Chapter III

Performance Reviews Relating to Statutory corporations

Himachal Pradesh State Electricity Board

3.1 Procurement, Performance and Maintenance of Transformers

Highlights

The Board incurred avoidable extra expenditure of Rs. 3.51 crore due to non-comparison of rates received with the rates already available, non-finalisation of requirement in time, non-placement of repeat supply orders and rejection of lowest offer.

(Paragraphs 3.1.11 to 3.1.16)

Non-finalisation of design of the sub-station had resulted in an avoidable extra expenditure of Rs. 3.67 crore.

(Paragraph 3.1.18)

The transformation losses of 40.02 MUs were in excess of the permissible limit resulting in loss to the Board.

(Paragraphs 3.1.20 and 3.1.21)

The failure rate of DTRs ranged between 4.33 and 5.69 *per cent* during 2003-08 which was much higher than the bench mark of 1.5 *per cent* fixed by the PGCIL.

(Paragraph 3.1.26)

The Board created transformation capacity at a cost of Rs. 26.73 crore which could not be put to optimum use.

(Paragraph 3.1.27)

Repair cost of damaged transformers was higher than the cost of new transformers which resulted in excess expenditure of Rs. 4.29 crore.

(Paragraph 3.1.35)

The Board did not explore the possibility of up-rating the power transformers which had been dismantled and lying unused. By up-rating, the Board could have saved Rs. 5.56 crore.

(Paragraph 3.1.37)

Introduction

3.1.1 A transformer is a static equipment used for stepping up or stepping down of voltage in generation, transmission and distribution of electricity. Power is generated at a low voltage of 11 KV to 15.4 KV. It is then stepped up to 132 KV/220 KV/400 KV through power transformers (PTRs) for bulk transmission to the load centers. At the receiving sub-station, voltage is brought down to 33 KV/66 KV/132 KV/220 KV by using step down power transformers and further stepped down through PTRs and Distribution Transformers (DTRs) to 11 KV to 0.4 KV for supply to the various consumers. The transformers used at generating station are called PTRs while transformers used in distribution system are called Distribution Transformers. Efficiency of transmission and distribution system depends on the transformation capacity by using transformers of adequate capacities and their proper maintenance. As on 31 March 2008, the Board had 118 PTRs, 19,907 DTRs and three Auto transformers.

The Organisational set up of the Board relating to procurement, performance, maintenance and repair of transformers comprises of a Chairman, five members and six Chief Engineers.

The Procurement, Performance and Maintenance of transformers in the Board was last reviewed in the Report of the Comptroller and Auditor General of India for the year 1999-2000. The review was discussed by the Committee on Public Undertakings (COPU) in May 2006 and recommendations of the COPU were received in August 2006. There were no specific recommendations of COPU relevant to the points included in the present performance review. Action Taken Notes of the Board on these recommendations were still awaited (September 2008).

Scope of Audit

3.1.2 The present performance review for the period 2003-08 conducted during October 2007 to April 2008 through a test check of records of the Head Office of the Board, all the six[*] controlling offices and 24[**] out of the 96 units of the Board selected on the basis of expenditure incurred (35.55 *per cent*) by the units against the total expenditure of Rs. 1,219.61 crore during 2003-08.

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[*] *Chief Engineer (MM), Director (Design) sub-station, Chief Engineer (Operation) Central Zone, Chief Engineer (North Zone), Chief Engineer (South) and Chief Engineer (Transmission).*

[**] *SE (M& T) Bilapsur, Executive Engineer (M&T) Solan, Sundernagar and Kangra, SE (Transmission), Shimla and Hamirpur, Executive Engineer (Transmission) Shimla, Hamirpur and 220 KV sub-station division, Jassore, Resident Engineer, Gaj and Banner, SE (Generation) Nahan, SE (Operation) Nahan, Executive Engineer (Operation) Nahan, Rajgarh, Poanta, Bilaspur, Sundernagar, Mandi, Nadaun, Dharamshala, Nurpur, Barsar, Una and Parwanoo.*

Audit objectives

3.1.3 Performance review on procurement, performance, maintenance and repair of transformers in the Board was conducted to assess whether:

- Procurement of transformers was made conforming to growth plan in accordance with the prescribed procedure and in a transparent, effective, efficient and economic manner;
- There existed an effective system for monitoring the performance of procured transformers with reference to functional manual and its standard life;
- The transformers were maintained properly and as per the maintenance schedule and devised policy of the Board for maintenance;
- The damaged transformers were got repaired economically and efficiently; and
- The internal control mechanism was efficient and effective.

Audit criteria

3.1.4 The criteria adopted for assessing the achievement of audit objectives was to check the extent of adherence to:

- Prescribed system of planning and assessment of requirement of transformers;
- Prescribed system of purchase, including terms and conditions of tendering and purchase orders, monitoring of performance and repair of transformers;
- Performance guidelines of Maintenance and Testing (M&T) workshops; and
- Instructions of the Board, Central Board of Irrigation and Power (CBIP), Central Electricity Authority (CEA) and Himachal Pradesh Electricity Regulatory Commission (HPERC).

Audit methodology

3.1.5 The following mix of audit methodologies was adopted for achieving the audit objectives:

- Analysis of assessment of requirement of transformers with reference to the growth plan and arrangement of funds;
- Scrutiny of tenders and agreements executed with the suppliers for procurement of transformers;
- Examination of agenda and minutes of the meetings of the Board and reports generated by the Board in regard to purchase, performance and repair of transformers;

- Verification of maintenance programmes, cause-wise reasons for failures and time taken to repair the failed transformers;
- Analysis of cost of repair in Board's workshops and outside agencies; and
- Issue of audit enquiries and interaction with the Management.

Audit findings

3.1.6 Audit findings, arising from the performance audit of procurement, performance, maintenance and repair of transformers in the Board were issued (July 2008) to the Government/Board and were discussed (19 September 2008) in the meeting of the Audit Review Committee for State Public Sector Enterprises (ARCPSE). The Chairman, Member (Finance), Member (Technical), Member (Operation) and Chief Auditor attended the meeting. The views expressed by the members have been taken into consideration while finalising the review. The points noticed during Performance review have been incorporated in the succeeding paragraphs.

Growth and adequacy of transformation and distribution system

3.1.7 Adequate grid power transformation capacity is required for evacuation of power from generating stations. Sub-transformation capacity is the middle chain for feeding DTRs to meet the requirement of the consumers. Each segment of transformation system *viz*. power transformation, sub-power transformation, distribution transformation and connected load should match with each other in order to ensure that neither any segment remains idle nor gets overloaded. Imbalance in transformation capacity with that of distribution capacity during the preceding five years ended 31 March 2008 is detailed below:

Sr.No.	Particulars	2003-04	2004-05	2005-06	2006-07	2007-08 (Provisional)
1	Sub-transformation capacity					
	MW	592.65	623.57	631.31	702.99	764.35
2	Distribution transformation capacity (11/0.4 KVA/22/.4 KVA)					
	MW	1,073.80	1,153.40	1,237.97	1,302.39	1,375.12
3	Excess distribution capacity (beyond 30 *per cent* of transformation capacity)	303.56	342.76	417.27	388.50	381.47
4	Percentage of distribution transformation capacity in excess of sub- transformation capacity of 30 *per cent*	51.19	54.97	66.10	55.26	49.91
5	Total connected load					
	MW	2,948.33	3,249.06	3,531.30	3,832.90	4,131.39
6	Connected load in excess of distribution transformation capacity (MW) (5-2)	1,874.53	2,095.66	2,293.33	2,530.51	2,756.27
7	Maximum permissible load allowed at 80 *per cent* of distribution transformation capacity (MW)	859.04	922.72	990.38	1,041.91	1,100.10
8	Percentage of excess connected load	218.21	227.12	231.56	242.87	250.54

It could be seen from the table that:

- The permissible capacity of distribution transformation was in excess of the sub-power transformation capacity in each year and ranged from 303.56 MW to 417.27 MW during the period 2003-08. Thus, against permissible 30 *per cent* increase of distribution capacity over and above the transformation capacity, the excess percentage during the period ranged between 49.91 and 66.10.
- The situation of imbalance was more visible on the distribution side where it was linked to connected load. The connected load was in excess of distribution capacity and it ranged from 218.21 *per cent* to 250.54 *per cent*. This resulted in overloading of distribution transformers leading to failure of large number of transformers as discussed in para 3.1.26 *infra*.

The Board stated (October 2008) that the demand factor in respect of consumers was on an average below 20 *per cent*. Thus, the net load growth was commensurate with the connected load growth. However, the Board had no safety factor in the event of drawal of full load by the consumers and the fact remained that the failure rate of DTRs was higher than the norm.

Identification of requirement of transformers

3.1.8 Assessment of requirement is a prerequisite before purchase and is essential to safeguard the financial interest of an organisation. On the basis of requirements indicated by the field offices, the Board finalises the overall requirement of PTRs/DTRs duly considering the inventory position and available budget allocation.

Audit noticed that the requirements of the field offices were mostly on *ad hoc* basis and not on realistic basis, which resulted in variation in requirement and actual purchase. In view of this variation and to comply with the requirements of Himachal Pradesh Electricity Regulatory Commission (HPERC) for submission of a long-term load forecast for the succeeding ten years, the Board engaged (November 2001) Administrative Staff College of India (ASCI), Centre for Infrastructure Management and Regulatory Studies to conduct study on the distribution planning of the Board for examining the adequacy of the existing distribution network and make a proposal for meeting the demand up to year 2015. The requirements of transformers (both PTRs and DTRs) were identified in the report of the ASCI submitted in September 2006. The Board had not considered the report for assessing the requirements for 2006-07 and 2007-08.

Procurement of transformers

Procurement procedure

3.1.9 The Chief Engineer (MM♦) and Director (Design) sub-station finalise the overall requirement of DTRs/PTRs after taking into account the overall

♦ *Material Management.*

inventory position including field requirement and available budget provision. The requirement is finally approved by the SPC headed by the Member (Technical) and supply orders are placed by the Chief Engineer (MM) and Director (Design) sub-station.

Audit observed the following deficiencies:

- The field units did not send their requirement in time (one in six months) so that consolidated purchases could be made at more competitive rates.
- No system had been devised to compare the rates of transformers purchased departmentally with the rates paid to contractors in the case of turnkey contracts.
- There was no system of monitoring the submission of requirement by the field offices.
- The SPC had failed to ensure invoking of the quantity variation clause of the previous purchase orders while processing the tenders for placement of repeat supply orders for entitled additional quantity.
- No system existed to evaluate the reasons for rejection of valid offer.

3.1.10 The table below indicates a comparative study of quantity of DTRs approved for purchase by the Store Purchase Committee (SPC) and the quantity for which purchase orders were actually placed:

(Rupees in crore)

Year	PTRs			DTRs		
	Requirement (Nos.)	Purchased (Nos.)	Value	Requirement (Nos.)	Purchased (Nos.)	Value
2003-04	27	27	3.24	1,179	1,524	6.25
2004-05	20	20	4.56	1,752	2,113	10.58
2005-06	23	23	26.05	1,572	2,262	16.15
2006-07	22	22	9.61	606	531	8.66
2007-08	10	10	15.49	934	12	0.61
Total	**102**	**102**	**58.95**	**6,043**	**6,442**	**42.25**

It could be seen from the above table that during the last five years ended 31 March 2008, the Board purchased total 102 PTRs and 6,442 DTRs valued at Rs. 58.95 crore and Rs. 42.25 crore respectively. The procurement of DTRs was much higher than the requirement during 2003-06 while it was much less during 2006-08. The overall procurement was, however, higher which was due to improper assessment of requirement. Quantity of *ad hoc* requirement placed by the field offices was frequently changed and arbitrarily increased resulting in mismatch of transformation capacity at different transformation ends.

The Board attributed (October 2008) the mismatch between requirement and actual purchases to time taken for procurement process. This indicated the failure of the Board in planning for procurement of transformers.

Audit noticed the following deficiencies in the procurement of transformers:

Avoidable extra expenditure due to non-comparison of rates with the rates already available

3.1.11 The Ministry of Power (MOP), Government of India (GOI) approved (August 2002 to May 2003) APDRP schemes for all the 12 Circles of the Board. For execution of the schemes, 45 PTRs of 3.15 MVA and 1.6 MVA were required for the construction of 33/11 and 33/22 KV sub-stations. The Board purchased 26 PTRs for construction of sub-stations which were executed departmentally. The remaining sub-stations were got constructed through contractors on turnkey basis and the balance 19 transformers were supplied by the contractors. Audit noticed that the rates of 19 transformers for 33 KV sub-stations which were got installed on turnkey basis, were much higher than the rates at which the Board purchased transformers for other works. The Board had not compared the rates paid to the contractors with the rates paid by it. Consequently, in respect of 11 sub-stations, the extra cost paid to the contractors on account of cost of transformers worked out to Rs. 1.74 crore.

The Board stated (October 2008) that instead of negotiating rate of single item with the lowest bidder, complete package was negotiated. The reply is not convincing as in case of Akanwali sub-station, the Board had awarded turnkey work without power transformers in view of higher cost of the transformers offered by the contractor.

Avoidable expenditure due to non-finalisation of requirement in time

3.1.12 The Board placed (December 2003) supply order for the purchase of six PTRs at the rate of Rs. 9.70 lakh per transformer. The Board, however, did not consider the requirement of five such transformers in respect of other three units which failed to submit their requirement in time, which was submitted in March 2004 / October 2005. Subsequent purchases in July 2004 and July 2006 had resulted in higher rate of Rs. 11.35 lakh and Rs. 21.36 lakh per transformer, which resulted in incurring of an avoidable extra expenditure of Rs. 28.27 lakh.

The Board stated (October 2008) that requirement of transformers for Banjar, Kanduan and Dadahu sub-stations was received late from the field units. The reply is not in consonance with fact that the schemes for construction of these sub-stations were already approved in 2002 and 2003 after survey of load requirement.

3.1.13 The contracts for construction of Bagthan (Rajgarh Division) and Purewalla (Paonta Division) sub-stations were awarded (November 2005) on turnkey basis. While in the contract for Bagthan sub-station, the cost of PTRs was excluded as the same was procured by the Board itself at the rate of

Rs. 9.70 lakh, the same was included in the contract of Purewalla sub-station at an extra cost of Rs. 20.14 lakh. Neither the requirement was submitted by Electrical Division, Paonta nor the Board considered the fact while placing order for Bagthan. Thus, non-submission of requirement in time by the Electrical Division, Paonta resulted in avoidable extra expenditure of Rs. 20.14 lakh due to subsequent purchase of a transformer at higher rate.

The Board stated (October 2008) that requirement of Purewala sub-station could not be included due to provision of lower capacity transformer at the earlier stage. In turnkey packages, the firms negotiate the overall package cost instead of individual items rate. The reply is not acceptable as the Board could have collected a realistic data and assessed the requirements properly so as to finalise the turnkey contract without inclusion of PTRs as was done in case of Bagthan sub-station.

3.1.14 The augmentation of 33/11 KV sub-station, Haripur and 33/11 KV sub-station, Chobin was approved (October 2002) by the MOP, GOI under APDRP. The Operation Circle, Kangra furnished (March 2004) requirement of three transformers of 1.6 MVA for these sub-stations (Haripur: 2 and Chobin: 1). But Director (Design) sub-station did not consider the requirement while placing purchase orders in March 2004 for transformers of similar type at the rate of Rs. 6.16 lakh per transformer. The three transformers were later on procured during 2006-07 at the rate of Rs. 13.92 lakh each when augmentation of these sub-stations was decided to be taken up departmentally resulting in avoidable extra expenditure of Rs. 23.28 lakh. There were no reasons on record for not including requirement for these transformers in purchase orders placed in March 2004.

The Board stated (October 2008) that requirement of these four sub-stations was received late from the field units. The reply is not acceptable as the schemes were approved in May 2003 and provision for construction was made as per actual requirement of load.

Avoidable extra expenditure due to non-placement of repeat supply orders

3.1.15 The Board is entitled to place repeat supply orders for additional 25 *per cent* of the quantity originally ordered in the supply orders on the same terms and conditions. In four cases, the Board did not place repeat orders for the additional quantity in spite of having demand received from the consumer/field units within the validity period for placing the repeat supply orders and the material was purchased subsequently at higher rates from the same firms. This resulted in incurring of an avoidable extra expenditure of Rs. 70.64 lakh in four cases during 2004-08.

The Board stated (October 2008) that the Director (sub-station) could make purchase only after receipt of requirement as budget provision had to be made. The reply is contrary to the fact that the field unit had submitted the requirement in March 2006 to the Chief Engineer (Technical) which resulted in non-placement of repeat orders.

3.1.16 To provide power supply to Tanda Medical Collage at 430 volts from sub-station, Tanda, the Board awarded (June 2006) construction of three 11/0.430 KV 2000 KVA indoor dry type transformers to Chopra Electrical Works, Dharamshala at a cost of Rs. 1.60 crore. The rate of transformer (Rs. 51 lakh) was higher by Rs. 11.79 lakh and Rs. 24.22 lakh when compared to the rates collected from Bharat Heavy Electricals Limited (BHEL) and Crompton Greaves respectively for the transformers of the same specification with transformation losses of 1.6 *per cent*. The Electrical Division, Kangra had also asked for 1.6 *per cent* transformation losses which were higher than the prescribed limit of CEA of 0.5 *per cent*. The purchase of three transformers at the rate of Rs. 51 lakh each resulted in extra expenditure of Rs. 35.37 lakh when compared to the rate of BHEL besides an extra burden on the State Health Department on account of excess transformation losses to the extent of 11.04 MUs[♣] during the operative life of transformers.

The Board stated (October 2008) that the works including the cost of these transformers were awarded on turnkey basis based on receipt of bids from various firms, the lowest bid was finalised for procurement. The Board failed to notice the high cost quoted for transformers in the bids submitted by the contractors and analyse the same for obtaining reduction as was obtained in the case of Akanwali sub-station.

3.1.17 As per the amendment (November 2001 and June 2003) to the Indian Electricity Rules, 1956, only dry type indoor transformers were to be installed in residential and commercial buildings. The Board had not, however, prepared any time bound action plan to replace the existing 148 oil filled indoor DTRs with dry type transformers in a phased manner to comply with the amended Electricity Rules.

The Board stated (October 2008) that in future dry type indoor transformers would be preferably procured.

Loss of anticipated revenue and avoidable extra cost due to non-finalisation of design

Due to non-construction of sub-stations as per schedule, the Board was deprived of the benefit of Rs. 1.66 crore on account of reduction in energy losses and had to incur extra cost of Rs. 3.67 crore on their construction due to price escalation.

3.1.18 The installation of 2x5MVA transformer at 33/11 KV sub-station, Damtal in Dalhousie Circle was provided in the working programme of 2004-05. The work had, however, not been started so far (March 2008) as the design of the sub-station had not been finalised for which no reasons were on record. Audit noticed that due to delay in taking up the work, the cost of the sub-station had increased from Rs. 2.03 crore in 2004-05 to Rs. 5.70 crore in March 2008 due to price escalation. Had the Board constructed the sub-station as per schedule during 2004-05, the extra expenditure of Rs. 3.67 crore could have been avoided. Besides, the Board was deprived of the benefit of Rs. 1.66 crore[▽] on account of reduction in energy losses during 2005-08.

♣ *Losses guaranteed by supplier: 21 units per hour per transformer; permissible losses as per CEA: 9 units per hour per transformer, Difference: 12 units per hour loss in respect of 3 transformers=12x3=36 units per hour. Loss per annum for 35 years (life of transformer)=36x35x8,760 (hours in a year)=11.04 MUs.*

▽ *10 MVA* x *0.188* x *10* x *36÷12* x *Rs. 2.95=Rs. 1.66 crore.*

The Board admitted (October 2008) that delay was due to non-finalisation of design and assured to complete the work in the financial year 2008-09.

Performance of transformers

3.1.19 The MOP, GOI prescribed (March 1994) the life of PTRs at 35 years and DTRs at 25 years. The Board had, however, not formulated any policy for replacement of transformers which had outlived their useful life. The CEA recommended (May 1986) the permissible limit of transformation losses of one *per cent* for Extra High Voltage/High Voltage (EHV/HV) system.

The Board takes due notice of inherent losses as disclosed by the bidders while evaluating the bids for the purchase of transformers. The inherent losses include the 'load loss'♦ 'no load loss'♣ and 'auxiliary loss'♥. In case, actual transformation losses exceed the admissible losses, the Board is entitled to impose penalty on the supplier.

Excess transformation losses over and above the guaranteed transformation losses

3.1.20 The scrutiny of relevant records revealed that the actual transformation losses of eight transformers were abnormally higher as compared to the losses permissible as per the supply orders placed by the Board for the purchase of the same as detailed in **Annexure 17**.

Transformation losses of eight transformers were in excess of the permissible limit to the extent of 5.63 MUs.

It could be seen from the table that against the permissible transformation losses of 1.31 MUs, the actual transformation losses were 6.94 MUs resulting in excess transformation losses of 5.63 MUs. The penalty of Rs. 1.66 crore for excess transformation losses was though recoverable from different suppliers as per the terms and conditions of the supply orders, no action to recover the same was ever initiated by the Board. Non-imposition of penalty resulted in extension of undue favour to the suppliers and loss to the Board to that extent.

The Board stated (October 2008) that losses of these transformers were verified before the purchase and were found within the permissible limit. The reply is not in consonance with the factual position that the actual losses of these transformers were higher.

Excess transformation losses

Transformation losses in 20 sub-stations were in excess of the norms of CEA to the extent of 34.39 MUs.

3.1.21 The test check of records in 20 out of 74 sub-stations revealed that in comparison to the norms fixed by the CEA, there were excess transformation losses of 34.39 MUs as detailed in **Annexure 18.**

The reasons for excess transformation losses were neither investigated by the Board nor action taken to reduce the losses to the extent of norms of the CEA.

♦ *Additional loss occurs as a result of load current flowing through the transformer based on the resistance of the winding.*

♣ *Power required to energise the core of the transformers.*

♥ *Power required to run auxiliary cooling equipment such as fan, pump, etc. of the transformer.*

The Board stated (October 2008) that losses including other losses and actual losses had been verified at the time of purchases. The reply is in variance with the factual position as the losses as shown in the Annexure were calculated as per the readings of the meters installed at both ends of the transformers.

Overloading of transformers

3.1.22 The guidelines issued by the Power Finance Corporation (PFC) provide that no transformer should be loaded beyond 75 to 80 *per cent* of its capacity as overloading results not only in excessive transmission losses but also leads to pre-mature failure of transformers. A study conducted by Administrative Staff College of India (ASCI), Hyderabad during 2006-07 regarding load growth in the Board also suggested that a power transformer should be augmented when the demand of power through the transformer reaches 80 *per cent* of its capacity.

Out of 96 PTRs, 22 PTRs in operation on EHV system were overloaded to the extent of 30.61 to 151.98 *per cent* as compared to the required loading.

Audit scrutiny of records revealed that 22 out of 96 PTRs (out of total 118 transformers, 22 PTRs are auto transformers) installed / in operation on Extra High Voltage system were overloaded to the extent of 30.61 to 151.98 *per cent* above their capacity during 2007-08 as compared to the required loading up to 80 *per cent* of the capacity as detailed in **Annexure 19.**

These transformers were overloaded due to increase in demand for electricity in the areas concerned. Instead of overloading, the Board should have augmented the capacity of these transformers.

The Board stated (October 2008) that the transformers at Baddi (II & III), Bajoura and Sansarpur Terrace had been augmented during 2007-08. The reply is contrary to the fact that the installed capacity had remained the same as per return of loading status received in October 2008. In respect of other sub-stations, the overloading had been calculated on 80 *per cent* of the capacity of the transformers.

Due to delay in addition of transformation capacity, the Board could not derive anticipated benefit of reduction in losses of 65.72 MUs.

Loss due to delay in addition of transformation capacity

3.1.23 Scrutiny of records relating to award and execution of works of construction of sub-stations including installation of transformers revealed that the works in the following cases were not completed within the prescribed period resulting in non-achievement of desired objectives in time. The details of sub-stations are tabulated below:

Sl. No.	Name of sub-station	Capacity	Date of award	Date of comple-tion	Date of commiss-ioning	Delay in months	Reasons for delay	Loss of energy in MUs
1	33 KV sub-station, Raja Ka Bag	2x6.3 MVA	March 2007	November 2007	Incomplete (8/08)	9	Not on record	17.77
2	33 KV sub-station, Bagthan and Purewalla	1x3.15 MVA	Novem-ber 2005	May 2006	January 2007 & September 2007	22	-do-	27.72
3	33 KV sub-station, Basal	2x3.15 MVA	June 2005	December 2005	April 2007 & March 2008	41	Delay in site develop-ment and receipt of ordered equipment by the contractor	20.23
	Total							**65.72**

Due to delay in completion of works, the Board could not derive anticipated benefit of saving 65.72 MUs of energy.

The Board stated (October 2008) that delay was due to factors like delay in handing over of land to the contractors and late receipt of equipments by the contractors. However, these factors could have been controlled through better planning.

3.1.24 A 2x3.15 MVA transformer at 33/11 KV sub-station, Kalapul commissioned (March 2007) at a cost of Rs. 3.32 crore to cater to the increasing demand of Dharamshala town and give relief to 33/11 KV sub-station, Sidhpur became overloaded within four months from its commissioning. It recorded (December 2007) a load of 6.43 MVA which was more than the capacity of the transformers. Consequently, the load had to be diverted to Sidhpur sub-station. Thus, the envisaged objective of catering demand of Dharmshala town and giving relief to sub-station, Sidhpur remained unachieved.

The Board stated (October 2008) that over loading of the sub-station was due to sharp increase in load requirement and it proposed to construct additional sub-station to give relief to this sub-station. The reply confirmed the Audit observation.

3.1.25 After commissioning (September 2006) the 2x3.15 KVA sub-station, Saulikhad at a cost of Rs. 2.16 crore, the Board had put a load of 6.33 MVA (2006-07), which was more than its capacity. During 2007-08, the load had increased to 6.47 MVA. It indicated that the Board had not assessed the requirement of load correctly.

The Board admitted (October 2008) over loading of sub-station and stated that the proposal for the augmentation of sub-station had been initiated. The reply confirmed the Audit observation.

Failure of transformers

3.1.26 The failure rate of DTRs has been fixed by PGCIL as 1.5 *per cent*. The total number of transformers, number of transformers failed and percentage of failure of DTRs during the last five years up to 2007-08 are tabulated below:

Sl. No	Particulars	Name of zone	2003-04	2004-05	2005-06	2006-07	2007-08
1	Number of transformers	North	6,827	5,841	6,285	6,787	7,380
		Central	3,415	4,840	5,441	5,969	6,501
		South	4,753	5,133	5,477	5,742	5,970
	Total		**14,995**	**15,814**	**17,203**	**18,498**	**19,851**
2	Number of transformer failed	North	349	346	292	331	342
		Central	231	273	260	326	264
		South	273	210	254	302	254
	Total		**853**	**829**	**806**	**959**	**860**
3	Percentage of failure		5.69	5.24	4.69	5.18	4.33

Failure rate of DTRs ranged between 5.69 and 4.33 *per cent* as against the bench mark of 1.5 *per cent* fixed by the PGCIL.

It could be seen from the above table that the failure rate of DTRs ranged between 4.33 and 5.69 *per cent*. This failure rate was much higher than the bench mark of 1.5 *per cent* fixed by the PGCIL. In six[*] out of 12 divisions, the average failure rate ranged between 4.58 and 6.33 *per cent*. Audit scrutiny in 12[**] divisions revealed that during 2003-08, failure of DTRs was attributed to internal defects (165 transformers), lightening (206 transformers) and short circuit (12 transformers) without investigating the actual load at the time of damage, periodical maintenance of the transformers and oil condition, *etc*. The failure could have been avoided by installing safety equipments and conducting periodical inspection/maintenance. In respect of 289 transformers, causes of failure were not recorded.

The Board stated (October 2008) that bench mark fixed by the PGCIL was for PTRs and higher failure rate was due to topography, atmospheric conditions, fall of trees/branches, flash floods, *etc*. The reply is not acceptable as the bench mark of PGCIL was for DTRs and the reasons stated could have been avoided by providing adequate protection equipments.

Under utilisation of transformers

3.1.27 Audit scrutiny of records relating to assessment of load requirement revealed that in the following cases, the Board created transformation capacity in excess of requirement, which rendered investment of funds of Rs. 26.73 crore as unfruitful.

The Board created transformation capacity in excess of requirement, which rendered investment of funds of Rs. 26.73 crore as unfruitful.

- To meet the anticipated requirement of load, the Board commissioned the following 11 sub-stations of 33 KV, 66 KV and 132 KV capacities during 2002-08 at a cost of Rs. 26.73 crore. Scrutiny of records relating to assessment of requirement, creation and utilisation of transformation capacity of these sub-stations revealed that the estimation of the Board was not based on factual data. Thus, the PTRs installed at these sub-stations at a cost of Rs. 2.70 crore (approximately) remained under utilised as the requirement of load did not increase as anticipated as would be evident from the details given in **Annexure 20.**

Due to creation of capacity in excess of the requirement, transformers installed at 11 sub-stations were utilised to the extent of 38.19 *per cent* only.

It may be seen from the Annexure that the utilisation of these sub-stations (transformers) to the extent of 38.19 *per cent* indicated that the load requirement of the area had not been assessed correctly and the funds were not invested prudently.

The Board stated (October 2008) that sub-stations were commissioned keeping in view the projections of the next 10 years. The fact, however, remained that these transformers were grossly under loaded even after two to six years of commissioning.

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[*] *Mandi, Dharamshala, Nurpur, Sundernagar, Bilaspur and Parwanoo.*

[**] *Electrical Division, Bilaspur, Sundernagar, Mandi, Nadaun, Dharamshala, Barsar, Nurpur, Parwanoo, Una, Nahan and Rajgarh.*

Performance of repaired transformers

The frequency of failure of repaired transformers was abnormally high when compared to failure of new transformers. It indicated that quality of repair was not satisfactory.

3.1.28 The damaged transformers repaired by the M&T workshops of the Board are to be treated at par with new transformers and carry warranty of six months. The field units did not maintain records to monitor the life span of the repaired transformers. A comparative study of performance of new (110 Nos.) and repaired (826 Nos.) transformers revealed that frequency of failure of repaired transformers was abnormally high as compared to new transformers. In eight[#] out of nine[$] operational divisions test checked in audit, the failure ratio of repaired and new transformers was 7.5:1 which reflected the unsatisfactory quality of repair by the M&T workshops.

Audit further noticed that essential infrastructural facilities for testing the transformers, as are available in the workshops of the manufacturers, were not available in the M&T workshops of the Board. In the absence of essential facilities for testing, proper repair of transformers could not be ensured and thus rendering cost of repairs of Rs. 16.04[▽] crore largely unproductive.

The Board stated (October 2008) that comparison of performance of new and repaired transformers was not justified as the performance/technical value of used material was exhausted due to prolonged use. The reply is not acceptable as the cost of repairs of transformers was very high and the transformers should have performed for the guaranteed period.

Premature scrapping of transformers

3.1.29 Every transformer has a prescribed life span. As per the existing practice in vogue, the cost of repair of transformer should not exceed 70 *per cent* (after allowing 30 *per cent* salvage value) of the cost of new transformers. In case, the estimated cost of repair exceeds this limit, the transformers are considered uneconomical for repair and are proposed for condemnation.

Out of 155 DTRs considered irreparable, 88 were scrapped without indicating their performance period and 42 before completion of prescribed life.

A test check of records revealed that 155 out of 19,709 DTRs considered irreparable were condemned during the last five years ended 31 March 2008. Out of above, only 25 transformers had completed the prescribed life of 25/35 years. While 88 transformers were scrapped without indicating the period of performance, the balance 42 transformers valued at Rs. 13.01 lakh were scrapped before completion of prescribed life. The premature scrapping of transformers resulted in loss of Rs. 13.01 lakh worked out on the basis of proportionate replacement cost for the balance period of prescribed life span of the transformers.

The Board stated (October 2008) that loss was unavoidable as these transformers were damaged due to adverse atmospheric conditions. The

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[#] *Electrical Division, Bilaspur, Sundernagar, Mandi, Nadaun, Dharamshala, Nurpur, Barsar and Parwanoo.*

[$] *Electrical Division, Bilaspur, Sundernagar, Mandi, Nadaun, Dharamshala, Nurpur, Barsar, Parwanoo and Una.*

[▽] *Direct cost towards repair of transformers during 2003-08.*

Board had not specified reasons for premature scrapping. Further, the damage could have been avoided by installing proper protection equipments.

Maintenance of transformers

The Board failed to adhere to the maintenance schedule prescribed by the CBIP for maintenance of transformers.

3.1.30 The Board had neither prepared any Manual for maintenance of transformers, nor had prescribed any time schedule for periodical maintenance of transformers. Audit scrutiny of record in 12[^] out of 50 divisions revealed that regular periodical maintenance had not been carried out resulting in reducing the life of the DTRs. To assess the performance of transformers, the Board is required to maintain transformer movement cards (TMCs) or History cards, which should *inter alia*, show complete details of transformers *i.e.* dates of receipt, installation, maintenance, failure and movement. Audit observed that no such cards were maintained.

As per the CBIP maintenance schedule for transformers of capacities less than 1,000 KVA, filtration of oil after two years and washing of core and coils by hosing down with clean dry oil after five years was required to be carried out. Audit observed (March 2008) that this schedule was not adhered to by any of the field units. The deficiencies noticed in this regard have been discussed in subsequent paragraphs.

The Board stated (October 2008) that manual for maintenance of transformers and schedule for their periodical maintenance existed and field officers were required to act accordingly. It further stated that deficient maintenance was due to shortage of staff and location of transformers in far-flung areas. The fact, however, remained that the maintenance schedule was not adhered to.

Non-installation of safety equipments

3.1.31 The transformer installed (October 1999) at Anu (Hamirpur) got damaged (June 2007) and was replaced by new transformer costing Rs. 1.80 crore. The new transformer, however, was connected to traditional safety equipment (ABCB[$]) instead of SF-6 which was not sufficient for its safety. The Committee constituted (December 2007) by the Board for investigating the reasons for failure of transformer also recommended to strengthen the safety system and to ensure availability of protective system at the time of commissioning of equipment. No action on the recommendations of the Committee has, however, been initiated so far (September 2008).

The Board admitted (October 2008) non-installation of fresh protection equipment and stated that equipment procurement was in progress.

Non-conducting of investigation for damaged transformers

3.1.32 According to the instructions issued (November 1996) by the Chief Engineers, the damaged transformers should be inspected at the site within 15

[^] *Electrical Division, Bilaspur, Sundernagar, Mandi, Nadaun, Dharamshala, Barsar, Nurpur, Parwanoo, Una, Nahan, Paonta and Rajgarh.*

[$] *ABCB: Air brake circuit breaker.*

The Board replaced 597 DTRs at a cost of Rs. 1.83 crore without conducting required investigation for their damage.

days time for initiating remedial action. Audit noticed that during 2003-08, 597 DTRs were damaged in six[#] divisions and were replaced at a cost of Rs. 1.83 crore without conducting required investigation of damaged DTRs. Not only this, the above expenditure on replacement of DTRs was also incurred without preparing works estimates and approval of the competent authority. The reasons for not conducting the investigation of damaged transformers and following the prescribed procedure before incurring the expenditure were not on record.

One 25/31.5 MVA power transformer of Rs. 43.86 lakh installed at sub-station, Girinagar was damaged in April 2006. The supplier firm visited (July 2006) the sub-station, Girinagar and concluded that the transformer could not be repaired as it had been damaged very badly. The investigation report was pending for finalisation (August 2008).

No specific reply had been given for non-investigation of 597 DTRs damaged in six divisions.

Repair of transformers

3.1.33 Repair of damaged/defective DTRs is a vital activity of the Board. Any delay in repairing of damaged transformers would not only affect the distribution system but also result in blockage of funds. The Board had four M&T workshops for the repair of DTRs and annual targets for each workshop are fixed. The Board also had one workshop for the repair of power transformers up to the capacity of 5 MVA. Audit observed that there was no workshop for the repair of power transformers above 5 MVA, the performance of repaired transformers had not matched with the standards adopted for purchase of new transformers and the cost of repair was not economical.

Non-achievement of targets for repair

3.1.34 The work of repair of DTRs was carried out by the four departmental transformer repair workshops known as M&T workshops of the Board. On the basis of average receipt of damaged DTRs and available skilled manpower, the target for repair in each workshop is fixed each year. The Board has though achieved the target of repair during 2003-07; the target fixed for the repair of five categories of transformers during 2007-08 was not achieved as detailed below:

Sl. No.	Category of transformer	Target fixed (No.)	Achievement (No.)	Shortfall (No.)	Percentage of achievement
1	25 KVA	597	351	246	58.79
2	50/63 KVA	219	189	30	86.30
3	100 KVA	162	105	57	64.81
4	200/250 KVA	33	42	-	127.27
5	Above 250 KVA	9	7	2	77.78

[#] *Electrical Division Kaza, Nahan, Nurpur, Paonta, Parwanoo and Rajgarh.*

Audit scrutiny revealed that the shortfall in repair was due to non-procurement of winding wire (which was essential for repair of transformers) despite receipt (June 2007) of requirement for the year 2007-08. Non-procurement of essential material resulted in payment of Rs. 53.92 lakh to the staff of the workshops on account of 62,875 idle working hours.

The Board accepted (October 2008) the audit observation.

Abnormally high repair cost of DTRs

3.1.35 Audit analysis of the cost of repair of damaged DTRs (25 KVA to 250 KVA) repaired in the Board's workshops during 2003-08 *vis-à-vis* cost of new transformers revealed that repair cost after including supervisory and administrative cost was high as is evident from the following details:

Sl. No.	Particulars	2003-04	2004-05	2005-06	2006-07	2007-08	Total
1.	Number of transformers repaired	890	1,003	984	1,032	694	4,603
2.	Direct cost (Rs. in lakh)	241.33	281.09	318.86	411.87	350.79	1,603.94
3.	Indirect cost (cost of supervisory staff and administrative cost) (Rs. in lakh)	253.14	284.22	308.25	317.18	394.76	1,557.55
4.	Total repair cost (Rs. in lakh)	494.47	565.31	627.11	729.05	745.55	3,161.49
5.	Cost of new transformers (Rs. in lakh)	313.32	449.10	625.15	821.35	523.83	2,732.74
6.	Excess repair cost (Rs. in lakh)	181.15	116.21	1.96	(-) 92.30	221.72	428.75

The repair cost of 4,603 transformers exceeded even the cost of same number of new transformers by Rs. 4.29 crore.

It could be seen from the above table that the repair cost of Rs. 31.61 crore incurred by various workshops on the repair of 4,603 transformers exceeded even the cost of same number of new transformers by Rs. 4.29 crore. The Board had not analysed the reasons for abnormally high repair cost to reduce the same, while audit analysed that the higher repair cost was due to excess supervisory staff.

The Board stated (October 2008) that high repair cost was due to charging of pay and allowances of supervisory staff who were undertaking many other jobs. The reply is contrary to the fact that only portion of the pay and allowances which pertained to it had been charged to the repair activity.

Non-establishment of workshop for repair of power transformers

3.1.36 The Board had installed 118 PTRs at EHV sub-stations and 282 PTRs at 33/11 and 33/22 KV distribution sub-stations. For the repair of these transformers, the Board had only one workshop at Sundernagar which can repair 10 to 12 transformers of capacity up to 5 MVA per year. The facilities for the repair of PTRs of higher capacity did not exist in this workshop.

Lack of workshop for repair of PTRs of capacity of more than 5 MVA resulted in non-repair of 17 PTRs valued at Rs. 5.86 crore.

The Board had constituted (July 1995) a Committee to explore the possibility of establishing own workshop. The Committee recommended (December 1995) for establishing a workshop at Una for the repair of higher capacity PTRs. No such workshop has, however, been established so far (August 2008). Consequently, 17 PTRs valued at Rs. 5.86 crore were lying

un-repaired for 9 to 113 months. The Board had not analysed/inspected these transformers to assess whether these were repairable or not.

The Board stated (October 2008) that the proposal was still under active consideration.

Non-uprating of transformers

3.1.37 While augmenting 220/132 KV sub-station at Jassore from 50 MVA to 150 MVA, the Board dismantled (November 1998) four 220/132 KV 16.66 MVA single phase auto transformers and replaced them with three 50 MVA transformers valued at Rs. 2.92 crore. These dismantled power transformers were still (August 2008) lying idle as there was no requirement of these transformers in other sub-stations of the Board. The Board did not explore the possibilities of their up-rating so as to utilise them in other higher capacity sub-stations though the technology for the same was available in the country and other states. The Board could have saved about Rs. 5.56 crore, if it had up-rated four dismantled power transformers instead of purchasing new ones. Besides, 24 power transformers valued at Rs. 5.07 crore were lying in various stores of the Board for 7 to 113 months which could also not be utilised due to their low capacity. The same could have been gainfully utilised after up-rating.

The Board failed to up-rate the transformers of lower capacity for reuse resulting in unnecessary purchase of new transformers.

The Board stated (October 2008) that up-rating was not feasible as there was limit of 35 *per cent* beyond which transformers capacity could not be enhanced. The reply is not acceptable as the Orisa Power Transmission Corporation had got up-rated power transformers from 25 MVA to 40 MVA.

Delay in repairing DTRs

3.1.38 Audit scrutiny of records relating to repair of DTRs revealed that 538 damaged DTRs valued at Rs. 1.11 crore were lying un-repaired in four workshops[♠] for one to 90 months as on 31 March 2008.

The Board did not give due attention to repair of damaged transformers. Resultantly, damaged transformers were not being repaired quickly.

Besides, 144 failed DTRs received in the M&T workshops during 2003-08 were repaired after a period of 7 to 37 months. Further, 287 damaged DTRs were sent for repair by the field units concerned after a delay of 7 to 49 months from the date of damage. Although monthly progress report was submitted by the field units to higher officers every month, steps had not been taken by the Board to get these transformers repaired.

The Board stated (October 2008) that delay was due to remote areas and the field units had been directed to avoid abnormal delays in future.

Non-accounting of damaged transformers

3.1.39 Audit scrutiny of records relating to accounting of transformers in six[£] units revealed that out of 463 DTRs of various capacities which failed during 2003-08, 347 DTRs were sent to M&T workshops for repair and balance 116 DTRs valued at Rs. 57.53 lakh neither existed in the stock nor were sent to

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♠ *Kangra, Solan, Una and Sundernagar.*

£ *Electrical divisions Bilaspur, Sundernagar, Mandi, Nurpur, Una and Dharamshala.*

M&T workshops for repair so far (March 2008). The Board had not taken any action to trace these 116 DTRs.

The Board stated (October 2008) that it was due to non-accounting of damaged DTRs in transit instead of missing transformers. The reply is not convincing as transformers can not remain in transit for months.

Non-disposal of condemned transformers

3.1.40 No action was taken to dispose of the two transformers of Rs. 61.13 lakh lying damaged at Jutogh (25/31.5 MVA) and Parwanoo (16 MVA) since April 2001 and August 2003 respectively, even though offer was received (April 2006) for the former while condemnation Committee for condemnation of the latter was not formed so far (August 2008).

The Board admitted (October 2008) non-disposal of the transformers and stated that final disposal was under process.

Internal control and Internal audit system

Internal control system

3.1.41 Internal control is an important management tool which provides reasonable assurance to the Management that objectives are achieved in an efficient, economical and effective manner, assets are safeguarded and rules and procedures are complied with. The following deficiencies were noticed in the internal control system relating to procurement, performance and repair of transformers and allied activities:

- The Board did not evolve a rational policy for the creation of transformation/distribution capacity to meet the growing trend of connected load to assess the requirement of transformers.
- The Board did not evolve vendor rating system and also did not maintain data bank of venders relating to the rates and performance of the transformers supplied by the firms.
- The Board did not have a system to review and monitor the performance of the transformers repaired in its own workshops.
- The Board had not issued appropriate guidelines for the periodical maintenance of the PTRs/DTRs resulting in excess failure rate of the transformers.
- There was no system of timely investigation of damaged transformers which resulted in non-highlighting of major shortcoming in the maintenance of transformers and resultant failure to take remedial steps.
- The system of assessing transformation losses of DTRs to monitor and review their performance was non-existent.
- There was no system of timely identification of obsolete and unserviceable transformers.

Internal audit system

3.1.42 Internal audit is an integral part of internal control system. The Board has its own Internal Audit Wing headed by the Chief Auditor under the control of Member (Finance). The Internal Audit Wing comprises two groups *viz*. Works Audit group and Commercial Audit group. The Works Audit group is responsible for conducting test audit of transactions affecting all accounts except consumers' accounts. As against 147 auditable units annually, the Works Audit group audited only 41 units during 2007-08. Audit scrutiny of Internal Audit Reports of 17 divisions for 2005-06 and 2006-07 revealed that the reports did not contain any observation on purchase, performance, maintenance and repair of transformers. This indicated that adequate importance was not given to purchase, performance, maintenance and repair of transformers though the Board was incurring huge expenditure on this activity each year.

Acknowledgement

Audit acknowledges the co-operation and assistance extended by the Board and officers of the State Government at various stages of conducting the performance audit.

Conclusion

The Board failed to assess requirement of transformers and to procure them most economically and efficiently. The Board had not formulated any policy for replacement of transformers which had outlived their life. There were instances of excess transformation losses over and above the guaranteed transformation losses. The transformation losses were in excess of the permissible limit fixed by CEA. The failure rate of transformers was more than the norms fixed. The Board had not carried out regular periodical maintenance of transformers. The repair cost of damaged transformers was higher than the cost of new transformers.

Recommendations

The Board needs to:

- **strengthen purchase procedure to assess correct requirement of transformers to avoid extra expenditure.**
- **avoid overloading of transformers to save energy losses and damage to the transformers.**
- **formulate a dependable policy for timely repair of failed transformers and up-rating of the dismantled transformers.**
- **prescribe time schedule for periodical maintenance of transformers.**

3.2 Execution of Electrification and System Improvement Schemes

Highlights

Out of 60 schemes taken up for implementation under rural electrification, there was a time overrun of 12 to 86 months in completion of 57 ongoing schemes. As these schemes were incomplete, the time overrun would increase further.

(Paragraph 3.2.11)

Due to implementation of T&D schemes by the Board, the T&D losses during 2006-07 and 2007-08, were 15.49 and 15.62 *per cent* respectively as against the limit of 18.5 and 17.5 *per cent* fixed by the HPERC.

(Paragraph 3.2.12)

The schemes of TSP, RGGVY, PMGY were yet to be completed resulting in non-achievement of the envisaged benefits.

(Paragraphs 3.2.16, 3.2.17 and 3.2.18)

There were excessive tripping and high incidence of failure of DTRs, which indicated that the quality and reliability of power supplied was low.

(Paragraphs 3.2.21 and 3.2.22)

In three Circles, the Board failed to achieve the target of reduction in distribution losses despite incurring an expenditure of Rs. 26.53 crore on the strengthening of power distribution system.

(Paragraph 3.2.23)

Introduction

3.2.1 To meet the anticipated power requirement of 2,015 MW (load growth), the Himachal Pradesh State Electricity Board (Board) formulated and executed (2003/2007) various schemes such as Rural Electrification (RE) schemes, Transmission and Distribution (T&D) schemes, System Improvement (SI) schemes, Rajiv Gandhi Gramin Vidyutikaran Yojna (RGGVY) and other schemes for creating new infrastructure of High Tension (HT)/Low Tension (LT) lines and sub-stations and strengthening of existing distribution system. The Board had a power load of 2,948.329 MW as on 31 March 2003, 15,585 distribution transformers in the network of 70,906 circuit kilo meters (CKM) of HT/LT line (22,986/47,920) to supply power to 16.46 lakh consumers. As on 31 March 2008, the Board had power load of 4,131.395 MW, 19,907 transformers and 79,742 CKM of HT/LT lines to supply power to 18.42 lakh consumers. The Board incurred Rs. 663.10 crore towards implementation of various schemes. The T&D losses, which were

23.36 *per cent* in 2003-04, had decreased to 15.62 *per cent* in 2007-08. The overall objectives of the schemes were:

- construction of new lines;
- electrification of the left out areas in the State;
- strengthening and up-gradation of existing sub-transmission and distribution system to reduce T&D losses;
- fulfillment of the social objective of the State Government to provide power supply to tribal and backward areas; and
- reliability and quality of power supply to the satisfaction of the consumers.

The execution of these schemes was under the overall control of the Member (Operation) who was assisted by three Chief Engineers (excluding Chief Engineer Commercial), 12 Superintending Engineers and 50 Executive Engineers having control over construction and distribution divisions.

Scope of Audit

3.2.2 The present performance audit on execution of electrification and system improvement schemes in the Board during 2003-08 was conducted from December 2007 to April 2008 through a test check of records at the Head Office, three[*] offices of the Chief Engineers, four[**] circles and 10[#] out of 50 divisions of the Board selected on the basis of expenditure incurred (42.23 *per cent*) by the selected units against the total expenditure of Rs. 663.10 crore during 2003-08.

Audit objectives

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

- The Detailed Project Reports (DPRs) were prepared realistically to achieve the scheme objectives and in consonance with the guidelines of the Central Electricity Authority (CEA)/Rural Electrification Corporation (REC)/Government of India (GOI);
- The funding requirements were assessed realistically and funds were sanctioned and released by the GOI/State Government in time and the same were utilised efficiently, economically and effectively for achievement of the objectives of the schemes;
- The AT & C losses were reduced in accordance with the action plan and targets;

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[*] *Chief Engineers (Operation), Central, North and South.*

[**] *Dalhousie, Kangra , Kullu and Rampur.*

[#] *Electrical Division Nalagarh, Kullu, Chamba, Jawali, Kangra, Palampur, Rampur, Recong Peo, Rajgarh and Paonta.*

- An effective and efficient system of monitoring and evaluation of achievements with reference to the envisaged objectives was in place; and
- The intended benefits from the schemes to the Board and to the general public were actually derived.

Audit criteria

3.2.4 The following criteria were adopted:

- Projections/targets set out in various schemes;
- Project Reports, cost estimates in respect of each scheme;
- Monitoring mechanism envisaged in the guidelines;
- Guidelines framed by CEA/REC/Board for various schemes;
- Policy, plan, schemes formulated by the Board; and
- Norms fixed by Himachal Pradesh Electricity Regulatory Commission (HPERC)/CEA for T&D losses.

Audit methodology

3.2.5 The audit adopted following mix of audit methodologies:

- Review of agenda papers and minutes of the meetings of Whole Time Members (WTMs) of the Board;
- Analysis of basic data and procedure for formulation of schemes;
- Examination of DPRs/Cost Estimates of the schemes;
- Review of details of funds received and utilised;
- Analysis of procedure for evaluation of schemes after completion;
- Analysis of data relating to achievement of envisaged benefits; and
- Issue of audit enquiries and interaction with the Management.

Audit findings

3.2.6 Audit findings arising from the performance audit on execution of electrification and system improvement schemes in the Board were issued (July 2008) to the Government/Board and were discussed (19 September 2008) in the meeting of the Audit Review Committee for State Public Sector Enterprises (ARCPSE). The Chairman, Member (Finance), Member (Technical), Member (Operation) and Chief Auditor of the Board attended the meeting. The views expressed by the members have been taken into consideration while finalising the review. Audit findings are discussed in succeeding paragraphs.

Financial outlay for execution of schemes and actual expenditure

3.2.7 The Board prepared annual budgets for capital expenditure on the execution of under mentioned eight categories of schemes depending upon the target fixed under the annual working programme. These eight categories of schemes were executed through loans obtained from the REC/Power Finance Corporation (PFC), own funds of the Board and grant received from the GOI/State Government. The interest rate on loans varied between 9.5 and 12.15 *per cent per annum*. The loan from REC and PFC is received by the Board on the basis of physical and financial progress intimated. The grants/loans under APDRP, RGGVY and *Pradhan Mantri Gramodaya Yojna* (PMGY) are received from the GOI through the State Government. The grant under Tribal Sub-Plan (TSP) and Special Component Plan (SCP) is received from the State Government through annual budgetary provision. In addition to above, the Board executed schemes under deposit contribution works where the full amount required for the scheme would be received prior to execution.

The category-wise budget allocation for schemes and actual expenditure thereagainst, during 2003-08, sources of funds, scope of work and status of implementation as at 31 March 2008 are tabulated below:

(Rupees in crore)

Sl. No.	Category of schemes	No. of schemes	Budget allocation	Actual expendi-ture	Source of funds	Scope of work	Present status
1	RE schemes	60	155.50	122.07	Loan from REC	Construction of new HT/LT lines and distribution sub-station	Three schemes completed and 57 not yet completed
2	RE (SCP) schemes	5	3.00	1.59	Grant from State Government	Construction of new HT/LT lines and distribution sub-station	Schemes closed at the end of each year but targets have not been achieved in full
3	APDRP schemes	12	425.04	359.67	90 *per cent* grant and 10 *per cent* loan from GOI.	Strengthening of existing sub-transmission and distribution system	Scheme has been closed in March 2007 without achieving full targets
4	T&D schemes	11	291.06	165.04	Board's funds	Augmentation of existing system	Ten Nos. completed and balance one not yet completed
5	PFC schemes	On going	2.17	0.84	Loan from PFC	System improvement schemes	Not yet completed
6	PMGY scheme	1	12.28	4.14	Grant from GOI	Electrification of left out area in tribal areas	Not yet completed
7	TSP schemes	5	13.25	7.48	Grant from State Government	Electrification of left out area in tribal/backward areas	Schemes closed at the end of each year but targets have not been achieved in full
8	RGGVY scheme	1	7.48	2.27	90 *per cent* grant and 10 *per cent* loan from GOI	Construction of new HT/LT lines and distribution sub-station	Works yet to start
	Total	**95**	**909.78**	**663.10**			

Audit observed that:

- Funds for the RE schemes are released by the REC on the basis of physical progress reported by the Board through the Director Design (REC) and Chief Engineer (System Planning). Analytical study of actual release and drawal of funds from the REC revealed that in respect of 31 out of 57 on going schemes, the Board availed funds of

Rs. 43.81 crore against which the actual expenditure was Rs. 36.09 crore. The drawal of loan of Rs. 7.72 crore over and above the actual expenditure resulted in avoidable payment of interest of Rs. 2.43 crore during the moratorium period of three years.

- Against the receipt of funds of Rs. 7.48 crore (Rs. 6.73 crore grant and Rs. 0.75 crore loan) under RGGVY from the GOI during 2006-07, the Board had utilised only Rs. 2.27 crore during 2007-08. The balance amount (Rs. 5.21 crore) was lying unutilised with the Board.

The Board stated (September 2008) that the main reasons for non-utilisation of budget were the initial problems with regard to preparation/finalisation of techno commercial conditions/technical specification to float tenders for turnkey projects, being the first experience of the Board. The reply is not acceptable as the Board had already executed many works on turnkey basis for construction of HT/LT lines and sub-stations under APDRP scheme.

- The GOI/State Government released Rs. 12.73 crore as grant under PMGY, T&D and RE (TSP) schemes. Test check of three♦ Circles revealed that the GOI and the State Government released Rs. 8.77 crore and Rs. 3.96 crore respectively under the PMGY, T&D and RE schemes under TSP. The Board had not utilised the grant of Rs. 8.57 crore received for electrification works in tribal area under these three schemes. In Kullu Circle, non-utilisation of grant was attributed to non-receipt of material from the Board. Thus, non-utilisation of the grant was indicative of lack of proper planning, which resulted in non-fulfilment of social objective contemplated by the GOI/State Government.

The Board stated (September 2008) that difference in budget allotment and actual expenditure was due to the fact that APDRP scheme was in initial stage of implementation and supply of material was delayed by various manufacturers. It was further stated that the State Government generally released funds during the month of February and March each year. The reply confirmed the audit observation.

Physical targets and achievement

3.2.8 The physical targets, achievements thereagainst and shortfall of HT/LT lines, distribution transformers (DTRs), power transformers (PTRs) and service connections in respect of schemes mentioned in paragraph 3.2.7 *supra* during the last five years ended March 2008 are detailed in **Annexure 21** and **Annexure 22**.

It could be seen from Annexures that while in case of construction of new HT/LT lines, the percentage achievement ranged between 54.5 and 59.9, in case of installation of new transformers, it ranged between 42 and 55.5. In

♦ *Rampur, Kullu and Dalhousie.*

case of augmentation of LT lines and issue of service connections, the achievement was higher to the extent of 34 and 22.7 *per cent* respectively. Under APDRP scheme, out of 19 schemes taken for implementation, five schemes were fully completed and 13 schemes are partially completed. The Board had not taken up computerisation work under APDRP scheme for which action was under progress.

Out of the eight schemes taken up for implementation, while schemes (serial Nos. 1, 5 and 6) had not been completed yet, the targets in respect of schemes at serial Nos. 2, 3, 4 and 7 had not been achieved in full. The works in respect of scheme at serial No. 8 were yet to start.

Thus, the objectives as envisaged in all the eight schemes *viz*. electrification of left out areas in the State, providing power supply to tribal and backward areas including power supply to the families below poverty line (BPL) remained partly unfulfilled.

Formulation and execution of schemes

Formulation

3.2.9 The Board prepared schemes mentioned in paragraph 3.2.7 *supra* for electrification of different areas of the State after collecting data regarding area to be covered, number of service connections to be issued, anticipated load growth and availability of funds. The schemes envisaged specific rate of return/reduction of energy losses. The proper formulation of schemes helps in avoiding/minimising deviations, time and cost overrun and delay in deriving the expected benefits.

Execution of schemes

3.2.10 For execution of schemes in an economical and efficient manner, timely arrangement/allotment of funds and material is necessary. Effective monitoring of pace of execution is required to avoid deviations and time and cost overrun.

The following deficiencies were noticed in formulation and execution of various schemes.

Rural Electrification schemes

Out of 60 RE schemes in operation during 2003-08, no scheme was completed within the prescribed period.

3.2.11 The REC sanctions schemes and loan assistance for rural electrification for all electricity Boards in the country. These schemes are required to be completed within two years from the date of sanction. There were 60 schemes in operation during the period under review. Out of these 60 schemes, three schemes were completed up to March 2007 with a time overrun of 27 to 45 months due to inadequate allotment of funds during the stipulated period of completion of schemes and the remaining 57 were still in progress even though these schemes should have been completed by

February 2007. The physical targets, achievement and shortfall thereagainst in respect of above schemes were as under:

Sl. No.	Item of work	Targets	Achievement	Shortfall	Percentage of achievement
1	HT lines (Km)	1,912.800	1,279.483	633.317	66.89
2	LT lines (Km)	3,008.700	1,902.234	1,106.466	63.22
3	Sub-stations (numbers)	2,146	1,660	486	77.35
4	Service connections (numbers)	1,86,248	1,52,387	33,861	81.82

Audit observed that:

- There was time overrun of 12 to 86 months up to March 2008 in the completion of the 57 on going schemes. As these schemes were still (July 2008) incomplete, the time overrun would increase further.
- The delay in execution of 35 schemes test checked was due to allocation of only Rs. 5 crore during the first two years from the date of sanction against the requirement of Rs. 70.44 crore.
- Due to delay in execution, the REC charged interest at the revised higher rate against the original rate of interest on the loan of Rs. 7.99 crore availed during March 2007 and February 2008, which would put an additional burden of Rs. 51.54 lakh on the Board even during the moratorium period of three years.

The Board stated (September 2008) that the budget allotment was made as per budget plan approved by the HPERC, which had been the main cause for time and cost overrun, and also delayed supplies of material. The reply is not relevant to the point as the HPERC approves the schemes and it is for the Board to allocate enough funds for execution of schemes. However, the Board had allocated funds of only Rs. 5 crore against the requirement of Rs. 70.44 crore.

- The scope and execution of work of 47 schemes **(Annexure 23)** were not formulated as per the guidelines of the CEA to maintain HT/LT lines ratio of 1:1. The schemes provided for the HT/LT lines ratio between 1:1.18 and 1:4.50. The scrutiny of physical progress report submitted by the Board to the REC revealed that the ratio in 21 schemes was between 1:2.11 and 1:50.7 which indicated that the schemes were not prepared after a detailed study.

The Board stated (September 2008) that every care was taken to restrict the LT lines, but being a commercial organisation, it was difficult to keep prospective consumers without electricity. The reply is not acceptable as the ill planned extension of LT lines beyond the provision of the schemes would ultimately result in voltage drop and energy losses.

- Potential revenue of Rs. 12.53 crore[♠] from the 24 schemes as per the norms fixed for completion within two years was deferred due to non-completion of schemes in time.
- In respect of 23 on going schemes **(Annexure 24)**, there was a shortfall in the construction of HT/LT lines and sub-stations to the extent of 587.296 Km lines and 201 sub-stations respectively but 19,741 service connections were released in excess of the provision in the schemes. This indicated that co-relation between the service connections and the distribution network was not kept in view.

The Board stated (September 2008) that new connections were released due to increase in demand and there was no resultant problem of voltage drop/higher energy losses due to release of excess connections. The reply is not acceptable as details of voltage regulations were not supplied by the Board.

There was cost overrun of Rs. 3.47 crore due to time overrun in the completion of three schemes.

- In two units, three schemes[£] for the construction of HT/LT lines and sub-stations sanctioned during April to September 2002 remained under construction beyond the stipulated period of two years. The time overrun ranging from 42 to 48 months resulted in delay in achievement of targets besides cost overrun of Rs. 3.47 crore.

The Board stated (September 2008) that HPERC stopped execution of RE schemes during June/July 2005 which resulted in shortfall in achievement of targets. The reply is not acceptable as execution of 53 schemes sanctioned between April 1999 and March 2003 should have been completed between March 2001 and March 2005.

T&D schemes

3.2.12 Transmission and Distribution (T&D) schemes of the Board include lines, sub-stations and augmentation of transformation capacity for various voltage levels. The funds for T&D schemes prepared by the Board were made available either from its own internal resources or loan raised from the financial institutions and REC.

During 2003-08, 11 T&D schemes were under implementation as detailed in **Anneuxre 25.** Out of total 11 schemes, 10 schemes were completed up to June 2008. There was time overrun of five to 70 months in the completion of eight schemes (serial Nos. 2, 4, 6 and 7 to 11) and cost overrun of Rs. 3.16 crore in the completion of six schemes (serial Nos. 2, 5, 7, 8, 10 and 11). It could be seen from the Annexure that against the provision of construction/augmentation of 130.850 Km 33/22/11 KV HT lines in eight schemes (serial Nos. 2, 3, 5 and 6 to 10), the actual physical progress was restricted to only 68.830 Km which indicated that initially the schemes were not formulated on the basis of actual requirement. In view of the

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♠ *Calculated on expected rate of return at 12 per cent.*

£ *Rural electrification of (i) Tehsil Churah, (ii) Chamba & Bharmour, (iii) Rampur & Nankhari.*

implementation of T&D schemes by the Board, the T&D losses during 2006-07 and 2007-08, were 15.49 and 15.62 *per cent* respectively as against the limit of 18.5 and 17.5 *per cent* fixed by the HPERC.

The Board failed to achieve target of reduction of losses/additional sale of power of 9.11 MUs.

3.2.13 Audit scrutiny of records relating to works executed revealed non-achievement of targets for reduction of losses and additional sale of power of 9.11 MUs as discussed below:

- The construction work of 18.37 Km additional 33 KV HT line from Baner Power House to Dehan under Palampur Electrical Division sanctioned (August 1999) at a cost of Rs. 73.09 lakh with completion period of two years, was completed after 65 months in December 2004 at a cost of Rs. 1.74 crore. The delay in completion was attributed to non-clearance of route through the cultivated fields, tea estate and Railway crossings. This resulted in cost overrun of Rs.1.01 crore besides potential revenue loss of Rs. 1.57 crore on account of non-evacuation of power of 78.392 LUs due to high voltage regulation on existing system. The line was also used for evacuation of power with effect from February 2006 i.e. after 14 months from the date of completion for which, no reasons were on record.

The Board stated (September 2008) that delay was on account of technical snags developed in terminal equipment.

- The work of construction of 33 KV HT line and sub-station at Lanj sanctioned (September 2005) for Rs. 1.36 crore with gross rate of return of 14.41 *per cent* was awarded (October 2006) to Chopra Electrical, Dharamshala at a cost of Rs. 1.91 crore. The work expected to be completed by June 2007 was actually completed in February 2008 at a cost of Rs. 2.03 crore. The sub-station, however, had not been commissioned (July 2008) due to technical and administrative reasons. Audit observed that the awarded cost (Rs. 1.91 crore) was higher by Rs. 55 lakh when compared to the estimated cost (Rs. 1.36 crore) for which no reasons were on record. The delay in completion/commissioning resulted in non-achievement of targets for additional sale of 11.03 LUs of power and reduction of losses to the extent of 1.68 LUs.

APDRP schemes

3.2.14 A performance review on the implementation of APDRP schemes was included in the Report of the Comptroller and Auditor General of India (Commercial) – Government of Himachal Pradesh for the year 2007. After implementation of scheme during 2002-07 the T&D losses during 2006-07 and 2007-08 were below the norms fixed. The present review covered four Circles involving expenditure of Rs. 143.20 crore which were not covered under the earlier audit report stated above.

Audit observed that:

- The works relating to replacement of electro mechanical meters, augmentation of HT lines and replacement of wooden poles, involving

cost of Rs. 30.52 crore under APDRP schemes were executed over and above the provisions to the extent of 43, 38 and 25 *per cent* respectively in the schemes, which affected financing of other works covered under the schemes.

Due to lack of proper planning, expenditure of Rs. 5.33 crore remained unfruitful for one to 26 months.

3.2.15 To derive the envisaged results from the schemes, proper planning for timely procurement of material and execution of all related works simultaneously was of utmost importance. Audit noticed that in the following cases, there was lack of proper planning which resulted in delay in energisation of express feeders, HT lines and sub-stations. Consequently, the expenditure of Rs. 5.33 crore incurred by the Board remained unfruitful for one to 26 months and the prospective consumers also remained un-benefited as detailed below:

- To provide reliable power supply to the consumers, the construction of express feeders from 132 KV sub-station at Kangra to Lanj and Rajol measuring 15.910 Km and 6.134 Km was completed in October 2006 and August 2007 respectively at a cost of Rs. 1.14 crore. These feeders were not put to use as the terminal equipments procured for these feeders were installed (June 2007) in the sub-station at Amb which had been damaged (10 June 2007) due to flash over in the incomer panel. The requisite terminal equipments were installed (July 2008) at sub-station, Kangra but the express feeders was yet to be energised (September 2008).
- The construction of the four 33/11 KV HT lines[▽] was not matched with the construction of sub-stations. Due to mis-match of construction schedule, the three lines (except 11 KV line between Bangana to Tanoh) erected at a cost of Rs. 1.63 crore were energised after a delay of 6 to 19 months from the date of completion and the 11 KV line between Bagana to Tanoh (Rs. 0.28 crore) had not been energised so far (July 2008).

The delay in energisation resulted in non-achievement of target for reduction in energy losses of 12.86 LUs and additional sale of power of 8.01 LUs.

The Board stated (September 2008) that due to delay in finalisation of competitive bidding, receipt of material/equipment/funds and less working season, some mis-matching/non-synchronisation could not be ruled out. It, however, did not offer any specific comments on non-achievement of targets for additional sale of power and reduction in losses.

The progress reports of newly constructed HT/LT lines and sub-stations revealed that in five[*] units, 106 distribution sub-stations constructed at a cost of Rs. 2.28 crore were energised after two to 26 months from the date of completion. The delay was due to non-completion of other allied work such

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▽ *33 KV Amb to Bharwain, 33 KV Garola to Bharmour, 11 KV lines at Bharmour and 11 KV Bangana to Tanoh line.*

* *CE Dharamshala, Rekongpeo, Rampur, Chamba and Kullu.*

as re-organisation of LT system and construction of LT lines. This resulted in blockage of Board funds to the extent of Rs. 2.28 crore.

The Board stated (September 2008) that delay in commissioning of sub-station/lines was due to late receipt of material. The reply is not acceptable as the Board itself procures the material and proper planning before taking up the schemes could have avoided the blockage of funds.

Audit further observed that in the following cases, works were awarded to the contractor at higher rates resulting in incurring of extra expenditure of Rs. 1.57 crore:

- Audit scrutiny of cost data prepared (2002-03) for the execution of works on turnkey basis under APDRP revealed that in three♠ circles, the construction of 33 KV and 11 KV lines were completed at the rates which were much higher than the rates considered for the formulation of the schemes. The item rate for providing, stringing and sagging of AAAC 7/4.26 was approved at Rs. 76,765 and Rs. 64,500 per Km for 33 KV and 11 KV HT lines respectively, against the Board's stock issue rate of conductor of Rs. 38,000 per Km. For works executed under Kangra and Mandi circles, the basic price of conductor was approved at Rs. 66,000 and Rs. 76,769 per Km respectively. After comparison of the rates of cost data and the rates approved for stringing and sagging, the approved rates were found to be higher by 34.6 to 102.69 *per cent*. This resulted in extra payment of Rs. 97.48 lakh to the contractors as detailed in **Annexure 26.**

The Board stated (September 2008) that contractor had to procure small quantity of conductor and the rates of the same could not be compared with the stock rates of the conductor for which tenders were floated about a year back. Further, the tenders were awarded as a package in which some items might appear to be cheaper and some as costly. The reply is not in conformity with fact that in some cases, the Board had mentioned the stock rate of conductor as Rs. 38,000 per Km and in February 2007 the procurement rate of conductor was Rs. 42,000 per Km.

- The construction of 33 KV HT line from Thirot to Karga, was awarded (ERI Tech, Kolkata) for Rs. 2.62 crore. The specifications of the firm suitable for snow bound area included use of 19 strand conductor against the Board's specification of 7 strand conductor and envisaged saving of energy loss of Rs. 1.42 crore *per annum*. During negotiation (February 2006), the Superintending Engineer (Operation) Circle Kullu proposed to construct the line departmentally at a cost of Rs. 1.88 crore. There were no reasons on record for not accepting the above proposal. Audit scrutiny revealed that the firm charged the rate of Rs. 1.10 lakh per Km of 19 strand conductor but actually supplied conductor with 7 strand. This resulted in avoidable payment of Rs. 59.02 lakh. The Board had not restricted its payment and admitted claim at the quoted rate of Rs. 1.10 lakh per Km.

♠ *Kangra, Mandi and Una.*

The Board stated (September 2008) that the job was not departmentally done due to shortage of staff as well as limited working season. As there was no mention of shortage of staff in the tender files, the reply is not acceptable. Besides, no specific comments were offered to justify provision of 19 strands conductor, which envisaged a saving in losses valued at Rs. 1.42 crore *per annum*.

- In Rampur Circle and Parwanoo Division of Solan Circle, where 1,429 energy meters were installed on 1,429 DTR feeders at a cost of Rs. 1.76 crore, energy audit was not being done though there was an increasing trend in T&D losses from 24.77 *per cent* (2003-04) to 27.98 *per cent* (2006-07) in Rampur Circle. In the absence of energy audit, the expenditure of Rs. 1.76 crore was rendered unfruitful.

  The Board stated (September 2008) that field units had been directed again to conduct the energy audit.

Tribal sub-plan

3.2.16 Under the scheme, the Board is to provide power supply to the remote tribal areas in the State after obtaining grant from the State Government. The Board had identified three districts in the State for implementing this scheme. The Board had taken up five works for value of Rs. 13.25 crore against which it incurred Rs. 7.48 crore up to March 2008. All the five works under the scheme remained in progress resulting in non-achievement of objective.

Audit observed the following deficiencies in execution of two such works:

The Board failed to recover Rs. 3.69 crore *per annum* from the State Government for an un-economical schemes executed on its behalf.

- To provide alternate power to Spiti Valley, the Board awarded (September 2006) the work for the installation of 1,380 KVA DG* sets at Tabo and Kaza at a cost of Rs. 1.38 crore. The funds were to be provided by the State Government. The DG sets were commissioned during September 2007. Audit scrutiny of records revealed that for the generation of 796 units per hour, the Board incurred an expenditure of Rs 0.17 lakh on 238 liters fuel. As the per unit cost of energy was Rs. 21.36 against the average sale rate of Rs. 2.50, the Board suffered a loss of Rs. 18.86 per unit. The Board failed to bring to the notice of the State Government the non-viability of the scheme to recover the extra burden of Rs. 3.69 crore *per annum*. The reimbursement of cost of the scheme was also awaited (March 2008) from the State Government.

The Board stated (September 2008) that efforts were being made to get the cost reimbursed from the State Government. It further stated that the State Government would also be approached for reimbursement of extra per unit generation cost.

* *DG: Diesel Generating.*

- The system improvement scheme for the construction of 33/11 KV 2x1 MVA sub-station at Bharmour sanctioned (July 2002) by the Board at a cost of Rs. 1.45 crore with gross return of 5.5 *per cent* was not viable as according to the REC norms, the gross return should be 12 *per cent*. For implementation of the scheme, the State Government provided (July 2004 and April 2005) the funds under the TSP. Due to inclusion of civil works in the scope and delay in execution for want of funds, the work was completed (August 2007) at a cost of Rs. 2.59 crore. The Board invested Rs 1.14 crore from its own resources though the scheme was not viable even at the original cost of Rs. 1.45 crore. The Board had not yet claimed the grant from the State Government under TSP.

After Audit pointed out this fact, the Board stated (September 2008) that the State Government would be approached for reimbursement of expenditure.

RGGVY

3.2.17 The Ministry of Power, GOI sanctioned (April 2005) Rs. 25.02 crore under Rajiv Gandhi Gramin Vidyutikaran Yojna for creation of infrastructure in power sector to supply power to the families who come below poverty line (BPL) category during the tenth plan. The target fixed was to provide electricity to 1,000 BPL families. Out of Rs. 25.02 crore, the Board had received Rs. 7.48 crore (July 2008). The works were yet to start resulting in non-achievement of objectives.

Audit scrutiny of the records relating to execution of three works under this category revealed following:

- There was provision for construction of 1,081.682 Km HT and 1,971.615 Km LT lines in the three works sanctioned in March 2007 (one work) and March 2008 (two works) in three[&] Circles for Rs. 7.48 crore. The ratio of these lines formulated for these works was calculated at 1:1.82 as against the ideal ratio of 1:1. Inappropriate HT/LT line ratio would result in more power losses. Further, the most of the material for Rs. 2.27 crore in respect of scheme sanctioned in March 2007 had been received but actual execution was awaited (July 2008). The balance amount of Rs. 5.21 crore was lying unutilised with the Board.
- Non-replacement of 59,973 single phase and 2,338 three phase meters in Operation Circle, Solan contributed to energy losses of 205.55 MUs[$] during the last five years ended March 2008. The Board is yet to take up the scheme for replacement of these meters at a cost of Rs. 7.49 crore.

The Board stated (September 2008) that procurement of electronic meters to replace the existing electro mechanical meters was under way.

[&] *Dalhousie, Nahan and Solan*

[$] *59,973 x 48 units x 60 months + 2,338 x 234 x 60 months/10 lakh.*

PMGY

3.2.18 The *Pradhan Mantri Gramodaya Yojna* is intended to provide electrification to backward and tribal areas in the State. The Board took up implementation in three Circles at a cost of Rs. 12.28 crore. The Board so far incurred Rs. 4.14 crore and the work was yet to be completed due to receipt of grant at fag end of the financial year.

Audit scrutiny revealed that there was a shortfall in the construction/augmentation of HT/LT lines and sub-stations to the extent of 424.520 Km and 74 Nos. respectively during the last five years ended March 2008. Audit observed that despite shortfall in achievement of physical targets, 173 service connections were released in excess of provisions. This indicated that maintenance of balance between distribution network and service connections to avoid adverse affect on the system was not kept in view.

Other schemes

3.2.19 In the execution of other schemes, the following points were noticed:

The Board failed to recover Rs. 4.24 crore from the State Government departments for the works executed for them.

- Regulation 8 of the Expenditure Regulations (April 2005) of the HPERC stipulates that the consumer shall deposit 100 *per cent* payment on notice of demand for amount payable before the commencement of the work. Contrary to above provision, five* units of the Board incurred an expenditure of Rs. 4.24 crore between August 2006 and March 2008 on different works without receipt of the amount from the Government departments (consumers) resulting in avoidable utilisation of its own funds as indicated in **Annexure 27**.

Audit scrutiny of physical progress reports of above works revealed that the works at serial Nos. three and five were not completed for want of funds rendering the expenditure of Rs. 1.84 crore already incurred on these works as unfruitful.

The Board stated (September 2008) that matter had been taken up with the authorities and the compliance would be reported as and when the money was received.

- The Board commissioned (May 2006) 33/11 KV, 2x 4 MVA sub-station at Tanda at a cost of Rs. 2.86 crore to meet the growing demand (10 MVA) of Medical Collage, Tanda. Before commissioning of above sub-station, the 33 KV bank of 132 KV sub-station at Kangra from which the supply to proposed sub-station at Tanda was to be made was also augmented from 2x9 MVA to 2x16/20 MVA at a cost of Rs. 1.89 crore. But the augmentation cost of Rs. 86 lakh was not recovered from the Department of Health.

The Board stated (September 2008) that augmentation of Kangra sub-station was carried out primarily to remove the outlived/old transformer units which

* *Chamba, Dharamshala, Keylong, Dalhousie and Rampur.*

were extremely inefficient leading to transformation losses in the system. The reply is not acceptable as in the sanctioned scheme, it was clearly mentioned that 33 KV sub-station was overloaded. Further, if the existing system was sufficient to cater the load of Tanda College as stated in the reply, then what necessitated the Board to add additional capacity of 14/22 MVA was not mentioned.

Reliability and quality of power supply

3.2.20 One of the goals of electrification schemes is to ensure improved quality and reliability of power supply. This encourages usage of energy efficient equipment/appliances and leads to improve the availability of energy. The key performance parameters for quality and reliability are:

- Frequency of feeder tripping;
- Failure rate of Distribution Transformers (DTRs).

In this connection, the following deficiencies were noticed:

Increasing trend in tripping

3.2.21 Despite incurring of an expenditure of Rs. 167.41 crore during 2004-06 in five Circles under different schemes on re-conductoring of HT lines (777.544 Km), LT lines (960.695 Km) and replacement of HT/LT wooden poles (11,459 Nos.), the duration of tripping in these Circles increased from 32.54 to 88.54 *per cent* during 2006-07 with reference to 2004-05 and 29.54 to 723.80 *per cent* with reference to 2005-06 instead of decrease as tabulated below:

Circle	2004-05	2005-06	2006-07	Percentage increase in 2006-07 w.r.t 2004-05	Percentage increase in 2006-07 w.r.t 2005-06
	(Tripping in minutes)				
Shimla	2,77,774	2,91,777	3,77,980	36.07	29.54
Nahan	2,68,179	3,86,452	5,05,619	88.54	30.84
Rampur	45,264	8,354	68,820	52.04	723.80
Kangra	82,944	26,053	1,50,263	81.16	476.76
Mandi	96,909	81,911	1,28,449	32.55	56.82
Kullu	34,173	24,643	19,139	(-)43.99	(-)22.33
Dalhousie	1,79,908	86,442	86,359	(-)52.00	(-)0.10

In Kullu and Dalhousie Circles, there was, however, decreasing trend in tripping. The data relating to tripping in these circles during 2007-08 has not been complied by the Board so far (September 2008). Though the Board noted (February 2008) the considerable slippage in various parameters including tripping as compared to targets, it did not take action to investigate the reasons for frequent cases of tripping and take remedial measures. This

resulted in interrupted supply of power and dissatisfaction among the consumers.

Failure of Distribution Transformers

3.2.22 The Distribution Transformer (DTR) is a key component of the distribution network and its failure not only results in financial loss to the utility but also affects consumer satisfaction due to interruption in power supply. For proper reliability, DTRs failure rate should be of less than 1.5 *per cent*. Against this norm, the rates of DTRs failure ranged between 4.33 and 5.69 *per cent* in the selected districts during 2003-08. The high failure rate of DTRs was due to overloading, improper earthing protection, improper fuses, inadequate preventive maintenance, *etc*.

The Board stated (October 2008) that number of tripping had increased due to expansion of system/feeders, higher failure rate of DTRs was due to topography, atmospheric conditions, fall of trees and flash floods. The reply confirms that there was mismatch in distribution network with reference to connected load.

Thus, excessive tripping and high incidence of failure of DTRs indicated that the reliability of power supplied was low.

Monitoring and Internal control system

Monitoring

3.2.23 Effective periodical monitoring is necessary for efficient and economical execution of schemes. It helps in detecting deficiencies at different stages of execution and taking remedial measures in time. Effective monitoring is possible through strong management information and internal control system.

Audit observed that the Board did not have an effective management information system. It had not prescribed periodical returns to monitor execution of various schemes at different stages. As a result, the deficiencies were noticed resulting in non-deriving of envisaged benefits which remained unnoticed/unaddressed as discussed in the above paragraphs.

Audit observed that while executing APDRP schemes, the Board failed to monitor properly resulting in non-achievement of desired benefits as detailed below:

- In two schemes sanctioned (January and April 2004) for Operation Circles Kullu and Dalhousie, the anticipated reduction in energy losses of 20.335 MUs *per annum*, was not achieved even after incurring an expenditure of Rs. 15.17 crore on augmentation of lines, sub-stations and replacement of meters during 2003-07. The actual reduction in losses during 2006-07 was 13.830 MUs. Audit observed that the main reason for shortfall of 6.505 MUs in achievement was due to non-replacement of 224 Km old, damaged and outlived service wires

and non-reconductoring of 113 Km LT lines costing Rs. 36.96 lakh and Rs. 1.37 crore respectively.

The Board stated (September 2008) that target could not be achieved within the stipulated period due to non-operation of RE schemes. The reply is not in conformity with the fact that these targets were covered under APDRP scheme and not under RE schemes as stated in the reply.

- In Rampur Circle, the energy losses increased from 24.77 *per cent* (2003-04) to 38.96 *per cent* (2007-08) despite incurring of an expenditure of Rs. 11.36 crore on re-conductoring of HT/LT lines, replacement of meters and service wire. The Board had not investigated the reasons for excessive losses. Thus, instead of reduction of 1.75 *per cent* losses per year envisaged in the scheme, the losses had gone up by 14.19 *per cent*. This resulted in potential loss of Rs. 11.38 crore to the Board on account of excessive losses to the extent of 38.58 MUs during the period April 2005 to March 2008.
- In four[$] Circles, the Board had incurred an expenditure of Rs. 116.80 crore during 2003-07 on the re-conductoring of 342.216 Km HT lines, 432.122 Km LT Lines, installation of 57,006 electronic meters, replacement of 802.575 Km service wire and other works. The average sub-transmission and distribution losses in respect of 99 feeders in these Circles were, however, 7.13 to 10.61 and 10.44 to 27.17 *per cent* as compared to the limit of 4 and 7.5 *per cent* respectively fixed by the CEA. Higher losses resulted in potential loss of 73.164 MUs during February 2005 to May 2007. The Board had not investigated the reasons for higher losses for taking remedial measures.

Internal Control

3.2.24 Internal control is an important management tool which provides reasonable assurance that objectives/targets are achieved in an efficient, economical and orderly manner and rules and procedures are complied with. The following deficiencies were noticed in the internal control system in execution of various schemes:

- The Board did not have a system to ensure timely execution of schemes/works and to restrict the actual expenditure to the extent of budget provision.
- The Board had not evolved an effective system to monitor the allotment of requisite funds to different schemes, ensure achievement of envisaged results and avoid cost overrun.
- The Board had not issued instructions to the field units to follow the norms/guidelines of the CEA for formulation and implementation of schemes.

[$] *Kullu, Dalhousie, Kangra and Una.*

Internal audit system

3.2.25 The Board has its own Internal Audit Wing headed by the Chief Auditor under the control of Member (Finance). The Works Audit group is responsible for conducting test audit of transactions affecting all accounts except consumers' accounts. As against 147 annually auditable units, the Works Audit group audited only 41 units during 2007-08. Audit scrutiny of Internal Audit Reports of 11 divisions for 2004-07 revealed that the reports did not contain any major observation on execution of the various schemes. General comments on procurement of material, theft of material, line losses, excess booking of material and awarding of higher rates were, however, included in the reports. This indicated that adequate importance was not given to cover execution of various schemes though the Board was incurring huge expenditure on this activity.

Non-appraisal of performance

3.2.26 The Board had no system of performance appraisal after completion of schemes with a view to assess the fulfillment of targets/benefits as envisaged in the schemes. It was not ascertained whether the desired results were actually obtained or not for taking remedial measures in preparation and implementation of the schemes in future.

The Board further stated that the system of performance appraisal had been introduced in a limited way.

Audit evaluated the growth in the distribution network with connected load, the distribution system and sub-transmission and distribution level and built up *vis-à-vis* power availability during 2003-08 as indicated in the **Annexure 28**. The Annexure indicates that:

- During the last five years ended March 2008, the distribution network did not grow in commensuration with the connected load/load growth as the Board made capacity addition of only 334.797[@] MVA to the system to meet with the load growth of 1,183.066[@] MW.

The Board stated (September 2008) that the demand factor in respect of consumers drawing power at 11 KV or low voltage was on an average below 20 *per cent.* Thus, the net load growth of 334.797 MVA commensurated with the connected load growth. As the Board had no safety factor in the event of drawal of full load by the consumers and the Board could not also deny the

[@] *1,527.910 MVA-1,193.113=334.797 MVA; 4,131.395 MW-2,948.329 MW=1,183.066 MW.*

drawal of load over and above the anticipated demand factor of 20 *per cent*, the reply is only a presumption.

As against the ideal ratio of 1:1, the ratio of HT/LT lines of the Board was 1:1.92.

- As against the ideal ratio of 1:1 of HT/LT lines recommended (July 1987) by the National Council of Power Utilities to avoid distribution of energy at lower voltage as it results in higher energy losses, the HT/LT lines ratio of the Board as a whole was 1:1.92 at the end of March 2008. The HT/LT lines ratio in Bilaspur and Mandi Circles at the end of March 2008 was 1:2.53 and 1:2.34 respectively.

The Board stated (September 2008) that the national standard of 1:1 ratio could not be followed in the State as most of the population lived in rural areas, having different topography. It was further stated that the Board had already decided to go ahead with the job of HVDS scheme which aimed at reducing the existing HT/LT ratio which would reduce the overall T&D losses in the next three to five years.

During 2003-06, T&D losses of the Board were more than the limit fixed by the HPERC to the extent of 231.53 MUs.

- The T&D losses for sale of power within the State ranged between 20.02 and 24.15 *per cent* during the last three years ended March 2006, which were higher in comparison to the limit fixed by the HPERC for this period. The excess T&D losses worked out to 231.53 MUs. In 2006-07 and 2007-08, the T&D losses were, however, 15.49 and 15.62 *per cent* respectively as against the limit of 18.5 and 17.5 *per cent* fixed by the HPERC. This was due to strengthening of sub-transmission and distribution system under APDRP and other schemes.

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Conclusion

The Board failed to complete various system improvement schemes within the stipulated period. There were deficiencies in formulation of schemes and considerable delays in execution resulting in cost overrun, unproductive expenditure and non-accrual of envisaged benefits. The Board failed to fully electrify rural/tribal/backward areas identified for electrification. Effective monitoring system for watching progress of implementation of schemes was absent. The system of performance appraisal for assessing fulfillment of the objectives of the executed schemes was not in place.

Recommendations

The Board needs to:

- **Streamline the system of formulation of schemes and procedure for implementation to ensure that the schemes are completed within the stipulated period;**
- **Periodically review physical and financial progress of incomplete schemes for remedial action;**
- **Ensure synchronisation of the line work and construction of sub-stations; and**
- **Put in place the system of performance appraisal of the schemes to assess their impact and utilise the feed back for preparation of schemes in future.**