Available Transfer Capability Implementation Document (ATCID) and Near Term Transmission Planning for Transmission Capability Methodology Document

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1. **History of Changes**

This procedure is a living document and will be periodically reviewed by the appropriate Sierra Nevada Region (SNR) personnel to ensure completeness and accuracy. Complete version history information for this document is kept via the Xerox DocuShare program’s Change and Version History functions.

2. **Introduction**

This ATCID defines the Western Area Power Administration – Sierra Nevada Region (Western or WASN) ATC Coordination Procedures including the methodology and criteria used to calculate Available Transfer Capability (ATC), Total Transfer Capability (TTC) and the assessment of Transfer Capability (TC) for the near term planning horizon. WASN calculates ATC utilizing the requirements of North American Electric Reliability Council (NERC) standard MOD-029-1 “Rated System Path Methodology.”

The ATC on WASN Central Valley Project (CVP) 230-kV Transmission network is posted on the WASN Open Access Same-Time Information System (OASIS). The CVP transmission includes the WASN owned share of the 500-kV California-Oregon Transmission Project (COTP) between Olinda and Tracy in addition to the federally owned CVP transmission network.

The CVP transmission is operated as a fully integrated transmission network. Parts of the CVP transmission network use are dictated by the simultaneous import into the greater Sacramento area during summer and certain operating conditions that
are governed by a simultaneous operating Nomogram as determined by the Sacramento Valley Study Group (SVSG). The methodology and criteria, for determining ATC, TTC and TC, conform to all NERC Reliability Standards along with MOD-029-1 and FAC-013-2 as applicable.

The CVP transmission is operated as a fully integrated transmission network in parallel with the Pacific AC Intertie (PACI) and COTP which together comprise the California-Oregon Intertie (COI). Even though the CVP cut-planes or paths do not have WECC rated path status, NERC MOD-029-1 was chosen since it is a best fit and most adaptable for compliance with the NERC and the Federal Energy Regulatory Commission (FERC) Order 890 standards for providing transmission services and administering the ATC.

3. Background

Western’s transmission system, which is federally owned, was built primarily to enable the delivery of Federal power to its electric service customers to meet both statutory and contractual obligations per Attachment K of the Western Area Power Administration (Western) Open Access Transmission Tariff (OATT). As such, Western has no obligations to serve full load or expand its transmission network to meet customer load growth beyond those authorized for Western’s statutory obligations such as Project Use and First Preference Customers. Network service customers receiving Network Integration Transmission Service (NITS) under the Western OATT will be responsible for (1) their supplemental energy over and above their Federal power allocation (2) ancillary services and (3) Western transmission expansion costs when determined necessary to serve their load growth. Western conducts its transmission planning in open and transparent forums in accordance with FERC and NERC established transmission planning standards.

Western owns and operates\(^1\) one of the COI 500-kV transmission lines (Captain Jack-Olinda 500 kV Line) between the Oregon border and WASN’s Olinda Substation and owns but does not operate the Malin-Round Mountain 500 kV No. 1 line. WASN has ownership rights and owns a section of the COTP 500 kV line from the Olinda Substation to the Tracy 500-kV Substation. In addition, Western owns one of the Los Banos to Gates 500-kV lines which is operated by CAISO as a part of Path 15 in Central California.

The California Independent System Operator (CAISO) administers the transmission service for WASN’s share of Path 15. CAISO is also the Path

\(^1\) WASN is owner and operator as noted, but CAISO is the Path Operator for COI.
Operator for Path 66 or California-Oregon Intertie (COI) consisting of PACI and COTP.

WASN operates and maintains the COTP under contract with the Transmission Agency of Northern California (TANC). The contiguous Western transmission system and the federal hydroelectric power plants along with some of its customer loads operate in a Sub-Balancing Area (SBA) within the Sacramento Municipal Utility District’s (SMUD) Balancing Authority (BA) as shown in Figure 1.

WASN’s 400 MW share of PACI is currently operated in the CAISO Balancing Authority and it is deemed delivered to Tracy under an agreement with other PACI owners and CAISO. The WASN share of the PACI is designated as a resource for delivery of custom product power as a part of Western Power Marketing Program.

WASN uses its COTP share for the balancing area energy and ancillary services. Currently, there is no ATC available on the PACI and it is not included in WASN’s posted paths.
4. Reference Documents

- Western Area Power Administration Open Access Transmission Tariff
- NERC Standard MOD-029-1 Rated System Path Methodology
- Sacramento Valley Study Group (SVSG) current year study report
- Current Year ATC Calculation Spreadsheets.
- Near Term TC Calculation Spreadsheets

5. Definitions

The following definitions are based on NERC definitions, FERC definitions, and definitions developed by WASN:

5.1 Available Transfer Capability (ATC) and Transfer Capability (TC)

The measure of transmission transfer capability remaining in the physical transmission network for further commercial activity, over and above already committed uses.

5.2 Total Transfer Capability (TTC)

TTC is the total transmission transfer capability across a cut-plane or path as calculated from the line components in the applicable line group of that cut-plane or path. The TTC for the CVP Network transmission will be based on the sum of the thermal limit(s) of a line or group of lines at a cut-plane into a load center, generation center or boundary point or specified reliability limit whichever is most restrictive.

When calculating TTC, ATC and TC, WASN utilizes the rated path methodology consistent with MOD-029-1a R1 and R2. In the study all transmission elements are modeled at or below 100% of the applicable normal continuous rating. The results of each seasonal study demonstrate transient, dynamic, and voltage stability, with no transmission element modeled above its emergency rating and no uncontrolled separation. The WASN 230 kV system operates as a network in parallel with the COTP 500 kV Olinda-Tracy line segment and as such is “flow limited” by definition\(^2\) of the NERC extension letter dated March 4, 2011. The TTCs are set to thermal ratings unless otherwise specifically limited to a lesser value on lines identified in WASN’s ATC Study Report\(^3\). The thermal values are established by WAPA SNR maintenance group and take into consideration all aspects of line loading such as conductor type, construction, CB ratings, disconnects, protection, and most limiting factor of all applicable components.

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\(^2\) “When the simulation cannot sufficiently load the transmission path such that a limit is encountered, the path is referred to as being ‘Flow Limited.’" NERC letter to Transmission Operators and Transmission Service Providers subject to MOD-029-1a, dated March 4, 2011.

\(^3\) WASN 2011 ATC Study Report
The simultaneous limit such as the SVSG Nomogram will govern the reservation and will be used when an operational reliability limit is identified, as applicable. To calculate a cut-plane capability, the total thermal limits of all lines will be used as TTC. When an operational limitation(s) or operational reliability is identified the lower limit such as the simultaneous import limit will be used as TTC for the cut-plane. The TTC of a Path is calculated from the TTC values of the component line group, using the WASN specified logic. Similar methodology will be used in the assessment of TC for the near term planning horizon.

5.3 Transmission Reliability Margin (TRM)

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.

5.4 Existing Transmission Commitments (ETC)

ETC or Committed Use (CU) represents existing (long term) committed uses considered when determining ATC. These committed uses (CU) are accounted for in the ATC model developed from power flow base cases in accordance with Western’s established methods for allocation of Base Resource, Project Use, First Preference, and other firm federal transmission rights (TRD). Base resource allocation is based upon a specified portion of hydro generation output from specified Northern Area USBR plants on the WASN system. Shorter term firm and non-firm transactions are scheduled, as applicable, by individual Transmission Providers on the WASN OATI OASIS website.

5.5 Capacity Benefit Margin (CBM)

CBM is the amount of firm transmission transfer capability preserved by the transmission provider for Load-Serving Entities (LSEs), whose loads are located on that Transmission Service Provider’s system, to enable access by the LSEs to generation from interconnected systems to meet generation reliability requirements. Preservation of CBM for an LSE allows that entity to reduce its installed generating capacity below that which may otherwise have been necessary without interconnections to meet its generation reliability requirements. The transmission transfer capability preserved as CBM is intended to be used by the LSE only in times of emergency generation deficiencies. WASN is a federal entity with no load growth requirements and therefore CBM for the CVP transmission Network is assumed to be zero (0) MW at this time. WASN may revise the CBM methodology based on actual operating experience on an on-going basis for transmission reliability and security.

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4 The calculation of the Path line group TTC and the Path TTC will be described later in this document.
5.6 Cut–plane

1. Transmission lines and facilities owned by WASN on a potentially constrained portion of WASN’s internal network transmission grid; or:

2. Transmission lines and facilities owned by WASN and one or more neighboring transmission providers that are interconnected and the separately owned facilities are operated in parallel in a coordinated manner to maintain the transfer capability of the path.

3. Transmission line or a group of lines between scheduling POR/POD that are owned by WASN or and facilities owned and operated by WASN include jointly owned transmission line or ownership like rights, the Olinda to Tracy 500-kV a portion of the COTP that is operated as an integral part of the CVP 230-kV transmission line. This section was configured as a double circuit 230-kV transmission line between Shasta/Cottonwood and Tracy before it was upgraded to 500-kV. Western owns this section and has specified transmission capacity rights in addition to its COTP ownership entitlement.

5.7 Counter Flows

The adjustments to firm ATC as determined by the Transmission Service Provider and specified in their ATCID. WASN does not use Counter flows in its ATC or TC calculations for firm or non-firm transmission services for specified periods excepting as described in section 6.2.5 of this document. WASN’s share of PACI and the Federal hydro generation located in the CAISO system are deemed delivered to Tracy 230-kV. These resources are accounted for to displace the federal power share of WASN customers that are located and operate within the CAISO balancing area.

5.8 Native Load (NL)

Native Load as defined by NERC is the end-use customers that the Load-Serving Entity is obligated to serve. WASN does not have Native load, only static federal statutory load. WASN’s loads do not comport with FERC/NERC defined Native Load (NL) obligations per Western’s OATT/Attachment K.

5.9 Path

A Path is a physical and electrical link (wires) between a scheduling Point of Receipt (POR) and Point of Delivery (POD).

5.10 Distribution Factor (DF)

The portion of an Interchange Transaction, typically expressed in per unit that flows across a transmission facility (Flowgate) or elements of a cut-plane or path.

5.11 Grandfathered Contracts (GF_F)

GF_F is the 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 OATT or “safe harbor tariff.”
5.12 Network Integration Transmission Service (NITS)

The firm capacity reserved for NITS serving load, to include losses, and Load growth, not otherwise included in Transmission Reliability Margin or Capacity Benefit Margin. ATC and TC calculations do not include any reservation for load growth since WASN is a wholesale Federal Power Marketing Agency and does not have the typical utility load (retail or wholesale) serving obligations per WASN OATT, Attachment K and specific Native Load definition defined in this document.

5.13 Other Services (OS_F)

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. WASN may use this reservation for purchasing reserve or exchanging reserve capacity for WASNS’s share of the Sub-Balancing Area reserve requirements.

6. WASN ATC and TC Methodology and Criteria

The ATC of cut-planes and paths within the CVP transmission network shall be determined using a network response method for ATC/TTC and TC determination, and using the most current load flow base cases from the WECC base case databank. The operating year cases are commented on by the SVSG and modified to reflect (Summer and Winter) seasonal operating parameters within the Sacramento Valley. Established operating procedures support and utilize the ATC data from the WASN ATC calculations. ATC is calculated in accordance with MOD-001-1a using the Summer and Winter Operating seasons for daily and Monthly values and WASN historical database for hourly requirements. The near term planning year base cases will be taken from the WECC base case databank and modified to reflect generation dispatch, long term outages, additions and retirements as well as Transmission system topology outages, additions and retirements with currently approved and projected transmission uses. Summer base cases will be utilized reflecting stressed conditions to reflect system demand. By utilizing WECC appropriate year base cases all system additions from adjacent utilities will be incorporated.

WASN has adopted the NERC MOD-029-1a to determine TTC and ATC. This choice was made based upon the fact that WASN’s CVP 230-kV transmission network operates in parallel with PACI and COTP as integrated parallel paths. The ATC of cut-planes or paths within the CVP transmission network is calculated based upon results of a WECC full network seasonal model and all pre and post-contingency simulations that reflect the rated paths response method. When the simultaneous import into an area is limited, operating nomograms are developed and operating procedures established for ATC calculations. WASN will use the same methodology used to determine TC as it does ATC and TTC for consistency and to assure planning methodology is consistent with operating methodology.
When calculating TTC, ATC and TC, WASN utilizes the rated path methodology consistent with MOD-029-1a R1 and R2. In the study all transmission elements are modeled at or below 100% of the applicable normal continuous rating. The results of each seasonal study demonstrate transient, dynamic, and voltage stability, with no transmission element modeled above its emergency rating and no uncontrolled separation. The WASN 230 kV system operates as a network in parallel with the COTP 500 kV Olinda-Tracy line segment and as such is “flow limited” by definition of the NERC extension letter dated March 4, 2011. The TTCs are set to thermal ratings unless otherwise specifically limited to a lesser value on lines identified in WASN’s ATC Study Report and WASN’s Assessment for Transmission Capability for the Near Term Transmission Planning Horizon Report. The TTC values are established by WAPA SNR maintenance group and take into consideration all aspects of line loading such as conductor type, construction, CB ratings, disconnects, protection, and most limiting factor of all applicable components as defined in WASN document OP-064.

The OATi webTrans ATC application provides the final ATC calculation and initiates posting of ATC for each posted path. The hourly, daily, and monthly ATC calculations are performed in accordance with MOD-001-1a and posted on OASIS.

As noted, the ATC calculations are based upon a valid seasonal study case. Additionally, hourly SCADA data inputs provide hourly updates to an automated process which serves to provide a more dynamic application of the cited method in order to ensure that all available ATC is made available while fully accounting for maintaining the WASN reliability. The methodology emulates that of the seasonal ATC study based upon the applicable base case data. The upload to webTrans ATC application of dynamic path TTC and TRM components takes into consideration near real-time flows, current TTC, applicable CU, ETC and TRM.

The ETCF, or firm CU, at WASN is complex and only partially based upon static MW values. A significant portion of the CU is based upon each federal customer’s unique percentage of USBR Northern Area daily hydro generation output. The ATC study logic defines how the ATC, CU, TTC, and TRM are calculated in each line group of a path and for the path as a whole. TC studies utilize a static value for CU although still based upon each federal customer’s unique percentage of USBR Northern Area modeled hydro generation output.

The path TRM automatic upload to webTrans always reflects 7% of the line group actual (unbiased) TTC for the applicable path. The OATi webTrans ATC application cannot accept hourly dynamic upload of path CU (ETC), so in order to arrive at a path

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5 “When the simulation cannot sufficiently load the transmission path such that a limit is encountered, the path is referred to as being ‘Flow Limited.’” NERC letter to Transmission Operators and Transmission Service Providers subject to MOD-029-1a, dated March 4, 2011.

6 WASN ATC 2011 Study Report
ATC compliant with MOD-029-1a, a fixed study path CU value is used and the uploaded TTC values incorporate a bias so each pre-impacts webTrans path ATC value is correct and compliant. The pre-impact ATC is that ATC before the “impacts” of ATC sales or post-backs are applied. The final webTrans ATC value for each posted path reflects all ATCF components as follows (wherein ETC = CU, CBM = 0 and counter-flow = 0 for WASN):

\[ \text{ATC}_F = \text{TTC} - \text{ETC}_F - \text{CBM} - \text{TRM} + \text{Postbacks}_F + \text{counterflows}_F \]

The automated process functions with the ATC study logic and injects near-real-time system data to enable a dynamic calculation of path data to be uploaded for ATC calculation by webTrans. This automation serves to both (a) maximize the offering of ATC and (b) ensure WASN transmission reliability is maintained (that is, ATC does not degrade reliability).

The criteria for all automated processes is that the logic and related calculations must be identical to those of the ATC and TC study with the only differences being input values, for ATC, which are dynamic and the resultant calculations from those dynamic inputs, whereas TC are static and based upon model conditions and assumptions.
The ATC study logic incorporates a number of interrelated factors which are summarized by the following functional diagram.

As shown in Appendix A, WASN transmission contains five major source and/or sink hubs with the prevailing direction of flow across each cut-plane.
6.1 ATC and TC Calculation Methodology

6.1.1 WASN Base Case Development

Starting with the applicable WECC base case, WASN uses an updated base case that includes the most recent load and generation forecast from each utility, LSE and generator operator members of the SVSG as well as modeling maximum import capability into the SMUD BA per the Sacramento Valley Nomogram with all lines in service. From these cases WASN develops peak summer and winter load flow (based on lower hydro) with the corresponding system load forecast for each season to determine ATC values. The ATC “base cases” are derived from the peak load base cases that SVSG annually updates and represent seasonal load profiles, in-service generating units, in-service transmission facilities and firm interchange contracts. The TC “base cases” are derived from the WECC Base case Databank for Heavy Summer conditions. The same criteria and assumptions are utilized for ATC and TC studies as for WECC and NERC compliant planning studies performed by the WASN Planning Coordinator’s planning practices.

WASN’s federal CVP hydroelectric and Calpine Corporation’s SEC generation are designated as network resources and utilize Network Integration Transmission Service (NITS) that is embedded in ATC and TC calculations. All other transmission obligations and existing contracts are accounted over and above the natural flow which accounts for the delivery of all the designated NITS resources to designated loads or delivery points. In the SEC situation, the prevailing flow is substantially different from the scheduled delivery. WASN considered the maximum prevailing flow and simultaneous flow when said flows are the reliability limit as TTC for a given path or Cut-Plane.

6.1.2 WASN ATC Databank

WASN uses the peak seasonal base case developed in 6.1.1 above to create and develop a flow and CU model for use in calculating seasonal ATC. The base case currently includes total load; therefore, interruptible demands are not utilized in determining ATC values. WASN utilizes the normal summer or winter facility ratings in the cases, where applicable, which results in all lines and transformers having ratings corresponding to continuous, long term loading limits. TC calculations are similar to those of the ATC calculation, however TC calculations use Heavy Summer base case conditions.

6.1.3 Capability Benefit Margin (CBM)

WASN’s CBM for the CVP transmission Network is zero (0) MW at this time. WASN does not set aside CBM for itself and therefore is not required to make CBM available to LSEs or resource planners, per FERC order 890-A Docket No. RM05-17-001 Para. 82 and as stated in the WAPA OATT Attachment C.
6.1.4 Transmission Reliability Margin (TRM)

The WASN TRM is intended to provide an overall reliability margin to account for load forecast/distribution errors, generation variations (balancing uncertainties and dispatch variations), system topology uncertainties, parallel path uncertainties, and simultaneous transfer uncertainties. The WASN TRM is seven percent (7%) of the facility TTC. Further discussion of the TRM may be found in Appendix D “WASN Transmission Reliability Implementation Document”.

6.1.5 Total Transfer Capability (TTC) and Cut-Plane TTC

Using the appropriate base cases, transfer limits are determined using normal continuous ratings for all cut-planes and commercially viable (posted) paths. These transfer limits are based on all equipment in service and first contingency conditions across the cut-plane. TTC is the total transfer capability across a cut-plane, path or line. The TTC for the CVP Network transmission will be based on the sum of the thermal limit(s) of a line or group of lines at a cut-plane or path into a load or generation center. The simultaneous limit such as the Sacramento Valley Study Group (SVSG) Nomogram will govern the reservation and will be used when congestion or an operational reliability limit is identified. To calculate a cut-plane capability, the total thermal limits of all lines will be used as TTC. To calculate the TTC for a path, the logic from the ATC Seasonal Study Matrix will be applied as illustrated in Appendix E of this document. The TTC is the reliability limit unless otherwise stated. The TC calculation utilizes the TTC in the same manner as stated for the ATC calculation.

6.1.6 Distribution Factor

In calculating ATC or TC for a given line or path, WASN uses the ratio of an individual element TTC or thermal rating in a cut-plane over the combined TTC or thermal rating in a cut-plane to determine the Capacity Distribution Factor (CDF) for calculating committed use across a cut-plane. All of the WASN’s NITS transmission services for Federal hydroelectric power deliveries and the SEC are accounted for in the base cases for ATC and TC calculations and distributed among the parallel paths in a cut-plane. Calpine’s NITS reservation for SEC is also distributed in the same manner and its energy and ancillary services are dynamically scheduled to the CAISO using Pseudo-tie protocols.

6.1.7 Existing Transmission Commitments (ETC)

The existing firm transmission commitment obligations or the firm Committed Uses (CU) are comprised of the components of the ETC calculation shown below. The CU’s are distributed among the lines in a cut-plane using distribution factor in a cut plane. WASN groups certain elements of system generation to simplify ATC and TC calculation and are deemed a committed use as follows: All CVP power plants are

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7 For an explanation of the Seasonal study logic, refer to the WASN ATC Calculation Logic Text Description document and the applicable ATC Seasonal Study Matrices.
designated as a federal resource and assumed to be located at Keswick as CVP Gen (a system unit or a virtual unit). The exception to CVP Gen located at Keswick are the federal Folsom/Nimbus power plants and the Roseville and SMUD generation. These resources are considered a part of the greater Sacramento area load center. The Sutter Energy Center is dynamically transferred into the CAISO Balancing Authority. WASN uses the following algorithm to calculate Firm ETC; WASN does not provide non-firm ETC:

\[ \text{ETC}_F = \text{NL}_F + \text{NITS}_F + \text{GF}_F + \text{PTP}_F + \text{ROR}_F + \text{OS}_F \]

Where:

- \( \text{NL}_F \) 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. As a Federal power transmission agency WASN does not have load serving obligations with the exception of the Bureau of Reclamation’s project use pumping loads located at WASN’s Tracy Substation. The Tracy project use loads are static with no plans for load increases. A value of zero is used.

- \( \text{NITS}_F \) is the firm capacity reserved for Network Integration Transmission Service serving Load, to include losses, and Load growth, not otherwise included in TRM or CBM. WASN currently has several NITs contracts. CVP generation is set at applicable seasonal values. The nameplate value of the northern CVP units is used as the percentage of which seasonal CVP generation is determined.

- \( \text{GF}_F \) is the firm capacity set aside for grandfathered Transmission Service and contracts for energy and/or Transmission Service that were executed prior to the effective date of a Transmission Service Provider’s Open Access Transmission Tariff or “safe harbor tariff.” WASN currently has grandfathered contracts with the several agencies.

- \( \text{Firm Point to Point (PTP}_F \) or (PTP) is the firm capacity reserved for confirmed OATT Point-to-Point Transmission Service. WASN currently has several Point-to-point contracts.

- \( \text{Firm Roll Over Rights (ROR}_F \) or (ROR) is the firm capacity reserved for Roll-over rights for transmission service contracts of five (5) years or more granting Transmission Customers the right to continue to take Transmission Service when the Transmission Customer’s Transmission Service contract expires or is renewed. WASN OATT provides a reservation priority for existing Firm Service Customers. Should the Transmission Customer
exercise this reservation priority right, the Transmission Customer would have a priority and first right of refusal to the same amount of transmission capacity provided under the previous transmission contract. Therefore, no additional transmission capacity is accounted for under a ROR as part of the ATC calculation process. A value of zero is used.

Firm Other Service \((OS_F)\) 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. Currently WASN does not provide for OS on its transmission system. A value of zero is used.

6.1.8 CAISO – WASN TTC and Flow

Cut-plane calculations capture transfers between WASN and the CAISO. The TTC for this element is based on the thermal limits of the ties associated with the boundary between WASN and the CAISO. The tie points are listed below: The WASN designated summer season is April through October and the winter season is November through March.

North Area WASN-CAISO 1594 MW (All seasons) Cottonwood G section tie-breaker 472
Cottonwood G section tie-breaker 482

South Area WASN-CAISO 1684 MW (All seasons)

- Tracy – Tesla #1 230-kV
- Tracy – Tesla #2 230-kV
- Tracy-LLNL 230 kV

CAISO study flow value set to 351, which represents average seasonal transfer for last 5 years (2006 through 2010).

6.1.9 Available Transfer Capability and Transfer Capability (TC)

In general ATC and TC for a path or cut-plane is defined by the algebraic sum of: ATC or TC = TTC – TRM – CBM – Committed Uses, where Committed Use are synonymous with ETC. ATC and TC will be based on the smallest of; Thermal Rating - (Flow + TRM) or Thermal Rating - (Comm. Use + TRM). The Point-of-Delivery (“POD”) and Point-of-Receipt (“POR”) associated these paths are listed in Appendix C - Listing of WASN posted paths POR/POD Paths (“Appendix C”). For ATC and TC calculation purposes the POR is treated as the “Source” point and the POD is treated as the “Sink” point. The POR/POD amount is subtracted from the ATC and TC amount, as calculated above, to determine if sufficient ATC is available.
for a request or sufficient TC for the near term planning horizon. WASN calculates ATC and TC in accordance with NERC requirements with the following algorithm:

\[
\text{ATC}_F = \text{TTC} - \text{ETC}_F - \text{CBM} - \text{TRM} + \text{Post backs}_F + \text{counterflows}_F
\]

Or

\[
\text{TC} = \text{TTC} - \text{ETC}_F - \text{CBM} - \text{TRM} + \text{Post backs}_F + \text{counterflows}_F
\]

Where

\(\text{ATC}_F\) is the firm Available Transfer Capability for the ATC Path for that period.

\(\text{TTC}\) is the Total Transfer Capability of the ATC Path for that period.

\(\text{ETC}_F\) is the sum of existing firm commitments for the ATC Path during that period.

\(\text{CBM}\) is the Capacity Benefit Margin for the ATC Path during that period.

\(\text{TRM}\) is the Transmission Reliability Margin for the ATC Path during that period.

\(\text{TC}\) is the Transfer Capability for the Near Term Planning Horizon.

\(\text{Post backs}_F\) 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. WASN does not currently provide for postbacks in the base (study) calculation of ATC calculation and uses a value of zero, but postbacks may be applied in webTrans as applicable as a component of the final calculation of path ATC. Any changes to firm ATC are captured in the WASN real-time scheduling process as stated in the WAPA OATT Attachment C.

\(\text{Counterflows}_F\) are adjustments to firm Available Transfer Capability as determined by the Transmission Service Provider. WASN does not currently provide for counter flow in the ATC or TC calculation as all flow in the WASN system is primarily North to South and therefore uses a value of zero.

### 6.1.10 Cut-plane ATC, Path ATC and TC

Cut-plane ATC calculation is primarily used to determine a Commitment Distribution Factor (CDF) on the transmission lines associated with a path or cut-plane and to

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8 As noted herein, WASN non-firm ETC (CU) is not applicable and WASN utilizes ETC\(F\) (firm CU) for both the firm ATC and the non-firm ATC. Therefore there is no difference in the calculation of firm and non-firm ATC (the pre-impact values are the same).
validate ATC at the WASN system boundaries or delivery points. Commitments for the WASN system are in the form of CVP generation deliveries to WASN customers within the CAISO BA and transmission service for WASN contract customers. Path ATC calculation is primarily used to determine ATC, on a specified path, for delivery of CVP generation within the WASN Sub-Balancing area (LSE’s), the SMUD and CAISO BA along with any transmission for WASN contract customers. Both Cut plane and Path ATC calculations utilize the same principals as defined in Paragraph 10. Path ATC takes into account parallel paths and/or paths from a POR to a POD. The path ATC is calculated using the ATC study logic and is determined by the most restrictive element in the series of elements from the POR to the POD\(^9\). TC is calculated in the same manner as path ATC.

6.1.11 Scheduling
Transmission schedules must be tagged from the same POR/POD combinations as identified in the OASIS reservation. Transmission schedules that do not match POR/POD as identified in OASIS will not be allowed and the e-tag will be denied.

6.1.12 Other Modeling Requirement
WASN shall include any other applicable modeling criteria or requirement should the need arise to be included in the ATC and TC calculation.

6.2 WASN ATC and TC Criteria

6.2.1 Study Criteria
ATC Path, cut-plane and TC studies shall meet all NERC Planning Criteria for Category A, B and C including the following.

a. All Transmission Elements will be modeled at or below 100% of their continuous rating.

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

c. Uncontrolled separation shall not occur.

d. The TC assessment shall respect all known WASN System Operating Limits (SOLs)

\(^9\) For examples of cut-plane and path ATC calculation, refer to Appendix E of this document.
6.2.2 ATC and TC Monitored Facilities List

Monitored Facilities are those facilities that are monitored for overloads and low voltage conditions (limits) under normal or first contingency analysis when calculating ATC. Monitored Facilities for use in ATC and TC calculations will generally include all CVP transmission facilities operated at 230-kV and above and any transformer banks within the CVP Transmission. Other facilities operated at lower voltage levels may be added to the Monitored Facilities list at the discretion of WASN. WASN receives CVP generation forecasts from the United States Bureau of Reclamation (USBR).

6.2.3 ATC Critical Contingencies List

Critical Contingencies are those facilities that, when taken out of service, are deemed to have an adverse impact on the reliability of the transmission network. These facilities may be transmission facilities, including multi-terminal lines, or generating units. The TRMID document is intended to document methodology compliant with MOD-008-1.

6.2.4 Generation Dispatch and ATC and TC Study

WASN shall observe the lower of thermal, voltage, or stability limits when determining ATC values for posting and TC for the near term planning horizon, and are expected to individually determine when voltage or stability limits may occur. WASN sub-balancing area federal hydro resources are dispatched based on flood control and up/downstream constraints and water delivery requirements. These resources are optimized within the above constraints and are subject to WASN’s Power Marketing allocations and protocols delivered to the designated loads and designated locations.

6.2.5 Netting or Net Scheduling

WASN uses netting of obligation transfer across established paths where appropriate and applicable to evaluate ATC and TC, otherwise transfers and flows are absolute values. In evaluating a committed use obligation across a path for the purpose of calculating ATC or TC, WASN shall use the committed use or flow, whichever is greater.

ATC for firm and non-firm reservations are scheduled until a thermal, reliability or contract path limit has been reached. Reservations for contracted long-term firm transactions are taken into consideration for determination of TTC and ATC values as well as TC where applicable.

Federal hydro resources located outside of WASN balancing area, such as WASN’s share of PACI and the Federal hydro generation (New Melones, San Luis and O’Neill) located in the CAISO system are deemed delivered to Tracy 230-kV. These resources are accounted for to WASN customers that have rights to federal power but are WASN...
customers that are located and operate within the CAISO balancing area and are not
included for delivery to customers within WASN balancing area. Additionally, long-term
contracted transmission for deliveries to the SMUD from Tracy is in a south to north
direction which is opposite prevailing flows and CVP base resources deliveries at Tracy.
These deliveries are netted against the prevailing direction of flow and CVP schedules.

7. WASN Coordinator Procedures
The following coordination procedures are used by WASN in determining its transfer
capabilities associated with ATC or near term TC, as applicable.

7.1 WASN Data Exchange Coordination
ATC and TC Path and cut-plane studies shall meet all NERC Planning Criteria for
Category A, B and C including the following.

1. WASN as a member in the SVSG jointly prepare on an annual basis a load flow base
case containing annual winter and summer peak cases. These load flow cases
include individual utility generation dispatch, projected load for the time period under
evaluation, planned generation or transmission facility additions in the future, and
designation of generation resources to serve all network loads. These cases provide
the starting point for all ATC determination beyond three days in the future. TC
calculation is the same as stated with the exception of base case preparation. TC
base case do not utilize SVSG input as SVSG is applicable only to the operating
horizon. TC base cases are based on WECC Heavy Summer base cases of the
applicable year stressed to reflect near term planning horizon system conditions.
The TC cases include simulations of transfers performed through adjustment of
generation dispatch and projected load for the time period under evaluation.

2. On a seasonal basis WASN compiles a tabulation of requested commercially viable
common paths and calculates the seasonal firm and non-firm ATC values
coordinates ATC values to be posted and to ensure compliance with the WASN ATC
and TC Methodology.

3. WASN shall make its own current data available, in the format maintained by WASN,
for up to 13 months into the future (subject to applicable confidentiality and security
requirements) for ATC purposes.

4. WASN shall make its ATC data available in accordance with MOD-001.

7.2 ATC Posting
Postings for ATC are currently made using the on OATI webOASISSM at
7.3 WASN ATC Dispute Resolution and Data Request Procedures

The email address of WASN is available on the OASIS. The contact person shall respond to all questions and/or concerns within 30 days by phone or email for ATC related issues and 45 days for TC associated with the near term planning horizon. If the transmission user does not believe that the transmission provider is following the “WASN Available Transfer Capability Implementation Document” or TC methodology or has questions/concerns about this document, the transmission user can contact the WASN contact person listed or utilize the OATI webOASISSM. Ira Witherspoon (916) 353-4659 withersp@wapa.gov.

8. WAPA-SNR Capacity entitlements on the California–Oregon Transmission Project (COTP)

Western retains 177 MW of capacity entitlements on the COTP\(^\text{10}\). A portion of these entitlements are statutorily designated for use by specific federal entities. Western also utilizes a portion of the 177 MW entitlement to balance loads and resources, when needed, within the Western Sub-Balancing Authority. The remainder of the 177 MW entitlement is marketed as short-term non-firm transmission on the Western OASIS website. The COTP is one of three lines of Path 66. The California Independent System Operator (CAISO) is the path operator for the California-Oregon Intertie (COI, Path 66). As such the CAISO performs path studies, which are coordinated with Western through the Operating System Study (OSS) process. The OSS issues system study reports on a seasonal basis, which Western reviews and provides concurrence. The CAISO, as the COI path operator, issues the ATCID associated with the COI.

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\(^{10}\) WASN reserves under non-curtailment state of ODA-TCY 500 kV COTP line segment an additional 600 MW TTC of firm transmission as an inherent part of the 230 kV North to South area WAPA interconnection that preceded the 500 kV COTP project. That 600 MW of capacity with associated committed use (ETC\(_{F}\)) is included in relevant seasonal ATC studies as reflected in the KES-TRY/TRY-KES path(s) and the OASIS ATC postings so reflect that inclusion.
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### 9. Appendices

A. Figure 1: WASN System cut-planes for ATC calculations
B. List of contingencies for ATC and TC calculation
C. Listing of WASN posted paths POR/POD Paths
D. Transmission Reliability Margin Information Document
E. WASN ATC Example Calculation

F. WASN Memo for ATC Calculation Dated 1994
Appendix A WASN System Cut-planes for ATC and TC Calculations

WASN SCA Cut-Planes

WASN Cut-Planes
Figure A-1
### Appendix A Continued

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Cut-Plane Line Listing
Figure A-2
Appendix A continued

The Cut-plane line listing provides the identification of each transmission line comprising the cited Cut-plane. The Cut-plane calculations provide the basis for the committed use (CU) values for lines in the given Cut-plane. An ATC or TC path may consist of lines that are associated with more than one Cut-plane in which case the study values used are those which are most restrictive to ATC or TC.


### Appendix A continued

**LINES**

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</tbody>
</table>

**POSTED PATHS**

The following table is an example of the fixed long-term N-0 study data (table from valid Summer 2012):

Each Path utilizes applicable seasonal N-0 study data or study data for applicable outage(s) for calculation and posting of long term ATC. Short-term ATC data for a rolling 96 hour is based upon either (a) automated dynamic ATC calculation or (b) study data for applicable outage(s).

The following table is an example of the fixed long-term N-0 study data (table from valid Summer 2012):

---

11 Refer to ATC Calculation Logic Description document for detailed explanation of the automated process. Refer to the applicable ATC Seasonal Study matrices for the Excel workbook utilizing the seasonal base study data and logic to determine N-0 and N-1 ATC component data.

12 Refer to the applicable WASN ATC Study matrices for the long term data sets used by webTrans for the specified year and season.
<table>
<thead>
<tr>
<th>PATH</th>
<th>Path base case TTC</th>
<th>Path base case (static) CU*</th>
<th>Path base case TRM</th>
<th>Path Outage State</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELV-KES</td>
<td>936</td>
<td>617.082</td>
<td>66</td>
<td>N-0</td>
</tr>
<tr>
<td>KES-AIR</td>
<td>987</td>
<td>580.900</td>
<td>69</td>
<td>N-0</td>
</tr>
<tr>
<td>KES-CTW</td>
<td>987</td>
<td>580.900</td>
<td>69</td>
<td>N-0</td>
</tr>
<tr>
<td>KES-ELV</td>
<td>936</td>
<td>617.082</td>
<td>66</td>
<td>N-0</td>
</tr>
<tr>
<td>KES-ODA</td>
<td>1297</td>
<td>855.081</td>
<td>91</td>
<td>N-0</td>
</tr>
<tr>
<td>KES-TRY</td>
<td>1350</td>
<td>1130.301</td>
<td>95</td>
<td>N-0</td>
</tr>
<tr>
<td>OBN-CTW</td>
<td>952</td>
<td>627.630</td>
<td>67</td>
<td>N-0</td>
</tr>
<tr>
<td>OBN-TRY</td>
<td>750</td>
<td>627.945</td>
<td>53</td>
<td>N-0</td>
</tr>
<tr>
<td>ODA-ELV</td>
<td>952</td>
<td>792.630</td>
<td>67</td>
<td>N-0</td>
</tr>
<tr>
<td>ODA-KES</td>
<td>1297</td>
<td>855.081</td>
<td>91</td>
<td>N-0</td>
</tr>
<tr>
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<td>57</td>
<td>N-0</td>
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<tr>
<td>RSC-TRY</td>
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<td>627.945</td>
<td>53</td>
<td>N-0</td>
</tr>
<tr>
<td>TRY-KES</td>
<td>1350</td>
<td>1130.301</td>
<td>95</td>
<td>N-0</td>
</tr>
<tr>
<td>RDM-CTW</td>
<td>328</td>
<td>126.000</td>
<td>23</td>
<td>N-0</td>
</tr>
<tr>
<td>CTW-RDM</td>
<td>328</td>
<td>126.000</td>
<td>23</td>
<td>N-0</td>
</tr>
</tbody>
</table>

Example of ATC Path Long Term Study Values
Figure A-4
Figure A-5 Verification of OASIS Posting for each webTrans listed Path

Excel version documentation available in supporting documentation
Appendix B – List of Contingencies for ATC and TC Calculation

- COTWDWAP - SHASTA #1 230.00-kV
- COTWDWAP - SHASTA #2 230.00-kV
- SHASTA - FLANAGAN 230.00-kV
- KESWICK - OBANION 230.00-kV
- OLINDAW - OBANION 230.00-kV
- KESWICK - AIRPORTW 230.00-kV
- FLANAGAN - KESWICK 230.00-kV
- AIRPORTW - COTWDWAP 230.00-kV
- COTWDWAP - ROSEVILLE 230.00-kV
- OLINDAW - COTWDWAP 230.00-kV
- OLINDAW - KESWICK 230.00-kV
- O'BANION – ELVERTA #1 230-kV
- O'BANION – ELVERTA #2 230-kV
- O'BANION-ELVERTA #3 (ESE) 230 kv
- O'BANION-NATOMAS 230 kV
- TRACY – HURLEY #1 230-kV
- TRACY – HURLEY #2 230-kV
- ROSEVILLE – ELVERTA 230-kV
- FIDDYMENT – ELVERTA 230-kV
- ELVERTA – HURLEY #1 230-kV
- ELVERTA – HURLEY #2 230-kV
- FOLSOM – ROSEVILLE 230-kV
### Credible N-2 Contingencies

#### List of Credible N-2 Contingencies Used in the WASN Seasonal ATC Study

The following table is an example of the N-2 considerations represented within the WASN seasonal studies, primarily with respect to the Sacramento load area import management.¹⁴

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<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>OBN-ELV 1/OBN-ELV 2</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OBN-NAM/OBN-NSE</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
<td>See note</td>
<td>Reduce SMUD SVS rights to zero MW</td>
<td></td>
</tr>
<tr>
<td>TRY-HUR 1/TRY-HUR 2</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELV-HUR 2/ELV-HUR 2</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
<td>N/A</td>
<td>Not applicable to ATC matrix</td>
<td></td>
</tr>
<tr>
<td>TRY-WES 1/TRY-WES 2</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Not applicable to ATC matrix</td>
<td></td>
</tr>
<tr>
<td>RSC-FIV/RSC-ELV</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ODA-CW 1/ODA-CW 2</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
<td>See note</td>
<td>Reliability degradation of SHA gen output</td>
<td></td>
</tr>
<tr>
<td>SHA-CW 1/SHA-CW 2</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
<td>See note</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KES-OBN/KES-ODA</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>N/A</td>
<td>See note</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KES-OBN/OBN-ODA</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>KES-CW PATH, KES-AIR Path, KES-ODA Path, ODA-KES Path.</td>
<td>YES</td>
<td>Credible Event. Pre-outage &amp; forecast max total MW for KES-AIR, KES-ODA, and KES-OBN &lt; 309/424. During outage duration, maintain KES-AIR &amp; KES-ODA total MW &lt; 361/477 * (Likely Northern Area CVP gen total would be below 871 MW).</td>
<td>Tabs 1 and 2, Path numbers 1, 7, and 9. See details. TTC/TRM/CU= 819/57/712 respectively to make available 50 MW ATC.</td>
</tr>
</tbody>
</table>

N/A - not applicable

---

¹⁴ Refer to the WASN ATC Seasonal Study matrices and ATC Calculation Logic Description document for detail calculations.
Appendix C – List of WASN Posted Paths POR/POD Paths

- Keswick 230-kV to Cottonwood 230-kV
- Roseville 230-kV to Tracy 230-kV
- Elverta 230-kV to Keswick 230-kV
- Keswick 230-kV to Elverta 230-kV
- Keswick 230-kV to Tracy 230-kV
- Tracy 230-kV to Keswick 230-kV
- O’Banion 230-kV to Tracy 230-kV
- Keswick 230-kV to Airport 230-kV
- Olinda 230-kV to Keswick 230-kV
- Keswick 230-kV to Olinda 230-kV
- O’Banion 230-kV to Cottonwood 230-kV
- Roseville 230-kV to Cottonwood 230-kV
- Olinda 230-kV to Elverta 230-kV
- Round Mountain 230 kV to Cottonwood 230 kV
- Cottonwood 230 kV to Round Mountain 230 kV
Appendix D – Transmission Reliability Margin Implementation Document

Transmission Reliability Margin Implementation Document
Revised 03/13/12

1 Purpose
The inherent uncertainties in the projected system conditions used to calculate Available Transfer Capability (ATC) and transmission capability associated with the near term planning horizon (TC) may result in unreliable transmission system operations. To ensure the integrity of the transmission system, an amount of transmission transfer capability will be set aside to provide a reasonable level of assurance that the interconnected transmission network will be secure. This capability is known as the Transmission Reliability Margin (TRM). 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 uncertainties in system conditions and its associated effects on ATC calculations and the need for operating flexibility to ensure reliable system operation as system conditions change.

2 Scope
This appendix describes the method which WASN utilizes in order to determine TRM in compliance with MOD-008-1.

3 Methodology
WASN uses the following method to determine TRM relative to the ATC and TC calculation.

The WASN TRM is intended to provide an overall reliability margin to account for load forecast/distribution errors, generation variations (balancing uncertainties and dispatch variations), system topology uncertainties, parallel path uncertainties, and simultaneous transfer uncertainties.

WASN does not use CBM in TRM calculation or any other ATC calculation. WASN sets any CBM field to zero.

The TRM calculation is used for the following time periods per MOD-008-1 R1.3: Same-day and real-time, Day-ahead and pre-schedule, and Beyond day-ahead and pre-schedule with up to 13 month look-ahead.

The incorporation of uncertainties in each seasonal study has included the following components of uncertainty in compliance with MOD-008-1 R1.1:

- Aggregate Load forecast, including WASN area loads including USBR pumping, other pumping, WASN substation losses, and resident LSE loads. SMUD loading effects upon WASN transmission is also considered.
- Load distribution uncertainty, including allowance for USBR pump variation, LSE load fluctuation, and expected WASN sub-Balancing Authority (SBA) Area mitigation from AGC.
- Forecast uncertainty in Transmission system topology (including, but not limited to, forced or unplanned outages and maintenance outages). WASN includes the N-1 and Sacramento Valley area N-2 contingencies as listed in Appendix B of ATCID.
- Allowances for parallel path (loop flow) impacts. Each WASN seasonal ATC study takes into consideration the maximum possible committed use for a given condition or the study flow whichever is greater. In this way the study flows and contingencies have been reflected into the ATC calculations to reflect this component of uncertainty.
- Allowances for simultaneous path interactions. WASN seasonal ATC studies (like WASN planning studies) take into consideration N-1 line loss conditions for each cut-plane and path defined.
- Variations in generation dispatch (including, but not limited to, forced or unplanned outages, maintenance outages and location of future generation). WASN studies include allowance for N-1 generation loss and mitigation by WASN available reserves.
- Short-term System Operator response (Operating Reserve actions). WASN carries adequate spinning reserve, non-spinning reserve, and regulating reserve to meet WECC and NERC requirements.
- Reserve sharing requirements. The WASN operating reserve also includes allowance for reserve sharing. WASN planning and ATC studies take this into account.
- Inertial response and frequency bias. Each ATC seasonal study, like the planning studies, take into account response by inertia, natural frequency characteristic, and AGC frequency bias of synchronous generators within the WASN SBA.

WASN interconnected system and internal system operating limits provide for operations which will remain stable and reliable for single line or equipment loss (N-1) as well as for Sacramento Valley Area credible double line outage events\(^{15}\) (N-2). Concurrently, WASN meets NERC and WECC operating standards in order to maintain contingency reserves to meet WASN sub-balancing area (SBA) loads and interchange scheduled and actual flows per NERC TOP-007 TOP-007-WECC, and WECC System Performance Criteria (TPL-001-WECC-1-CR through TPL-004-WECC-1-CR, including WRS3.2). The planning and operating of WASN transmission fully meets applicable NERC requirements including but not limited to TOP-002-2a, TOP-004-2, TOP-006-2, and TOP-008-1.

WASN maintains sufficient USBR hydro on AGC control to provide for required regulation associated with load changes, scheduling ramps, and resource variations within the SBA and with simultaneous transfers. The accuracy and SCADA visibility of the WASN SBA transmission and associated interconnections is excellent and reliable consisting of two levels of high accuracy line flow readings, a third level of SCADA data source, and with a pending option of EMS state estimation. The single greatest contingency to be considered for the WASN transmission system is unplanned outage of transmission equipment. With the transmission configuration of the WASN SBA, it was deemed reasonable to provide a 7% TRM for each transmission line included on a posted ATC and TC path. WASN conducted a study\(^{16}\) to determine the average change in MW flow as a percent of the normal summer line rating for

\(^{15}\) Credible double line (N-2) events consist of the following: OBN-ELV 1/OBN-ELV 2, OBN-NAM/OBN-ESE, TRY-HUR 1/TRY-HUR 2, ELV-HUR 1/ELV-HUR 2, TRY-TESS 1/TRY-TESS 2, TRY-WES 1/TRY-WES 2, RSC-FIY/RSC-ELV, ODA-CW 1/ODA-CW 2, SHA-CW 1/SHA-CW 2, KES-OBN/KES-ODA, and KES-OBN/OBN-ODA.

\(^{16}\) Excel summary of study results, Study_summary_TRM_Percent_031312.
each line of a path for an N-1 event with other parallel lines in that path. The result was that there was an average change of approximately 6% (0.057773). WASN added 1% for a total TRM of 7% to ensure reliability margin. In addition to support the validity of the 7%, it should be noted that the WECC unscheduled flow (USF) procedure IRO-006-WECC requires unscheduled flow accommodation of 5% for Qualified Paths. The OASIS posted 230 kV ATC paths within WASN are not WECC Qualified Paths, however WASN has set aside 6% of the TTC for accommodation of contingencies and unscheduled flow for the posted ATC paths within WASN plus 1% for additional reliability margin. This is based upon the study results and would also appear to be consistent with what WECC requires for its Qualified Paths. The 7% TRM is applied to each line on posted 230 kV ATC paths within WASN.

WASN may update the TRM methodology based on actual operating experience on an on-going basis for transmission reliability and security. The line TRM calculation and subsequent value is based upon applicable line TTC, contract limit, or reliability limit (whichever is most restrictive) and is otherwise independent of time period. Path TRM is based upon the line component TTC in the line group of each path as described in the WASN ATCID document17.

\[
\text{Line TRM} = 0.07 \times \text{TTC}^{18} \quad \text{(or applicable limit)}
\]

\[
\text{Path TRM} = 0.07 \times (\text{TTC}^{19} \text{of line group as defined in ATCID})
\]

The line TTC values upon which the TRM values are based are adjusted seasonally by WASN. Additionally, WASN shall review and update TRM values in accordance with this document no less frequently than once every 12 months to exceed the minimum requirement of MOD-008-1 R4 of thirteen months.

4 Availability of TRM to the Market

WASN uses TRM in all ATC calculations. WASN includes TRM in the calculation to provide a reasonable level of assurance that the interconnected transmission network will be secure. TRM is preserved as a reliability margin to reflect the uncertainty of the operation of the electric system. TRM does not include any of the components of Capacity Benefit Margin (CBM).

---

17 The WASN ATCID document describes the calculation of ATC, including the TRM component thereof.

18 TTC, contract limit, or reliability limit (whichever is most restrictive)

19 TTC, contract limit, or reliability limit (whichever is most restrictive)
Transmission Reliability Margin Implementation Document Appendix A
Record of WASN TRM Calculation and Validation
Revised 03/13/12

MOD-008-1

R4. Each Transmission Operator that maintains TRM shall establish TRM values in accordance with the TRMID at least once every 13 months. [Violation Risk Factor: Lower] [Time Horizon: Operations Planning]

R5. The Transmission Operator that maintains TRM shall 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. [Violation Risk Factor: Lower] [Time Horizon: Operations Planning]

TRM of 7% was initially established and effective 4/1/11. The following table provides a record of updates at intervals no less frequently than 13 months. The TRMID has been updated, but the TRM value has not changed since initial documentation of 04/01/11.

<table>
<thead>
<tr>
<th>TRM Update Date</th>
<th>Copy to planners, TSS and TSO Date</th>
<th>Previous TRM Percent</th>
<th>New TRM Percent</th>
<th>Included into ATCID Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/13/12(^{20})</td>
<td>3/14/12</td>
<td>7%</td>
<td>7%</td>
<td>5/29/12(^{21})</td>
</tr>
</tbody>
</table>

The table above must be updated only in the original TRMID document

\(^{20}\) Update of 3/13/12 provided no change in TRM calculation, but did provide additional clarification.

\(^{21}\) Added reference for date TRMID was added to the ATCID annual update for 05/29/12.
Appendix E – WASN ATC Example Calculation

Example Cut-plane ATC Calculation:

<table>
<thead>
<tr>
<th>Outage</th>
<th>Lines</th>
<th>TTC (MW)</th>
<th>Flow</th>
<th>CDF%</th>
<th>C.U. (MW) CDFxCTDAC</th>
<th>TRM (7% of TTC) (MW)</th>
<th>ATC (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Line A</td>
<td>600</td>
<td>200</td>
<td>600/2000=30%</td>
<td>0.30x250=75</td>
<td>0.07x600=42</td>
<td>358</td>
</tr>
<tr>
<td></td>
<td>Line B</td>
<td>500</td>
<td>300</td>
<td>500/2000=25%</td>
<td>0.25x250=62.5</td>
<td>0.07x500=35</td>
<td>165</td>
</tr>
<tr>
<td></td>
<td>Line C</td>
<td>500</td>
<td>300</td>
<td>500/2000=25%</td>
<td>0.25x250=62.5</td>
<td>0.07x500=35</td>
<td>165</td>
</tr>
<tr>
<td></td>
<td>Line D</td>
<td>400</td>
<td>200</td>
<td>400/2000=20%</td>
<td>0.2x250=50</td>
<td>0.07x400=28</td>
<td>172</td>
</tr>
<tr>
<td>Totals</td>
<td>Sum= 2000</td>
<td>Sum=1000</td>
<td>Sum=100%</td>
<td>Sum=250</td>
<td>Sum=140MW</td>
<td>860*</td>
<td></td>
</tr>
</tbody>
</table>

*Note: The cut-plane ATC totals are in general the sum of the individual lines. The exception to this is the Sacramento Valley Cut-plane which is governed by a nomogram operation. In the case of the Sacramento Valley Cut-plane the Total ATC is the sum of the least two line pairs. The cut-plane ATC calculations are prerequisite step in determining the committed use (CU) as applicable for the lines in each posted path. The committed use for each cut-plane and path is based upon the respective CU obligations. The CU obligations are based upon one or more of the following determinants22: (a) Applicable CVP Northern Area hydro generation; (b) Base resource (BR) as a percentage of Northern Area CVP hydro generation; (c) Project use (PU); (d) First Preference customer allocation; and (e) TRD. Contract Transmission Deliveries at cut-plane (CTDAC) = 250 MW.

Line A ATC: 600-200-42=358MW or 600-75-42=483MW Use the smaller of the two
Line B ATC: 500-300-35=165MW or 600-62.5-35=502.5MW Use the smaller of the two
Line C ATC: 500-300-35=165MW or 600-62.5-35=502.5MW Use the smaller of the two
Line D ATC: 400-200-28=172MW or 400-50-28=322MW Use the smaller of the two

Example Path ATC and TC Calculation:

22 Refer to ATC Seasonal Study Matrices, “Calc Sheet” for specific customer and project use allocation.
Assume Lines A, C and D comprise a path, further assume Lines A and C double circuit elements and Line D is single circuit element arranged in Figure 1

![Diagram of Lines A, C, and D](image)

Figure E-2

All Line CU values used in the Path ATC and TC calculation are provided from the cutplane ATC and TC calculation table. The line TTC* and line Flow (MW) are provided from the study line ratings and study flow data respectively, excepting in the automated ATC calc in which case the line TTC and flow data come from the production SCADA system via pi. In every case, the TRM is 7% of the actual selected line TTC. The Path TTC, Path CU, Path Flow, and Path TRM are calculated based upon the parallel or series-parallel line arrangement.

<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
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<tbody>
<tr>
<td>21</td>
<td>Line</td>
<td>TTC</td>
<td>Flow</td>
<td>CU</td>
<td>TRM</td>
<td>Segment ATC</td>
<td>Line Group ATC</td>
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<td>100</td>
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<tr>
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<td>50</td>
<td>63</td>
<td>35</td>
<td>402.00</td>
<td>=IF($J$23&lt;$J$24,E22+E23,E24)</td>
</tr>
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<td>24</td>
<td>D</td>
<td>400</td>
<td>150</td>
<td>50</td>
<td>28</td>
<td>222.00</td>
<td>=IF($J$23&lt;$J$24,F22+F23,F24)</td>
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<td>Path</td>
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<td>150</td>
<td>50</td>
<td>28</td>
<td>222.00</td>
<td>=IF($J$23&lt;$J$24,G22+G23,G24)</td>
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<td></td>
<td></td>
<td></td>
<td>=IF($J$23&lt;$J$24,H22+H23,H24)</td>
</tr>
</tbody>
</table>

Figure E-3

The line ATC (or TC) = Line TTC* max (line CU, line flow) – line TRM
Line Group A-C (Line A and C in parallel) ATC = (Line A TTC + Line C TTC) – (max (Line A flow, Line A CU) + max (Line C flow, Line C CU)) – (Line A TRM + Line C TRM)
Line Group D (Line D in series with A-C) ATC = Line D TTC – max (Line D flow, Line D CU) – Line D TRM
PATH ATC (or TC) = min (Line Group A-C ATC, Line Group D ATC)

* TTC, Reliability Limit, or Contract Limit, whichever is most restrictive

\[
\text{ATC}_F = \text{TTC} - \text{ETC}_F - \text{CBM} - \text{TRM} + \text{Postbacks}_F + \text{counters}_F
\]

23 Transmission line normal thermal limits are utilized from WASN Operations Facility Ratings (OP-64) or WASN dispatcher entered de-rating, whichever is most restrictive.

24 WASN CU is synonymous with ETC. At WASN, CBM and counters are each set to zero. TRM is always equal to 7% of actual, unbiased TTC.
The timeline for WASN calculation provides for posted path ATC calculation compliant with NERC Standard MOD-001-1a wherein (R8.1) the hourly values are provided for 96 contiguous hours (recalculated hourly unless none of the calculated values identified in the ATC equation have changed); (R8.2) Daily values are recalculated no less frequently than once per day (and more frequently as data therein reflects changes); and (R8.3) Monthly values are recalculated no less frequently than weekly (and more frequently as data therein reflects changes).

The following provides minimum update intervals for webTrans Main ATC:
- R8.1 Hourly values (operating horizon), once per hour updated hourly for no less than next 96 contiguous hours with any changes from previous hour.
- R8.2 Daily values (operating horizon), from webTrans ATC Daily Segment ATC updated at least daily will also display monthly values and may be viewed for future 12 months.
- R8.3 Monthly values are updated at least daily and may be viewed from webTrans ATC Monthly Segment ATC for at least the current year through the consecutive future 2 years.

The following table from OATi webTrans settings at WASN confirms that update intervals meet or exceed the NERC requirements in MOD-001-1a R2 and R8.

For documentation regarding the retrieval and re-calculation of ATC after-the-fact, please refer to WASN Process for Retrieval of ATC Data document.
The following timeline provides a visual representation of the automated and/or manual data upload and the webTrans posted path ATC calculation.

![Timeline Diagram]

The logic used to calculate the line group ATC components and the path ATC components is line and path specific. This logic is explained in the WASN document ATC Calculation Logic Description. The pre and post-impacts ATC posted are in compliance with MOD-001-1a and MOD-029-1a as well as other applicable NERC Standards.
Appendix F – WASN Memo for ATC Calculation Dated 1994

Friday, December 16, 1994

Memo to File

Notes from the Western-wide meeting 12/14/94, in Golden re- FERC’s Available Transmission Capacity (ATC)

All area offices agreed to compile ATC for their respective area by the end of March, 1995. We agreed that a simple approach such as the following may be best for ATC:

Available Transmission Capacity (ATC) = Rating - Commitments

Commitments may have the following & or other components:

  - Contractual Obligations
  - Set-aside capacity for load growth
  - Set-aside capacity for operational flexibility &
  - Project use

We agreed that is difficult to develop a number that is useful without a clear understanding of how it is to be used. We also agreed that a single definition or approach may not be practical for use by all areas due to system characteristics & other concerns.

The need to establish ATC and how it may be used is still of great concern to all, but everyone agreed to do their best & develop their ATC just in case.

Each area representative discussed their transmission and load (see attached). I stressed that we don’t have an established path rating for our 230-kV system and it is advantageous to established a rating and ATC. I also emphasized that this is an opportunity for the SAO and the rest of Western to use our transmission to enhance revenues in light of the present environmental constraints on hydro operations.

A2300 staff is working to compile a data base that will incorporate each areas input into a Western-wide data base for ATC. Each area will be responsible for maintaining their portion of the data base. The next meeting is set for 2/7&8/95 in Denver.

cc: N0000, N0001, N2000, N4000, N6000, N6100, & N2313
APPENDIX D

ENTITLEMENTS

D.1 Participants' Entitlements Generally

Each Participant shall have the right to use Project facilities for the purpose of utilizing its Entitlement. Such use shall be up to the megawatt amount of that Participant's Entitlement simultaneously in both directions for each Segment of the Project, in the proportion specified in Appendix E to this Agreement, as Appendix E may be modified from time to time as provided herein without requiring an amendment to this Agreement. Such use shall begin with the Commercial Operation Date of a Segment and any required corresponding Project substation facilities.

D.2 Western's Entitlement on Project Facilities Between Olinda Substation and Tracy Substation

D.2.1 In addition to that Entitlement specified in Appendix E to this Agreement, and in accordance with Section D.3, Western shall have the first right to use 300 megawatts of Transfer Capability over Project facilities between Western's Electric System at the Olinda Substation and its Electric System at Tracy Substation as replacement for its original double-circuit 230-kV transmission lines whenever the available Transfer Capability of the Project facilities between such locations is 1900 megawatts or less, provided that:

D.2.1.1 Whenever the available Transfer Capability of Project facilities between Western's Electric System at the Olinda Substation and its Electric System at Tracy Substation is greater than 1900 megawatts and less than or equal to 2200 megawatts, Western shall have the first right to use such Transfer Capability in excess of 1900 megawatts; and