

## Financial Losses Due to Higher T&D Losses of HPSEB

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### ABSTRACT

In the present paper, an attempt is made to calculate the financial losses due to higher Transmission and Distribution losses occurring in Himachal Pradesh State Electricity Board (HPSEB). T&D losses above 15 per cent are taken to calculate the revenue losses. What are the weaknesses? What are the deficiencies of the T&D system responsible for revenue losses? Such issues are discussed by the author in the article, on the basis of which some suggestions are given to minimise the T&D losses.

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THE SUREST WAY to ease the power situation in Northern India lies in harnessing the tremendous hydel-potential of Himachal Pradesh estimated around one-fifth of total of country. An effort has been made by the Himachal Pradesh State Electricity Board (HPSEB) which came into existence on 1st day of Sept. 1971, to make master plans of hydro-power development of individual river basins on the basis of available topographical, hydrological and geological data and site inspections of potential projects. Some projects on these basins have already been constructed and some are under construction with Himachal Pradesh and Central Government agencies. A conservative estimate of the total potential of the state could well be pitched at more than 20,000 MW. In spite of harnessing the large hydel potential, HPSEB always remains in the crunch of financial constraints. The reason is that out of the total exploitation of 3333.47 MW, only 277.72 are under the control of HPSEB and the rest is either with the Central Government agencies or with the neighbouring states at the cost of many side effects beared by the state like people uprooting, submergence of valuable forest and agricultural land, soil erosion etc. But it is again a pity that a large part of this available potentiality in the state has gone due to T&D losses.

Financial losses are also being incurred by the HPSEB for supply the electricity to small industries and agricultural pumping supply at unremuneratively low rates. Recently, the Board is supplying power to SSIs upto load of 20 KW at the rate of 70 paise per unit per month for entire consumption. Whereas energy charges for pumping supply and pump house

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lighting are only 30 paise/unit per month for entire consumption.<sup>1</sup> The average hydel power generation cost in the state is about Re. 1. It means the Board is incurring losses of crores of rupees by supplying electricity on much subsidised rates to these industries. Even the Board is also suffering financial losses in domestic supply by not charging the full generation cost. It charges 50 paise/ unit for first 50 KWh, 60 paise/ unit for next 100 KWh and 70 paise/ unit for all above 150 KWh per month.

The transmission and distribution losses comprise technical losses and commercial/ unaccounted losses. The technical losses comprise both avoidable and unavoidable components and are caused by energy dissipation in the conductors and equipments used for transmission and distribution of power. The magnitude of energy dissipation or the unavoidable component of technical losses depends largely on the system configuration, pattern of loading of transmission and distribution lines, magnitude and types of loads, characteristics of equipments etc. The avoidable component is due to weak and inadequate sub-transmission and distribution lines, inadequate sizes of conductors used, lengthy transmission and distribution lines and inadequate reactive compensation in the system. While unavoidable component is inevitable.<sup>2</sup> The avoidable component can be minimised by better design of distribution networks, use of higher voltage levels wherever feasible, relocation of transformers, provision of capacitors, use of higher efficiency equipment etc. However, due to inadequate investment on T&D works and massive programme of rural electrification and pump set energisation, the transmission and distribution system are deteriorating and the effect of system improvement measures wherever taken, is getting nullified due to increase in loads.

### Objectives

The present study is mainly based on two objectives.

- i. To calculate revenue losses due to higher T&D losses.
- ii. To give some suggestions for more effective management to reduce T&D as well as financial losses.

### Research Methodology

The financial losses are calculated on the basis of higher T&D losses as

$$\begin{aligned}
 \text{Total units sold} &= \text{'X' MU} \\
 \text{Actual T\&D losses} &= x\% \\
 \text{i.e. Actual Availability} &= 100 - x\% = y\% \\
 \text{Desirable Availability} &= 85\% \\
 &\text{(i.e. 15\% losses)} \\
 \text{Units gained on 85\% availability} &= \frac{\text{'X' MU} \times 85\%}{y\%} = \text{'Z' MU} \\
 \text{Revenue losses} &= \text{'Z' MU} \times \frac{\text{AR/unit}}{100} \times 10^6
 \end{aligned}$$

Where, AR/unit is Actual Revenue per unit from sale of electricity, which may be calculated as

$$\frac{\text{Actual Revenue from sale of electricity (in Lacs Rs.)}}{\text{Total units sold (in million units)}} = \frac{\text{Actual Revenue from sale of electricity (in Rs.)} \times 10^5}{\text{Total units sold (in units)} \times 10^6}$$

**Revenue Losses due to higher T&D losses**

The transmission and distribution losses of HPSEB are calculated by subtracting the total energy sold (within and outside the state) during the year from the total energy available for sale (i.e. net energy generated + energy purchased). T&D losses are given in percentage in the Table which shows that except 1972-73 and 1973-74, these losses remained between 15 to 22 percent. Only in the very first year of existence of board i.e. in 1972-73, the T&D losses were as low as 9.5 percent. The major losses in all other years that go into account for this large percentage are

- i. Generation losses,
- ii. Transformation losses,
- iii. Transmission losses,
- iv. Distribution losses,
- v. Pilferage

Though these losses with the present technology and available methods can not be completely removed but can be brought down to 15 percent. A national workshop on distribution system jointly sponsored by the Central Board of Irrigation and Power, Central Electricity Authority (CEA), Central Power Research Institute and Rural Electrification Corporation was held at Vigyan Bhawan, New Delhi on 20th and 21st March, 1986 in order to have an indepth discussion on the various factors responsible for the persistingly rising T&D losses and to evolve suitable remedies. The committee has drawn up an action plan to eliminate the pilferage of energy and reduce the T&D losses to the extent possible. They emphasized the need for making all possible efforts to bring down T&D losses to the level of 15 percent.<sup>3</sup> Though some developed countries have less than 10 percent losses, but 15 percent is a respectable as well as achievable figure for India. The area where special emphasis is to be placed i.e. where large savings are possible are transmission, distribution and pilferage.

**Revenue Losses Due to Higher T&D Losses.**

Year	Total Energy Sold (MU)	Total Revenue from sale of Electricity (Lakh Rs.)	T&D Losses (%age)	Higher T&D Losses (%age)	Revenue Losses (Lakh Rs.)
1	2	3	4	5	6
1972-73	317.579	306.41	9.50	--	--
1973-74	310.385	303.07	14.50	--	--
1974-75	303.924	455.20	15.10	0.10	0.54
1975-76	328.207	687.33	19.30	4.30	36.43

1976-77	341.108	579.42	17.70	2.70	19.02
1977-78	309.740	629.48	20.84	5.84	45.70
1978-79	500.492	1207.72	18.17	3.17	46.54
1979-80	474.809	1247.55	18.89	3.89	59.26
1980-81	411.859	1143.43	19.10	4.10	58.44
1981-82	559.607	1761.50	18.64	3.64	80.13
1982-83	687.740	2376.19	18.07	3.07	90.20
1983-84	804.018	2832.85	18.78	3.78	130.97
1984-85	687.302	2587.67	21.04	6.04	199.77
1985-86	787.242	3750.65	20.22	5.22	247.25
1986-87	882.247	5410.10	21.01	6.01	409.49
1987-88	1091.454	6149.62	21.55	6.55	510.33
1988-89	1211.954	6757.64	19.11	4.11	344.85
1989-90	1577.984	8733.03	18.74	3.74	399.47
1990-91	1910.642	14206.86	17.51	2.51	430.24
1991-92	1840.249	14134.76	18.07	3.07	530.99
1992-93	1906.632	17451.07	18.51	3.51	752.56
Total Revenue Losses:					4392.18
					≈ 44 crores

Source: HPSEB Administrative Report of different years.

Therefore, upto 15% T&D losses are not the financial losses for the board. Beyond 15 per cent T&D losses are taken to calculate the revenue losses. It means the desirable availability of energy is 85 percent and the actual availability in any year below this limit are the higher T&D losses. Financial losses of the Board given in the Table are calculated on the basis of these higher T&D losses. In the first two years of the existence of HPSEB, the T&D losses were below 15 percent and therefore, no revenue losses for the Board due to transmission and distribution. After that, the financial losses calculated was more or less depend upon either high T&D losses or total revenue earned from sale of electricity. Up to the year 1992-93, HPSEB suffered a total loss of about 44 crores of rupees due to only higher transmission and distribution losses. Therefore, it is very important to take some essential steps to minimize the T&D losses.

#### Suggestions

It is clear from the above discussion that the T&D losses can be minimized but can not be fully removed. Therefore, some suggestions are given to minimize these losses up to the possible extent of 15 percent.

1. There is a need for scrupulously enforcing the unauthorised tapping of the distribution lines as well as strengthening the transmission network on a priority basis to minimise the line losses.
2. Vigilance squads should be set up and surprise inspection be intensified to detect cases of malpractices and pilferage of energy. According to the amended provision of the I.E. Act, 1910 under which this has been made a cognizable offence, and all those found guilty of indulging in practices

leading to pilferage of energy and financial losses to the supplier of electricity should be prosecuted. Publicity should also be organised through the various media such as Audio, Video and Press to bring awareness among the consumers at mass level.

3. 'Energy metres' should be installed in temper proof meter boxes, sealed with temper proof numbered seals. Meter boxes should be so located that these are easily visible and accessible to the suppliers of electricity. The service lines from the L.T. lines to the meter boxes should not traverse the consumer premises.
4. 'Computer Software' of the appropriate type can be used for optimal planning and design of sub-transmission and distribution system, will be very helpful in preparing system improvement schemes for reducing T&D losses.
5. The use of equipment of updated and energy efficient design in the distribution systems can considerably help in reducing energy losses. There is constant loss of energy due to heavy load on the distribution transformers which keep on occurring so long as the transformers are energised and these losses can be reduced by using transformers having no load losses. Some other equipments must be used like switched hunt capacitors on H.T. and L.T. lines, and light sensitive switching devices to control switching on and switching-off of street lights. It is necessary to educate the consumers with these equipments.
6. HPSEB should introduce energy audit in their system as the CEA has already issued guidelines to all the SEBs for carrying out energy audit in their power systems to identify the areas where there is scope for reduction in energy losses and consumption of energy. To facilitate the implementation of the scheme of energy audit, meters should be provided atleast upto 11 KV level so that assessment of energy flow on each feeder can be made and no supply should be made without metering.
7. The T&D system have grown by accretion. As a result, the primary and secondary lines in urban areas carry excess load, lending to power losses and break downs. The rural lines, on the other hand are overextended. The losses could be reduced by realigning the lines to reduce line milage and by using small distribution transformers to reduce the length of low tension lines. The Board should prepare table for the permissible KVA/KM for standard sizes of conductors for various voltage levels and load power factors and make these available to the officers responsible for release of connections, planning of system improvements etc.
8. The electricity suppliers should make suitable arrangements for the consumers, especially those in rural areas face so many problems about release of service connection, receipt and payment of energy bills, complaints of power supply failure and have no guidance about purchase of good quality energy efficient electrical equipments and right type of

pump sets etc. The electricity suppliers should publish some pamphlets in simple language in the form of questions and answers on the procedure for the release of service connections, essential information about electricity bills and their payment procedure, penalties for late/ non-payment, procedure of lodging of complaints, procedure for getting faulty energy meters and replaced, and source of availability of energy equipment etc. should be made available to the consumers.

9. The Board should maintain complaint registers in each complaint centres, which are located within reach of the consumers. From these registers, a monthly abstract of the complaints of different types should be prepared locality-wise and submitted to the concerned Incharge (SDO) of the area. Comparison of the number of consumer complaints over the years is necessary.<sup>4</sup> After analysis, the abstract of complaints should be submitted to the Executive Engineer. The Executive Engineer should also inspect the complaint register periodically at the complaint centres to see if the attendance of the complaints is satisfactory and the time taken for attending the complaints is reasonable.

#### **Conclusion**

The above suggestions if adopted, will go a long way to help the power utilities in reducing its financial losses, enabling to improve its revenues. This will help the HPSEB to avoid transfer of capital resources to defray losses on revenue account as is being done by a number of SEBs with the improvement in financial affairs, it will be possible to HPSEB to invest more funds towards improvement of Transmission and Distribution facilities resulting in lower T&D losses. This in turn will further improve the revenue earning capability of the Board. As the increased earnings would enable the board to import a latest technology, procure adequate quantity of quality spare parts and machinery and equipments, leading to lower down the per unit generation cost. This will further enable the HPSEB to come out of the present morass and put it on a sound footing.

#### **Notes and References**

1. "Administrative Report — 1992-93", H.P.S.E.B., Shimla.
2. "Report of the committee on the problem of High Transmission and Distribution Losses", Department of Power, Ministry of Energy, New Delhi, 1987.
3. "Recommendation of Working Group of Action Plan for Eliminating of Pilferage of Energy and Reduction of Transmission Losses." Central Electricity Authority, New Delhi, 1986.
4. The practice is being followed by Haryana and Gujarat SEBs. Model complaint centres known as 'Bijli Sewa Kendras' are set up by the Haryana SEB in villages to attend the Consumer's Complaint relating to quality and quantity of electricity supply, billing and all the other matters relating to electricity. While in Gujarat, a trained personnel known in Gujarati is 'Vijaligar' is provided in a group of three to four villages.