
 California ISO	System Operations	Reliability Standard	MOD-001-1a
		Version No.	7.0
		Effective Date	10/14/2021
MOD-001-1a Available Transfer Capability Implementation Document			



California ISO

Available Transfer Capability
Implementation Document
for NERC Standard MOD-001-1a

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1.0 Purpose

The California Independent System Operator Corporation (CAISO), as a Transmission Service Provider¹ and Transmission Operator registered with the North American Electric Reliability Corporation (NERC), must comply with NERC reliability standards applicable to those functions, including MOD-001-1a. MOD-001-1a requires each Transmission Operator to select a methodology for calculating Available Transfer Capability (ATC) or Available Flowgate Capability (AFC) for ATC paths within their Transmission Operator area. As discussed below, the ISO has selected the methodology set forth in NERC standard MOD-029-2a, “Rated System Path Methodology.” MOD-001-1a also requires each Transmission Service Provider to prepare and keep current an ATC Implementation Document (ATCID) that includes processes, procedures, and assumptions used in the determination of ATC under the selected methodology. This document serves as the CAISO’s ATCID and, therefore, documents the CAISO’s compliance with the requirements of NERC standards MOD-001-1a and MOD-029-2a.

This ATCID can be found on the CAISO OASIS site.²

2.0 Selection of ATC Calculation Methodology

(MOD-001-1a R1) *Each Transmission Operator shall select one of the methodologies listed below for calculating Available Transfer Capability (ATC) or Available Flowgate Capability (AFC) for each ATC Path per time period identified in R2 for those Facilities within its Transmission operating area.*


- *The Area Interchange Methodology, as described in MOD-028*
- *The Rated System Path Methodology, as described in MOD-029*
- *The Flowgate Methodology, as described in MOD-030³*

The CAISO has selected the Rated System Path Methodology in MOD-029 for all ATC paths within its Transmission Operator area.

¹ Capitalized terms have the meaning set forth in the NERC Glossary of Terms, unless otherwise noted.

² MOD-001-1a R3 and R5

³ Text in italics represents language from the NERC standards

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3.0 Types of ATC Values and Frequency of Recalculation

(MOD-001-1a R2) *Each Transmission Service Provider shall calculate ATC or AFC values as listed below using the methodology or methodologies selected by its Transmission Operator(s):*

- R2.1 Hourly values for at least the next 48 hours*
- R2.2 Daily values for at least the next 31 calendar days*
- R2.3 Monthly values for at least the next 12 months (months 2-13)*

(MOD-001-1a R8) *Each Transmission Service Provider that calculates ATC shall recalculate ATC at a minimum on the following frequency, unless none of the calculated values identified in the ATC equation have [sic] changed:*

- R8.1 Hourly values, once per hour.*
- R8.2 Daily values, once per day.*
- R8.3 Monthly values, once per week.*


The CAISO calculates and posts to its OASIS hourly ATC values once per hour for each ATC path for the next 168 hours (7 days) on a rolling basis. The hourly ATC values are determined after the close of the CAISO's Day-Ahead Market (DAM) and updated for the next operating hour after the close of the CAISO's Hour Ahead Scheduling Process (HASP). Transmission outage information is incorporated into the hourly ATC values.

The CAISO calculates daily ATC values once per day for each ATC path for the next 31 calendar days on a rolling basis. For calendar days 1-7, the daily ATC value for a particular ATC path will be set at the minimum hourly ATC value determined after the close of the DAM. For calendar days 8 – 31, the daily ATC value for a particular ATC path will be set to the ATC path's Total Transfer Capability (TTC) calculated for that period less aggregate existing transmission commitments, which is made up of Existing Transmission Contracts and Transmission Ownership Rights.⁴

The CAISO calculates monthly ATC values once per week for each ATC path for months 2 – 13 on a rolling basis. The monthly ATC value for a particular ATC path will be set to the ATC path's TTC for that period less aggregate existing transmission commitments.

The daily and monthly ATC values will not be posted to OASIS. Rather, the CAISO will make such values available on request to the ATC Contact.

⁴ An Existing Transmission Contract or ETC under the CAISO Tariff means, "The contracts which grant transmission service rights in existence on the CAISO Operations Date (including any contracts entered into pursuant to such contracts) as may be amended in accordance with their terms or by agreement between the parties thereto from time to time." A Transmission Ownership Right or TOR under the CAISO Tariff means "the ownership or joint ownership right to transmission facilities within the CAISO Balancing Authority Area of a Non-Participating TO that has not executed the Transmission Control Agreement, which transmission facilities are not incorporated into the CAISO Controlled Grid." (See CAISO Tariff, Appendix A.)

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4.0 Minimum Requirements for ATCID

4.1 Description of Rated System Path Methodology

(MOD-001-1a R3.1) *Information describing how the selected methodology (or methodologies) has been implemented, in such detail, that given the same information used by the Transmission Service Provider, the results of the ATC or AFC calculations can be validated.*

The information describing how the CAISO's Rated System Path Methodology is implemented to develop ATC is set forth below and in the following documents:

- Appendix L to the CAISO Tariff;
- Operating Procedure – 3100 **Establishing** System Operating Limits **for** the Operations Horizon
- Operating Procedure – 3640 Existing Transmission Contract Calculator Update
- Business Practice Manual for Market Operations

As set forth in Appendix L to the CAISO Tariff, ATC is defined as TTC less the Transmission Reliability Margin (TRM), less the sum of any unused existing transmission commitments (i.e., transmission rights capacity for ETCs or TORs (collectively Unused TR Capacity in CAISO Tariff at Appendix L)), less the CBM (which value is set at zero), less the scheduled net energy from imports/exports, less ancillary service capacity from imports.

The CAISO's ATC algorithms therefore are:


Imports

ATC = Total Transfer Capability (TTC) – TRM – CBM – AS from Imports - Scheduled Net Energy - Hourly Unused TR Capacity.

Exports

ATC = TTC – TRM – CBM – Scheduled Net Energy - Hourly Unused TR Capacity.

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Where:

TTC is the Total Transfer Capability defined as the amount of electric power that can be moved or transferred reliably from one area to another area of the interconnected transmission system by way of all transmission lines (or paths) between those areas under specified system conditions.

CBM is the Capacity Benefit Margin for the Interface during that period, which is set to zero (0).

TRM is the Transmission Reliability Margin for the Interface during that period.

AS from Imports is transmission capability in MW reserved for ancillary services imported into the CAISO Balancing Authority Area over a specified transmission interface.

Scheduled Net Energy is the difference between the quantity of energy in MW scheduled in the import and export directions on a particular transmission interface. This value will include any portion of ETCs and TORs scheduled in the CAISO DAM or HASP.

Hourly Unused TR Capacity is the sum of any unscheduled ETCs and TORs.


The CAISO's ATC algorithms can be equated to that set forth in MOD-029-2a. The CAISO does not distinguish between firm and non-firm transmission service, but rather provides usage of transmission capacity under its operational control based on the outcomes of its security constrained unit commitment process for the DAM and Real-Time Market (RTM). Accordingly, an instructive comparison is the calculation of firm ATC under R7 of MOD-029-2a as follows:

$$\mathbf{ATC = TTC - ETC - CBM - TRM + Post\ backs + Counterflows}$$

Where:

ATC_F is the firm Available Transfer Capability for the transmission interface for that period.

TTC is the Total Transfer Capability of the transmission interface for that period.

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ETC is the sum of existing firm commitments for the transmission interface during that period (including Firm Transmission Flow Utilization).

$$\mathbf{ETC = NL + NITS + GF + PTP + ROR + OS}$$

Where:

NL is the 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 TRM or CBM.

NITS is the capacity reserved for Network Integration Transmission Service serving load, to include losses, and load growth, not otherwise included in TRM or CBM.

GF is the 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."

PTP is the firm capacity reserved for confirmed point-to-point transmission service.

ROR is the firm capacity reserved for rollover 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.

OS is the firm capacity reserved for any other service(s), contract(s), or agreement(s) not specified above using firm transmission service.


CBM is the Capacity Benefit Margin for the transmission interface during that period.

TRM is the Transmission Reliability Margin for the transmission interface during that period.

Post backs are changes to firm ATC due to a change in the use of transmission service for that period, as defined in Business Practices.

Counterflows are the adjustments to ATC as determined by the CAISO.

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The CAISO does not use Post backs and accordingly would be set at zero (0) under the CAISO’s ATC formulation. As discussed below, the CAISO’s scheduled net energy and ancillary services from imports equates to counterflow adjustments, which may be determined by the CAISO under MOD-029-1a. The CAISO further accounts for existing firm commitments. In this regard, the CAISO does not set aside capacity for Native Load, other services or any rollover rights or offer Network Integration Transmission Service or point-to-point transmission service. Thus, applying the MOD-029-2a ETC algorithm to the CAISO would result in:

$$\text{ETC} = 0 \text{ (NL)} + 0 \text{ (NITS)} + \text{GF} + 0 \text{ (PTP)} + 0 \text{ (ROR)} + 0 \text{ (OS)}$$

Consistent with MOD-029-1a, the CAISO sets aside capacity for grandfathered transmission service contracts executed prior to the effective date of a the CAISO’s commencement of operations. However, as noted above, the CAISO uses Hourly Unused TR Capacity, which is the aggregate capacity subject to ETCs and TORs less ETC and TOR capacity scheduled through the CAISO’s DAM or HASP. Accordingly, only for hourly ATC values covering periods beyond that subject to the close of the DAM will the Hourly Unused TR Capacity reflect aggregate ETC and TOR capacity for that particular transmission interface.

In addition, it should be noted that daily ATC values for days 8 through 31 and monthly ATC values are set at the TTC for the ATC path for that period under the CAISO’s ATC algorithm. Because there is no market information to determine ancillary service capacity needed to accommodate Imports, scheduled net energy or Hourly Unused TR Capacity, each of those values are also set at zero.


4.2 Accounting for Counterflow

(MOD-001-1a R3.2.1) How confirmed Transmission Reservations, expected Interchange and internal counterflow are addressed in firm and non-firm ATC or AFC calculations.

(MOD-001-1a R3.2.2) A rationale for that accounting specified in R3.2.

The CAISO does not distinguish between firm and non-firm ATC calculations. Nor does the CAISO market design rely on transmission reservations separate from transmission usage determined by the outcome of the CAISO’s DAM, HASP, and Real-Time Market, including, but not limited to, Day-Ahead Schedules, Ancillary Services Schedules, TOR Self- Schedules and HASP Intertie Schedules.⁵ The CAISO posts the hourly ATC values for ATC paths in

⁵ Appendix A of the CAISO Tariff defines the following terms. A Day-Ahead schedule is “a Schedule issued by the CAISO one day prior to the target Trading Day indicating the levels of Supply and Demand for Energy cleared through the IFM and scheduled for each Settlement Period, for each PNode or Aggregated Pricing Node, including Scheduling Points of that

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megawatts (MW) to OASIS in conjunction with the closing events for the DAM and HASP. The CAISO’s hourly ATC calculation includes a variable that addresses counterflow through the determination of scheduled net energy or hourly net energy flow over a particular transmission interface or ATC path. Hourly net energy flow is the difference between energy schedules accepted in the CAISO’s Integrated Forward Market of the DAM as well as the HASP, as applicable, including scheduled Existing Transmission Contract rights or Transmission Ownership Rights, for imports and exports at a scheduling point over a particular ATC path or transmission interface. For the next operating hour, that calculation will be based on the accepted HASP Intertie Schedule and accepted schedules from ETCs and TORs minus accepted demand bids at a scheduling point associated with the transmission interface. For additional hours of the operating day, that calculation will be based on accepted Day-Ahead Schedules minus accepted demand bids at a scheduling point associated with the transmission interface. Thus, counterflow from expected scheduled energy in the opposite direction is included in the ATC calculation at 100% value. No virtual bids are used in the calculation.

4.3 Identity of Transmission Operators and Transmission Service Relied Upon for Data


(MOD-001-1a R3.3) *The identity of the Transmission Operators and Transmission Service Providers from which the Transmission Service Provider receives data used in calculating ATC or AFC.*

The CAISO receives data, including, but not limited to, network changes and updates, equipment outages, load levels, voltage levels, major path flows, and other operating requirements, from the following internal and adjacent Transmission Owners and/or Transmission Service Providers for calculating transfer capability:

- Arizona Public Service Company
- Bonneville Power Administration
- Centro Nacional de Control de Energia
- Imperial Irrigation District
- Los Angeles Department of Water and Power
- NV Energy (Nevada Power Company)
- PacifiCorp

Trading Day.” An Ancillary Service Schedule is “the notification by the CAISO indicating that a Submission to Self-Provide an Ancillary Service has been selected to provide such service in the DAM, HASP, or RTM.” A HASP Intertie Schedule is “the binding output of the HASP including accepted Bids for imported Energy or Ancillary Services and associated LMPs and ASMPs.” A TOR Self-Schedule is “a Self- Schedule submitted by a Scheduling Coordinator pursuant to Transmission Ownership Rights as reflected in the TRTC Instructions.”

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- Sacramento Municipal Utility District
- Salt River Project
- TransBay Cable
- Turlock Irrigation District
- Western Area Power Administration

4.4 Identity of Transmission Operators and Transmission Service Providers Which Receive Data from the CAISO

(MOD-001-1a R3.4) *The identity of the Transmission Service Providers and Transmission Operators to which it provides data for use in calculating transfer or Flowgate capability.*

The CAISO provides data, including, but not limited to, network changes and updates, equipment outages, load levels, voltage levels, major path flows, and other operating requirements, for the following internal and adjacent Transmission Operators and/or Transmission Service Providers to assist in calculating transfer capability:

- Arizona Public Service Company
- Bonneville Power Administration and
- Centro Nacional de Control de Energia
- Imperial Irrigation District
- Los Angeles Department of Water and Power
- NV Energy (Nevada Power Company)
- PacifiCorp
- Sacramento Municipal Utility District
- Salt River Project
- Turlock Irrigation District
- Western Area Power Administration

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4.5 Description of Specific Allocation Processes

(MOD-001-1a R3.5) *A description of the allocation processes listed below that are applicable to the Transmission Service Provider:*


- *Processes used to allocate transfer or Flowgate capability among multiple lines or sub-paths within a larger ATC Path or Flowgate*
- *Processes used to allocate transfer or Flowgate capabilities among multiple owners or users of an ATC Path or Flowgate*
- *Processes used to allocate transfer or Flowgate capabilities between Transmission Service Providers to address issues such as forward-looking congestion management and seams coordination.*

The CAISO is the path operator for the California-Oregon Intertie (COI) (WECC Path 66) pursuant to the California-Oregon Intertie Path Operating Agreement, which can be found as Appendix 5. The COI is made up of the Pacific AC Intertie and the California-Oregon Transmission Project. The CAISO is the Transmission Service Provider for transfer capability on the Pacific AC Intertie and a relatively small portion of the California-Oregon Transmission Project. Other entities with ownership interests in the California-Oregon Transmission Project serve as the Transmission Service Provider for the bulk of the transfer capability on that portion of COI. The CAISO, as the path operator, allocates transfer capabilities between the Transmission Service Providers for COI in response to outage and other system conditions in accordance with the California-Oregon Intertie Path Operator Agreement.

The CAISO is also the path operator for the West of River Path (WECC Path 46), but is not the Transmission Service Provider or Transmission Operator for all lines forming the path. The CAISO determines the transfer capability of the path based on system conditions, i.e., each combination of specific line and equipment outages, and calculates the effect of any changes on the allocation of flow limits on the individual lines forming the path and notifies participants of the updated flow limits directly. Other participant owners of the West of River Path include the Los Angeles Department of Water and Power and the Imperial Irrigation District. This calculation and allocation process is performed using a calculator that accounts for the various confidential contractual agreements of the path participants.

Each of the foregoing processes affects the determination of total transfer capability that is used as an input into determining the ATC for a particular ATC path. For other CAISO ATC paths, the ATC is calculated using an application called Existing Transmission Contracts Calculator or ETCC. The ETCC calculates the amount of transmission capacity reserved (in MW) for each ETC or TOR on each transmission interface for each hour of the trading day. The CAISO reserves transmission capacity for each ETC and TOR based on Transmission

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Rights and Curtailment (TRTC) Instructions⁶ provided by the responsible participating transmission owner or non-participating transmission owner to implement the respective obligations reflected in the underlying transmission rights. Accordingly, the amount of transmission capacity reserved for ETC and TOR rights is determined based on the TTC of each transmission interface and in accordance with TRTC Instructions stipulated in the existing agreements and provided to the CAISO. The types of TRTC Instructions the CAISO receives generally fall into three basic categories:


- The ETC or TOR reservation is a fixed percentage of the TTC on a line, which decreases as the TTC is derated (ex. TTC = 300 MW, ETC fixed percentage = 2%, ETC = 6 MWs. TTC derated to 200 MWs, ETC = 4 MWs);
- The ETC or TOR reservation is a fixed amount of capacity, which decreases if the line's TTC is derated below the reservation level (ex. ETC = 80 MWs, TTC declines to 60 MW, ETC = TTC or 60 MWs; or
- The ETC or TOR reservation is determined by an algorithm that changes at various levels of TTC for the line (ex. Intertie TTC = 3,000 MWs, when line is operating greater than 2,000 MWs to full capacity ETC = 400 MWs, when capacity is below 2000 MWs ETC = TTC/2000* ETC).

ETC capacity reservations remain reserved during the DAM and HASP. To the extent that the reservations are unused, they are released in real-time operations for use in the Real-Time Market. TOR capacity reservations remain reserved during the Day-Ahead Market and HASP, as well as through real-time operations. This capacity is not under CAISO operational control and is not released to the CAISO for use in the market.

For further information on the ETCC, see:

- Appendix L to the CAISO Tariff
- CAISO Operating Procedure 3630 Modeling - Scheduling ETC and TOR Rights, which is publicly available on the CAISO Website

⁶ Under Appendix A of the CAISO Tariff, TRTC Instructions are the “operational directives developed (i) between Existing Rights holders and holders of Converted Rights and the Participating TO, submitted to the CAISO by the Participating TO, unless otherwise agreed to by the Participating TO and the Existing Rights or Converted Rights holder, and (ii) by TOR holders, to facilitate the accommodation of Existing Rights, Converted Rights, and TORs in the CAISO Markets.”

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4.6 Description of Treatment of Generation and Transmission Outages

(MOD-001-1a R3.6) *A description of how generation and transmission outages are considered in transfer or Flowgate capability calculations, including:*

- R3.6.1 The criteria used to determine when an outage that is in effect part of a day impacts a daily calculation*
- R3.6.2 The criteria used to determine when an outage that is in effect part of a month impacts a monthly calculation*
- R3.6.3 How outages from other Transmission Service Providers that cannot be mapped to the Transmission model used to calculate transfer or Flowgate capability are addressed.*

Generation and transmission outages that create significant reductions in the transfer capability are modeled as reductions in the seasonal TTC to derive the CAISO's hourly TTC.

If the generation or transmission outage is only in effect for part of the hour, the hourly ATC value will be impacted. Since the daily ATC values for days 1 through 7 are determined by the lowest hourly ATC value for the particular day for each ATC path, any outage that impacts hourly ATC calculations will also impact the daily ATC calculations. Outages are not considered for daily ATC values for days 8 through 31 and for monthly ATC values.

The outages of other Transmission Service Providers that cannot be mapped to the transmission model may include outages from the neighboring Balancing Authority Areas. Outages that are supplied to the CAISO that would affect the TTCs are received through outage coordination information and modeled by the CAISO and, if they impact hourly TTC, will be used in the hourly ATC calculations for days 1 through 7. Other information on the treatment of outages can be found at:


- Appendix L to the CAISO Tariff at L5.4.1

5.0 Using Assumptions No More Limiting Than Those Used in Planning of Operations

(MOD-001-1a R6) *When calculating Total Transfer Capability (TTC) or Total Flowgate Capability (TFC) the Transmission Operator shall use assumptions no more limiting than those used in the planning of operations for the corresponding time period studied providing such planning of operations has been performed for that time period.*

(MOD-001-1a R7) *When calculating ATC or AFC the Transmission Service Provider shall use assumptions no more limiting than those used in the planning of operations for the corresponding time period studied providing such planning of operations has been performed for that time period.*

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The assumptions used to determine ATC, which are no more limiting than those used in the planning of operations for the corresponding time period, are described in the following documents:

- Appendix L to the CAISO Tariff;
- Operating Procedure - 3100 **Establishing** System Operating Limits **for** the Operations Horizon

6.0 Transmission Model Requirements

(MOD-029-2a R1) *When calculating TTCs for ATC Paths, the Transmission Operator shall use a Transmission mode, which satisfies the following requirements:*

R1.1. The model utilizes data and assumptions consistent with the time period being studied and that meets the following criteria:

R1.1.1. Includes at least:

- R1.1.1.1. The Transmission Operator area. Equivalent representation of radial lines and facilities 161 kV or below is allowed.*
- R1.1.1.2. All Transmission Operator areas contiguous with its own Transmission Operator area. (Equivalent representation is allowed.)*
- R1.1.1.3. Any other Transmission Operator area linked to the Transmission Operator's area by joint operating agreement. (Equivalent representation is allowed.)*

R1.1.2. Models all system Elements as in-service for the assumed initial conditions.

R1.1.3. Models all generation (may be either a single generator or multiple generators) that is greater than 20 MVA at the point of interconnection in the studied area.

R1.1.4. Models phase shifters in non-regulating mode, unless otherwise specified in the Available Transfer Capability Implementation Document (ATCID).

R1.1.5. Uses Load forecast by Balancing Authority.

R1.1.6. Uses Transmission Facility additions and retirements.

R1.1.7. Uses Generation Facility additions and retirements.


R1.1.8. Uses Remedial Action Scheme (RAS) models where currently existing or projected for implementation within the studied time horizon.

R1.1.9. Models series compensation for each line at the expected operating level unless specified otherwise in the ATCID.

R1.1.10. Includes any other modeling requirements or criteria specified in the ATCID.

R1.2. Uses Facility Ratings as provided by the Transmission Owner and Generator Owner.

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Information describing the transmission model used by the CAISO can be found at:

- Appendix L to the CAISO Tariff
- Operating Procedure – 3100 **Establishing System Operating Limits for the Operations Horizon**

The CAISO constructs its base case model from the most recent WECC cases available for the study time frame and conditions (summer, winter, spring, peak load, off-peak load, etc.) to be studied and uses a basic power flow model to run the load flow analyses. The base cases are updated or refined to reflect the most accurate information available regarding system topography, including generation and transmission additions and retirements, generation dispatch, and load level developed through the CAISO’s load forecasting program (ALFs) or any other competent method to estimate load level for the study area. Consistent with MOD-029-2a, phase shifters are modeled in non-regulating mode, existing RAS are represented, and series compensation for each line is included at the expected operating level.

7.0 Modeling Process to Determine Transmission Transfer Capability

(MOD-029-2a R2) *The Transmission Operator shall use the following process to determine TTC:*

R2.1. Except where otherwise specified within MOD-029-2a, adjust base case generation and Load levels within the updated power flow model to determine the TTC (maximum flow or reliability limit) that can be simulated on the ATC Path while at the same time satisfying all planning criteria contingencies as follows:

R2.1.1. When modeling normal conditions, all Transmission Elements will be modeled at or below 100% of their continuous rating.


R2.1.2. When modeling contingencies the system shall demonstrate transient, dynamic and voltage stability, with no Transmission Element modeled above its Emergency Rating.

R2.1.3. Uncontrolled separation shall not occur.

The CAISO satisfies the performance levels included in the planning and operating criteria described in the following documents:

- Appendix L to the CAISO Tariff
- Operating Procedure – 3100 **Establishing System Operating Limits for the Operations Horizon**

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In this regard, the CAISO analysis to establish the TTC for any ATC path for which it is also the TOP, equates to its determination of a System Operating Limit for that path, such that the CAISO TTC and SOL for an ATC path are the same. (MOD-029-2a R3) Procedure 3100 states “All operating limits, including Facility Ratings, WECC Path Ratings, cut plane ratings and Total Transfer Capabilities (TTCs), are designated SOLs to the California ISO in the Operations Horizon” However, for an ATC path whose capacity is limited by contract, the CAISO sets TTC on the ATC path at the lesser of the maximum allowable contract capacity or the reliability limit. (MOD-029-2a R2.3)

7.1 Where Impossible to Simulate a Reliability-Limited Flow

(MOD-029-2a R2.2) Where it is impossible to actually simulate a reliability-limited flow in a direction counter to prevailing flows (on an alternating current Transmission line), set the TTC for the non-prevailing direction equal to the TTC in the prevailing direction. If the TTC in the prevailing flow direction is dependent on a Remedial Action Scheme (RAS), set the TTC for the non-prevailing flow direction equal to the greater of the maximum flow that can be simulated in the non-prevailing flow direction or the maximum TTC that can be achieved in the prevailing flow direction without use of a RAS.


For the conditions described by R2.2, the CAISO calculates the TTC of “Flow Limited” paths consistent with practices used in the past, including using the path thermal rating. Any paths for which TTC has not been calculated based on R2.1 will be demonstrated to be flow limited.

7.2 Development of Nomogram

(MOD-029-2a R2.4) For an ATC Path whose TTC varies due to simultaneous interaction with one or more other paths, develop a nomogram describing the interaction of the paths and the resulting TTC under specified conditions.

The CAISO generally does not limit the TTC of a path due to the simultaneous interaction with another path in the form of a nomogram. 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 limitations.

In accordance with the TRM implementation document (TRMID), the reduction of ATC due to interaction between a CAISO intertie ATC Path and a non-CAISO path may be managed through the utilization of TRM.

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The CAISO applies a nomogram developed by the Sacramento Municipal Utility District (SMUD) to establish the ATC values for all ATC paths connecting the CAISO to SMUD. The nomogram is described in the SMUD.

7.3 Determination of Adverse Impact

(MOD-029-2a R2.5) *The Transmission Operator shall identify when the TTC for the ATC Path being studied has an adverse impact on the TTC value of any existing path. Do this by modeling the flow on the path being studied at its proposed new TTC level simultaneous with the flow on the existing path at its TTC level while at the same time honoring the reliability criteria outlined in R2.1. The Transmission Operator shall include the resolution of this adverse impact in its study report for the ATC Path.*

7.4 Allocation of Transmission Transfer Capability by Contract


(MOD-029-2a R2.6) *Where multiple ownership of Transmission rights exists on an ATC Path, allocate TTC of that ATC Path in accordance with the contractual agreement made by the multiple owners of that ATC Path.*

See [Section 4.5](#) above.

7.5 Pre-1994 Transmission Transfer Capability Determinations

(MOD-029-2a R2.7) *For ATC Paths whose path rating, adjusted for seasonal variance, was established, known and used in operation since January 1, 1994, and no action has been taken to have the path rated using a different method, set the TTC at that previously established amount.*

A number of CAISO ATC paths have ratings that were established, known and used in operation since January 1, 1994, and no action has been taken to have the path rating updated using a different method. Accordingly, the TTC for those ATC paths will be set at the previously established amount. For more information on such ATC paths, see ATC Contact.

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Version History

Version	Change	Date
2.1	Added Version History Table	6/10/2012
3.0	Updated ATCID document to reflect MOD-029-2a - Replaced references to Special Protection System and SPS with Remedial Action Scheme and RAS. Also Replaced MOD-029-1a to MOD-029-2a	4/01/2017
4.0	Annual Review: Deleted non-working links. Replaced CAISO with ISO in most instances. Minor formatting and grammar updates.	8/01/2018
5.0	Annual Review: Added document control statement in footer; no other content changes.	8/01/2019
6.0	Annual Review: Replaced all ISO Tariff references to include <u>CAISO</u> . Replaced references of Comission Federal de Electricidad with Centro Nacional de Control de Energia. Minor format and grammar updates.	10/29/2020
7.0	Annual Review: Updated NERC Standard references, updated CAISO Procedure references, and updated from ISO to CAISO. Removed references to Total Transfer Capability Plan 05, as it retired and was previously overlooked. Removed Sierra Pacific and added "NV Energy" to Nevada Power Company references. Minor format and grammar updates. Removed history prior to five years.	10/14/2021

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