Transmission Reliability Margin Implementation Document
For Georgia System Operations Corporation

PURPOSE:

Georgia System Operations Corporation ("GSOC") as Transmission Operator with Georgia Transmission Corporation ("GTC") as Transmission Service Provider have identified a need for an amount of Transmission Transfer Capability ("TTC") to be maintained as Transmission Reliability Margin ("TRM") necessary to provide a reasonable level of assurance that the interconnected transmission network will be secure. GSOC is within the Southern Balancing Authority Area ("SBAA"); the Southern Balancing Authority ("SBA") maintains TRM[1] for imports from the major interconnections with neighboring transmission systems. GSOC and GTC are responsible for an allocated share of SBA's TRM on ATC Paths listed in Attachment A.

I. GSOC as Transmission Operator with GTC as Transmission Service Provider have prepared and will keep current this Transmission Reliability Margin Implementation Document ("TRMID") that includes the following:

   a. Identification (on each of the respective ATC Paths) of the following components of uncertainty used in establishing TRM, and a description of how that component is used to establish a TRM value.

      i. Aggregate Load forecast error = 0 MW
      ii. Load distribution uncertainty = 0 MW
      iii. Forecast uncertainty in Transmission system topology (including, but not limited to, forced or unplanned outages and maintenance outages) = 0 MW
      iv. Allowances for parallel path (loop flow) impacts = 0 MW
      v. Allowances for simultaneous path interactions = 0 MW

[1] GTC is an Integrated Transmission System (ITS) of Georgia participant. The ITS interconnections are a subset of the Southern Balancing Authority's ("SBA") interconnections. The SBA calculates the TRM for the SBA, including the ITS interconnections, using the all applicable FERC approved NERC standards and the methodology of this TRMID.

vi. Variations in generation dispatch (including, but not limited to, forced or unplanned outages, maintenance outages and location of future generation) = 0 MW

vii. Short-term System Operator response (Operating Reserve actions) = 900 MW for SBAA; Attachment A identifies the respective ATC Paths for the 900 MW. Transfer Capability must remain available to allow for operator flexibility and inrush current immediately following a contingency. The need for TRM to ensure the reliability of the transmission system across SBAA is determined for imports into SBAA for major ATC Paths. SBA's TRM component for Short Term System Operator response is 900 MW for imports and zero for exports. The methodology of how Short-term System Operator response is used to establish a TRM value is described in Attachment B.

viii. Reserve sharing requirements = 0 MW

ix. Inertial response and frequency bias = 0 MW

b. The method used to allocate TRM on ATC Paths is described in Attachment C.

c. TRM calculation is the same for the following time periods:

i. Same day and real-time

ii. Day-ahead and pre-schedule

iii. Beyond day-ahead and pre-schedule, up to thirteen months ahead

II. GSOC as Transmission Operator with GTC as Transmission Service Provider only use Short-term System Operator response to establish TRM, and do not include any of the components of Capacity Benefit Margin ("CBM").

III. GSOC makes this TRMID available on Georgia Transmission Corporation's ("GTC") OASIS. If requested, underlying documentation used to determine TRM, in the format used by GSOC[2], will be provided to NERC registered Transmission Service Providers, Reliability Coordinators, Planning Coordinators, Transmission Planners, and Transmission Operators who make a written request. The underlying documentation used to determine TRM will be made available no more than 30 calendar days after receiving the request.

[2] The SBA calculates the TRM for the SBA, including the ITS interconnections.

IV. GSOC as Transmission Operator with GTC as Transmission Service Provider establish TRM values in accordance with this TRMID. GSOC, with GTC, reviews and re-establishes its TRM values at least once every 13 months. TRM values are posted on GTC's OASIS along with the most recent date that the TRM values were established.

V. GSOC as Transmission Operator with GTC as Transmission Service Provider provide the TRM values to Transmission Service Providers and Transmission Planners listed in Attachment D no more than seven calendar days after a TRM value is established or subsequently changed.

Attachment A: List of ATC Paths

The following ATC Paths are Southern Company Services, Inc. – Transmission ATC Paths where GSOC and GTC are responsible for an allocated share of TRM.

1. DUK-SOCO
2. EES-SOCO: GSOC and GTC allocated share of TRM on the EES-SOCO ATC Path is zero because GTC's transmission is not connected to EES
3. FL-SOCO[1]
4. TVA-SOCO

[1] FL-SOCO is a collection of four ATC Paths that are intermingled on the interface between the Southern Balancing Authority Area ("SBAA") and four Balancing Authority Areas in peninsular Florida. The four ATC Paths are FPC-SOCO, FPL-SOCO, JEA-SOCO and TAL-SOCO; and these four ATC Paths are listed in GTC's ATCID. The four ATC Paths are intermingled, and their only external connection outside of peninsular Florida is their radial connection to SBAA. Since the four intermingled ATC Paths have intermingled Short-term System Operator response with SBAA as well as the radial nature of peninsular Florida, the TRM for the four ATC Paths is calculated on a FL-SOCO ATC Path. These four ATC Paths are treated as a single ATC Path (FL-SOCO) for TRM purposes only, to adequately maintain reliability given their parallel interactions.

Attachment B: Method Used to Calculate Southern Balancing Authority TRM

Calculation of TRM is consistent with the applicable NERC MOD standards: MOD-001-1a – Available Transmission System Capability, MOD-008-1 – TRM Calculation Methodology, and MOD-028-1 – Area Interchange Methodology. The Southern Balancing Authority ("SBA") typically assumes in the planning of operations studies an "Operating Reserve" of at least 1800 MW. Of the 1800 MW of Operating Reserves, a) typically at least 67% [typically 1200 MW – approximately equal to the largest unit in the Southern Balancing Authority Area] or more is Contingency Reserves, with a target of 50% [typically 600 MW] or more of the Contingency Reserves being Spinning Reserves with the remainder being made up of Supplemental Contingency Reserves including generation available within 10 minutes or load that can be fully removable within 10 minutes; and b) a portion can be made up of online resources and other resources not on-line that are not available within the 10 minute contingency response time frame but are available within 90 minutes. The total Transmission Reliability Margin ("TRM") is set to equal the total non-spinning operating reserves (normally 900 MW). Unreleased Transmission Reliability Margin ("TRM_U") is set to equal the total non-spinning operating reserves (normally 900 MW) minus any TRM that is made available on a non-firm basis. TRM values are presently maintained only for imports. No TRM values are presently maintained for exports. The relationship of TRM and TRM_U to the other components of Available Transfer Capability is the same as described in MOD-028-1; the relationship is repeated below for documentation purposes.

$$\mathbf{ATC_F = TTC - ETC_F - CBM - TRM + Postbacks_F + counterflows_F}$$

Where:

ATC_F is the firm Available Transfer Capability for the ATC Path for that period.

TTC is the Total Transfer Capability of the ATC Path for that period.

ETC_F is the sum of existing firm Transmission commitments for the ATC Path during that period.

CBM is the Capacity Benefit Margin for the ATC Path during that period.

TRM is the Transmission Reliability Margin for the ATC Path during that period.

Postbacks$_F$ are changes to firm ATC due to a change in the use of Transmission Service for that period, as defined in GTC's ATCID.

counterflows$_F$ are adjustments to firm ATC as determined by GTC and specified in GTC's ATCID.

$$\mathbf{ATC_{NF} = TTC - ETC_F - ETC_{NF} - CBM_S - TRM_U + Postbacks_{NF} + counterflows_{NF}}$$

Where:

ATC$_{NF}$ is the non-firm Available Transfer Capability for the ATC Path for that period.

TTC is the Total Transfer Capability of the ATC Path for that period.

ETC$_F$ is the sum of existing firm Transmission commitments for the ATC Path during that period.

ETC$_{NF}$ is the sum of existing non-firm Transmission commitments for the ATC Path during that period.

CBM$_S$ is the Capacity Benefit Margin for the ATC Path that has been scheduled without a separate reservation during that period.

TRM$_U$ is the Transmission Reliability Margin for the ATC Path that has not been released for sale (unreleased) as non-firm Transfer Capability by GTC during that period.

Postbacks$_{NF}$ are changes to non-firm ATC due to a change in the use of Transmission Service for that period, as defined in GTC's ATCID.

counterflows$_{NF}$ are adjustments to non-firm ATC as determined by GTC and specified in GTC's ATCID.

Attachment C: Method Used to Allocate TRM across ATC Paths

I. **Allocation of TRM across SBAA Interfaces and ATC Paths.** The Southern Balancing Authority Area ("SBAA") has four major interfaces; the four major interfaces are (a) Entergy, (b) Florida, (c) TVA, and (d) VACAR.

a. The interface between SBAA and Entergy is one ATC Path (EES-SOCO) with a low impedance 500 kV line as well as lower voltage lines. Therefore, the EES-SOCO ATC Path is allocated some TRM.

b. As described in Attachment A, the Florida interface is a collection of four ATC Paths that are intermingled between SBAA and four Balancing Authority Areas in peninsular Florida. The four ATC Paths have two low impedance 500 kV lines, five 230 kV lines as well as lower voltage lines that (in some places) terminate with multiple BAs. The intermingling of the four ATC Paths as well as the radial nature of peninsular Florida are combined for TRM purposes into a single ATC Path (FL-SOCO).

c. The interface between SBAA and TVA is one ATC Path (TVA-SOCO) with two low impedance 500 kV lines as well as lower voltage lines. Therefore, the TVA-SOCO ATC Path is allocated some TRM.

d. The interface between SBAA and VACAR is composed of ATC Paths between SBAA and Duke ("DUK"), SCE&G ("SCEG"), and SCPSA ("SC"). The DUK-SOCO ATC Path has a low impedance 500 kV transmission line as well as lower voltage lines interconnected to SBAA. The SCEG-SOCO and SC-SOCO ATC Paths do not have 500 kV transmission lines and are weakly connected to SBAA. Therefore, the DUK-SOCO ATC Path is allocated some TRM. TRM on SCEG-SOCO and SCPSA-SOCO are set to zero MW due to higher impedances.

The total megawatts of SBAA TRM are allocated among the EES-SOCO, FL-SOCO, TVA-SOCO, and DUK-SOCO ATC Paths as described in Sections II and III below. TRM on ATC Paths associated with some interfaces, such as SCE&G and SCPSA, are set to zero MW due to higher impedances. TRM on ATC Paths associated with other interfaces, such as AEC or SMEPA, are set to zero MW because the Point Of Receipt is wholly contained within SBAA.

II. **Southern Balancing Authority Area Allocation Methodology**

The methodology uses the inertial response of the interfaces for the loss of a generator in SBAA. Analysis is performed by:

a. Tripping one major unit of generating capacity greater than 500 MW at several plant sites, one at a time, in order to assess inrush requirement on each interface.
b. Siemen's PSS/E program is used to examine the governor's response for all of the generators in the Eastern Interconnection modeled 30 seconds after the loss of the major unit. Thirty seconds was selected to allow the generator governors to settle out at the new operating point. Analyses have indicated that approximately 75% of the lost generation is picked up within Balancing Authority Areas external to the SBAA (i.e., outside of the SBAA). Note that 75% of the largest generating unit in SBAA (Vogtle) is 900 MW. This reinforces that using 900 MW for the total TRM is appropriate.
c. The following units in SBAA are removed one at a time and the response of each interface is recorded: Vogtle 2, Miller 4, Hatch 2, Gaston 5, Watson 5, Farley 2, Bowen 4, Wansley 2, Scherer 3, Gorgas 10, Barry 5, and Daniel 2.
d. The largest MW response of each interface (for the outage of units under consideration) is selected for allocation towards TRM.
e. The TRM of each interface is normalized based on the total value of 900 MW. The TRM is assigned to an ATC Path on each interface that most accurately represents the inertial response of the interface.

Example:

- For this example, the largest response for each of the Entergy, Florida, TVA, and VACAR interfaces is 285.92, 193.4, 295.31, and 370.78 MW, respectively. Therefore the SBAA TRM value for each of the EES-SOCO, FL-SOCO, TVA-SOCO, and DUK-SOCO ATC Paths is 285.92, 193.4, 295.31, and 370.78 MW.
- The largest response for the Duke-SOCO ATC Path is 370.78 MW; the SBAA TRM value for the Duke-SOCO ATC Path based on 900 MW is:

  370.78 x (900/(285.92+193.40+295.31+370.78)) = 291.34 MW.
- As a result, the SBAA TRM value for the DUK-SOCO ATC Path is 291.34 MW. TRM calculations for the FL-SOCO and TVA-SOCO ATC Paths are performed using the same process. After rounding off to the nearest integer, TRM for the EES-SOCO ATC

Path is adjusted so that the total amount of TRM of all ATC Paths does not exceed 900 MW.

III. **Further Allocation Among Georgia Integrated Transmission System Participants**

a. The allocation of SBAA TRM as described in Section II of Appendix C is further allocated among Dalton Utilities ("Dalton"), Georgia Power Company ("GPC") (a subsidiary of Southern Company), Georgia Transmission Corporation ("GTC"), and Municipal Electric Authority of Georgia ("MEAG"), which operate their transmission facilities collectively in a network referred to as the Georgia Integrated Transmission System ("ITS"). The allocation process GTC uses to allocate SBAA TRM is determined by the Integrated Transmission System Agreements ("ITSAs"). The ITSAs are three bi-lateral contracts between GPC and Dalton, GPC and GTC, and GPC and MEAG.

b. SBAA TRM values on the FL-SOCO, TVA-SOCO, and DUK-SOCO ATC Paths are allocated among the Georgia ITS participants. ITS Interconnections are defined in the ITSAs as "Certain Transmission Facilities" that "interconnect with the transmission facilities of other electric utilities". For the purposes of allocating TRM, the ITS Interconnections are the FL-SOCO, TVA-SOCO, and DUK-SOCO ATC Paths. The Georgia ITS is not connected to the Entergy Balancing Authority; therefore the GTC/GSOC are not allocated any TRM on the EES-SOCO ATC Path. The Georgia ITS participants determine the allocation percentages of each ITS participant for all ATC Paths that use an ITS interface (FL-SOCO, TVA-SOCO, and DUK-SOCO). These allocation percentages are applied to the ATC Path's calculated SBAA TRM values described in section II to determine the appropriate TRM value for each ITS participant.

IV. **Allocation Processes Applicable to GTC**

a. Section III above contains a description of the process used to allocate TRM among four ATC Paths in the FL-SOCO ATC Path. There are no processes used to allocate TRM among multiple lines or sub-paths within any other larger ATC Path.

b. Section III above contains a description of the process used to allocate TRM among Georgia ITS participants (owners) of the FL-SOCO ATC Path.

c. There are no processes used to allocate TRM between Transmission Service Providers to address issues such as forward looking congestion management and seams coordination.

Attachment D:

List of Transmission Service Providers and Transmission Planners that Receive TRM Values within Seven Calendar Days

1. Georgia Transmission Corporation
2. Municipal Electric Authority of Georgia
3. Southern Company Services, Inc. – Transmission