

# Energy Development





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**E**nergy is an essential input to the overall development of the economy. It provide light and fuel to millions of households, electricity to industry, agriculture, commerce, all service sectors and so on. Since energy is a critical component, development of conventional and Non-conventional forms of energy for meeting the growing demand of the society at reasonable price and quality is the responsibility of the Govt. For the purpose so many projects are initiated during XI<sup>th</sup> plan.

## Power Sector in India

9.2 The power sector has achieved significant progress since planned development of the Indian economy. The Eleventh Plan envisaged an increase in primary energy availability (i.e. from coal, lignite, crude oil, natural gas, hydro power, nuclear power, wind power and non-commercial energy) at 6.4 % per year taking the total availability from 550Mtoe in the terminal year of the Tenth Plan to 715Mtoe in the terminal year of the Eleventh Plan. Hydro power and coal based thermal power have been the main sources of generating electricity in India and nuclear power development is at slower pace. The Government of India got itself involved in a big way in the generation and bulk transmission of power to supplement the efforts at the State level and took upon itself the responsibility of setting up large power projects to develop the coal and hydroelectric resources in the country as a supplementary effort in meeting the country's power requirements.

9.3 The Indian Power Sector is one of the fastest growing sectors in the world and energy availability has increased by around 36% in the past 5 years, the demand for power exceeds its supply. Nearly 60 crore Indians do not have access to electricity. The energy and peaking deficits have been hovering around double digits for the past two years and the condition might worsen in the coming years considering the huge demand of power from India's rising population and rapid industrialization and urbanization. Hence, there is no slowing down of demand for the Power Sector , thus offering ample scope for rapid capacity addition.

## Installed Power Generation in India

9.4 Power sector witnessed severe fluctuations in performance during the periods of Eleventh Five Year Plan in terms of capacity addition. The country hopes to achieve 78000 MW in the generation capacity in the five years ending 2012. The country produces 173626.40 MW of power as on March 2011, but nothing can illustrate the slack pace of capacity addition. The total demand for electricity in India is expected to cross 950000 MW by 2030. About 65 % of the electricity consumed in India is generated by thermal power plants, 22 % by hydro electric power plants and 3 % by nuclear power plants and 10 % by renewable sources. Details shown in the Table 9.1

**Table 9.1**  
**Total Installed Capacity in India as on 31.03.2011**

Fuel	MW	(Percentage)
Thermal	112824.48	64.98
Hydro	37567.40	21.64
Nuclear	4780.00	2.75
Renewable Sources	18454.52	10.63
Total	173626.40	100.00

Source: Ministry of Power, Govt of India

9.5 The installed power generation in the country has increased from 167077.36 MW as on 30.11.2010 to 173626.40 as on 31.03.2011. The capacity addition was 6549.04 MW. Out of the total installed capacity of 173626.40 MW, a major chunk of the energy generation comes from thermal energy as 112824.48M.W (64.98%). It was followed by hydro 37567.40 MW (21.64%), nuclear 4780.00 MW (2.75%) and 18454.52 MW (10.63) of renewable sources. The percentage of increase in installed capacity from 2010 to11 was 3.92 %. Contribution of each sector to the national grid as on March 2011 is shown in the table 7.2.

**Table 9.2**  
**Sectoral Contribution as on 31.03.2011**

Sector	MW	(Percentage)
State Sector	83340.67	48
Central Sector	53824.18	31
Private Sector	36461.55	21
Total	173626.40	100.00

Source: Ministry of Power, Govt of India

## Kerala's Power Sector Projections

9.6 In the past, the energy demand was presumed to be basis with load factor being used to convert the projected energy demand to peak MW demand. The projected energy demand was worked out by a combination of end use and time series analysis. This was the methodology used in the Electric Power Surveys (EPS) conducted by CEA in conjunction with the State Electricity Boards.

9.7 One of the problems with the above approach has been consistent over projection of peak demand. The annual growth of peak power demand has been assumed to be of the order of 7-8% and this has resulted in projections well beyond actual demand realised.

9.8 Some of these anomalies have been corrected in the current Electric Power Surveys conducted and the projections for Kerala as continued in the 17th Survey. The figures for Kerala in terms of demand projection in the Draft 17th EPS are given below.

**Table 9.3**  
**17th EPS Estimates for 11th Plan period**

Year	Energy Consumption	Peak Demanded	Annual Load Factor (%)
2006-07	11147	2699	60.75
2007-08	12037	2823	61.54
2008-09	12973	2947	62.34





Year	Energy Consumption	Peak Demanded	Annual Load Factor (%)
2009-10	13977	3078	63.14
2010-11	15112	3227	63.94
2011-12	16345	3391	64.74

Source: EPS Draft report

9.9 It is evident from the 17th EPS Draft Report, that a number of assumptions made for projections which may result in the actual demand being more than what is projected in the EPS or less. KSEB's own projections taking into account a higher growth rate and a slightly lower load factor projects the following demands for the 11th plan period.

**Table 9.4**  
**KSEB's projections for the 11th Plan Period**



Year	Energy Consumption	Peak Demand	Annual Load Factor (%)
2007-08	15217	2856	60.82
2008-09	16096	3004	61.17
2009-10	17025	3159	61.52
2010-11	18077	3335	61.87
2011-12	19230	3528	62.22

Source: EPS Draft report

## Power Sector in Kerala

9.10 Power Sector in Kerala plays a vital role in all developmental activities in Kerala. Obviously power crisis is the prime obstacle to start new initiatives in the industrial field. The need for power is increasing and the production of power should also be increased accordingly. Monsoon is essential to sustain the hydropower base in the state and the shortage in rainfall usually creates power crisis. Kerala received abundant monsoon during the current year and it increased the inflow in to KSEB reservoirs; the KSEB could manage the power supply situation with higher quantum of cheaper hydel power. Kerala is one among the very few states in the country where there was no load shedding and power cut during 2010-11. KSEB has been responsible for the generation, transmission and supply of electricity in the State, with particular emphasis to provide electricity at affordable cost to the domestic as well as for agricultural purposes. The Board has been passing through a transitional phase of reforms in the electricity sector. The Electricity Act 2003 envisages separate organizations for Transmission and Distribution.



## Generation

9.11 The history of Hydro Power development in Kerala begins with the commissioning of Pallivasal Hydro Electric Project in 1940. Next few decades reflected the progressive developments of various hydroelectric schemes implemented in the state. Sabarigiri in 1966 and Idukki in 1976 are milestones of Power Development in Kerala.

9.12 As per the seventeenth power survey, there is an additional generation requirement of about 1000 MW for the state during next five years. KSEB has set a target for providing affordable and reliable electricity to all households on demand by 2011. Water is the only commercially viable source for power generation within the State. To ensure reliability of supply as well as energy security, capacity addition in Kerala has to be given due importance. Meanwhile KSEB has proposed to add about 610.50 MW of new hydel capacity during Eleventh plan period.

## Capacity Addition during 2010-11

9.13 Power System in Kerala consisted of hydel, thermal and wind sources. Hydel energy is the most reliable and dependable source in Kerala. Of the total installed capacity, 2857.59 MW during 2011, the lion's share of 2040.8 MW of installed capacity comes from 24 hydel stations; 783.11 MW is from the thermal projects including NTPC at Kayamkulam which is Kerala's dedicated thermal station. Kanjikode wind farm, Palakkad has an installed capacity of 2.03 MW. Wind Energy from IPP is 31.65 MW. Capacity addition made during 2010-11 was only 111.40 (4%) that of 2746.19 MW on 2009-10. The table (9.5) depicts detail of energy source and its installed capacity in Kerala as on 31-3-2011.

**Table 9.5**  
**Energy Source in Kerala as on 31-3-2011**

Sl. No.	Source of Energy	Installed Capacity (MW)
1	Hydel – KSEB	1997.80
2	Thermal : KSEB	234.60
3	Wind : KSEB	2.03
4	NTPC	359.58
5	Thermal : IPP	188.93
6	Hydel : Captive	33.00
7	Hydel: IPP	10.00
8	Wind: IPP	31.65
	<b>Total</b>	<b>2857.59</b>

Source: KSEB

9.14 Total Sector wise installed capacity in Kerala as on 31.03.2011 as shown in the Table 9.6

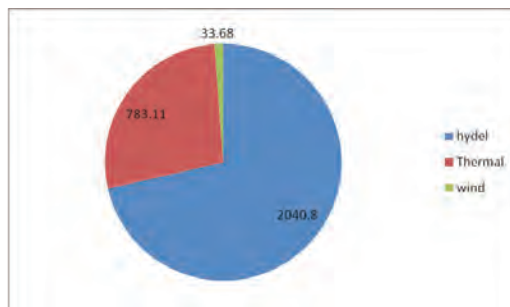
**Table 9.6**  
**Sector wise Installed Capacity in Kerala as on 31.03.2011**

Sector	MW	Percentage
State Sector	2234.43	78.19
Central Sector	359.58	12.58
Private Sector	263.58	9.22
Total	2857.59	100

Source: KSEB

9.15 Figure 9.1 highlights total installed Capacity from hydel, thermal and wind sources.

**Fig 9.1**



9.16 Under the purview of KSEB, 28 hydel projects are in the pipeline. The details of the project can be seen in the Table 9.7

**Table 9.7**  
**Projects in the pipeline**

Sl. No	Name of the Project	Installed Capacity (MW)	Energy Potential (MU)
1	Pallivasal Extension	60.00	153.90
2	Adyanpara	3.50	9.01
3	Athirappally	163.00	233.00
4	Sengulam Augmentation		85.00
5	Sengulam Tailrace	3.60	12.57
6	Chathankottunada II	6.00	14.76
7	Vilangad	7.50	22.63
8	Thottiar	40.00	99.00
9	Mankulam	40.00	82.00
10	Ranni-Perunadu	4.00	16.73
11	Perumthenaruvi	6.00	25.77
12	Chimony	2.50	6.03
13	Peechi	1.50	3.30
14	Barapole	15.00	36.00
15	Achankovil	30.00	75.81
16	Chinnar	24.00	78.00
17	Anakkayam	7.50	22.83
18	Poringalkuthu	24.00	45.02
19	Pazhassi Sagar	15.00	42.14
20	Kakkayam	3.00	10.39
21	Upper Kallar	2.00	5.15
22	Peechad	3.00	7.74
23	Western Kallar	5.00	11.23
24	Chembukadavu III	6.00	14.92
25	Olikkal	4.50	10.18
26	Poovaramthodu	2.70	5.88



Sl. No	Name of the Project	Installed Capacity (MW)	Energy Potential (MU)
27	Vakkallar	24.00	45.00
28	Pambar	40.00	84.79
	<b>Total</b>	<b>543.30</b>	<b>1258.78</b>

Source: KSEB

## Hydel Generation

9.17 During the year 2010-11, Kerala received abundant inflow into KSEB reservoirs. During this period the peak demand reached 3119 MW. On account of various factors like the reduction in inflow, high cost of naphtha and LSHS during the beginning of the year, reduction in availability of CGS etc, reflected wide gap in the availability and the requirement.

## Availability of Negative Surplus Power during 2010-11

9.18 With the hike in the consumption of energy, the State's power quota from the central pool has suddenly shrunk from 900 MW to 650 MW and also poor yield from hydel reservoirs is creating an expensive predicament, thermal power too is not beyond agenda etc leads KSEB in to a situation of Negative Surplus Power during 2010-11 though there was significant increase in hydel generation. Negative situation occurred mainly due to the drastic reduction in the purchase of power from IPPS and decline in thermal power generation and at the same time the total requirement increased to 17739.51 in 2010-11 from 17335.57 MU in the previous year and at the same time power availability was 15996.07Mu resulted a negative surplus. The details are shown in Table 9.8

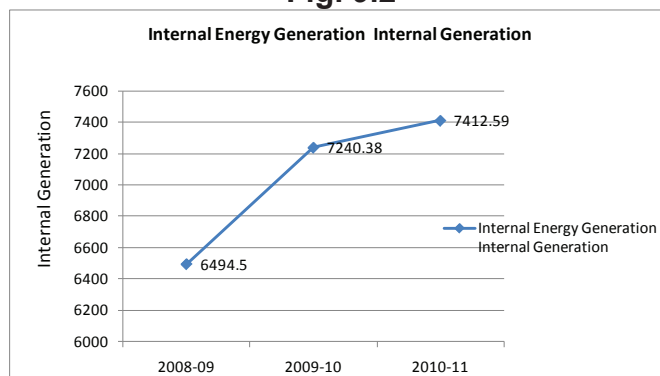
**Table 9.8**  
**Details of Power Availability as on 31.03.2011**

Sl. No.	Internal Generation	Million Units
1	Hydel Generation	7095.73
2	KSEB -Thermal Generation	315.35
3	Wind	1.51
4	Total Internal Generation	7412.59
5	Less Auxiliary Consumption	55.13
6	Power Purchase from CGS	7245.30
7	Power Purchase from IPPs	1393.31
8	Total Energy Availability	<b>15996.07</b>
9	<b>Energy requirement</b>	<b>17739.51</b>
10	Surplus	<b>-1743.44</b>

Source: KSEB

9.19 Total Internal Energy generation in Kerala from 2008-09 to 2010-11 are shown in Fig. 9.2



**Fig. 9.2**

## Power Consumption

9.20 The domestic category consumers showed a reasonable growth of 3.9 percentages to 8063039 in 2010-11 from 7760645 in 2009-10. But LT & HT Commercial category consumer registered an increase of 9.99 percentages over 2009-10. Growth of other agricultural pumping, Licensees (Bulk supply) also increased substantially over the year. The sale of energy has increased corresponding to the increase of total consumers. During 2010-11, 14678.14 MU of energy was sold showing an increase of 630.39 MU as compared to the last year (14047.75 MU). The details of consumption and revenue collected during 2010-11 can be seen in the Appendix 9.6

9.21 As per the 17th Power Survey, it is estimated that by the end of 11th plan period (2012), the annual consumption and maximum demand will be 19230 MU and 3528 MW respectively.

## Power Purchase Agreement (PPA)

9.22 KSEB has entered into PPA with various Central Generating Stations of NTPC, NLC, NPCIL etc. envisaged for Southern Region. In addition to this, power was purchased from Rajiv Gandhi combined cycle power plant of NTPC at Kayamkulam, BSES Kerala Power Ltd, Kochi and Kasaragod Power Corporation Ltd., Mylatti. Recently, KSEB has also executed PPAs with Mega Power Projects such as SIMHADRI Stage II, NLC, Tutucorin-a joint venture project of NLC and TNEB, NLC Stage II expansion etc. As a measure to encourage non-conventional sources of energy, KSEB has executed 38 PPAs for purchase of power from wind energy projects and from two Small Hydro Projects, namely, Meenvallom and Iruttikkanam. The capacity allocated from various stations for which the PPAs have been executed is given in the table 9.9

**Table 9.9**  
**Power Purchase Agreement with Power Generation Stations**

Sl. No.	Name of the Power Generation Stations	Allocation MW
I	CGS	
<b>A</b>	<b>Nuclear Power Stations</b>	
1	Kaiga I & II	38.00
2	Madras Atomic Power Station (MAPS-440 MW)	18.00
<b>B</b>	<b>Thermal Power Stations</b>	
1	NLC Stage II -ITPS II – Stage I	63.00
2	NLC Stage II – II	90.00



Sl. No.	Name of the Power Generation Stations	Allocation MW
3	NLC Stage I –Expansion	58.80
4	NLC Stage II Expansion	70.00
5	NLC New (1000MW)	32.38
6	Ramagundam I & II	245.00
6	Ramagundam III	61.00
7	Talcher II	247.00
8	RGCCP	180.00
9	Simhadri Stage II	80.90
10	Vallur Thermal Power Plant (VTTP)	49.90
11	Tutucorin	72.50
II	<b>IPPs</b>	
<b>A</b>	<b>Thermal</b>	
1	BSES Kerala Power Ltd	157.00
2	KPCL	20.436
3	MP Steel	10.00
<b>B</b>	<b>Hydro</b>	
1	Meenvallam	3.00
2	Iruttukkanam	3.00
<b>C</b>	<b>Wind</b>	
1	Agali	17.4
2	Ramakkalmedu	14.25

Source: KSEB

9.23 Kerala is planning a capacity addition of 610.50 MW (1653.86 MU) through hydel and non-conventional sources during the Eleventh plan. Allocation of 733 MW power from the projects viz. Koodamkulam Atomic Power Station (266 MW), Neyveli Lignite Corporation Expansion (70 MW), Simhadri Thermal Power Station (200 MW), Vallur (75 MW) and Tuticorin (122 MW) are expected. To fulfill the demand in 12th plan period, KSEB has planned for 1000 MW coal based project. Allocation of coal (200.66 MT) for generating 1000 MW power for the next 25-30 years from Baitarni West Coal Company Ltd (BWCCCL) in Orissa has already been obtained from Ministry of Coal, Government of India.

## Cheemeni Power Plant back in favour

9.24 The Kerala State Electricity Board is seriously contemplating the setting up of a 2400 MW thermal power project at Cheemeni in Kasaragod district. The coal for this project will come from the coal field of the Union Government in Orissa has allotted for Kerala. A Company for undertaking the mining operations has already been set up there by the KSEB in association with outside public sector power utilities. The Centre would provide all assistance for the project. The centre was attaching top priority to power capacity addition all over the country.

9.25 Earlier, Kerala has been wavering between the options of setting up a pit head power project in Orissa in association with outside public sector power utilities and having a new power projects in the State itself to utilize the coal from the field allotted to it in Orissa. Land is already available for the project at Cheemeni. KSEB was taking concrete steps to ensure long term power security in the State. With the commissioning of the LNG Terminal in Kochi, expected by 2012, natural gas would be available as fuel for power generation here. The plant now is to upgrade the KSEB's Brahmapuram Power Project to 1000 MW capacity, in addition to setting up one more project with a capacity to generate

1000 MW of electricity with LNG as fuel. KSIDC has been appointed as the nodal agency for setting up the project. A special purpose vehicle will be formed between KSIDC and KSEB with 50:50 participation for implementing the project. Board has decided to transfer its share of 5 MT per annum of coal produced from Baitarni West Coal Block to the Cheemeni project.

## Growth of Power System in Kerala

9.26 The installed capacity has been increased to 2857.59 MW during 2010-11 as against the 2850 MW in the previous year. Likewise, per-capita consumption has also been increased by 519.29 KWh from 474 KWh. The details of growth of power system in Kerala is seen in Table 9.10

**Table 9.10**  
**Growth of Power System in Kerala**

Particulars/Year	2008-09	2009-10	2010-11	2011 up to 30.09.11
Installed Capacity (MW)	2685.00	2746.19	2857.59	2857.59
Annual Sales (MU)	12414.32	13971.09	14547.9	
Per-capita Consumption (KWh)*	472	474	519.29	
EHT lines (circuit KM)	10139	10406	10514	10566
Sub stations (Nos)*	305	330	340	348
H.T. lines (circuit KM)	41791	45541	49232	50240
L.T lines (circuit KM)	252458	260670	266856	268731
Distribution Transformers (Nos)	46955	<b>52724</b>	<b>58247</b>	<b>60575</b>
Revenue from sale of power (Rs.crores)	<b>4893.02</b>	<b>4950.60</b>	<b>5403.76</b>	<b>2950.96</b>

Source: KSEB

\* includes 1 No. 400 KV Pallippuram S/s of PGCIL

## Hydro – Thermal Energy

9.27 Taking into account the present hydro storage status in the reservoirs, expected, an inflow equivalent to the average of past 10 years during the remaining period of the current water year (2010-11), the present allocation from the CGS and CERC norms for target availability and auxiliary consumption, the average quantum of energy expected to KSEB from CGS is 18.48 MU per day. Expecting the nominal pattern of increase in peak demand during summer months, KSEB proposed to schedule about 40 MW from BDPP and 60 MW from KDPP during peak hours to meet the evening peak demand. Hydro-thermal mix in Kerala is shown in Table 9.11.



**Table 9.11**  
**Hydro-Thermal Mix in Kerala from 2003-04 to 2010-11**

Year	Hydel (MU)	Thermal + Import (Mix) (MU)	Total (MU)	Hydel (%)	Thermal (%)
2003-04	3910	8545	12455	31	69
2004-05	6134	6314	12448	49	51
2005-06	7539	5866	13405	56	44
2006-07	7497	7029	14526	52	48
2007-08	8327	6884	15211	55	45
2008-09	5839	10283	16122	36	64
2009-10	6612	10711	17389	38	62
2010-11	7065	10742	17870	39	60

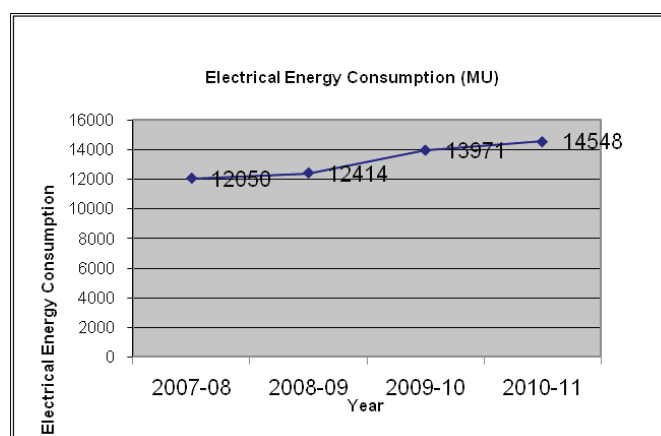
Source: KSEB

9.28 The ratio of hydro-thermal mix indicates that from 2005-06 to 2007-08 availability of hydel power has comparatively greater than the thermal power and subsequent years thermal power increased till 2010-11. It reveals that KSEB has purchased high cost thermal power for meeting the power requirement.

## Electrical Energy Consumption

9.29 In Kerala, electrical energy consumption has increased to 14547.9 MU during 2010-11 from 13971 MU during 2009-10. The percentage of consumption increased to 4.13 %. Electrical Energy consumption in Kerala during 2007-08 to 2010-11 are depicted in Fig 9.3

**Fig. 9.3**



## Transmission

9.30 Transmission of Electricity means bulk transfer of power over a long distance at high voltage, generally of 132 KV and above. It is an important sector to evacuate the power in different parts of Kerala. A good transmission system is necessary to the effective distribution and to bring power from outside the state. In the transmission Sector targeted commissioning 41 substations and construction of 484.26KMS kms of transmission lines during the period . Of which 8 substations were commissioned

and 51.96ct kms of lines were completed during 2011. At present there are two 400 KV substations. One at Madakkathara (Thrissur) and the other at Pallippuram (Thiruvananthapuram). Also another 400 KV substation at Arecode (Malappuram District) is being constructed by PGCIL. The site for the construction of this substation has been identified and taken over by PGCIL and the route Survey for the construction of Mysore - Arecode line has also been completed. Thus, there will be one 400 KV substations in each region of Kerala, i.e North, Central and South.

9.31 As per the scheme approved by Southern Regional Electricity Board (SREB), 400 KV Multi – Circuit line is proposed from Thirunelveli – Edamon and 400 KV Double Circuit line from Edamon-Kochi (East) Madakkathara. One 400 KV sub station at Kochi (East) is also sanctioned as part of this evacuation scheme.

9.32 Kerala's Transmission system consisting of substations and its connected lines are given in Tables 9.12 & 9.13

**Table 9. 12**  
**Transmission Infrastructure**

Sl.No	Item	Target	Unit	Achievement	Unit	Percentage of Achievement
1	400 KV Substation	Nil	Nos	Nil	Nos	
2	220 KV Substations	Nil	Nos	Nil	Nos	
3	110 KV Substations	13	Nos	5	Nos	38.46
4	66 KV Substations	4	Nos	1	Nos	25.00
5	33 KV Substations	24	Nos	7	Nos	29.17

Source: KSEB

9.33 It is evident that the progress of construction of substation with various capacities has not achieved the target. Out of the target of 13 numbers 110 KV substations, only 5 substations are completed and in the case of 66 KV substations, 1 substation is completed against the target of 4 numbers and out of 24 number of 33 KV substations, only 7 substations were completed. The present status of Transmission facilities set up in state due to upgradation and construction of transmission lines are shown in the table9.13.

**Table 9.13**  
**Transmission facilities in Kerala (As on 30.9.2011)**

Capacity	Substation (Nos)	Lines (Ct km)
400 KV	2*	260**
220 KV	17	2701
110 KV	131	4035
66 KV	80	2387
33 KV	118	1418
<b>Total</b>	<b>348</b>	<b>10842</b>

Source: KSEB

\* One number owned by PGCIL      \*\* owned by PGCIL

## Voltage Improvement Works

9.34 KSEB is committed to provide 230 volts between phases and neutral consumers premises in the L.T services and corresponding higher voltages in the case of higher voltage service within allow-



able limits. KSEB cannot always fulfill this commitment due to rapid load growth and corresponding changes in system parameters. When conditions prevailing low voltage in any locality come to the notice of KSEB, work is taken up as voltage improvement work. This is usually carried out at the expense of the Board. Converting existing single phase lines to 3 phase, strengthening distribution system by providing higher capacity conductors, providing additional transformers on the existing 11 KV line or by extending 11 KV line by providing adequate size of capacitors are the works usually carried out for providing higher voltage in distribution network.

## Renovation, Modernisation and Uprating (RMU) of old Generating Stations

9.35 The normal life span of a hydro generating station is 30-40 years, depending on service conditions in many of our existing generating stations are old and in service for 30 years and beyond. When the machines become old, their operational efficiency decreases. Major breakdowns occur and shut-downs of long duration will be necessary for maintenance work.

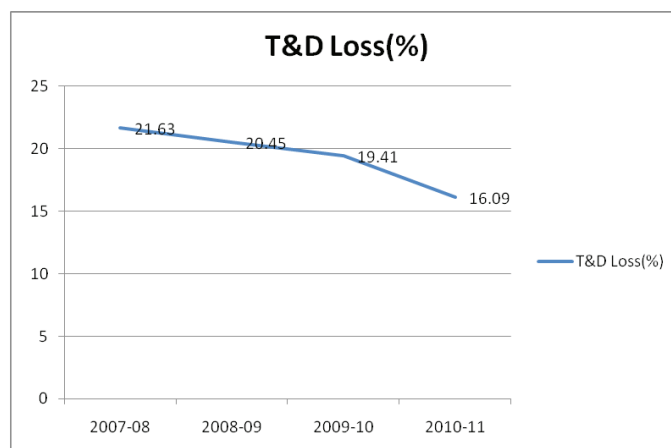
9.36 The renovation and modernization and uprating of Sabarigiri Power Station has been completed. In the case of R&MU of rehabilitation of Panniyar Power House, rebuilding of (unit 3 & 4) of Sabarigiri powerhouse, Idamalayar protection works are being undertaken.

## Transmission and Distribution Loss (T&D loss)

9.37 KSEB have to bear proportionate losses in PGCIL line through which allocation to KSEB from Ex bus of Central Generating Stations (CGS) is transmitted to KSEB Periphery and this loss component is treated as external losses to KSEB system. The energy loss in the KSEB System is accounted as internal loss.

9.38 During 2010-11 T&D loss has come down to 16.09 percent from 17.71 percent in 2009-10. KSEB made significant achievement in the field of reducing the T&D loss. During 2003-04 onwards T&D loss was considerably reduced by way of faulty meter replacement, intensification of theft detection, installation of new substations and lines, upgradation and modernization of sub transmission and distribution network through APDRP Scheme. This is in line with the efforts of reducing the loss by 2% every year. It can be seen in the fig 9.4

**Fig 9.4**



## Distribution

9.39 Distribution Sector is a profound area, which provides electricity to all consumers in Kerala. In the distribution segment, 3644.67 kms of 11 KV lines, 6928.69 kms of LT lines and 5800 nos of distribution transformers were added during the period under review. Kerala has achieved full electrification in all villages, which is above average of national level. KSEB has given great attention to strengthen the distribution backbone by new ventures of Restructured- Accelerated Power Development and Reforms Programme (R- APDRP) and Rajiv Gandhi Grameen Vidhythikaran Yojana (RGGVY). The power consumption comes to all time high. As on 2010-11, total number of consumers has increased to 10127946 nos against the 9743476 during 2009-10. The details of pattern of power consumption and revenue collected are shown in the Appendix 9.6. The distribution infrastructure is an essential part of electrifying to all domestic and non-domestic purpose. The target and achievement of the distribution infrastructure during 2010-11 is given in the Table 9.14

**Table 9. 14**  
**Targets and Achievements of distribution Infrastructure during 2010-11**

Sl. No.	Item	Target	Unit	Achievement	Unit	Percentage of Achievement
1	11 KV Lines	4063	Kms	3644.67	Kms	89.70
2	Distribution Transformer	5812	Nos	5800	Nos	99.79
3	L.T. Lines	3141	Kms	6928.69	Kms	220.59
4	Service Connections	425221	Lakhs	442611	lakhs	104.09

Source: KSEB

9.40 The above table reveals the lying of 11 KV lines the expected target could not achieved during this period. Whereas effecting new service connections and LT lines that achievements exceeded the targets.

9.41 During the financial year 2011-12, 442611 service connections were given as against the target of 425221 and 3644.67 kms of 11KV lines, 5800 nos of transformers and 6928.69 kms of LT lines were commissioned during the year.

## Tariff

9.42 Over all average realisation rate from tariff has been increased to 354.24 paise per unit in 2010-11 as against the 338.03 paise per unit in 2009-10

## R-APDRP (Restructured APDRP) Scheme

9.43 The APDRP Scheme for the improvement of sub transmission and distribution system with a total outlay of ₹ 863.61 Crore has been completed on 31.3.2009. The new restructured APDRP (R-APDRP) sanctioned as per order No. 14.04.2008 – APDRP/GOI/MOP/ dated, 19.9.2008 of Government of India has been launched from 1.4.2009. The focus of the Programme shall be on actual demonstrable performance in terms of sustained loss reduction i.e. 15% AT & C loss reduction on a sustained basis for a period of 5 years. Projects under the scheme shall be taken up in two Parts. Part A of the project includes collection of accurate base line data and adoption of IT in the areas of energy accounting, networking, MIS, consumer indexing, etc. and enable objective evaluation of the performance of utilities before and after implementation of the programme. The Ministry of Power had approved detailed project reports for an amount of ₹ 214.38 Crore submitted by KSEB for 43 town schemes. First installment of loan amounting to ₹ 64.31 Crore has been disbursed by the PFC. Evaluation of bids of implementing agency is completed; tender finalized & LOI issued to M/s KDN Ltd on 30.6.201, Government approval obtained on 4.9.2010 and LOA issued on 6.9.2010. After is-

su ing LOA, Government vide letter dated 1.10.2010 issued direction to keep the order issued to M/S KDN Ltd in abeyance. On 27.12.2010 Government issued order to cancel the contract awarded to M/s KDN Ltd and directed for retendering.

## Rajiv Gandhi Grameen Vidyuthikaran Yojana (RGGVY)

9.44 Under the Rajiv Gandhi Grammeen Vidyuthikaran Yojana (RGGVY), sanction has been obtained to implement the scheme in 7 districts of Kerala, namely, Kasargod, Kannur, Kozhikode, Wayanad, Malappuram, Palakkad and Idukki with an amount of ₹ 221.75 crore as a first package on 5.8.2005. Implementation of the Scheme in Idukki District has been completed. REC issued sanction on revised DPR for Kasargod, Kannur, Kozhikode, Wayanad, Malappuram and Palakkad for a total amount of ₹ 114.57 crore.

9.45 The details of the financial and physical progress of implementation of RGGVY as on 30-09-2011 is shown in the Table 9.15.

**Table 9.15**  
**Financial & Physical Progress of implementation of RGGVY as on 30.09.2011 (₹lakh)**

Sl. No.	Name of Item	Unit	Amount released	Target for 2006-07 to 30.09.2011	Achievement as on 31.09.2011	Expenditure As on 30.09.2011
1	Installation of 25 KVA transformer	No.	4844.21	308.00	275.00	3068.966
2	Construction of 11KV Line	KM		2725350.90	253.00	
3	Construction of LT single phase line	KM		25835.00	368.688	
4	Construction of LT three phase line	KM		62.14	76.00	
5	Effecting BPL/SC service connection	No.		16097.00	17238.00	

Source: KSEB

## Non - Conventional Energy

9.46 The major programmes targeted by ANERT during 2011 comprises of Baseline studies on energy demand, renewable energy potential and energy conservation potential, implementation of renewable energy and energy conservation programmes and infrastructure development for sustaining interactive energy planning and development programmes with local governments.

9.47 The programmes of ANERT can be brought under five categories of activities as follows:

- Baseline Energy Studies
- Energy Resource Assessment
- Energy conservation Programmes
- Decentralised Energy Generation Programmes
- Other supporting and Institution Building Programme

9.48 As part of the baseline energy demand studies ANERT had carried out a detailed study of the households that are yet to be electrified. The total houses registered as Un-electrified counts to 2, 03,694 from the 454 local bodies. The direct survey conducted in these households covers the reason for non-electrification as well as the distance of existing grid from the surveyed houses as well, along with an estimation of power requirement. The data being consolidated forms a firm basis for charting



out programmes for the coming years with a focus to achieve the long cherished dream of the State to achieve 100% household electrification, through collaborative functioning with Local Self Governments and KSEB.

9.49 Under the renewable energy potential assessment studies ANERT had compiled the Database on Probable SHP sites in the state covering 867 locations spread over 163 local bodies in 13 districts of the State, having a total estimated potential of 331 MW at 30 % dependability. In continuation to this, detailed study of a cluster of sites with 14 locations in Peravoor of Kannur district has also been completed and the implementation of these projects with RIDF support as a model for cluster based development of mini hydel projects. Steps for taking forward Wind Energy potential assessment studies in collaboration with Centre for Wind Energy Technology (C-WET) are also being planned.

9.50 Energy conservation potential assessment studies planned for the year comprised of energy audit in 10 selected institutions transferred to local governments and installation of renewable energy and energy conservation devices based on the recommendations of the study. Presently energy Audit Study of 5 institutions are completed with the help of the Energy and Resources Institute ( TERI).

## **Conservation of Energy**

### **Energy Management Centre**

9.51 Energy Management Centre – Kerala (EMC) is an autonomous body under Department of Power, Government of Kerala, registered under the Travancore – Cochin Literary, Scientific and Charitable Societies Act of 1955. The Centre is devoted to the improvement of energy efficiency in the State, Promotion of energy conservation and encouraging development of technologies related to energy conservation and management through research, training, demonstration programmes and awareness creation. The centre is networking with institutions within and outside the State for research and training activities.

9.52 Government of Kerala, with the concurrence of Bureau of Energy Efficiency, Ministry of Power, government of India designated EMC as the State Designated Agency to enforce, regulate, co-ordinate and to implement the provision of the Energy Management Centre. The United Nations Industrial development Organisation (UNIDO) has opened its first Regional Centre for Small Hydro Power Development in EMC in the year 2003

## Achievements

- As a recognition of the excellent performance in the field of promoting energy efficiency, EMC got 3 National Awards. In the year 2008 and 2010 EMC was adjudged as the Best State Designated Agency in India and award was given by then Ministry of Power, Government of India. Received India Power Award for the best Demand side Management Programmes for the year 2010.
- EMC jointly with KSEB distributed 1.27 crores of CFLs as part of the Bachat Lamp Yojana project. Two CFL's were distributed to each domestic consumer against two incandescent lamps of 60 W. Kerala is the first State which implemented Bachat Lamp Yojana (BLY). Due to the distribution of CFLs a savings of 300 MW was achieved during the peak hours of March and April 2010.
- 217 Million Units of electricity saving through SAVE Programme. EMC in association with Malayala Manorama organized a programme for students and general public on the need of Energy Conservation. Quiz, Essay Competition and other programmes were organized and also the participants were requested to meter their energy consumption for one month. After implementing best practices on energy conservation, the meter reading was taken and it was noticed that 217 Mu were saved by the participants in the programme.
- Energy Conservation Fund: The Government of India has launched Energy Conservation Fund, in compliance with Energy Conservation Act 2001, providing State Governments with financial support to promote energy efficiency. Government of Kerala constituted the State Level Steering Committee for Energy Conservation Fund Rules. As part of this, financial support are envisaged to Government agencies, State enterprises, non-government organizations Individuals and business that implement provision of Energy Conservation Act and intend to save energy by means new technology adoption and other means.
- Implemented first LED Village : The village Ayakkurissi' in Palakkad district in Kerala is the first 'LED village' in south India for which EMC joined hands with BEE to showcase this village as energy efficient model village. 250 household bulbs and 50 streetlights were replaced with LED lights.
- EMC is regularly conducting training, awareness, demonstration programmes to general publics, skilled and unskilled employees of industries, students, and housewives etc. to make aware of the need for energy conservation. Also EMC is conducting Energy Audit/Energy Efficiency studies in different organization with a view to reduce the energy consumption and to improve energy efficiently. Students being the future of Nation, EMC started energy conservation clubs in schools and Energy – environment Conservation clubs in colleges/ polytechnics / it is to inculcate the habit of Energy conservation.
- Energy Smart School programme have started in schools as an energy education programme in association with General Education Department, Government of Kerala.
- EMC developed computer based touch screen energy information kiosks for school students to demonstrate how to save energy. With the support of BEE the systems were distributed to 14 Government High Schools (one each in each district)

## Electrical Inspectorate



9.53 The Electrical Inspectorate is a department of the Government of Kerala. Safety inspections are carried out and sanction for energisation for all HT / EHT and other medium voltage installation in the State are issued by this department. Enquiry of all electrical accidents occurred in the State and forwarding the enquiry report to the Government and take actions against responsible person / authority are also done by this department.

## Activities and Achievements for the year 2010-11

- Accreditation for the parameter Energy by the NABL is received during July 2011. This Laboratory is the first and only one in the state with NABL Accreditation for energy.
- Started online application for supervisor Grade A, B permit by the licencing board.
- Providing Patent Seal to Energy Meter Testing as per the regulation of Central Electricity Authority.
- Purchase of equipments required for Meter Testing Labs and Inspecting Officers are in Progress.

## Challenges in the Energy Sector

- Inadequate capacity addition over the years leading to massive in-house demand supply gap.
- Hydel power dominated supply scenario,
- Negligible share of Renewable Energy in the Energy mix,
- High Aggregate Technical & Commercial (ATC) Losses,
- Losses/inefficiencies of the main power utility
- Gap between energy conservation potential and its realisation,
- Limited presence of Independent Power Producers (IPPs) and Co-Generating Stations (CGS),
- Limited penetration of star labelled products,
- Insufficient interventions/incentives to promote energy conservation and thereby manage demand,
- No coal based plant, no gas based plant,
- Energy price volatility.