



**Transmission Reliability Margin
Implementation Document
(TRMID)**

Reference: NERC Standard MOD-008-1

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Revisions denoted by **highlight**

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1. Purpose

The purpose of BC Hydro’s Transmission Reliability Margin Implementation Document (TRMID) is to address the requirements of the North American Electric Reliability Corporation (NERC) Mandatory Reliability Standard MOD-008 Transmission Reliability Margin Calculation Methodology adopted for British Columbia. This TRMID documents the Transmission Reliability Margin (TRM) set aside when it calculates Available Transfer Capability (ATC) for each ATC Path in the BC Hydro System for a time horizon up to 13 months including the current month.

2. Effective Date

Effective date: 1 July 2023

3. Definitions

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

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

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

CBM_s is the Capacity Benefit Margin for the ATC Path that has been scheduled during that period.

$Counterflows_F$ are adjustments to firm Available Transfer Capability as determined by the Transmission Service Provider and specified in their ATCID.

$Counterflows_{NF}$ are adjustments to non-firm Available Transfer Capability as determined by the Transmission Service Provider and specified in its ATCID.

ETC_F is the sum of Existing Firm Commitments for the ATC Path during that period.

ETC_{NF} is the sum of Existing Non-firm Commitments for the ATC Path during that period.

GF_{NF} is the non-firm capacity set aside for grandfathered Transmission Service and contracts for energy and/or Transmission Service, where executed prior to the effective date of a Transmission Service Provider’s Open Access Transmission Tariff or “safe harbor tariff.”

$NITS_F$ is the firm capacity reserved for Network Integration Transmission Service serving Load, to include losses, and Load growth, not otherwise included in Transmission Reliability Margin or Capacity Benefit Margin.

$NITS_{NF}$ is the non-firm capacity set aside for Network Integration Transmission Service serving Load (i.e., secondary service), to include losses, and load growth not otherwise included in Transmission Reliability Margin or Capacity Benefit Margin.

NL_F is the firm capacity set aside to serve peak Native Load forecast commitments for the time period being calculated, to include losses, and Native Load growth, not otherwise included in Transmission Reliability Margin or Capacity Benefit Margin.

OS_F is the firm capacity reserved for any other service(s), contract(s), or agreement(s) not specified above using Firm Transmission Service as specified in the ATCID.

OS_{NF} is the non-firm capacity reserved for any other service(s), contract(s), or agreement(s) not specified above using non-firm transmission service as specified in the ATCID.

Postbacks_F are changes to firm Available Transfer Capability due to a change in the use of Transmission Service for that period, as defined in Business Practices.

Postbacks_{NF} are changes to non-firm Available Transfer Capability due to a change in the use of Transmission Service for that period, as defined in Business Practices.

PTP_F is the firm capacity reserved for confirmed Point-to-Point Transmission Service.

PTP_{NF} is non-firm capacity reserved for confirmed Point-to-Point Transmission Service.

ROR_F is the firm capacity reserved for Roll-over rights for contracts granting Transmission Customers the right of first refusal to take or continue to take Transmission Service when the Transmission Customer's Transmission Service contract expires or is eligible for renewal.

System Operating Limit (SOL) is the value (such as MW, MVar, Amperes, Frequency or Volts) that satisfies the most limiting of the prescribed operating criteria for a specified system configuration to ensure operation within acceptable reliability criteria.

TRM is the Transmission Reliability Margin for the ATC Path 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 capacity by the Transmission Service Provider during that period.

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

4. Components of Uncertainty

The following is a list of the components of uncertainty that may be used to establish TRM:

- 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 and maintenance outages)
- Short-term System Operator response (Operating Reserve actions)
- Reserve Sharing Requirements
- Inertial Response and frequency bias

Table 1 lists components that apply to the BC Hydro System. While BC Hydro recognizes there are components of uncertainty that could be used to establish a TRM, BC Hydro does not quantify these components. BC Hydro uses an assessment of variability of the actual transfer flows to quantify the total variability of all components in aggregate.

Table 1

ATC Path Name	Components for TRM	Components for TRM_U
BCHA – BPAT	<ul style="list-style-type: none"> • Aggregate Load forecast. • Variations in generation dispatch. • Inertial Response and frequency bias. • Forecast uncertainty in Transmission System topology. 	<ul style="list-style-type: none"> • Aggregate Load forecast. • Variations in generation dispatch. • Inertial Response and frequency bias.
BPAT – BCHA	<ul style="list-style-type: none"> • Aggregate Load forecast. • Variations in generation dispatch. • Inertial Response and frequency bias. 	<ul style="list-style-type: none"> • Aggregate Load forecast. • Variations in generation dispatch. • Inertial Response and frequency bias.
BCHA – AESO	<ul style="list-style-type: none"> • Aggregate Load forecast. • Variations in generation dispatch. • Inertial Response and frequency bias. 	<ul style="list-style-type: none"> • Aggregate Load forecast. • Variations in generation dispatch. • Inertial Response and frequency bias.
AESO – BCHA	<ul style="list-style-type: none"> • Aggregate Load forecast. • Variations in generation dispatch. • Inertial Response and frequency bias. • Forecast uncertainty in Transmission System topology. 	<ul style="list-style-type: none"> • Aggregate Load forecast. • Variations in generation dispatch. • Inertial Response and frequency bias.

5. TRM Calculations

Has established TRM for each applicable ATC Path for the following time periods:

- Same day and real-time;
- Day-ahead and pre-schedule; and
- Beyond day-ahead and pre-schedule, up to thirteen months ahead.

BC Hydro has established the capacity amounts shown in Table 2, which have been established based on operating experience, have proven sufficient and effective. A review conducted November 10, 2022 of the established TRM confirms that regulation to schedules is maintained within the TTC, without exceeding operating limits.

BC Hydro sets aside the following capacity amounts for TRM_U, for each ATC Path:

Table 2

ATC Path Name	TRM _U (MW)
BCHA – BPAT	50
BPAT – BCHA	50
BCHA – AESO	65
AESO – BCHA	65
FBC – BCHA	0
BCHA – FBC	0
VI – BCHA	0

For calculating ATC_F, BC Hydro may set aside additional capacity amount to account for Transmission System topology uncertainty due to unplanned and forced outages and maintenance outages. The impact of an outage varies depending on the actual element out of service. Studies show that the maximum SOL/TTC after a most severe single contingency is 600 MW, 850 MW, 2400 MW, and 2000 MW for AESO-BCHA Path, BCHA-AESO Path, BCHA-BPAT Path, and BPAT-BCHA Path respectively.

For details of the maximum TTC for these paths under various outage topologies, please see SOO-7T-17 and SOO-7T-18 available at:

<https://www.bchydro.com/energy-in-bc/operations/transmission/transmission-system/system-operating-orders.html>.

The published ATCID and TRMID can be found at:

<https://www.bchydro.com/energy-in-bc/operations/transmission/transmission-system/atc-methodology.html>.

TRM Amount Required for Transmission System Topology and Uncertainty

The specific capacity amount needs to be set aside to account for Transmission System topology uncertainty will depend on what the calculated SOL/TTC is for the relevant time period. Therefore, the capacity amount for this component of uncertainty will be determined as shown in Table 3 below for the TRM and TRM_U for each ATC Path.

Table 3

ATC Path Name	TRM (MW)	Minimum TRM _U Value (MW)
BCHA – BPAT	Higher of (TTC – 2350, 50)	50
BPAT – BCHA	Higher of (TTC – 1950, 50)	50
BCHA – AESO	Higher of (TTC – 480, 65)	65
AESO – BCHA	Higher of (TTC – 535, 65)	65
FBC – BCHA	0	0
BCHA – FBC	0	0
VI – BCHA	0	0

BC Hydro will revise and re-establish, if required, this TRMID once every 13 months.

6. Information Sharing

BC Hydro will provide a copy of this TRMID and underlying documentation (if any) used to determine TRM to any of the following who make a written request to tdso.compliance@bchydro.com no more than 30 calendar days after receiving the request:

- Planning Coordinators
- Reliability Coordinators
- Transmission Operators
- Transmission Service Providers

7. Document Change History

Issue	Reason for Issue	Date
0	Initial Implementation.	21 November 2011
1	Correct typos	30 November 2011
2	Change in TRM amount required for transmission system topology uncertainty	25 June 2012
3	Revised link to system operating order (Page 7), revised table 3 and supporting information.	31 January 2016
4	Section 5 – revised hyperlink to posted System Operating Orders. Added hyperlink to the ATCID. Revised functions for calculating TRM to clarify/simplify, and to address BCUC decision on firm limits on BCHA to AESO. Revised TRM _u to indicate these are the minimum values.	23 May 2019
5	Reviewed for TRM and practices. Re-established/confirmed TRM with no changes.	23 December 2020
6	Reviewed and revised for TRM practices. Re-established/confirmed TRM with no changes.	13 December 2021
7	Reviewed for TRM practices. Re-established/confirmed TRM with no changes.	13 December 2022
8	Reviewed for alignment with ATCID updates	7 June 2023