

# **CENTRAL ELECTRICITY REGULATORY COMMISSION**

## **NEW DELHI**

No.L-1/250/2019/CERC

Dated: 4<sup>th</sup> May 2020

### **NOTIFICATION**

In exercise of the powers conferred under Section 178 read with Part V of the Electricity Act, 2003 (36 of 2003), and all other powers enabling it in this behalf, and after previous publication, the Central Electricity Regulatory Commission hereby makes the following regulations:

#### **CHAPTER 1**

#### **PRELIMINARY**

##### **1. Short title, extent and commencement**

- (1) These regulations may be called the Central Electricity Regulatory Commission (Sharing of Inter-State Transmission Charges and Losses) Regulations, 2020.
- (2) These regulations shall apply to all Designated ISTS Customers (DICs), Inter-State Transmission Licensees, National Load Despatch Centre (NLDC), Regional Load Despatch Centres (RLDCs), State Load Despatch Centres (SLDCs) and Regional Power Committees (RPCs).
- (3) These regulations shall come into force from the date to be separately notified by the Commission.

##### **2. Definitions**

- (1) In these Regulations, unless the context otherwise requires:-

- a) **'Act'** means the Electricity Act, 2003 (36 of 2003);
- b) **'Associated Transmission System' or 'ATS'** means the transmission system identified for a generating station by the Central Transmission Utility in the Long Term Access grant;
- c) **'Basic Network'** means the power system at voltage levels of 110 kV and above containing all the power system elements including generating station and transmission systems ;
- d) **'Billing month'** means the month in which bills for transmission charges are raised by the Central Transmission Utility in accordance with these regulations;
- e) **'Billing period'** means the month for which bills are raised in a billing month by the Central Transmission Utility;
- f) **'buyer'** shall have the same meaning as defined in Central Electricity Regulatory Commission (Deviation Settlement Mechanism and Related Matters) Regulation, 2014 and any subsequent amendments or re-enactments thereof;
- g) **'COD of the Associated Transmission System'** shall mean COD of the last transmission element of the Associated Transmission System;
- h) **'Connectivity Regulations, 2009'** means the Central Electricity Regulatory Commission (Grant of Connectivity, Long-term Access and Medium-term Open Access in inter-State Transmission and related matters) Regulations, 2009 and any subsequent amendments or re-enactments thereof;
- i) **'Date of Commercial Operation' or 'COD'** shall have the same meaning as defined in the Grid Code;

- j) **‘Designated ISTS Customer’ or ‘DIC’** means the user of any transmission element(s) of the Inter-State Transmission System (ISTS) and shall include generating station, State Transmission Utility (STU), distribution licensee including State Electricity Board or its successor company, Electricity Department of State and any other entity directly connected to the ISTS and shall include an intra-State entity or a trading licensee that has obtained Medium Term Open Access or Long Term Access to ISTS;
- k) **‘Grid Code’** means the Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2010 and any subsequent amendments or re-enactments thereof;
- l) **‘Hybrid Methodology’** means hybrid of the Marginal Participation Method and the Average Participation Method as detailed in Annexure-I of these regulations;
- m) **‘Implementing Agency’ or ‘IA’** means NLDC or such other agency designated by the Commission to undertake various functions under these regulations and such other functions as may be assigned by the Commission from time to time;
- n) **‘Monthly Transmission Charges’ or ‘MTC’** in a billing month means the transmission charges derived from the Yearly Transmission Charges for the corresponding billing period or part thereof;
- o) **‘node’** means a sub-station of a transmission system or a switchyard of a generating station and shall include injection node, drawal node and regional node;

- p) **‘Open Access Regulations, 2008’** means the Central Electricity Regulatory Commission (Open Access in inter-State Transmission) Regulations, 2008 and any subsequent amendments or re-enactments thereof;
- q) **‘Participation Factor’** of a node in any transmission line means the percentage usage of that line by the node, as explained in Annexure-I of these regulations;
- r) **‘Peak block’** means the block in which sum of net ISTS drawals by all States is maximum during the month;
- s) **‘Power Supply Regulations, 2010’** means the Central Electricity Regulatory Commission (Regulation of Power Supply) Regulations, 2010 as amended from time to time and any re-enactment thereof;
- t) **‘regional node’** means an injection node or a drawal node which is under the control area jurisdiction of a Regional Load Despatch Centre;
- u) **‘Regional Transmission Account’** means the monthly account of transmission charges issued by the Secretariat of respective Regional Power Committee on the basis of which the Central Transmission Utility shall raise the first bill in the billing month under these regulations;
- v) **‘Regional Transmission Deviation Account’** means the monthly account of Transmission Deviation charges issued by the Secretariat of respective Regional Power Committee on the basis of which the Central Transmission Utility shall raise the third bill in the billing month under these regulations;
- w) **‘seller’** shall have the same meaning as defined in the Central Electricity Regulatory Commission (Deviation Settlement Mechanism and Related

Matters) Regulation, 2014 and any subsequent amendments or re-enactments made thereof;

- x) **‘Surge Impedance Loading’ or ‘SIL’** means loading on transmission line for various configurations as per Annexure-II to these regulations;
- y) **‘Target Region’** means the region to which Long Term Access is granted to a DIC, without identified beneficiaries in the said region;
- z) **‘Tariff Regulations, 2014’** means the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2014, as amended from time to time;
- aa) **‘Tariff Regulations, 2019’** means the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2019, as amended from time to time;
- bb) **‘Transmission Deviation’** means the deviation as specified in and computed under Regulation 12 of these regulations;
- cc) **‘Transmission Deviation Rate’** means the rate calculated in accordance with Regulation 12 of these regulations;
- dd) **‘Untied LTA’** means the quantum of Long Term Access granted to a DIC less the quantum for which buyers have been identified under Long Term Access or Medium Term Open Access or both;
- ee) **‘Yearly Transmission Charges’ or ‘YTC’** means the annual transmission charges as determined or adopted by the Commission for the transmission elements of ISTS which have achieved COD upto the last day of a billing period, and for intra-State transmission lines used for inter-State transmission of electricity as approved by the Commission;

- (2) Words and expressions used in these Regulations and not defined herein but defined in the Act or the regulations of the Commission, shall have the meanings assigned to them respectively in the Act and the regulations of the Commission.

### **3. Principles of sharing transmission charges**

- (1) The transmission charges shall be shared amongst the DICs on monthly basis based on the Yearly Transmission Charges such that:-
- (a) The Yearly Transmission Charges are fully recovered; and
  - (b) Any adjustment on account of revision of the Yearly Transmission Charges are recovered.
- (2) Yearly Transmission Charges for transmission system shall be shared on monthly basis by DICs in accordance with Regulations 5 to 8 of these regulations subject to the exceptions provided in Clauses (3), (6), (9) and (12) of Regulation 13 of these regulations.
- (3) Long Term Access or Medium Term Open Access for projects covered under Clause (1) of Regulation 13 shall not be considered for apportionment of Yearly Transmission Charges under Regulations 5 to 8 of these regulations.
- (4) Sharing of transmission charges for DICs shall be based on the technical and commercial information provided by the DICs, inter-State transmission licensees, NLDC, RLDCs, SLDCs and CTU to the Implementing Agency.

## **CHAPTER 2**

### **COMPONENTS AND SHARING OF ISTS CHARGES AND LOSSES**

#### **4. Components of Transmission Charges**

Transmission charges for DICs shall have the following components:

- a. National Component (NC);
- b. Regional Component (RC);
- c. Transformer Component (TC); and
- d. AC System Component (ACC).

#### **5. Components and sharing of National Component (NC)**

(1) National Component shall be sum of the following components:

- (a) National Component-Renewable Energy (NC-RE); and
- (b) National Component-HVDC (NC-HVDC).

(2) National Component-Renewable Energy shall comprise of the Yearly Transmission Charges for transmission systems developed for renewable energy projects as identified by the Central Transmission Utility.

(3) National Component-HVDC shall comprise of the following:

- (a) 100% of Yearly Transmission Charges for “back-to-back HVDC” transmission system;
- (b) 100% of Yearly Transmission Charges for Biswanath-Chariali/ Alipurdwar to Agra HVDC transmission system;
- (c) Yearly Transmission Charges of Mundra–Mohindergarh 2500 MW HVDC transmission system corresponding to 1005 MW capacity:

Provided that Yearly Transmission Charges corresponding to 1495 MW for the said transmission system shall be borne by M/s Adani Power (Mundra) Limited or its successor company; and

(d) 30% of Yearly Transmission Charges for all other HVDC transmission systems except those covered under sub-clauses (a), (b) and (c) of this clause of this Regulation.

(4) The Yearly Transmission Charges for the National Component shall be shared by all drawee DICs and injecting DICs with untied LTA in proportion to their quantum of Long Term Access plus Medium Term Open Access and untied LTA respectively. ✓

## **6. Components and sharing of Regional Component (RC)**

(1) Regional Component shall be sum of the following components:

(a) Regional Component of HVDC (RC-HVDC) comprising of 70% of Yearly Transmission Charges of HVDC transmission systems planned to supply power to the concerned region, except HVDC transmission systems covered under sub clauses (a),(b) and (c) of Clause (3) of Regulation 5; and

(b) Yearly Transmission Charges for static compensators (STATCOMs), static VAR compensators (SVCs), bus reactors, spare transformers, spare reactors and any other transmission element(s) located in the concerned region and identified by the Central Transmission Utility as being critical for providing stability, reliability and resilience in the grid.

Provided that where separate Yearly Transmission Charges are not available in respect of specific transmission elements, the Yearly Transmission Charges for such transmission elements shall be worked out and provided by the



Central Transmission Utility, apportioning Yearly Transmission Charges approved by the Commission for the integrated project, based on indicative capital cost.

- (2) Yearly Transmission Charges covered under sub-clause (a) of Clause (1) of this Regulation shall be shared by drawee DICs of the receiving region and injecting DICs with untied LTA in the receiving region, in proportion to their quantum of Long Term Access plus Medium Term Open Access and untied LTA, respectively.
- (3) Yearly Transmission Charges covered under sub-clause (b) of Clause (1) of this Regulation shall be shared by drawee DICs of the region and injecting DICs (with untied LTA) of the same region, in proportion to their quantum of Long Term Access plus Medium Term Open Access and untied LTA, respectively.

## **7. Components and sharing of Transformer Component (TC)**

- (1) Transformer Component for a State shall comprise of Yearly Transmission Charges for inter-connecting transformers (ICTs) planned for drawal of power by the concerned State. A list of such transformers for each State shall be provided by the Central Transmission Utility to the Implementing Agency.

Provided that where the Yearly Transmission Charges of ICTs for a State are not available, the Yearly Transmission Charges for such transformers shall be worked out and provided by the Central Transmission Utility, apportioning Yearly Transmission Charges approved by the Commission for the integrated project, based on indicative capital cost. For transformers used for drawl requirement of more than one State, Yearly Transmission Charges shall be apportioned to such States in the ratio of number of feeders from such transformers for each State.

- (2) Transformer Component for a State shall be borne and shared by the drawee DICs located in the concerned State in proportion to their Long Term Access plus Medium Term Open Access.

## **8. Components and sharing of AC System Component (ACC)**

- (1) AC System Component shall comprise of the Yearly Transmission Charges, excluding the Yearly Transmission Charges covered under Regulations 5 to 7 of these regulations.
- (2) AC System Component shall have following components:
  - (i) Usage Based Component (AC-UBC); and
  - (ii) Balance Component (AC-BC).
- (3) The Yearly Transmission Charges of AC-UBC shall be shared by drawee DICs and injecting DICs with untied LTA corresponding to their respective usage of the transmission lines, in accordance with Regulation 9 of these regulations.
- (4) The Yearly Transmission Charges under AC-BC shall be the balance Yearly Transmission Charges for AC System Component after apportioning the charges for AC-UBC.
- (5) Transmission charges under AC-BC shall be shared by all drawee DICs and injecting DICs with untied LTA in proportion to their quantum of Long Term Access plus Medium Term Open Access and untied LTA respectively.

## **9. Computation of share of transmission charges under AC-UBC**

- (1) Base Case shall be prepared by the Implementing Agency corresponding to the peak block for each billing period comprising of:
  - (a) Basic Network for the power system corresponding to the peak block of the billing period; and
  - (b) Actual generation and actual demand, in MW, at each node of the Basic Network corresponding to the peak block.
- (2) DICs, inter-State transmission licensees, NLDC, RLDCs, SLDCs and STUs shall provide data for sub-clauses (a) and (b) of Clause (1) of this Regulation and the Yearly Transmission Charges to the Implementing Agency in the stipulated formats as per the timelines specified in Regulation 24 of these regulations.
- (3) MTC covered under AC-UBC shall be apportioned on transmission lines of the Basic Network, whose charges have been included in the Yearly Transmission Charges. Such apportionment shall be made on per circuit kilometer basis for each conductor configuration at each voltage level as per the methodology specified in Annexure-I of these regulations, for obtaining transmission line-wise transmission charges for each conductor configuration at each voltage level.
- (4) The Implementing Agency shall run AC load flow studies on the Base Case as prepared in accordance with Clause (1) of this Regulation to determine power flow on each transmission line:

Provided that while carrying out AC load flow studies, the Implementing Agency may make minor adjustment in generation and demand data, if required, to ensure load-generation balance.
- (5) Percentage usage of each transmission line shall be computed by dividing the power flow on each transmission line obtained in accordance with Clause (4) of this Regulation

by Surge Impedance Loading of the transmission line as per Annexure-II of these regulations:

Provided that in case power flow on any transmission line is more than Surge Impedance Loading, the percentage usage shall be capped at 100%.

- (6) Percentage usage of each transmission line obtained in accordance with Clause (5) of this Regulation shall be multiplied by transmission line-wise transmission charge obtained in accordance with Clause (3) of this Regulation to obtain transmission line-wise usage-based transmission charges for each conductor configuration at each voltage level.
- (7) Transmission charges at each drawal node and each injection node with untied LTA shall be calculated as per Hybrid Methodology, using transmission line-wise usage-based transmission charges obtained in accordance with Clause (6) of this Regulation.
- (8) The Implementing Agency shall aggregate the transmission charges as obtained in accordance with Clause (7) of this Regulation at drawal nodes within the geographical boundary of the State to determine the transmission charges for the State under AC-UBC:

Provided that drawee DICs other than the distribution licensees of the State, who have taken Long Term Access or Medium Term Open Access shall be apportioned the transmission charges under AC-UBC as per the transmission charges obtained at their drawl node(s) in accordance with Clause (7) of this Regulation and such transmission charges shall not be included in the aggregate transmission charges of the State.

- (9) Injecting DICs with untied LTA shall be apportioned transmission charges under AC-UBC as per the transmission charges obtained at their injection node in accordance with Clause (7) of this Regulation.

## 10. Sharing of Transmission Losses

- (1) Transmission losses for ISTS shall be calculated on all India average basis by the Implementing Agency for each week, from Monday to Sunday, as under:

$$[(In - Dr) / (Ir)] \times 100$$

Where:

‘In’ denotes sum of injection into the ISTS at regional nodes for the week;

‘Dr’ denotes sum of drawal from the ISTS at regional nodes for the week;

‘Ir’ denotes sum of injection into the ISTS at regional nodes less injection from projects covered under Clause (1) of Regulation 13 of these regulations for the week.

- (2) Drawal schedule of DICs shall be prepared as per provisions of the Grid Code taking into account the transmission losses of the week preceding the last week as calculated in accordance with Clause (1) of this Regulation:

Provided that while preparing drawal schedule of DICs in respect of projects covered under Clause (1) of Regulation 13, transmission losses shall be considered as zero.

- (3) Transmission losses for ISTS shall be considered as zero while preparing injection schedule of DICs including that for Collective Transactions in the Power Exchanges.

## 11. Transmission charges for Short Term Open Access

- (1) Short Term Open Access Rate (in paise/kWh) shall be published for each billing month by the Implementing Agency which shall be calculated State-wise as under:

Transmission charges of the State for the billing month (in rupees) / (7200 X the quantum, in MW, of Long Term Access plus Medium Term Open Access of the State for the corresponding billing period)

- (2) Transmission charges for Short Term Open Access shall be payable by generating stations and embedded entities located in the State, as per the last published Short Term Open Access Rate for the State, along with other charges or fees as per Open Access Regulations, 2008 and the Transmission Deviation charges, if any, as per these regulations.
- (3) Transmission charges for Short Term Open Access paid by an embedded intra-State entity during a month shall be reimbursed in the following billing month to the State in which such entity is located.
- (4) Transmission charges for Short Term Open Access, paid by a DIC with untied LTA shall be offset against the transmission charges payable by the said DIC for untied LTA in the following billing month.
- (5) No transmission charges for Short Term Open Access for inter-State transmission system, shall be payable by a distribution licensee which has Long Term Access or Medium Term Open Access or both, or by a trading licensee acting on behalf of such distribution licensee:

Provided that other charges or fees as per Open Access Regulations, 2008 and the Transmission Deviation charges, if any, as per these regulations shall be payable.

- (6) Transmission charges for Short Term Open Access collected in a billing month, after adjustment as per Clauses (3) and (4) of this Regulation, shall be reimbursed to the DICs in proportion to their share in the first bill in the following billing month.

## **12. Transmission Deviation**

- (1) Transmission Deviation, in MW, shall be computed as under:

- (a) For a generating station, net metered ex-bus injection, in a time block in excess of the sum of Long Term Access, Medium Term Open Access and Short Term Open Access:

Provided that for a hydro-generating station, overload capacity of 10% during peak season shall be taken into account.

- (b) For a State net metered ex-bus injection or net metered drawal, in a time block, in excess of the sum of Long Term Access and Medium Term Open Access.

- (c) For any drawee DIC, which is a regional entity other than distribution licensees, net metered drawal in a time block in excess of the sum of Long Term Access, Medium Term Open Access and Short Term Open Access.

- (2) Transmission Deviation Rate in Rs./MW, for a State or any other DIC located in the State, for a time block during a billing month shall be computed as under:

$1.05 \times (\text{transmission charges of the State for the billing month in Rs.}) /$   
 $(\text{quantum in MW of Long Term Access plus Medium Term Open Access of}$   
 $\text{the State for the corresponding billing period} \times 2880)$

- (3) The Transmission Deviation charges shall be recovered through the third bill and shall be reimbursed to the DICs in proportion to their share in the first bill in the following billing month.

### CHAPTER 3

#### SPECIFIC CASES

#### 13. Treatment of transmission charges and losses in specific cases

- (1) No transmission charges and losses for the use of ISTS shall be payable for:

(a) generation based on solar power resource for the useful life of the projects commissioned during the period from 1.7.2011 to 30.6.2017.

(b) generation based on solar or wind power resources for a period of 25 years from the date of commercial operation, fulfilling the following conditions:

(i) Such generation capacity has been awarded through competitive bidding; and

(ii) Such generation capacity has been declared under commercial operation during the period from 1.7.2017 to 12.2.2018 for solar based resources or during the period from 30.9.2016 to 12.2.2018 for wind based resources; and

(iii) Power Purchase Agreement(s) have been executed for sale of power from such generation capacity to the Distribution Companies for compliance of their renewable purchase obligation.

(c) generation based on solar or wind power resources , for a period of 25 years from the date of commercial operation, fulfilling the following conditions:

(i) Such generation capacity has been awarded through competitive bidding process in accordance with the guidelines issued by the Central Government; and

(ii) Such generation capacity has been declared under commercial operation during the period from 13.2.2018 to 31.12.2022; and

(iii) Power Purchase Agreement(s) have been executed for sale of such generation capacity to all entities including Distribution Companies for compliance of their renewable purchase obligations.



- (2) Where a generating station or any other seller has been granted Long Term Access or Medium Term Open Access and has entered into Power Purchase Agreement(s) for supply of power under such Long Term Access or Medium Term Open Access, the transmission charges towards such Long Term Access or Medium Term Open Access for components identified under Regulations 5 to 8 of these regulations shall be determined at the drawal nodes, and billed to the buyer(s) after COD of generating station or unit(s) thereof:

Provided that where the generating station or any other seller is responsible to pay the transmission charges in terms of the Power Purchase Agreements, bills for transmission charges shall be raised on the buyer in terms of this clause notwithstanding the provision in the PPA and settlement of the transmission charges *inter se* between the buyer and the generating station or the seller shall be made in terms of the PPA or as may be mutually agreed.

- (3) Where COD of a generating station or unit(s) thereof is delayed and the Associated Transmission System has achieved COD, which is not earlier than its SCOD, the generating station shall pay Yearly Transmission Charges for the Associated Transmission System corresponding to Long Term Access granted for the generating station or unit(s) thereof, which have not achieved COD:

Provided that Yearly Transmission Charges in respect of Associated Transmission System shall be included for determination of transmission charges of DICs in accordance with Regulations 5 to 8 of these regulations upon the generating station or unit(s) thereof achieving COD.

- (4) Where only some of the transmission elements of the Associated Transmission System have achieved COD before the COD of the Associated Transmission System

and the generating station seeks part operationalisation of Long Term Access, the Central Transmission Utility shall part operationalize Long Term Access, subject to availability of transmission system and Yearly Transmission Charges in respect of such transmission elements of the Associated Transmission System shall be included for determination of transmission charges of DICs in accordance with Regulations 5 to 8 of these regulations.

- (5) Where only some of the transmission elements of the Associated Transmission System have achieved COD before the COD of the Associated Transmission System and if such transmission elements are certified by the respective Regional Power Committee(s) as required for improving the performance, safety and security of the grid, the Yearly Transmission Charges for such transmission elements of the Associated Transmission System shall be included for determination of transmission charges of DICs in accordance with Regulations 5 to 8 of these regulations.
- (6) If any transmission element(s) of the Associated Transmission System is required by the generating station prior to COD of the Associated Transmission System, the Yearly Transmission Charges for such transmission element(s) shall be payable by the generating station from the COD of the said transmission element(s) of the Associated Transmission System till the generating station achieves COD.
- (7) Where Long Term Access is granted to a generating station on existing margins and COD of the generating station or unit(s) thereof is delayed, the generating station shall, corresponding to the capacity that is delayed, pay transmission charges at the rate of 10% of transmission charge per MW for the State where such generating station is located:

Provided that the amount so received in a billing month, shall be reimbursed to the DICs in proportion to their share in the first bill in the following billing month.

- (8) In case a generating station or unit(s) thereof has achieved COD and the Associated Transmission System is delayed, the concerned inter-State transmission licensee(s) shall make alternate arrangement at its own cost for despatch of power of the generating station or unit(s) thereof in consultation with the Central Transmission Utility:

Provided that till such alternate arrangement is made, the inter-State transmission licensee(s) shall pay to the generating station, the Yearly Transmission Charge corresponding to the quantum of Long Term Access for the period for which the transmission system has got delayed.

- (9) Where a dedicated transmission line has already been constructed or is under construction by an inter-State transmission licensee under coordinated transmission planning of the Central Transmission Utility, the Yearly Transmission Charges for such dedicated transmission line shall be payable by the concerned generating station to the inter-State transmission licensee (including deemed inter-State transmission licensee) from the COD of the dedicated transmission line till operationalization of Long Term Access of the generating station. After operationalization of Long Term Access, Yearly Transmission Charge for the dedicated transmission line proportionate to the quantum of Long Term Access operationalized qua the quantum of Connectivity for the dedicated transmission line shall be considered in accordance with Regulations 5 to 8 of these regulations and the balance transmission charges shall continue to be paid by the generating station.

- (10) Generating stations drawing start-up power from ISTS shall pay transmission charges at the rate of Transmission Deviation Rate for the State in which they are located:

Provided that the amount so received in a billing month, shall be reimbursed to the DICs in proportion to their share in the first bill in the following billing month.

- (11) Where a generating station is connected to both ISTS and intra-State transmission system, only ISTS charges and losses shall be applicable on the quantum of Long Term Access and Medium Term Open Access corresponding to capacity connected to ISTS.

- (12) In case of a transmission system where COD has been approved in terms of proviso (ii) of Clause (3) of Regulation 4 of the Tariff Regulations, 2014 or Clause (2) of Regulation 5 of the Tariff Regulations, 2019 or where deemed COD has been declared in terms of Transmission Service Agreement under Tariff based Competitive Bidding, the Yearly Transmission Charges for the transmission system shall be:

- (a) paid by the inter-State transmission licensee whose transmission system is delayed till its transmission system achieves COD, or
- (b) paid by the generating company whose generating station or unit(s) thereof is delayed, till the generating station or unit thereof, achieves COD, or
- (c) shared in the manner as decided by the Commission on case to case basis, where more than one inter-State transmission licensee is involved or both transmission system and generating station are delayed.

- (13) An intra-State transmission system for which tariff is approved by the Commission shall be included for sharing of transmission charges of DICs in accordance with Regulations 5 to 8 of these regulations, only for the period for which such tariff has been approved.

## CHAPTER 4

### ACCOUNTING, BILLING AND COLLECTION OF TRANSMISSION CHARGES

#### 14. Accounting

- (1) The Implementing Agency shall publish transmission charges payable by drawee DICs and injecting DICs with untied LTA for the billing month in Rupee terms.
- (2) Regional Transmission Accounts and Regional Transmission Deviation Accounts for the billing month for the DICs shall be prepared by the Secretariat of the respective Regional Power Committee on the basis of:
  - (a) DIC-wise transmission charges for the billing month, as furnished by the Implementing Agency; and
  - (b) Meter readings of all Special Energy Meters for computation of Transmission Deviations for every time block of the corresponding billing period, as furnished by respective RLDCs.
- (3) Regional Transmission Accounts and Regional Transmission Deviation Accounts shall be issued by the Secretariat of respective Regional Power Committee to DICs, the Central Transmission Utility and inter-State transmission licensees and also be displayed on the website of respective Regional Power Committees.
- (4) Where the transmission charges were being billed to a distribution licensee or any designated agency in the State before coming into force of these regulations, the distribution licensee or the designated agency, as the case may be, shall be treated as DIC in that State for the purpose of preparation of Regional Transmission Account by

Regional Power Committees and for the purpose of billing and collection of transmission charges by the Central Transmission Utility:

Provided that after coming into force of these regulations, the States may designate any agency as DIC for the above purpose.

(5) Timelines for preparation of Base Case, notification of transmission charges of DICs, issue of Regional Transmission Accounts and Regional Transmission Deviation Accounts and raising of bills shall be as under:

(a) Base Case for the billing period shall be prepared by the Implementing Agency by 15<sup>th</sup> day of the month following the billing period.

(b) Transmission charges payable by DICs shall be notified by the Implementing Agency by 25<sup>th</sup> day of the month following the billing period.

(c) Secretariat of the respective Regional Power Committee shall issue Regional Transmission Accounts and Regional Transmission Deviation Accounts by the end of the month following the billing period.

(d) The Central Transmission Utility shall raise the first bill and the third bill for transmission charges on DICs in first week of the second month following the billing period.

Provided that in case of delay in issuance of Regional Transmission Account for a billing month, the Central Transmission Utility may raise provisional bills based on last available Regional Transmission Account and subsequently raise adjustment bills when Secretariat of respective Regional Power Committee issues Regional Transmission Account for the said billing month.

## **15. Billing.**

- (1) The Central Transmission Utility shall, raise the bills for transmission charges, as per the timelines specified in sub-clause (d) of Clause (5) of Regulation 14 of these regulations.
- (2) The bills for transmission charges for the DICs shall be raised by the Central Transmission Utility under the following three categories:
  - (a) The first bill of each billing month shall contain the transmission charges for the billing period in accordance with Regulations 5 to 8 of these Regulations.
  - (b) The second bill shall be raised in the months of April, July, October and January every year for the quarter ending on 31<sup>st</sup> March, 30<sup>th</sup> June, 30<sup>th</sup> September and 31<sup>st</sup> December respectively to adjust variations on account of any revision in transmission charges allowed by the Commission, including incentives as applicable:

Provided that under-recovery or over-recovery of any amount on account of such revision in transmission charges in respect of a billing period shall be billed by the Central Transmission Utility to DICs in proportion to their first bill in the relevant billing month.
  - (c) The third bill shall be raised in each billing month for Transmission Deviation charges, along with the first bill.
- (3) The Central Transmission Utility shall raise separate bills, as per the timelines for the first bill, for transmission systems covered under Clauses (3), (6), (8), (9) and (12) of Regulation 13 and not covered under Regulations 5 to 8 of these regulations.
- (4) All bills raised by the Central Transmission Utility shall also be posted on its website.

## **16. Due Date**

Notwithstanding any provision to the contrary in the applicable Tariff Regulations or Transmission Service Agreement under tariff based competitive bidding, due date in relation to any bill raised by the Central Transmission Utility under these regulations shall mean the forty fifth (45<sup>th</sup>) day from the date of presentation of such bill.

#### **17. Rebate**

Notwithstanding any provision to the contrary in the applicable Tariff Regulations or Transmission Service Agreement under tariff based competitive bidding, rebate on payment of bills shall be governed as under:

- (a) A rebate of 1.50% shall be allowed for payment of bills within a period of 5 days of presentation of bills.

Explanation: In case of computation of '5 days', the number of days shall be counted consecutively without considering any holiday. However, in case the last day or 5<sup>th</sup> day is an official holiday, the 5<sup>th</sup> day for the purpose of rebate shall be construed as the immediate succeeding working day.

- (b) A rebate of 1% shall be allowed where payments are made on any day after 5 days and within a period of 30 days of presentation of bills.

#### **18. Late Payment Surcharge**

Notwithstanding any provision to the contrary in the applicable Tariff Regulations or Transmission Service Agreement under tariff based competitive bidding, in case the payment of any bill for charges payable under these regulations is delayed by a DIC, beyond the due date, a late payment surcharge at the rate of 1.50% per month shall be payable by the concerned DIC.

#### **19. Letter of Credit and other instruments of Payment Security Mechanism**

- (1) The Central Transmission Utility shall, at least 3 (three) months prior to the date of



operationalization of Long Term Access or Medium Term Open Access, in respect of a DIC, give a notice to such DIC, indicating the date of operationalization of such Long Term Access or Medium Term Open Access and requiring the DIC to furnish an irrevocable, unconditional and revolving Letter of Credit through a scheduled bank or any other acceptable instrument of payment security mechanism in favour of the Central Transmission Utility. Not later than 1 (one) month prior to the date of operationalization of Long Term Access or Medium Term Open Access, the DIC shall open such Letter of Credit or provide such acceptable instrument of payment security mechanism that shall be operative from a date prior to the Due Date of its first bill.

- (2) In case tripartite agreement for securitization on account of arrears against the transmission charges with the Government of India exists, the Letter of Credit or the acceptable instrument of payment security mechanism shall have a term of 12 (twelve) months and shall be for an amount equal to 1.05 (one point zero five) times the average amount of the first bill of a year:

Provided that where such tripartite agreement does not exist, the DIC shall open the Letter of Credit or provide an acceptable instrument of payment security mechanism for an amount equal to 2.10 (two point one times) the average amount of the first bill of a year.

- (3) If at any time, the amount for which Letter of Credit or the acceptable instrument of payment security mechanism is provided, falls short of the amount specified in Clause (2) of this Regulation, the DIC shall replenish such shortfall within 7 (seven) days of intimation by the Central Transmission Utility.
- (4) If a DIC fails to pay any bill or part thereof by the Due Date, the Central Transmission Utility may encash the Letter of Credit or recover through such other

instrument of payment security mechanism provided by the DIC, the amount of the bill or part thereof that is overdue plus Late Payment Surcharge, if applicable.

- (5) In case of such encashment of the Letter of Credit or recovery through such other instrument of payment security mechanism provided by the DIC, in full or in part, by the Central Transmission Utility in accordance with these regulations, the DIC shall replenish the amount through the Letter of Credit or such other instrument of payment security mechanism, as the case may be, within 7 (seven) days of intimation of such encashment or recovery by the Central Transmission Utility.
- (6) The DICs shall renew the Letter of Credit or such other instrument of payment security mechanism, 30 (thirty) days prior to the date of expiry.
- (7) In case of failure on the part of any DIC to maintain the Letter of Credit or such other instrument of payment security mechanism for the required amount in accordance with Clause (2) of this Regulation or replenish the Letter of Credit or such other instrument of payment security mechanism in accordance with Clauses (3) and Clause (5) of this Regulation and renew the Letter of Credit or such other instrument of payment security mechanism in accordance with Clause (6) of this Regulation, CTU may regulate the power injection of or supply to the concerned DIC, as the case may be in accordance with the Power Supply Regulations, 2010.

## **20. Collection and Disbursement**

- (1) The Central Transmission Utility shall collect transmission charges on account of the first bill for transmission system covered under Regulations 5 to 8 of these regulations and disburse the amount so collected to inter-State transmission licensees and intra-State transmission licensees in proportion to their Yearly Transmission Charges:

Provided that in case of shortfall in collection of transmission charges, the amount to be disbursed to inter-State transmission licensees and intra-State transmission licensees shall be reduced pro-rata from their share of Yearly Transmission Charges.

- (2) Transmission charges collected by the Central Transmission Utility for transmission systems covered under Clauses (3), (6), (8), (9) and (12) of Regulation 13 and not covered under Regulations 5 to 8 of these regulations shall be disbursed directly to the concerned inter-State transmission licensee or the generating company, as the case may be.
- (3) The Central Transmission Utility shall collect transmission charges under the second bill and disburse the same to the respective inter-State transmission licensees.
- (4) The Central Transmission Utility shall collect Transmission Deviation charges under the third bill and reimburse the same to the DICs, in proportion to their first bill in the following billing month.
- (5) All payments and disbursements under provisions of this regulation shall be executed through National Electronic Funds Transfer (NEFT) or Real Time Gross Settlement (RTGS) or any other means of electronic transfer approved by the Reserve Bank of India.
- (6) The charges collected shall be first adjusted towards late payment surcharge on the outstanding transmission charges and thereafter towards outstanding transmission charges, starting from the longest overdue bill.

## **21. Consequences of non-payment of dues by a DIC**

Failure on the part of a DIC to make payment, in full, against the bills by the due date under these regulations shall make such DIC liable for action for any or combination of the following, by the Central Transmission Utility, on behalf of inter-State transmission

licensee(s):

- (a) regulation of power supply in accordance with the Power Supply Regulations 2010;
- (b) denial of Short term Open Access by RLDC or NLDC in accordance with the Open Access Regulations, 2008;
- (c) suspension or termination of Long Term Access or Medium Term Open Access in accordance with Connectivity Regulations, 2009.

## **22. Transition Period**

Notwithstanding anything to the contrary contained in these regulations, bills for the first two billing periods, after these regulations come into force, shall be based on the Central Electricity Regulatory Commission (Sharing of Inter-State Transmission Charges and Losses) Regulations, 2010.

## **CHAPTER 5**

### **INFORMATION AND PROCEDURES**

#### **23. Procedures to be framed under these Regulations**

- (1) The Implementing Agency shall, within 90 (ninety) days of the notification of these regulations, publish the detailed procedures and formats for collection of data and information from various agencies and entities for implementation of the provisions of these regulations after stakeholder consultation.
- (2) The Implementing Agency shall be responsible for development and maintenance of the software for implementation of these regulations and shall get the same audited before it is put to use.

- (3) The Central Transmission Utility, in discharge of its functions under these regulations, may make such procedure as may be necessary, which is not inconsistent with these regulations or any other regulations of the Commission.

#### **24. Timeline for furnishing the information**

- (1) On or before the end of the billing period, all entities whose transmission elements have declared COD during the billing period shall submit to the Implementing Agency, network data, date(s) of commercial operation of the new transmission element and Yearly Transmission Charge of such transmission element in the format stipulated by the Implementing Agency.
- (2) The Implementing Agency shall publish, on its website, the peak block for the billing period on the first day of the month following the billing period.
- (3) Within 7 (seven) days after end of the billing period, the Central Transmission Utility shall submit indicative cost for transmission lines for each conductor configuration at each voltage level to the Implementing Agency.
- (4) Within 7 (seven) days after end of a billing period, DICs shall submit the following to the Implementing Agency for the billing period:
  - (a) MW and MVAR data for actual injection or actual drawal at various nodes or a group of nodes for peak block.
  - (b) Quantum for which buyers have been identified under Long Term Access or Medium Term Open Access or both along with details of such buyers;
  - (c) Any other information as required by the Implementing Agency
- (5) In the event of such information required by the Implementing Agency is not available within the stipulated timeframe or to the level of details required, the

Implementing Agency shall compute transmission charges based on such information from the available sources.

## **25. Information to be published by the Implementing Agency**

- (1) The information to be made available, on its website, by the Implementing Agency shall include:
  - (a) The Basic Network, generation at nodes and drawal at nodes considered for the Base Case and the load flow results, for each billing period;
  - (b) Assumptions made in the Base Case, if any;
  - (c) Details of transformers, list of transmission elements and corresponding transmission charges considered under Regional Component for the billing period;
  - (d) Transmission System covered under National Component;
  - (e) New transmission systems added during the billing period;
  - (f) Yearly Transmission Charges for the transmission elements considered in the billing period, as submitted by the inter-State transmission licensees and intra-State transmission licensees;
  - (g) Details of Long Term Access and Medium Term Open Access in respect of each DIC for the billing period;
  - (h) Detailed calculations of indicative cost for arriving at the average cost in respect of each transmission line; and
  - (i) Transmission charges payable by each constituent for the billing month along with component-wise break-up.

- (2) All information in accordance with Clause (1) of this regulation shall be made available on the website of the Implementing Agency in editable “Microsoft Excel” format.
- (3) Interactive “query” may be designed to give results including (i) a given generator is meeting which loads and in what proportion, (ii) a given load(s) is met by which generators and in what proportion, (iii) a given DIC is using which transmission lines and in what proportion, and (iv) a given transmission is serving which DICs and in what proportion.
- (4) Any data considered sensitive by the Implementing Agency, may be provided to concerned DICs with access control.

## **CHAPTER 6: MISCELLANEOUS**

### **26. Savings and Repeal.**

- (1) Save as otherwise provided in these regulations, Central Electricity Regulatory Commission (Sharing of inter-state transmission charges and losses) Regulations, 2010, as amended from time to time, is hereby repealed.
- (2) Notwithstanding such repeal, anything done or any action taken or purported to have been done or taken under the repealed regulations shall be deemed to have been done or taken under these regulations.

### **27. Power to Relax.**

The Commission may, for reasons to be recorded in writing, relax any of the provisions of these regulations on its own motion or on an application made before it by an interested person.

## **28. Power to Remove Difficulties**

If any difficulty arises in giving effect to any of the provisions of these regulations, the Commission may, by general or specific order, make such provisions not inconsistent with the provisions of the Act, as may appear to be necessary for removing the difficulty.

sd/-

**(Sanoj Kumar Jha)**

**Secretary**



## THE HYBRID METHODOLOGY FOR USAGE BASED TRANSMISSION CHARGES

1. Utilization of the network is generally determined in terms of either average utilization or marginal utilization of the transmission assets. Pricing of transmission services based on average or marginal utilization of the network branches is known as Average Participation or Marginal Participation method respectively. A usage-based methodology determines the power that flows through each of the lines in the system due to the existence of a certain network user.

### 2. Marginal Participation Method

2.1 The marginal participation method analyzes how the flows in the grid are modified when minor changes are introduced in the generation or load of agent  $i$ . The procedure shall be as follows:

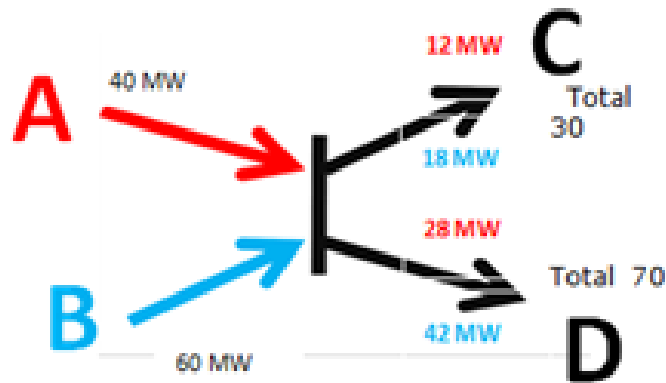
- (a) Marginal Participation sensitivities  $A_{ij}$  are obtained which represent how the flow in line  $j$  changes when the generation or load at bus  $i$  is increased by 1 MW. The increase in 1 MW has to be compensated by a corresponding increase in load or generation at some other bus(es), called the slack bus(es).
- (b) Total participations for each agent are calculated as a product of its net injection by its marginal participation. If net injection is considered positive for generating stations and negative for loads, the total participation of any agent  $i$  in line  $j$  is  $A_{ij}(\text{generation}_i - \text{demand}_i)$ .
- (c) The cost of each line is apportioned pro-rata to the different agents according to their total participation in the corresponding line.

### 3. Average Participation Method

3.1 The procedure for average participation shall be as follows:

- (a) For every individual generating station  $i$ , a number of physical paths are constructed, starting at the node where the generator injects power into the grid, following through the lines as the power moves through the network, and finally reaching several of the loads in the system.
- (b) Similar calculations are also performed for the demands, tracing upstream the energy consumed by a certain user, from the demand bus until some generating stations are reached. One such physical path is constructed for every generator and for every demand.
- (c) In order to create such physical paths, a basic criterion is adopted wherein responsibility for the actual flows on various lines from sources to sinks is assigned according to an allocation rule, in which inflows are distributed proportionally between the outflows. An illustrative example of the proportional allocation mechanism is demonstrated in figure below.

Fig.: Average Participation Method



$$\text{Portion of A at C} = 30 \times \frac{40}{(60+40)} = 12$$

$$\text{Portion of B at C} = 30 \times \frac{60}{(60+40)} = 18$$

$$\text{Portion of A at D} = 70 \times \frac{40}{(60+40)} = 28$$

$$\text{Portion of B at D} = 70 \times \frac{60}{(60+40)} = 42$$

(d) The average participation method calculates the participation of agent  $i$  by tracking the influence in the network of a transit between node  $i$  and several ending nodes that result from the rules that conform the algorithm. In the example above, based on flow in the outgoing lines, the injection of 40MW (through the red line) is allocated to the outgoing lines in the proportion of the transfers from the two outgoing lines. Thus, the outgoing line that transfers 30 MW (i.e. 30% of the total transfer out of the bus) is allocated 30% of the 40 MW injection from the red line, i.e. 12 MW. Similar allocations are made for the other flows as well.

#### 4. Hybrid Methodology

Under the Hybrid Methodology, the slack buses shall be selected by using the Average Participation Method, and the transmission charges on each node shall be computed using the Marginal Participation Method.

## **5. Steps to be followed under Hybrid Methodology**

5.1 Following steps are involved in the Hybrid Methodology

- (A) Data acquisition;
- (B) Computation of load flows on the Basic Network;
- (C) Identification of slack node(s);
- (D) Determination of transmission charges; and
- (E) Determination of sharing of transmission charges

### **(A) DATA ACQUISITION: INPUTS TO THE MODEL**

5.2 The transmission pricing model requires a set of inputs for peak block of the month as follows:

- Generation information at nodes;
- Demand information at nodes;
- Transmission circuits between these nodes and their electrical characteristics required for load flow analysis, the associated lengths of these transmission lines and their capacity and Yearly Transmission Charges (YTC) of each transmission line; and
- Identification of reference node(s).

5.3 The DICs will provide actual generation and actual drawal {MW and MVAR at each node in the Basic Network. The data provided by the DICs shall be as per the formats stipulated by the Implementing Agency. All drawee DICs shall also submit generation

from their own generating stations for the peak block during the billing period to the Implementing Agency to prepare the Base Case for load-generation balance.

5.4 Information provided by the DICs shall be verified by the Implementing Agency as per the detailed procedure stipulated by the Implementing Agency.

5.5 Inter-State transmission licensees, intra-State transmission licensees whose transmission system are included in Yearly Transmission Charges, and the DICs shall supply network data for the existing network, in the format stipulated by the Implementing Agency.

5.6 The Basic Network shall contain all the power system elements including generating station and transmission line at 110 kV and above. ~~Power flow into a lower voltage system from the voltage levels~~ indicated in the definition of the Basic Network shall be considered as load at that sub-station. Power flow from a lower voltage system into the electricity systems at the voltage levels shall be considered as generation at that sub-station.

5.7 The transmission system declared under commercial operation on or before the last day of the billing period shall be considered for computation of transmission charge for a billing month. However, Basic Network shall be considered as in the peak block of the billing period.

5.8 Dedicated transmission lines constructed, owned and operated by the inter-State transmission licensees shall be considered to be a part of the Basic Network. However, dedicated transmission lines constructed, owned and operated by generating stations shall not be considered as a part of the Basic Network and the generating station shall be deemed to be connected directly to the ISTS at the pooling point for the purpose of

modelling Basic Network. Actual injection of such generating stations at the pooling station shall be taken as actual injection at the pooling point.

5.9 The transmission charge per circuit kilometer for a transmission line for each conductor configuration at each voltage level shall be made uniform. The methodology followed shall be as follows:

5.9.1 The Central Transmission Utility shall provide indicative cost per circuit kilometer for a transmission line for each conductor configuration at each voltage level.

5.9.2 Total circuit kilometer for transmission lines for each conductor configuration at each voltage level shall be allocated uniform charges as in following illustration:

Type	Cost (Rs Lakh)	Cost (Rs Lakh) /Circuit	Actual ckt-km Type Wise	Equivalent ckt km	Indicative Cost Type Wise per ckt-km
				w.r.t 400 kV D/C Quad Moose	(Rs Lakh/ckt-km)
765 kV - D/C – HEXA	a <sub>1</sub>	b <sub>1</sub> =a <sub>1</sub> /2	T <sub>1</sub>	K <sub>1</sub> =T <sub>1</sub> ×(b <sub>1</sub> /b <sub>3</sub> )	I <sub>1</sub> = <sup>T</sup> C <sub>M</sub> ×( K <sub>1</sub> /K)/T <sub>1</sub>
765 kV - S/C – HEXA	a <sub>2</sub>	b <sub>2</sub> =a <sub>2</sub>	T <sub>2</sub>	K <sub>2</sub> =T <sub>2</sub> ×(b <sub>2</sub> /b <sub>3</sub> )	I <sub>2</sub> = <sup>T</sup> C <sub>M</sub> ×( K <sub>2</sub> /K)/T <sub>2</sub>
400 kV - D/C - Quad Moose	a <sub>3</sub>	b <sub>3</sub> =a <sub>3</sub> /2	T <sub>3</sub>	K <sub>3</sub> =T <sub>3</sub> ×(b <sub>3</sub> /b <sub>3</sub> )	I <sub>3</sub> = <sup>T</sup> C <sub>M</sub> ×( K <sub>3</sub> /K)/T <sub>3</sub>
400 kV - D/C - Twin Moose	a <sub>4</sub>	b <sub>4</sub> =a <sub>4</sub> /2	T <sub>4</sub>	K <sub>4</sub> =T <sub>4</sub> ×(b <sub>4</sub> /b <sub>3</sub> )	I <sub>4</sub> = <sup>T</sup> C <sub>M</sub> ×( K <sub>4</sub> /K)/T <sub>4</sub>
400 kV - S/C - Twin Moose	a <sub>5</sub>	b <sub>5</sub> =a <sub>5</sub>	T <sub>5</sub>	K <sub>5</sub> =T <sub>5</sub> ×(b <sub>5</sub> /b <sub>3</sub> )	I <sub>5</sub> = <sup>T</sup> C <sub>M</sub> ×( K <sub>5</sub> /K)/T <sub>5</sub>
220 kV - D/C -	a <sub>6</sub>	b <sub>6</sub> =a <sub>6</sub> /2	T <sub>6</sub>	K <sub>6</sub> =T <sub>6</sub> ×(b <sub>6</sub> /b <sub>3</sub> )	I <sub>6</sub> = <sup>T</sup> C <sub>M</sub> ×( K <sub>6</sub> /K)/T <sub>6</sub>
220 kV - S/C -	a <sub>7</sub>	b <sub>7</sub> =a <sub>7</sub>	T <sub>7</sub>	K <sub>7</sub> =T <sub>7</sub> ×(b <sub>7</sub> /b <sub>3</sub> )	I <sub>7</sub> = <sup>T</sup> C <sub>M</sub> ×( K <sub>7</sub> /K)/T <sub>7</sub>
132 kV - D/C -	a <sub>8</sub>	b <sub>8</sub> =a <sub>8</sub> /2	T <sub>8</sub>	K <sub>8</sub> =T <sub>8</sub> ×(b <sub>8</sub> /b <sub>3</sub> )	I <sub>8</sub> = <sup>T</sup> C <sub>M</sub> ×( K <sub>8</sub> /K)/T <sub>8</sub>
132 kV - S/C -	a <sub>9</sub>	b <sub>9</sub> =a <sub>9</sub>	T <sub>9</sub>	K <sub>9</sub> =T <sub>9</sub> ×(b <sub>9</sub> /b <sub>3</sub> )	I <sub>9</sub> = <sup>T</sup> C <sub>M</sub> ×( K <sub>9</sub> /K)/T <sub>9</sub>
400 kV - D/C - Triple Snowbird	a <sub>10</sub>	b <sub>10</sub> =a <sub>10</sub> /2	T <sub>10</sub>	K <sub>10</sub> =T <sub>10</sub> ×(b <sub>10</sub> /b <sub>3</sub> )	I <sub>10</sub> = <sup>T</sup> C <sub>M</sub> ×( K <sub>10</sub> /K)/T <sub>10</sub>
400 kV - D/C - Twin HTLS	a <sub>11</sub>	b <sub>11</sub> =a <sub>11</sub> /2	T <sub>11</sub>	K <sub>11</sub> =T <sub>11</sub> ×(b <sub>11</sub> /b <sub>3</sub> )	I <sub>11</sub> = <sup>T</sup> C <sub>M</sub> ×( K <sub>11</sub> /K)/T <sub>11</sub>
		Sum	T	K	

<sup>T</sup>C<sub>M</sub> = Monthly Transmission Charge w.r.t. AC System Component

5.10 While carrying out the calculations under Clause 5.9 above and while computing the transmission line-wise transmission charges and transmission line-wise usage-based transmission charges in accordance with Clauses (3) and (6) of Regulation 9 of these regulations, the provisions as under shall be followed:

5.10.1 The transmission lines covered under Clause (2) of Regulation 5 shall be considered with “zero circuit kms”.

5.10.2 Where entire Yearly transmission charge is to be billed to a generating station under Clauses (3), (6) and (9) of Regulation 13, such transmission lines shall be considered at “zero circuit kms”.

5.10.3 Where Yearly Transmission Charges are to be partly included for computation of transmission charges in accordance with Regulations 5 to 8 of these Regulations and partly to be billed to the generating station or any other entity under provisions of Regulation 13 of these regulations, the circuit kilometers of such transmission lines shall be reduced pro rata corresponding to the Yearly Transmission Charges to be included for computation of transmission charges in accordance with Regulations 5 to 8 of these regulations.

*Illustration:*

*Suppose Kudgi-Narendara transmission line has 500 circuit km and 50% of its Yearly Transmission Charges are to be billed to a generating station ‘A’ and 50% is to be included for computation of transmission charges in accordance with Regulations 5 to 8 of these regulations. For calculation of AC-UBC, circuit km for this transmission line shall be taken as 250 circuit km.*

## **(B) COMPUTATION OF LOAD FLOWS ON THE BASIC NETWORK**

5.11 The Implementing Agency shall run AC load flow on the Basic Network. In case of a STU or SEB, total injection at all injection nodes owned by the STU or SEB shall be equal to the aggregate of injection of all the entities connected in the STU or SEB

network. Similarly, total drawal at all the drawal nodes owned by a SEB or STU shall be equal to aggregate of drawal of all the entities connected in the SEB or STU network.

5.12 In the process of convergence of AC load flow on the Basic Network, the Implementing Agency may make certain minor adjustments in load or generation at various buses to ensure load-generation balance.

### **(C) IDENTIFICATION OF THE SLACK NODES: USING AVERAGE PARTICIPATION METHOD**

5.13 According to the Kirchoff's laws, any 1 MW increase in generation (or load) at node  $i$  has to be compensated by a corresponding increase in load (or generation) at some other node(s). Thus, the calculation of quantum of injection (or drawal) at a certain bus affecting the power flow in the Basic Network depends on the choice of the node(s) that responds.

5.14 The external slack bus(es) for each node shall be found as follows:

5.14.1 For every node in a particular scenario, Average Participation Method shall be applied to each generation and each load located in the State under consideration. Tracing from load to generating station (or from generating station to load), a set of generating stations (or loads), including those outside the State and their contribution to the load (or generating station) is determined for each load (or generating station) bus.

5.14.2 Using the above choice of slack buses for each generating station and load, marginal participation of each generating station and load in each transmission line is computed.

### **(D) DETERMINATION OF TRANSMISSION CHARGES**



5.15 Hybrid Methodology analyzes the modifications in power flows in the grid when minor changes are introduced in the production (or consumption) of agent  $i$ , and it assumes that the relationship of the flow through line  $j$  with the behaviour of the agent  $i$  can be considered to be linear. The procedure is as under:

5.15.1 Marginal participation sensitivities are obtained that represent the increase in power flow through each network branch  $j$  when the injection or drawal in a bus is increased by 1 MW. Flow variation in each network branch  $j$  incurred by 1 MW injection or drawal at each bus is computed for each scenario,  $e$ .

5.15.2 As already stated at Clause 5.14 of this Annexure, due to the Kirchoff's laws, any 1 MW increase in generation (or load) at node  $i$  has to be compensated by a corresponding increase in load (or generation) at some other node(s) (after adjusting for incremental system losses). Thus, the calculation of quantum of injection (or drawal) at a certain bus affecting the power flows in the Basic Network depends on the choice of the node(s) that responds. The methodology used to identify such node shall be distributed slack buses as explained above at Clause 5 (C).

5.15.3 Once the power flow variation in each transmission line incurred by each agent is obtained, it is possible to compute a usage index for each network user. This index is computed according to equation given below. Only positive increments in the direction of the power flow in the base case are considered while increments which reduce burden on transmission lines are neither given any credit nor charged for use of the system.

5.15.4 The index (for each block of months) is computed as:

$$U_{e,i,l} = \left( |F_{le}^i| - |F_{le}| \right) \cdot P_{ie} \cdot \left[ |F_{le}^i| - |F_{le}| > 0, \text{Sign}(F_{le}^i) \text{ is same as Sign}(F_{le}) \right]$$

Where,

$U_{eil}$  is the monthly usage index in line  $l$  due to injection or drawal at node  $i$

$F_{le}$  is the flow in line  $l$  under scenario  $e$  under base case

$F_{le}^i$  is the flow in line  $l$  under scenario  $e$  due to injection or drawal of 1 MW at node

$P_{ie}$  is power dispatch or demand at bus  $i$  under scenario  $e$  under base case

5.15.5 The line-wise usage-based transmission charge of each transmission line is allocated pro-rata to the different agents according to their total participation in the corresponding transmission line.

$$Cost\ Allocated_{eil} = \frac{U_{eil}}{\sum_i U_{eil}} \times C_l$$

Where,

$C_l$  is the transmission line-wise usage-based transmission charge obtained in accordance with Clause (6) of Regulation 9 of these regulations.

$\frac{U_{eil}}{\sum_i U_{eil}}$  is the marginal participation factor

## **(E) DETERMINATION OF SHARING OF TRANSMISSION CHARGES**

5.16 The following steps shall be followed:

5.16.1 Using AC load flow, Marginal Participation Factors (MPF) shall be computed for determination of transmission system utilization due to marginal injection or drawal at each node.

5.16.2 For each transmission line, transmission line-wise usage-based transmission charge will be attributed to injection or drawal for the peak block. This transmission line-wise usage-based transmission charge is allocated to each agent in proportion of the change in the power flow in network branch affected by that agent.

5.16.3 The following steps shall be followed for calculation of AC-UBC charges:

(a) Following shall be taken:

- i. Transmission line-wise usage-based transmission charges for the billing month; and
- ii. Base Case

(b) Import Base Case in software

(c) Run AC load flow and obtain Marginal Flow (MF) file.

(d) Modify the Marginal Flow file obtained at clause (c) above as follows (illustration is at Clause 5.16.4 of this Annexure):

- For generating stations or sellers having no untied LTA and having identified buyers for full capacity of the generating station, reduce values of Marginal Participation Factors to zero.
- For generating stations or sellers having no identified buyers but having untied LTA, retain values of Marginal Participation Factor as obtained at sub-clause (c) of Clause 5.16.3 above.
- For generating stations or sellers having part untied LTA and part capacity with identified buyers:
  - Retain values of Marginal Participation Factor as obtained at sub-clause (c) of clause 5.16.3 above for capacity corresponding to untied LTA; and

- Reduce values of Marginal Participation Factor to zero for capacity corresponding to identified buyers.
- (e) Reduce negative Marginal Participation Factors to zero.
- (f) Reduce Marginal Participation Factors of less than 0.0001 to zero.
- (g) Normalize Marginal Flow file so as to make sum of all Marginal Participation Factors as '1'.
- (h) Multiply normalized values of Marginal Participation Factor as obtained at sub-clause (g) above for every transmission line with transmission line-wise usage-based transmission charges for that transmission line.
- (i) Node-wise transmission charges are allocated.

5.16.4 Following illustration is for sub-clause (d) of Clause (5.16.3) above of this Annexure:

(1) Suppose a generating station "A" (with installed capacity of 1000 MW) is located in Western Region and it has taken Long Term Access to Northern Region as target region for 300 MW and Western Region as target region for 400 MW. Untied LTA for "A", therefore, shall be 700 MW i.e. 300 MW in Northern Region and 400 MW in Western Region. Suppose, later on, "A" enters into Power Purchase Agreement with a buyer in Northern Region, say, distribution licensees of Haryana for 250 MW. Consequent upon entering into Power Purchase Agreement with Haryana, untied LTA of "A" would become 450 MW i.e. 50 MW (= 300 MW – 250 MW) in Northern Region and 400 MW in Western Region.

(2) If "A" has actual injection of 900 MW for the peak block of the billing period, this injection has to be segregated into injection corresponding to untied LTA and injection corresponding to Power Purchase Agreement with Haryana. This shall be done as follows:

(i) Injection corresponding to united LTA of 450 MW =  $450 \times 900 / 700 = 578.6$  MW; and

(ii) Injection corresponding to identified buyer =  $250 \times 900 / 700 = 321.4$  MW

(3) For the capacity under 2(i) above i.e. 450 MW, Marginal Participation Factor of “A” shall be retained as obtained at sub-clause (c) of Clause 5.16.3 of this Annexure.

(4) For the capacity under 2(ii) above i.e. 250 MW, Marginal Participation Factor of “A” shall be considered zero.

5.16.5 Transmission charges based on Hybrid Methodology (in Rs.) for DICs for each billing month will be computed.

5.17 Transmission charges as allocated to each demand node shall be grouped together within geographical boundary of a State subject to Clause 8 of Regulation 9 of these Regulations.

## Annexure-II

**Surge Impedance Loading to be considered for determination of utilization of transmission line under these Regulations**

Voltage (KV)	S.I.L (MW)
765	2250
765 Op at 400	614
400	515
400 Op at 220	155
220	132
132	50

SIL for Transmission line built with HTLS conductor or Quad conductor shall be considered, as twice the above said values for respective voltage, for the purpose of these Regulations.