

Uttar Haryana Bijli Vitran Nigam Limited and Dakshin Haryana Bijli Vitran Nigam Limited

2.2 Erection, augmentation and maintenance of high tension/low tension lines and sub-stations

Highlights

The companies did not prepare any time bound plan to achieve the targeted low tension/high tension line length ratio of 1:1. The companies failed to achieve growth of distribution network in commensuration with connected load with the result that there was overloading on the existing system and excessive energy losses. During 2000-05, the overall distribution loss in excess of norms prescribed by Central Electricity Authority was 19,342.29 MUs valued at Rs. 4,784.71 crore.

(Paragraph 2.2.7)

The companies failed to achieve the norms of 11.50 per cent sub transmission and distribution losses fixed by Central Electricity Authority, through augmentation of their networks. The companies had to forgo the envisaged benefits of reduction in energy losses due to delays in completion of 52 system improvement schemes at an estimated cost of Rs. 598.46 crore during 1999-2003, which were scheduled to be completed by March 2005. Physical progress in execution of these schemes ranged between three and 87 per cent by the completion date.

(Paragraphs 2.2.7, 2.2.10 and 2.2.11)

The companies failed to derive envisaged benefit of reduction in energy loss of 16.65 MUs valuing Rs. 4.88 crore due to delay in construction of 33 KV sub-stations and underutilization of 33 KV sub-stations.

(Paragraphs 2.2.13, 2.2.14 and 2.2.15)

The objective behind resorting to turnkey construction of 11 KV HT feeders was not fully achieved as the works were not completed within time schedule due to deficient planning and non-synchronisation of various components of the schemes. Resultantly the companies could not derive the envisaged benefit of reduction in energy losses of 17.13 MUs valuing Rs 5.02 crore on 53 feeders test checked in audit.

(Paragraph 2.2.17)

Due to installation of defective low tension capacitors (Rs. 7.15 crore), the companies could not derive envisaged benefits of reduction in energy loss of 29.2 MUs valuing Rs. 8.56 crore.

(Paragraph 2.2.19)

Delayed/non completion of augmentation schemes coupled with deficient maintenance contributed to higher transformer damages than the norms during 2002-05 and consequent financial burden of Rs.32.74 crore on repair of damaged transformers.

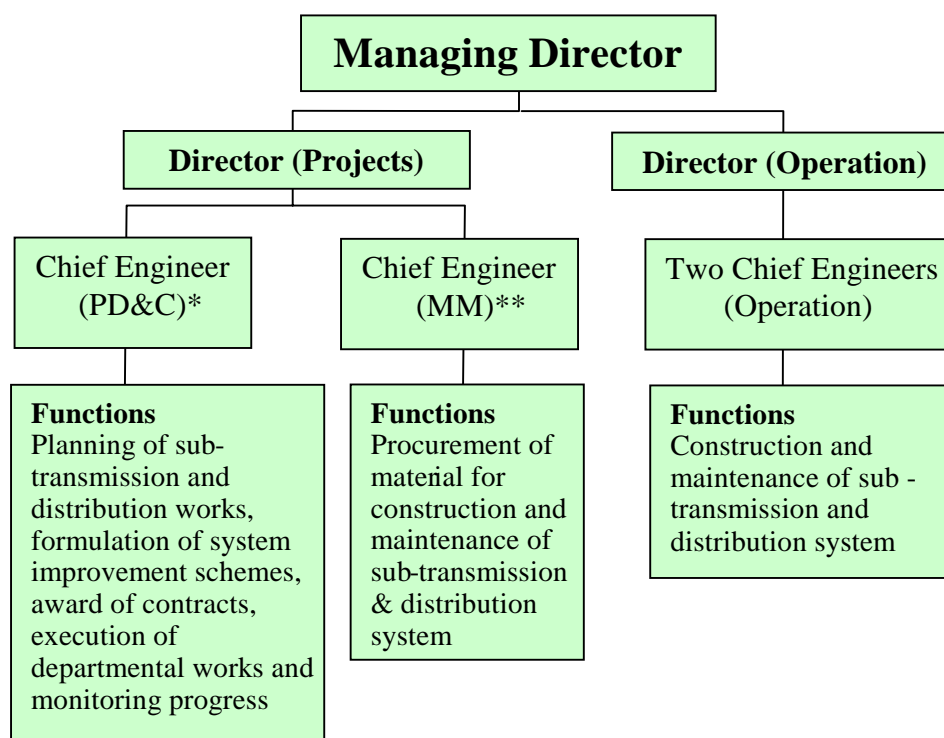
(Paragraph 2.2.20)

The companies consumed material valuing Rs. 2.77 crore for maintenance of sub-stations and lines during 2001-04 in excess of the norms.

(Paragraph 2.2.21)

Introduction

2.2.1 Haryana Vidyut Prasaran Nigam Limited (HVPNL) controls the transmission and sub-transmission system of 220 KV, 132 KV and 66 KV (including 33 KV sub-stations located in these sub-stations) in the State. Uttar Haryana Bijli Vitran Nigam Limited (UHBVNL) and Dakshin Haryana Bijli Vitran Nigam Limited (DHBVNL) control the sub-transmission and distribution system of 33 KV and below for distribution of power in northern and southern parts of the State, respectively. Organisational set-up for erection, augmentation and maintenance of HT/LT[#] lines and sub-stations in UHBVNL/DHBVNL is given below:



High Tension/Low Tension

* Planning, Design and Construction.

** Material Management.

There were nine (UHBVNL: four, DHBVNL: five) construction divisions as on 31 March 2005 for construction activity. For maintenance of sub-stations and lines, there were 26 operation divisions under seven circles in UHBVNL and 23 operation divisions under six circles in DHVBNL.

Scope of Audit

2.2.2 Construction of transmission lines and sub-stations in the erstwhile Haryana State Electricity Board was last reviewed in the Report of Comptroller and Auditor General of India for the year 1985-86 (Commercial), Government of Haryana. Recommendations of the Committee on Public Undertakings (COPU) are contained in their 34th report presented to the State Legislature on 12 March 1993.

The present review conducted during November 2004 to March 2005 covers the erection and maintenance of 33 KV sub-stations and HT/LT lines under the control of UHBVNL and DHBVNL through scrutiny of plan proposals, formulation and implementation of system improvement schemes, execution of works and maintenance of distribution system.

Records of Chief Engineer (PD&C) at headquarters of each company, six* out of nine construction divisions, two[§] out of four Chief Engineers (Operation) and six* out of thirteen operation circles for the years 2000-05 were test checked in audit on the basis of quantum of work involved in the field offices of both the companies.

Audit findings were reported (May 2005) to the Government/companies and discussed at a meeting of the Audit Review Committee for State Public Sector Enterprises (ARCPSE) held on 30 August 2005, which was attended by Director (Finance) and Director (Project) of UHBVNL and Chief Auditor of DHBVNL. Viewpoint of the management was taken into account before finalising the review.

Audit objectives

2.2.3 Improvement of existing sub-transmission and distribution system is required for better services, quality and reduction in energy losses. The audit objectives of the review were to ascertain whether:

- the companies had prepared a time bound plan to bring down the LT/HT line length ratio to the desired level of 1:1 and to what extent the high distribution losses and damage to distribution transformer due to over loading could be arrested;

* Ambala, Yamuna Nagar and Sonapat (UHBVNL); Hisar, Sirsa and Gurgaon (DHBVNL)

§ Panchkula (UHBVNL) and Hisar (DHBVNL)

- the companies were geared to augmenting their sub-transmission and distribution system with the objective of reducing the energy losses to the target of 11.5 *per cent* and to what extent the companies could achieve the target;
- growth of sub-transmission and distribution system was adequate to cope with the increased demand load;
- system improvement schemes were efficiently planned and effectively executed to generate the targeted benefits
- contracts on turnkey basis were efficiently planned, awarded and completed in time; and
- maintenance of sub-stations, lines and local distribution system was adequate.

Audit criteria

2.2.4 The following audit criteria were adopted:

- adequacy of sub transmission and distribution system in relation to power supply;
- achievement of targets fixed in system improvement schemes for their completion and deriving envisaged benefits;
- adherence to time schedule for completion of works awarded on turnkey basis as well as departmentally;
- sub-transmission and distribution system was maintained as per maintenance guidelines; and
- compliance of norms/guidelines of Government of India/State Government/Central Electricity Authority (CEA) and National Council of Power Utilities.

Audit methodology

2.2.5 Audit followed the following methodologies:

- analysis of basic data on sub-transmission and distribution system with reference to the norms and increasing demand of power;
- examination of records relating to system improvement schemes and their progress with reference to scheduled and actual time of completion; and
- analysis of data on damaged transformers with reference to the norms.

Audit findings***Errection and augmentation of sub-transmission and distribution system***

2.2.6 The companies procure power from HVPNL for supply to consumers through their sub-transmission and distribution network of 33KV and below. Performance of the companies covering audit objectives is discussed in the succeeding paragraphs.

Growth and adequacy of distribution system

2.2.7 The table below indicates the distribution system built-up vis-à-vis power availability during 2000-05:

Particulars	2000-01	2001-02	2002-03	2003-04	2004-05 (Provisional)
Uttar Haryana Bijli Nigam Limited					
Units available for sale (MUs)	7,580.23	8,521.87	9,322.76	10,084.46	10,231.20
Units sold (MUs)	5,211.99	5,482.83	6,058.37	6,821.20	7,060.87
Distribution losses (MUs)	2,368.24	3,039.04	3,264.39	3,263.26	3,170.33
Percentage of distribution loss	31.24	35.66	35.01	32.36	30.99
Total length of 440 Volt LT lines (Km)	59,257	58,816	59,239	59,825	60,368
Total length of 11 KV HT lines (Km)	28,745	29,919	30,786	31,563	32,737
Ratio of LT/HT lines	2.06:1	1.97:1	1.92:1	1.90:1	1:84:1
Installed capacity of distribution transformers (MVA)	4,584	4,885	5,098	5,378	5,822
Connected load (MVA)	4,662	4,982	5,187	5,439	5,760
(MW)	3,963	4,235	4,409	4,623	4,896
Dakshin Haryna Bijli Nigam Limited					
Units available for sale (MUs)	7,222.00	7,785.87	8,744.63	9,453.40	10,038.42
Units sold (MUs)	4,894.00	5,149.76	5,682.24	6,301.57	6,746.47
Distribution losses (MUs)	2,328.00	2,636.11	3,062.39	3,151.83	3,291.95
Percentage of distribution loss	32.23	33.86	35.02	33.34	32.79
Total length of 440 Volt LT lines (Km)	47,960	48,320	48,456	48,730	48,832
Total length of 11 KV HT lines (Km)	27,856	28,328	28,943	29,451	29,967
Ratio of LT/HT lines	1.72:1	1.71:1	1.67:1	1.65:1	1:63:1
Installed capacity of distribution transformers (MVA)	3,412	3,590	3,842	4,204	4,525
Connected load (MVA)	4,392	4,694	4,927	5,336	5,768
(MW)	3,733	3,990	4,188	4,536	4,903

The above table shows that the distribution network in both the companies did not grow in commensuration with connected load. Audit noticed the following points in this regard:

Failure to install distribution transformers in proportion to connected load resulted in higher distribution losses.

- Distribution transformation capacity should not be less than the connected load. The capacity of distribution transformers was, however, less than the connected load in both the companies. In UHBVNL, the capacity of distribution transformers (DTs) per MVA of connected load ranged between 0.98 and 0.99 during 2000-04 and in DHBVNL, it ranged between 0.76 and 0.79 during 2000-05.
- The National Council of Power Utilities had recommended (July 1987) bringing down the LT/HT line length ratio to 1:1 as distribution of energy at lower voltage results in higher energy loss. The companies, however, did not prepare any time bound plan to achieve this ratio. In UHBVNL, the ratio during 2000-05 ranged between 1.84:1 and 2.06:1 and in DHBVNL it ranged between 1.63:1 and 1.72:1 during the same period. This resulted in higher distribution losses and excessive damage to distribution transformers due to overloading of the existing system as discussed in paragraph 2.2.20.

While admitting the facts, UHBVNL stated (August 2005) that with the addition of more HT lines and conversion of LT to HT lines, the ratio would be brought down to 1:1 in the next few years. DHBVNL stated (August 2005) that the ratio had been brought down after sustained efforts. The fact, however, remains that the companies failed to prepare any time bound plan to achieve the target.

Distribution losses exceeded the norms of 11.5 per cent fixed by CEA and caused revenue loss of Rs. 4,784.71 crore.

- Against the norms of maximum sub-transmission and distribution losses of 11.5 per cent as fixed by CEA, the actual losses ranged between 30.99 and 35.66 per cent in UHBVNL and 32.33 to 35.02 per cent in DHBVNL respectively during 2000-05. Resultantly, the companies suffered loss of Rs. 4,784.71 crore (UHBVNL: Rs. 2,234.06 crore, DHBVNL: Rs. 2,550.65 crore) on excessive energy loss of 19,342.29 MUs (UHBVNL: 9,845.11 MUs; DHBVNL: 9,497.18 MUs) during these years. Distribution losses on account of inadequate HT/LT lines had not been worked out by the companies separately.

A general review of feeder wise energy audit reports of operation circles of UHBVNL revealed that the extent of distribution losses on 379 (out of 1,662) feeders during March 2004 ranged between 30 and 40 per cent (175 feeders); 40 and 50 per cent (84 feeders) and above 50 per cent (120 feeders). In DHBVNL, the extent of distribution losses on 591 (out of 1,636) feeders during March 2004 ranged between 25 and 35 per cent (210 feeders); 35 and 50 per cent (211 feeders), 50 and 75 per cent (152 feeders) and above 75 per cent (18 feeders).

The companies stated (August 2005) that bifurcation/trifurcation of heavily loaded feeders, renovation/replacement of obsolete transformers having higher

energy losses and augmentation of conductors had been taken up to bring system losses within permissible limits.

Targets and achievements

Shortfall in construction of new sub-stations was 27 to 92 per cent.

2.2.8 Targets are fixed on the basis of techno-economic feasibility and accordingly the funds are arranged from funding agencies. Physical and financial targets vis-à-vis achievements in construction of 33 KV sub-stations and lines during 2000-05 in UHBVNL and DHBVNL are given in **Annexure-9**. It is seen from the Annexure that the companies did not come up with new sub-stations as per targets during 2000-05 (except for UHBVNL in 2004-05). The shortfall was 27 to 76 per cent (UHBVNL) and 45 to 92 per cent (DHBVNL) during these years.

The companies failed to achieve the targeted capacity of existing sub-stations. As against the targeted capacity augmentation by 324 MVA, UHBVNL could achieve 255 MVA of capacity leading to overall shortfall of 21 per cent. Similarly as against the targeted capacity to augment 281.10 MVA, DHBVNL could augment 241.50 MVA of existing capacity with overall shortage of 14 per cent.

The companies also did not achieve the targets set for construction of 33 KV lines. The shortfall was nine to 14 per cent in UHBVNL and 40 to 81 per cent in DHBVNL.

The companies stated (August 2005) that the shortfall in construction of new sub-stations and lines was due to delay in completion of civil works, delay in approval for railway crossing and non-availability of right of way for erecting lines. Further, augmentation of sub-stations was delayed due to non-availability of matching equipment, deficient manpower and special tools and plants. The reply is not tenable as the companies should have taken care of such problems in advance by better planning and coordination.

System improvement schemes

2.2.9 In order to minimise energy losses and to meet further load growth of the area, the companies evolved “System Improvement Schemes”, which consisted of the following works:

- Construction/augmentation of 33 KV sub-stations and 33 KV lines;
- Construction of 11 KV HT lines for bifurcation/trifurcation of heavily loaded HT feeders;
- Installation of distribution transformers of 25 KVA, 63 KVA, 100 KVA and 200 KVA; and
- Construction/augmentation of LT lines.

Formulation of schemes

2.2.10 The companies formulated 52 (UHBVNL: 33 DHBVNL: 19) system improvement schemes at an estimated cost of Rs. 598.46 crore (UHBVNL: Rs. 274.95 crore and DHBVNL: Rs. 323.51 crore) during 1999-2003, which were scheduled to be implemented during 2002-05. On completion, these schemes were aimed at achieving annual savings in energy losses of 665.78 MUs (UHBVNL: 299.67 MUs and DHBVNL: 366.11 MUs) valued at Rs. 202.13 crore (UHBVNL: Rs. 104.61 crore and DHBVNL: Rs. 97.52 crore).

Rural Electrification Corporation (REC), National Bank for Agriculture and Rural Development (NABARD), Power Finance Corporation (PFC), National Capital Region Planning Board (NCRPB), Accelerated Power Development and Reforms Programmes (APDRP) and GOI sanctioned loan assistance of Rs. 577.43 crore (UHBVNL: Rs. 267.35 crore and DHBVNL: Rs. 310.08 crore) for financing these schemes during 1999-2003. Details of loan sanctioned and drawn up to March 2005 against these schemes are given below:

Source of finance	Number of schemes	Year of sanction	Estimated cost (Rupees in crore)	Projected annual savings		Loan		Percentage of funds drawn
				Energy (MU)	Amount (Rupees in crore)	Sanctioned	Drawn	
(Rupees in crore)								
A. Uttar Haryana Bijli Vitran Nigam Limited								
REC	21	1999-2002	33.10	26.78	7.84	33.10	22.66	68
NABARD	2	2001-03	27.35	16.35	4.79	22.53	16.54	73
NCRPB	1	2001-02	11.11	2.07	0.61	8.33	4.67	56
APDRP/ PFC/ GOI	9	2002-03	203.39	254.48	91.37	203.39	125.72	62
Total A	33		274.95	299.68	104.61	267.35	169.59	63
B. Dakshin Haryana Bijli Vitran Nigam Limited								
REC	7	1999-2002	15.15	15.16	4.44	15.15	10.05	66
NABARD	2	2001-03	18.18	20.09	5.89	14.79	8.02	54
NCRPB	1	2002-03	40.16	20.79	6.82	30.12	25.00	83
APDRP/ PFC/ GOI	9	2002-03	250.02	310.06	80.37	250.02	125.56	50
Total B	19		323.51	366.10	97.52	310.08	168.63	54
Total (A+B)	52		598.46	665.78	202.13	577.43	338.22	58

The above table shows that actual amount drawn up to March 2005 by UHBVNL was Rs. 169.59 crore (63 per cent) of the sanctioned loan of Rs. 267.35 crore and by DHBVNL Rs. 168.63 crore (54 per cent) of the total sanctioned loan of Rs. 310.08 crore. The shortfall in drawl was attributable to slow progress of work as discussed in paragraphs 2.2.13 and 2.2.17.

Execution of system improvement schemes

2.2.11 The economic viability of the schemes i.e deriving benefit of reduction in energy losses depends on linking of LT lines with the installation of distribution transformers, HT lines and sub-stations. Volume of work to be executed and actually executed by companies up to March 2005 in respect of the 52 schemes sanctioned by REC/NABARD/PFC/NCRPB during 2000-05 and scheduled to be completed by March 2005 is given below:

Source of funds (No. of schemes)	Progress	33 KV sub-stations		11 KV line		11 KV feeders		Distribution transformers (Nos)	LT lines	
		New (Nos.)	Augmen-tation (Nos.)	New	Augmen-tation	New	Augmen-tation		New	Augmen-tation
UHBVNL										
REC (21)	Target	14	-	614.35	294.23	-	-	698	258.56	364.67
	Actual	14	-	300.31	218.78	-	-	344	17.18	56.58
NABARD (2)	Target	4	-	677.56	307.30	-	-	835	241.88	164.91
	Actual	3	-	403.80	224.20	-	-	525	31.07	68.27
NCRPB (1)	Target	3	6	65.35	79.53	-	-	60	23.00	35.16
	Actual	1	4	16.05	Nil	-	-	9	3.55	-
APDRP (9)	Target	12	15	967.46	819.64	-	-	2270	621.33	446.89
	Actual	7	13	585.03	438.32	-	-	1193	124.12	143.50
Total (33)	Target	33	21	2324.72	1500.70	-	-	3863	1144.77	1011.63
	Actual	25	17	1305.19	881.30	-	-	2071	175.92	268.35
Per cent achievement		76	81	56	59			54	15	27
DHBVNL										
REC (7)	Target	4	-	-	221.61	16	-	323	42.10	30.65
	Actual	4	-	-	-	12	-	-	-	-
NABARD (2)	Target	2	1	-	-	31	-	117	69.75	55.00
	Actual	2	1	-	-	23	-	-	-	-
NCRPB (1)	Target	-	-	-	175.00	40	-	790	220.00	125.00
	Actual	-	-	-	111.00	31	-	223	-	-
APDRP (9)	Target	9	30	83.50	2808.00	48	100	146	32.47	70.00
	Actual	7	19	20.30	527.50	37	Nil	142	11.50	17.00
Total (19)	Target	15	31	83.50	3204.61	135	100	1376	364.32	280.65
	Actual	13	20	20.30	638.50	103	Nil	365	11.50	17.00
Per cent achievement		87	65	24	20	76	Nil	27	3	6

Though progress in construction/augmentation of 33 KV sub-stations in both the companies was 76 and 87 per cent respectively, progress in related works ranged between three and 76 per cent.

Audit observed that in UHBVNL though the scheme period expired in March 2005, progress in construction/augmentation of 33 KV sub-stations was 76 and 81 per cent respectively whereas progress in execution of related works was 56 and 59 per cent respectively in construction and augmentation of HT lines, 54 per cent in installation of distribution transformers; 15 and 27 per cent in construction/augmentation of LT lines.

In DHBVNL, though progress in construction of 33 KV sub-stations was 87 per cent, progress in execution of related works was 76 per cent in construction of HT lines, 27 per cent in installation of distribution

transformers, three and six *per cent* in construction & augmentation of LT lines, respectively.

As a result of delay in execution of schemes, the companies could not derive the envisaged benefit of reduction in energy losses. Besides, the companies could not achieve the objective of providing reliable and quality power to consumers as higher incidence of damage to distribution transformers and frequent interruptions persisted.

Audit further observed that:

- In UHBVNL, against eight schemes (REC: seven and NABARD: one) scheduled to be completed by March 2003 (REC) and March 2004 (NABARD), HT feeders were energised on turnkey basis during February 2002 to July 2004 at a cost of Rs 10.64 crore, but as of March 2005, progress in execution of related works of DTs and LT lines to be executed departmentally varied between seven and 56 *per cent*. The delay was due to non-synchronisation of HT works executed on turnkey basis with related works of installation of DTs and LT lines at the time of planning and execution of the schemes. This resulted in non realisation of full envisaged annual benefit of saving 23.70 MUs valuing Rs 6.94 crore.

UHBVNL stated (August 2005) that delay in completion of related works was due to non-availability of matching material and shortage of staff. But the fact remains that better planning and timely action for critical activities could overcome the delays.

- NABARD sanctioned (November 2001) a scheme to DHBVNL for Rs. 7.70 crore for rehabilitation of 19 heavily overloaded HT feeders under operation circle/Gurgaon (seven feeders) and Narnaul (12 feeders). The scheme was to be completed by March 2004. Though the work of 15 feeders was got done on turnkey basis, work of rehabilitation of four* feeders at an estimated cost of Rs. 1.33 crore to be executed departmentally had not been taken up so far (March 2005). Due to non-execution of work of these feeders, the Company could not avail annual benefit of anticipated savings in energy losses of 15.34** LUs (value: Rs. 44.95 lakh) during 2004-05.

DHBVNL stated (August 2005) that the work on the feeders could not be taken up due to feeding constraints (Wazirabad), railway line crossing (Khandora) and right of way problem (Sarai and Mushedpur) and works are likely to be completed by March 2006. But the fact remains that better planning and timely action for critical activities could overcome the delays.

- In NABARD schemes, DHBVNL did not take up work of rehabilitation of three 11 KV feeders involving estimated cost of

* Wazirabad, Mushedpur, Sarai and Khandora.

** Does not include energy loss of Khandora feeder (estimated cost Rs. 64.28 lakh) for which details were not supplied.

Rs 3.04 crore on the ground of outstanding amount against defaulting consumers in the area. Dropping of works on this ground was not justified as amount of default was required to be recovered as per procedure prescribed in sales manual. Rehabilitation of these feeders was in the interest of the Company because of high voltage drop, distribution losses and damage rate of DTs.

- DHBVNL though got sanctioned a scheme from NCRPB in March 2002 for completion in two years, it finalised contracts for construction of nine feeders only in January 2004 after a period of 20 months with completion schedule up to September 2004. As a result of delay in tendering for construction of these feeders, the Company could not avail benefits of anticipated savings in energy losses of 3.18 MUs (value: Rs. 1.04 crore) during April to September 2004.

Non-formulation of system improvement schemes for overloaded feeders

2.2.12 The Financial Commissioner to the State Government (Power department) directed (August 2001) both the companies to bifurcate the 11 KV feeders immediately wherever the load was more than 200 amperes and restrict load on these feeders to 100 amperes only so as to reduce number of trippings, line losses and improve the quality of power.

Records maintained in planning wing of HVPNL revealed that in UHBVNL, maximum demand during 2003-04 on 167 feeders of 11 KV (out of 1,662) ranged between 220 and 480 amperes and energy losses on these feeders ranged between 20 and 74 *per cent* against the norms of seven *per cent* fixed by CEA.

In DHBVNL, maximum demand during 2003-04 on 105 feeders (out of 1,636) ranged between 210 and 400 amperes and energy losses on these feeders were also higher between 20 and 78 *per cent*.

Audit observed that there was no system at headquarters of the utilities for identifying overloaded feeders to formulate system improvement schemes to bring the current load within permissible limits.

In violation of the directions of the State Government the companies did not prepare any system improvement scheme for 272 feeders though the load was substantially higher than the permissible limits.

Erection of sub-stations and lines

2.2.13 For improvement of sub-transmission system, UHBVNL awarded (July 2002 to July 2003) five turnkey contracts for construction of 19 new sub-stations of 33 KV and associated 33 KV lines at aggregated cost of Rs. 17.71 crore with completion period of nine months. The works were to be completed between April 2003 to April 2004. Similarly, DHBVNL awarded (August 2002 to January 2004) six contracts at aggregated cost of Rs.13.70 crore for erection of 18 new sub-stations of 33 KV and associated 33 KV lines. The works were to be completed between May 2003 and August 2004. As per the terms of the contracts, UHBVNL/DHBVNL were responsible for construction of civil works for control room buildings, plinths for power transformers, etc.

Details of commissioning of sub-stations and related lines are depicted in **Annexure-10**. It is seen from the Annexure that all the 19 sub-stations of UHBVNL were delayed by 18 to 321 days.

Similarly, in DHBVNL, out of 18 sub-stations, five sub-stations were commissioned in time, nine were commissioned with delays ranging from 49 to 745 days and works in respect of remaining four sub-stations were in progress (March 2005).

Neither of the companies could derive envisaged benefits of loss reduction of 14.58 MUs (value: Rs 4.27 crore) due to delayed construction of 33 KV works.

Due to delay in commissioning of sub-stations, UHBVNL and DHBVNL were deprived of the benefits of 3.46 MUs (value: Rs. 1.01 crore) and 11.12 MUs (value: Rs. 3.26 crore) respectively in saving of energy losses. Besides, consumers also suffered due to low voltage and short availability of power.

The companies stated (August 2005) that reasons of delays in completion of works were non receipt of possession of land, delay in completion of civil works due to shortage of cement and steel, delayed approval of railway crossing from railway authorities, construction of 33 KV bays and augmentation of power transformers to feed the proposed 33 KV sub-stations from existing 66/132/220 KV sub-stations by HVPNL and right of way problem. The reply is not tenable because better planning and timely action for critical activities could overcome the delays.

Under utilisation of 33 KV sub-stations due to defective planning

2.2.14 Under a scheme financed by NABARD, DHBVNL departmentally constructed and commissioned 33 KV sub-station at Kharian under operation circle, Sirsa in May 2004 with one 5 MVA transformer at a cost of Rs. 60.34 lakh. The sub-station was being fed from 132 KV sub-station, Odhan on a newly constructed 33 KV line constructed at a cost of Rs. 51.52 lakh.

After commissioning of the sub-station in May 2004, the Executive Engineer, construction division, Sirsa observed (October 2004) that the 132 KV feeding sub-station, Odhan was over loaded with connected load of 36 MVA against the installed capacity of 16/20 MVA only.

Pending augmentation of 132 KV sub-station, Odhan, the sub-station was fed from existing 132 KV sub-station Dabwali by erecting a four Km long 33 KV T-Off* link line from 33 KV Odhan-Kharian line.

Audit observed that due to feeding constraints, only one 11 KV feeder (out of proposed four feeders) was put on load and the maximum demand recorded on 33 KV sub-station, Kharian ranged between 0.95 MVA and 2.66 MVA during June 2004 to March 2005.

33 KV sub-station at Kharian constructed at a cost of Rs. 1.12 crore remained under utilised due to defective planning.

Thus, due to defective planning the installed capacity of 5-MVA transformer and related 33 KV line created at a cost of Rs.1.12 crore remained underutilised during June 2004 to March 2005. Resultantly, the Company

* T-Off means take off arrangement from existing line.

could not derive envisaged benefits of reduction in energy losses of 6.69 LUs (value: Rs. 19.61 lakh).

2.2.15 DHBVNL constructed and commissioned (3 November 2003) 33 KV sub-station, Hansi with transformation capacity of 8 MVA and 33 KV T-Off line from 33 KV Hansi-Barwala line at a cost of Rs. 76.92 lakh. The SE Operation circle, Hisar observed (6 November 2003) that existing 33 KV Hansi-Barwala line could not take the load of 33 KV sub-station, Hansi as augmentation of conductor was not possible because all the areas through which the line was passing were densely populated. The SE's proposal (November 2003) for separate 10 Km 33 KV line from 132 KV sub-station Hansi to feed the above 33 KV sub-station was not materialised (March 2005).

Audit observed that due to feeding constraints, load of only one 11KV feeder (out of 4 feeders proposed to be shifted from 132KV sub station, Hansi) was put on the newly created 33KV sub-station and the maximum demand on the sub-station was 4.01 MVA only up to November 2004.

33 KV sub-station Hansi constructed at a cost of Rs. 76.92 lakh remained under utilised due to feeding constraints.

Thus, due to wrong assessment of feasibility of feeding 33 KV sub-station through 33 KV T-Off line instead of separate 33 KV line from 132 KV sub-station Hansi, investment of Rs.76.92 lakh remained under utilised and the Company could not derive the envisaged benefits of reduction in energy loss of 14.06 LUs (valued: at Rs. 41.20 lakh) per annum since November 2003 due to non shifting of load of remaining three feeders.

DHBVNL stated (August 2005) that the sub station at Hansi would be independently connected from 132 KV sub-station Hansi by creating a separate 33 KV line for which work was in progress. The fact remains that the Company continues incurring loss due to high energy losses.

Non shifting of load of 33 KV sub-station, Behal

2.2.16 33 KV sub-station, Behal under operation circle, Bhiwani having installed capacity of 10 MVA was being fed through 42 km 33KV single circuit line from 132 KV sub-station, Jui. Due to low voltage, the sub-station was upgraded to 132 KV with installed capacity of 32 MVA and commissioned in April 2004 at a cost of Rs. 4.28 crore. As of March 2005, load of 33 KV sub-station, Behal was not shifted to the upgraded 132 KV sub-station at Behal and the Company continued to get supply on both the lines.

Non shifting of load of 33 KV sub-station to the upgraded 132 KV sub-station, Behal resulted in avoidable energy loss of 9.29* LUs valuing Rs. 27.22 lakh.

DHBVNL stated (August 2005) that process of dispensing with 33 KV sub-station was undertaken by its operation wing by creating new 11 KV link lines in phased manner. It further stated that one 5 MVA transformer had been taken out of service and another 5 MVA transformer was in the process of sparing which was held up due to non-availability of material for link lines.

* Worked out on the basis of transmission loss at 4.5 per cent of energy of 206.42 LUs received at 33 KV sub-station, Behal during May 2004 to March 2005.

Erection/augmentation of 11 KV feeders

2.2.17 For bifurcation/trifurcation of existing overloaded feeders and augmentation of conductor, UHBVNL awarded 37 turnkey contracts during September 2001 to November 2003 at an aggregated cost of Rs. 34.41 crore. The works were to be completed within eight months during May 2002 to July 2004.

Similarly, DHBVNL also awarded 43 turnkey contracts during January 2002 to January 2004 at an aggregated cost of Rs. 42.72 crore. The works were to be completed during September 2002 to September 2004. Mode of turnkey contracts was adopted for expeditious execution of works.

Audit observed that out of 254 feeders (UHBVNL: 139 DHBVNL: 115), only 74 feeders (UHBVNL:17 DHBVNL:57) were completed within the time schedule. Of the delayed 180 feeders, delay in 52 feeders ranged between three months to one year (UHBVNL: 21; DHBVNL:9), one to two years (UHBVNL:19) and more than two years (DHBVNL:3). Construction of one feeder of UHBVNL was still (March 2005) in progress even after a delay of over two years. Resultantly, the projected benefit of saving in energy loss of 171.32 LUs (value: Rs. 5.02 crore) on these 53 feeders could not be achieved as detailed in **Annexure 11**. It is seen from the Annexure that delays were mainly on account of:

- Lack of co-ordination between these companies and HVPNL for arranging timely extension of switch house building of 66/132 and 220 KV sub-stations owned and controlled by HVPNL for installation of vacuum circuit breakers (VCBs) and arranging permit to work for energizing new feeders;
- Delay in approval of drawings and providing right of way;
- Delay in obtaining permission for railway crossing lines from railway authorities; and
- Rerouting of lines and change of scope of work due to improper survey before award of contracts.

While admitting the facts, the companies stated (August 2005) that delays occurred due to above reasons during the execution of work and that necessary penalty under relevant clause of contract agreement had been imposed on the firms. The fact, however, remains that there were abnormal delays in execution of works which could have been avoided by better monitoring and coordination and the levy of penalty was not commensurate with the estimated benefits envisaged in the schemes.

Erection of LT lines and installation of distribution transformers

Avoidable expenditure due to double installation of lightning arrestors

2.2.18 Lightning arrestors to protect the equipment from lightning are required to be provided at all sub-stations. Technical specifications of distribution transformers (DTs) of 25 KVA, 63 KVA and 100 KVA, procured by DHBVNL provide that these arrestors (one each for three phases) shall be mounted on the body of the transformer.

The Company awarded (April to December 2004) eight contracts for supply of material/equipment for turnkey construction of HT lines and DTs of 25 and 63 KVA for release of 1,271 tubewell connections.

Double installation of lightning arrestors resulted in avoidable expenditure of Rs. 29.19 lakh.

Audit noticed that despite provision of the arrestors on the DTs, the turnkey contracts, *inter-alia*, included supply and erection of 3,198 lightning arrestors at Rs. 29.19 lakh for installation at HT lines also. As lightning arrestors were already provided on DTs from where tubewell connections were to be released, installation of lightning arrestors on HT lines resulted in avoidable expenditure of Rs. 29.19 lakh. It is pertinent to mention here that UHBVNL had not provided for installation of the arrestors on HT lines against similar contracts for turnkey construction of 11 KV lines.

DHBVNL assured (30 August 2005) that the provision of the arrestors would be withdrawn in future tender enquiries.

Installation of LT capacitor banks

2.2.19 Capacitor banks are installed to minimise reactive* power drawn from the system, improve voltage/power factor of the load and save energy loss.

The companies got sanctioned (July/August 2000) two schemes each from REC for installation of LT capacitors on all the operation circles at estimated cost of 11.20 crore. The schemes envisaged annual reduction in energy loss of 29.2 MUs (value: Rs. 8.56 crore). DHBVNL placed (20 December 2000) a purchase order on GVR Electro Techniques Pvt. Ltd. Secunderabad for supply, installation and commissioning of 79,756 capacitors of 3 KVAR (25,314); 9 KVAR (34,025) and 18 KVAR (20,417) on DTs of all 13 operation circles of the companies at a total cost of Rs. 7.38 crore.

The companies could not derive envisaged benefits of reduction in energy losses of 29.2 MUs (value: Rs. 8.56 crore) on installation of defective LT capacitor banks valuing Rs. 7.15 crore.

Terms and conditions of the purchase order provided that the firm was liable to repair/replace all defects in capacitors noticed within 12 months from the date of their receipt free of cost for which security deposit/bank guarantee was taken from the firm. The firm completed supply of the capacitors up to August 2002, warranty of which expired during August 2003. The firm installed 76,839 capacitors up to October 2003 at a cost of Rs. 7.15 crore.

The Executive Engineer, operation division, Sirsa reported (July 2001) that due to defective design, 382 capacitors installed in operation circle Sirsa got

* Reactive power is part of current flow in the system used by electro-magnetic circuits of motors, transformers etc.

damaged and caused damage to the DTS. A committee of two SEs each of operation and construction circle and other officers of the Company confirmed (July 2001) that there was design defect, which needed rectification. SE (Construction) of the Company further pointed out (November 2001) that all the 817 capacitors (cost: Rs 7.60 lakh) installed by the firm were not in working condition or connected in the circuit.

UHBVNL also observed (November 2004) that a large number of capacitors damaged during warranty period had not been replaced by the firm. This indicates that the performance of the capacitors was not satisfactory. Audit observed that ignoring the defects pointed out by field offices in working of the capacitors and without obtaining report on the capacitors damaged during warranty period from field offices, the Company released (July 2004) Rs.63.98 lakh performance security. Thus, the Company did not utilise the benefit of warranty clause mentioned in the contract. The companies had also not assessed the extent to which benefit of envisaged reduction in energy loss was derived.

In the ARCPSE meeting, Director (Projects) admitted that the companies had not assessed the number of damaged capacitors for their replacement.

Maintenance of sub-stations and lines

Excessive damage of distribution transformers

2.2.20 Mention regarding excessive damage of DTs was made in paragraph 2B.6.1.2 of the Report of the Comptroller and Auditor General of India for the year ended 31 March 2002 (Commercial), Government of Haryana. As against the norm of 10 *per cent* fixed (April 1983) by the erstwhile Board, *percentage* of damage of transformers to the installed transformers exceeded the norms as detailed below:

Year	Average number of transformers installed	Number of transformers damaged	Damage as per norm (Nos)	Damaged in excess of norm (Nos)	Percentage of damaged transformers	Average repair charges per transformer (Rupees)	Expenditure in excess of norms (Rupees in crore)
UHBVNL							
2002-03	69,462	9,721	6,946	2,775	13.99	14,728	4.09
2003-04	73,456	10,817	7,346	3,471	14.73	15,407	5.35
2004-05	79,083	11,433	7,908	3,525	14.46	18,000	6.35
Total							15.79
DHBVNL							
2002-03	51,873	8,619	5,187	3,432	16.62	14,728	5.05
2003-04	56,416	9,102	5,642	3,460	16.13	15,407	5.33
2004-05	61,334	9,783	6,133	3,650	15.95	18,000	6.57
Total							16.95
Grand total							32.74

Companies had to bear financial burden of Rs. 32.74 crore on repair of damaged transformers in excess of norms.

Thus, the companies had to bear heavy financial burden of Rs. 32.74 crore on repair of transformers damaged in excess of the norms during 2002-05.

Audit observed that while damage rate in operation circle Ambala was ranging between 9.14 and 10.40 *per cent* during 2002-05, damage rate in remaining 12 operation circles of UHBVNL and DHBVNL ranged between 10.74 and 20.30 *per cent* during 2002-05.

UHBVNL attributed (August 2005) the excessive damage rate to overloading of transformers due to unauthorised extension of load by agricultural consumers, two phase supply causing imbalance and low system voltage during peak tubewell load months. During ARCPSE meeting, the Director (Project) stated that in order to overcome these problems, the Company was making efforts for separating the agricultural and domestic loads in rural areas. Outcome of these efforts would be awaited in audit.

Excess expenditure on maintenance of 33 KV sub-stations and HT/LT lines

2.2.21 The estimates for repair and maintenance of HT/LT lines and 33 KV sub-stations are prepared and sanctioned every year by field units and provision of material is made in the estimates as per norms laid down in technical instructions keeping in view the length of lines and number of sub-stations.

During test check of records relating to provision and actual consumption of material in maintenance of HT/LT lines and 33 KV sub-stations of operation divisions of UHBVNL. Audit noticed that in respect of 140 works, material valuing Rs. 97.33 lakh was consumed in excess (43.95 *per cent*) of the provision in concerned estimates during 2001-04. Similarly, in DHBVNL material valuing Rs. 1.80 crore in 155 works was consumed in excess (85.56 *per cent*) of norms during the same period.

Despite extra expenditure on maintenance of HT/LT lines and 33 KV sub-stations, quality of maintenance was poor. Annual average number of interruptions per 10 Km due to fault on lines during 2001-04 ranged between 26 and 36 in respect of 33 KV lines and 42 and 50 in respect of 11 KV lines in UHBVNL. Similarly, interruptions per 10 km ranged between 16 and 24 in respect of 33 KV lines and 29 and 37 in respect of 11 KV lines in DHBVNL during the same period.

UHBVNL stated (August 2005) that norms for repair and maintenance were last revised during 1994, and the price index had gone up considerably due to high annual inflation and that the State had to face dust storms/wind storms which were unprecedented and sensitive equipment had to suffer damage for which no provision was made in the estimates and unauthorised extension of load by consumers were the reasons for excessive expenditure. The norms would be revised to make them realistic .

The reply was not tenable because provision of material was made as per norms laid down in the revised (1998) technical instructions in estimates with respect to length of lines and number of sub-stations and separate special estimates were prepared for replacement of equipments damaged during storms/replacement of damaged transformers.

The companies incurred excess expenditure of Rs. 2.77 crore on maintenance of sub-stations and lines.

Conclusion

The companies failed to achieve their targets for erection and augmentation of sub-stations and transmission lines. Delays in implementation of system improvement schemes/works resulted in non-accrual of envisaged benefits through reduction in distribution losses.

Distribution losses were higher than the prescribed norms and the companies suffered considerable financial loss. The maintenance and up keep of distribution transformers was marred by deficiencies, which rendered the transformers susceptible to higher risk of damage.

Recommendations

- **The companies need to take steps for timely implementation of system improvement schemes to bring the energy losses within the prescribed range.**
- **The maintenance and up keep of distribution transformers need to be strengthened in order to avoid damage to these transformers and ensure availability of quality power to consumers.**

The matter was referred to the Government in May 2005; the replies had not been received (August 2005).