

**Procedure for
Computation of Point of Connection (PoC) Transmission
Charges**

**In compliance of
Central Electricity Regulatory Commission
(Sharing of inter-State Transmission Charges and Losses)
Regulations, 2010**

June, 2011

**The Implementing Agency
(National Load Despatch Centre)**

Procedure for Computation of PoC Transmission Charges

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Procedure for Computation of PoC Transmission Charges

1.0 Outline

- 1.1 This Procedure is made in compliance with Regulation 15(1) (b) Central Electricity Regulatory Commission (Sharing of Inter State Transmission Charges and Losses) Regulations, 2010 herein after called “the Sharing Regulation”
- 1.2 This procedure provides the modalities followed by Implementing Agency for computation of PoC transmission charges.

2.0 Scope

- 2.1 This procedure will be applicable to the following categories of Designated ISTS Customers who use the ISTS:
 - (a) Generating Stations/ Generating Units defined as regional entities in the IEGC, 2010 and any subsequent amendment made thereto.
 - (b) ISTS Licensees and CTU and Deemed ISTS Licensees
 - (c) Non-ISTS Licensees whose assets have been certified by RPCs as being used for inter-State transmission.
 - (d) Any Bulk consumer directly connected with ISTS, and
 - (e) Any other designated entity representing a physically connected entity as per clauses (a), (c) and (d) above.

3.0 Data Acquisition and Basic Network Preparation

- 3.1 The basic network Data pertaining to the network elements shall be submitted by all DICs, inter-State transmission licensees, Deemed ISTS Licensees and non-ISTS Licensees whose assets have been certified by RPCs as being used for inter-State transmission, as per the Sharing Regulations, and “Procedure for Obtaining data by Implementing Agency for determination of Point of Connection transmission charges and losses”.
- 3.2 The Central Commission on an application made by the Implementing Agency under the “Removal of Difficulties” has approved for the first year of implementation, a single representative scenario based on average energy availability and generation figures for the preceding three years obtained from the Monthly Power Supply Position Report and Eighteen Column Report, respectively, as available on the website of Central Electricity Authority (CEA).
- 3.3 The Implementing Agency shall specify the nodes/ group of nodes in a zone by the first week of October for the application period 2012-13 onwards. This shall be available on the website of Implementing Agency.

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- 3.4 The Implementing Agency may moderate the average nodal injection and withdrawal for each DIC so as to maintain load generation balance in the representative base cases in consultation with NLDC/ RLDCs/ RPCs, if required, based on the historic injection and demand data available with them.
- 3.5 DICs having merchant capacity may have obtained Long Term Access from the CTU to a target Region, but may not have matching long-term Power Purchase Agreements (PPAs) for supply of power. Such generator shall declare the forecast injection which shall be used for carrying out Base Case studies and determining the Injection PoC charges. The charges so determined shall be applied on the Approved Injection which shall be considered as equal to Long Term Access obtained from the CTU plus pre-approved Medium Term injection for that year, if any. The quantum of power as contracted through PPAs shall be used for the purpose of scheduling.
- 3.6 Normative auxiliary consumption shall be subtracted from the Installed Capacity of Generating stations/ Generating Units while arriving at the approved injection/ approved withdrawal.
- 3.7 In case of non-ISTS lines certified by RPC as being used as ISTS line, the YTC should be approved from the State Electricity Regulatory Commission (SERC). Such YTC shall be duly excluded from the total Annual Revenue Requirement (ARR) of the STU. In case the ARR has not been approved by SERC, then the average circuit km rate arrived at on the basis of the “Procedure for Collection of Data” shall be taken. However, the amount paid to the STU for usage of its transmission lines as ISTS shall be deducted by its SERC while approving tariff.
- 3.8 The Implementing Agency shall furnish the list of non-ISTS lines certified by the RPCs to the Commission for their approval.

4.0 Load Flows Studies on the Basic Network

- 4.1 The Implementing Agency shall run AC load flow on the Basic Network, separately for NEW and SR Grid till the time both are asynchronously connected, based on the network data obtained from all the DICs, inter-State transmission licensees, deemed ISTS Licensees and Non-ISTS Licensees whose assets have been certified by RPCs as being used for inter-State transmission including the NLDC, RLDCs and SLDCs.
- 4.2 In the event of such information not being available within the stipulated time frame or to the level of detail required, the Commission may authorize the Implementing Agency to obtain such information from the alternate sources as may be approved for use by the Commission.
- 4.3 In case some data is missing, reasonable assumptions shall be made by the Implementing Agency based on data available with it and/or reference to

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standards published on the Power System Studies, such as the CEA Transmission Planning Criteria

- 4.4 The real power generation at the generator nodes and the withdrawal nodes in the Basic Network shall be as per forecast demand and generation data obtained from the average energy data.
- 4.5 In the process of convergence of the load flow on the basic network, the IA may require to make certain adjustments in the injection/ withdrawal at various buses to ensure load generation balance.

5.0 Validation of Basic Network and Load Flow Results

- 5.1 The Basic Network, nodal injection, nodal withdrawal and the load flow results for the subsequent application period for each grid condition will be validated by the Validation Committee.
- 5.2 Subsequent to the validation by the Validation Committee, the Basic Network, nodal injection, nodal demand along with the load flow results shall be presented for approval to the Commission not later than 15th day of December in each financial year.
- 5.3 The approved Basic Network, nodal injection, nodal demand along with the load flow results shall be made available on the website of the IA immediately after its approval by the Commission.

6.0 Network Reduction

- 6.1 The Basic network for each grid condition and season shall be reduced as per the methodology set out by the Commission in the Annexure of the Sharing Regulations.
- 6.2 The network shall be reduced to 400 kV in the case of all the Regions except NER where the network will be reduced to 132 kV.
- 6.3 After truncation, injection from lower voltage system into 400 kV (except NER) and 132 kV in the case of NER grid and vice versa in the case of net withdrawal, the system below each node shall be replaced by a net demand.

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7.0 Computation of Point of Connection Transmission Charges

- 7.1 The reduced network shall form the basis of the computation of Marginal Participation Factor. The simulations shall be carried out by the IA by using Webnetuse software supplied by IIT-Mumbai.
- 7.2 The total yearly transmission charges to be recovered for all lines of a given voltage level and line configuration shall be divided by the total circuit kilometer for that voltage level and line configuration to arrive at the average transmission charge per circuit km, as provided in the “Procedure for Data Collection”.
- 7.3 The line cost shall then be attributed to various nodes as per their utilization factors of the line in proportion to the nodal injection/ demand so as to arrive at the nodal PoC charges.
- 7.4 The load flow results and average PoC charges of each line of the truncated network corresponding to a particular scenario shall form the basis of calculation of PoC charges and the input to the software. The output of the software shall be the computed PoC Nodal transmission charges and Loss Allocation Factors. .
- 7.5 The transmission rates in Rs/MW/Month at each node shall be computed thereafter.
- 7.6 For applying on the Short term Open Access transactions, PoC rates shall be computed in Rs/MW/hour.
- 7.7 Point of Connection nodal and zonal charges shall be computed for one representative scenario of the year during the first year of implementation. This procedure shall be modified as per the directions of the Commission.

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8.0 Zoning of Nodes

- 8.1 Based on the rates for each node, the IA shall aggregate the charges for geographically and electrically contiguous nodes on the ISTS to create zones. Generation Zones shall contain relevant nodes whose charges are within the same range.
- 8.2 The demand zones shall normally be the State control areas except in the case of North Eastern States, which are considered as a single demand zone. Generation zones are formed by combining the generators connected to the ISTS.
- 8.3 Considering the fact that several 400/ 220 kV ICTs in the country could feed more than one State, PoC charges worked out at a given node could be used for computing zonal charges for more than one zone. In these cases, the cost of withdrawal at common nodes would be used in pro rata basis in zoning.

Example

For instance 400/ 220 kV ICTs at Bhiwadi (PG) feed both Rajasthan and Haryana say in the ratio 80:20 in the base case with full network. After truncation at 400 kV level there could be 400 MW load at Bhiwadi (PG) and a certain POC would be obtained. The POC obtained at Bhiwadi would be used for working out the PoC for both Rajasthan and Haryana zones assuming 320 MW Rajasthan load at Bhiwadi node and 80 MW Haryana load at Bhiwadi.

- 8.4 PoC Transmission charges for thermal power generators either directly connected with ISTS or through pooling stations that are designed to handle generation capacity of more than 1500 MW for inter-State transfer shall be determined as the charges at these specific nodes (such nodes shall be considered as separate generation zones) and not clubbed with other generator nodes in the area.
- 8.5 Similarly PoC Transmission charges for the hydro power generators either directly connected with ISTS or through pooling stations that are designed to handle generation capacity of more than 500 MW for inter-State transfer shall be determined as charges at these specific nodes (such nodes would be considered as separate generation zones) and not clubbed with other generator nodes in the area.
- 8.6 For some of the DICs which are not directly connected to ISTS, PoC charges shall not be derived in the computation. In such cases, injection/ drawal PoC charges of the electrically nearest node shall be used for computing the transmission charges.
- 8.7 DICs which neither have no generation PoC charges or withdrawal PoC charges due to absence of either injection or withdrawal nodes. In such cases, the respective PoC charges of the electrically nearest node shall be considered for recovery of charges.

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- 8.8 Zone shall normally be fixed in a given financial year unless significant changes in the power system during a year require re-zoning. Any such re-zoning shall be approved by the Commission before implementation by the Implementing Agency.

9.0 Determination of PoC Transmission Charges

- 9.1 The transmission access charges for a zone shall be determined by computing the weighted average of nodal charges at each node in the zone. This shall be used to calculate the PoC charges of a zone. The weights used shall be the generation/load at the respective node in the 400 kV truncated network.
- 9.2 The PoC charge of a zone shall be sum of some percentage of Uniform charge and some percentage of Zonal charge in the as specified by the Central Commission from time to time.

Example: PoC rate (PoC) = m * Uniform charge + n *Zonal charge

Where m and n are the constants specified in the regulation which is 0.50 for initial two years of application of the PoC methodology.

- 9.3 The Uniform rate component of PoC charge shall be calculated as follows:

$$UC = \frac{\text{Total ARR}}{(\text{Sum of Approved Injection} + \text{Sum of Approved Withdrawal} + \text{Sum of Approved Additional Medium Term Injection} + \text{Sum of Approved Additional Medium Term Withdrawal})}$$

This shall be worked out separately for the NEW grid and SR grid till such times the both NEW and SR grids are synchronized.

- 9.4 For the first two years of implementation, PoC charge shall comprise of 50% of Uniform Charge and 50% Charge obtained through hybrid methodology.
- 9.5 The under/ over recovery on account of revenue requirement of 220 kV and 132 kV voltage level ISTS assets, PoC charges shall be scaled on pro-rata basis.
- 9.6 Inter-State Generating Stations connected at 220kV and below which are not featuring in the reduced network shall be charged at the zonal charges determined for the regions where such generators are physically located.
- 9.7 Charges corresponding to the transmission system built by Powergrid dedicated wholly to one State shall be recovered through the existing mechanism. Similarly for ISGS embedded in the State network, charges shall be recovered as per existing mechanism.
- 9.8 The monthly transmission charges to be used for the PoC charges shall be computed by dividing the YTC by 12 months.

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- 9.9 Wherever lines belonging to an ISTS Licensee are Looped In Looped Out by an Intra-State Transmission Licensee, the entire length shall be considered for Load flow studies and average cost shall be applied on the whole line. Similarly wherever line belonging to an Intra-State Transmission Licensee that is not certified by RPC is Looped In Looped Out by an ISTS Licensee, the charges of such lines shall not be considered in PoC computation. The same may be recovered through scaling up the final charges.
- 9.10 Within a synchronous system the cost of HVDC links shall be recovered by an indirect method as per provision of the Regulations as detailed below:

Flow on the HVDC line is regulated by power order and hence it remains constant for marginal change in load or generation. Hence, marginal participation of a HVDC line is zero. Thus, MP-method cannot directly recover cost of a HVDC line. Therefore, to evaluate utility of HVDC line for a load or a generator, the following methodology shall be applied:

Step 1: Evaluate the Transmission System charges (of AC network) for all loads and generators corresponding to base case which has all HVDC lines in service.

Step 2: Disconnect the HVDC line and again compute the new flows on the AC system. Hence, evaluate the new transmission system charges (of AC network) for all the loads and generators.

Step 3: Compute the difference between the Nodal Charges (unit – Rs) with and without HVDC line and identify nodes which benefit from the presence of the HVDC lines. Benefit is new (with disconnection) usage cost minus old (with HVDC) cost. If benefit is negative, it is set to zero.

Step 4: The cost of the HVDC line is then allocated to the nodes in proportion of the benefits they derive from its presence as computed above. In the case of SR Grid, which is not synchronously connected with the NEW grid, the 'benefits' shall be computed at nodes which were indicated to have higher transmission usage costs attributed to them 'without' the HVDC line (Talcher- Kolar). When Talcher Kolar link is disconnected, the loads in the SR are reduced proportionately such that net reduction is equal to the power received from the Talchar-Kolar link. Then, new usage costs are worked out. Benefit herein is defined as old cost (base case with injection from Talchar Kolar) minus new usage cost i.e. with link disconnected. If any HVDC line can be modeled as a load with MW equal to P-order at the sending end and a generator with corresponding MW at the receiving end. A 'without' scenario for a HVDC line, corresponds to disconnecting the corresponding load-generation pair. Sensitivities for these fictitious loads and generators are not computed as they are not to be priced.

The Central Commission on an application made by the Implementing Agency under the "Removal of Difficulties" has approved that the cost of Talcher-Kolar HVDC link shall be borne by the Southern Region DICs alone, whereas the cost of Bhadrawati and Gazuwaka HVDC Back to Back links shall be borne by NEW grid DICs and SR DICs in 50:50 ratio.

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- 9.11 Implementing Agency shall provide the following information to RPC as per Format I and Format II of this procedure:
- (i) One set of Approved Withdrawal/ Injection (MW) data for the year 2011-12, and subsequently as per CERC directive.
 - (ii) Zonal Point of Connection rate (Rs/MW/month) for Generation and Demand Zones.
 - (iii) Approved Additional Medium Term Withdrawal/Injection (MW).
- 9.12 Schedule of charges payable by each constituent for the future Application Period shall be published by RPC on its website.
- 9.13 The existing practice of sending processed metered data from all SEMs for UI billing shall be continued for issuance of Regional Transmission Account.
- 9.14 RLDCs shall send the details of short-term open access to respective RPCs for issuance of Regional Transmission Account.

10.0 Information in Public Domain

- 10.1 Implementing Agency shall provide following information on public domain after approval from Commission:
- i. Approved Basic Network Data and Assumptions, if any
 - ii. Zonal PoC transmission charges for the next financial year on monthly basis.
 - iii. Zonal or nodal transmission losses data;
 - iv. Schedule of charges payable by each constituent for the future financial years, after undertaking necessary truing-up of costs.
 - v. The underlying information and base load flows used.
- 10.2 The above information can be viewed on the website of IA only after logging in. The username and password for this purpose can be generated through registration on the website.

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Format II

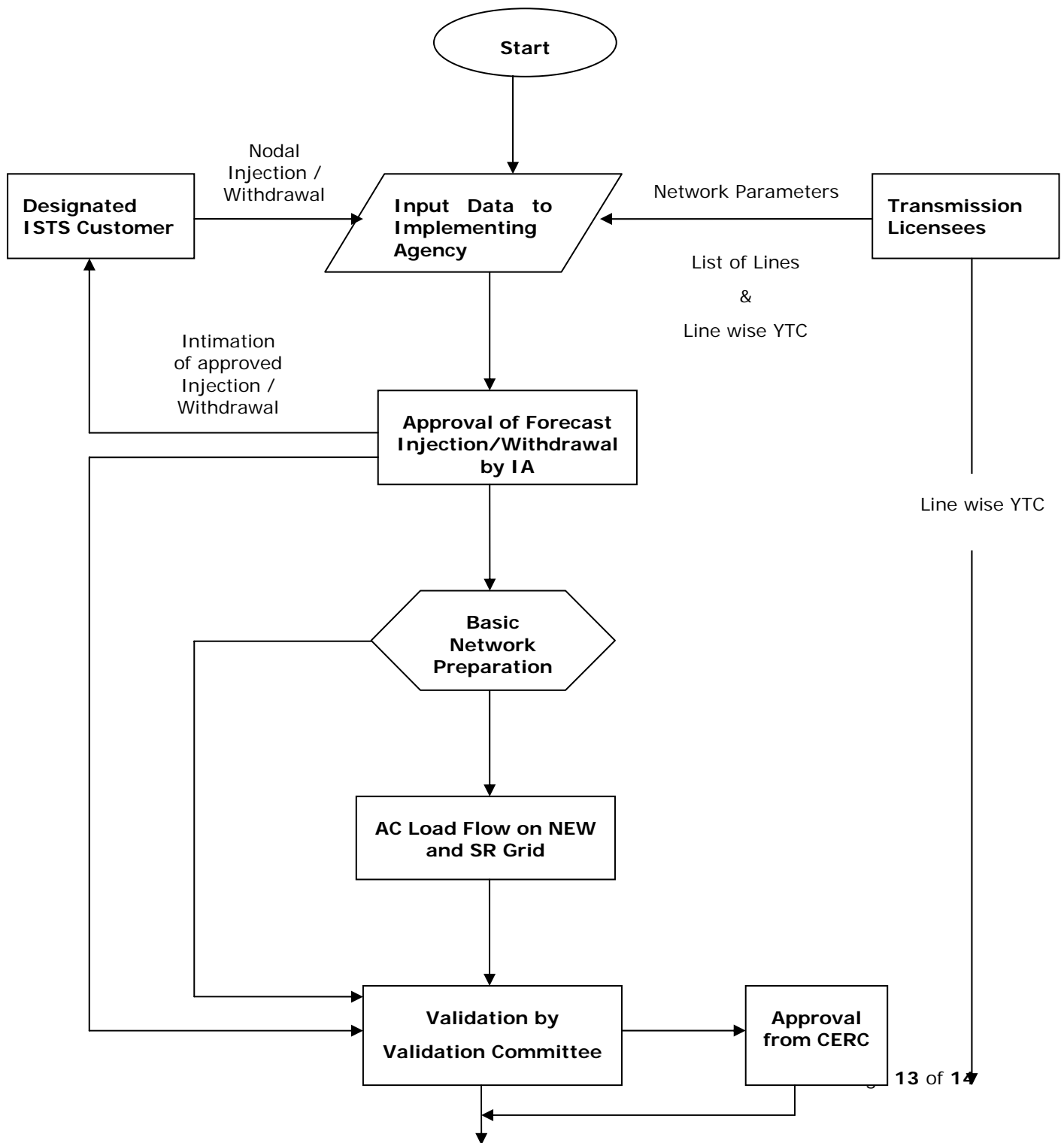
Format for Submission of Approved Additional Medium Term Withdrawal/Injection (as given by CTU/ DIC)

SL NO	Name of DIC	Duration		Approved Additional Medium Term Withdrawal (MW)	Approved Additional Medium Term Injection (MW)
		From	To		

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Annexure I

Process Chart for Determination of Transmission Charges



Procedure for Computation of PoC Transmission Charges

