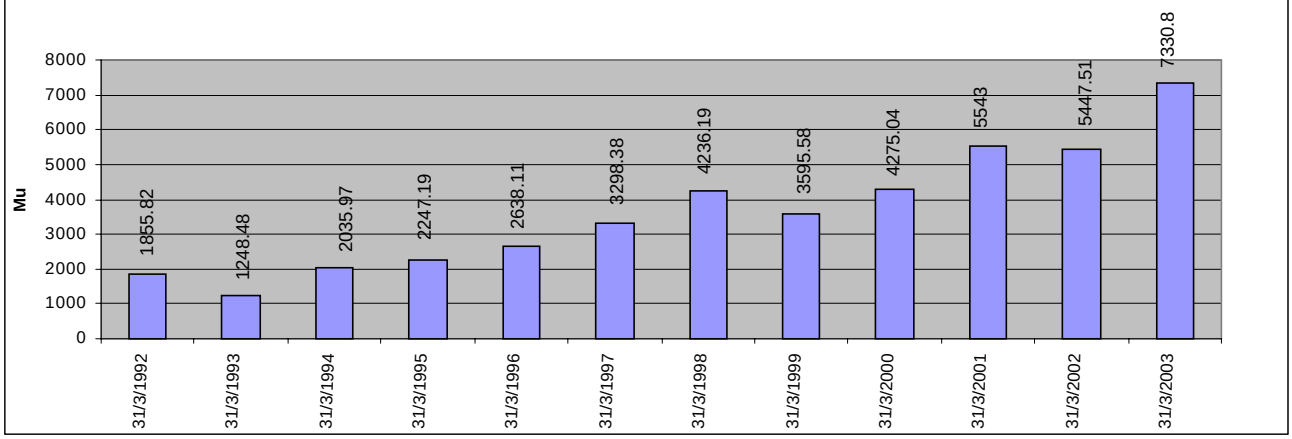
7.9 The growth on import of power can be seen in the following figure 7.1. Thus the changing mix of hydro and thermal power, further reinforced by successive failure of monsoons, in recent years, has pushed up cost of power steeply. On an average, now one unit costs Rs.3.99, but the realisation is only Rs. 2.96 as on 31.3.2003.

Table - 7.6
Energy availability in the State during 2002-03

Sl. NO	Source	2002-03
1	Generation (in million /KWH)	
a	Hydel	4844.03
b	Thermal (BDPP + KDPP)	674.81
c	Wind farm	2.44
	Total (1)	**5521.28**
2	Power Purchase (in Million KWH)	
a.	NTPC (Kayamkulam)	1857.53
b.	NTPC (Ramagundam)	2191.73
c	Neyveli Lignite Corporation	1216.47
d	Western Region	12.28
e	Madras Atomic Power Project	93.02
f	Eastern Region	808.66
g	Maniyar	23.36
h	Kaiga	376.73
i	BSES	305.80
j	Kuthungal	23.60
k	KPCL, Kasargode	147.65
l	NLCTPS.1. Expansion	12.07
m	PTC DVC Power	30.48
n	UI Units	219.78
o	Thalchar stage ii	11.64
	Total (2)	**7330.80**
3	**Total (1 + 2)**	**12852.08**
4a	Less bilateral Exchange	
b	Less Losses in MU	
c	Auxilary Consumption	45.53
	Total (4)	
5.	**Net Availability (in million KWH) (3)-(4)**	**12806.55**

Source: KSEB

Fig 7.1
Import of Power



Transmission

7.10 Strengthening the infrastructure to match the generation capacity is given prime importance in the plan programmes of KSEB. The present situation of trans mission infrastructure is given in Table 7.7.

Table 7.7
Power System Transmission Infrastructure
Substations (As on 31-10-2003) Lines

Capacity	Existing Nos.	Ongoing Nos.
400kV	1	0
220kV	11	4
110kV	94	29
66kV	95	10
33kV	24	83
Total	225	126

Capacity	Existing Ctkm	Ongoing Ctkm
400kV	260	0
220kV	2583	78
110kV	3747	354
66kV	3011	27
33kV	534	1148
22kV	121	0

Source: KSEB

Distribution

7.11 All the villages are electrified in the State. More than 84 per cent of households are electrified. But there are certain habitats yet to be supplied with electricity. All consumers are metered. All 11 kv lines are also metered. The details of distribution infrastructure in the State are given Table 7.8.

Table - 7.8
Distribution Infrastructure
(As on 31.10.2003)

Particulars	Existing
No. of consumers Nos (lakhs)	71
11 Kv Lines (Kms)	31705
LT lines (Kms)	197278
Distribution Transformers (Nos)	33591
Pump sets energised Nos (lakhs)	4
Street Lights Nos. (lakhs)	8.32

Source: KSEB

Pattern of Power Consumption and Contribution to Revenue

7.12 As on 31.3.2003 there were 69,47,803 consumers served by KSEB. The different categories of consumers and their contribution to the revenue generated are shown in Table7.9. The domestic sector which is the largest consuming sector continues to be heavily subsidized as could be seen from Table 7.9.Out of the total consumers 78.57 per cent belonging to domestic sector consume 43.42 per cent of the energy whereas the revenue realized from them is only 22.41 per cent. Domestic consumers enjoy the lowest tariff next to agriculture. HT & EHT consumers consumed 28.48 per cent of the energy sold but contribute 40 per cent of the revenue collected.

7.13 The pattern of Electricity consumption in Kerala is shown in figure 7.2.

Fig 7.2
Consumption pattern (Percentage)

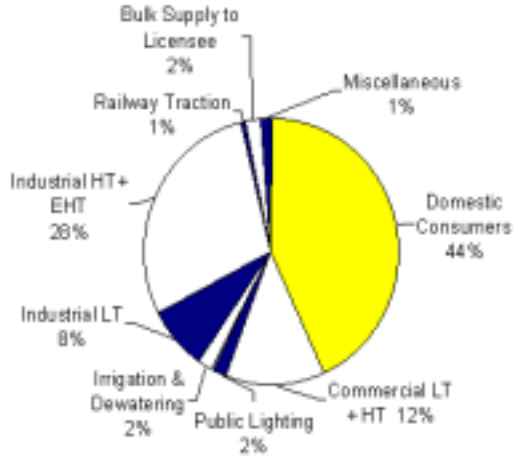


Table 7.9
Power Consumption & Revenue Collected during 2002-03

Sl. No.	Category	Percentage of Consumers To Total	Consumption as Percentage To Total	Revenue as percentage to Total
1	Domestic	78.57	43.42	22.41
2	Commercial LT+HT	14.26	12.47	20.97
3	Industrial LT	1.50	7.76	10.90
4	Industrial HT & EHT	0.01	28.48	40.00
5	Others	5.66	7.87	5.72
	Total	**100.00**	**100.00**	**100.00**

Source: KSEB

Financial Performance of KSEB

7.14 K S E B has been continually running at loss since late 1970s. Despite the statutory requirement to earn an ROR of 3% since 1985, the losses have only increased. K S E B has been showing in the accounts the 3% ROR by assuming the required amount as grant from Government (though never received). K S E B was covering the losses in actual practice by:

- Not paying interest to government;
- Not passing on in full to government the Electricity duty collected;
- Diversion of borrowed funds for Revenue purposes;
- Non payment of dues to central P S Us;
- Low capital investment.

7.15 The tariff was not rationalized commensurate with the increase in purchase of thermal power. Inadequate tariff to meet additional expenditure for thermal power purchase has resulted in more revenue deficit. Even though the object of providing subsidies to industries, domestic and agriculture sectors was to meet the social obligation of the Government, K.S.E.B. has not been suitably compensated by government by way of reimbursement of subsidy in cash. This has increased the revenue gap. Due to stagnant industrial consumption and increasing domestic consumption the load curve became skewed with an average demand of 1400 MW during the period from 6.00 am to 6.00 pm, 2300 MW during the peak hours from 6.00 pm to 10.00 pm and 1100 MW during the period from 10.00 pm to 6.00 am. In order to avoid load shedding and power cut, the Board had been forced to purchase very high cost energy especially during peak hours. The Board had to depend on more borrowings to meet the additional expenditure for purchase of costly thermal power and for debt servicing (Table 7.10), further widening the revenue gap. Though the Board was statutorily enjoined to function as a commercial institution, it continues to function mainly as an extension of Government.

7.16 The revenue requirement and the gap in revenue to meet the expenditure in recent years are given in table 7.11.

7.17 The performance in the year2003-04 (till August 2003) shows that there is a revenue gap Rs.148.84 crores corresponding to 11.53 per cent of the revenue receipt

Issues Confronting the Sector

- In recent years, there is an increase in the expenditure on power purchase due to high cost of thermal power from NTPC, Kayamkulam and other IPPs.
- The category contributing to major percentage of consumption is 'domestic consumers' but the tariff rate for domestic consumers is low.
- There is no substantive increase in the number of general industrial and commercial consumers that pay higher tariff.
- Continuing high revenue deficit because the tariff has not been revised to the necessary levels as has been done in other states.
- There is an anomaly in the tariff structure. Whatever be the power consumed, the consumer has to pay only as per the rates for different slabs within the high total consumption. Thus a domestic consumer who uses up to 40 units of power pays Rs.1.15 for the first, 41-80 units Rs.1.90 for the next, 81-120 units, Rs.2.40 and so on.
- Another major cause is huge

Table - 7.10
Debt Service

(Rs.Crores)

Year	Borrowings	Repayment			Average monthly debt servicing
		Principal	Interest	Total	
1999-00	849.73	277.61	387.04	664.65	55.39
2000-01	1303.57	232.14	514.58	746.72	62.23
2001-02	690.31	457.11	574.79	1031.90	85.99
2002-03	1380.24	1018.69	573.94	1592.63	132.72
2003-04 (BE)	1567.32	938.01	616.21	1554.22	129.52

Source: KSEB

Table - 7.11
Revenue Requirement and Revenue Gap at Current Tariff

(Rs.Crores)

Particulars	2001-02	2002-03	2003-04*
GrossRevenue Requirement(a)	3358.29	3722.50	3825.58
Less:Non-tariff Income(b)	95.86	226.27	200.00
Revenue Requirement from Tariff(c=a-b)	3262.43	3496.23	3625.57
Revenue at Current Tariff(d)	1946.00	2480.69	2693.86
Revenue Gap(e= c-d)	1316.43	1015.54	941.72

**projected. Source: KSEB*

Table:7.12
Domestic Tariff Rates

Units	Rs.
0-40	1.15
41-80	1.90
81-120	2.40
121-150	3.00
151-200	3.65
201-300	4.30
301-500	5.30
501 and above	5.45

liability of the Board in debt servicing. The reason for accumulation of debt is the non payment of amount spent under rural electrification, non- payment of subsidy to enable the board to earn the statutory three percent ROR and non-repayment of subsidy for pre-1992 tariff under the industrial policy announced in 1992 An amount of Rs.125 crore per month is projected to be the obligation of the Board for debt servicing

- KSEB's productivity is not commensurate with the staff strength
- Employee cost is high in relation to revenue.
- High T & D losses partly due to theft.
- Time and cost over run of projects.

Reform Initiatives in India

7.18 The Govt. of India initiated reform measures to resolve the accumulated problems of the sector in 1991, when it introduced policy measures to attract private sector participation in the area of power generation. Unbundling of vertically integrated structure of State Electricity Boards and privatisation were considered as desirable reform measures. A Central Electricity Regulatory Commission was constituted in 1998. States were also to form State Electricity Regulatory Commissions. States like Orissa, Haryana, Andhra Pradesh, Delhi, Uttar Pradesh and Karnataka have unbundled and corporatised different segments of the power sector. The experience of reform has not been uniform. The basic problems of tariff for different categories, pricing of power to distributors and collection of dues have remained intractable issues affecting the reforms.

Power Sector Reforms in Kerala

7.19 Governments in Kerala decided to keep K S E B as a vertically integrated structure in the public domain, without unbundling and have tried to introduce Profit Centres and other measures for improved performance. The need to take decisive measures arose when the arrears due to NTPC were offered to be securitised by Government of India in 2002 in return for monitorable improvements in performance. The MOU signed in this context between Government of India and the Government of Kerala and the back to back MOU between Government of Kerala and KSEB accelerated the reform process. Government of Kerala constituted State Electricity Regulatory Commission on 14th November 2002.

7.20 KSE Board has made significant progress in the reform path as could be seen from the following.

- **100% electrification of households by 2007**

7.21 Approximately 85% of residential buildings have been electrified. Target can be completed by 2007 at the rate of 4,00,000 new connections per annum.

- **100% Metering of consumers**

7.22 All consumers have been metered.

- **Energy Accounting and Audit**

a) All 11 KV feeders have been metered.
b) Boundary meters have been established down to the level of division boundaries.
c) Energy accounting is being done on a monthly basis.

- **Replacement of faulty and sluggish meters by electronic meters**

7.23 Approximately 8.75 lakh faulty / sluggish meters have been replaced during 2002-03 and 2003-04.

- **Anti -Power Theft Legislation and implementation**

a) Indian Electricity (Kerala Amendment) Ordinance, 2003 was promulgated on1st April 2003.
b) Anti- Power Theft Wing has been strengthened and its activities have been intensified. During 2002-03 and 2003-04, 15427 cases have been detected and penal amount of Rs. 7.02 crores have been realized.

- **Computerization of billing and collection**

7.24 Billing and revenue collection systems are being computerized stage by stage. Billing of Extra High Tension (EHT) consumers has been computerized and that of High Tension (HT) consumers is expected to be completed shortly. Computerization of LT consumers in 80 Sections will be completed by December 2003, 97 Sections by

March 2004 and the remaining 379 Sections by end of December 2004.

Speedy settlement of disputes

7.25 The Board is taking action to settle disputes and billing complaints so as to achieve realization of revenue. Approximately 2012 cases could be settled during 2002-03 and 2003-04.

- **Reduction in administrative expenses**

7.26 Multi-pronged approach was resorted to for reducing administrative expenses. Important among them are:

a) Shifting of offices from rented buildings to own buildings.
b) Curtailing advertisement expenses.
c) Curtailing travel expenses.
d) Outsourcing contingent services.
e) Hiring of vehicles as and when required instead of purchasing new ones.
f) Limiting telephone and transportation expenses.
g) Ban on non-remunerative construction works.

- **Reduction in employee cost**

7.27 Major Steps taken are:

a) Reduction in number of posts by cutting down redundant posts of both staff and officers and freezing of filling of vacancies for three years.
b) Redeployment of employees to vacant posts.
c) Curtailing certain allowances like leave surrender and holiday wages.
d) Reducing disbursement expenses by stopping pension disbursement by money order.
e) Stoppage of granting increment to officers beyond maximum of the pay scale.
f) Moratoriums on recruitment of employees except Electricity workers, special recruitment for SC/ST and compassionate employment.

- **Restructuring of high cost loans**

7.28High cost loans in the interest range of 13 to16.5 percent have been restructured with a lower interest rate ranging from 8.5 to 11.25%. The gross savings of account of this would be Rs. 100.20 crores during the entire repayment period. But institutions like REC and PFC insist on pre-payment premium. An amount of Rs.36.56 crores has been paid as pre-payment premium thereby reducing the net gain to Rs. 63.64 crores. On an average, the annual savings would be Rs. 7.15 crores.

- **Availing low cost energy under Availability Based Tariff (ABT) Regime**

7.29 ABT regime was introduced in Southern Region with effect from 1.1.2003. During the period from April 2003 to October 2003 KSE Board could avail 376.41 Million Units of energy on an average at a cost of Rs.1.62 per unit.

- **Speedy completion of generation and transmission projects by effective project management.**

7.30 The implementation of generation and transmission projects are regularly monitored and effective project management is ensured. The projects that can be completed in a time bound manner have been identified and put under Project Managers.

- **Effective Inventory Management**

7.31 Purchase procedures have been streamlined to ensure quality and competitive rate. Stock of inventory is regularly monitored to ensure optimum purchase for meeting the requirements.

- **Speedy disposal of unserviceable articles**

7.32 Disposal of unserviceable articles have been streamlined and accelerated through the functioning of Scrap Disposal Committees.

- **Consumer Satisfaction**

7.33 Government have issued GO (MS) No. 12/02/PD/ Thiruvananthapuram, dated 31.5.2002 constituting Panchayat level committees to resolve problems at grass root level. The Deputy Chief Engineers of Distribution Circles have been delegated with powers to settle consumer grievances. Public Grievance Cell has been constituted at Vydyuthi Bhavanam, Thiruvananthapuram for monitoring the matters relating to public grievance at Headquarters level.

7.34 Mobile Fault Rectification Units have been constituted at Thiruvananthapuram for speedy restoration of power supply. Centralized complaint registering system with Interactive Voice Response System (IVRS) facility has also been introduced.

The Electricity Act 2003(Act No.36 of 2003)

7.35 The Electricity Act, 2003 is a comprehensive law on electricity generation transmission, distribution, trading and use. It replaces the Indian Electricity Act 1910, The Electricity (Supply) Act 1948 and the Electricity Regulatory Commission Act 1998. The statement of Objects and Reasons is unusually long and is reproduced in full below as it also summarises the main features of the Act. It will be seen that the Act is far reaching in intent and comprehensive in coverage and

claims to strike a balance between its objectives and the 'current realities', by giving some flexibility to State Governments 'to develop their power sector in the manner they consider appropriate'

7.36 In reality, the Act has two contradictory directions: One is that of further centralisation with Government of India (through the power to frame the National Electricity Policy and Plan, National Tariff Policy and even the policy on electrification and local distribution in rural areas and on stand-alone systems for rural areas and non-conventional system after consultation with the states); the other is that of decentralisation (through delicensing of generation except for certain restrictions in the case of hydel power, freedom for generation and transmission of captive power, free access to consumers, private transmission licensees , distribution licensees, stand alone system for rural areas etc). In effect, it makes electricity more a subject in the union list rather than one in the concurrent list, the main objective being the unbundling the SEBs and removal of their monopoly position in the states concerned.

Box -7. 1

THE ELECTRICITY ACT, 2003
STATEMENT OF OBJECTS AND REASONS

The Electricity Supply Industry in India is presently governed by three enactments namely, the Indian Electricity Act, 1910, the Electricity (Supply) Act, 1948, the Electricity Regulatory Commissions Act, 1998.

1.1 The Indian Electricity Act, 1910, created the basic framework for electric supply industry in India which was then in its infancy. The Act envisaged growth of the Electricity Industry through private licensees. Accordingly, it provided for licensees who could supply electricity in a specified area. It created the legal framework for laying down of wires and other works relating to the supply of electricity.

1.2 The Electricity (Supply) Act, 1948 mandated the creation of a State Electricity Board. The State Electricity Board has the responsibility of arranging the supply of electricity in the State. It was felt that electrification which was limited to cities needed to be extended rapidly and the State should step in to shoulder this responsibility through the State Electricity Boards. Accordingly, the State Electricity Boards through the successive Five-Year Plans undertook rapid growth and expansion by utilising plan funds.

1.3 Over a period of time, however, the performance of S.E.Bs has deteriorated substantially on account of various factors. For instance, though power to fix tariffs vests with the State Electricity Boards, they have generally been unable to take decisions on tariffs in a professional and independent manner and tariff determination in practice has been done by the State Governments. Cross-subsidies have reached unsustainable levels. To address this issue and to provide for distancing of Government from determination of tariffs, the Electricity Regulatory Commissions Act, was enacted in 1998. It created the Central Electricity Regulatory Commission and has an enabling provision through which the State Governments can create a State Electricity Regulatory Commission. Sixteen States have so far notified/created State Electricity Regulatory Commissions either under the Central Act or under their own Reform Acts.

2 Starting with Orissa, some State Governments have been undertaking reforms through their own Reform Acts. These reforms have involved unbundling of the State Electricity Boards into separate Generation, Transmission and Distribution Companies through transfer schemes for the transfer of the assets and staff into successor companies Orissa, Haryana, Andhra Pradesh, Karnataka, Rajasthan and U.P have passed their Reform Acts and unbundled their State Electricity Boards into separate companies, Delhi and M.P have also enacted their Reforms Acts which, *inter alia*, envisage unbundling/corporatisation of S.E.Bs.

3. With the policy of encouraging private sector participation in generation, transmission and distribution and the objective of distancing the regulatory responsibilities from the Government to the Regulatory Commissions, the need for harmonising and rationalising the provisions in the Indian Electricity Act, 1910, the Elec-

Continued....

Box 7.1 Continuation.

tricity (Supply) Act, 1948 and the Electricity Regulatory Commissions Act, 1998 in a new self contained comprehensive legislation arose. Accordingly, it became necessary to enact a new legislation for regulating the electricity supply industry in the country which would replace the existing laws, preserve its core features other than those relating to the mandatory existence of the State Electricity Board and the responsibilities of the State Government and the State Electricity Board with respect to regulating licensees. There is also need to provide for newer concepts like power trading and open access. There is also need to obviate the requirement of each State Government to pass its own Reforms Act. The Bill has progressive features and endeavours to strike the right balance given the current realities of the power sector in India. It gives the State enough flexibility to develop their power sector in the manner they consider appropriate. The Electricity Bill, 2001 has been finalised after extensive discussions and consultations with the States and all other stake holders and experts.

4 The main features of the Bill are as follows:

i) Generation is being delicensed and captive generation is being freely permitted .Hydro projects would, however, need approval of the State Government and clearance from the Central Electricity Authority which would go into the issues of dam safety and optimal utilisation of water resources.

ii) There would be a Transmission Utility at the Central as well as State level, which would be a Government company and have the responsibility of ensuring that the transmission network is developed in a planned and coordinated manner to meet the requirements of the sector. The load despatch function could be kept with the Transmission Utility or separated. In the case of separation the load despatch function would have to remain with a State Government organisation/company.

iii) There is provision for private transmission licensees.

iv) There would be open access in transmission from the outset with provision for surcharge for taking care of current level of cross subsidy with the surcharge being gradually phased out.

v) Distribution lincensees would be free to undertake generation and generating companies would be free to take up distribution licensees.

vi) The State Electricity Regulatory Commissions may permit open access in distribution in phases with surcharge for –

- current level of cross subsidy to be gradually phased out alongwith cross subsidies; and
- obligation to supply.

vii) For rural and remote areas stand alone systems for generation and distribution would be permitted.

viii) For rural areas decenntralised management of distribution through Panchayats, Users Associations, Cooperatives or Franchisees would be permitted.

ix) Trading as a distinct activity is being recognised with the safeguard of the Regulatory Commissions being authroised to fix ceilings on trading margins, if necessary.

x) Where there is direct commercial relationship between a consumer and a generating company or a trader the price of power would not be regulated and only the transmission and wheeling charges with surcharge would be regulated.

xi) There is provision for a transfer scheme by which company/companies can be created by the State Governments from the State Electricity Boards. The State Governments have the option of continuing with the State Electricity Boards which under the new scheme of things would be a distribution licensee and the State Transmission Utility which would also be owning generation assets. The service conditions of the employees would as a result of restructuring not be inferior.

xii) An Appellate Tribunal has been created for disposal of appeals against the decision of the C.E. R.C and State Electricity Regulatory Commissions so that there is speedy disposal of such matters. The State Electricity Regulatory Commission is a mandatory requirement.

xiii) Provisions relating to theft of electricity have a revenue focus.

5. The Bill seeks to replace the Indian Electricity Act, 1910, the Electricity (supply) Act, 1948 and the Electricity Regulatory Commissions Act, 1998

6. The bill seeks to achieve the above objects.

Implications of the Electricity Act 2003

- KSEB, Constituted under section 5 of the Electricity Supply Act 1948 loses statutory support and has to become State Transmission utility to be constituted as a State Government Company which will have the responsibility of developing transmission network to meet the requirements of the sector.
- The Act provides the formation of independent units under Indian Companies Act 1956 for Generation (Section 7), Distribution (Section 14), Trading (Section 14), Transmission (Section39) and State Load Despatch Centre (Section 31). Generation, Distribution and Trading can be grouped together to form a Single Company. State Transmission Utility and Load Despatch Centre can be grouped together to form another corporate entity under the control of the government. Privatisation is not a must.
- Generation is delicensed.
- State Electricity Regulatory Commission (SERC) will issue the guidelines for tariff (Section 51). Determination of tariff for generation, supply, transmission, wheeling, wholesale/bulk/retail (Section 62) will be done by SERC after elaborate consultations. Interested parties can argue there case before it. Government has no role in it.
- The present system of providing KSEB directly subsidies will cease to exist. If any subsidy is to be paid, it is to be given in advance by Government to compensate the licensee affected by the grant of subsidy in manner of SERC may direct.

Directives of Kerala State Electricity Regulatory Commission

7.37 The Kerala State Electricity Regulatory Commission has issued orders on Aggregate Revenue Requirement (ARR) and Expected Revenue from Charges (ERC) for the years 2003, 2004 in December 2003. The Commission approved an ARR of Rs.3697.83 crores and the total Revenue Receipts of Rs.3141.37 crores for the year 2003-04.

7.38 The salient points of the directives issued by the Commission are as follows:

- The Commission strongly recommended specific action on the part of the KSE Board to improve the current level collection efficiency to the level of 98 to 99 per cent as even an increase of one per cent in efficiency would improve the cash flow by over Rs.30 crores during a year.
- The Commission urged upon the KSEB to take up complete the computerisation of billing activity in the shortest possible time.
- Hydro-generation is required to be regulated on the basis of annual, monthly, fortnightly and daily schedules. These schedules are to be updated and the revised on daily and fortnightly basis depending on the changes in the Hydro availability and the economic of power purchase from external sources.
- Expenditure of dead servicing would be significantly reduced by strict financial management and control.
- The Commission urged upon the KSE Board to institute a system for project management, monitoring and controlling so that the cost and time over – runs and capital project are totally avoided.
- The Commission required to the KSE Board to take immediate action for speedy progress on construction work under Accelerated Power Development and Reforms Programme (APDRP) and also directed the Board to formulate additional schemes for APDRP assistance with a view to reduce borrowings at commercial rate of interest.
- The Commission recommended the computerisation of the inventory and disposal of unwanted stores in the shortest possible time.
- The Commission required the Board to submit the details regarding cost of supply to the various categories of consumers and their consumption along with full supporting data so as to enable to undertake the exercise on tariff rationalisation.

7.39 The KSEB has submitted the ARR and ERC for the year 2004-05 to KSERC and its order is expected to be issued in April 2004. The second order of the KSERC is expected before the end of March 2004. Significant decisions will have to be taken by the State Government and KSEB in April 2004 in accordance with the order of KSERC and the Electricity Act 2003. Meanwhile, certain turnaround options have been proposed, which are summarised below:

Turnaround Options

7.40 KSEB in its submission to SERC on Annual Revenue Requirements (ARR) has proposed to cover the

Annual Revenue Gap over Rs.900 to 1000 crores through a combination of subsidy support from govt. and postponing a part of the revenue requirements by forming a regulatory asset. The regulatory asset is to be amortised in subsequent years and associated financing cost is to be allowed to be included in the revenue expenditure during this period as business expenditure. The turnaround option proposed by KSEB can be seen in Table - 7.13.

7.41 KSEB has also raised the question of past arrears, its heavy loan and interest liability.

7.42 On the basis of the analysis of data on power sector in Kerala over the last few years Shri T.L.Sankar, Advisor, Energy Group, ASCI, Hyderabad has come out with certain suggestions for making the KSEB a viable and profitable entity, within a period of seven years[1]. The turn around plan is based on graduated tariff increase for different categories while protecting the poor, reduction in the T&D losses, improvement in professional work of KSEB etc. Major components of this proposal are:

- The rate of growth of consumption can be kept at

Table - 7.13
TURNAROUND STRATEGY (Rs. crore)

No	Particulars	2001-02(Actual)	2002-03(Provisional)	2003-04(Revised)	2004-05	2005-06	2006-07
1	Statutory Surplus	62.85	80.78	91.83	99.75	109.65	115.65
2	Total Expenditure	3295.44	3641.72	3758.48	3579.41	3774.22	3968.95
	Generation Power	84.60	166.23	159.56	165.94	172.58	179.48
	Purchase Of Power	1451.55	1872.08	1851.89	1621.39	1749.61	1887.03
	Interest	648.95	672.78	721.54	730.97	737.69	740.70
	Depreciation	212.61	277.10	334.52	340.00	365.00	380.00
	Employee Cost	615.00	670.82	693.64	712.00	735.00	762.00
	Repairs & Maintenance	70.32	60.64	66.70	69.37	72.14	75.00
	Admn&General Expenses	66.40	51.80	55.88	58.24	60.57	63.00
	Other Expenses	399.70	89.51	110.00	114.00	119.00	124.00
	Less:Expenses Capitalised	124.82	118.15	119.80	115.54	119.34	123.75
	Less:Interest Capitalised	128.87	101.09	115.45	116.96	118.03	118.51
3	Less Non Tariff Income	95.86	226.27	240.37	249.60	259.58	269.96
4	Annual Revenue Requirement (1+2-3)	3262.43	3496.23	3609.94	3429.56	3624.29	3814.64
5	Less Revenue from Tariff	1946.00	2480.69	2683.86	2936.47	3233.55	3563.23
6	Revenue Gap(4-5)	1316.43	1015.54	926.08	493.09	390.74	251.41

Source: KSEB

1. Power Reforms in Kerala; Exploring New Approaches under Electricity Act 2003, A Presentation by Shri.T.L. Sankar, Advisor, Energy Group ASCI, Hydrabad at Centre for Management Development, 18th Oct 2003.

the average observed over 1990-91 to 2001-02. The overall growth rate of consumption will be about 5 to 6 per cent per year.

- Tariff increase suggested is as follows.
  - Domestic –poor 5% per annum (constant)
  - Domestic-others-14% up to 2010-11 and then on 5%
  - Commercial-constant up to 2010-11 and then on 5%
  - Industries LT-2.2% up to 2005-06 and then on 5%
  - Industries HT-15% up to 2005-06 and then on 3%
  - Agriculture-10% up to 2010-11 and then on 5%
  - Others-9.5% up to 2010-11 and then on 5%
- While moving for commercial viability, protect the poor ie. Households with a consumption of 40 units per month and keep the tariff at affordable levels-say about Rs.25 per month per household.
- Since the benefit of subsidisation of power for agriculture is not being enjoyed by actually poor, rate could be raised by 50% of the average cost of supply in seven years.
- T&D losses are to be reduced to 18 per cent by 2 per cent reduction per year.
- Another aspect is reduction of losses, which can be achieved by (a) consumer mapping and (b) by energy accounting.
- From each pole the number of connections given should be identified by introducing suitable code system and their consumer number, meter number and connected load should be entered in the ledger.
- The consumption by the consumers is to be recorded monthly or bi-monthly. This will be summed up for each period and compared with the energy passing through the feeder at the substation level during that period. The results should be evaluated at the corporate office and published as widely as possible.
- Operating cost control: - Effective control of costs is possible by rationalising the tasks of the employees even without any reduction in their number.
- Containing power purchase costs – KSEB should ensure that long term, short term and spot purchases are settled each year to keep the average cost of power purchase that year within the projected costs.
- Power intensive industries, which wish to directly access power from outside, may be encouraged to do so.
- Accountability: - Strategic Business Units (SBU) based reorganization should be done. The technical and commercial responsibility for each section should be with the Section Officer and at the Divisional level the figure should be aggregated and the divisional officer should take the responsibility to deliver performance according to the target set.
- A special task force under the Chief Secretary and a few independent experts in electrical engineering and management should monitor the entire reforms.

7.43 The key feature of this package is that it involves no privatisation. But it calls for bold strategic and operational decisions and closely monitored implementation in the larger interests of the State.

LNG as an energy source

7.44 The high cost of thermal power is due to the use of naphtha as fuel. The State has been urging shift to LNG as fuel and this was pending for some years. It now looks that this will be a reality in the near future. NTPC at Kayamkulam has decided to shift to LNG and enhance the capacity from the present level of 350 MW to 2300 MW (in phases). The State Government have decided to sign an MOU with NTPC for establishing an LNG terminal. The completion of this will result in substantial reduction in the cost of thermal power. The availability of LNG as a fuel will also trigger rapid industrialisation of the Kochi – Kayamkulam belt, as happened in Gujarat due to its availability.

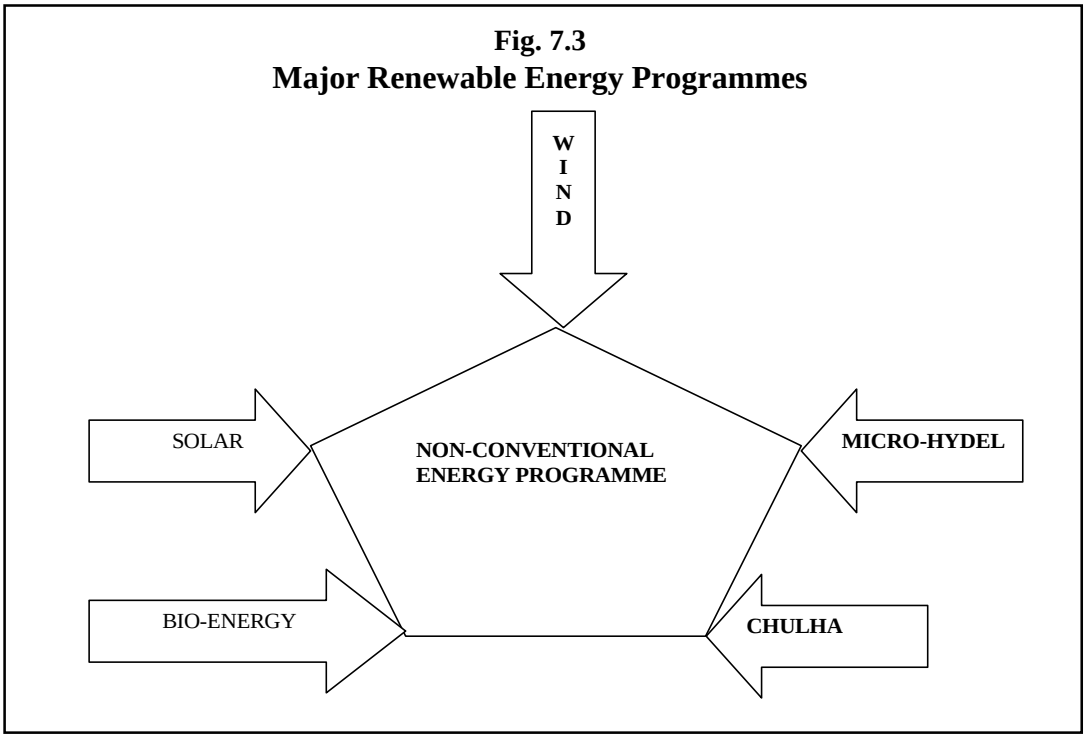
NON-CONVENTIONAL ENERGY PROGRAMME

7.45 India has the world's largest programme for renewable energy. As regard to tapping of wind power, the country is almost a "Wind Super Power", with an installed capacity of 1167 MW. More than 700000 PhotoVoltaic systems with a total installed capacity of 44 MW have been installed all over India., for applications such as home lghting, street lighting, solar lanterns and water pumping for irrigation. Over 17 grid interactive solar photo voltaic generating stations of more than 1400 KW in operation in 18 states in India.

Renewable Energy Programmes in Kerala

7.46 Major Renewable Energy Programmes in the state are depicted in Figure 7.3.

Fig. 7.3
Major Renewable Energy Programmes



Solar Photovoltaic Programme

7.47 The projects under SPV include Solar Village Electrification, Line interactive PV roof top systems in government Offices and hospitals, stand alone Power Plants on roof tops of residential buildings, grid-interactive P V power plants in Autonomous and Private Institutions for enhancing the quality of power.

Wind Energy Programme

7.48 As regards wind energy projects, India ranks fifth in the world; having installed capacity of more than 1167 MW . However, an achievement of 1167 MW is miniscule, in comparison to the total resource potential which is pegged today anywhere between 65000 MW to 100000 MW. It is possible to achieve the same only through a properly designed policy and institutional set up, backed with a multi-year trade policy.

7.49 In Kerala, the wind energy potential is assessed to be 600-800 MW. But so far only 2.03MW has been tapped.

7.50 ANERT conducted a micro-survey on wind energy potential in the State and has prepared a master plan for Ramakkalmedu.It is estimated that 100 MW wind energy potential is available at Ramakkalmedu area.

Small Micro-Hydel Programme

7.51 Government of India, in its policy on Hydro power development has given emphasis to small hydel projects. It is realised as a solution for energy problem in remote and hilly areas where extention of Grid System is uneconomical. India has a potential of about 15000 MW of Small Hydro Power. About 4233 potential sites up to 25 MW Station Capacity aggregating to a capacity of about 10,000 MW have been identified. Details are given in Table 7.14. 466 projects have already been set up and 196 projects are under various stages of implementation. Table 7.15 shows the state-wise details of projects set up and projects ongoing.

7.52 Under micro –hydel programme, implementation of Micro Hydel projects on behalf of two District Panchayats, Kammadi in Kasargode district and Chakkarakundu in Kozhikode district, have been undertaken by ANERT.. The unit at Kammadi is envisaged to energise one small scale production unit proposed as an income generation activity to the local tribal people. The second project is aimed at electrification

of about 50 houses in the localitly. The projects are ready for take off.

7.53 UNIDO has set up a Regional Centre on Small Hydropower at Energy Management Centre (EMC).The Centre has initiated preparation of Detailed Project Reports (DPR) for ten small Hydro power projects in Kerala. UNIDO has also agreed to set up one 30KW Micro Hydel Station in an off grid (remote) village in Kerala. It aims at establishment of a multi purpose project for poverty alleviation through employment generation in that area. Mankulam Panchayat in Idukki district has been identified for this activity .

7.54 Government of Kerala has nominated EMC as the Promotion cell for Small Hydro Power development of CPPs and IPPs. Sixtyone projects have been identified. EMC has completed the D P R preparation and Environment Impact Assessment(E I A) study of the S H P Barapole Project (21MW) which was awarded to Travancore – Cochin Chemicals Ltd. EMC has also assisted many Local Governments in the pre-feasibil-

Table:7.14
State Wise Identified Small Hydel Sites
Up To 25 MW Capacity

Sl. No.	Name of State	Identified no. of sites	Total Capacity in MW
1	Haryana	22	30.05
2	Himachal Pradesh	323	1624.78
3	Jummu& Kashmir	201	1207.27
4	Punjab	78	65.26
5	Rajasthan	49	27.26
6	Uttar Pradesh	211	267.061
7	Uttaranchal	354	1478.235
8	Goa	3	2.6
9	Gujarat	290	156.83
10	Madhya Pradesh	85	336.325
11	Chhatisgarh	47	57.9
12	Maharashtra	234	599.47
13	Andhra Pradesh	286	254.63
14	Karnataka	230	652.61
15	Kerala	198	466.85
16	Tamil Nadu	147	338.92
17	Bihar	92	194.02
18	Jharkhand	89	170.05
19	Orrisa	161	156.76
20	Sikkim	68	202.75
21	West Bengal	145	182.62
22	Arunachal Pradesh	492	1059.03
23	Assam	46	118.00
24	Manipur	96	105.63
25	Meghalaya	98	181.50
26	Mizoram	88	190.32
27	Nagaland	86	181.39
28	Tripura	8	9.85
29	A&N Island	6	6.40
	Total	**4,233**	**10,324.37**

Source: Proceedings of the Asia-Africa Regional Seminar on small hydro power from 11 to 15 November , 2003 at Thiruvananthapuram.

ity investigation of S H P projects. It has also undertaken the work of two multipurpose hydel stations at Attapaddy in Palakkad District.

Bio-Energy Programme

7.55 The project under Bio-energy programme has been implemented from 1998 onwards with the financial assistance of MNES .The activities included Biomass assessment study, power recovery from Municipal Solid Waste (MSW) and industrial waste, bio-mass gasifier programme etc. Government of India accorded sanction to set up 15 Bio-gas plants. Applications were received from 92 beneficiaries through 28 IREP offices in the State and 15 projects were approved for implementation. Seven projects have been completed till now.

Table - 7.15
State wise SHP projects (up to25 MW) set up & under construction

Sl. No.	State	Projects Set-Up		Project Ongoing	
		Nos.	Cap. (mw)	Nos.	Cap. (mw)
1	Haryana	4	48.30		
2	Himachal Pradesh	41	93.24	13	67.50
3	Jummu& Kashmir	27	102.24	9	13.31
4	Punjab	21	108.40	1	2.70
5	Rajasthan	10	23.85		
6	Uttar Pradesh	8	21.50	1	3.60
7	Uttaranchal	70	64.60	31	33.02
8	Goa	1	0.05		
9	Gujarat	2	7.00		
10	Madhya Pradesh	7	38.96	4	26.40
11	Chhatisgarh	2	1.00		
12	Maharashtra	27	207.08	4	15.75
13	Andhra Pradesh	49	155.61	12	26.50
14	Karnataka	38	198.88	18	91.90
15	Kerala	10	72.02	10	73.00
16	Tamil Nadu	11	76.40	2	7.90
17	Bihar	4	44.90	10	15.00
18	Jharkhand	6	4.05	8	34.85
19	Orrisa	6	7.30	7	40.97
20	Sikkim	18	92.28	5	5.62
21	West Bengal	12	35.60	5	15.20
22	Arunachal Pradesh	50	32.37	27	51.64
23	Assam	3	2.11	8	51.00
24	Manipur	8	5.45	3	2.75
25	Meghalaya	3	30.71	9	3.28
26	Mizoram	16	14.78	3	15.50
27	Nagaland	8	20.47	6	12.40
28	Tripura	3	16.01		
29	A&N Island	1	5.25		
	Total	**466**	**1530.41**	**196**	**609.79**

Source: Proceedings of the Asia-Africa Regional Seminar on small hydro power from 11 to 15 November , 2003 at Thiruvananthapuram.

Table - 7.16
State-Wise Gasifier Installation Details
As on 31-3-2003

No	State	Cumulative	
		No. of system	Capacity K W
1	AndhraPradesh	231	15384
2	Arunachal Pradesh	3	180
3	Assam	6	123
4	Bihar	2	20
5	Chhattisgarh	1	500
6	Goa	3	22
7	Gujarat	237	11961
8	Haryana	25	964
9	Himachal Pradesh	2	7
10	Jammu & Kashmir	4	120
11	Karnataka	476	4499
12	Kerala	13	725 (1.3%)
13	Madhya Pradesh	144	4529
14	Maharashtra	316	3823
15	Mizoram	2	200
16	Orissa	16	72
17	Punjab	27	700
18	Rajasthan	21	218
19	TamilNadu	83	2652
20	Tripura	4	1000
21	Uttarpradesh	50	2746
22	West Bengal	27	4100
23	Andaman & Nicobar Island	17	167
24	Delhi	16	74
25	Others	91	318
	Total	**1817**	**55104**

Source: *Bio-mass gasifers- Paper presented by Dr. R.. Sethumadhavan Co-ordinator, Institute of Energy Studies, Anna University, Chennai.*

7.56 Present status of Biomass gasifier installations in the country in India is given in Table -7.16.

7.57 Kerala has potential for tapping bio-mass energy, using agro-based residues. The total agro-based bio-mass production in the State is estimated to be 8.46 million tonnes comprising of coconut shell, coconut and aracanut fronds, cashew shell etc. Of this bio-mass available for power generation is nearly 5 million tonnes. Potential biomass factor is as high as about 80 per cent for coconut shell and 70 per cent for tapioca stalk. Details are given in Table 7.17.

7.58 Bio-gassifiers are suitable for thermal as well as electrical applications. A unit which was utilising 20-lit diesel has been replaced with 100 KW gasifier unit, consuming 100 kg of coconut shell in the gasifier mode. The present status of bio-gasifiers put into thermal applications in Kerala is given in Table 7.18.

Table - 7.18
Thermal application of bio-gasifiers in Kerala

Sl. No.	Type of Industry	Electrical Equivalent (kw)
1	Copra Processing Units	150
2.	Crumb Rubber Units	1500

National Programme on Improved Chulha

7.59 ANERT is identified as the nodal agency for implementation of National Programme on Improved Chulha in the state. Improved chulahs result in 30 per cent savings of fuel wood when compared with the traditional type. The programme aims to cover all rural areas with due importance to SC/ST beneficiaries. The

Table - 7.17
Bio-mass Availability In Kerala

Sl no	Type of bio-mass	Total bio-mass production	Potential bio-mass availability for power generation (million tones)	Power generation potential (mw)
1	Coconut Fronds	5.04	2.52 (0.50)	302.5
2	Tapioca stalk	2.02	1.42(0.70)	198.3
3	Coconut Shell	1.14	0.91(0.80)	127.9
4	Areca nut Fronds	0.16	0.06(0.35)	8.1
5	Cashew nut stalk	0.10	0.02(0.20)	2.8
Total		**8.46**	**4.93(0.58)**	**639.6**

Note: Figures in Parenthesis of column-4 gives the excess biomas factor.
Source: Indian Institute of Science, Bangalore.

achievement is reported as 8741 during the year 2002-03.

Energy Conservation Programme

7.60 ANERT distributed solar lamps and CFLs during 2002-03 as part of popularising energy saving devices Table 7.19).

Table - 7. 19
Distribution of energy saving devices
2002-03

Item	Nos Distributed
Solar Lantern	990
CFL 18 watts	381
CFL 13 watts	4267
CFL11 watts	31
TOTAL	**5669**

7.61 EMC has successfully developed I T based Temperature Monitoring and Alerting systems (TMAS) for energy efficiency in Tile industries for South Indian States and also for the glass Industry in Firozabad,in Uttar Pradesh.. Installation of T MAS in 4 tile industries in Kerala is over. The Centre is enforcing the Energy Conservation Act 2001 in the State. Thus Kerala is the first State to implement the Energy Conservation Act 2001 The Centre has modified the design of Thapabharani, a cost effective thermal cooker, for saving energy in the domestic sector with the financial assistance of Department of Science & Technology (D S T) Government of India

7.62 The Centre has prepared an action plan called "Sradha" for achieving energy conservation in public buildings. "Sradha" aims to increase the energy efficiency and reduction in energy bills in public buildings through energy audit and proper installation and handling of electrical equipment .Action has already been initiated to implement the programme in the Government secretariat.

7.63 Three hundred and fifty energy conservation clubs (E C C) with a membership of 20,000 students are functioning in the State under the support and guidance of E M C with the cooperation of Energy Conservation Society(ECS) – an N G O. There are 60 Energy and Environment Conservation clubs with activities in full swing in the Arts/Science/Engineering / Agricultural colleges and I T I / I T Cs run with the co-operation of the above society.

Demand side Management and Monitoring

7.64 EMC developed P C based Energy monitoring system for industries for Demand side management of Electricity .One such system was installed in the KINFRA Apparel Park, Kazhakuttom.

Training Programmes

7.65 E M C organised various training programmes for public, engineers, supervisors, architects for inculcating the culture of energy conservation. The various training programmes conducted by E M C are shown in Box 7.2.

Box -7. 2

Training Programmes

- Energy clinic for women
- Transport clinic for drivers
- Energy manager certification programme
- Training programme on small hydro – power development
- Training programme on Energy efficient pumping system
- Training programme on Best Practices in House wiring
- Training programme on Best Practice in Building electrification
- Energy Conservation awareness classes for Engineers, women, students etc.

Research and Development

7.66 In the field of research and development, ANERT constituted a Research Advisory Committee (RAC) which will guide the department to evaluate the proposals submitted by its scientists and assess the performance of R&D activities to improve the quality of work. According to the recommendation of RAC, the department decided to carry out the following works. Recommendations of RAC are shown in Box 7.3.

STANDARDS AND STATUTES

7.67 The Electrical Inspectorate is responsible for enforcing statutes and standards as regard to all electrical installations in the State.

Box -7. 3

R&D Activities Recommended

- Renewable Energy Resources Data Base.
- Sodium Lamp Street Light.
- New Design for Solar lantern (using LED).
- Cost Reduction of Solar Collectors.
- Performance analysis of Solar Lantern.
- Investigative study on the extraction energy from industrial waste in Kerala.
- Solar Evaporation of industrial effluents by green house/surface heating technique.
- Performance analysis and standardization of small hydro systems.

7.68 In order to get accreditation from National Accreditation Board for Laboratories (NABL) and recognition from the Bureau of Indian Standards (BIS). Action has been taken to suitably equip the Meter Testing and Standards laboratory. The laboratory has facilities for the calibration and testing of various electrical measuring equipments/instruments/and electrical equipments like ammeters, insulation testers, earth testers, energy meters, multi meters, tri-vector meters, two part tariff meters, current transformers, potential transformation, phase sequence indicators, frequency meters, rubber mats, MCBs, cables, conductors, UPS, changeover switches, high voltage Test set unit, Electronic Ballast, Power factor metre etc. Kerala State Electricity Licensing Board is functioning with in the department and carries out the function of issuing licence to electrical contractors, supervisors and wiremen.

Box -7. 4

Functions of Electrical Inspectorate

- Ensure standard and quality of electrical installations and thereby ensure safety and efficiency in the generation, transmission and distribution and use of electricity.
- Give approval for Electrification of Extra High Tension installations in buildings and Cinema theatres.
- Issue prior sanction for installations like X-rays, Lifts, Neon-signs and Generators.
- Conduct periodical inspection of all electrical installations except those supplied at Low Voltage, as prescribed by the Government.
- Investigate electrical accidents and submit reports to the Government enumerating the causes and suggestions to avoid recurrence.
- The Chief Electrical inspector is the "Appropriate Authority" to implement the provisions of the Quality Control Orders regarding (Sec.14 of BIS Act 1986 and Sec.3 of Essentail Commodities Act 1955) Household Electrical Appliances. Quality of electrical wire, cables etc. are to be ensured by conducting the relevant tests prescribed by the Bureau of Indian Standards.