

Procedure for  
Sharing of Inter-State Transmission System Losses

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)**

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## **Procedure for Sharing of inter-State Transmission System Losses**

### **1.0 Outline and Scope**

- 1.1 This Procedure is made in compliance of Regulation 6 of the 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 detailed methodology for application of the inter-State transmission system (ISTS) losses on the DICs for the purpose of scheduling power on the ISTS.
- 1.3 This procedure describes the modalities for application of transmission losses during scheduling of all categories of transactions involving usage of ISTS viz. Long-term Access, Medium-term Open Access and bilateral and collective Short-term Open Access contracts.
- 1.4 The ISTS losses as arrived as per this procedure shall be applied on all the Regional Entities in line with Regulation 7 (1) (r) and 7 (1) (s) of Central Electricity Regulatory Commission (Sharing of inter-State Transmission Charges and Losses) Regulations, 2010. The entities embedded within the State jurisdiction shall have to share additional losses for using intra-State system as applicable in the respective control area.
- 1.5 The percentage loss shall be applied on regional basis to harmonise with the scheduling and despatch and regional Energy Accounting on the regional basis.
- 1.6 The Central Commission on an application made by the Implementing Agency under the “Removal of Difficulties” has approved three slabs for PoC losses for the first year of implementation, i.e. 2011-12.

### **2.0 Objectives**

- 2.1 The procedure aims to compute the PoC losses in a methodical way and accordingly to decide schedules at various State/ regional boundaries.
- 2.2 The procedure also aims to ensure that the estimated transmission losses to be applied for scheduling of generation and demand under various contracts are as near to the actual transmission losses as possible for the following reasons:
  - (a) The DICs to know a priori the percentage of losses in the inter-State transmission system at the point of their injection or drawal.
  - (b) To minimize the mismatches in the withdrawal and the injection in real-time operation of the grid.

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- (c) To minimize the mismatches between the Unscheduled Interchange payables and the Unscheduled Interchange receivable in the Unscheduled Interchange pool.

### 3.0 Computation of Generation and Demand Zone losses

- 3.1 As per methodology outlined in the Sharing Regulations, the losses shall be computed separately for injection and for withdrawal. Thus the percentage loss for injection in a zone would be distinct from the percentage loss for withdrawal in a zone.
- 3.2 The load flow studies shall be carried out separately for the truncated network of the NEW grid and the truncated network of the Southern Grid as per the methodology outlined in the Sharing Regulations uptill the time they get synchronously connected.
- 3.3 The load flow studies would compute PoC charges as well as loss allocation factors for each injection and demand nodes and the total system losses for the truncated networks of the NEW and SR grids using Power System Analysis Software and the Webnet use software supplied by IIT Mumbai.
- 3.4 The losses shall be settled in kind for all types of transactions involving usage of ISTS. The losses shall be applied ex-ante and there shall be no post facto truing up of losses.
- 3.5 The PoC losses on zonal basis have to be computed for five scenarios as given in the Sharing Regulations for peak and other than peak conditions.
- 3.6 The Central Commission, on an application made by the Implementation Agency for removal of difficulties, has directed that in the first year of implementation, i.e. year 2011-12, load flow studies would be done for average scenario as per the methodology outlined in the Sharing Regulations and shall be carried out for the year considering average load and generation scenario, based on the data published by CEA.
- 3.7 The total study losses shall be apportioned to each generation node and demand node in the NEW and SR grids by multiplying the total study losses with the corresponding loss allocation factors.
- 3.8 Geographically and electrically contiguous nodes within a synchronous grid shall be clustered as per the Sharing Regulations to create demand and generation zones for losses. These zones for losses shall be the same as those created for applying the Point of Connection Charges.
- 3.9 The PoC (MW) loss for the generation nodes within a zone and the PoC (MW) loss for the demand node within that zone shall be aggregated separately.
- 3.10 The percentage loss for injection in a zone shall be obtained by dividing the aggregate PoC (MW) loss of each injecting node in that zone by the aggregate injection of the zone. The percentage loss for withdrawal in a zone shall be obtained by dividing the aggregate PoC (MW) loss of each demand node in that zone by the aggregate demand of the zone.

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3.11 The percentage PoC loss for injection from a zone and the percentage PoC loss for withdrawal into a zone shall be moderated using average regional loss for last one year based on SEM readings. The computation of moderation factor and its usage for arriving at the modified PoC losses is elaborated in the following sections.

### 4.0 Computation of ISTS losses with the help of data from Special Energy Meters (SEMs)

4.1 The injection and withdrawal in the ISTS by the Regional Entities is metered with the help of Special Energy Meters (SEMs) installed at their interface boundary with ISTS. The SEM data is collected and processed weekly for the previous week starting from 0000 hours of Monday to 2400 hours of Sunday.

4.2 The actual losses in each of the five regions shall be computed from the data of Injection and withdrawal for each time block by the Regional entities and the inter-regional exchanges as computed from the SEMs installed at the Regional Entities' boundaries. The actual losses shall be found as per the following formula:

**Actual Transmission losses (in MWh) in Regional ISTS, L =**

$(\sum \text{Injection of Regional Entities, } G + \sum \text{Interregional injection, } I) - (\sum \text{Regional Entity drawals} + \sum \text{Inter-regional drawals})$

**Actual Percentage Regional losses,  $L_{PA} = \frac{L}{G+I} * 100$**

4.3 The average of all such 15 minutes time blocks in a week would give percentage (%) actual loss of the region for that week.

4.4 The Regional boundaries shall be as per Annexure - 1 of Indian Electricity Grid Code (IEGC) Regulations, 2010 and any subsequent amendments made thereto.

### 5.0 Computation of moderation factor

5.1 The total truncated network loss in a region shall be divided by aggregate of the MW injection at all nodes in the region to arrive at the percentage loss of the truncated network ( $L_{PT}$ ) of the regional system.

5.2 Average of percentage loss declared during the last one year ( $L_{PA\text{-annual}}$ ) is to be used for moderation.

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- 5.3 The moderation factor shall be computed by dividing the percentage loss for the last one year ( $L_{PA-annual}$ ) of the regional system declared by RLDC by the percentage study loss ( $L_{PT}$ ).

$$\text{Moderation factor} = \frac{L_{PA-annual}}{L_{PT}}$$

where

$L_{PA-annual}$  = percentage loss in the regional system for last one year as declared by RLDC

$L_{PT}$  = percentage regional Loss in the truncated network

- 5.4 The percentage loss for injection and withdrawal in different zones obtained as per methodology in Para 3.10 and shall be multiplied by the above moderation factor to arrive at moderated PoC loss of the zone.
- 5.5 50% of the zonal injection or withdrawal PoC loss obtained as above shall be combined with 50% of uniform loss ( $L_{PA-annual}$ ) to arrive at zonal injection or withdrawal PoC loss.
- 5.6 The Central Commission, on an application made by the Implementation Agency for removal of difficulties, has directed that in the first year of implementation, i.e. year 2011-12, the segregation of demand or injection zones in three slabs; high, normal and low, shall be done based on the modified zonal percentage loss obtained as per Para 5.5 above. Injection or withdrawal zones where modified loss percentage is 0.3% lower than the weighted average modified zonal loss of the region shall be placed in 'low' slab. Similarly zones with modified loss percentage higher by 0.3% than the weighted average modified zonal loss of the region shall be placed in 'high' slab. All other zones shall be placed in the 'normal' slab. The placement of DICs in a particular slab shall remain fixed for an application period as per the Sharing Regulation.
- 5.7 The applicable loss slabs; low, normal and high for injection or demand zone of DIC shall be published on the website of NLDC and RLDCs.

### **6.0 Application of losses while scheduling of contracts**

- 6.1 Based on the actual average weekly loss percentage computed in Para 4.2 based on data of previous week (w-1), Regional Load Despatch Centres declare average weekly loss to be used for scheduling during the subsequent week (w+1). Since, PoC losses are applied separately on the drawee and injecting DICs, 50 % of this average regional loss shall be applied on the DICs falling in the 'Normal Slab'. DICs falling in 'High slab' would have a loss percentage 0.3% more than that of normal slab and those in 'Low slab' would have a loss percentage 0.3% less than the normal slab.

## 6.2 Scheduling of Long-term Access and Medium-term Open access Transactions

- 6.2.1 The PoC loss is applicable to injecting and withdrawal DICs separately for the purpose of scheduling. However, in line with the existing practice for all Long-term Access and Medium-term Open access transactions, the PoC losses shall be applied on the drawee DICs for their own PoC losses as well as injecting DICs PoC losses for the purpose of scheduling.
- 6.2.2 The net drawal schedule of a drawee DIC from an injecting DIC (generator) shall be computed by deducting the percentage loss applicable to respective Injecting (generator) DIC as well as its own percentage loss as illustrated below:

**Explanation:** Say X, Y, Z are the injecting DICs (Installed Capacity of 100 MW) with corresponding effective PoC loss for injection in the respective zones as x, y and z. Let A, B, C and D be drawee DICs with a, b, c and d being the effective PoC loss for withdrawal in the respective zones. If each drawee DIC has a 25% share in each injecting DIC and has requisitioned full power from each generator then the ex-bus schedule of DIC A in any 15 minute time block of the day would be  $25+25+25 = 75$  MW. The net drawal schedule of A at its periphery with ISTS in same block would be  $25*[(1-x/100)* (1-a/100)] + 25*[(1-y/100)* (1-a/100)] + 25*[(1-z/100)* (1-a/100)]$ .

- 6.2.3 In case the injecting DIC, say X is located in a region other than that of drawee DIC, say A, the inter-regional boundary schedule for this transaction would be  $25*(1-x/100)$  MW. If this transaction involves a wheeling region also, then the schedule at both exporting Region to wheeling Region and wheeling Region to importing Region boundary would be same as above.
- 6.2.4 The total losses attributable to the drawee DIC (including that of injecting DIC corresponding to its share in them) shall be shown in one separate column along with different ex-bus power plant schedule from each injecting DIC for each 15 minute time block to compute the net drawal schedule of the drawee DIC in that time block.

## 6.3 Scheduling of Bilateral and Collective Short-term Open Access transactions

- 6.3.1 For all transactions under this category, PoC losses for respective zone shall be applied on both the injecting DIC and drawee DIC. Accordingly, the injecting DIC shall have to inject contracted quantum of power plus the applicable injection PoC losses. Similarly the drawee DIC shall draw contracted quantum of power after deducting the applicable drawee PoC losses.
- 6.3.2 In case the DIC is embedded within a State Control Area, loss in that State control Area loss shall be in addition to the above ISTS losses for each embedded entity, i.e. the schedule of injecting embedded entity shall be further scaled up by the applicable

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losses of that State and the schedule of the drawee embedded entity shall be further scaled down by the applicable losses of that State.

6.3.3 The examples of cases for intra-Regional and inter-Regional Short-term Open Access transactions are shown at Clause 6.3.4 and 6.3.5.

### 6.3.4 Example of intra-Regional Short-term Open Access transactions

Let contracted quantum in an intra-Regional Short-term Open Access transactions is P (MW) at the notional regional periphery. Zonal PoC loss of the injecting DIC be 'a' and that of drawee DIC be 'b', then the Injecting DIC has to inject  $P/(1-a/100)$  and drawee DIC will be scheduled to draw  $P*(1-b/100)$ .

### 6.3.5 Computation of Inter-Regional Schedules for Bilateral and Collective Short-term Open Access transactions

The losses applicable to an injecting DIC shall be the PoC injection loss in the zone where that injecting node is located. Likewise the losses applicable to a withdrawing DIC shall be the PoC withdrawal loss for the zone where the withdrawing DIC is located. Thus there shall be no pan caking. The contracted power shall be at the regional periphery. All schedules of the injecting and demand DICs at their respective bus-bars/ State boundaries in the case of embedded entity shall be arrived at by applying the PoC losses of injecting and withdrawing DICs, respectively. The sample calculation of schedule at the inter-regional boundaries is illustrated below:

**Example:** Let the Injecting DIC is located in Region-1 and the power is wheeled through Region-2 and the Drawee DIC is located in Region-3.

Let the contracted quantum power be P.

Let Effective PoC Loss percentage of the injecting DIC in Region-1 be 'a' and that of drawee DIC in Region-3 be 'b'.

Then the injecting DIC has to inject  $\frac{P}{(1-\frac{a}{100})}$

The schedule at the inter-regional boundary between Region-1 and Region-2 shall be P and that between Region-2 and Region-3 shall also be P.

The schedule of drawee DIC shall be =  $P*(1-\frac{b}{100})$

6.3.6 However, in order to have smooth transition from the existing methodology of application of losses to that as per Clause 6.3.1, the treatment of losses for scheduling of short-term bilateral transactions shall be as per the procedure outlined in Clause 6.2.1 till 30.09.2011.

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