सत्यमेव जयते

भारत सरकार
Government of India
विद्युत मंत्रालय
Ministry of Power
केंद्रीय विद्युत प्राधिकरण
Central Electricity Authority
विद्युत प्रणाली योजना एवं मूल्यांकन प्रभाग-II
Power System Planning & Appraisal Division-II

सेवा में / To,

(All Stakeholders in Power Sector & General Public)

विषय / Subject: Notice inviting suggestions / comments on Draft Paper on reconductoring of Transmission Lines in ISTS – reg.

महोदय /Sir,

In the 10th meeting of National Committee on Transmission (NCT), it was directed that a base paper needs to be prepared for identification of Implementation Modalities for Reconductoring works in order to standardize / simplify decisions in this regard in future.

Accordingly, a base paper on reconductoring of Transmission Lines in ISTS has been prepared by CEA, which is enclosed herewith.

All stakeholders in Power Sector and general public are hereby requested to kindly send their views/suggestions (if any) on the draft Paper on reconductoring of Transmission Lines in ISTS to CEA by 17th July 2023 in the address given below, so that same could be appropriately considered while finalizing the paper.

Sh. Ishan Sharan
Chief Engineer (PSPA-II)
Central Electricity Authority,
3rd Floor, Sewa Bhawan (N), R.K.Puram,
New Delhi-110066
Email id: cea-pspa2@gov.in

भवदीय/Yours faithfully,

27.6.2023

(बी.एस. बैरवा / B.S. Bairwa)
निदेशक/ Director

CENTRAL ELECTRICITY AUTHORITY

Draft paper on reconductoring of Transmission Lines in ISTS

1. INTRODUCTION

The Indian National Grid having voltage level up to 765 kV AC and ±800 kV HVDC system, is widely spread over 4,72,345 circuit km (220 kV and above voltage level as on May, 2023). It consists of Inter-State Transmission System (ISTS) and Intra-State Transmission System (Intra-STS).

To meet the changing demand and generation scenario, transmission system needs to be expanded and strengthened. The strengthening may require building of new transmission lines and substations or augmentation of existing transmission/transformation capacity by suitable means. One of the method to preserve the right of way (RoW) and increase transmission capacity of a line is reconductoring with high capacity high performance conductors.

By definition, reconductoring is a process of stringing of new conductors on existing towers using the same RoW to increase the thermal capacity of transmission lines. However, this may require modification or replacement of some towers in cases where load bearing capacity of tower is not sufficient enough. The scheme may also require replacement of terminal bay equipment with high rating equipment commensurate with rating of new conductors.

This paper broadly covers planning of reconductoring, approval and mode of implementation.

2. Planning for reconductoring in ISTS

2.1. Planning studies:

As per Section 38 (2) of the Electricity Act, 2003, the Central Transmission Utility (CTU) is responsible for development of an efficient and coordinated inter-state transmission system (ISTS). Accordingly, the CTU, in consultation with stakeholders and after system studies, draws proposal for new elements in ISTS or augmentation including reconductoring.

2.2. Factors to be considered for planning reconductoring and finalization of scope:

a) The new conductor ampacity should be as per new power transfer requirements subjected to the tolerable sag/tension parameters, and maximum acceptable conductor temperature. This should be in conformity to the CEA's Manual on Transmission Planning Criteria, 2023.

b) New Conductors shall have higher continuous operating temperature and higher ampacity as compared to the existing conductors. Further, physical

design parameters viz. sag, swing and diameter etc of the new conductors shall be similar/better to the existing conductors to the transmission lines

c) As sag value is critical for reconductoring a line involving long spans (e.g. River crossings, wide valley spans, high wind, ice loadings, etc), the tension forces on existing towers and foundations should be limited to the existing values.

d) Short-circuit current rating of the new conductor should not be less than the Short-circuit current rating of the existing conductor.

e) Reconductoring with advanced type of conductors and operating them to the extent of its capacity limit may face terminal constraints (e.g. such as breakers, switches, protection, flexible AC transmission system (FACTS) controller and other devices). Further, the existing current rating capacity (kA) of sub-station bus may get exceeded. Requirement of replacement of bay equipment at terminal ends commensurate with rating of new conductor will arise and as such, planning for upgradation of bay equipment need to be carried out along with reconductoring.

f) Tower healthiness to be ensured by verifying the compatibility of existing foundations and towers, the mechanical stresses and tension. In case, any tower reinforcement is needed, the same can be taken up in conjunction with reconductoring

g) Reconductoring of EHV lines on multi-voltage and multi-circuit tower lines might be difficult, and suitable strategies may be required while the adjacent circuit(s) on the same tower remains energized

3. Approval and mode of Implementation:

Transmission schemes costing below Rs.100 Crs. are approved by CTU. Schemes costing more than Rs.100 crs and up to Rs 500 Crs. are approved by National Committee on Transmission (NCT) and schemes estimated to cost above Rs.500 Crs. are recommended by NCT for approval of Ministry of Power, Govt of India. The approved schemes are implemented either through Regulated Tariff Mechanism (RTM) or Tariff Based Competitive Bidding (TBCB) routes.

Clause 7.1(7) of Tariff Policy, 2016 provides that **"***While all future inter-state transmission projects shall, ordinarily, be developed through competitive bidding process, the Central Government may give exemption from competitive bidding for (a) specific category of projects of strategic importance, technical upgradation etc. or (b) works required to be done to cater to an urgent situation on a case to case basis*."

As reconductoring requires upgradation and replacement of existing conductors of transmission lines with new higher rating capacity conductors using the same RoW, the works related to reconductoring are generally considered as technical upgradation. Accordingly, exemption is given from competitive bidding and implemented under RTM by the owner of original transmission line.

In line with provision at Para 2.2 in the MoP's "Guidelines for Encouraging Competition in Development of Transmission Projects" dated 10-08-2021, *"The CEA and the CTU (both being the planning agencies) in the thirty second year (32th) of COD of project will examine the need of upgradation of the system or renovation and modernization of the existing system depending on technological options and system studies at that time. The project may then be awarded to successor bidder selected through a competitive bidding process for renovation and modernization, if required, and operation and maintenance after 35 years from COD of project".* Accordingly, requirement of reconductoring at/near end of useful life need to be taken up through TBCB.

4. Life of transmission Assets

Regulation 3(73) of CERC (Terms and Conditions of Tariff) Regulations 2019 defines 'Useful Life' in relation Transmission line (including HVAC & HVDC) as 35 years. Further, it provides that the extension of life of the projects beyond the completion of their useful life shall be decided by the Commission on case to case basis.

Standard Bidding Documents (SBDs) for procurement of Inter-State Transmission Services (ISTS) through Tariff Based Competitive Bidding (TBCB) issued in August, 2021, provides that "The TSP shall ensure transfer of all project assets along with substation land, right of way and clearances to CTU or its successors or an agency as decided by the Central Government after 35 years from COD of project at zero cost and free from any encumbrance and liability".

In case the reconductoring of transmission line is carried out before 35th year, there would be situations wherein, only towers would have lived their life and not the conductor. Further, the cost of conductors and associated bay equipment, if any, would not have been recovered when the tower completes 35 years.

5. Concerns over allotting reconductoring works under RTM

Representations have been received from transmission associations as well as industry over allocating reconductoring works under RTM to transmission licensee of original line. Their apprehensions include higher implementation cost and lack of transparency in RTM.

6. Reconductoring work under TBCB

In case, reconductoring work of a line owned by a transmission licensee is allotted to another transmission licensee, following types of questions may arise:

(i) Whether the proposed reconductoring and bay work will have any implication on Tariff of original owner?
(ii) If yes, what should be the methodology for adjustment (Removal/ replacement of bays and Reconductoring)?

(iii) As existing assets are licensed assets, whether the modification of same requires approval of CERC?

(iv) Operational aspects in respect of O&M responsibility, as there will be Joint Ownership of transmission line i.e. towers will be owned by one licensee whereas conductor and terminal equipment will be of another licensee. The reconductoring may require upgradation of terminal equipment which may become difficult when terminal station is owned by a different licensee.

(v) The presence of multiple owners creates challenges in identifying root cause of tripping of lines. The tripping can take place on account of fault in conductor, tower structure or terminal bays/equipment. The root cause analysis for cases of faults at boundary conditions may become difficult. This impacts the down time of the line. Attributing the cause of failure would also be a challenge. As per CERC Standard of performance of inter-state transmission licensees Regulations 2012, transmission licensees need to submit to Grid India about reliability, dependability and security indices, which is further reported by Grid India to CERC. In case of inconclusive analysis of trippings, it would become difficult to compile these indices.

(vi) Role and responsibility of declaring Availability so as to avoid possible issues and defining the responsibility e.g. in case of conductors snapped or Tower collapsed.

(vii) Transfer of assets to CTUIL after 35 years may also be an issue if there is joint ownership.

Example:

In the 3rd meeting of NCT held on 26th & 28th May, 2020, Comprehensive Transmission System for evacuation of 4.5 GW RE Injection at Khavda under Phase-II that was recommended for implementation. MoP vide Gazette dated 23.09.2020 notified the “Transmission scheme for evacuation of 4.5 GW RE injection at Khavda PS under Phase-II – Part D” for implementation through TBCB route. The scope of notified scheme was “LILO of Pirana (PG) – Pirana (T) 400 kV D/c line at Ahmedabad S/s with twin HTLS alongwith reconductoring of Pirana (PG) – Pirana (T) line with twin HTLS conductor with OPGW for both main line and LILO section and Bay upgradation work with requisite FOTE at Pirana (PG) & Pirana (T)”. The scheme went under bidding.

The Pirana (PG) – Pirana (T) 400kV D/c line along with associated bays at both ends are owned by Torrent Power Grid Limited (TPGEL).

TPGEL raised the issue that reconductoring of the Pirana (PG) – Pirana (T) 400 kV D/c line by another transmission licensee will lead to joint ownership of the line with the transmission towers/accessories being owned by TPGEL and the conductors/bay equipment being owned by the new transmission licensee. This would lead to several commercial as well as operational issues such as tariff implications for existing asset owner, responsibility of O&M of towers, line etc.

As the issues raised could not be addressed under existing mechanism, NCT recommended for denotification of the scheme from TBCB and allocating the reconductoring work along with bay upgradation work under RTM to the original transmission licensee of the line i.e. TPGEL.

7. Reconductoring work under RTM vs TBCB

In present scenario, the pros and cons of reconductoring work under RTM by the owner of transmission line and TBCB may be summarized as under:

Sl. No.	Issue	Reconductoring under RTM by the owner of transmission line	Reconductoring under TBCB by other transmission licensee
1.	Cost Implications	Differential cost for carrying out reconductoring works will be less, as the value of old scrap conductors (de-capitalisation cost) would also be significant.	Joint ownership. May be at competitive cost. However, disputes on scrap value of old conductor may arise.
2.	Tariff	As tariff will be determined by CERC, dispute free mechanism.	Disputes may arise on sharing of tariff as towers are owned by one licensee and conductor by another licensee
3.	Availability of transmission element	No issue in transmission availability calculation	Blame game on forced outage may happen.
4.	Ownership	Single ownership.	Shared ownership may introduce challenges in operation of the line.
5.	Execution time (reconductoring generally carried out for heavily loaded lines and involves continuous shutdown of the lines)	Single entity. Execution time can be compressed.	Multiple entities. Disagreements between multiple owners Eg. Time & duration of shutdown may impact timely completion of the work.

8. Conclusions and Way forward

(i) In the period of useful life of transmission system, to avoid technical, commercial and operational issues in reconductoring of transmission line, it would be prudent to allocate the scheme to existing owner (TSP) through RTM route.

(ii) The transmission system implemented under TBCB would be handed over to CTUIL or its successors or an agency as decided by the Central Government after 35 years (as per SBD) and the asset would be again bid out. At this stage fresh bidding may include reconductoring and strengthening, if required.

(iii) Tariff recovery of reconductoring to be made coincidental with other equipment.

(iv) In case the project is already implemented under RTM mechanism then it's technical upgradation within/ after useful life to be done under RTM mode.

(v) Reconductoring of line and upgradation of bay equipment to be carried out by concerned licensee simultaneously.

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