

पावर सिस्टम ऑपरेशन कारपोरेशन लिमिटेड

(पावरग्रिड की पूर्ण स्वामित्व प्राप्त सहायक कंपनी)

POWER SYSTEM OPERATION CORPORATION LIMITED

(A wholly owned subsidiary company of POWERGRID)

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संदर्भ संख्या/Ref No.

NLDC/LTA

Dated: 25th Nov 2013

The Chief Operating Officer,
Central Transmission Utility (CTU),
Power Grid Corporation of India Limited,
'Saudamini', Plot no 2, Sector-29, Gurgaon-122 001

Sub: Synchronization of Southern Region (SR) with NEW grid; ATC of NEW grid and SR
Ref: C/CTU/W/Operations/Solapur-Raichur dated 18th Nov 2013

Sir,

Please refer the above correspondence and studies carried out by the CTU for determining the Total Transfer Capability (TTC), Transmission Reliability Margin (TRM) and Available Transfer Capability (ATC) for power transfer from NEW Grid to Southern Region. In this connection, Southern Regional Load Despatch Centre (SRLDC) have already forwarded their comments vide letter SRLDC/AGM/2013 dated 21st Nov 2013. It is suggested that the following aspects may also be considered while finalizing the ATC.

- i) A reference has been made to the TTC/TRM/ATC computation procedure approved by the Central Electricity Regulatory Commission (CERC) for relieving congestion in real time operation. It is stated that these procedures are essentially for the operational planning horizon. Considering that the long term and medium term planning by its very nature have more uncertainty, the same necessitates more stringent contingencies as well as a higher TRM than that in the operational planning horizon.
- ii) The CERC approved procedure has a reference to the Transmission Planning Criteria (TPC) issued by Central Electricity Authority (CEA). The revised criteria as of January 2013 have introduced the N-1-1 criteria. It is observed from SRLDC's comments that even the base case power flows for 2000 MW import by Southern Region on 765 kV Sholapur-Raichur 2 x S/C indicate an abnormal level of power flows on many of the line sections. Such flows would violate N-1 criteria; leave aside N-1-1. Hence the TTC computed by the CTU appears optimistic, if one considers these aspects. This could have an adverse impact on the grid security. As also brought out in NLDC's periodic quarterly

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operational feedback as per section 4j of NLDC Rules 2005 (available at <http://posoco.in/documents/operational-feedback>), the number of outages are often greater than even N-2. So N-2 and greater is also credible in the Indian power system. These contingencies greater than N-2 are mainly due to the CEA Grid Standards being violated repeatedly; a fault in the transmission system at 400 kV and above level should ideally get cleared in 100 milliseconds; instances of 1000 milliseconds for fault clearance are common.

- iii) The CERC approved procedures have evolved over a period of time (since Dec 2009) and needs to be further refined with experience. The Southern Region has a high penetration of renewables. When it comes to a renewable rich region, it is the 'net load' forecast which becomes very important. Net load forecast is the load forecast less Renewable Energy generation forecast. These errors would be much higher than even the 2% load forecast error indicated in the CERC procedure, necessitating higher TRM. This aspect is also important considering that the Indian power system is yet to adopt 'tight control' with utilities still not mandated to keep the Area Control Error (ACE) to zero. Even if the CERC Regulations are amended to mandate tight control, it would mean that the utilities could keep their reserve margins outside their control area and even outside the region. Worldwide, a Capacity Benefit Margin (CBM) is also kept aside to take care of this aspect in addition to the TRM.
- iv) In the planning horizon, SPS should ordinarily not be considered. Even if it is considered, the CTU should specify the Safety Integrity Levels (SIL) of SPS. As per the CIGRE TB 187 on System Protection Schemes

'Each SIL has associated target failure measures, according to whether the mode of operation is low demand operation where frequency of demand for operation is not more than once per year or high demand operation where this frequency is greater than once per year. For low demand operation, the average probability of failure to perform the design function on demand should lie in the range: 10^{-4} to 10^{-5} (SIL 4), 10^{-3} to 10^{-4} (SIL 3), 10^{-2} to 10^{-3} (SIL 2), and 10^{-1} to 10^{-2} (SIL 1). For high demand operation, the probability of a dangerous failure per hour should lie in the range: 10^{-8} to 10^{-9} (SIL 4), 10^{-7} to 10^{-8} (SIL 3), 10^{-6} to 10^{-7} (SIL 2), and 10^{-5} to 10^{-6} (SIL 1).'

In the Indian context, there are no design principles for SPS and no checks exercised. Unless these are specified and SIL indicated, it might make little sense to consider SPS in the long term planning horizon.

- v) Size of largest generating unit has been specified for computation of TRM. In case of Southern Region, it is Kudankulam nuclear power unit of 1000 MW capacity. A 1000 MW trip without System Protection Scheme (SPS) action would lead to at least 750-800 MW flow on the 765 kV Sholapur-Raichur 2 x S/C lines. As stated by Charles Concordia, eminent power systems guru in his Tutorial on Interconnections (Electrical Power and Energy Systems , Vol 3, no 3, July 1981, pp 167-174),

'It is further evident that, no matter how strong the ties are, if they are already sufficiently loaded (importing energy), they may still trip. That is, if a tie is installed to allow an economic interchange of energy, then it can only be counted upon for reserve support if it has enough margin of capacity at its maximum normal load to withstand a sudden further increase of power flow equal to at least the capacity of, for example, the largest generating unit of the receiving system. Thus, it is the dependable pick-up capacity, rather than the total capacity, that is significant. On the other hand, if the import is so great that loss of a generator causes the tielines to trip, then even more generation is lost, so the situation is made worse. That is, a tie will make things either better or worse; it cannot remain neutral.'

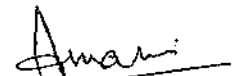
- vi) In case of high wind penetration, there is a strong possibility of loss of a large wind farm due to inadequate Fault Ride Through (FRT) capabilities in the wind turbines. In fact we have already had two instances viz. 28th May 2013 and 7th June 2013 of loss of 1000-1500 MW or more generation from windfarms in Tamilnadu in the 2013 wind season. Kudankulam 1000 MW loss pales in comparison to this size of windfarm and it is a credible contingency considering the relaxed CEA Standards as well as its implementation. In fact such FRT related issues had resulted in problems elsewhere when Portugal lost a large chunk of its wind farm on 15th Nov 2009 leading to increased imports from France to Spain and the danger of losing this connection.
- vii) Considering that the LTA applications are for Tamilnadu, the TTC/ATC in S1-S2 corridor and that for Tamilnadu also need to be specified. This was stated by POSOCO in the meeting taken by Chairperson CEA on 3rd Oct 2013. Further since the injection points of these LTAs are primarily the Chhattisgarh and Jharsuguda, the TTC for W3 region may also be specified.
- viii) It is also observed from Annexure-1 of CTU's communication dated 18th Nov 2013 that twenty (20) elements are required to be commissioned in Western and Southern Region

before 2000 MW TTC is possible towards Southern Region. This excludes the line reactors/bus reactors at the different substations which are also important from the viewpoint of voltage control. It must be made abundantly clear that the LTAs would be effective only after all these elements are commissioned. Alternatively considering that twenty transmission elements are involved with the attendant uncertainties, the issue of LTA approval can be taken up later when these elements are commissioned so that there is more certainty.

It is therefore requested that both the TTC and TRM be reviewed urgently by the CTU in the interest of system security, particularly as after the deficit Southern Region synchronization, operation would be through weak ties at least in the initial few years. This is also important considering the fact that the power system has been planned in 2007 considering Southern Region as surplus and exporting to the NEW grid; the situation today is just the reverse. A smaller deficit region getting connected to a larger surplus system is much more serious than vice-versa as was the case of Eastern Region (surplus) getting synchronized with Western Region (deficit) in March 2003.

Thanking you,

Yours faithfully



(A Mani)

General Manager

Copy to:

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