

## Appendix-III

### Procedure for Calculation of Transmission System Availability Factor for a Month

1. Transmission system availability factor for a calendar month (TAFM) shall be calculated by the respective transmission licensee, got verified by the concerned RLDC and certified by the Member-Secretary, Regional Power Committee of the region concerned, separately for each AC and HVDC transmission system and grouped according to sharing of transmission charges.
2. TAFM, in percent, shall be equal to  $(100 - 100 \times \text{NAFM})$ , where NAFM is the non-availability factor in per unit for the month, for the transmission system / sub-system.
3. NAFM for A.C. systems / sub-systems shall be calculated as follows :

$$\text{NAFM} = \left[ \sum_{l=1}^L (\text{OH}_{l1} \times \text{Cktkm}_1 \times \text{NSC}_1) + \sum_{t=1}^T (\text{OH}_{t1} \times \text{MVA}_{t1} \times 1.5) \right. \\ \left. + \sum_{r=1}^R (\text{OH}_{r1} \times \text{MVAR}_{r1} \times 7) \right] \div \text{THM} \times \left[ \sum_{l=1}^L (\text{Cktkm}_1 \times \text{NSC}_1) \right. \\ \left. + \sum_{t=1}^T (\text{MVA}_{t1} \times 1.5) + \sum_{r=1}^R (\text{MVAR}_{r1} \times 7) \right]$$

Where,

- l identifies a transmission line circuit
- t identifies a transformer / ICT
- r identifies a bus reactor, switchable line reactor or SVC
- L = total number of line circuits

T	=	total number of transformers and ICTs
R	=	total number of bus reactor, switchable line reactor and SVCs
OH	=	Outage hours or hours of non-availability in the month, excluding the duration of outages not attributable to the transmission licensee, if any, as per clause (5)
Cktkm	=	Length of a transmission line circuit in km
NSC	=	Number of sub-conductors per phase
MVA	=	MVA rating of a transformer / ICT
MVAR	=	MVAR rating of a bus reactor, switchable line reactor or an SVC (in which case it would be the sum of inductive and capacitive capabilities )
THM	=	Total hours in the month

4. NAFM for each HVDC system shall be calculated separately, as follows :

$$\text{NAFM} = [\Sigma (\text{TCR} \times \text{hours})] \div [\text{THM} \times \text{RC}]$$

Where,

TCR = Transmission capability reduction of the system in MW

RC = Rated capacity of the system in MW.

For the above purpose, the HVDC terminals and directly associated EHV / HVDC lines of an HVDC system shall be taken as one integrated system.

5. The transmission elements under outage due to following reasons shall be deemed to be available:
- i. Shut down availed for maintenance or construction of elements of another transmission scheme. If the other transmission scheme belongs to the transmission

- licensee, the Member-Secretary, RPC may restrict the deemed availability period to that considered reasonable by him for the work involved.
- ii. Switching off of a transmission line to restrict over voltage and manual tripping of switched reactors as per the directions of RLDC.
6. Outage time of transmission elements for the following contingencies shall be excluded from the total time of the element under period of consideration.
- i. Outage of elements due to acts of God and force majeure events beyond the control of the transmission licensee. However, onus of satisfying the Member Secretary, RPC that element outage was due to aforesaid events and not due to design failure shall rest with the transmission licensee. A reasonable restoration time for the element shall be considered by Member Secretary, RPC and any additional time taken by the transmission licensee for restoration of the element beyond the reasonable time shall be treated as outage time attributable to the transmission licensee. Member Secretary, RPC may consult the transmission licensee or any expert for estimation of reasonable restoration time. Circuits restored through ERS (Emergency Restoration System) shall be considered as available.
  - ii. Outage caused by grid incident/disturbance not attributable to the transmission licensee, e.g. faults in substation or bays owned by other agency causing outage of the transmission licensee's elements, and tripping of lines, ICTs, HVDC, etc. due to grid disturbance. However, if the element is not restored on receipt of direction from RLDC while normalizing the system following grid incident/disturbance within reasonable time, the element will be considered not available for the period of outage after issuance of RLDC's direction for restoration.