

CHAPTER 7

ENERGY DEVELOPMENT

The growth of electricity generated at national level from 1997-98 to 2003-04 is shown in figure 7.1. The over all generation from hydel, thermal and nuclear in public utilities in the country reached 558.1 billion units in 2003-04. Over all shortage of power for the year 2003-04 fell to 7.1 per cent from 8.8 per cent in 2002-03. The shortage at the time of peak demand is estimated to be 11.2 per cent, which is less than that in the previous year by one per cent. The Plant load factor of Thermal / utilities during the period is found to be 72.71 per cent as against a target of 72 per cent. The hydro thermal mix in 2003-04 is 26.33: 73.67 as can be seen in figure 7.2.

7.2 The target for capacity addition in the Tenth Plan is 41110 MW comprising of 14393 MW hydro, 25417 MW thermal and 1300 MW nuclear. The target for 2003-04 was 5202.34 MW where as the achievement was only 76 per cent (3951.62 MW). Share of Kerala in the total installed capacity of power generation in the country is only 2.33 per cent .

Power System in Kerala

7.3 The Kerala power system includes 18 hydel stations, two captive power plants, two thermal stations, three IPPs, five major inter state transmission lines, one 400 KV sub station and two 220 KV substations with the inter connecting grid. The growth of power system in Kerala can be seen in Table 7.1.

Generation

7.4 Power generation in Kerala is characterized by its hydel resource, the only local resource endowment. Hence the performance of KSEB bears a direct relationship with the quantum of rainfall received. The share of hydel energy per day in normal rain fall is 18.77 MU on an average, while the overall daily demand is 35 MU. Any shortfall in rain fall necessitates drawing of costly thermal power. Average/daily generation from January 2004 to June 2004 came down drastically to 11.4 MU due to decrease in rainfall resulting in a shortfall of 1113 MU in this period. This resulted in drawing of thermal power incurring an additional expenditure of Rs. 282 crores. Installed capacity increased from 2601.62 MW as on 31.3.2003 to 2615.71 MW as on 31.3.2004. The hydro thermal mix came down to 31.44:68.54 in 2003-04 as against 38.28:61.7 in previous year.

7.5 The changes in hydro-thermal mix in the power sector since 1998-99 is given in Table 7.2.

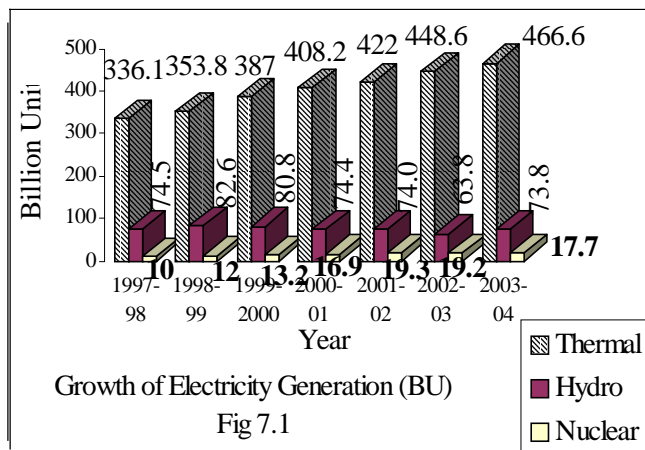


Fig 7.1

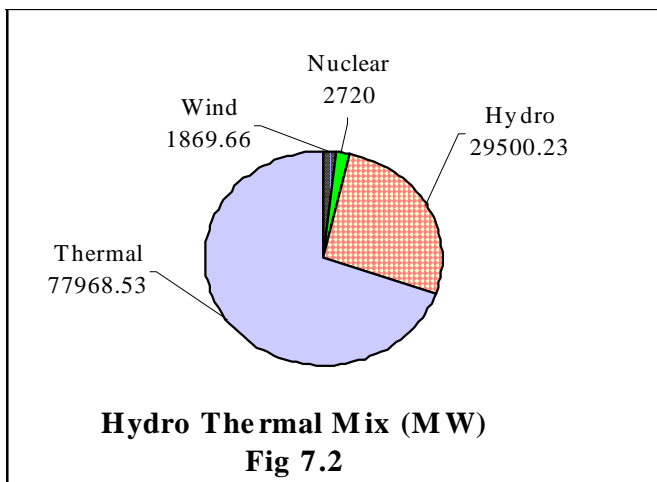


Fig 7.2

Table 7.1
Growth of Power System in Kerala

Particulars	1951	1961	1980	1995	2000	2001	2002	2003	2004
Installed Capacity MW	37.5	132.5	1011.5	1491.5	2350.68	2420.68	2601.62	2601.62	2615.71
Annual Sales MU	140	517.2	4318.2	7027.69	9812.88	10319	8667.32	8752.07	8910.84
Per Capita Consumption Kwh	13	30	96	231	300.54	311.67	395	392	386
EHT lines Circuit KM	910.7	1900	4404.5	6106.21	7598.97	8955.18	9091.13	9065.91	9256.12
EHTS/S(Nos)	12	22	85	157	178	190	194	198	205
HT lines Circuit KM	1067	5449.4	13348	24509	28672	30035.7	30971.2	32054.42	33280.22
LT lines Circuit KM	992	8889.2	47606	125390	180499	187170	191931	196974	201637
Distribution Transformers (Nos)	324	2898	10821	22478	29551	31329	32585	33455	34758
Annual Revenue in Rs. crores	0.584	3.117	91.249	625.194	1669.24	1811.13	1946	*3722.530	*4068.91

Source:KSEB

*Provisional

Table 7.2
Hydro – Thermal Mix

Year	Hydel (MU)	Thermal (MU)	Import (MU)	Total (MU)	Hydel (%)	Thermal+ Import (%)
1998-99	7348.68	493.23	3115.00	10958	67.06	32.93
1999-00	7074.10	1829.43	3047.00	11952.50	59.19	40.80
2000-01	6221.71	2871.31	3414.97	12510.60	49.73	50.25
2001-02	6784.58	2074.32	3979.07	12842.00	52.83	47.14
2002-03	4866.14	3224.56	4619.00	12712.10	38.28	61.70
2003-04*	3951.47	2727.88	5886.85	12568.70	31.44	68.54

Source:KSEB

*Provisional

7.6 The projects commissioned during the year 2003-04 are shown in Table 7.3

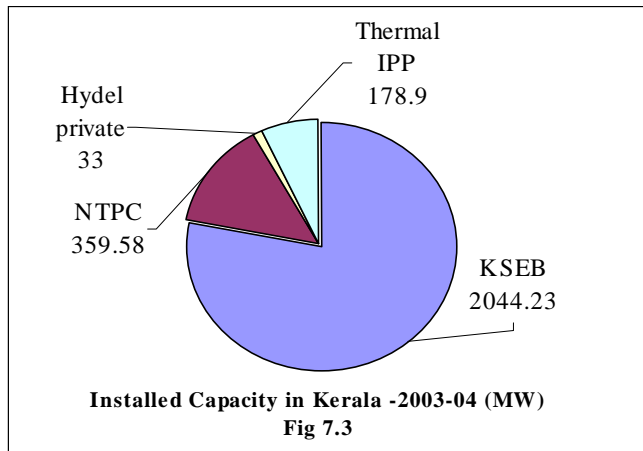
7.7 Out of the total installed capacity of 2615.71 MW in the State, the Kerala State Electricity

Table :7.3
Projects Commissioned in 2003-04

Sl.No	Name of Projects	Capacity
1	Chempukkadavu I	2.7 MW
2	chempukkadavu II	3.75 MW
3	Urumi I	3.75 MW
4	Urumi II	2.4 MW
5	Vadakkepuzha Diversion	12 Mu

Source:KSEB

Board holds 2044.23 MW .The distribution of the capacity based on the nature of source is given in Figure 7.3.



7.8 Generation of power by KSEB from its plants in 2003-04 stood at 4488.06MU, out of which, 87.14% came from hydel sources. The power availability during the year 2003-04 is given in Table 7.4. Kerala has not purchased power from NTPC since June 2004 due to improved rainfall. It is expected to commission Malankara (10.5MW) and Kuttiadi augmentation (223 MU) before the onset of the south-west monsoon.

7.9 As regards new projects, Athirappally could not be implemented for want of environmental clearance from Govt of India.

Table 7.4
Energy availability in the State during 2002-03&2003-04

Sl.No	Source	2002-2003	2003-04
1	Generation (in Million KWH)		
a	Hydel	4844.03	3910.68
b	Thermal (BDPP + KDPP)	674.81	574.89
c	Wind Farm	2.44	2.49
	Total- 1	5521.28	4488.06
2	Power Purchases (in million KWH)		
a	NTPC (Kayamkulam)	1857.53	1034
b	NTPC (Ramagundam)	2191.73	2271.22
c	Neyveli Lignite Corporation	1216.47	1348.11
d	Western Region	12.28	
e	Madras Atomic Power Project	93.02	80.13
f	Eastern Region	808.66	467.52
g	Maniyar	23.36	
h	Kaiga	376.73	373.6
i	BSES	305.80	992.21
j	Kuthungal	23.60	
k	KPCL,Kasargode	147.65	77.23
l	PTC Power	30.48	71.2
m	UI Units	219.78	682.15
n	GEL		12.03
o	Talchar Stage II	11.64	605.06
	Total of (2)	7330.80	8015.41
3	Total(1+2)	12852.08	12503.47
4a	Less-Bilateral Exchange		
b	Less losses in MU		174.5
c	Auxiliary Consumption	45.53	48.1
	Total of (4)		222.6
5	Net Availability in MKwh(3-4)	12806.55	12280.87

source :kSEB

BOX 7.1**Kayamkulam Plant's Capacity to go up to 2300 MW**

The second stage expansion project at a total investment of Rs 6000 crores will pave the way for the switch over of the unit from a Naphtha – based unit to a LNG based project. NTPC is in the process of finalizing the bids for the supply of LNG to its Kayamkulam Unit. NTPC unit at Kayamkulam has a capacity of 350 MW at present. With reduced demand for thermal power, Kerala was taking only 50% of the power while the remaining was being sold to Tamilnadu. Since June, 2004 the Kayamkulam Unit has stopped generating power as there are no takers.

Table 7.5
On going hydel projects

Project	Install ed Capacity	Energy Potential
Malankara HGP	10.5 MW	65 mu
Kuttiadi Augmentation Scheme	-	223 mu
Additional Centre share	200 MW	1400 mu
Total by 2007	210.5 MW	1688 mu
Lower Meenmutti	3.5 MW	10.14 mu
Kuttiadi Additional Extension	100 MW	240 mu
Kuttiadi tail race	3.75	15 mu
Nariamangalam Extension	25 MW	58.26 mu
Pallivasal Extension	60 MW	132 mu
Kuttiadi Diversion	-	37 mu
Total by 2012	192.25 MW	492 mu

Source: K S E B

Imports and Exports.

7.10 Based on Availability Based Tariff (ABT) regime which was introduced in the southern states from 1-1-2003 improved grid discipline in the region during the period has helped KSEB in availing cheap power, thereby easing the power position of the State as well as the financial position of KSEB. KSEB has been able to exploit the system by drawing cheap power at low rates and export any surplus power available during low frequency conditions based on hydro power availability.

7.11 During 2003-04 Board has drawn 771.5MU and exported 110.5MU utilising favourable conditions as Unscheduled Interchange(UI), while adhering strictly to merit order despatch principles. The net drawal is 661MU at a daily average of 1.81MU. During 2004-05 the UI export so far (up to 30-11-2004) is 137.14 MU and drawal is 306.13

MU. The net drawal during 2004-05 is 168.99MU at a daily average of 0.69MU.

Transmission

7.12 Transmission Infrastructure facility was substantially modified and strengthened during 2003- 04 as can be seen in Table 7.6.

7.13 In the load despatch station, real time data from the generating stations and sub stations are obtained through Power Line Carriers Communication(PLCC) Network. Depending on the load condition, generators in various power stations are synchronized and loaded to meet the varying load requirements. Unified Load Despatch and Communication System is implemented in the State also as part of the National Policy for Unified Load Despatching and the formation of National Grid and National Load Despatch Station.

Table 7. 6.
Transmission Infrastructure Commissioned -2003-04&2004-05

Capacity	Sub Stations (Nos)		Transmission Lines(Nos)	
	2003-04	2004-05 (Up to 31-8-2004)	2003-04	2004-05(Up to (31-8-2004)
1	2	3	4	5
220 KV	1	-	1	-
110 KV	6	2	7	2
66 KV	3	-	3	-
33 KV	7	3	8	3

Source: K S E B

Distribution

7.14 KSEB is the sole distributor of the Electrical Energy for the State of Kerala except Thrissur Corporation and Munnar where the distribution is managed by licensees. In Thrissur the City Corporation and in Munnar, M/s Tata Tea Limited are the licensees. The KSEB distribution system consists of 30,296 circuit kms of 11 KV lines, 1,89,309 circuit kms of LT lines and 31,579 Distribution Transformers.

7.15 The number of consumers recorded an increase of 4.4 percent from 6947803 as on 31-3-2003 to 7253866 as on 31-3-2004.

7.16 Revenue collection increased from Rs.2480.69 crores in 2002-03 to Rs. 2756.83 crores in 2003-04 with an increase of 11.13 percent.

7.17 As of now 4.74 lakh applications for power connection are pending with KSEB. A scheme is

being prepared to provide 5 lakh more connections covering the balance of pending applications and two lakh new applications expected during the period.

7.18 As part of loss reduction measures, 866936 faulty energy meters were replaced during 2003-04 and 236994 in 2004-05 (up to 30-11-2004).

7.19 Schemes to improve the quality of power supply in Trivandrum and Kochi at a cost of Rs. 163 crores and Rs. 200 crores respectively have been chalked out. The Board is to vigorously pursue power theft cases against high tension consumers. Achievement during 2003-04 & 2004-05 in the field of distribution sector in Kerala can be seen in Table.7.7.

7.20 Out of new service connections effected

Table 7.7
Distribution –2003-04&2004-05

Particulars	Achievement	
	2003-2004	2004-05(Up to 31-8-2004)
No. of service connections	391815	152132
11 KV lines (km)	1269.10	249.22
LT Lines (Km)	4429.23	2087.159
Distribution Transformers (nos)	1063	398
Street Lights (nos)	34383	20313

Source: K S E B

during 2003-04, 77.25% falls in the cross subsidy receiving category, only 22.7% falls in the cross subsidy paying category of commercial and LT industrial consumers.

Cost of Power

7.21 KSEB now spends more than Rs. 4.00 per unit for power from thermal projects. The average cost of power comes to Rs. 3.30 per unit. But, it sells power at an average rate of Rs. 2.34 per unit.

Tariff

7.22 The price differential in retail tariff is 795 ps/unit, in the extreme case. While agriculture consumers are charged at 65 ps/unit, high and commercial consumers are charged at 825 ps/unit and non-domestic consumers in LTVI(c) category at 860 ps/unit. Similarly average rate for domestic consumption remains at 176 ps/unit, whereas average per unit cost is 359 ps and average tariff is 309 ps/unit.

Demand

7.23 Today, about 20 per cent of the demand in the State is for lighting. The Board's difficulties in managing peak loads in the evenings also arises out of this.

Sponsored Works

7.24 KSEB has recently made rapid progress in executing the works entrusted by Local Governments under decentralised planning. Details of works completed during 2003-04 and that up to october 2004 are seen in Table 7.8

7.25 Details of schemes undertaken by KSEB under M P's Local Area Development Scheme (MP LADS) and Special Development Fund for MLAs (SDF) upto 31.8.2004 can be seen in the Table.7.9.

Accelerated Power Development and Reforms Programme (APDRP)

7.26 Government of India approved a scheme called 'APDRP' in March 2003 to accelerate

Table 7.8
Works under Kerala Development Plan

Years	Area	No. of works completed
2003-04	South	746
	Central	655
	North	265
	Total	1666
2004-05 (Up to October 2004)	South	29
	Central	41
	North	6
	Total	76

Source: K S E B

Table 7.9
Works under MP LADS / SDF for MLAs

Years	Area	No. of completed works	
		MP LADS	SDF for MLAs
As on 31.8.2004	South	171	113
	Central	68	55
	North	96	109
	Total	335	277

Source: K S E B

transmission and distribution sector reforms. The main objectives of the programme are :

- Reduce Aggregate Technical & Commercial (AT&C) losses to 15%
- Bring about commercial viability in the power sector
- Reduce outages and interruptions
- Increase consumer satisfaction

7.27 The schemes undertaken under APDRP are

- (a) renovation and modernisation of sub-stations,
- (b) strengthening transmission lines,
- (c) installation of distribution transformers, feeders, energy meters ,
- (d) strengthening of High Voltage Distribution System (HVDS),
- (e) implementing Consumer Indexing and computerised billing.

7.28 An upto date status of fund released/utilised is shown in Table.7.10.

7.29 In Kerala, KSEB has undertaken schemes under APDRP covering circle schemes and town schemes. The works of three circle schemes and seven town schemes are almost complete. Now Board has taken up new 26 town schemes costing Rs. 123.91 crores under APDRP.

Critical Issues faced by the Sector:

7.30 Power Sector has been confronting some sensitive issues. Major problems are:

- Delay in taking up Hydel Projects for want of clearance from competent agencies.
- Difficulties in land acquisition and right of way for transmission works due to the peculiar nature of population distribution and thick vegetation.
- Large revenue gap and heavy interest

burden

- Increasing domestic consumption and decreasing HT&EHT consumption-
- Domestic consumption increased from 32.74 per cent in 1994-95 to 43.34 percent in 2003-04. Industrial HT and EHT consumption decreased from 36.96% to 32.92% during the same period
- Drawing huge quantity of thermal power in years of low rainfall;
- The loss due to additional purchase of costly power during 2002-03 and 2003-04 was about Rs 720 crores per year.
- Huge deficit resulting in reduced capacity to undertake capital expenditure and additional borrowing.
- Due to high cost, Brahmapuram and Nallalam power stations could not be utilised on a continuous basis.
- With the ever increasing price of crude oil in the international market , the variable cost of power generated by IPPs in Kerala viz BSES, KPCL and the NTPC has become prohibitively costly. With Naptha price above Rs. 20,000/M.T, the variable cost of power from NTPC and BSES power stations comes to above Rs 4 per unit. While complying to merit order despatch principles, power from these stations could hardly be utilised, especially in the scenario of better hydel resources and availability of cheap power from eastern region and UI power during off peak hours. These stations remained grossly under utilised during the period.

Power Sector Reforms

7.31 A study on man power as well as skill requirements arriving at work norms, job specification etc in the reformed context is being conducted through the Administrative Staff

Table 7.10
APDRP status in Southern States as on 31.3.2004

(Rs. crores)

Sl. No.	State	Project Outlay	Total Released 2002-03 & 2003-04	Total utilisation upto March 2004
1	Kerala	350.35	104.66	145.07
2	Tamil Nadu	968.17	344.16	251.10
3	Andhra Pradesh	1511.40	566.76	402.30
4	Karnataka	1161.19	435.45	249.45

Source : Annual Report 2003-04 ,Ministry of Power, Govt of India .

College of India (ASCI), Hyderabad. The work study is not yet completed.

7.32 Primarily the restructuring of the distribution sector becomes all the more important and significant as this sector is dealing directly with the beneficiaries/customers. The formation of Generation, Transmission and Distribution functions in to separate profit centres is still pending. The state government have meanwhile made it clear that it is not proposed to disengage as of the functions of KSEB.

The reform measures initiated or continued in 2003-04 include

- Acceleration of electrification programme to cover all the house holds by 2007@ providing 4 lakh service connections per year.
- Reduction in T&D loss –
- T&D loss brought down to 26.07% in July 2004.
- R & M works in Pallivasal, Sengulam and Panniar projects have been completed.
- Out of the target of installing 8775 nos of 9 KVAR distribution transformers capacitors ,only 2708 were installed.

- Computerisation of Billing, Collection and Accounting in Towns have been effected.
- Issue on constitution of District Level Committee for Resource Planning monitoring of distribution reforms and rural electrification has been presented to the Government of Kerala
- Action for reducing expenditure and increase in revenue has been expedited.
- Power theft detection activities intensified.
- Introduced ABT in Southern Region and Kerala have been strictly following rigid regulations.

Works entrusted to Consultants appointed for availing ADB loan towards the Power sector reforms and strengthening of the system are in progress.

Financial Performance of KSEB

7.33 Performance of KSEB in 2002-03 and for 2003-04 is given in Table 7.11.

7.34 Expenses were reduced mainly on capital expenditure and interest on capital. Meanwhile employee cost steeply increased in 2003-04. Moreover, Kerala State Electricity Regulatory Commission (KSERC) has directed Kerala State

Table 7.11
Receipts&Expenditure(KSEB's figures)

(Rs.Crores)

Sl. No.	Particulars	2002-03 (Actual)	2003-04 (Provisional)
1	Statutory Supply	80.78	91.82
2	Total Expenditure	3641.75	3977.09
	Generation of Power	166.23	143.70
	Purchase of Power	1872.08	1887.70
	Interest	597.88	622.85
	Depreciation	27710	326.19
	Employee Cost	670.83	788.31
	Repairs and Maintenance	60.64	63.79
	Administration and General Expenses	51.80	84.74
	Other Expenses	164.42	247.56
	Less : Expenses capitalised	118.15	109.05
	Less : Interest capitalised	101.08	78.11
3.	Less Non Tariff Income	226.27	304.26
4	Annual Revenue Requirement (1+2+3)	3496.26	3764.26
5	Less: Revenue from Tariff	2480.69	2756.83
6	Revenue Gap (5-4)	1015.57	1007.43

Source: K S E B

Electricity Board (KSEB) to manage with the existing power tariff structure during this financial year. Earlier, KSEB, in its petition submitted to the KSERC, had estimated that it would be requiring an additional sum of Rs. 854 crores during 2004-05. On processing the petition, KSERC ordered that the gap could be narrowed down to Rs. 296 crores by improving its collection efficiency and ensuring that the consumers who had fallen into arrears on the settlement of their electricity bills are brought up to date with their payments. KSEB had also informed that its collection efficiency was between 90 and 92 per cent.

7.35 The KSEB's projection was that it would require Rs. 3766.72 crores to meet all its expenses during 2004-05. The KSERC made reductions in the projected expenses under several heads like interest charges, employee cost, other expenses, etc. The lower expenses allowed and the higher income calculated by the KSERC would bring down the revenue gap of the KSEB to Rs. 296 crores as against Rs. 854 crores given in the petition.

Power Consumption and Revenue Realisation

7.36 Consumption in domestic sector increased from 43.42% in 2002-03 to 44.93% in 2003-04 registering a growth of 1.51%. Consumption share in the other category of consumers also increased except for HT&EHT category in 2003-04. Category wise details during 2003-04 are given in Table 7.12.

Kerala State Electricity Regulatory Commission (KSERC)

7.37 KSERC issued orders on Aggregate Revenue Requirement (ARR) and Expected Revenue Requirement (ERR) for the year 2004-05 in April 2004. The Commission approved an ARR of Rs. 3492.46 crores and the total revenue receipts of Rs. 3196 crores for the year 2004-05.

7.38 Major points in the directives issued by the Commission are as follows:

1. To complete the computerisation of billing activity at the earliest.
2. To regulate hydro generation 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. The schedules for power generation from the Diesel Plants of K S E B and power purchase from external sources are required to be co-ordinated with the schedules for hydro generation and the power generation from Diesel Plants and power purchase from external sources should be regulated strictly on merit order basis. The schedules should also be formalized and reviewed at various levels in KSEB through appropriate Management Information System.
3. To take immediate action to correct the discrepancies in the accounts and provide a correct picture regarding the current level of demand and collection.
4. The current level collection efficiency stood at 90-92 percent and the gap is mainly due to the non payment of dues by the Government Departments including K W A .The commission urged upon the Board to take up

Table 7.12
Power Consumption and Revenue Collected during 2003-04

Sl. No.	Category	% of consumers to total	consumption as % to total	Revenue as % to total
1	Domestic	78.79	44.93	25.52
2	Commercial LT+HT	14.22	13.28	20.99
3	Industrial LT	1.47	8.422	11.08
4	Industrial HT & EHT	0.022	25.053	37.93
5	Others	5.498	8.315	4.48
	Total	100	100	100

Source: K S E B

- the matter with the govt. for releasing all outstanding and current dues by the Government departments without fail.
5. To report the position of the programme regarding replacement of faulty meters and to proceed with the work of replacement of faulty meters on a continuous basis.
 6. To revise the white paper by incorporating a concrete and time bound action plan for improving collection efficiency and swapping of all high interest loans and also directed to submit the revised white paper to the commission at the earliest.
 7. To furnish the details of the continuing and new work programme and the details of physical and financial progress of each item of work along with the reasons for slippage with reference to the targets.
 8. To furnish a report on computerisation of the inventory and disposal of unwanted stores
 9. To prepare a detailed work programme for R & M works during the year 2004-05, corresponding to the approved outlay of Rs. 66.70 crores and submit to the Commission at the earliest.
 10. The Commission suggested that the Board should submit the investment plan including the details of the projects completed / spillover and new projects well in advance .

7.39 The KSEB has submitted the ARR and ERC for 2005-06 and the orders on ARR and ERC are to be issued very soon.

National Electricity Policy (NEP)

7.40 The Electricity Act 2003 empowered the Central Government to prepare a National Electricity Policy (NEP) in consultation with the State Government and the Central Electricity Authority (CEA) to provide power for all by 2012, completing rural electrification for providing electricity access to all house holds within the next five years, supply of reliable and quality power, increase the per capita consumption of power and protect consumers' interest. Broad features of the draft NEP are indicated below.

-Power Generation

7.41 The NEP outlines a strategy for meeting the target of addition in capacity of one lakh Mega Watts(MW). It proposes debt financing of longer tenure for hydro projects to have an additional production capacity of 50000 MW.As regard to Nuclear Power, the objective is to achieve 20,000 MW of installed capacity in 2020.

-Transmission

7.42 NEP envisages that the Central Government would facilitate the development of a national grid for inter state transmission.

Table 7.13
Overall Position Regarding Aggregate Revenue Requirement For 2004-05

(Rs. crores)

Item	As per ARR of KSEB	As approved by KSERC
Return / Surplus (a)	155.30	105.00
Total expenditure (b)	3766.72	3387.46
Power generation	148.99	100.53
Power purchase	1729.74	1605.00
Interest charges	723.30	618.30
Depreciation	382.27	382.27
Employee Cost	736.64	718.47
Repair & Maintenance	85.25	66.70
Administration & General	69.80	68.68
Other Expenses	130.00	50.00
Less : Expenses capitalized	123.53	123.53
Less : Interest capitalised	115.73	98.96
ARR (a+b)	3922.02	3492.46

source:KSERC

-Distribution

7.43 Robust competition in the Electricity market depends on open access and multiple licenses in the same area of supply. The liabilities of State Electricity Boards.(SEBs). need to be restricted for ensuring financial viability and sustainability. Other focus areas include upgradation and augmentation of the distribution network, energy audit, time bound programme for reduction of technical and commercial losses and implementation of Information Technology (IT) based system to reduce T& D losses.

7.44 The other areas of focus in NEP are rural electrification, creation of a power exchange for marketing electricity, energy conservation and regulation of quality of power to protect consumer interests.

7.45 There are major differences of opinion on the draft NEP. However, it is essential to arrive at early decisions if investment in the sector is to increase sharply to meet the needs of a fast growing energy.

Non Conventional Energy Programme

7.46 The search for alternative fuels that would ensure sustainable development on the one hand and energy security on the other began in the 1970s itself. Consequently new and renewable sources of energy have emerged as an option.

7.47 India has a policy frame work in place to tap the potential for renewable energy such as solar, wind, biomass, small hydro etc irrespective of capacity

7.48 Renewable sources of energy presently contribute about 4800 MW, which represents over 4.5% of the total installed capacity. Wind power contributes about 2483 MW, while biomass and co-generation account for 613 MW and the share of small hydropower is 1603 MW. Agency for Non-Conventional Energy and Rural Technology(ANERT) is the nodal agency of the Ministry of Non Conventional Energy Sources (MNES), Government of India for the State of Kerala.

Table 7.14
Status of Renewable Energy Programmes 2003-04

Category	Kerala	All India
1. Wind Mills (Nos)		
a) Sanctioned	95	1174
b) Installed	79	945
2. Aero generators and Hybrid systems (KW)		
a) Sanctioned	8	484.65
b) Installed	8	369.86
3. Identified SHP Projects up to 25 MW capacity		
a) No. of projects	198	4233
b) Total capacity	466.85	10324.37
4. SHP projects set up and under construction.		
a. Projects setup	14	495
i. Number	84.62	1603.32
ii. Capacity		
b. On going	6	170
i. Number	60.4	569.26
ii. Capacity		

Source: Annual Report 2003-04, MNES, Govt of India

Renewable Energy Programmes in Kerala

7.49 The status of renewable energy programmes at the national and state levels is given in Table 7.14

Wind Energy Programme

7.50 Wind Power has emerged as the most promising source among all other Renewable Energy Sources for Power generation and is one of the most cost effective options for grid connected power generation. Wind farms are becoming popular all over the world. Pasavaikumbe in Kasaragod district and Kalyanathandu in Idukki district are the two sites identified for study under the National Wind Energy Resource Assessment. The programme is to be implemented jointly by ANERT and Centre for Wind Energy Technology (C-WET), Chennai.

7.51 As per the wind energy policy guideline, ANERT will provide necessary power evacuation facilities for the wind farm (25 MW) being established at Ramakkalmedu area in 135 ha of land. It is estimated that 100 MW Wind Energy Potential is available at Ramakkalmedu area.

Solar Photovoltaic Programme (SPV)

7.52 Solar Photovoltaic Technology helps to directly convert sunlight into electricity. SPV systems are an option for meeting electrical energy needs of remote areas where grid electricity has not yet reached

7.53 In the country the number of remote and unelectrified villages identified so far stands at 24,500 where as the number of remote colonies in Kerala is 302

7.54 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 top of residential buildings and grid interactive PV power plants in autonomous and private institutions.

7.55 As part of Remote Village Electrification Programme, a survey was carried out with the help of IREP offices. It is estimated that more than 1500 hamlets are still remaining unelectrified/partially electrified.

Solar Thermal Energy Programme (STEP)

7.56 STEP Envisages the promotion of use of Solar heat energy to meet the various thermal needs. The most popular solar thermal devices are Solar Water Heating Systems. (SWHS), Solar cookers, Solar Dryers, Solar Stills etc. These devices help to save considerable amount of fuel used for heating.

Bio Energy Programme

7.57 Bio Energy Programme includes biogas programme, biomass gasification programme, alternate fuels and waste to energy programme. ANERT is implementing the National Biogas programme of the MNES since 1999-2000 by installing Community, Institutional and nightsoil based biogas plants ranging from capacities of 15 m³ to 35 m³ for the production of biogas from the biodegradable waste like animal waste, kitchen waste etc. National Biomass resource assessment survey was conducted in all districts of the state to assess the availability of biomass for conversion into energy. ANERT has installed so far 64 biogas plants with MNES assistance. But MNES has stopped financial support to this programme recently.

7.58 Biomass gasifiers are designed to generate heat or electricity by using bio fuel materials like coconut shell, wood chips, rice husk, rubber wood waste, bamboo waste, saw dust etc. MNES is supporting the programme with different subsidy levels. Action is initiated to undertake few pilot projects for conversion of oil fired boilers into biomass gas firing.

Rural Energy Programme

7.59 ANERT has initiated steps to reorient the rural energy programme. Major activities taken up under IREP for effecting the reorientation are the following.

- 1 Selection of deserving village clusters and preparation of micro level energy plans for each selected village cluster.
- 2 Preparation of District level and State level Energy plan and updating these plans on annual basis
- 3 Implementation of Model Integrated Rural Energy Projects in selected Village clusters.

Table 7.15
District wise list of village clusters selected for the implementation of the odified IREP scheme in Kerala.

Sl.No	District	Name of clusters
1	Thiruvananthapuram	Vithura
2	Kollam	Aryancavu
3	Pathanamthitta	Perinadu
4	Alappuzha	Purakkad
5	Kottayam	Aymanam
6	Idukki	Kanjikuzhi
7	Ernakulam	Kuttampuzha
8	Thrissur	Panamchery – Peechi
9	Palakkad	Sholayur
10	Malappuram	Chaliyar
11	Kozhikode	Koodaranji
12	Wayanad	Thondaranad
13	Kannur	Payyavur
14	Kasaragod	Panathadi

source :ANERT

Small Micro – Hydel Programme

7.60 The United Nations Industrial Development Organisation (UNIDO) has established its first Regional Centre for small hydro power in Thiruvananthapuram. The first off – grid 100 kw micro hydel power project was commissioned in Mankulam in Idukki district. This micro hydel power project consists of two units of 50 Kw turbine generators of which one unit of 50 Kw turbine generator was sponsored by UNIDO and the other by the Village Panchayat. In order to avoid T & D Losses, 11 KV line was drawn by the Panchayat from the power house to Mankulam with a transformer at Mankulam town for efficient distribution work with the technical support of Energy Management Centre (EMC) . The electricity generated from the Mankulam micro hydel project is distributed to the residents of Mankulam Town area and Pambumkayam.

Small Hydel Project(SHP) Cell

7.61 Government of Kerala has constituted a special SHP Cell in EMC for allotment of small hydro projects, inviting tenders, processing tenders etc. Out of 61 projects identified for private participation. 30 projects having DPR/DIR were offered for private investment. After completing

the formalities of bidding, 5 small hydro projects were allotted to two bidders under captive power projects on BOOT basis and 8 projects to 4 bidders under Independent Power Producer category on BOOT basis

Standards and Statutes

7.62 The Electrical Inspectorate Department formed in 1968 enforces statutes and standards. The Department has Offices in all districts. Also, there is a Meter Testing and Standards Laboratory at Thiruvananthapuram. Regional Testing Centres are attached to the district offices in Thiruvananthapuram, Ernakulam, Thrissur and Kozhikode. The

duties and functions of the department include the following.

- To ensure standard and quality of electrical installations and thereby ensure safety and efficiency in the generation, transmission and distribution and use of electricity
- To give approval for electrification of Extra High Tension installations, buildings and cinema theatres
- To issue prior sanction for installations like X-rays, Lifts, Neon-signs and Generators
- To conduct periodical inspection of all electrical installations except those supplied at Low Voltage, as prescribed by the Government
- To investigate electrical accidents and submit reports to the Government enumerating the causes and suggestions to avoid recurrence.

7.63 The Chief Electrical inspector is the “Appropriate Authority” to implement the provisions of the Quality Control Orders (Sec. 14 of BIS Act 1986 and Sec. 3 of Essential Commodities Act 1955).