HIMACHAL PRADESH STATE ELECTRICITY BOARD LIMITED
(A State Government Undertaking)
Registered Office: Vidyut Bhawan, HPSEBL, Shimla-171004 (H.P.)
CIN: U40109HP2009SGC031255
Phone No.: 0177-2803600 (Office) 2813563 (FAX) 2801675
Website: www.hpseb.com, E-mail: cmd@hpseb.in, directorfa@hpseb.in

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To

The Chief Engineer (Op.) South
HPSEBL, Shimla

The Chief Engineer (Op.) North
HPSEBL, Dharamshala

The Chief Engineer (Op.) C.Z.
HPSEBL, Mandi

Subject: - Standard Operating Practices for field engineers in Distribution wing.

May refer to the Video Conference held under the chairmanship of Chairman, HPSEBL on 14.01.2021 wherein the issue of reduction of losses by implementation of zero/low investment measures was brought up and it was desired that suitable instructions be given to field units to adopt practices to curb losses. Accordingly, standard operating practices for field engineers in Distribution wing **(copy enclosed)** have been framed and issues have been highlighted where direct saving can be done by just paying personal attention without requiring any major investment.

It is, therefore, requested that the above said SOP's be circulated among the field units under your jurisdiction and be given suitable directions to comply with so that a reduction of 1-1.5% in T&D losses is achieved.

DA: - As above

(Er. Rajiv Sood)
Chief Engineer (P&M),
HPSEBL, Shimla-04.
TELEFAX 0177-2659990
E Mail: cepmhpsebl@gmail.com

Copy to: -

1.) The Superintending Engineer, IT, Vidyut Bhawan, Shimla. It is requested that the SOP's **(copy enclosed)** be uploaded on official website of HPSEBL for ready reference of all.
2.) All the Superintending Engineers in Operation wing of HPSEBL.
3.) All the Sr. Executive Engineers in Operation wing of HPSEBL.
4.) All the Assistant Engineers in Operation wing of HPSEBL.
5.) The Spl.P.S./P.S. to the Managing Director/ Director (Op.) for kind information of Managing Director/Director (Op.), please.

IT Cell HPSEBL VR Shimla-4
Sr EE/ASE (IT-II)
APS/Suno

Chief Engineer (P&M)
HPSEBL, Shimla-04.

STANDARD OPERATING PRACTICES FOR FIELD ENGINEERS IN DISTRIBUTION WING

1.) Metering: -

a) All Assistant Engineers will tally and confirm the number of consumers billed during the month with the billing schedule. The same is to be cross checked through ISU billing. This will ensure that 100% meters are read by the billing clerk and no unbilled energy is left as per schedule. Further, the billing done by MLC/billing staff shall be got cross checked through JE concerned (at least 100 consumers per JE) to avoid coffee shop billing.

b) The zero consumption consumers shall be identified and got cross-checked from the field officials (not involved in billing) to identify the reasons for zero consumption on monthly basis. This will ensure the elimination of mal-practices by MLC's/billing staff, if any.

c) Sr. Executive Engineer/Assistant Engineer shall ensure the applicability of correct multiplying factor on regular basis. Replacement of CT/ PT unit shall also be incorporated through MCO [CE (Comm.) to confirm]. The replacement of CT/ PT unit through MCO will ensure the automatic correction in multiplying factor in case of damage to the CT/PT unit also.

2.) Meters: -

a) The connections of secondary terminals of CT/ PT unit with the meter should invariably be through GI pipe sealed at both ends and the pipes should not be concealed to avoid apprehended attempt of theft by consumers. The cable used for CT/PT connections should not be less than 4mm2 and should be routed through glands. Further, the termination at both the ends should be through lugs of adequate size. The meter should be accessible to HPSEBL officials and the length of CT/PT wires should be minimum.

b) The installation of meter in residences/shops should invariably be installed outside in meter boxes and at a readable height of approximately 70 inch. This will help in accurate meter reading by MLC. Further, the meters installed

inside lockable premises be got identified through MLC's on monthly basis. Details of such meters shall be prepared by the MLC's and the same shall be got cross-checked by Junior Engineers through field officials. The Assistant Engineers/Junior Engineers shall take corrective measures to shift these meters outside lockable premises at a readable height of approximately 70 inch. It is also added that the use of meter boxes shall be ensured during installations.

c) The sealing of CT-PT units and meters be ensured as per Sales Manual instructions. Further, the MLC's/billing staff while billing will ensure that the seals of all the meters and CT-PT units are intact and proper record of the same shall be maintained. Old & broken seals and signs of tempering of the PVC, if any shall be brought to the notice of Junior Engineer concerned who will take corrective action immediately. Further, the broken seals should be replaced with new seals by the authority who had originally fixed it and the reasons for breakage/ tempering of seals shall be investigated without delays. This will help in preventing theft of energy.

d) The Sub-Divisions must not wait for application from consumer for replacement of dead-stop/burnt meter. The charges be debited as per Sales Manual instructions/Schedule of tariff through sundry. Dead-stop meter in distribution system is as good as direct theft of energy.

e) All the billing clerks/MLCs shall be asked to submit the list of burnt/dead-stop meters during the execution of billing cycle to the Assistant Engineer for immediate necessary action. The Assistant Engineer's shall ensure the replacement of dead stop/burnt meter within seven days of its report.

f) Variation of consumption in high consumption consumers shall be analysed by the Assistant Engineer/Sr. Assistant (Commercial) personally.

3.) **GI wire on HT/LT Lines:** - Any GI wire existing in distribution lines (HT/LT) shall be replaced with proper size of conductor within three months from the issue of this letter by formulating scheme for the purpose. Budget provision for the same shall be kept in the annual plan/working programme.

The Assistant Engineer/Junior Engineer concerned shall ensure that existing GI wire is replaced within stipulated time period.

4.) **HT/LT lines touching tress/bushes:** - In distribution network the touching of HT/LT lines with trees/bushes etc. adds to loss. The Junior Engineers shall ensure proper maintenance of lines on these accounts including lopping of trees etc.

5.) **Fixed Shunt Capacitor:** - In power distribution system, most of the electrical equipment connected release certain amount of reactive power. Our electrical feeders/line carry active as well as reactive power. Shunt capacitors are utilized in the system for reactive power compensation (power factor correction) and high power factor (≤ 1) can help in utilizing the full capacity of our system. Their use also provides capacity relief to our source generators. Hence, DTRs having poor power factor should be provided with the fixed type of shunt capacitor of 10% of its rated capacity with suitable switching control through MCB of required rating. For DTR of 25 kVA it is recommended to have a fixed capacitor of 3kVAr and for a 63 kVA DTR it is recommended to have a fixed capacitor of 6 kVAr capacity. By ensuring working/installation of such capacitor banks we can reduce the reactive component of our network and total current, thereby reducing T&D losses. The Sr. Executive Engineer shall randomly check at least 20% shunt capacitors and ensure their healthiness.

6.) **Low Voltage:** - Any problem in voltage in a power network is undesirable as it aggravates the quality of the power. Lower voltage increases the current which contributes to the losses (I^2R) occurring in our network. Uneven distribution of load, variation in load demand and unbalanced voltages & currents are major contributors to low voltage and existence of low voltage pockets in the network is an indication of poor distribution system, thereby resulting into losses. Corrective measures need to be taken by ensuring balanced load distribution among consumers and maintaining a proper phase balance (i.e. balanced voltages & currents in phases). Strengthening of our existing network

by ensuring replacement of undersized cables/conductors with cables/conductors of proper size, planned replacement of old and ageing equipment, feeder/line augmentation etc. are other mitigating measures which can help us to combat the issue of low voltage.

7.) **Overloading & Load Balancing in Distribution Transformers: -**

a.) The overloaded transformers are a source of direct losses. Distribution transformers should be operated at normally 65-70% of rated capacity for best efficiency.

b.) The distribution transformer shall be checked for load balancing of domestic consumers during peak load hours of morning and evening and necessary correction shall be done immediately.

c.) The load balancing of all DTR's shall be checked by Junior Engineer under his jurisdiction once in three months and every fifteen days during adverse weather months and confirmation of the same shall be sent to Sub-Division office. The Assistant Engineers shall cross check 25% of DTR's randomly.

d.) Due care shall be taken while releasing the load and while releasing energy connection. Even for load balancing on DTR, phase wise balance must be maintained on LT line.

e.) The consumers should be supplied electricity from DTR through multiple feeders depending upon the capacity of DTRs. The feeder arrangement on the DTRs should be as follows: -

Capacity of DTR	No. of feeders
25 kVA	2 feeders
63 kVA	Minimun 2 feeders
100 kVA	Minimum 3 feeders
250 kVA	Minimum 4 feeders

f.) DTRs shall be augmented to a maximum capacity of 250kVA and the practise of augmentation of DTRs beyond 250kVA should not be resorted to.

g.) DTRs of higher capacity (400kVA, 630 kVA etc.) shall not be used and emphasis shall be given to install DTRs of smaller capacity in load pockets so that healthy HT to LT ratio is maintained and quality power supply at standard voltage could be supplied to the consumers.

h.) Overloading, LT line loose span, use of fuse wire of improper size & specification, improper maintenance of breathers, oil leakage, tree branches touching LT lines, non-topping of oil, improper earthing, not connecting Lightning Arrestors are some of the major causes of non-healthiness and failures in DTRs. The failure of a DTR may lead to high losses in the system due to shifting of the load on adjoining DTR which results in overloading. Hence, corrective measures shall be taken to ensure DTR healthiness thereby increasing reliability of distribution system.

8.) **Hotspots: -**

a.) Reliability of distribution system is an important aspect for ensuring power availability to our consumers. Development of hotspots in distribution network not only threatens system reliability but also aids increment of distribution losses which is not commonly known to all. Loose or overtightened connections, unequal voltage distribution, overloaded equipment and use of old and ageing equipment are major reasons for development of hotspots whereas G.O. switches, Isolators, Jumpers are major locations for development of hotspots in the system. As such, hotspots in the distribution network must be got attended and rectified to save energy loss and equipment failure. Scanning with thermo-vision cameras in sub-station premises need to be prioritized and shall be got done in sub-stations and HT/LT lines under each Sub-Division in every three months.

b.) Hotspots generally can also be detected by visual inspection during night hours. However, in major cases these hotspots are visible at terminal stages. Corrective measures to rectify such hotspots shall invariably be taken up

Assistant Engineers/Junior Engineers immediately for ensuring network reliability and this will help in reducing losses.

c.) Use of bimetallic contacts and thimbles with nuts in power circuit should be avoided. Only crimping type mechanical lugs should be used in power circuits and use of proper crimping tools for their installation be ensured.

9.) The Sr. Executive Engineer and Assistant Engineer shall carry out energy audit of feeders and DTRs to identify the areas which are showing/experiencing higher losses. The reasons for higher losses (*i.e. whether it is because of low voltage, use of undersized cable/ conductor, less billing etc.*) need to be analysed by them for taking corrective measures and they shall come out with an action plan for reduction of these losses.

10.) Maintenance of Lines: -

a) Due care should be taken while installation of HT/LT lines. The conductor being used should not be damaged and kinks should be removed from the conductor during installation stages only.

b) Use of trefoil (triangular form) arrangement should be ensured where single core cables are being used for providing three phase network because connecting the individual cables in the trefoil formation minimizes the magnetic field around the conductor and reduces the loss.

c) No PVC wires with inadequate capacity in commensurate (proportion) to the load be installed in consumer installations. However, such locations where undersized and long PVC wires have been laid/used be got identified and cross-checked from the field officials and the task of their replacement should be taken up. It shall invariably be ensured that all PVC wires to consumer premises are laid with GI wire. The process of such replacement nonetheless is continuous and should be taken up through General Service Connection (GSC) scheme.

d) Overhead transmission and distribution lines are suspended on poles/tower supports and keeping desired sag in these lines is important. If the sag is not

loose, the conductor is exposed to a higher mechanical tension which may break the conductor. Whereas, loose sag leads to lower clearances. Additionally, the conductor may swing due to wind and get in contact with alongside conductors causing interphase faults. Thus, it is very important sag should be correct and that the conductors with loose sags are identified. Such conductors be got identified while carrying out during seasonal inspection of distribution lines and corrective measures for their rectification be taken.

e) AAA conductor 7/2.50 mm, 7/3.15 mm and 7/4.26 mm shall be used in LT lines in the network whereas the use of ACSR conductor in snow bound areas shall invariably be ensured.

f) The continuous earth wire shall invariably be provided in HT/LT lines and the same shall be earthed at dead structures. Proper guarding should be provided in the line at road crossings so that any mishap due to breaking of live conductor could be avoided.

Further amendments (if any) shall be communicated subsequently. However, any suggestions regarding above instructions shall be furnished to the concerned Chief Engineer who will further take up the matter with Board office.

22/1/2021

(Er. Rajiv Sood),
Chief Engineer (P&M),
HPSEBL, Shimla-171004.
Fax. No. 0177-2812500
Email: *cepmhpsebl@gmail.com*