**CENTRAL ELECTRICITY REGULATORY COMMISSION**
**NEW DELHI**

**No.L-7/139(159)/2008**

**Coram:**

1. **Dr. Pramod Deo, Chairperson**
2. **Shri S.Jayaraman, Member**
3. **Shri V.S.Verma, Member**
4. **Shri M.Deena Dayalan, Member**

**Date of order: 11.6.2010**

**In the matter of**

Approval of detailed procedure for relieving congestion in real time operation under regulation 4 (2) of the Central Electricity Regulatory Commission (Measures to relieve congestion in real time operation) Regulations, 2009.

**And in the matter of**

Rate of congestion charge in real time operation in inter-State transmission of electricity.

**ORDER**

Clause (2) of Regulation 4 of the Central Electricity Regulatory Commission (Measures to relieve congestion in real time operation) Regulations, 2009 (hereinafter referred to as "the congestion charge regulations) provides as under:

"Congestion charge may be imposed on any Regional entity or entities in any Region or Regions for causing congestion and paid to any Regional entity or entities in any Region or Regions for relieving congestion as per the detailed procedure under these regulations formulated by NLDC and approved by the Commission".

2. The National Load Despatch Centre (NLDC) in its letter No. CSO/CERC, dated 5th April, 2010 has submitted the "Detailed procedure for relieving congestion in real time operation".

3. We hereby approve the detailed procedures titled "Procedure for relieving congestion in real time operation" in exercise of our power under regulation 4(2) of the congestion charge regulations. The approved procedure is enclosed as Annexure-I to this order. NLDC is directed to append the order relating to rate of congestion charge in real time operation in inter-State in inter-State transmission in electricity issued by the Commission from time to time with the detailed procedure.

4. NLDC is further directed to submit the details of congestion charge account for every month as per format appended as Annexure –II to this order.

5. We direct the National Load Despatch Centre to give wide publicity to the procedure for the information of and compliance by all concerned.

6. We also direct the National Load Despatch Centre to operationalise the procedure as per Annexure to this order with immediate effect.

| Sd/- | sd/- | sd/- | sd/- |
|---|---|---|---|
| **(M.DEENA DAYALAN)** | **(V.S.VERMA)** | **(S.JAYARAMAN)** | **(Dr. PRAMOD DEO)** |
| **MEMBER** | **MEMBER** | **MEMBER** | **CHAIRPERSON** |

**Annexure-I**

# Detailed Procedure for Relieving Congestion in Real Time Operation

**Prepared in compliance to Section 4(2) of**
**The Central Electricity Regulatory Commission**
**(Measures to relieve congestion in real time operation)**
**Regulations, 2009**

**(Revision: 0 Dated: 05.04.10)**

**National Load Despatch Centre**

**Real Time Congestion Management Procedure**

## 1. Background

1.1. This Procedure is issued in compliance to Regulation 4(2) of the "Central Electricity Regulatory Commission (Measures to relieve congestion in real time operation) Regulations, 2009. All regional entities shall abide by this procedure.

1.2. This procedure will be implemented with effect from the date of approval by the Commission.

## 2. Transfer Capability

2.1. "Total Transfer Capability (TTC)" means the amount of electric power that can be transferred reliably over the inter-control area transmission system under a given set of operating conditions considering the effect of occurrence of the worst credible contingency.

2.2. "Transmission Reliability Margin (TRM)" means the amount of margin kept in the total transfer capability necessary to ensure that the interconnected transmission network is secure under a reasonable range of uncertainties in system conditions.

2.3. "Available Transfer Capability (ATC)" means the transfer capability of the inter-control area transmission system available for scheduling commercial transactions (through long term access, medium term open access and short term open access) in a specific direction, taking into account the network security. Mathematically ATC is the Total Transfer Capability less Transmission Reliability Margin.

2.4. TTC is dependent upon the network topology, point and quantum of injection /drawal and power flows in other paths of the interconnected network as well as prevailing voltage profile in the network during the assessment period.

2.5. TTC is directional in nature and the transfer capability for import of power in a region or control area from another region or control area may be different from

the transfer capability for export of power from that region or control area to the other region or control area.

2.6. Total Transfer Capability is time variant and there could be different figures for different time of the day/ month/ season/ year.

2.7. Transfer Capability shall be mentioned in MW.

## 3. Methodology for assessment of TTC, TRM and ATC

3.1. The methodology shall be in harmony with the detailed procedure of the Central Transmission Utility (CTU) prepared under 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 so as not to have different methodology for determination of TTC, TRM and ATC by the CTU in respect of long-term access and medium-term open access and NLDC/ RLDCs in respect of short-term open access.

3.2. TTC assessment is required for reliable system operation and to facilitate non discriminatory open access in transmission as per CERC regulations on Open Access and Power Markets.

3.3. TTC and TRM shall be assessed with the help of simulation studies carried out for a representative scenario to arrive at an initial or base case. Simulation studies may require setting up of a power system model and obtaining a power flow solution. The construction of an accurate base case power system model is a key step in the execution of a meaningful study.

3.4. **Power System model to be considered for simulation studies**

3.4.1. EHV transmission network shall be normally modeled down to 220 kV level with exceptions for generating units connected at 132 kV and for North Eastern Region, it shall be modeled down to 132 kV.

3.4.2. Normally all generating units greater than 50 MW and connected at 132 kV and above shall be modeled. Smaller generating units (particularly hydro units) may be lumped for study purposes.

3.4.3. Load shall be generally lumped at 220 kV or 132 kV, as the case may beActual system data wherever available shall be used for power system

modeling. In cases where data is not available, standard data as given in the CEA Manual on Transmission Planning Criteria shall be considered.

3.4.4. The requirements at clauses 3.3.1 to 3.3.3 are for use of data for RLDCs and NLDC. The SLDC may consider lower voltage level and smaller units if required.

3.5. Separate base cases calculating the export and import capability corresponding to both peak and off- peak load and generation with the likely scenario during the time frame for which transfer capability is to be assessed shall be used in the Simulation Studies for calculation of TTC and TRM of the required transmission corridors.

3.6. **Input Data for Base Case Preparation**

3.6.1. **Network Topology**: This shall be as per network data obtained from CTU and STUs. New transmission elements shall be considered only after the date of commissioning of that asset and duly considering their reliability during initial period.

3.6.2. **Unit Availability**: This shall be as per the maintenance schedule finalized by RPC. The new generating units expected to be available during the assessment period shall be considered only after commissioning of the new units and duly considering their reliability during initial period.

3.6.3. **Coal Fired Thermal Despatch**: This shall be as per the anticipated ex-bus generation of the thermal generating units arrived after deducting a normative auxiliary consumption as per the norms specified by Central Commission**.** and provisioning for partial outage based on experience of system operator from the installed capacity

3.6.4. **Gas/ Nuclear Despatch**: This shall be as per past trend of Plant Load Factor available with Central Electricity Authority (CEA) or as per past trend available at SLDCs/ RLDCs.

3.6.5. **Hydro Despatch**: This shall be as per the past trend available at RLDCs/ SLDCs. The day corresponding to the median value of daily consumption of the same month last year would be chosen. The current inflow pattern shall also be considered.

3.6.6. **Reactive power capability of generating units**: As per the generator capability curve or based on the assumption recommended in CEA's Manual on Transmission Planning Criteria.

3.6.7. **Nodal MW demand** : As per the anticipated load provided by SLDCs or Load Generation Balance Report (LGBR) prepared by CEAor past trend available at RLDCs/ NLDC.

3.6.8. **Nodal MVAR demand**: As per the anticipated power factor provided by SLDCs. In the absence of data from SLDCs, the load power factor at 220kV or 132 kV voltage levels shall be taken as 0.85 lag during peak load condition and 0.9 lag during light load condition except areas feeding predominantly agricultural loads where power factor can be taken as 0.75 and 0.85 for peak load and light load conditions as given in the CEA's Manual on Transmission Planning Criteria. This would be verified, post facto, with actual data, and if different, would be made more accurate for the future.

3.6.9. Normal Operating limit for a transmission line shall be equal to the permissible line loading limit as defined in the CEA Manual on Transmission Planning Criteria. Normal operating limit for an Inter connecting transformer shall be 90 % of its Maximum Continuous Rating (MCR).

3.6.10. Emergency limit for a transmission element shall be taken as 110 % of the normal operating limit.

3.7. In case data from any of the sources mentioned above is unavailable or in case of additional data requirement, reasonable assumptions shall be made.

3.8. Total Transfer Capability between two areas would be assessed by increasing the load in the importing area and increasing the generation in the exporting area or vice versa till the constraints are hit for a credible contingency. The following credible contingencies shall be considered:

3.8.1. Outage of single transmission element (N-1) in the transmission corridor or connected system whose TTC is being determined as defined in IEGC

3.8.2. Outage of a largest unit in the importing control area Station.

3.9. During assessment of Total Transfer Capability it shall be ensured that:

3.9.1. All transmission element loadings in the base case are within normal operating limits and the voltages remain within operating range defined in the IEGC.

3.9.2. All transmission element loadings after a credible contingency are within emergency ratings and grid voltage is within the operating range as defined in the IEGC.

3.10. The Total Transfer Capability shall be limited by

3.10.1. Violation of grid voltage operating range or

3.10.2. Violation of transmission element operating limit in the base case or

3.10.3. Violation of emergency limit in the contingency case

3.11. Transmission Reliability Margin (TRM) shall be kept in the total transfer capability to ensure that the interconnected transmission network is secure under a reasonable range of uncertainties in system conditions. Computation of TRM for a region or control area or group of control areas would be based on the consideration of the following:

3.11.1. Two percent (2%) of the total anticipated peak demand met in MW of the control area/group of control area/region (to account for forecasting uncertainties)

3.11.2. Size of largest generating unit in the control area/ group of control area/ region

3.11.3. Single largest anticipated in feed into the control area/ group of control area (which could be a combination of States for the purpose of Power Exchange and for others)/ region.

## 4. Procedure for declaration of TTC, TRM, ATC and anticipated Constraints

4.1. State Load Despatch Centre (SLDC) shall assess the Total Transfer Capability (TTC), Transmission Reliability Margin (TRM) and Available Transfer Capability (ATC) on its inter-State transmission corridor considering the meshed intra State corridors for exchange (import/ export) of power with inter-State Transmission System (ISTS). These figures along with the data considered for assessment of TTC would be forwarded to the respective RLDC for assessment

of TTC at the regional level. The details of anticipated transmission constraints in the intra State system shall also be indicated separately.

4.2. Regional Load Despatch Centres shall assess TTC, TRM and ATC for the inter regional corridors at respective ends, intra regional corridors (group of control areas) and for individual control areas within the region (if required) for a period of three months in advance. During assessment of TTC, the RLDCs would duly consider the input provided by the SLDCs. The TTC, TRM and ATC figures for the inter-regional corridors, intra regional corridors (group of control areas) and for individual control areas within the region (if required) along with all the input data considered shall be forwarded to NLDC. The details of anticipated transmission constraints in the intra regional system shall also be indicated separately.

4.3. National Load Despatch Centre (NLDC) shall assess the TTC, TRM and ATC) of inter and intra-regional links/ Corridors respectively for three months in advance for each month up to the fourth month based on :

4.3.1. The inputs received from RLDCs

4.3.2. TTC/ TRM/ ATC notified/ considered by CTU for medium-term open access.

Sample format for declaration of TTC/TRM/ATC is enclosed as **Format-I**.

4.4. NLDC shall inform the TTC/ TRM/ ATC figures along with constraints observed in inter-regional/ intra-regional corridors to the RLDCs. These shall be put on the website of RLDCs as well as NLDC.

4.5. NLDC may revise the TTC, TRM and ATC due to change in system conditions (including commissioning of new transmission lines/ generation), vis-à-vis earlier anticipated system conditions which includes change in network topology or change in anticipated active or reactive generation or load, at any of the nodes in the study. Revisions may be done by NLDC based on its own observations or based on inputs received from SLDCs/ RLDCs. Revised TTC, TRM and, ATC shall be published on website of NLDC and RLDCs along with reasons thereof.

## 5. Declaration of congestion in real-time

5.1. SLDCs/ RLDCs/ NLDC shall have a display available in their web-sites showing TTC, TRM, ATC declared in advance. Real time power flow in the corridor for

which TTC has been declared shall be displayed alongside for comparison. The voltage of the important nodes in the grid downstream/ upstream of the corridor shall also be displayed. The format of the display is enclosed as **Format II**.

5.2. A corridor shall be considered congested under the following circumstances:

5.2.1. Grid voltage in the important nodes downstream/ upstream of the corridor is beyond the operating range specified in the IEGC and/or

5.2.2. The real-time power flow along a corridor exceeds the ATC for that corridor for continuously one time block of 15-minute and/ or

5.2.3. One or more transmission lines in the corridor are loaded beyond the operating limit.

5.3. Whenever actual flow on inter/ intra regional link/ corridor exceeds ATC and security criteria as mentioned in clause 5.2 are violated for continuously two time blocks, NLDC may issue a warning notice. In case SLDC observes congestion within the intra State grid it shall inform the respective RLDC which in turn shall inform the NLDC. The notice for congestion shall be communicated to all the Regional entities telephonically or through fax/ voice message/ e-mail and through postings on website and making the same available on the common screen at NLDC/ RLDCs/ SLDCs. The format of the notice is enclosed as **Format III**.

5.4 If the power flow on the corridor is as per the schedule, but the congestion has been caused by forced outages of a transmission line in the corridor, which occurs after the drawal schedule has been fixed, then open access transactions shall be curtailed in the priority given in 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 followed by revision of TTC, TRM and ATC. No congestion charge shall, however, be applicable in such a case.

5.5 If the power flow on the corridor is as per the schedule and the corridor is congested due to either of the circumstances mentioned in clauses 5.2.1 and 5.2.3 of this procedure then TTC, TRM and ATC shall be revised accordingly. No congestion charge shall, however, be applicable in such a case.

5.6. If congestion persists for 2 time-blocks not counting the time-block in which warning notice was issued by RLDC and no affirmative action by the defaulting agency is taken, NLDC/ RLDC(s) shall issue a notice for application of

congestion charge. This notice shall be communicated to all the concerned Regional entities telephonically or through fax message and through postings on website and making available the same at the common screen at NLDC/ RLDCs/ SLDCs. The format is enclosed as **Format IV**.

## 6. Applicability of Congestion Charge

6.1. Congestion Charge shall be applicable to Regional entities as per the CERC (Measures to relieve congestion in real time operation) Regulations and orders on rate of congestion charge as applicable from time to time.

6.2. At frequency below 50 Hz, congestion charge would be levied for over drawal or under-injection in the importing control area and at frequencies above 50 Hz, congestion charge would be levied for under drawal or over-injection in the exporting control area.

6.3. Congestion charges may also become applicable for an intra-regional corridor of one region, if the congestion is attributable to other regional entities of other region.

6.4. Congestion charge shall be applicable only after two time blocks from the time of issuing the notice, not counting the time block in which notice is issued.

6.5. Congestion charge shall be withdrawn after the power flow on the affected transmission link/ corridor has come down to the ATC and remains at this level for one time block. NLDC/ RLDC shall communicate to all concerned Regional entities telephonically or through fax message/ e-mail and through postings on website and making available the same on the common screen available at NLDC/ RLDCs/ SLDCs for lifting of congestion charge. The format of the notice is enclosed as **Format-V**.

## 7. Rate of Congestion Charge

7.1 The rate of congestion charge shall be as specified by the Commission from time to time, through an order.

## 8. Congestion Charge Accounting and Settlement

8.1. At the end of the operating day, NLDC/ RLDC shall indicate the times when notice on application of congestion charge was given along with the reasons of

congestion. The format is enclosed as **Format-VI**. This format shall be available on the NLDC/ RLDCs websites.

8.2. Computation of congestion charge is a post facto event and shall be dictated by the average frequency in the 15-minutes time block as recorded by Special Energy Meters.

8.3. 'Congestion Charge account shall be settled on a weekly basis. This bank account shall be maintained and operated by RLDC in the same manner as the account for UI charges. The bank account details for congestion charge payment shall be intimated separately.

8.4. The statement of receipt and disbursal of congestion charge shall be issued by the Regional Power Committee Secretariat on weekly basis along with statement for Unscheduled Interchange charge.

8.5. The constituents required to pay congestion charge, shall pay the charges to the Congestion charge account within 10 days of issue of account and no cross adjustment with any other account would be allowed. Delay beyond 12 days after the issue of account for the short payment would attract a simple interest of 0.04% per day

8.6. RLDC shall release the amount to the Regional entities who have to receive congestion charge within three(3) working days after the receipt of the congestion charges.

8.7. The Commission will separately notify the procedure regarding the maintenance and operation of the funds accumulated out of the congestion charge.

8.8. RLDC shall submit a statement to the Commission on monthly basis, furnishing details of undisbursed amount.

8.9. The procedure shall be reviewed as and when required and shall be submitted to the Commission for approval.

## 9. Removal of Difficulties

9.1 In case of any difficulty in implementation of this procedure, this procedure shall be reviewed or revised by NLDC with the approval from the Commission.

**Format-I**

**National /_____Regional Load Despatch Centre**

**TOTAL TRANSFER CAPABILITY FOR** mmmm, yyyy

Issue Date: Issue Time: Revision No.

| Corridor/ Control Area | Date | Time Period | Total Transfer Capability (TTC) (MW) | Reliability Margin (RM) (MW) | Available Transfer Capability (ATC) (MW) |
|---|---|---|---|---|---|
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**Assumptions:**

**A. Load (MW)**

| Region / Entity Name | Peak Load | Off Peak Load |
|---|---|---|
| | | |
| | | |
| **Total** | | |

**B. Generation(MW)**

| | Thermal | | Hydro | |
|---|---|---|---|---|
| | Peak | Off Peak | Peak | Off Peak |
| **ISGS** | | | | |
| **State** | | | | |

### C. Major Transmission Line Outages

| | Element | Voltage (kV) | Remarks |
|---|---|---|---|
| **Central Sector** | | | |
| | | | |
| **State Sector** | | | |

### D. Generation Outages

| | Generating Unit | MW | Remarks |
|---|---|---|---|
| **Central Sector** | | | |
| | | | |
| **State Sector** | | | |
| | | | |

### E. HVDC Settings

| Name | Setting (MW) |
|---|---|
| | |
| | |
| | |

### F. Constraints

### G. Miscellaneous

Note: Format may be changed as per requirement with prior approval of the Commission.

**Format II**

**National/_____Regional Load Despatch Centre**

**CONGESTION MONITORING DISPLAY**

**dd/mm/yyyy, hh:mm**

| Corridor/ Control Area | TTC (MW) | ATC (MW) | Actual (MW) |
|---|---|---|---|
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Note: Format may be changed as per requirement with prior approval of the Commission.

**Format III**

**National/_____Regional Load Despatch Centre**

**Notice Number: (NLDC/RLDC)/yyyy/mm/…. Date: *dd/mm/yy***
**Time of Issue: *hh:mm***

**To**

**WARNING NOTICE**

The actual transfer of electricity on following corridors has crossed the ATC.

| **Corridor/Control Area** | **ATC (MW)** | **Actual Flow (MW)** |
|---|---|---|
| | | |
| | | |

The following regional entities, which are downstream of the congested corridor, are advised to reduce their drawl/increase their generation to decongest the system:
**1.**
**…**
**m**.

The following reginal entities, which are upstream of te congested corridor are advised to
/ increase their drawl/reduce their generation to decongest the system:
**1.**
**…**
**n**.

**Shift Charge Manager**

This is a warning notice before levying of congestion charges and issued in accordance with the Central Electricity Regulatory Commission (Measures to relieve congestion in real time operation) Regulations, 2009

NLDC would send this notice to RLDC and RLDC would send this notice to regional entities

Note: Format may be changed as per requirement with prior approval of the Commission.

**Format IV**

**National/_____Regional Load Despatch Centre**

**Notice Number: (NLDC/RLDC)/yyyy/mm/….** **Date: *dd/mm/yy***
**Time of Issue: *hh:mm***

**To**

**NOTICE FOR APPLICATION OF CONGESTION CHARGE**

Congestion charge for Unscheduled Interchange (UI) energy as per CERC (Measures for relieving congestion) Regulations 2009 dated 22nd December 2009 would be applicable w.e.f time block no. ( hh:mm )of **dd/mm/yyyy.**

| **Corridor/Control Area** | **TTC (MW)** | **Actual Flow (MW)** |
|---|---|---|
| | | |
| | | |

Congestion charge would be applicable on the following regional entities, which are downstream of the congested corridor:
**1.**
**…**
**m**.

Congestion charge would be applicable on the following regional entities, which are upstream of the congested corridor:
**1.**
**…**
**n.**

**Shift Charge Manager**

Issued in accordance with the Central Electricity Regulatory Commission (Measures to relieve congestion in real time operation) Regulations, 2009

NLDC would send this notice to RLDC and RLDC would send this notice to regional entities

Note: Format may be changed as per requirement with prior approval of the Commission.

**Format V**

**National/_____Regional Load Despatch Centre**

**Notice Number: (NLDC/RLDC)/yyyy/mm/….  Date: *dd/mm/yy*  Time of Issue: *hh:mm***

**To**

**NOTICE FOR WITHDRAWAL OF CONGESTION CHARGE**

Congestion charge on Unscheduled Interchange (UI) energy that was applicable w.e.f **hh:mm of dd/mm/yyyy** vide **Notice Number**.... issued at hh:mm of dd/mm/yyyy would be lifted w.e.f **time block no**. (**hh:mm) of dd/mm/yyyy**.

**Shift Charge Manager**

Issued in accordance with the Central Electricity Regulatory Commission (Measures to relieve congestion in real time operation) Regulations, 2009

NLDC would send this notice to RLDC and RLDC would send this notice to regional entities

Note: Format may be changed as per requirement with prior approval of the Commission.

**Format VI**

**National/_____Regional Load Despatch Centre**

**STATEMENT ON NOTICE OF APPLICATION AND WITHDRAWAL OF CONGESTION CHARGE FOR**

**Date:** **Issued on:**

| **Application** | | **Withdrawal** | | **Downstream Regional Entities** | **Upstream Regional Entities** |
|---|---|---|---|---|---|
| **Time Block** | **Time** | **Time Block** | **Time** | | |
| 1 | 0000-0015 | | | | |
| 2 | 0015-0030 | | | | |
| 3 | 0030-0045 | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| 96 | 2345-0000 | | | | |

Note: Format may be changed as per requirement with prior approval of the Commission.

**Annexure - II**

**Format for submission of details of Congestion Charge by NLDC for the month of**

(Rs. in Lakh)

| Sl. No. | Name of the RLDCs | Total Receipt of Congestion Charge | Total Disbursal of Congestion Charge | Undisbursed Amount in Congestion Charge Account |
|---|---|---|---|---|
| | | | | |
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