Transmission Reliability Margin
Implementation Document

1.0 Purpose

The California Independent System Operator Corporation (CAISO) maintains Transmission Reliability Margin (TRM) to prepare and keep current a TRM Implementation Document (TRMID) that identifies each component of uncertainty the TOP considers in establishing TRM and describes how TRM is calculated and allocated for each component for each applicable time period.

This TRMID shall be available on the CAISO website under Rules > Requirements and Guidelines Modeling, data and analysis.

This document describes the TRM components derived for purposes of calculating Wheeling Through Priority ATC on the interties where ATC is reserved in advance, across a monthly 13-month horizon and a daily 7-day horizon, ahead of the Day-Ahead Market and Real-Time Market operations for purposes of establishing Wheeling Through Priority across the CAISO system.

The document also describes the TRM components that can be introduced during the market operational timeframe that reduce the physical path limits in the market optimization to recognize operational uncertainty that may materialize.

2.0 Identification of Components of Uncertainty in TRM

The CAISO considers the following components of uncertainty in establishing TRM values in calculating monthly and daily Wheeling Through Priority ATC values for reservation in advance and reducing physical transmission limits in the market operational timeframe for ATC Paths located at interties between the CAISO Balancing Authority Area (BAA) and its adjacent BAAs:

- Forecast uncertainty in Transmission system topology (including, but not limited to, forced or unplanned outages and maintenance outages)
- Variations in generation dispatch (including, but not limited to, forced or unplanned outages, maintenance outages and location of future generation)
- Allowances for parallel path (loop flow) impacts
- Allowances for simultaneous path interactions

3.0 Description of Method Used to Calculate and Allocate TRM for Each Component of Uncertainty

The CAISO uses the following methods to calculate and allocate TRM values for each of the components of uncertainty identified in Section 2.0 of this TRMID:

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

In calculating Wheeling Through Priority ATC to support the establishment of Wheeling Through Priority reservation in advance of market operations, the CAISO will initially set the TRM value at 3% of TTC on each intertie to represent the forecast uncertainty in transmission system topology. This value approximates historical average volumes of forced outages and operational discretion, representing a reasonable risk of forced transmission outages that can be accounted for in the horizon for which Wheeling Through Priority ATC is calculated to establish priority. This TRM is applicable across the monthly 13-month horizon and carried into the daily 7-day calculation horizon.

The transmission set aside for TRM for purposes of calculating Wheeling Through Priority ATC in the monthly and daily horizons, prior to market operations, can nevertheless continue to be utilized by the market to support optimized market outcomes, including low priority wheeling through transactions.

The TRM value may be increased beyond the initial 3% on MALIN500 and PVWEST interties to reflect internal Path 26 limitations. On the internal CAISO transmission system, Path 26 supports flows from the northern part of the CAISO system through to the southern part of the CAISO system and vice versa. A sizable outage or rerate on Path 26 impacts flows through the system and the ability to wheel transactions through the system. Since the CAISO does not calculate or allocate Wheeling Through Priority ATC on internal paths, an outage or rerate on Path 26 would be accounted for through TRM on the identified interties that are impacted by the path depending on the size and location of the limitation (whether in the north to south or south to north direction).

In the event that there is uncertainty about the availability in Real-Time[1] of certain Transmission system resources due to potential forced outages, the CAISO would utilize TRM to manage risk and reliability, using a TRM value up to the amount of the expected path limit reduction (the potential additional ATC Path derate) for the impacted intertie ATC Paths.

Example: If an intertie ATC Path is rated at 1000 MW during system intact, and, as a result of approaching fires, there is an uncertainty of full availability due to a potential Forced Outage that may derate the ATC path by 200 MW to a new rating of 800 MW, then the CAISO would utilize a TRM value of up to 200 MW for the time period during which that uncertainty exists.

[1] "Real-Time" is defined in Appendix A of the CAISO Tariff.

3.2 Variations in generation dispatch

The CAISO uses the variations in generation dispatch component of uncertainty to address variations in generation dispatch driven by resource outages or other conditions to recognize that in some circumstances, supply may have to be replaced or additional supply may have to be brought into the system to meet the changing needs. TRM may account for the unavailability of solar and other renewable energy during the net-peak load periods, unavailability of hydroelectric capacity during drought conditions, or wind capacity not performing to its Net Qualifying Capacity.

In calculating Wheeling Through Priority ATC across the monthly and daily horizons, the CAISO sets aside a TRM of 3% of TTC on ATC paths to manage the uncertainty driven by unavailability of supply during different conditions, such as when solar and other renewable supply is unavailable during net load peak periods, This initial value is determined based on historical incremental average import volumes, above RA import and non-RA contracted import volumes during peak periods. The TRM is set aside on the prevalent ATC intertie paths that have historically supported incremental imports during these periods of supply unavailability.

The TRM is set aside on the following import intertie ATC paths:

MALIN500	NOB	SYLMAR
MCCULLOUG500	CFETIJ	MIR2
PVWEST	MONA	ELDORADO230
COTTONWOOD230	RNCHLAKE	MEADMKTPC

The TRM may be at times increased or re-evaluated to the extent further uncertainty is anticipated in different horizons once conditions are better known. For example, to the extent there are expected drought conditions reducing availability or creating unavailability of hydro generation, the CAISO may further re-evaluate the TRM value to account for this uncertainty and will update the relevant public documents.

The TRM set aside for this component does not reduce the physical transmission limits in the operations of the market and can support further optimization of transactions in the market. The transmission set aside for TRM for purposes of calculating Wheeling Through Priority ATC in the monthly and daily horizons, prior to market operations, can nevertheless continue to be utilized by the market to support optimized market outcomes, including low priority wheeling through transactions.

3.3 Allowances for parallel path (loop flow) impacts.

In the event that the CAISO forecasts, based on currently observed parallel path (loop flow) conditions and projected scheduled flow for an upcoming Operating Hour,[2] that parallel path (loop flow) impacts will be realized in Real-Time over a qualified intertie ATC Path in amounts sufficient to trigger Step 2 or higher of the Western Interconnection Unscheduled Flow Mitigation Plan (WIUFMP)[3] for that Path, the CAISO may establish for that Path a TRM value up to the amount that would be required to be curtailed in Real-Time under the applicable Step of the WIUFMP.

Example: An intertie ATC Path has a TTC value of 1000 MW, the path is a qualified path for the WIUFMP, and the following conditions exist:

- Unscheduled flow + Real-Time flow is forecasted to be above 95% of Path TTC, *and*
- It is expected based on the forecast that WIUFMP Step 2 will need to be invoked in Real-Time absent application of a TRM.
- ***Then***
  - The CAISO may utilize up to 5% of Path TTC as the TRM value for the impacted Path for the next available run of the CAISO's Hour-Ahead Scheduling Process (HASP).[4]

When it is expected based on the forecast that WIUFMP Step 3 or 4 will need to be invoked in Real-Time absent application of a TRM, the CAISO will utilize up to 7% of Path TTC as the TRM value for the impacted Path for the next available HASP run.

3.4 Allowances for simultaneous path interactions.

The CAISO generally does not limit the TTC of an intertie ATC Path due to the simultaneous interaction with another path in the form of a nomogram that is enforced prior to Real-Time. Rather, the impact of the interaction between multiple ATC Paths is accounted for with nomograms enforced in Real-Time, either in an automated manner through market systems or manually through monitoring by operations staff, to ensure there are no violations of the System Operating Limit.

There are, however, a number of CAISO intertie ATC Paths that have simultaneous interactions with non-CAISO ATC Paths. In the event that one or more CAISO ATC Paths become constrained due to interactions with another non-CAISO ATC Path, TRM may be utilized to ensure there are no violations of the System Operating Limit in the CAISO ATC Path. The amount of TRM value assigned will be set to be no greater than the impact of its interaction with the non-CAISO ATC Path.

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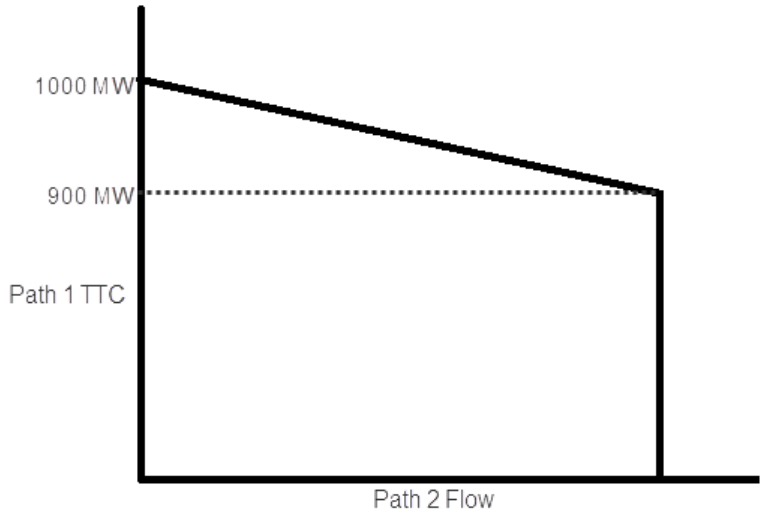
[2] "Operating Hour" is defined in Appendix A of the CAISO Tariff.
[3] The WIUFMP Procedure followed by the CAISO is set forth in CAISO Operating Procedure 3510, which is available on the CAISO's public website.
[4] The "Hour Ahead Scheduling Process (HASP)" is defined in Appendix A of the CAISO Tariff.

Example: If an ATC Path within the CAISO is found to be dependent with other ATC Paths as seen in the figure immediately below:



In the example above, the CAISO may utilize up to 100 MW of TRM value in Path 1 if the CAISO forecasts that Path 2 flow would be at its maximum.

4.0 Identification of TRM Calculation for Different Time Periods and its calculation frequency

For the day-ahead and pre-schedule time period, the CAISO sets its TRM values for intertie ATC Paths at 0 MW at all times in the market, not reducing what is available to the market to optimize transactions.

For the beyond day-ahead and pre-schedule, up to thirteen months ahead, time period, the CAISO also sets its TRM values for intertie ATC Paths based on the Wheeling Through Priority ATC calculation for purposes of establishing Wheeling Through Priority across the CAISO system.

The hourly TRM values for Real-Time and same day are established on the day of dispatch, no earlier than 2 hours in advance of dispatch. Whenever a TRM value greater than zero is established due to the existence of one or more of the components of uncertainty identified in Section 2.0 above, the hourly TRM values will be set for the duration of the periods during which the applicable component of uncertainty is expected to occur, in accordance with the methodology set forth in Section 3.1-3.3 above.

5.0 Using Components of Uncertainty

The CAISO does not maintain Capacity Benefit Margin (CBM). Therefore, the CAISO does not include any of the components of CBM in establishing its TRM values.

The only components of uncertainty included in TRM are those listed in Section 2.0 of this document.

6.0 TRM Reference Materials

Additional CAISO documentation associated with TRM can be found in the CAISO Tariff, Appendix L. The CAISO Tariff is available on the CAISO's public website.

7.0 Posting TRM Values

The TRM values established by the CAISO and the reason for the TRM for each of the ATC Path will be made public and posted in the OASIS.

8.0 Revisions to TRMID

This document reflects the CAISO's current TRMID. In the event that the CAISO determines that it is necessary to revise any aspect of the process or methodology covered by this document, the CAISO will issue a revised TRMID, which will be made publicly available and posted on OASIS.

Version History

Version	Change	Date
3.1	Periodic Review: Added TRMID location to Purpose section. Updated all instances of ISO to CAISO. Added Version History table. Minor formatting and grammar updates.	5/04/23
3.2	Updates to the TRMID document to reflect the calculation of TRM as part of deriving ATC for reservation in advance of market operations to support Wheeling Through Priority in accordance with Appendix L-1 of the tariff.	1/17/24
4.0	Updated due to the retirement of NERC MOD-008 Standard. Removed all standards references and updated language accordingly.	2/01/24