Transmission Reliability Margin Implementation Document (TRMID)
Upper Great Plains Region (UGPR)

This document includes or references all applicable documentation that demonstrates UGPR's compliance with the requirements of the NERC standards for a TRM Implementation Document[1].

UGPR is a NERC registered Transmission Service Provider, Transmission Operator, and Balancing Authority, and also a member of the Southwest Power Pool (SPP). UGPR's OASIS site is located at: http://www.oasis.oati.com/wapa/index.html.

SPP is the Transmission Service Provider for UGPR's eligible facilities placed under the SPP Open Access Transmission Tariff (SPP Tariff). SPP's OASIS site is located at: http://www.oasis.oati.com/swpp/index.html.

UGPR obtains Reliability Coordination Services from SPP for its transmission facilities located in the Eastern Interconnection, and from Peak Reliability for its transmission facilities located in the Western Interconnection.

1.0 Background:

The NERC MOD Standard MOD-008-1 Transmission Reliability Margin adopted on November 13, 2008 requires the Transmission Operator to prepare and keep current a "TRM Implementation Document" (TRMID) that includes processes, procedures, and assumptions used in the determination of TRM for each Available Transfer Capability (ATC) Path or Flowgate.

This document contains UGPR's TRMID documentation. MOD-008-1 only requires information related to Requirement R1 be in the TRMID. Other requirements R2 through R5 are not required to be in the TRMID.

[1] Based on NERC MOD Standard MOD-008-1 "Transmission Reliability Margin", NERC Adopted November 13, 2008; FERC Approved 11/24/2009

2.0 TRM Implementation Document (TRMID):

(MOD-008-1 R1.) *Each Transmission Operator shall prepare and keep current a TRM Implementation Document (TRMID) that includes, as a minimum, the following information: [Violation Risk Factor: Lower] [Time Horizon: Operations Planning]*

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M1. *Each Transmission Operator shall produce its TRMID evidencing inclusion of all specified information in R1. (R1)*

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UGPR's Transmission Reliability Margin Implementation Document (TRMID) documentation is contained in this document and is reviewed at least annually. UGPR's TRMID is available on UGPR's public OASIS website under the ATC Information folder at the link below in its entirety. http://www.oasis.oati.com/wapa/index.html

The TRMID document is also available at the following direct link:
http://www.oasis.oati.com/woa/docs/WAPA/WAPAdocs/TRMID.pdf

2.1 TRM Components:

(MOD-008-1 R1.1) *Identification of (on each of its respective ATC Paths or Flowgates) each of the following components of uncertainty if used in establishing TRM, and a description of how that component is used to establish a TRM value:*

- *Aggregate Load forecast.*
- *Load distribution uncertainty.*
- *Forecast uncertainty in Transmission system topology (including, but not limited to, forced or unplanned outages and maintenance outages).*
- *Allowances for parallel path (loop flow) impacts.*
- *Allowances for simultaneous path interactions.*
- *Variations in generation dispatch (including, but not limited to, forced or unplanned outages, maintenance outages and location of future generation).*
- *Short-term System Operator response (Operating Reserve actions).*
- *Reserve sharing requirements.*
- *Inertial response and frequency bias.*

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The specific component(s) of uncertainty set forth in MOD-008-1 R1.1 that are utilized on each ATC Path or Flowgate for which UGPR maintains a TRM value are summarized in UGPR's Flowgate Definition File. The Flowgate Definition File is located on UGPR's OASIS under the ATC Information folder at the following link:
http://www.oasis.oati.com/woa/docs/WAPA/WAPAdocs/FG-Definition-File.pdf

UGPR includes the specific component(s) of uncertainty in its TRM values to provide a reasonable level of assurance that the interconnected transmission network will be secure. TRM components are generally set forth in the Operating Guides associated with each ATC Path or Flowgate. The release of TRM on a Non-Firm basis is allowed provided the ATC Path or Flowgate can be operated in compliance with NERC Standards.

A description of how UGPR uses each component of uncertainty in setting the TRM values is described below. The nature of each ATC Path or Flowgate also dictates how TRM is calculated and what component(s) of uncertainty are included in its TRM values. To the extent that one component of uncertainty is sufficiently large enough to address other component(s) of uncertainty on the same ATC Path or Flowgate, no additional TRM value may be included on that ATC Path or Flowgate for every component of uncertainty (i.e. the components of uncertainty are not needed to be additive).

1. Aggregate Load forecast.

   This component of uncertainty is utilized when inaccuracies in the load forecast for an area, or sub-area (such as UGPR's system in the Western Interconnection) can impact the loading of an ATC Path or Flowgate. TRM holdback from ATC/AFC is therefore required to ensure that the actual load can be served across the ATC Path or Flowgate when the actual load exceeds the load forecast. For example, if the actual load can deviate by up to 10 MW maximum above the load forecast resulting in a 10 MW increase in the flow across the impacted ATC Path or Flowgate, a 10 MW component of TRM will be utilized to address this aggregate load forecast uncertainty for the area/sub-area. The maximum load deviation is determined from historical data comparing the load forecasts against actual loads and from operating experience.

2. Forecast uncertainty in Transmission system topology (including, but not limited to, forced or unplanned outages and maintenance outages).

   This component of uncertainty is utilized when changes in system topology (e.g. outages or reconfigurations of transmission facilities, either internal or external to UGPR's system) impact the ability to maintain the loading of an ATC Path or Flowgate. TRM

holdback from ATC/AFC is therefore required to allow such flows to be curtailed appropriately, taking into account priority of service. For example, in cases where certain loading levels on an ATC Path or Flowgate can be accommodated only on a Non-Firm basis because the system is not built to withstand outages (e.g. prior outage) that impact the ability to maintain the loading of an ATC Path or Flowgate during such event (whether forced, unplanned, or scheduled).

3. Allowances for parallel path (loop flow) impacts.

   This component of uncertainty is utilized when unscheduled power can flow across and impact the loading of an ATC Path or Flowgate. This creates the need for TRM holdback from ATC/AFC to ensure that the loading does not exceed the ATC Path or Flowgate rating. The maximum variations in the loop flow are determined, as applicable, from historical operating data, power flow simulations, or based upon maximum deviations allowed by control parameters on controlled ATC Path or Flowgates. An example of the latter is where phase shifters with automated controls are in place. The maximum deviations for phase shifter controlled paths is typical described as the "deadband", and is a settable control parameter.

4. Allowances for simultaneous path interactions.

   This component of uncertainty is utilized when the ATC Path or Flowgate studied rating is not independent from studied limits of other ATC Paths or Flowgates (either internal or external to UGPR's system). For example, the North Dakota Export (NDEX) transfer limit is interdependent and varies with the transfer limit posted on the Manitoba Export (MHEX) interfaces, and the Minnesota-Wisconsin (MWEX) interface. At lower values of the MHEX, and/or MWEX interfaces, the NDEX transfer limit can generally be increased, and vice versa. To account for these simultaneous path interaction impacts, this component of uncertainty is utilized. UGPR, in coordination with the other owners/operators of the interdependent paths, studies and sets transfer limits for these paths based upon nomograms and Operating Guides developed, and agreement among the owners/operators. In the case of NDEX, as an example, UGPR studies and sets a "simultaneous" transfer limit, which is utilized for the basis of Firm ATC/AFC postings, and which seeks a maximum simultaneous operating point for the interdependent interfaces (i.e, none of the interfaces is at is absolute maximum, but the operating point has all interdependent interfaces at their maximums that can be achieved at the same time and allow for provision of Firm service on each interface). UGPR also studies and sets a "non-simultaneous" transfer limit (or more than one as there may be multiple operating points where UGPR's ATC Path or Flowgate may increase above the "simultaneous" transfer limit), which can be utilized for the basis for Non-Firm ATC/AFC postings. The difference(s) between TTC values developed using simultaneous and non-

simultaneous transfer limits and the related interdependency due to these simultaneous path interactions is addressed by including a TRM value(s), as needed.

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

   This component of uncertainty is utilized when variations in the generation dispatch for an area, or sub-area (such as UGPR's system in the Western Interconnection) can impact the loading of an ATC Path or Flowgate. TRM holdback from ATC/AFC is therefore required to ensure that the actual load can be served across the ATC Path or Flowgate when the actual generation varies from expected dispatch. For example, if the actual generation can deviate by up to 10 MW maximum above the load forecast resulting in a 10 MW increase in the flow across the impacted ATC Path or Flowgate, a 10 MW component of TRM will be utilized to address this generation dispatch variability for the area/sub-area. The maximum generation variation range is determined from historical data comparing the desired generation dispatch against actual generation and from operating experience.

6. Short-term System Operator response (Operating Reserve actions).

   This component of uncertainty is utilized when variations in the generation scheduled output due to short-term System Operator response (including for Operating Reserve actions) can impact the loading of an ATC Path or Flowgate. TRM holdback from ATC/AFC is therefore required to ensure that the actual flow across the ATC Path or Flowgate when the generation output is changed based upon such requirements. For example, if the actual generation output may be required be increased by up to 10 MW maximum resulting in a 10 MW increase in the flow across the impacted ATC Path or Flowgate, a 10 MW component of TRM will be utilized to address this impact. The maximum ATC Path or Flowgate impact due to short-term System Operator response (including Operating Reserve actions) is determined from historical data, the single greatest contingency(ies) needed to be addressed under the NERC Standards and applicable reserve sharing group, studies showing impact of generation changes on the ATC Path or Flowgate, the maximum amount of generation output changes needed to address Operating Reserve requirements, and the impact of those generation output changes on the ATC Path or Flowgate, and from operating experience. For UGPR, the greatest generator outage, or other applicable contingency, affecting each ATC Path or Flowgate due to Operating Reserve actions is determined by studying the effect of tripping various generators within the applicable region and dispatching generators within the applicable system or reserve sharing group to reflect their share of the Operating Reserves required to be delivered to replace the output of the generator that tripped or other loss of resource. The generator outages or loss of resource are

analyzed with the contingent facility out of service. The greatest generator outage or loss of resource affecting the ATC Path or Flowgate is the outage that results in the greatest incremental flow over the ATC Path or Flowgate. The highest incremental flow on the flowgate is the amount of TRM required to deliver Operating Reserves. Additional margin may be included to account for annual variations in the Operating Reserve requirements (e.g. party's allocation of the Operating Reserve requirements).

7. Inertial response and frequency bias.

   This component of uncertainty is utilized when variations in the generation output due to inertial response or frequency bias on the system can impact the loading of an ATC Path or Flowgate. TRM holdback from ATC/AFC is therefore required to ensure that the actual flow across the ATC Path or Flowgate when the generation varies based upon inertial response and frequency bias. For example, if the actual generation can deviate by up to 10 MW maximum resulting in a 10 MW increase in the flow across the impacted ATC Path or Flowgate, a 10 MW component of TRM will be utilized to address this generation output variability. The maximum generation variation range is determined from historical data, studies showing inertial response, if necessary, and control settings, as applicable, that impact the amount of generation deviation from schedule, and from operating experience.

The release of TRM on a Non-Firm basis is allowed provided the ATC Path or Flowgate can be operated in compliance with NERC standards and other applicable requirements. UGPR releases TRM for Non-Firm ATC/AFC postings by adjusting the TRM value coefficient(s). The TRM sub-component related to reserve sharing may be reduced for Non-Firm ATC postings. This may be appropriate depending upon the applicable NERC Standards and reserve sharing group requirements for the amount of the operating reserve that must be delivered immediately via spinning reserves and the amount that may be non-spinning. Non-Firm curtailments would be expected to be effective before the non-spinning portion of the operating reserves would need to be delivered. Additionally, the TRM sub-component related to TTC values developed using simultaneous and non-simultaneous study procedures described above is reduced to allow for selling of Non-Firm capacity identified in a non-simultaneous study; provided that UGPR has coordinated a procedure for posting of Non-Firm capability above the simultaneous limit with other affected owner/operators of the interdependent interfaces.

The methodologies and studies used by UGPR to determine TRM for each ATC Path or Flowgate are reviewed, as necessary, by the appropriate SPP committees or other group(s).

TRM coefficient(s) is utilized to set the TRM values for all Firm and Non-Firm ATC Path or Flowgate ATC/AFC calculations. 100% of the TRM value is utilized for Firm ATC Path or Flowgate ATC/AFC calculations.

The Flowgate Definition File contains the identification of each of the components of uncertainty referenced above that are utilized for each ATC Path or Flowgate for which UGPR maintains a TRM value. The Flowgate Definition File is located on UGPR's OASIS under the ATC Information folder at the following link:
http://www.oasis.oati.com/woa/docs/WAPA/WAPAdocs/FG-Definition-File.pdf

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2.2 Methodology used to allocate TRM across ATC Paths or Flowgates:

(MOD-008-1 R1.2.) *The description of the method used to allocate TRM across ATC Paths or Flowgates.*

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ATC/ATC of a particular ATC Path or Flowgate is an approximate indication of the anticipated transmission transfer capability remaining on the transmission network that could be scheduled for further commercial activity relative to the designated path under the conditions studied. Specific study of conditions, including source and sink of generation and load, is required before Firm transmission service commitments can be made. Typically, TRM is allocated to the specific ATC Path or Flowgate for which it is calculated. If there is a case where a composite TRM is calculated that impacts multiple ATC Paths or Flowgates, such allocation of TRM across those ATC Paths or Flowgates will be described in the Flowgate Definition File. Any such allocation of TRM across ATC Paths or Flowgates would be done to ensure that sufficient TRM is withheld on each ATC Path or Flowgate to maintain its independent ATC/AFC postings.

Transfer capability of the transmission network is limited by physical and electrical characteristics of the system including thermal equipment loading, protective equipment limitations, voltage, and stability considerations and provisions of coordination agreements. Transfer capability is evaluated based on base system loading and an assessment of critical contingencies on the transmission system. The critical contingencies will be defined as appropriate. The Transmission Operator's calculation of transfer capability will be consistent with the principles in the NERC Standards. These calculations will be performed through a combination of planning and operational analyses, employing both real-time functionality and

off-line analytical tools as appropriate. The Firm and Non-Firm ATC/AFC values are determined, taking into account the applicable Transmission Operator provided TRM values in order to meet applicable NERC Standards.

Treatment of Transmission Reliability Margin (TRM)

TRM accounts for the inherent uncertainty in system conditions and its associated effects on ATC/AFC calculations and the need for operating flexibility to ensure reliable system operation as system conditions change.

UGPR calculates TRM using the following methodology:

TRM shall be set in accordance with the results of the uncertainty calculated from the process above for all UGPR ATC Paths or Flowgates except as noted below.

1. *TLR and IROL*. TRM may be set to 5% for all ATC Paths or Flowgates that had NERC Transmission Loading Relief (TLR) issued in the 12 months prior to Transmission Operator's annual TRM re-evaluation and are Interconnection Reliability Operating Limits (IROLs) located in UGPR.

2. *Current and Expected Operating Conditions*. During times of unusual circulation or other operating conditions, Transmission Operator may set a larger TRM values, as necessary.

3. *Historic Conditions*. Transmission Operator may set TRM on specific ATC Path or Flowgates consistent with historic loading, load forecast and distribution error, variations in facility loadings, uncertainty in transmission system topology, loop flow impact, variations in generation dispatch, automatic sharing of reserves, and other uncertainties as identified through the NERC reliability standards.

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2.3 Identification of the TRM Calculation:

(MOD-008-1 R1.3.) *The identification of the TRM calculation used for the following time periods:*

R1.3.1. Same day and real-time.
R1.3.2. Day-ahead and pre-schedule.
R1.3.3. Beyond day-ahead and pre-schedule, up to thirteen months ahead.

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UGPR uses the same calculation of TRM values for all 3 time periods: *1) Same day and real-time; 2) Day-ahead and pre-schedule; and 3) Beyond day-ahead and pre-schedule, up to thirteen months ahead.*

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3.0 Questions- Contact

If you have any questions please contact Steve Sanders at (406) 255-2840 or by email at sanders@wapa.gov , or Kass Portra at (406) 255-2842 or by email at portra@wapa.gov .