

## CHAPTER III

### PERFORMANCE REVIEW RELATING TO STATUTORY CORPORATION

#### TRANSMISSION SYSTEM IMPROVEMENT BY KERALA STATE ELECTRICITY BOARD

##### Highlights

The Board could achieve a capacity addition of only 2081.90 MVA (22 per cent) in 114 substations with 1142.82 CKM (35 per cent) transmission lines against the overall target of 9674.40 MVA in 309 substations with 3214.98 CKM transmission lines. The shortfall in achievement was due to delay in identifying/purchase of land and giving various approvals, inept decision making in respect of Right of Way disputes, delay in conducting line route survey and making payments to contractors, etc. Loans sanctioned by financial institutions were withdrawn and foreclosed due to slow pace of work.

*(Paragraphs 3.9 and 3.11)*

Non-synchronisation of complementary works resulted in idle investment on transformers, substations and lines, loss of benefits and interest amounting to Rs.128.71 crore.

*(Paragraphs 3.14 and 3.15)*

Non/delayed commissioning of 45 substations executed on turn key basis resulted in loss of envisaged savings in line losses amounting to Rs.54. 52 crore.

*(Paragraphs 3.16, 3.17, 3.18 and 3.19)*

Delay in commissioning of 130 departmentally executed works, idle investment on substations and loss of anticipated benefits amounted to Rs.537. 04crore.

*(Paragraphs 3.20, 3.21, 3.22, 3.23, 3.24, 3.26, 3.29 and 3.30)*

Delay in commissioning of evacuation lines from four micro hydel projects resulted in loss of potential generation of 6.06 MU equivalent to a revenue of Rs.1.88 crore.

*(Paragraph 3.32)*

Delay in commissioning of shunt capacitors installed in 15 substations and their poor performance in three substations resulted in a revenue loss of Rs 18.70 crore

*(Paragraph 3.33)*

## **Introduction**

**3.1** The transmission system which forms an essential link between power generating/receiving source and load centres/distribution point plays a vital role in power management. All the power stations are connected with different sub-stations set-up for supply of power to consumers through 220KV, 110KV, 66KV and 33KV network. For efficient functioning of transmission system, it has to be ensured that, there is minimum loss in transmission of power. Electricity generated at 11KV in generating stations is stepped up to 33/66/110/220 KV and transmitted to transmission and distribution substations which in turn stepped down to 11KV for ultimate distribution to consumers. The State Government signed (August 2001) a Memorandum of Understanding (MOU) with the Union Government (GOI) for power sector reforms which *inter alia* stipulated reduction of system losses to 17 *per cent* by December, 2004. In order to achieve this objective, the Board decided (March 2002) to complete within two years all spill over works from previous five year plan, with more than 25 *per cent* progress and various system improvement works, such as upgradation of all 66KV system to 110KV, wherever possible, withdrawal of 66KV system within five to ten years in a phased manner, optimisation of transformer capacity and installation of capacitors in transmission system, etc. The Board also introduced 33KV sub-transmission system envisaging addition of 149 sub-stations within a period of two years.

A review on Transmission and Distribution Loss in Kerala State Electricity Board was included in the Report of the Comptroller and Auditor General of India for the year ended 31 March 1996 (Commercial), Government of Kerala. The review was discussed by Committee on Public Undertakings (COPU) and the main recommendations contained in the 11<sup>th</sup> Report presented (July 2002) to the Legislature were:

- Restructuring of the entire system of transmission and distribution and a detailed study to analyse the various factors that contributed to the high percentage of loss.
- Implementation of suitable schemes to bring down the transmission and distribution loss to the stipulated level.
- Implementation without delay of all pending works in the system improvement as well as new works to bring down transmission and distribution loss.

The Board failed to fully implement the above recommendations since there was enormous delay in completion of system improvement works and the desired level of reduction of transmission and distribution loss could not be achieved as is evident from the audit findings infra.

## **Scope of Audit**

**3.2** This review conducted during December 2006 to March 2007 covers the performance of the Board during 2002-03 to 2006-07 in the

implementation of all the 114 completed transmission system improvement projects like construction of new substations and transmission lines, upgradation of existing substations and capacity enhancement, installation of capacitors, etc. Audit reviewed the records available with the offices of the Chief Engineer Transmission South, North and Systems Operation, Deputy Chief Engineers of all the ten\* transmission circles and 10 out of 30 Divisional offices selected on the basis of number and value of works executed.

### **Audit Objectives**

3.3 The audit objectives of the performance review were to ascertain whether:

- the Board undertook transmission system improvement works systematically to achieve economy, efficiency and effectiveness in execution of transmission system improvement;
- the available resources were utilised effectively for earmarked purposes; and
- the Board was successful in reduction of transmission and distribution losses as envisaged and thereby increasing the revenue.

### **Audit Criteria**

3.4 The following audit criteria were adopted:

- provision of Memorandum of Understanding (MoU), plan documents, project reports/feasibility study for various schemes;
- prescribed procedure for inviting tenders, their evaluation, award of contracts, terms and conditions of agreements for works, etc;
- environmental laws, land acquisition procedures, etc;
- monitoring system for implementation and timely completion of projects; and
- norms fixed by Central Electricity Authority for Transmission and Distribution loss and targets fixed by GOI as per MOU.

### **Audit methodology**

3.5 The audit adopted following mix of methodologies:

- review of agenda notes and minutes of Board, administration reports and annual accounts;
- scrutiny of loan files, physical and financial progress reports, reports on transmission system improvement schemes, etc;

---

\* Alappuzha, Kalamasseri, Kanjikode, Kannur, Kottarakkara, Kozhikode, Malappuram, Pooanthuruthu, Thiruvananthapuram and Thrissur.

- review of tenders, contracts, work orders, payment details, etc; and
- formal interaction with the Management at various levels.

### **Audit findings**

**3.6** Audit findings emerging from the performance review were reported (May 2007) to the Board/Government and discussed in the meeting (30 July 2007) of the Audit Review Committee for State Public Sector Enterprises (ARCPSE). The meeting was attended by the Deputy Secretary, Power Department, representing Government of Kerala and the Board was represented by its Chairman. The views expressed by the members have been considered while finalising the review.

Audit findings are discussed in succeeding paragraphs:

#### ***Transmission network***

**3.7** The Board had two sources of power *viz.*, own generation from Hydel/Thermal projects and purchase from Central pool, other State electricity Boards, Power Trading Corporation of India Limited (PTC) and Independent Power Producers. Power purchased from Central pool and from outside the State was being transmitted into the State through 400/220KV inter-state lines and sub-stations. There were two 400 KV sub-stations in the State one at Pallipuram owned by Power Grid Corporation of India Limited (PGCIL) and the other at Madakkathara constructed by the Board. The Board transmits power received from these sub-stations as well as own generation through its network of 220,110, 66 and 33KV substations. As of March 2007 the Board had 287 substations (400 KV-1, 220KV-14, 110KV-114, 66KV-99 and 33KV-59).

#### ***Growth of transmission network***

**3.8** Transformer capacity, installed capacity for transmission, length of transmission lines, total power handled, total power supplied and transmission loss during 2002-07 are given in **Annexure 15**. As against the transmission loss of four *per cent* fixed by Central Electricity Authority (CEA), transmission loss ranged between 4.4 and 6 *per cent* during 2002-07. The delays in execution of transmission system improvement (TSI) works contributed towards transmission loss of 685.78 MU in excess of the norm, during 2002-07 as discussed in the succeeding paragraphs.

### **Targets and achievements**

#### ***Physical targets and achievements***

**3.9** The Board had been framing a five year plan for transmission system improvement such as construction of new substations, transmission lines, upgradation of existing substations and lines and capacity enhancement. While the Board fixed annual targets, incomplete works were being carried forward

from year to year. Targets and achievements in physical terms during 2002-07 were as given in **Annexure 16**.

It was noticed that:

**The Board failed to achieve targets for addition of transformer capacity and construction of lines.**

- Against the overall target of 9674.40 MVA for capacity addition in 309 substations with 3214.98 CKM transmission lines, the achievement was 2081.90 MVA (22 *per cent*) in 114 substations with 1142.824 CKM (35 *per cent*) transmission lines.
- Achievement against new substations was 22 *per cent* and transmission lines was 32 *per cent*.
- Achievement against upgradation of existing substations and capacity enhancement of substations was 20 *per cent* and 23 *per cent* respectively.

The shortfall in achievement was due to delay of the Board in identifying/purchase of land and giving various approvals, inept decision making in respect of Right of Way (RoW) disputes, delay in conducting line route survey, delay in making payments to contractors and also partially due to delay in execution of work by contractors as discussed in succeeding paragraphs. Achievement of the targets was extremely low despite the fact that there were no financial constraints as 90 *per cent* of the schemes/works taken up were financed by Rural Electrification Corporation Limited (REC) and Kerala State Power and Infrastructure Finance Corporation Limited (KPFC).

### **Financial outlay and actual expenditure**

**3.10** The Board prepared annual budget for capital expenditure on various works including transmission schemes and system improvement based on physical targets fixed in the annual plans without any reference to the amount required as per five year plans.

The budgeted (original/revised estimates) and actual expenditure on TSI works during 2002-07 were as follows:

Particulars	<i>(Rs. in crore)</i>				
	2002-03	2003-04	2004-05	2005-06	2006-07
Budgeted estimate	269.32	274.10	269.68	297.53	218.50
Revised estimate	228.55	255.50	275.54	230.20	200.18
Actual expenditure for the year	183.48	204.86	253.23	228.35	227.12*
Percentage of revised estimate to budget estimate	84.86	93.21	102.17	77.37	91.62
Percentage of actual expenditure to revised estimate	80.28	80.18	91.90	99.20	113.46
Amount required as per five year plan proposed	507.43	500.83	106.17	101.90	72.94

\* Provisional figures since expenditure is yet to be segregated and booked by Board.

The budgeted/ revised estimates and actual expenditure was not having any relation to requirements as per five year plans of the Board.

It would be seen from the above table that

- the budgeted/revised estimates and actual expenditure in each year was not having any relation to requirement as per five year plan proposals given to State Government/Planning Board;
- even though revised estimates were being prepared in the month of December in each budget year after considering the original budget estimates and actual expenditure incurred up to that date, the actual expenditure for the year was on the lower side except 2006-07, indicating that the assessment lacked accuracy.

### **Transmission system improvement schemes**

3.11 The REC and KPFC sanctioned (1998-2001) loans amounting to Rs 808.31 crore (REC Rs 683.94 crore and KPFC Rs 124.37 crore) at 13.5 per cent interest, in respect of 59 schemes involving 207 substations with transformation capacity of 4748.69 MVA during 1998-2007. Targets and achievements against the 59 (REC 54 and KPFC 5) schemes having projected cost of Rs 854.96 crore were as given below:

Source of finance	Capacity in MVA (number of substations)									
	220 KV		110 KV		66 KV		33 KV		Total	
	Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual
REC	1666.69 (7)	337.5 (3)	1350.0 (54)	411.50 (15)	112.0 (5)	20.0 (1)	1035.0 (112)	295.00 (35)	4163.69 (178)	1064.0 (54)
KPFC	--	--	167.5 (11)	115.5 (9)	48.5 (2)	48.5 (2)	369.0 (16)	247.00 (6)	585.0 (29)	411.00 (17)
<b>Total</b>	<b>1666.69</b> (7)	<b>337.5</b> (3)	<b>1517.5</b> (65)	<b>527.00</b> (24)	<b>160.50</b> (7)	<b>68.50</b> (3)	<b>1404.00</b> (128)	<b>542.00</b> (41)	<b>4748.69</b> (207)	<b>1475.0</b> (71)

The Board, however, could draw only Rs 613.99 crore of the sanctioned loan of Rs.808.31 crore. Owing to the slow pace of work, against the targeted 207 substations with transformation capacity of 4748.69 MVA the achievement was 71 substations with transformation capacity of 1475 MVA (31.1 per cent) only up to 31 March 2007. Achievement of transmission lines under these schemes was also low (41.1 per cent) i.e. 755.45 CKM as against targeted 1883.18 CKM.

Audit analysis revealed as under;

- Out of 61 schemes (Rs 775.66 crore) originally sanctioned, 7 schemes were withdrawn (2003-04) by REC as there was no progress during 1998 to 2003. Out of Rs.683.94 crore sanctioned against remaining 54 schemes, the Board could avail of only Rs.489.62 crore up to 2005-06. Further, 27 REC schemes with sanctioned loan of Rs.260.76 crore were foreclosed against which the Board had availed Rs.235.16 crore only and the balance Rs.25.60 crore was not drawn.
- Out of 27 ongoing schemes of REC, Rs.5.35 crore relating to four schemes remained unutilised (March 2007). The Board completed 5 out of 17 substations envisaged under the schemes (March 2007). In respect of one scheme (Pullanpara), the loan drawn (March 2001) by

the Board amounting to Rs 1.12 crore was required to be refunded to the REC as the land acquisition was not completed (March 2007). Avoidable interest due to delayed refund of unutilised loan amounted to Rs.67.20 lakh for the period from March 2001 to March 2007 at ten *per cent*\* per annum.

- Out of five schemes financed by KPFC, in respect of one scheme (involving Changanassery, Chathannur and Karunagapally) Rs 34.39 crore sanctioned had been fully drawn by the Board (March 2005) for 29 substations. Against this the loan amount of Rs 27.76 crore in respect of 12 substations remained unutilised/diverted for other purposes (March 2007).

The loans sanctioned by REC and KPFC carried interest at the rate of 13.5 *per cent* per annum with a repayment period of seven years and moratorium (implementation) period of two years. Had the Board commissioned the substations and lines within the targeted period of two years it could have repaid the loan out of the additional revenue generated. The Board, however, failed to complete/ commission the substation in time whereby anticipated benefits such as additional revenue due to reduction in transmission and distribution loss, stable transmission of power and supply of better quality power to consumers could not be derived as discussed in para 3.14 to 3.34 *infra*.

The Management stated (August 2007) that short fall in achievement was due to delay in getting various clearances, litigation in land acquisition, contract failures and Right of Way problems. Fact remains that such type of hindrances are common in construction work of substations and transmission lines. Board though fixed targets for completion of works and tied up funds with financial institutions, failed to control these foreseeable factors.

### ***Monitoring***

**3.12** The proposals for installation of new substations, transmission lines and augmentation works with the object of reduction of transmission and distribution loss and improvement of voltage profile, were approved by the Board based on feasibility report submitted by the planning and project department. The five year/annual plans for implementation of the projects were prepared taking into account availability of finance from institutions such as REC, KPFC, etc. It was noticed that even though periodical progress reports on TSI projects along with details of bottle necks were put up to the Planning Department of the Board, no effective corrective action was taken to address the problems/bottle necks with a view to facilitate timely completion/commissioning of the projects. The abnormal delays in completion of the projects were not being analysed for corrective action.

**The abnormal delay in completion of projects were not analysed with its pros and cons.**

The Management stated (August 2007) that monthly review of the progress and evaluation of pros and cons is being made as far as possible and corrective

---

\* Worked out at mean of the interest rates of REC loan availed during 2002-07.

measures were taken within the limitations of the Board. The reply is not tenable since transformers and other equipments were procured in advance and remained idle due to non-identification/purchase of land and poor progress of work while in other locations substation works were held up for want of transformers and other equipments.

### ***Time and cost overrun***

**Lack of planning and co-ordination resulted in a cost overrun of Rs.31.61 crore.**

**3.13** In respect of 114 substations and allied works completed by the Board during 2002-07 against an investment of Rs.372.02 crore, the delay ranged between eight months to nine years. In 22 cases where the cost has been booked completely, the cost overrun was Rs.31.61 crore (60.10 *per cent*) against project cost of Rs.52.61 crore. In the remaining 92 cases completed up to March 2007, the cost has not been booked immediately after its commissioning as envisaged under the Electricity Supply (Annual Accounts) Rules, 1985.

The Board does not have any system of

- booking substation-wise cost of ongoing works and capitalising the cost of substations commissioned in the year of commissioning itself; and
- comparing the actual cost of the completed substation with the estimated cost and obtaining the approval of the Board Members for cost overrun or analysing the variations.

### ***Non-synchronisation of works***

**3.14** The works of substations/transformer bays, feeder lines and beneficiary substations were required to be carried out simultaneously so as to achieve the anticipated benefits. The Board, however, failed to complete the associated works simultaneously. **Annexures 17 to 19** give the details of mismatch in construction. It can be seen that:

**Non-synchronisation of works resulted in idling of substation and associated lines valuing Rs.91.72 crore and loss of anticipated benefit of Rs.34 crore.**

- Three 33KV transmission lines constructed at a cost of Rs.4.13 crore remained idle for periods ranging from 10 to 48 months due to non-completion of associated substation works (**Annexure 17**).
- Two 110/33/11KV and nine 33KV substations constructed at Rs.14.51 crore remained idle for periods ranging from 10 to 33 months due to non-completion of associated line works (**Annexure 17**).
- Forty seven 110/33KV transformers and two 66/33KV transformers erected at 30 locations, at Rs.66.33 crore remained idle/under utilised for periods ranging between 3 and 67 months due to mis-match between feeder substations and other substations (**Annexure 18**). This

had resulted in loss of envisaged benefits by way of reduction in line loss of Rs.34 crore.\*

- Seven 33 KV transformers, four 110/11KV transformers, four 110/33 KV transformers and other equipments purchased at an aggregate cost of Rs.6.75 crore remained idle at site for periods ranging from 6 to 74 months (**Annexure19**).

The Management stated (August 2007) that delay in getting land, litigation, public objections, delay in making available materials, poor performance of some of the contractors, etc., were the main reasons for the delay/non-commissioning of the projects. The reply is not tenable as the Board had taken into consideration these hindrances at the time of fixation of target dates for completion of substations and lines.

#### ***Idling of 220 KV transformers at Kalamassery Substation***

**3.15** The Board took up (February 1999) the work of capacity enhancement of 220KV substation at Kalamassery from 440MVA to 800MVA, in order to cater to anticipated additional demand. This was to be done by replacing the existing four transformers of 440 MVA with 12 new transformers of 800 MVA. Accordingly, twelve 66.67 MVA transformers were procured (March 2001) at a cost of Rs.11.36 crore. Capacity of the substation was enhanced (June 2003) to 720 MVA only, by replacing three transformers of 320 MVA with nine transformers of 600 MVA. Due to slow pace of growth of load requirements (1999-2003), further work on enhancement in capacity of the substation was not implemented. The remaining three transformers costing Rs.1.87 crore had been idling for the past six years (March 2007), and was not diverted to other substations. This resulted in loss of interest on the blocked funds amounting to Rs.1.12 crore<sup>#</sup>.

**Delay in decision making as to the utilisation of the transformers resulted in blocking up of funds amounting to Rs.1.87 crore.**

#### **Construction of substations and lines on turnkey basis**

**3.16** The Board undertook (2000-04) construction of 45 substations to be completed within five to nine months (April 2000 to July 2003), envisaging capacity addition (new substations, upgradation and capacity enhancement in existing substations) of 458 MVA with 658.13 CKM transmission lines on turnkey basis, at a contract price of Rs.90.76 crore as detailed below:

Substation	No of turnkey contracts	Substations (Target)			Substations (achievement)		
		No.	Capacity (MVA)	Line length (CKM)	No.	Capacity (MVA)	Line length (CKM)
110/11kv & 110/33kv	5	7	143	106.00	3	64 (44.8)	Nil
33/11kv	8	38	315	552.13	23	195 (61.9)	425.93 (77.1)
<b>Total</b>		<b>45</b>	<b>458</b>	<b>658.13</b>	<b>26</b>	<b>259</b>	<b>425.93</b>

Note : Figures in bracket indicate percentage.

\* Worked out at 15 per cent per annum on investment expected by way of additional revenue due to reduction in line losses as envisaged by REC while sanctioning the loans

# Worked out at the mean of the interest rates on REC loans availed during 2002-07

**Delay/non-completion of Substations and lines by turnkey contractors resulted in loss of savings of Rs.23.95 crore.**

Against capacity addition of 458 MVA with 658.13 CKM transmission lines targeted, the turnkey contractors completed the work of 26 substations with a capacity of 259 MVA (56 per cent) and 425.93 CKM (64.7 per cent) lines, with a delay ranging between 17 and 59 months. As at the end of 2006-07, 19 substations with aggregate capacity of 199 MVA and 232.20 CKM lines remained incomplete. The delays upto March 2007 ranged from 56 to 74 months. The delayed/non-completion of 25 substations resulted in loss of envisaged savings by way of reduction of line loss amounting to Rs.23.95 crore\*. Loss of envisaged benefit in respect of 20 remaining substations is discussed in paragraphs 3.17 to 3.19.

The reasons for non-completion /delayed completion of substations ranging between 17 and 74 months, in respect of works undertaken on turnkey basis as analysed in audit were due to delay in acquisition of land/handling over site for substation and line route, giving approval for designs and layouts of substations, earthmat design<sup>#</sup>, sanction for excavation, obtaining approval from Railways for line route, making payment to the contractors, absence of quick and apt decision making in the case of Right of Way disputes of line route, lack of proper planning, monitoring, co-ordination and supervision of the work.

Against the REC stipulation of two years, the Board had stipulated five to nine months for completion of substations and lines on turnkey basis. But the Board itself had taken 32 months to 11 years for completion of substation works. Procurement of transformers on the basis of unrealistic time schedule, coupled with dispute with contractors, delay in payments, foreclosure of contracts, abandonment of work, etc., resulted in idling of transformers and other equipments as discussed in paragraph 3.14 *supra*. A few illustrative cases are discussed in the succeeding paragraphs:

***Contract with Andrew Yule and Company, Kolkata***

**3.17** The Board awarded (April-August 2000) two works for construction of three 110/33 KV transformer bays and eight 33KV substations with associated lines at Balussery Project and Edaricode Project to Andrew Yule and Company (AYC) for a contract price of Rs.19.81 crore, on turnkey basis. The work was stipulated to be completed within six months from the date of handing over site. There was delay attributable to the Board, ranging from 7 to 27 months (April 2000-October 2002) in handing over sites of seven substations and one bay. The work was progressing slowly due to poor financial position of the contractor, as well as delay in releasing payments by the Board. Transformers and other substation equipments valuing Rs.5.87 crore were supplied (December 2000, December 2001) by the contractor. Despite giving extension of time (September 2002-February 2005) on three occasions the progress of work was very poor.

The Board terminated (September, December 2005) two contracts at the risk and cost of the contractor and the bank guarantees given by the contractor in

\* Worked out at 15 per cent per annum on investment expected by way of additional revenue due to reduction in line losses as envisaged by REC while sanctioning the loans.

<sup>#</sup> Earthmat design is the floor design for sub station switch yard.

respect of two projects amounting to Rs.1.98 crore were adjusted (December 2005) against the payments made (December 2000, August 2004) to the contractor amounting to Rs.3.92 crore. On taking (November 2006) inventory of material lying at site in respect of Balussery Project, the serviceability of the material valuing Rs.2.50 crore was reported to be doubtful and out of this, material valuing Rs.15 lakh was lost in fire.

**Investment of Rs.3.92 crore on two projects remained blocked up for five years.**

Audit noticed that AYC was incurring huge losses since 1996-97 and became a sick Company in 2003-04. The Board entrusted the works for Rs.19.81crore to AYC without ensuring the financial credibility. There was also delay in handing over sites, approval of drawings of substation, change in site of one transformer bay necessitating extra work, delays in handing over line routes and non-payment of bills, and resultant blockage of Rs.3.92 crore in the two projects, for a period of five years (December 2000-December 2005). After adjustment of (December 2005) bank guarantee given by the contractor the balance investment of Rs.1.94 crore remained blocked up for one year and three months (January 2006 to March 2007). Non-commissioning of the substations, even after a lapse of six years (February 2001 to March 2007) from the scheduled date (February 2001) of completion resulted in loss of envisaged benefits of reduction in line loss and anticipated revenue amounting to Rs.14.82 crore\*.

#### ***Contract with IComm (ARM) Limited***

**3.18** The Board entrusted (August 2000 to May 2001) the work of construction of one 110/33KV transformer bay and seven 33KV substations with associated lines on turnkey basis to IComm (ARM) Limited, Hyderabad at a contract price of Rs.14.94 crore. Name of work, date of contract, period of completion, scheduled date of completion, deficiencies noticed in audit, etc., are as follows:

Sl. No	Name of work	Date of contract (Period of completion)	Scheduled Date of completion	Deficiencies noticed
(1)	(2)	(3)	(4)	(5)
1	110/33 kv Bay Pazhayannur	31.05.2001 (6 months)	November 2001	Even though the contractor had identified (March 2001) the land as envisaged in the contract, the Board took 36 months (March 2001 to March 2004) to take a decision as to whose name the land was to be registered and purchased (May 2006) another plot.  Transformers and other materials supplied (December 2003) valuing Rs.65.06 lakh were lying idle for 3 years and 3 months (December 2003–March 2007) and the contractor was paid Rs 25.15 lakh. The work remained incomplete (March 2007)
2	33kv SS Chelakkara, 11km SC Line	-do-		
3	33kv SS Mullurkara, 17km SC Line	-do-		

\* Worked out at 15 per cent per annum on investment expected by way of additional revenue due to reduction in line losses as envisaged by REC while sanctioning the loan.

(1)	(2)	(3)	(4)	(5)
4	33kv SS Parappukara, 11.6km DC Line, 7.2km 11kv feeders.	28.08.2000 (6months)	March 2001	There was delay in giving approval for deviation in route of 11 KV lines proposed by the contractor and sanction for changing 11 KV over head lines to under ground cable by 11 months (August 2000-July 2001). The progress of work also was very slow and the substation was completed (August 2003) after a lapse of 29 months from the scheduled date of completion. The contractor had not completed (March 2007) two 11 KV feeders and the substation could not be utilised involving idling of investment of Rs.2.25 crore for 43 months from August 2003 to March 2007.
5	33 kv SS Ananthapuram, 12km SC line	19.03.2001 (5 months)	September 2001	The contractor had stopped (August 2001) the work, due to paucity of funds accentuated by non-payment of bills by the Board by five to eight months. The work was restarted (March 2003) but the progress was very poor. The contract was terminated (September 2006) at the risk and cost of the contractor after a lapse of five years. The contractor had supplied transformer and other material (Rs.1.19 crore) and had completed other works amounting to Rs. 83.71 lakh and was paid (September 2006) only Rs.78.08 lakh. There was no further progress in the work (March 2007)
6	33kv SS Perla, 12km SC line	-do-		
7	33kv SS Belur, 12km DC line	-do-		
8	33kv SS Bediaduka, 24km SC line	-do-		

**Non-completion of substation resulted in loss of envisaged benefit of reduction in line losses amounting to Rs.11.68 crore.**

Non-completion (March 2007) of the above substations, even after a lapse of more than five years from the scheduled dates of completion (March/September/November 2001) resulted in loss of envisaged benefit of reduction in line losses amounting to Rs.11.68 crore\*

***Contract with SPIC SMO Limited.***

**3.19** The Board awarded (March 2000) construction work of one 110/33 KV substation at Melattur and 19.6 Km associated Double Circuit line to SPIC SMO Limited, Chennai at a contract price of Rs.5.43 crore. The target date of completion was December 2000 for substation and January 2001 for line work. The substation work was completed in December 2000 itself incurring Rs.3.96 crore.

**Delay of 5 years in implementation of the project led to loss of envisaged benefit of Rs.4.07 crore.**

The construction of associated line was commenced by the contractor only in October 2000 due to delay in settlement of Right of Way dispute of land along the line route. While the case relating to the ROW of a stretch of 1.653 km of land was in progress, the contractor completed (July 2002) 17.9 km out of 19.6 km of line work, at a cost of Rs.1.79 crore. On the pending dispute of land Additional District Magistrate (ADM) had passed orders (August 2001) directing the Board to divert the line route along 1.653 km which involved an

\* Worked out at 15 per cent per annum on investment expected by way of additional revenue due to reduction in line losses as envisaged by REC while sanctioning the loan.

additional cost of Rs.36 lakh. The Board, however, filed (November 2001) appeal against the decision which was rejected (January 2005) by the Hon'ble High Court. Thereafter the balance portion of line work was completed (January 2006) and substation commissioned (January 2006) after a delay of five years from the targeted date (December 2000) of completion. The decision to go on appeal against the order of ADM for an additional expenditure of Rs.36 lakh, delayed the implementation of the project for five years from December 2000 to January 2006 leading to loss of envisaged benefit of Rs.4.07 crore\*. Stoppage of line work (July 2002) after investing Rs.1.79 crore for resolving the dispute resulted in idling of substation costing Rs 3.96 crore for five years with consequent interest loss of Rs.2.59 crore♦ on the idle investment for the period December 2000 to January 2006.

### **Departmentally executed substations and lines**

**3.20** The Board had completed 78 substations (excluding Gas Insulated Switch Yard Substations) with a capacity of 1,629.50 MVA and 1,094.26 CKM transmission lines (new substations and upgraded substations) during 2002-07. Out of these, 24 substations of 258.0 MVA capacity and 456.33 CKM transmission lines were executed on turnkey basis. The remaining 54 substations completed (commissioned) departmentally were delayed by 8 to 109 months as indicated below:

<b>Voltage ratio of substations</b>	<b>No. of substations</b>	<b>Capacity in MVA</b>	<b>Length of lines in CKM</b>	<b>Delay in months</b>
220 KV	3	457.50	40.77	18 - 45
110 KV	22	665.00	260.08	8 - 53
66 KV	7	74.00	40.23	17 - 109
33 KV	22	175.00	296.85	9 - 45
<b>Total</b>	<b>54</b>	<b>1371.50</b>	<b>637.93</b>	

The reasons for delay as analysed in audit were delay in identification and purchase of land, arranging funds, giving approvals for various stages of works, providing transformers, other substation equipments, yard structures, line materials, defective route survey, revision of estimate, awarding stage-wise work, tree valuation in line route, making payment to contractors, inept decision making on disputes and matters of court cases relating to ROW and splitting of substation and line works into too many small units involving preparation of estimate, tendering, approval, negotiation, acceptance, execution of agreement, measurement of works, preparation of bills in respect of various works which were time consuming process as per the procedures and practices prevalent in the Board. The delay arising from mismatch in completion of substation work with that of related lines for transmission of power resulted in blockage of funds, deprivation of better voltage and power factor to targeted consumers and loss of envisaged benefits (savings in line losses) to the Board. Out of the 54 cases, in 48 cases the Board lost envisaged

\* Worked out at the mean of the interest rates on REC loans availed during 2002-07.

benefits amounting to Rs. 67.84 crore\* and the major deficiencies noticed in six cases are discussed in succeeding paragraphs:

***Award of work without detailed survey and soil test***

**3.21** The Board decided (August 1998) to upgrade the 110 KV substation at Kundara and Edappon to 220 KV substations at an estimated cost of Rs.30.25 crore and Rs.18 crore respectively. The work of substations were carried out departmentally from July 1999 (Kundara) and May 1999 (Edappon) onwards, using Board's own funds. The projects were subsequently included (May 2000) under Project System Improvement Finance Scheme of REC revising the estimated cost of substations as Rs.57.43 crore (Kundara Rs.33.21 crore and Edappon Rs.24.22 crore) and the scheduled date of completion was revised to March 2003. The Kundara project was commissioned (January 2006) at a cost of Rs.10.15 crore and Edappon substation remained incomplete (March 2006) after investing Rs.8.70 crore, due to non-completion of the associated line works.

In the meantime the construction of associated Loop In Loop Out (LILO) line of Kundara substation was entrusted (May 2001) to Tata Projects Limited (TPL), Chennai on turnkey basis at a contract price of Rs.13.88 crore with scheduled date of completion as May 2002. The detailed survey and soil test reports were submitted during November 2001. The Board, however, revised the contract price for Kundara on the basis of soil test as Rs.36.21 crore only in October 2003 involving a delay of 21 months. TPL completed the line work in January 2006.

On completion of the above line work, the substation was commissioned (January 2006) by installing six (33.33 MVA) 29 year old transformers removed from Kalamassery substation, overhauled and transported at a cost of Rs.44.62 lakh. The transformers eventually failed twice (February/March 2006) and were not able to meet the anticipated load requirement (April 2006). Thereupon the Board decided (June 2006) to shift three new 66.67 MVA transformers purchased in 2001 for Rs.1.87 crore, from its store at Kalamassery to Kundara. Thus, the earlier decision to install old transformers proved to be imprudent and resulted in avoidable expenditure of Rs.44.62 lakh on overhaul and transportation.

It was further noticed that work at Kundara substation completed (March 2003) to the extent of 80 *per cent* by investing Rs.10.15 crore also could not be commissioned (January 2006) due to delay in completion of associated Kundara line arising from award of work without conducting detailed survey and soil test.

In the case of Edappon line, the Board retendered (January 2006) and awarded the work for Rs 17.83 crore. The progress of line work was only 5 *per cent* (January 2007) whereas, the corresponding Edappon substation was

---

\* Worked out at the mean of the interest rates on REC loans availed during 2002-07.

95 per cent complete in March 2006 itself. Due to delay in completion of line work the investment of Rs.8.70 crore had been idling since March 2006.

As per administrative sanctions issued (August 1998-May 2000) by the Board, the capacity of Edappon substation was 200 MVA (2x100 MVA). Transformers purchased (466 MVA) for Kundara substation (440 MVA) at a cost of Rs.4.36 crore, however, was erected (March 2006) at Edappon substation without obtaining Board sanction. This resulted in wasteful investment of Rs.2.49 crore in the additional capacity of 266 MVA created and resultant interest loss of Rs.1.60 crore\* for the period from October 2000 to March 2007 at the rate of 10 per cent per annum.

**Delay/non-completion of two substations resulted in loss of envisaged benefits of Rs.403.82 crore.**

The delay/non-completion of the above two substations resulted in loss of envisaged benefits through reduction in line losses amounting to Rs.403.82 crore as per project report.

#### ***Non-synchronisation of work***

**3.22** The Board decided (May 2000) to upgrade the Shoranur 110 KV substation to 220 KV including 4.26 km double circuit associated LILO line by installing two transformers at an aggregate estimated cost of Rs.13.66 crore. The targeted date of completion was March 2003. The work of substation and the LILO line started during August 2000. After completion of 40 per cent work and investment of Rs.4.36 crore, work had to be stopped for six months (November 2002-May 2003) on account of non-availability of substation equipments, yard structures and conductors since the Board did not synchronise the procurement of materials with the execution of substation and line works. The substation and line works were completed (September 2003) and the substation was partially commissioned (September 2003) with one transformer and single circuit LILO line. Delay in completion of work resulted in blocking of Rs.4.36 crore for a period of six months (November 2002 to May 2003) and unproductive interest of Rs.21.80 lakh at the rate of ten per cent per annum. The envisaged benefit to consumers by way of better quality of power supply was also delayed accordingly.

The Management stated (August 2007) that there was no deliberate delay in any of the projects as the delays were caused mainly due to Right of Way (ROW) problem, court cases, objection from public and delay in acquisition of land. Audit however noticed that substantial portion of the delays arising from ROW problems and acquisition of lands was avoidable through better follow up action. Splitting of substation and line works into too many small contracts also contributed to the delay in completion of work.

#### ***Delay in providing statutory clearances***

**3.23** Based on the request (August 1993) of Travancore Devaswam Board (TDB) the Board decided (October 1994) to construct a 66 KV substation (estimated cost Rs.3.59 crore) at Thriveni and associated lines (12.30 Km)

---

\* Worked out at the mean of the interest rates on REC loans availed during 2002-07

from Pamba to Thriveni to ensure uninterrupted power supply with better voltage in Sabarimala Sannidhanam. The TDB agreed (August 1993) to bear 25 per cent (Rs 87.25 lakh) of the estimated cost and remitted (August 1993) Rs.35 lakh.

The work of construction of the associated lines awarded (August 1995) at a contract price of Rs 3.28 crore and commenced in August 1995, was targeted for completion in June 1996. The line work was completed (October 2002) after a delay of more than six years. The delay was attributable to obtaining clearance from Ministry of Environment (MOE) by more than three years (June 1996-October 1999), supply of towers and payment to contractor by the Board.

**Inept handling of case resulted in delay in completion of Substation rendering the line constructed at a cost of Rs. 3.28 crore idle for nine years.**

The construction of substation commenced in July 1996 and was targeted for completion in December 1996. The contractor stopped (October 1997) the work and demanded (August 1999) revision of rates citing delay on the part of the Board in effecting payment of bills and failure in making available materials in time. Thereupon, termination notice was issued (August 1999) by the Board, the contractor approached (October 1999) the Hon'ble High Court of Kerala and further action to defend the case was initiated by the Board only in March 2003 involving a delay of three years and resultant idle investment of Rs.3.28 crore in line works and interest loss of Rs.98 lakh on the investment at 10 per cent per annum.

The work of substation was completed through alternate arrangement and was commissioned (November 2005) after a lapse of more than nine years (October 1996–November 2005). Delay in commissioning of substation resulted in non- achievement of the envisaged benefits through reduction in line loss involving revenue of Rs.4.92 crore\*. The Board also could not ensure the interest of Sabarimala pilgrims by providing uninterrupted supply of better quality power and failed to claim Rs. 52.25 lakh towards 25 per cent cost from TDB.

The Management stated (August 2007) that in view of the long delay in execution of work the Board could not claim the balance amount due from TDB.

### ***Defective site plan and design***

**3.24** The Board decided (December 1994) to construct a 66 KV substation on its own land at Nedumkandam and associated LILO lines ( 11 Km) from Nirmala city to Nedumkandam substation at an aggregate estimated cost of Rs 6.42 crore. The site for substation under the control of Civil wing was identified (August 1999) and handed over (May 2000) to Transmission wing after a lapse of nine months. The approval of design and lay out of substation was delayed by 22 months (March 1996 to January 1998) and the site plan and

---

\* Worked out at 15 per cent per annum on investment expected by way of additional revenue due to reduction in line losses as envisaged by REC while sanctioning the loan.

design of retaining wall by nine months (April 2001-January 2002). The estimated cost was revised (July 2001) to Rs.7.22 crore. The work relating to LILO lines and substation which were scheduled for completion in July 2001 and March 2002 commenced only in January 2001 and March 2002 respectively. The construction of yard structure required for the substation was slated for completion in January 2004 but was completed only to the extent of 70 per cent by the contractor up to April 2005. Since the drawings of another substation (Punnapra) was unauthorisedly used (March 2002) by the Assistant Executive Engineer of the Board, the above foundation yard structure had to be demolished (July 2004) involving an avoidable delay of 28 months. Thereafter, the work was carried out (November 2004) departmentally and the substation was commissioned (December 2006) after 57 months (March 2002-December 2006) of the scheduled date.

**Delay in completion of substation due to delay in handing over site, approval at various stages and settlement of tree cutting compensation resulted in loss of anticipated benefit of Rs.4.57 crore.**

In the meantime the construction of (11 Km) 66 KV LILO line (feeder) to the Nedumkandam substation (estimated cost Rs.3.08 crore) commenced in January 2001 and was scheduled for completion in July 2001. The work was delayed by 24 months due to non-payment of tree cutting compensation (January 2003- May 2004) and for want of tower parts and line stringing materials (November 2004-July 2005). The substation with line was commissioned (December 2006) after an overall delay of 57 months (March 2002-December 2006) leading to loss of envisaged benefit by way of reduction in line loss and revenue amounting to Rs 4.57 crore\*. Investment of Rs.1.30 crore in the substation remained idle for 29 months (July 2004-December 2006) resulting in unproductive interest of Rs 31 lakh♦.

### ***Deviation from approved proposals***

**3.25** The Board decided (October 1998) to departmentally construct a 33 KV substation at Pathanapuram by installing two transformers of 5 MVA each along with 12 km 33 KV single circuit line from Punalur to Pathanapuram at an estimated cost Rs.3.09 crore. Two transformers intended for the substations were purchased (September 2000) at a cost of Rs 80 lakh. The 33 KV substation yard structures were transported (September 2000) to the site, earthmat was laid (May 2001), column foundation and transformer plinth constructed (August 2001). When construction of control room was progressing (November 2001) the Minister for Electricity and Minister for Transport, Government of Kerala convened a meeting of Board officials and decided to convert the 33 KV substation to 66 KV as a temporary measure with the intention of upgrading it to 110 KV in future. The transformers available at a decommissioned substation at Punalur were used in the 66 KV substation. The substation was commissioned (December 2003) with a reduced capacity of 4 MVA instead of 10 MVA.

---

\* Worked out at 15 per cent per annum on investment expected by way of additional revenue due to reduction in line losses as envisaged by REC while sanctioning the loan.

♦ Worked out at 10 per cent, the mean of the interest rates on REC loans availed during 2002-07

**Change of voltage rate of substation from 33 KV to 66 KV resulted in wasteful investment of Rs. 34.24 lakh and loss of interest of Rs. 26 lakh on blockage of funds.**

It was observed that the decision (November 2001) to convert the 33 KV to 66 KV substation without technical assessment resulted in increase in transmission loss by 0.03 *per cent* in 66 KV as compared to 33 KV as per technical data prepared afterwards (June 2002); the expenditure of Rs. 34.24 lakh on the construction of yard structures and masonry works for the 33 KV substation was rendered wasteful; and the Board also suffered interest loss of Rs. 26 lakh on the funds blocked in the transformers which remained idle for more than three years (September 2000–December 2003) till these were diverted (December 2003) for use in another substation.

### ***Failure in timely selection of land***

**3.26** The Board decided (March 1999) to construct a 33 KV substation at Kallettumkara and associated Single Circuit Line (11.5 Km) from Chalakkudy to Kallettumkara at an estimated cost of Rs.2.34 crore in the land offered (December 1999) by a private party for Rs.16.26 lakh. The scheduled date of completion of work was September 2003. For constructing substation, land (one acre) offered by Kerala Feeds Limited free of cost was not found (December 1999) suitable as it required construction of additional two Km of 33 KV line, three numbers of 11 KV outlets, etc., at a cost of Rs. 19.78 lakh. The matter regarding finalisation of the site for the substation remained pending till October 2002 when it was decided to go for the free land offered by Kerala Feeds Limited on the ground that the land offered by the private party required earth filling at a cost of Rs.30 Lakh. The Board departmentally commenced the work in May 2003. After commencing the work there was also delay in providing materials for substation and line by 17 months (April 2004-September 2005). The substation and associated line was commissioned in November 2005. The project was delayed by 26 months (September 2003-November 2005) due to delay in deciding the site of substation and providing materials. This had resulted in loss of envisaged benefits of Rs.76 lakh\* by way reduction in transmission and distribution loss for 26 months.

### ***Defective design***

**3.27** The construction of 4.5 KM 110 KV DC line from Kumbalangi to 110 KV substation Chellanam was entrusted (November 2000) with Penta Constructions at a contract price of Rs.39.91 lakh for completion by July 2001. The design and method of construction was changed (December 2000) attributing weak sub soil conditions. No soil test was conducted before awarding the work even though it was a pre-requisite for preparation of estimate. The foundation design adopted was also based on type of design used in the nearby area for similar line which was not suitable for the work. Due to this, the estimate had to be revised to Rs.99.51 lakh involving increase of 149.3 *per cent* for which approval was not taken. The contractor was then directed (June 2001) to stop the work for want of approval for the revised estimate which was granted (May 2004) after a lapse of three years.

---

\* Worked out at 15 *per cent* per annum on investment expected by way of additional revenue due to reduction in line losses as envisaged by REC while sanctioning the loan.

The work was entrusted (June 2005) to the same contractor with a price escalation of rupees eight lakh raising the estimated cost to Rs.1.08 crore involving an additional cost of Rs.68.09 lakh and was completed in December 2006. The substation was commissioned only in December 2006.

**Investment of Rs.80.67 lakh in transmission lines remained idle for 5 years and 6 months due to non-completion of sub-station.**

It was noticed that the construction of line was delayed by five years and six months (July 2001-December 2006) due to defective estimate prepared without conducting soil test and delay in giving approval of revised estimate. The line work was 80 *per cent* complete (June 2001) after incurring an expenditure of Rs.80.67 lakh. Delay in completion of the balance work of line resulted in investment of Rs.80.67 lakh in line works remaining without use for 66 months from June 2001 to December 2006. Unproductive interest on blocked funds for the period worked out to Rs.44.37 lakh<sup>♦</sup>.

### ***Incomplete substations and lines***

**3.28** As of March 2007, 76 departmentally executed works of construction of substations and lines involving capacity addition of 2129 MVA and 953.56 CKM line (new substations, upgradation and capacity enhancement) excluding Gas Insulated Switchyard (GIS) substations and turnkey works remained incomplete. In these cases the targeted dates of completion were already over by periods ranging from 12 to 66 months as indicated below:

<b>Substation</b>	<b>No</b>	<b>Capacity in MVA</b>	<b>Length of line CKM</b>	<b>Delay in months</b>
220 KV	5	1025	121.41	36 - 66
110 KV	21	579	262.68	12 - 60
66 KV	3	75	11.00	66
33 KV	47	450	558.47	36 - 60
<b>Total</b>	<b>76</b>	<b>2129</b>	<b>953.56</b>	

Of the 76 cases of delay, in 25 cases the work was not started (March 2007) due to delay in purchase of land required for the substations; in six cases the work was just initiated and in the remaining 45 cases the physical progress ranged from 10 to 99 *per cent*. The Board has not analysed the reasons for abnormal delay and slow progress in the completion of these projects indicating lack of monitoring by the Board as already discussed in paragraph 3.12 *supra*.

**Non-completion of 73 Substations in time as targeted resulted in loss of anticipated benefits amounting to Rs. 168.21 crore.**

As of March 2007 the Board had incurred expenditure of Rs.292.02 crore on these incomplete works. Loss of envisaged benefit by way of reduction in line losses arising due to delay in completion of 73 substations upto March 2007

<sup>♦</sup> Worked out at 10 *per cent* per annum, the mean of the interest rates on REC loans availed during 2002-07

worked out to Rs.168.21 crore\*. A few cases of delay in completion of work are discussed below:

**Decision to delay the Substation project by 54 months for a saving of Rs. 30.58 lakh entailed loss of revenue of Rs. 16.42 crore.**

**3.29** The Board decided (June 2000) to construct a 110 KV substation at Thrikkodithanam (2x10 MVA) for an estimated cost of Rs 7.14 crore including cost of land Rs. 75 lakh. The project was scheduled for completion in March 2004. Land for the project was identified (May 2001) at a cost of Rs.70 lakh but not purchased on the ground of high cost. Another plot of land was acquired (November 2005) at a price of Rs.39.42 lakh. The substation work remained to be completed (March 2007). Delay of over 54 months (May 2001- November 2005) in acquiring a new site involving savings in price amounting to Rs.30.58 lakh correspondingly delayed the commissioning of the substation. The imprudent decision of the Board has resulted in loss of envisaged benefit of Rs.16.42 crore by way of reduction in line losses and additional revenue as per project report during May 2001 to November 2005.

***Under estimation of line work and change of design***

**Delay in completion of line due to revision of design work and estimate resulted in blocking up of funds amounting to Rs. 6.06 crore in substations for 21 months**

**3.30** The Board decided (April 1999) to upgrade the 66 KV substation Mavelikkara to 110 KV substation and to construct 4.66 Kms of associated double circuit line (Estimated cost Rs.11.58 crore) departmentally. The work of substation commenced in December 2000 and was targeted for commissioning in March 2004. Subsequently (December 2002) the financing of the work was changed over from REC to KPFC loan and estimate revised to Rs.12.55 crore. The substation was 93 *per cent* complete (June 2005) with an investment of Rs.6.06 crore and had not been commissioned (March 2007).

The reasons for non-commissioning were revision of earthmat design for want of materials and initial underestimation of line work. Due to this there was blocking up of Rs.6.06 crore on the substation work for a period of 21 months (June 2005- March 2007) with eventual loss of benefit by way of reduction in line loss and revenue amounting to Rs.5.65 crore<sup>#</sup> (March 2004-March 2007). Unproductive interest on blocked up funds amounted to Rs.1.06 crore<sup>♦</sup>.

***Delay in completion of gas insulated switch yard substations:***

**3.31** Non-completion of master plan scheme, implemented with the World Bank assistance aimed at improving the power system in the three cities of Thiruvananthapuram, Kochi, and Kozhikode targeted for completion in 1991-92 and consequent blockage of funds amounting to Rs.52.62 crore and interest payment of Rs.49.35 crore thereon in respect of five GIS substations at Thiruvananthapuram (two) Kochi (two) and Kozhikode (one) were reviewed and included in Report of the Comptroller and Auditor General of India for the year ended 31 March 2002 (Commercial) Government of Kerala.

\* Worked out at 15 *per cent* per annum on investment expected by way of additional revenue due to reduction in line losses as envisaged by REC while sanctioning the loan.

<sup>#</sup> Worked out at 15 *per cent* per annum on investment expected by way of additional revenue due to reduction in line losses as envisaged by REC while sanctioning the loan.

<sup>♦</sup> Worked out at 10 *per cent* per annum, the mean of the interest rates on REC loans availed during 2002-07.

The substation at Kozhikode targeted for completion in 1993 was partially (March 2004)/fully commissioned (January 2006) and the two substations at Thiruvananthapuram targeted for completion in 1992 were commissioned in May/ June 2005. The two substations at Kochi originally targeted for commissioning in 1993 were not commissioned so far (March 2007). The reasons for delay in commissioning as well as non-commissioning of the substations by 11 to 14 years are discussed below:

- Work of laying underground cable in two spans 4.35 km and 6.75 km in respect of two substations at Thiruvananthapuram was delayed by four years (January 2001–June 2005) due to delay in obtaining clearance/ approval from Public Works Department, Kerala State Road Transport Corporation and National High Ways Authority. The abnormal delay could have been avoided by constant follow up by the Board at highest level.
- Work of substation building at Fort Kochi was carried out by five contractors due to change of contractors for various reasons. Change of design on four occasions resulted in escalation claims, legal suites, termination of contracts and delay of more than nine years (September 1995- November 2004) in completion.
- Change of design of pile foundation, consequent escalation claim and termination of contract in respect of Marine Drive substation at Kochi, resulted in a delay of more than five years (November 1997-January 2004).
- Work of under ground cable laying in four spans of 3.85 km, 4.2 km and 4.3 km in respect of the two substations at Kochi was delayed by six years (January 2001-December 2006) due to delay in obtaining clearance from Public Works, Irrigation and Police Departments, Municipal Corporation of Kochi and Bharat Sanchar Nigam Limited.
- Work of laying underground cable in two spans 4.37 km each in Kozhikode substation was delayed by 15 months (December 2000-March 2002) due to delay in obtaining clearance from Public works and Irrigation Departments.
- Eight separate feeders of 11 KV cables for a total length of 19 km from GIS substation Puthiyara (Kozhikode) completed (July 1998 ) at a cost of Rs.4.5 crore, remained idle for more than five years (July 1998-March 2004) due to non completion of the substation. Unproductive interest payment on blockage of funds amounted to Rs.4.08 crore at the rate of 16 *per cent* \* per annum.
- Two feeder lines (3.9 km) from Fort Kochi GIS Substation completed in December 1999 incurring Rs. 94 lakh remained idle for seven years and three months (December 1999–March 2007) due to

**Eight 11 KV feeders remained idle for more than five years due to non-completion of substation.**

**Two feeder lines remained idle for seven years due to non-completion of substation.**

---

\* Borrowing interest rate for the project

non-completion of the substation. Interest paid on blockage of funds amounted to Rs.92 lakh at 13.5\* *per cent* per annum.

**Due to storage of 16 bushings purchased in 1992 it became unserviceable leading to avoidable expenditure of Rs.7.99 crore.**

- Delay in commissioning of these five substations resulted in prolonged storage of 16 numbers of imported bushings purchased in 1992 which became unserviceable and the validity period of composite contract for supply and erection of substation equipment with VA TECH Elin Holic High Voltage BV, Netherlands expired (December 2002). On account of this, the Board had to import (October 2006) the bushings afresh by renewing the contract for erection of equipments involving avoidable expenditure of Rs.7.99 crore.
- Against the estimated cost of Rs.40 crore, total expenditure incurred on these five substations stood at Rs.73.51crore up to 2007.

### ***Loss of potential generation***

**3.32** The power generated from four<sup>#</sup> Chinese aided (micro hydel) Projects were proposed (August-December 2002) to be evacuated to Agasthyamoozhy 110/33/11KV substation through Chembukadavu-Thiruvambady 33KV single circuit line, Thiruvambady Agasthmoozhy double circuit line and Urumi-Thiruvambady single circuit line of aggregate length of 25.6 km. The line works were targeted for completion in May 2003.

**Failure to complete power evacuation lines from three micro hydel projects to the Substation resulted in revenue loss of Rs. 1.88 crore.**

Delay in commissioning of the 33KV lines due to ROW disputes forced (May 2004) the Board to evacuate power generated from these projects in 2004 monsoon season (May-December 2004) through 11KV lines to Thamarassery 66KV substation, involving an additional expenditure of Rs.0.92 crore. This, however, had resulted in many technical problems and tripping of lines. As a result, generation from Chembukadavu I, II and Urumi II had to be stopped during June-September 2004. Due to this there was loss of generation for 41 days at Chembukadavu I & II and 104 days at Urumi II. Thus, due to failure to undertake line works in time the Board suffered revenue loss of Rs.1.88 crore on 6.06 MU of power not generated at the average sales realisation of Rs.3.11 per unit for 2004-05.

Management stated (May 2006) that the work on 33KV lines was delayed due to obstruction from public demanding rerouting of line and delay in settling tree cutting compensation. The reply is not tenable as the delays occurred in deciding on alternate substation at Thiruvambady (February 2000-December 2002), surveying alternate route (September 2002-April 2003) and reverting to original route considering the increase in expenditure.

### ***Non-compliance with mutual obligations***

---

<sup>#</sup> Chembukadavu stage-I, (2.7MW), Stage-II (3.75MW), Urumi stage I (3.75MW) and stage II (2.40MW)

**Delay in completion of installation of shunt capacitor resulted in a revenue loss of Rs. 15.07 crore.**

**3.33** The Board decided (September 2001) to install 350 MVAR<sup>♦</sup> shunt capacitor in fifteen 220/110/66KV substations in the State on turnkey basis. The proposal envisaged reduction of line loss of 19.859 MW equivalent to 28.954 MU per annum, with a capital investment of Rs.8.32 crore. The turnkey contract was awarded (December 2001) to Shreem Capacitors, Kolhapur at a price of Rs.8.48 crore. The work was scheduled for completion in May 2003 but completed during March 2004 to December 2005. The delay was due to various reasons such as delay in execution of agreement with the contractor, approval of drawings and handing over site to the contractor. The delay in completion ranged between 300 to 940 days resulting in loss of savings of 51.1996 MU equivalent to Rs.15.07 crore.

**Failure of capacitor banks due to overload, leakage and problems with relay resulted in a revenue loss of Rs. 3. 63 crore.**

On a further review of the performance of the capacitors installed in fifteen substations it was observed that in three 110KV substations at Chalakudy, Sasthancottah and Kunnamangalam, the capacitor banks installed were not working or tripping off or switched off due to over load, leakage, problem with the relay, etc., with the result the capacitor banks were out of service for 730 days, 576 days and 536 days respectively during April 2004 to March 2007. Loss of envisaged savings due to failure of capacitor banks was 11.6838 MU equivalent to revenue of Rs. 3.63 crore as per project report.

#### ***Non-adherence to transmission and distribution loss norms***

**3.34** Based on the MoU (August 2001) between the State Government and GOI the Board had initiated various system improvement measures such as addition of transmission lines, substations, distribution transformers, capacitors, anti-power theft activities and metering of transmission and distribution transformers with a view to reduce the Transmission and Distribution (T&D) losses to 17 per cent by December 2004.

**Failure to reduce T & D losses to the targeted level of 17 per cent resulted in a revenue loss of Rs. 1899.43 crore.**

Due to various measures taken by the Board, the T&D loss was reduced from 30.4 per cent in 2002-03 to 23.4 per cent in 2006-07. When compared to the targeted loss of 17 per cent the shortfall in reduction of loss of 6295.25 MU (including transmission losses 685.78 MU) of power involving revenue loss of Rs.1899.43 crore during 2002-07, mainly due to delay in implementation of transmission system improvement works as targeted.

The Management stated (August 2007) that the main reason for maximum T & D loss in the State was high ratio (1:6) in respect of high tension and low tension lines as compared to ideal ratio of 1:1 arising from nature of topography in hilly areas and dispersed pattern of housing. The Board also agreed that intensive measures would also be taken to reduce T & D loss in future.

#### ***Short accountal of power purchases***

**Short accountal of quantity of power purchased resulted in incorrect reporting of the performance.**

**3.35** On a comparison of the quantity of power purchased from Central power stations reckoned for working out T&D loss with energy billed during 2002-06, it was observed that the quantity reckoned as purchases during

<sup>♦</sup> MVAR = Mega Volt Ampere Reactive

2003-04 and 2005-06 were lesser than the quantity billed and paid for (**Annexure 20**), resulting in short account of T&D loss by 209.23 MU (1.54 *per cent*) in 2005-06 involving aggregate amount of Rs.64.65 crore. Due to this the achievement against reduction in transmission and distribution loss as reported in the Annual Statement of Accounts does not convey the correct position. The Board had not investigated the above short-account of quantity of power purchased.

The above matters were reported to the Government (May 2007); the reply had not been received (September 2007).

### **Acknowledgement**

Audit acknowledges the co-operation and assistance extended by the staff and the Management of the Board at various stages of conducting the performance audit.

### **Conclusion**

**Performance of the Board with regard to transmission system improvement schemes suffered due to avoidable delays in taking timely decisions, poor contract management, non-synchronisation of various constituent parts of the schemes, Board's inability to surmount delays in acquisition of land required for substations and transmission lines. Board's failure to complete the projects undertaken for augmenting the capacity and containing transmission losses resulted in foregone savings. Unprofessional financial management resulted in drawal of funds before requirement and consequent loss due to interest payments. The Board failed to evolve a system to avoid procedural delays in giving and obtaining various approvals from outside agencies for construction of substations and lines. Lack of adequate planning, monitoring, coordination and due professional care resulted in abnormal delay in commissioning and completion of schemes resulting in withdrawal of loans by financing agency, foreclosure of loan, idling of equipments, loss of anticipated benefits to the Board and deprivation of uninterrupted better quality power supply to targeted consumers.**

### **Recommendation**

- **The Board should streamline procedure for identifying/purchase of land for substations and decide the line route before arranging finance and awarding the work of substation.**
- **The Board should have an effective monitoring mechanism at higher level to ensure better coordination among the purchase, finance and executing departments and avoid idling of equipments and stoppage of work for want of equipments.**
- **The Board should follow commercial practices in evaluation and award of contracts so that sound and experienced contractors are only selected.**

- **Ensure proper synchronisation in the execution of sub stations and line works with a view to avoiding idling of completed works and reducing loss of envisaged benefits.**