

**CENTRAL ELECTRICITY REGULATORY COMMISSION  
NEW DELHI**

**Petition No. 36/MP/2015**

- Subject : Approval under Central Electricity Regulatory Commission (Grant of Connectivity, Long term and Medium term Open Access to the inter-State transmission and related matters) Regulations, 2009, to determine the Transmission Reliability Margin between the NEW Grid and SR Grid post commissioning of 765kV S/C Raichur-Solarpur transmission line.
- Date of hearing : 26.2.2015
- Coram : Shri Gireesh B. Pradhan, Chairperson  
Shri A.K. Singhal, Member  
Shri A.S. Bakshi, Member
- Petitioner : Power Grid Corporation of India Limited
- Respondents : Power System Operation Corporation Limited and others
- Parties present : Shri I.S. Jha, PGCIL  
Ms. Seema Gupta, PGCIL  
Shri Dilip Rozekar, PGCIL  
Shri Y.K. Sehgal, PGCIL  
Ms. Jyoti Prasad, PGCIL  
Shri KVMM. Rao, PGCIL  
Shri S.K. Soonee, POSOCO  
Shri V.K. Agrawal, POSOCO  
Shri S.R. Narasimhan, POSOCO  
Ms. Abiha Zaidi, POSOCO  
Shri Pankaj Batra, CEA  
Shri S. Vallinayagam, Advocate, TANGEDCO  
Shri S. Thiruivavukkarasu, TNEB  
Shri S. Ravichadran, TNEB  
Shri P. Murugavelan, TNEB  
Shri K. Seshadri, TNEB  
Shri M. Venkata Reddy, APTRANSCO  
Shri B. Bhanu Prasad, APTRANSCO  
Shri Anand K. Ganesan, Advocate, KSK Mahanadi  
Shri Vikas Saksena, JPL  
Shri G. Sreenivas, KSEB

## Record of Proceedings

The representative of the petitioner referred to para 16 of Detailed Procedure under Central Electricity Regulatory Commission (Grant of Connectivity, Long-term Access and Medium-term Open Access in inter-State Transmission and related matters) Regulations, 2009 (Connectivity Regulations) regarding Total Transfer Capability (TTC), Transmission Reliability Margin (TRM) and Available Transfer Capability (ATC) and submitted as under:

- (a) TTC itself accounts for system operating conditions considering effect of worst credible contingency. These contingencies range from N-1 of the system element to the outage of single largest unit in the inter-connected system without requiring rescheduling. The uncertainties that remain uncovered are uncertainties for correctness of the assumptions considered while arriving at TTC like aggregate load forecast, load distribution, forecasted transmission topology, allowances for parallel path (loop flow) impacts and simultaneous path interactions, variations in the generation dispatch, inertial response and frequency bias etc.
- (b) TRM is a margin kept in the TTC to assist in handling the dynamic behavior of the transmission system. Upon any deviation from the steady state conditions TRM will allow the operator sufficient time to take corrective actions (like generation back down, load shedding etc.) to bring back the system under prescribed normal limits of power flow operations.
- (c) The methodology for computation of TRM covered in Detailed Procedure issued under the Regulation 3(1) of the Central Electricity Regulatory Commission (Measures to relieve congestion in real time operation) Regulations, 2009 (Congestion Management) provides that computation of TRM for a region or control area or group of control areas would be based on the consideration of the following:
  - (i) Two percent (2%) of the total anticipated peak demand in MW of the control area/group of control area/region (to account for forecasting uncertainties); and
  - (ii) Size of largest generating unit in the control area/group of control area/region.
- (d) The above consideration has been analyzed with respect to the TRM between NEW Grid and SR Grid as under:
  - (i) 2% of Peak Demand met-This uncertainty is aimed at addressing the deficit in net power availability in the importing region thereby causing unintentional power flow across the flowgate. The deficit can be on account of numerous reasons like error in spatial distribution of projected load, error in generation dispatch, load

distribution variation etc. Under the unintended deficit in the importing SR the power flow can take place from NEW Grid to SR.

- (ii) The change in the power flow on tie-lines shall be dependent on the relative stiffness of two interconnected systems.
- (iii) The smaller the change in frequency for a given load change the stiffer the system. If 0.5 Hz change in frequency is effected in system “A” by change of 500 MW whereas for same frequency change in system “B” requires 1000 MW, then system B is said to be stiffer. The power-frequency characteristic may be approximated by a straight line and  $\Delta P/\Delta f = K$ , where K is a constant (*MW per Hz*) depending on the governor and load characteristics. The stiffness constant of interconnected systems is dependent on variety of reasons like Governor action, type of load (lighting, agriculture, industrial etc) and hence, it varies over the seasons and during the day.
- (iv) The stiffness constant or Power Order for SR is varies between 1500 to 2500 MW/Hz and for NEW Grid it varies between 2000 to 3500 MW/Hz.
- (v) Considering 37,000 MW peak demand for SR (based on CEA Power Supply Position report for August, 2014), 2% of the demand works out to be about 740 MW.
- (vi) The different values of  $\Delta P_t$  Additional unintended power flow across Raichur-Solapur transmission line for demand variation of 740 MW is as shown below:

<b>NEW Grid Power Order (MW/Hz)</b>	<b>2000</b>	<b>2500</b>	<b>3000</b>	<b>3500</b>
<b>SR Grid Power Order (MW/Hz)</b>	<b>Power flow in Tie Line (MW) <math>\Delta P</math></b>			
1500	422.9	462.5	493.3	518.0
2000	370.0	411.1	444.0	470.9
2500	328.9	370.0	403.6	431.7

- (vii) The above table calculates the incremental power flow on the Raichur-Solapur 765 kV 2xS/C transmission line upon a change in demand of SR by 740 MW in the ratio of the stiffness constant. It can be seen that the maximum flow on Raichur– Solpaur 765 kV 2xS/C transmission line may increase by 518 MW (259 MW on each circuit). The trend shows that as the stiffness constant in NEW Grid increases the power flow on Raichur- Solapur 765 kV 2xS/C line increases, and when stiffness constant in SR Grid increases,

the power flow on Raichur-Solapur 765 kV 2xS/C transmission line decreases.

- (e) Dynamic studies with 1100 MW power flow on Raichur-Solapur 765 kV 2xS/C transmission lines have been carried for a disturbance of loss of about 900 MW (net dispatch at Kundankulam APP) due to tripping of 1000 MW unit at Kundankulam. The results have been seen as variation of power flow on important lines, voltage variations at important nodes and angular plots for important generating stations.
- (f) Considering all the above, while determining TTC, worst credible contingencies including outages of generation units, transmission lines, ICTs, demand variation were considered as per the Transmission Planning Criteria by CTU. In case of NEW Grid-SR Grid inter-connection, TTC has been determined to be 4750 MW based on the comprehensive studies considering various contingencies.
- (g) In view of shortage in SR, TRM may not be kept at normative level but be kept on the basis of studies carried out by CTU.
- (h) From the international practices followed by the Utilities of USA and NERC in respect of determination of TRM between two large inter-connections, it is clear that TRM does not include allowances for planned outages and other known transmission conditions which should be included in the calculation of TTC. The Transmission Service Provider has the option of including the above described components of TRM in either in the determination of TRM or TTC, but not in both.

2. The representative of TNEB, TANGEDCO and TANTRANSCO submitted as under:

- (a) CTU has carried out studies prescribed in the regulations and arrived at TRM of 500 MW. However, it is not clear that how CTU arrived at the figure.
- (b) CTU had vide letter dated 18.11.2013 circulated the agenda to SR and WR constituents proposing TRM between NEW Grid and SR Grid as 500 MW. However, after receiving the comments from the Southern and Western Regions constituents, the TRM between NEW Grid-SR Grid was declared as 750 MW which is not clear.
- (c) The approved Detailed Procedure under Connectivity Regulations provides that CTU shall assess the Total Transfer Capability (TTC), Available Transfer Capability (ATC) and Transmission Reliability Margin (TRM) of inter-regional links/Corridors. Further the TTC, ATC, and TRM along with the details of basis of calculations, including assumptions, if any, shall be put up on the website of CTU.

- (d) The figure of 750 MW as TRM was arrived unscientifically just by considering 2% of the total anticipated peak demand. The studies carried out by CTU show that TRM of 500 MW is sufficient to keep the system without any risk.
- (e) As per CA&G audit report laid down in Parliament on 4.8.2014, TTC is less than 50% in four of the six regional corridors. The audit is concerned about TTC being less than 50%. The Raichur-Solapur 2xS/C transmission line was built with huge investment with transfer capacity of 7600 MW but TTC of 1100 MW has been declared on Raichur-Solapur 2xS/C transmission line which is around 14% of the transfer capacity.

3. The representative of POSOCO submitted as under:

- (a) POSOCO supports the CTU's proposal for reduction of TRM for 750 MW to 500 MW due to the following reasons:
  - (i) Southern Region is facing severe shortage of electricity.
  - (ii) The studies carried out by CTU show that TRM should be reduced to 500 MW instead of 750 MW on Raichur-Solapur 2xS/C transmission line.
  - (iii) (N-1) is already considered for arriving TTC and hence, it should not be taken again in TRM calculation.
  - (iv) The figure of 500 MW as TRM is as per the International practices followed by many developed countries.
  - (v) Considering the CA&G audit report which highlights that TTC is less than 50% in four of the six regional corridors.
- (b) With regard to the prayer of the petitioner for taking TRM on NEW grid and SR grid inter-connector with TTC of 1100 MW as 500 MW, the following is relevant:
  - (i) As per Regulation 4 of the Connectivity Regulations, the Central Transmission Utility is the nodal agency for grant of connectivity, long-term access and medium term open access to the inter-State transmission system.
  - (ii) Regulation 9 of the Connectivity Regulations provides that CTU shall consider augmentation of inter-State transmission system proposed under the plans made by the CEA in case of long term open access. The Medium-term open access can be granted if the resultant power flow can be accommodated in the existing transmission system or the transmission system under execution.

- (iii) As per Regulations 20 of the Connectivity Regulations, CTU as the Nodal Agency is responsible for carrying out system studies before granting or refusing Medium Term Open Access.
  - (c) As per the Connectivity Regulations, CTU is required to formulate Detailed Procedure on grant of Connectivity, Long-term Access & Medium-term Open Access. The Detailed Procedure so made by CTU was approved by the Commission vide order dated 31.12.2009.
  - (d) The Detailed Procedure approved by the Commission entrusted the CTU to assess the Total Transfer Capability (TTC), Available Transfer Capability (ATC) and Transmission Reliability Margin (TRM) of inter-regional links / Corridors. TTC, ATC and TRM along with the details of basis of calculations, including assumptions if any and put up on the website of CTU.
  - (e) POSOCO has been entrusted with similar duty by the Commission for Short Term Open Access and the same has been followed with diligently and transparently. CTU has not been following all the steps enumerated in the detailed procedure regarding grant of LTA and MTOA.
  - (f) The Commission has approved the Detailed Procedure wherein it is the duty of the CTU to decide on the values of TTC, ATC or TRM. Therefore, the petition is not maintainable before the Commission in the present form.
4. The representative of CEA submitted as under:
- (a) The Commission has framed two regulations, namely Connectivity Regulations which comes under the purview of the CTU and Measures to relieve congestion Regulations which comes under the purview of the POSOCO. There is slight procedural difference between the two Detailed Procedures which is creating confusion in the instant case.
  - (b) Initially the 2% of the total anticipated peak demand in importing region was not considered. At present, there is need to refine the procedure as per international practices.
  - (c) The Commission may consider the present petition to remove anomaly in the two Detailed Procedures. The petitioner may approach the Commission for the same.
  - (d) The Commission cannot approve TRM which is the responsibility of CTU/POSOCO.
5. The Commission observed that TRM has to be calculated in accordance with the methodology provided in the Detailed Procedure approved by the Commission and the Commission cannot be expected to approve the TRM of 500 MW between the NEW grid and SR grid.

6. The representative of the petitioner sought time to amend the prayers in the petition which was allowed by the Commission.

7. The Commission allowed a time for 15 days to CTU to file the amended petition with revised prayers. The petition shall be listed for hearing thereafter.

**By order of the Commission**

**sd/-  
(T. Rout)  
Chief (Law)**