CHAPTER 7

ENERGY DEVELOPMENT

Power Sector–aftermath of Liberalisation

Before liberalisation took place in India in 1991, the growth in power sector was very sluggish. The reforms were expected to solve the problems; it is more or less clear that they cannot. There has always been a huge power deficit as power generation could not meet the demand. With the growth in demand being exponential, still power deficit is a big problem. Several Accelerated initiatives were taken by India Government after liberalization to address the crisis. Some of them are (a) Government is encouraging private players not only to produce power but also carrying out its transmission and distribution activities. In effect there has been significant increase in private participation. (b) Government has come with the provision for determining the tariff based on cost of generation and not based on purchasing power. So the ambiguity involved in complicated tariff rates has been done away with.(c) States have been asked to bare the brunt of requirement generation much more than in the past. (d) To regulate the power Industry at Central level and also at State level, regulatory authorities like Central Electricity Regulatory Commission (CERC) & State Electricity Regulatory Commission (SERC) are appointed.

7.1 Even though, the Indian Power Sector was opened with much fanfare to private participation 1991 to hasten the increase in generating capacity and to improve the system efficiency as well. Independent power producers (IPPs) point out litigation, financial arrangements, and obtaining clearances and fuel supply agreements have not been streamlined. On the other hand, the State Electricity Boards have been burdened by power purchase agreements (PPAs) that favour the IPPs with such clauses as availability payment irrespective of plan utilization, tariff reflecting high capital costs and returns on equity etc. The consumer is complaining about increasing blackouts and increasing tariffs. The process of inviting private participation in the power sector on the restructuring of the power sector has not been able to resolve the issues in the power sector.

Mythical Projections

7.2 International Energy Agency (IEA) predicts that the global energy demand will increase by more than 50% by 2030, with 60% of that supply by oil and gas. It also forecasts a severe gap been demand and supply, as could become evident by 2010. So over or later, this gap will be filled by a mix of technologies ranging from alternatives, coal and nuclear. The impact of the growing demand from countries like India and China will be responsible for the future charges in the global oil demand against the finite and depleting oil resumes. With the global oil production expected to peak around the year 2010-15, it would result in a major crisis for the global economy. From a longer term perspective and the need to maximally develop options as well as need to diversify energy sources, renewables remain important to India's energy sector. Even with a concerned push of 20 fold increase in capacity, renewables can account for around 5-7% of India's energy mix by 2031-32. It offers a detailed analysis of how global energy system is likely to evolve from now to 2030. These include supply and demand projections to 2030 for oil, gas, coal, renewables, nuclear and electricity, plus projections of energy related CO2 emissions. If current Government policies do not change, energy – related emissions of carbon dioxide will grow faster than energy use. The pace of technology development and developments in other areas (alternative energy) are the keys to making the global energy system more economically, socially and environmentally sustainable in the large term. Planners have been looks at these projections with suspicion and indicate that the GDP energy correlation has been delinked and the projections based on growth rate is based on consumption obsessed growth scenario and it is possible to work out sensible alternative.

Crisis in meeting demands and projections

7.3 In the process of emerging as an economic giant, India is facing the critical challenge of meeting a fast increasing demand for energy. As the economy is on the growth path, the demand for energy over next two decades will increase considerably. Energy is truly most indispensable growth factor to the world's economy and human well being. Indian energy growth projections have also been caught in the supply sided consumption obsessed frames and needs rationalization serious equity issues also exist with wide gaps between per capita consumption levels between metros and rural areas across the states. Fossil energy sources-coal and oil - are currently the primary sources of cheap energy that powers our modern industrialized civilization. They provide over 60% of the world's electrical power and 95% of the world's total energy demands. The inconsistency between a rapidly growing demand and a limited supply has made the oil market vulnerable to jitters that global oil companies today feel that they have reached the end of growth period. Against rising oil price and stagnant production of oil, India has heightened the problem of energy crisis. Some of the major barriers include distribution challenges, lower scalability, international trade barriers and powerful oil lobbies along with relatively higher production costs etc.

Climate change related issues

7.4 Climate change as a driving force in redefining tomorrow's energy mix on a global level, emission trading – a solution for tackling climate change. It ends with an overview of key facts related to energy and climate change – facts and trends to 2050. Despite being the fourth largest economy, India's percapita emission levels are 70% below world average and 93% lower than those in the United States. It is highlighted that carbon emissions in India increased by 65% between 1990 and now and are projected to grow by close to 70% in the next decade or so. But it remained low as compared to other major economies, accounting for only 2% of cumulative energy related emissions since many decades. India maintains that major responsibility of curbing of emissions rests with developed countries – which have accumulated emissions over a long period of time – pointed out the report that comes at a time when tough negotiations were on at the Copenhagen climate change

Nuclear Programme

7.5 For a large country like India, long term energy security, mainly based on indigenous recourses, is an important and inevitable need, from economic as well as strategic considerations. Nuclear Power is the fourth largest source of electricity in India after thermal, hydro and renewable sources of electricity. As of 2008, India has 17 nuclear power plants in operation generating 4120 MW while 6 other are under construction and are expected to generate an additional 3160 MW. India has recently made a 123 – Nuclear deal with USA where Indian atomic sector is divided into two sectors; military atomic sector and civilized atomic sector. Under this deal, Indian civilized atomic sector has come under the governance of IAEA (International Atomic Energy Agency). India can receive the required fuel to generate the power from nuclear power plant as well as nuclear reactors also from various countries. Costs of nuclear power on dependence as internal technologies are serious issue especially when there was large coal reserves Uranium versus thorium.

Power for ALL

7.6 The Government of India has an ambitious mission of Power for All by 2012. This mission would require that the installed generation capacity should be at least 2, 00,000 MW by 2012 from the present level of 156092.23 MW of power as on December 31, 2009. Power requirement will double by 2020 to 4, 00,000 MW.

7.7 Rajiv Gandhi Grameen Vydhuthikaran Yojana (RGGVY) electrifying all villages and habitations as per new definition for power for all. This can be clear from the physical & financial progress of RGGVY Projects under implementation as on 01/02/2010 for all India data in the table 7.1.

Table - 7.1
Physical & Financial Progress of RGGVY Projects under implementation as on 01/02/2010 (All India)

(Rs.crores)

No. of DPRs (27 states)	Project Cost Sanctioned	Rrevised Cost	Total Amount released	Electrification of Un/De-electrified Villages		Intensive Electrification of Electrified villages		No. of connections to Rural Households including BPL		No. of connections to BPL Households	
				Coverage (No.)	Achievement (No) (%)	Coverage (No.)	Achievement (No) (%)	Coverage (No.)	Achievement (No) (%)	Coverage (No.)	Achievement (No) (%)
1	2	3	4	5	6	7	8	9	10	11	12
567	**26235.1**	**31168.8**	**18916.4 (60.7%)**	**118499**	**71793 (60.6%)**	**354375**	**102759 (29%)**	**41455745**	**10285314 (24.8%)**	**24606500**	**9115691 (37%)**

Source: Ministry of power, Government of India.

Installed Power Generation in India

7.8 Power sector witnessed severe fluctuations in progress in 2009 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 156092.23 MW of power as on December 31, 2009, but nothing can illustrate the slack pace of capacity addition better than the performance in the last fiscal - the country was to add 11,061 MW in 2009 while it managed only 3500 MW. The total demand for electricity in India is expected to cross 950000 MW by 2030. So far, between 2007-08 and 2008-09, about 12000 MW of capacity has been added and another 66000 MW is in various stages of the pipeline. Much of this will be private funded and managed. About 65 % of the electricity consumed in India is generated by thermal power plants, 25 % by hydro electronic power plants 3% by nuclear power plants and 7 % by renewable sources. India was one of the pioneering countries in establishing hydroelectric power plants.

7.9 However, the sector continues to be ridden with some fundamental problems. Slack capacity addition continues to be a serious worry as it may jeopardize infrastructure as well as economic growth. The growth in Electricity Generation during 2008-09 was constrained due to unsatisfactory performance of some of the new thermal generating units commissioned during 2006-07 and 2007-08, delay in commissioning of new units during 2008-09, long outages, shortage of coal / gas / nuclear fuel, poor hydrology etc.

7.10 As on December 31, 2009, position of All India Installed Capacity can be seen in the Table 7. 2

Table - 7.2
Total Installed Capacity in India

Fuel	MW	(Percentage)
Thermal	99861.48	64.6
Hydro	36885.40	24.7
Nuclear	4120.00	2.9
Renewable Sources	15225.35	7.8
Total	**156092.23**	**100**

Source: Ministry of Power, Govt of India

7.11 The installed power generation in the country has increased from 147402.81 MW as on 31.12.2008 to 156092.23 MW as on 31.12.2009. The capacity addition was 8689.42 MW. Out of the total installed capacity of 156092.23 MW, a major chunk of the energy generation comes from thermal energy. It was estimated as 99861.48 M.W. It was followed by hydro 36885.40 MW, nuclear 4120 MW and 15225.35 MW of renewable sources. The percentage of increase in installed capacity from 2008 to 2009 was only 5.9 %. The overall generation in the country has increased from 704.469 BU during 2007-08 to 723.794 BU during the year 2008-09. Contribution of each sector to the national grid as on 31.12.2009 is shown in the table 7.3.

Table - 7.3
Sectoral Contribution

Sector	MW	(Percentage)
State Sector	78413.99	52.5
Central Sector	49812.63	34.0
Private Sector	27865.61	13.5
Total	**156092. 23**	**100.00**

Source: Ministry of Power, Govt of India

Box .7.1
Power Generation to grow by 5.9% in 2009-10

Power generation will grow by 5.9% in 2009-10. A healthy growth in thermal and nuclear power generation will push up the total generation this year. Higher power generation will also bring down the power deficit in India by 30 basis points to 10.8%.

With improved availability of Uranium from domestic as well as International sources, nuclear power generation bounced backed by 17.4% during April – October 2009. We accept that it will grow by 30.9% in 2009-10, after having suffered setbacks since 2003 due to unavailability of Uranium.

During April - October 2009, Thermal Power generation grew by 9.7%. This was fuelled by the gas based thermal plants, which got a fillip due to the availability of gas from the KG – basin project. Coal based plants also recorded a decent growth during the period. We expect thermal power generation to grew by 8.5% this year.

The Hydel Power Generation, on the other hand, fell by 7.3% during April - October 2009. A deficient rainfall took its toll on hydel power generation this year. However, year of year declined in the hydel power output will come down in the coming months and we expect it to decline by 5.3% in 2009-10.

Power for the Poor

7.12 Several State Governments in India provide electricity at subsidized rates or even fee to some sections. This includes for use in agriculture and for consumption by backward classes. The subsidies are mainly as cross-subsidization, with the other users such as industries and private consumers paying the deficit caused by the subsidized charges collected. Such measures have resulted in many of the State Electricity Boards becoming financially weak.

7.13 At present (2009), the price per unit of electricity in India is about Rs 4 (8 US cents) for domestic consumers and Rs. 9 for the commercial supply. The Ministry of India has so far provided support for coverage of around 9300 villages and hamlets in 25 States under electricity to the poor. The programme is expected to cover 10000 remote unelectrified villages and hamlets and benefit around 1 million households. Availability of lighting/ basic electricity to the remote villages and hamlets is expected to lead to implement in the quality of life of the people, including better health and education.

Kerala's Power Sector Projections

7.14 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.

7.15 One of the problems with the above approach has been the 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 demands reaslised.

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

Table - 7.4
17th EP S 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
2009-10	13977	3078	63.14
2010-11	15112	3227	63.94
2011-12	16345	3391`	64.74

7.17 As can be seen from 17th EPS Draft Report, these are a number of assumptions made, which may result in the actual demand being more than what is being projected in the EPS or being 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 - 7.5
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

7.18 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 increase accordingly. Monsoon is essential to sustain the hydropower base in the state and the shortage in rainfall usually creates power crisis. Kerala received 18 % less than the average inflow in to KSEB reservoirs; the KSEB could manage the power supply situation with higher quantum of cheaper hydel power. As the power situation improved, all the restrictions were withdrawn on 01.05.2009. Kerala is one among the very few states in the country where there was no load shedding and power cut during 2008-09. KSEB has been responsible for the generation, transmission and supply of electricity in the Sate of Kerala, with particular emphasis to provide electricity at affordable cost to the rural population and 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 etc.

Generation

7.19 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 schemes. Sabarigiri in 1966 and Idukki in 1976 are milestones of Kerala State Electricity Board.

7.20 As per the seventeenth power survey, there is an additional generation requirement of about1000 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 2008-09

7.21 Power System in Kerala encompasses hydel, thermal and wind sources. Hydel energy is the most reliable and imperative source in Kerala. Of the total installed capacity, 2694.75 MW, the lion's share of 1921.1 MW of installed capacity comes from 24 hydel stations; 771.62 MW is contributed by the thermal energy including NTPC at Kayamkulam which is Kerala's dedicated thermal station. Kanjikode wind farm, Palakkad has an installed capacity of 2.03 MW. Capacity addition during 2008-09 was only 1.22 percent to 2694.75 MW as on 31-3-2009 from 2662.24 MW on 31-3-2008. The table (7.6) depicts detail of energy source and its installed capacity in Kerala as on 31-3-2009.

Table - 7. 6
Energy Source in Kerala as on 31-3-2009

Sl. No.	Source of Energy	Installed Capacity (MW)
1	Hydel – KSEB	1888.10
2	Thermal : KSEB	234.60
3	Wind : KSEB	2.03
4	NTPC	359.58
5	Thermal :IPP	177.44
6	Hydel : Captive	33.00
	Total	**2694.75**

Source: KSEB

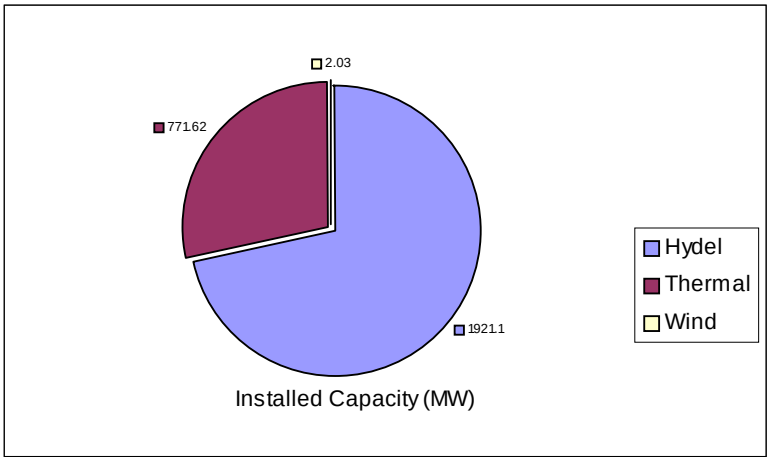
7.22 Based on the status of various projects, the target for 2008-09 was fixed at 69.6 MW, of which 32.5 MW has been achieved upto October 2009. It is expected that the total capacity addition during the current financial year would be 133.75 MW with hydel, thermal and wind sources.

7.23 Sabarigiri hydel projects increased its capacity by 5 MW from 325 MW during the period of 2007-08 to 330 MW in 2008-09. It can be seen in the Appendix 7.3. Meanwhile Neriamangalam Extension Scheme & Two Units of Kuttiadi Tailrace Project were commissioned in 2009. Thereby 32.5 MW was added to the system with capacity to generate 82.6 MU.

7.24 As for contribution from renewable sources of energy is concerned, Wind Energy Projects at Agali (6 MW) under Private Sector were also commissioned.

7.25 Figure 7.1 highlights total installed capacity in Kerala from hydel, thermal and wind sources.

Figure 7.1



Hydel Generation

7.26 During the year 2008-09, Kerala received 18 % less than average inflow into KSEB reservoirs. During this period the peak demand reached 2765 MW was recorded on 20.3.2009. The maximum daily consumption of energy during the year was 49.2932 MU was also recorded on 20.3.2009. On account of various factors like the reduction in inflow, disaster at Sabarigiri Power house, shut down of Panniar Power house, high cost of naphtha and LSHS during the beginning of the year, reduction in availability of CGS etc, there was huge gap in the availability against the requirement.

Box. 7. 2

Kerala bets on hydel power despite clouds

Hydel Power dependent Kerala is smarting under 1870 million units power deficit this season, following truant rains. But this has not deterred, KSEB the least from putting its investment nest egg in the hydel power stream once again. Out of its Rs. 1370 crores investment plans (generation, transmission and distribution) for 2009-10, as much as Rs. 403 crores is earmarked for generation schemes, mainly hydel. The outlay for generation is mainly for five ongoing plus 16 new hydroelectric schemes and 7 wind projects. The State has just two thermal projects, since it usually pins its hope on surviving on an 80: 20 (Hydel Power to Thermal Power) ratio.

If the second Monsoon (North East Monsoon) is good enough another 1000-1200 million units could be added. Even this is not sufficient, as the State's average daily consumption has spiraled to 46.56 million units per day. The State's power quota from the central pool has suddenly shrunk from 900 MW to 650 MW and poor yield from hydel reservoirs is creating an expensive predicament.

7.27 Under the purview of KSEB, 20 hydel projects are in the pipeline. The details of the project can be seen in the Table7.7

Table - 7.7
Projects in the Pipeline

Sl. No.	Name of the Project	Installed capacity (MW)	Energy Potential (MU)
1	Pallivasal Extension	60	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	Poozhithode	4.80	10.97
8	Vilangad	7.50	22.63
9	Thottiar	40.00	99.00
10	Mangulam	40.00	82.00
11	Pasukkadavu	2.00	5.36
12	Maniyar tailrace (Ranni- Perinad)	4.00	16.73
13	Perumthenaruvi	6.00	25.77
14	Chimony	2.50	6.03
15	Peechi	1.50	3.30
16	Barapole	21.00	51.00
17	Kakkadam poil-I	5.00	15.21
18	Kakkadampoil-II	20.00	55.08
19	Achankovi	30.00	75.81
20	Chinnar	24.00	78.00

Source; KSEB

Availability of Zero Surplus Power during 2008-09

7.28 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 into zero surplus in energy during 2008-09. The zero Surplus Power in 2008-09 is as given in Table 7.8

Table - 7. 8
Details of Surplus Power

Sl. No.	Internal Generation	Million Units
1	Hydel Generation	5839.28
2	KSEB Thermal Generation	653.54
3	Wind	1.68
4	Total Internal Generation	6494.50
5	Less Auxiliary Consumption	6440.44
6	Power Purchase from CGS	7667.81
7	Power Purchase from IPPs	1961.17
8	Total Energy Availability	16069.42
9	Energy requirement	16069.42
10	Surplus	0

Source: KSEB

Power Consumption

7.29 The domestic category consumers showed a reasonable growth of 5.04 percentages to 7443028 in 2008-09 from the 7085652 in 2007-08. But LT & HT Commercial category consumer registered a decline of –0.23 percentages over 2007-08. Growth of other railway traction, 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 2008-09, 12877.65 MU of energy was sold marking a decrease of 518.96 MU as compared to the last year. The details of consumption and revenue collected during 2008-09 can be seen in the Appendix 7.7

7.30 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)

7.31 KESEB has entered into PPAs 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 7.9

7.32 As on 31.07.09, the revenue earned from sale of power and other receipts was Rs. 1698.80 crores for the year 2009-10. The expenditure towards purchase of power was Rs.1167.81 crores.

Table - 7. 9
Power Purchase Agreement with Stations

Sl. No.	Name of the Station	MW
	Thermal Power Projects	
	NTPC Stations	
1	Ramagundam I to III	306.00
2	Talchar II	280.00
	NLC Stations	
3	NLC TPS II – Stage I	63.00
4	NLC TPS II – Stage II	90.00
5	NLC TPS II – Stage I Expansion	58.80
	NPCIL Stations	
6	MAPS	18.00
7	Kaiga I to IV	73.00
	Mega Power Projects	
8	SIMHADRI STAGE II	140.00
9	NLC – Tutucorin	122.00
10	NLC TPS II – Stage II Expansion	70.00
11	Vallur Thermal Power Plant	37.50
12	RGCCP	359.58
13	BKPL	157.00
14	KPCL	20.44
	Non-Conventional Sources	
15	Wind Energy – 38 Nos for 41 WEGS	27.30
16	Meenvallom Small Hydro Projects	3.00
17	Iruttikkanam Small Hydro Projects	3.00

Source: KSEB

7.33 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. Moreover, share of power from NLC New (50MW), Orissa NLC (200MW) and Kayamkulam Expansion (500 MW). Meanwhile, Kerala has also been allocated 300 MW from Tamil Nadu Ultra Mega Power Projects (UMPP) and 190MW from Orissa UMMP. 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 (BWCCL) in Orissa has already been obtained from Ministry of Coal, Government of India.

Cheemeni Power Plant back in favour

7.34 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 the Union Government has allotted for Kerala in Orissa. 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.

7.35 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 was 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

7.36 Growth is necessary in every sector in the power system particularly, generation, and transmission. As on 30.09.2009, installed capacity has been hiked by 2694.75 MW as against the 2662.24 MW in the same period of previous year. Likewise, per-capita consumption has also been increased by 490 KWh. The details of growth of power system in Kerala is seen in Table 7.10

Table 7. 10
Growth of Power System in Kerala

Particulars/Year	2007	2008	2009
Installed Capacity (MW)	2657.24	2662.24	2694.75
Annual Sales (MU)	11331	12049.85	12414.32
Per-capita Consumption (KWh)	465*	485*	490*
EHT lines (circuit KM)	10217	10424	10580
Sub stations (Nos)	272	290	303
H.T. lines (circuit KM)	38048	38384	41403.43
L.T lines (circuit KM)	223370	234252	241888
Distribution Transformers (Nos)	39872	42401	46510
Revenue from sale of power (Rs.crores)	4009.7	4696.95	4893.02

Source: KSEB

* *Population based on 2001 Census*

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

Hydro - Thermal Energy

7.37 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 (2008-09), 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 7. 11.

Table - 7. 11
Hydro-Thermal Mix in Kerala from 2003-04 to 2008-09

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

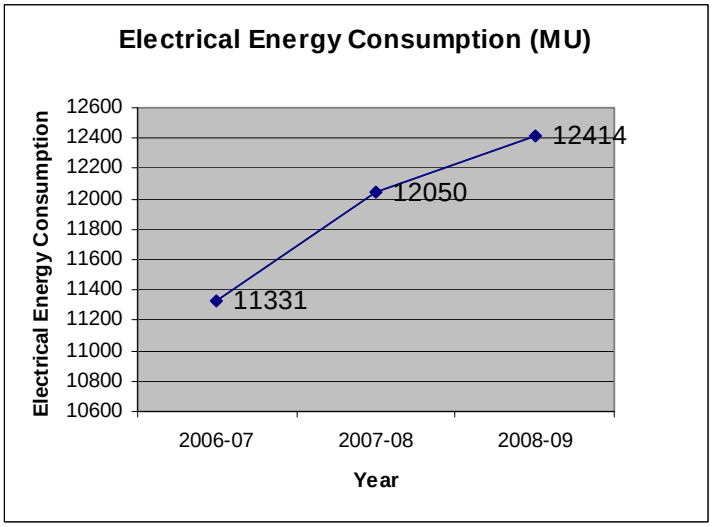
Source: KSEB

7.38 The ratio of hydro-thermal mix indicates that during 2005-06 availability of hydel power has comparatively outnumbered the thermal power and subsequent years this phenomenon has also continued till 2008-09. Meanwhile, thermal power has outnumbered than hydel power as 64 % and 36 % respectively during 2008-09. It reveals that KSEB has purchased high cost thermal power than hydel power.

Electrical Energy Consumption

7.39 In Kerala, electrical energy consumption has increased to 12414 MU during 2008-09 from 12050 MU during 2007-08. The percentage of consumption increased to 3.02 %. Electrical Energy consumption in Kerala during 2006-07, 2007-08, and 2008-09 depicted in Fig 7.2

Fig: 7. 2



Transmission

7.40 Transmission of Electricity is defined as 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 facility is necessary to effective distribution and to bring power from outside the state. In the transmission Sector commissioning 66 Nos of substations and construction of 587.19 kms of transmission lines has been targeted during the period under review. Out of which 5 substations and 116.5 kms of lines were commissioned as on 31.8.2009. Now there are two 400 KV substations. One at Madakkathala (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.

7.41 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.

7.42 Kerala's Transmission system consisting of substations and its connected lines are given with Tables 7.12 and 7.13

Table - 7. 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	2	Nos		Nos	0
3	110 KV Substations	13	Nos	2	Nos	15.38
4	66 KV Substations	4	Nos		Nos	0
5	33 KV Substations	47	Nos	14	Nos	29.79

Source: KSEB

7.43 It can be observed that, performance of the construction of substation with various capacities has not achieved the intended target. The table 7.12 reveals that none of 220 KV and 66 KV substations was completed against its targets of 2 & 4 respectively. The construction of 110 KV and 33 KV sub stations are still at a snail's pace: Out of the target of 13 numbers 110 KV substations, only two substations are completed and in the case of 33 KV substations, 14 substations are completed against the target of 47 numbers. It will have an adverse impact on power evacuation facility.

Table - 7.13
Transmission facilities in Kerala (As on 30.9.2009)

Capacity	Substation (Nos)	Lines (Ctkm)
400 KV	2*	
220 KV	15	2654
110 KV	116	3924
66 KV	84	2987
33 KV	86	1015
Total	**302**	**10580**

Source: KSEB

** One number owned by PGCIL*

Kayamkulam Expansion remains non-operational

7.44 There are apprehensions that the NTPC might not go ahead with the expansion of the Kayamkulam plant by 1950 MW in the next plan by shifting to Liquefied Natural Gas (LNG) as fuel. KSEB is also exploring the feasibility of converting the Brahmapuram Diesel Power Plant into a 1000 MW gas based project by utilizing the gas from proposed Petronet LNG / GAIN Gas Projects.

Voltage Improvement Works

7.45 KSEB is committed to provide 230 volts between phase and neutral consumers premises in the L.T services and corresponding higher voltages in the case of higher voltage service within allowable limits of toleration. 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 to improve voltage 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

7.46 The normal life span of a hydro generating station is 30-40 years, depending on service conditions. 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 shutdowns of long duration will be necessary for maintenance work.

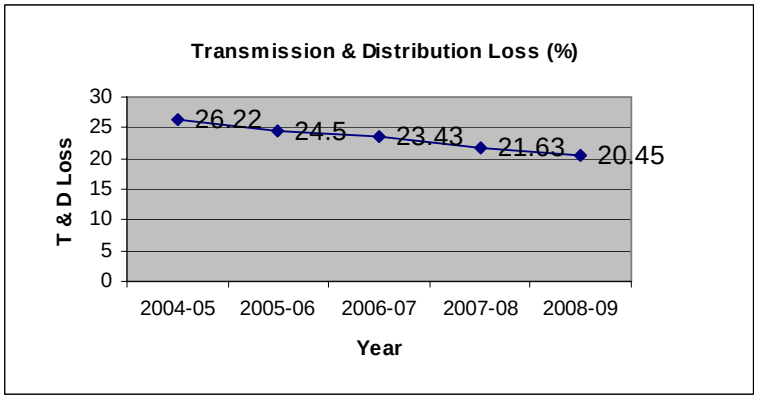
7.47 The renovation and modernization of Pallivasal, Panniar, Shengulam and Neriamangalam Projects have been completed. In the case of R&MU of rehabilitation of Panniyar Power House, rebuilding of (unit 3 & 4) of Sabarigiri powerhouse, Idamalayar protection works are being undertaken.

Transmission and Distribution Loss (T&D loss)

7.48 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.

7.49 During 2008-09, T&D loss has come down to 20.45 percent from 21.63 percent in 2007-08. 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, up gradation 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: 7.3

Figure 7.3



Distribution

7.50 Distribution Sector is a profound area, which provides electricity to all consumers in Kerala. In the distribution segment, 3018 ct kms of 11 KV lines, 7636 kms of LT lines and 4109 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 Accelerated Power Development and Reforms Programme (APDRP) and Rajiv Gandhi Grameen Vidhythikaran Yojana (RGGVY). The power consumption comes to all time high. As on 31.3.2009, total number of consumers has increased to 9363461 nos against 9033756 nos as on 31.3.2009. The details of pattern of power consumption and revenue collected are shown in the Appendix 7.6. The distribution infrastructure is essential part of electrifying to all domestic and non-domestic purpose. The target and achievement of the distribution infrastructure during 2008-09 is given in the Table 7.14

Table - 7. 14
Targets and Achievements of distribution Infrastructure during 2008-09

Sl. No.	Item	Target	Unit	Achievement	Unit	Percentage of Achievement
1	11 KV Lines	10900	Kms	3018.00	Kms	27.69
2	Distribution Transformer	9080	Nos	4109.00	Nos	45.25
3	L.T. Lines	9250	Kms	7636.00	Kms	82.55
4	Service Connections	550000	Lakhs	444794.00	lakhs	80.87

Source: KSEB

7.51 The above table reveals that lying of LT lines and 11 KV lines, effecting new service connections and distribution transformers are made comfortable achievement.

Schemes for the Poor

7.52 As part of providing electricity to households as social obligation belonging to consumers Below Poverty Line (BPL) at the cost of the KSEB. The criteria for selection to be considered in this group based on the proof, connection and connected load should not exceed 500 MW. Houses wired up at the cost of the agencies such as local bodies, NES Blocks, Residents Association, Co-operative societies etc are eligible to be considered in this scheme. Accordingly, 49912 connections were effected during the year. Service connections aggregating 444794 were effected during the year 2008- 09.

7.53 Anti Power Theft Squad (APTS) was active during the year with 15792 inspections throughout the state. An amount of Rs.18.97 crores was realised against an assessment of Rs.29.58 crores.

7.54 During the financial year 2009-10, 212491 service connections were given up to 30.09.2009 against the target of 512920 and 1035.18 kms of 11KV lines, 1955 nos of transformers and 3466.13 kms of LT lines were commissioned during the year. The APTS wing conducted 6914 inspections till 30.9.2009 and out of the assessed amount of Rs.12.437 crores, Rs.7.748 crores was realised.

7.55 As part of Demand Side Management activities, an Energy Audit Cell has been formed in KSEB in the year 2007 with an organizational set up for conducting Energy Audit and for taking steps as per provisions of the Energy Conservation Act 2001. As part of this, workshops have been conducted in the thermal, hydro stations for formulating the action plan for energy audits and for promoting energy conservation activities.

Bachat Lamp Yojana (BLY)

7.56 KSEB has decided to implement the CFL- CDM Scheme Bachat Lamp Yojana (BLY) in the entire State as part of the demand side management. This scheme is formulated such that high quality CFL will be provided to all the domestic consumers in the project area in exchange for a working incandescent bulb. The difference in returns is proposed to be adjusted through Carbon Credit that may be obtained through the Certified Emission Reduction from United Nations Framework Convention on Climatic Change (INFCCC). The Energy Management Centre (EMC) will be the implementing agency in the South and Central region while M/s Arctic Holdings Pvt Ltd will be the implementing agency in the Northern region. M/s EMC is planning to implement the project by availing assistance of Rs. 45 crores from Government of Kerala and Rs. 45 crores from Energy Efficiency Services Ltd., Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India.

7.57 Accordingly, the procurement arrangement is in progress so as to commence the supply by January - 2010 end and it is proposed to start the CFL distribution from the beginning of February – 2010 and complete the supply by May-2010.

7.58 By implementing the above scheme, KSEB is expecting a saving of 100 MW.

Tariff

7.59 The Kerala State Electricity Regulatory Commission (KSERC) has accorded sanction for restructuring power consumption of HT, EHT consumers and accordingly, KSEB issued orders that all HT and EHT consumers of KSE Board and other licensees should restrict their energy consumption of 75% of the base average consumption. Again based on Board's Petition, KSERC accorded sanction to restrict the consumption of LT consumers and Board had implemented the same with effect from 15.10.2008. Average monthly quota for LT domestic consumers has been fixed as 200 units and for all other categories (except LTVID) 80% of average monthly consumption.

7.60 As per the orders of KSERC to impose thermal surcharge to all categories of consumers including licensees, KSEB had imposed thermal surcharge to all consumers with effect from 20.8.2008 as detailed in Table 7.15.

Table - 7. 15
Thermal Surcharge

Category	Tariff Structure
All categories of consumers (except the LT domestic consumers with monthly consumption up to 80 units)	50 paise per unit (From 20.08.2008 to 01.03.2009)

Source: KSEB

7.61 Meanwhile, overall average realisation rate from tariff has been raised to 380 paise Per Unit in 2008-09 as against the 351 Paise per Unit in 2007-08; the major contribution for raising realisation rate from tariff was sold to NVVN/PTC. During 2008-09 Board sold energy to NVVN/PTC @ 947 paise per unit. The details can be seen in the Appendix 7.4 and 7.5

The Electricity (Amendment) Act, 2007

7.62 The Electricity (Amendment) Act, 2007, enacted on May 29, 2007, and brought into force from June 15, 2007, amends certain provisions of the Electricity Act, 2003. Its main features are:

- The Central Government, jointly with the State Governments will endeavour to provide access to electricity to all areas including villages and hamlets through rural electricity infrastructure and electrification of households;
- No licence is required for sale from captive units.
- Deletion of the provision for elimination of cross subsidies. The provision for reduction of cross subsidies would continue.
- Definition of theft expanded to cover the use of tampered meters and use for unathorised purpose. Theft is made explicitly cognizable and non-bailable.

Corporatisation of KSEB

7.63 In order to comply with the provisions of Electricity Act and the Government of India directives, the Kerala Government notified a transfer scheme vide GO (M.S) No.37/2008/PD dated, 25.9.2008 through which all assets and liabilities of KSEB are vested with the State Government. These Assets and Liabilities now vested with the Government will be revested in a fully owned government company to be incorporated under the Companies Act

7.64 Activities for registration of a company to revest the assets and liabilities of the Board are in progress. The Memorandum of Association (MoA) and Articles of Association (AoA) of the proposed company were prepared by the M/s Mohan and Mohan Associate, Chartered Accountants, engaged as consultants for the work. The Government has approved the Memorandum and articles of association and decided the name of the proposed Company as 'Kerala State Electricity Board Limited'. The Government has also appointed the existing members of the Board as First Directors of the proposed Company. Application has been filed with the Registrar of Companies for registration of the Company and is being processed.

7.65 To assist the Board in restructuring process, M/s PFC Consultancy Ltd, New Delhi (a subsidiary of Power Finance Corporation) is engaged as consultant. The major works in restructuring include preparation of Transfer Scheme for revesting, preparation of Financial Restructuring Plan, creation of Pension Fund etc. The draft transfer scheme prepared by the consultant is under consideration of the Government. The revesting assets and liabilities to the New Company are to be completed by December 2009.

7.66 The major issues, which need attention, are noted below:

a. The swapping of high cost loans being pursued
b. Effective Inventory Control
c. Final Order from Government of Kerala, on netting of dues between Government and Board
d. Creation of Pension Fund

Accelerated Power Development and Reforms Programme (APDRP)

7.67 APDRP is one of the lucrative schemes initiated by the Government of India to strengthen the transmission and distribution segment. KSEB has played a vital role to implement this scheme in Kerala since its inception.

7.68 A total outlay of Rs. 863.62 crores, which includes 3 numbers of circle schemes (Rs. 148.24 crores), town schemes and city schemes. As far as 46 town schemes are considered, Rs.341.81 crores and for 3 city schemes Rs. 373.57 crores is sanctioned.

7.69 All the above schemes were completed / foreclosed / short closed as on 31.3.2009 with a total allowable expenditure of Rs. 556.599 crores as per Ministry of Power Guidelines. 25% grant from Government of India for the works completed.

7.70 The ST & D project for cities of Thiruvananthapuram, Kochi and Kozhikode with an outlay of Rs. 373.57 crores is awarded on turnkey basis. The major works include construction of 11 KV UG cables, installation of Ring Main Units, Compact Secondary Substation and distribution Transformers. The works are in progress. Total expenditure upto 31.3.2009 is booked under APDRP (Rs. 82.19 crores) and balance works are decided to complete utilizing Board's own fund.

7.71 Total expenditure to the extent of Rs. 556.599 crores has been met as on 31.3.2009 for all the schemes. Government of India to KSEB through Government of Kerala released an amount of Rs. 139.135 crores and Rs. 115.275 crores as grant and loan respectively. An amount of Rs. 159.12 crores was received from M/s REC Ltd., as counterpart fund. Details of scheme outlay and expenditure are shown in Table 7.16

Table - 7.16
Financial Achievement under ADDRP Scheme as on 31.3.2009
(Rs.Crores)

Name of Scheme	Scheme Amount	Actual Expenditure	Remarks
Circle Scheme (3 Circles)	148.24	143.099	Closed on 31.03.2009
Town Scheme (7 Towns)	160.72	151.73	
New Town Scheme (26 Towns)	123.91	55.81	
New Town Scheme (13 Towns)	57.18	123.77	
New city (3 cities)	373.57	82.19	
Total	**863.62**	**556.599**	

Source: KSEB

R-APDRP (Restructured APDRP) Scheme

7.72 Sanction for implementation of R-APDRP scheme during 11th 5-Year Plan with revised terms & conditions is conveyed by Government of India. The project focuses on actual demonstrable performance in terms of sustained loss reduction. The scheme includes collection of accurate base line data and adoption of IT in the areas of energy accounting. The scheme proposes to cover urban areas; towns and cities with population more than 30000. Forty three towns in Kerala state are eligible for implementation of the scheme.

7.73 The project has 2 parts – PART – A & PART – B. Part-A covers establishment of base line data and IT applications and Part-B includes regular distribution strengthening projects. Apart from this, the programme will require enabling activities, which will be covered under Part-C.

7.74 The following projects are included for implementation under Part-A of the project.

- Establishment of Wide Area Network
- Establishment of Date Center
- Energy auditing
- Management Information system
- GIS based Asset mapping
- GIS based integrated network analysis
- Centralized customer care services
- Web self service
- Identity and access management system
- Development of commercial database for consumers
- Mail messaging System
- Antivirus solution
- Establishment of Enterprise architecture for KSEB's IT environment.

7.75 The quadripartite agreement (MoA) for the scheme duly signed by the Principal Secretary (Power), Govt. of Kerala and the Chief Engineer, Corporate Planning, KSEB, Power Finance Corporation Ltd and the Govt of India is executed on 17.8.2009.

7.76 DPR for part A of the project was approved by District Reforms Committee (DRC) amounts to Rs.650.77 crores. Out of this, Rs. 574.73 crores is expected from Govt of India and the balance amount of Rs.76.04 crores has to be met from KSEB's own fund. The DPR is forwarded to PFC Ltd for appraisal and awaiting approval from Govt of India.

Rajiv Gandhi Grameen Vidyuthikaran Yojana (RGGVY)

7.77 Under the Rajiv Gandhi Grameen Vidyuthikaran Yojana (RGGVY) sanction has been obtained to implement the scheme in 7 districts of Kerala, namely, Kasaragod, Kannur, Kozhikode, Wayanad, Malappuram, Palakkad and Idukki with an amount or Rs. 221.75 crores as a first package on 5.8.2005. A quadripartite agreement has been executed among Government of Kerala, KSEB, REC and NIPC Electric Supply Company Ltd (NESCL) to entrust implementation of the scheme in the 6 northern districts of Kasaragod, Kannur, Kozhikode, Wayanad, Malappuram and Palakkad with M/s NESCL.

7.78 For implementation of the scheme in Idukki district on turnkey basis, contract agreement has been executed between M/s ICSA (India) Ltd., Hyderabad and KSEB on 23.3.2007. REC has released the first installment of Rs. 5.12 crores (30% of Rs. 19.75 crores, sanctioned project cost) on 21.3.2007 and an amount of Rs. 0.8351 crores towards 50% of cost of 11135 nos. of BPL service connections.

7.79 REC has approved the revised cost estimate along with the revised DPR for implementation of the scheme in Idukki District with an outlay of Rs. 19.95 crores on 8.1.2009. The physical progress achieved as on 31.10.2009 is shown in the table 7.17.

7.80 Electrification of 42 karas in 23 villages and electrification of 14293 BPL households is the significant achievement of the scheme.

7.81 REC has intimated that the implementation of the remaining 6 districts will be considered only in the second phase of Eleventh Plan and as per the direction of REC the revised DPR for these 6 districts for an amount of Rs. 10671.36 lakhs are submitted to REC for approval.

7.82 Submitted also to REC for approval for implementation of the schemes in the districts viz. Thiruvananthapuram, Kollam, Pathanamthitta, Alappuzha, Kottayam, Ernakulam and Thrissur with outlay of Rs. 99.25 crores.

7.83 The condition of implementation of the scheme on turnkey basis is one of the major difficulties faced by KSEB during the implementation of the scheme.

7.84 The details of the progress of implementation as on 30-10-2009 is shown in the Table 7.17.

Table - 7.17
Details for progress of implementation of RGGVY

Sl. No.	Name of Item	Unit	Target for 2008-09	Achievement as on 31.10.2009
1	Installation of 25 KVA transformer	No.	275	189
2	Construction of 11KV Line	KM	272.75	178.31
3	Construction of LT single phase line	KM	320.53	164.29
4	Construction of LT three phase line	KM	76.18	33.97
5	Effecting BPL service connection	No.	16097	14293

Source: KSEB

Power Sector Reforms

7.85 Reforms in Kerala power sector and KSEB are mandated by Govt of Kerala Power Policy 1988. As a part of implementation of the reform process as envisaged in this policy and to take advantage of the benefits offered by the Govt of India, the Govt of Kerala signed a MoU with the Govt of India on 20-8-2001. Moreover, KSEB has been implementing various reform processes with the positive results of improving quality of energy service to customers and financial health of the Board. The major reform process being undertaken by the Board is as follows.

- KSEB has targeted to reduce the loss by 2% every year. T&D loss brought down to 20.45 percent as on 31-3-2009
- All villages have been electrified
- Completed 100 percent metering of all distribution feeders
- All consumers have metered
- Energy audit of 11 KV and above metering has been computerised
- All 641 sections have been computerised in open source platform
- Efficient financial management resulted in reducing the outstanding loan from Rs.1856.72 crores (as on 31.3.2008) to Rs.1100.37 crores (as on 31.3.2009).

Box 7. 3

Power Sector Reforms: India's biggest problem

Though power reforms are the most important item on the Government's agenda, it often leads to face-offs between the Centre and States. Electricity is the common denominator for all technologically advanced societies. Correlation between percapita income and percapita power consumption is very strong. If the power industry is below par overall growth is hobbled.

Power sector reform is the biggest problem the Indian Economy faces. India's public generation capacity (State + Central + Private utilities) is around 148000 MW and captive capacities add up to another 55000 MW. The public system has a plant load factor of about 75% (thermals). Transmission and distribution losses are 27%. Collection losses are another 7%.

According to MAIT (Manufacturing Association of Information Technology) India Inc lost around Rs. 44000 crores (Rs. 440 billion) in 2008-09, due to power outages. Hence, the overall loss may be around 5% of GDP. Roughly 20% of villages remain off – grid.

Around 300-400 million Indians have no access to power. Percapita consumption is 700 units per annum (I unit = 1 KWH or the power consumed by using a 40W tube for 250 hours). The average first world per capita consumption is around 1000 units per month.

Over the 11th Plan (ending 2011-12), India hopes to add 78000 MW of capacity and the 12th Plan (2012-17) targets additions of another 100000-110000 MW. So far, between 2007-08 and 2008-09, about 12000 MW has been added and another 66000 MW is in various stages of the pipeline. Much of this will be private funded and managed.

Financial Performance of the Board

7.86 The prudent power management initiatives have resulted in a situation wherein the state was considerably reduced power cuts and load shedding. Voltage and frequency of the power system was well within the specified limits. The availability of HT and EHT feeders was about 98% all over the state. The results for 2008-09 indicate an increasing trend in the financial and operating performance on account of power management and overall productivity and efficiency. As a result, revenue deficit was increased from Rs. 91.29 crores in 2007-08 to Rs. 749.17 crores in 2008-09. The total revenue during 2008-09 amounted to Rs. 5349.82 crores and the total expenditure was Rs. 6098.99 crores. Efficient financial management resulted in reducing the outstanding loan from Rs.1856.72 crores (as on 31-3-2008) to Rs. 1100.37 crores (as on 31-3-2009).

7.87 The details of revenue earnings and revenue gap from 2006-07 to 2008-09 are shown in Tables 7.18 and 7.19.

Table - 7. 18

Revenue Earnings **(Rs. crore)**

Sl. No	Particulars	2006-07	2007-08	2008-09
1	Revenue from sale of power	4286.13	4934.06	5097.49
2	Revenue from subsidies & grants	0	0	0
3	Revenue gap/ Regualtory Asset	142.23	91.29	749.17
4	Other Income	130.04	201.79	252.33
	Total	**4558.40**	**5227.14**	**6098.99**

Source: KSEB

Table - 7. 19
Revenue Gap **(Rs. crore)**

Year	Income			Total Expenditure	Revenue Gap
	Tariff	Non-Tariff	Total		
2005-06	3367.3	325.44	3692.74	3837.32	-144.58
2006-07	4009.71	406.46	4416.17	4558.40	-142.23
2007-08	4696.95	438.89	5135.84	5227.13	-91.29
2008-09	4893.022	456.79	5349.815	6098.99	-749.17

Source: KSEB

Category of Consumers and Realisation 2008-09

7.88 During 2008-09 realisation from tariff has down to Rs.445423.45 lakhs from Rs. 469695.48 in 2007-08. Out of this, Rs. 143305.56 lakhs comes from the HT& Extra high voltage category of consumers and their energy consumption was registered at 2986.97 MU. Their tariff income was more than the other category of consumers.

7.89 The domestic category consumers are second largest group for paying tariff. Their contribution was Rs. 113590.56 lakhs and their energy consumption was 5925.23 MU. Details can be seen in the Table 7.20

Table - 7. 20
Consumers and Realisation 2008-09

Category of Consumers	Sales (MU)	Revenue (Rs. lakhs)
Domestic	5925.23	113590.56
Commercial	1501.6	111666.48
Public lighting	294.32	5895.63
Irrigation & Dewatering	225.22	3048.41
Industrial (LT)	1015.4	46688.86
HT & EHT	2986.97	143305.56
Railway Traction	142.07	6760.29
Bulk Supply	317.47	14467.66
Total	**12408.28**	**445423.45**

Source: KSEB

Aggregate Revenue Requirement (ARR)

7.90 KSEB has submitted their ARR for 2009-10 to the KSERC. The actual net expenditure during 2008-09 was Rs.5881.57 crores and total income was Rs. 5349.82 crores. The revenue gap was Rs.749.17 crores. On the other hand, ARR for 2009-10, projection of tariff collection came to only Rs. 4522.93 crores and the net expenditure by Rs.5895.80 crores. Consequently revenue gap projected by KSEB was Rs. 1099.28 crores. The summary of ARR is shown in the Table 7.21.

Table - 7. 21
Summary of Aggregate Revenue Requirement (ARR) for the year 2009-10 (Rs. Crores)

Items	2007-08			2008-09			2009-10
	ARR	KSERC	Actual	ARR	KSERC	Actual	ARR
Generation of Power	54.96	143.30	195.97	207.03	207.03	414.96	310.85
Purchase of Power	2020.39	1734.65	2101.07	2674.65	2603.92	3417.23	3024.61
Interest & Finance Charges	458.61	458.61	352.77	357.31	365.60	339.60	345.31
Depreciation	460.42	260.18	419.09	459.30	290.69	434.74	489.41
Employee Cost	965.00	1090.00	904.88	1136.86	1136.86	1255.19	1069.96
Repair & Maintenance	101.47	101.47	116.26	131.05	131.05	138.80	152.74
Administration & General Expenses	125.63	54.47	125.35	140.06	63.61	135.46	155.21
Other Expenses	227.00	100.00	871.70	495.29	52.03	-160.95	431.40
Gross Expenditure (A)	**4413.48**	**3942.68**	**5087.09**	**5601.55**	**4850.79**	**5975.03**	**5979.49**
Less: Expenses Capitalised	37.63	37.63	48.08	25.75	25.75	70.75	55.82
Less: Interest Capitalised	48.25	48.25	29.33	59.19	59.19	22.71	27.87
Net Expenditure (B)	**4327.60**	**3856.80**	**5009.68**	**5516.61**	**4765.85**	**5881.57**	**5895.80**
Return on Equity (RoE) **(C)**	217.42	217.42	217.42	217.42	217.42	217.42	217.42
ARR (D) = (B) + (C)	**4545.02**	**4074.22**	**5227.10**	**5734.03**	**4983.27**	**6098.99**	**6113.22**
Less Non-Tariff Income	361.84	361.84	438.89	528.21	528.21	456.80	491.01
Less: Revenue from Tariff							
(a) with in the State	3753.07	4042.11	4696.95	4451.13	4451.13	4893.02	4522.93
(b) Outside the State							
Total Income	**4114.91**	**4403.95**	**5135.84**	**4979.34**	**4979.34**	**5349.82**	**5013.94**
Revenue Gap	**430.11**	**-329.73**	**91.26**	**754.69**	**3.93**	**749.17**	**1099.28**

Source: KSEB

Total Electrification Initiatives

7.91 Various schemes and programmes would help to take the next level several initiatives such as total rural electrification and energy efficiency campaign with a major push to micro hydro electric projects. A cluster based programme would be initiated to tap the micro hydro electric projects whose mandate would be to tap energy using optimum resources from run – of – the – river flows in forest and other vulnerable localities. An atlas of 996 potential micro hydro sites in the State has been drawn up as part of the total electrification drive. Electrification of houses of the marginalized sections has been identified as one of the thrust areas. About 5 lakh non electrified houses have been identified as part of the total electrification programme in TESM local Governments.

7.92 The total Electrification Programme comes as a bonanza to a large number of tribes who live in remote forest areas where drawing power lines is almost impossible. The highlight of the total electrification scheme is that power lines were drawn for more than 10 to 15 km so as to provide power supply to tribal areas. The State Government is trying to provide power to each house hold in the State, the central electricity act brought by the Central Government is trying to bifurcate Electricity Boards into different companies. This is attempting to privatize the power sector. But the State Government is opposed to the bifurcation of the board in to different companies. It wanted the Kerala State Electricity Board to remain as one company. The State Government will oppose the move to privatize the electricity board.

Box 7.4

Palakkad to become first fully Electrified District

Palakkad will be marked on the country's map as the first totally electrified district on 2010 February 16. Out of the 11 Assembly constituencies in the districts, 8 had already been fully electrified (90%) and electrification of all houses in the remaining segments of Malmpuzha, Ottappalam and Mannarkad would be completed by February 11.

Kerala State Electricity Board targeted to complete electrification of another 100 assembly segments during the current calendar year. The State has 141 assembly segments. Power Infrastructure to a tune of Rs. 520 crores had been created in Palakkad district.

The total Electrification Programme comes as a bonanza to a large number of tribes who live in remote forest areas in the district where drawing power lines is almost impossible. The highlight of the total electrification scheme is that power lines were drawn for more than 10 to 15 km so as to provide power supply to areas like Moolaganga adivasi ooru in Attapady.

An exhibition in this connection will be held from February 11 at the Muncipal Stand in Ottappalam. Over 60 stalls, including that of Vikram Sarabai Space Centre, Medical College, Pharmaceutical College, Industries Department, Aeronautical College and Engineering Institutions, will feature in the expo.

The total electrification project was implemented in the Panchayats of Vadakarapathy, Eruthenpathy, Kozhinjanpara, Nallepilly, Pattancherry, Perumatty, Vadvannur as well as the Municiapal areas of Chittur and Thattamangalum in Palakkad district.

No other district has so far come forward to embrace the title of "the fully electrified district." KSEB has ensured power on demand in the entire district. The KSEB has no provision to meet the expense of wiring and the requirements on the part of the consumers. In the case of weaker families, the board has suggested the local bodies and welfare departments to financially support them.

Non – Conventional Energy

7.93 ANERT was entrusted with the programmes for renewable energy studies and development programmes in the State. ANERT is also functioning as the State Nodal Agency (SNA) of the central Ministry of New Renewable Energy (MNRE), but owing to various administrative constraints the achievements of ANERT have been badly marred by its rather poor performance during the past plan period. The incompetence of ANERT in carrying out resource and demand assessment studies as well as working out an overall plan for renewable energy resource development targeting lifeline energy availability to all in the State and the reluctance to support the energy development programmes of Local Self Government Institutions.

7.94 The major targets of ANERT during 2009 were organisation of TESM limited programme on Renewable Energy and Energy Management for Domestic and Community purpose directly for Guest Houses and Tourism related institutions jointly with Tourism Department and for Hospital, jointly with Health Department.

7.95 Major target under TESM was to ensure knowledge and Technology Support Services for energy projects of LSGIs in areas of information management, IEC, handling GIS etc. Training of TESM functionaries in Technology Support and aspects of implementation of renewable energy projects and supporting implementation of various programmes for decentralized power generation based on renewable sources of energy covering solar, Biomass, small Hydro as well as hybrids and Demand Side Management Schemes in local Governments and for transferred institutions were also included under this programme.

Renewable Energy and Energy Management

7.96 ANERT had initiated steps to conduct Energy Audit of 28 Government Guest Houses jointly with Tourism Department and of 30 Hospitals jointly with Health Department. Audit reports are being finalized. Steps were initiated to conduct energy audit of street lighting system would provide most optimum lighting level for the streets with up to date technology in which energy savings combined with reduced maintenance costs will be the prime benefits. Pilot Study in this regard was conducted in Varkala Municipality. Report and DSM Plans are being prepared.

7.97 TESM – ANERT had also been part of 'One Million CFL Campaign of the State which had taken up beneficiary database, finalisation, distribution and erection completed jointly with KSEB and LSGs, Distribution of CFLs to 6,16,789 beneficiaries out of 7,93,187 completed as on 2nd November 2009.

Improved Chulha Programme

7.97 Improved Chulha installations initiated, for which training was conducted and inspection of 2400 locations out of 4200 installations completed.

Technology Entrepreneurship Promotion and Incubation Cell (TEPIC) and the Centre of Excellence

7.98 TEPIC was entrusted with implementation of MNRE assisted programmes with specific inputs and adaptations significant to the state. Remote Village Electrification Programme was taken forward accordingly with detailed discussions with LSGIs. Field Survey, testing and pre-installation survey were carried out followed by installation and commissioning in the tribal hamlets of Kuttichal Panchayat in Thiruvananthapuram. The work is in progress in other 4 districts covered under the scheme.

7.99 Detailed Project Report is prepared and submitted to Government for establishing Centre of Excellence hosting 5 laboratories to set up jointly with premier academic and research institutions in Lighting, Solar, Biomass, Small Hydro and Energy Conservation.

Decentralised Power Generation

7.100 Draft Project Report for decentralized power generation proposals of various District Panchayats, covering 300 Cu.m biogas plants, 20 MW gasifiers, 2 Biomass Gasifier Crematoria, 5 Solar Steam Cookers and one Scheffler Cooker are prepared jointly with World Institute of Sustainable Energy (WISE), Pune. DPRs and Tender documents for this are being finalized. Proposal for a joint special vehicle for implementation with District Panchayats is also being finalized.

Small Hydro Power

7.101 Small Hydro Power (SHP) potential of the State is observed as one of the renewable energy sources that could cater to the needs of a section of remote, isolated habitations and could support existing grid to enhance energy availability of the villages in high lands. TESM – ANERT had carried out reconnaissance survey of probable SHP sites listed out based on GTS top maps and interactions with LSGIs. The survey covered 875 sites of varying capacities. Geo spatial details and spot discharge data of these sites are compiled with the support of LSGIs and NGOs. Kerala State Land Use Board (KSLUB) is preparing maps relating to the location and catchments of these sites. Detailed Atlas being finalised with this data for publication jointly with CWRDM and KSLUB. Detailed survey conducted for 14 promising sites in Peravoor Block of Kannur District and Detailed Project Report finalized for integrated implementation of these projects under the RIDF assisted project.

Conservation of Energy

7.102 Considering the commendable performance, EMC has been awarded the 2008 National Award for the State Designated Agency for implementing energy conservation act 2001, by the Government of India.

7.103 To promote energy conservation in the domestic sector, EMC has undertaken a novel campaign christened SAVE (Aerve As Volunteer for Energy conservation) by inducting school students for residential energy audits / conservation. A total number of 6.73 lakhs households participated in the campaign. The estimated savings through this SAVE Campaign is 276 MU corresponding to 50.6 MW of avoided generation capacity.

7.104 The following are major activities and notable achievements conducted by EMC during 2008-09.

- The development of automatic streetlight switching device, an almanac fed electronically controlled switching system to control streetlights and commissioning this at Thalassery, Kannur district.
- Preliminary design for the touch screen energy efficiency information system for schools has been completed.
- Energy efficiency improvement studies under Investment Grade Energy Audits were done in 22 public buildings including Government Secretariat, legislature Complex, High Court buildings, etc.
- Energy Clinic is a unique programme of EMC in the domestic sector through women as change agents. This year, 42,800 women participated in the clinics.
- EMC acts as the technical secretariat for the Kerala State Energy Conservation Award scheme and host the UNIDO Centre for Small Hydro Power.
- Detailed topographical surveys, geological investigations and engineering have been completed for the 3 MW Arippara SHP for Kozhikode District Panchayat.
- EMC acted as a catalyst for the commissioning of 7 MW Ullungal SHP at Pathanamthitta district under – IPP (BOOT) scheme.
- The 15 MW Karikkayam projects, which was allotted to a captive power producer during 1994, was re-allotted and work of the project has started.

Enforcement of Standards and Statutes

7.105 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 2008-09

- Steps have been taken to implement the Office automation of electrical inspectorate and district offices.
- The Kerala State Electricity Licensing Board in this department has almost completed during this year.
- During 2008-09 the department has executed the programmes like purchase of equipments, calibration of instruments / equipments / NABL accreditation repair of equipments etc.

7.106 A detailed study has been conducted at Thrissur Municipaltiy regarding the power quality of Electricity Supply at the Municipal area using high tech equipments such as harmonic analyser AC leekage clamp meter and various testing equipments by a technical team from this department. In this study various types of electricity losses occurring at various level of distribution system has been identified and the preventive measures to be implemented to reduce the losses is formulated.

Kerala State Electricity Regulatory Commission (KSERC)

7.107 The KSERC established in the year 2002, entered in the 8th year of service. During this period, this statutory body has taken all efforts to set up a fair, transparent, modern and objective electricity regulatory process in the State of Kerala.

Mission of the Commission

(a) To promote competition, efficiency and economy in the activities of the Electricity Industry within the State of Kerala.
(b) To regulate the power purchase and procurement process of the Distribution licensees for sale distribution and supply of electricity within the State of Kerala.
(c) To determine the tariff for generation transmission, wheeling and supply of electricity, wholesale bulk or retail, as the case may be within the State of Kerala.

Functions of the Commission

7.108 The Commission is vested with the responsibility of discharging the following functions:

(a) Determine the tariff for generation, supply, transmission and wheeling of electricity, wholesale, bulk or retail, as the case may be, within the State;
(b) Regulate the electricity purchase and procurement process of distribution licensees including the price at which electricity shall be procured from the generating companies or licensees or from other sources through agreements for purchase of power for distribution and supply within the State:
(c) Facilitate intra-State transmission and wheeling of electricity;
(d) Issue licenses to persons seeking to act as transmission licensees, distribution licensees and electricity traders with respect to their operations within the State;
(e) Promote co-generation and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and also specify, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee;
(f) Adjudicate upon the disputes between the licensees and generating companies and to refer any dispute for arbitration;
(g) Levy fee for the purposes of the Electricity Act, 2003;
(h) Specify State Grid Code;
(i) Specify or enforce standards with respect to quality, continuity and reliability of service by licensees;
(j) Fix the trading margin in the intra-State trading of electricity, if considered, necessary;
(k) Discharge such other functions as may be assigned to it under the Electricity Act, 2003;
(l) Advise the State Government on all or any of the following matters, namely:-
(i) Promotion of competition, efficiency and economy in the activities of the electricity industry;
(ii) Promotion of investment in the electricity industry;
(iii) Reorganization and restructuring of the electricity industry in the State;
(iv) Matters concerning generation, transmission, distribution and trading of electricity or any other matter referred to the State Commission by the State Government.

Regulations issued by the Commission

1. Kerala State Electricity Supply Code (Second Amendment) Regulations, 2007
2. KSERC (Fees) Regulations, 2007
3. KSERC (Supply of Power from Captive Generating Plants to Distribution Licensees) Regulations, 2007
4. Kerala State Electricity Supply Code (Third Amendment) Regulations. 2007
5. KSERC (Licensees' Standards of Performance) Regulations, 2006 – Postponement of enforcement in the case of KSEB.