



Electric System Operations

CSV-MOD-A01_TRMID_for_Duke_Energy_Carolinas.docx

ESO Team Applicability	RCSVCS
Associated Standard(s) or Directive	MOD-001 MOD-008
Reference(s)	
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Purpose:

The purpose of this document is to describe the methodology that Duke Energy Carolinas (DEC) uses to determine Transmission Reliability Margin (TRM) in its ATC process and promote the consistent and reliable calculation, verification, preservation, and use of Transmission Reliability Margin (TRM) to support analysis and system operations.



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Overview:

TRM is the amount of transmission transfer capability necessary to provide reasonable assurance that the interconnected transmission network will be secure. TRM accounts for the inherent uncertainty in system conditions and the need for operating flexibility to ensure reliable system operation as system conditions change.

Duke Energy Carolinas (DEC) uses two separate forms of TRM that are described in this document.

- The first form is the calculated value of TRM on each individual flowgate that will be referred to hereafter as “Flowgate TRM.”
- The second form is the calculated value of TRM on each Duke Energy Carolinas’ Contract Path with other VACAR Balancing Authorities that are members of the VACAR Reserve Sharing Group that will be referred to hereafter as “Interface TRM.”

The Flowgate TRM is determined by the greatest impact on a flowgate due to one of the following scenarios:

- The loss of Duke Energy Carolinas’ largest single generator, currently Catawba Nuclear Station’s Unit 1 or 2, with the Interconnection responding to the loss, or
- Duke Energy Carolinas’ delivery of its reserve sharing commitment to each participating company (based on contractual obligations), or
- Duke Energy Carolinas’ receipt of its reserve sharing commitment from each participating company (based on contractual obligations).

After performing the evaluations of these three scenarios, DEC will designate each flowgate’s Flowgate TRM equal to the highest impact on that flowgate from the above scenarios.

The Interface TRM is calculated using the VACAR Reserve Sharing Group’s current member Balancing Authority allocations.

The Flowgate TRM is used in the Available Flowgate Capability (AFC) calculations while the Interface TRM is used in the Remaining Contract Path Capability (RCPC) calculations. The same TRM values for each respective form of TRM are applied to both Firm and Non-Firm calculations.

Duke Energy Carolinas will use the TRM calculated by neighboring Transmission Operators on honored flowgates if it is made available.

Flowgate TRM Calculation Procedure:

PowerGEM's TARA Viewer is used to calculate each Flowgate TRM for each one of the scenarios described in the **Overview** section. The inputs to the process are the PSS/e raw file for SERC NTSG OASIS seasonal basecase being studied, the TRM subsystem file containing the generator and area responding data, and the flowgate file containing all of the Duke Energy Carolinas' and external companies' flowgates. The output of TARA Viewer (Flowgate TRM's) is uploaded into the flowgate definition file and used for the calculation of flowgate limited AFC.

TARA Viewer is used to calculate the generation shift factors for each scenario for each of the flowgates. For the loss of DEC's largest single generator, the generation shift factors for each flowgate are multiplied by the capacity of that generator. For the delivery or receipt of DEC's VACAR Reserve Sharing commitment, the difference of the generation shift factors of the responding generators is multiplied by the delivering companies' reserve sharing commitment.

Whichever scenario delivers the greatest positive impact on a flowgate, that value is the TRM allocation on that flowgate. If there is no impact or a negative impact (decrease in flow), the Flowgate TRM is set to "0."

Interface TRM Calculation Procedure:

Duke Energy Carolinas allocates TRM across its Contract Paths based on contractual obligations to supply and receive reserves. The Interface TRM is calculated according to the VACAR Reserve Sharing Group Manual.

The contractual requirements for the VACAR Reserve Sharing Group are reviewed, established, and updated annually. Duke Energy Carolinas allocates these contractual obligations to its Contract Paths through the utilization of TRM, based on the following methodology:

- **Imports** – TRM for Contract Paths sinking into the Duke Energy Carolinas Balancing Authority Area from another VACAR Balancing Authority Area are set equal to the opposing Balancing Authority Area's share of the VACAR RSG allocated reserve requirement.
 - TRM on all other (Non-VACAR RSG Balancing Authority Areas) Contract Paths sinking into the Duke Energy Carolinas Balancing Authority Area are set to zero.
- **Exports** – TRM for Contract Paths sourcing from the Duke Energy Carolinas Balancing Authority Area to another VACAR RSG Balancing Authority Area are set equal to Duke Energy Carolina's share of the VACAR RSG allocated reserve requirement.
 - TRM on all other (non-VACAR RSG Balancing Authority Areas) Contract Paths sourcing from the Duke Energy Carolinas Balancing Authority Area are set to zero.

Effective Time Periods:

Duke Energy Carolinas utilizes the TRM Allocation Methodology, as described above, for the following time periods:

- Same day and real-time
- Day-ahead and pre-schedule
- Beyond day-ahead and pre-schedule and up to at least thirteen months ahead

Identification of Components of Uncertainty Used:

As described in the above methodologies, the following components of uncertainty are used in the calculation of TRM for Interface TRM followed by the components used in the TRM for flowgates.

Flowgate TRM:

The uncertainty components used in this calculation are the variation in generation dispatch and inertial response and frequency bias. The loss of Duke Energy Carolinas' largest single unit is used to calculate the largest MW impact that the Interconnection can have on the Duke Energy Carolinas' transmission system due to the loss of a single Duke Energy Carolinas' generator. The SERC NTSG OASIS seasonal case includes planned generator maintenance outages and future generation which is planned to come online in the season being studied.

Interface TRM:

The only uncertainty components used are the reserve sharing requirements on applicable interfaces as discussed previously.

Standard Requirements:

Duke Energy Carolinas Transmission Operator (TOP) will make changes as necessary to the TRMID to keep it updated with the current process.

Duke Energy Carolinas TOP will make available its TRMID, and if requested, underlying documentation used to determine TRM, in the format used by the TOP, to any of the following who make a written request no more than 30 calendar days after receiving the request.

- Transmission Service Providers
- Reliability Coordinators
- Planning Coordinators
- Transmission Planner
- Transmission Operator

Duke Energy Carolinas TOP will establish TRM values in accordance with the TRMID at least once every 13 months.

Duke Energy Carolinas TOP will provide the TRM values to its Transmission Service Provider(s) and Transmission Planner(s) no more than seven calendar days after a TRM value is initially established or subsequently changed.



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Date	Version	Changed By	Pages or Sections Revised and Description
03-31-2011	0	Linwood Ross	Initial Version of TRM ID
06-27-2011	1	Linwood Ross	<ul style="list-style-type: none">- Converted document to the new ESO documentation design- Overview Section: Added bullets for the 3 scenarios, moved portions to ensure consistent references to Flowgate/Interface TRM- Flowgate TRM Calculation Procedure Section: changed section name from “Flowgate TRM Allocation Procedure”, removed step-by-step calculation procedure and replaced with high-level process statements- Interface TRM Calculation Procedure Section: Changed name from “Interface TRM Allocation Procedure”, removed “until such time as Contingency Reserve is identified and contracted for on those interfaces” from both the Import and Export discussion- Identification of Components of Uncertainty Used Section: added comment about planned generator maintenance outages and future generation
06-04-2012	2	Linwood Ross	<ul style="list-style-type: none">- Overview Section: Added caveat that Duke Energy Carolinas uses the TRM other Transmission Operators calculated on their flowgates that Duke Energy Carolinas honors- Completed Annual Review
05-29-2013	3	Linwood Ross	<ul style="list-style-type: none">- Standard Requirements: Removed Annual Review Requirement- Updated logo