Available Transfer Capability Implementation Document (MOD-001-1a)

Bonneville Power Administration
Transmission Services

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I. Purpose

This BPA Available Transfer Capability Implementation Document (ATCID) addresses all of the requirements of North American Electric Reliability Corporation (NERC) Reliability Standard MOD-001-1a Available Transmission System Capability. This ATCID is specifically required by MOD-001-1a, R3 and its subrequirements. This ATCID only applies to ATC calculations through month 13.

II. Definitions

All capitalized terms used in this ATCID are either contained in NERC's Glossary of Terms used in NERC Reliability Standards or, if not in NERC's glossary, are defined in this ATCID.

Defined terms specific to BPA include:

- **Federal Columbia River Power System (FCRPS):** The Transmission System constructed and operated by BPA and the 31 federally-constructed hydroelectric dams[1] on the Columbia and Snake Rivers, and the Columbia Generating Station nuclear plant. Each entity is separately managed and financed, but the facilities are operated as an integrated power System.
- **Federal Columbia River Transmission System (FCRTS):** The FCRTS is comprised of BPA's main grid network Facilities (Network), Interconnections with other Transmission Systems (External Interconnections[2]), Interties,[3] delivery Facilities, subgrid Facilities, and generation Interconnection Facilities within the Pacific Northwest region and with western Canada and California.
- **Long-Term Reservation:** a confirmed reservation that has duration greater than or equal to 365 days or any confirmed firm Network Integration Transmission Service reservation.
- **Short-Term Reservation:** a confirmed reservation that has duration less than 365 days, excluding confirmed firm Network Integration Transmission Service reservations.

[1] Albeni Falls, Anderson Ranch, Big Cliff, Black Canyon, Boise River Diversion, Bonneville, Chandler, Chief Joseph, Cougar, Detroit, Dexter, Dworshak, Foster, Grand Coulee, Green Peter, Green Springs, Hills Creek, Hungry Horse, Ice Harbor, John Day, Libby, Little Goose, Lookout Point, Lost Creek, Lower Granite, Lower Monumental, McNary, Minidoka, Palisades, Roza and The Dalles

[2] Northern Intertie, Reno-Alturas Transmission System, West of Hatwai, West of Garrison and LaGrande paths.

[3] California-Oregon AC Intertie, Pacific DC Intertie, and Montana Intertie.

III. Overview

BPA owns and provides Transmission Service over the FCRTS (see p. 3 for definition). BPA is registered with NERC as a Transmission Operator (TOP) and Transmission Service Provider (TSP), among other registrations.

Methodologies Selected

MOD-029-1a

BPA has elected to use the Rated System Path Methodology (MOD-029-1a) to calculate ATC for its ATC Paths. The description of how BPA implements this methodology for these paths is included in Sections VII, VIII, and IX of this ATCID. (MOD-001 R1)

MOD-008-1

BPA maintains Transmission Reliability Margin (TRM) as described in NERC Standard MOD-008-1 for its Northern Intertie Path. The description of how BPA implements TRM can be found in BPA's TRM Implementation Document (TRMID) found on BPA's website http://transmission.bpa.gov/business/atc_methodology/. BPA does not maintain TRM for any other ATC Path.

Methodologies Not Applicable to BPA

BPA does not use the Area Interchange Methodology (MOD-028-2), the Flowgate Methodology (MOD-030-2), or a Capacity Benefit Margin (CBM) (MOD-004-1). Therefore these standards are not applicable to BPA.

ATC Calculations

ATC Calculation Periods

BPA calculates ATC values using the Rated System Path Methodology for the following time periods: (MOD-001 R2)

- Hourly values for up to 168 hours. The next hour may be calculated in subhourly intervals, with the most limiting subhourly ATC value being the hourly value. (MOD-001 R2.1)
- Daily values for day 3 through day 90. For days 3 to 7 (up to hour 168), the daily ATC value is the most limiting hourly ATC value for that day. (MOD-001 R2.2)
- Monthly values for month 2 through month 13. For months 2 and 3 (up to day 90), the monthly ATC value is the most limiting daily ATC value for that month. (MOD-001 R2.3)

Frequency of ATC Recalculation

BPA recalculates ATC on the following frequency, even if the calculated values identified in the ATC equation are unchanged: (MOD-001 R8)

- Hourly, at least once per hour. (MOD-001 R 8.1)
- Daily, at least once per day. (MOD-001 R8.2)

- Monthly, at least once per day. (MOD-001 R8.3)

BPA may recalculate ATC values more frequently due to changes in TTC, Power Transfer Distribution Factors (PTDFs), system issues or as deemed necessary.

Limiting Assumptions

BPA studies assumptions of various system conditions to develop the System Operating Limits (SOLs) for its planning of operations. BPA uses these SOLs as the TTC in its ATC calculations. Therefore when determining the TTC, BPA uses studied assumptions that are no more limiting than those used to determine the SOLs in its planning of operations for the corresponding time period, when such planning of operations has been performed for that time period. (MOD-001 R6)

When calculating ATC, BPA subtracts its Existing Transmission Commitments (ETC) from the TTC determined from the studied assumptions that BPA uses to develop SOLs for its planning of operations. No additional studies beyond those developed to determine SOLs and used in calculating TTCs are performed to calculate ATC. BPA may use more recent system condition information in its SOL calculations when the studies are updated after the ETC Cases are performed. However, this is not considered a difference in assumptions. Therefore, there are no different assumptions used to calculate ATC to compare to assumptions used in BPA's planning of operations. (MOD-001 R7)

IV. Allocation Processes

BPA uses the same methodology to allocate transfer capability among multiple lines or sub-paths within a larger ATC Path as it uses to allocate transfer capability among multiple owners or users of an ATC Path. For Paths where ownership Agreements exists, the methodology is to allocate transfer capabilities according to contractual rights defined in individual Agreements among the various owners. These Agreements define the specific percentages of capacity or MW amounts of rights assigned to each owner for specific time periods. See Appendix A for a list of contracts and specified Paths with shared ownership. Agreements do not exist for three of BPA's Network Paths: South of Allston S>N, Columbia Injection N>S and Wanapum Injection N>S. For South of Allston S>N the same allocation methodology described in the SOA N>S Contract (#06TX-12300) is used. For Columbia Injection N>S and Wanapum Injection N>S, BPA determines its share of Total Transfer Capability based on BPA's owned transmission lines that make up the Network Path when all lines are in service. During outage conditions, individual allocations exist for the loss of each transmission line in the Network Path. BPA determines its share of Existing Transmission Commitments for Columbia Injection N>S and Wanapum Injection N>S by modeling the full path of BPA's lines only.

At this time BPA does not allocate transfer capabilities between TSPs to address forward-looking congestion management and seams coordination. (MOD-001 R3.5)

V. Outages

Outages from all TSPs that are internal or adjacent to BPA's Balancing Authority Area (BAA) can be mapped to the WECC base cases. (MOD-001 R3.6.3)

Outage Planning and Criteria for TTC Calculations

Outage plans and the policy are posted to the Outage Plans website (http://www.oatioasis.com/bpat/index.html). (MOD-001 R3.6.1) (MOD-001 R.3.6.2)

VI. SOL Priorities Used to Set TTC

BPA may update assumptions and calculate new SOLs when changes to System conditions will significantly impact those limits and may use those updated assumptions to determine new TTC values. The following hierarchy of priorities categorizes the SOL values based on the time period being calculated and the reason for the change. This prioritization may then be used to revise the TTC for a given time period based on the concept that more recent assumptions to calculate SOL values are more accurate since they are based on updated System information:

- **Real-time limit (highest priority):** The "Real-time limit" priority governs when BPA updates the assumptions of system conditions to calculate SOLs during the Real-time horizon. A change to the SOL calculation with the Real-time priority governs over all other priorities. For example, if BPA receives an update that a scheduled outage will be extended by two hours early in the Real-time day, BPA will update the assumptions for the SOL calculation accordingly for the additional two hours and may use those same updated assumptions to update the TTC. If there are multiple real-time updates to assumptions and SOL calculations, the most recent SOL calculated governs.
- **Scheduling limit:** The "scheduling limit" priority may be used occasionally when the assumptions for the lowest SOL (TTC) is not governing or an actual Scheduling limit has been imposed. For example, if there is a studied outage on the California-Oregon Intertie (COI) that results in a "studied" priority SOL of 3200 MW, but there is another outage combination in conjunction with the studied outage on the COI for the same time period that results in a Scheduling limit of 3400 MW, the Scheduling limit of 3400 MW governs during this time period and is used to set TTC. If there is more than one Scheduling limit, the lowest Scheduling limit governs until a Real-time limit SOL is submitted.
- **Pre-schedule forecast:** The "pre-schedule forecast" SOL priority may be used for a Path where the assumptions for the SOL calculations are updated for the pre-schedule period. For example, the SOL calculated for Network Paths that are derived using nomograms and the assumptions are re-evaluated just prior to the pre-schedule day to incorporate updated data inputs. The pre-schedule forecast of system conditions for SOL calculations governs over all the studied outages and may be used to set the TTC value for a Path.
- **Studied:** The "studied" priority is used when there are outages where a study report has been issued, including those provided by other TOPs. For example, if a study report is issued for BPA's John Day-Grizzly #1 500kV Line outage, the study report evaluated assumptions for system conditions to provide SOLs for the COI and Pacific DC Intertie during the time period of the outage, which governs over any lower-priority SOLs.
- **Estimated known limit:** The "estimated known limit" priority is used to establish unstudied TTCs or to define seasonal Path TTCs that govern over "short-term seasonal" or "Path Rating" priorities.

- **Short-term seasonal:** The "short-term seasonal" priority is used for TTCs issued for seasonal Path Ratings. As these Ratings may be higher at certain times during the year, the short-term seasonal priority governs over the Path Rating priority. For example, if the longer-term Path Rating for North of John Day is 7800 MW, but seasonally, this Rating increases to 8000 MW, the short-term seasonal Rating of 8000 MW governs and is used to set the TTC during the season to which it applies.
- **Path Rating:** The "Path Rating" priority is used to set base TTCs using either the Rating of the Paths, SOLs studied using normal conditions, SOLs calculated for the planning horizon, or all of the above. The lowest value resulting from the above calculations within this grouping governs for the given time period and is used to set the TTC. For example, if under normal conditions the SOL for North of Hanford N>S is 4410 MW, but the SOL calculated for the planning horizon is 4100 MW, the lower SOL of 4100 MW governs and is used to set the TTC for this Network Path.
- **Informational limit (lowest priority):** The "informational limit" is used while establishing the initial setup of Paths within the scheduling and reservation system. The informational limit is equal to the initial Path Rating of the Path.

VII. Rated System Path Methodology

This section describes in detail how BPA implements the Rated System Path methodology for the Paths listed in Table 1. It addresses all of the Requirements in Standard MOD-029-1a.

BPA Paths

The following table shows the Paths for which BPA uses the Rated System Path methodology.

Table 1

Path Name	Direction
Northern Intertie Total On Oasis: NI_TOTL_N>S	(N>S)
Northern Intertie Total On OASIS: NI_TOTL_S>N	(S>N)
West of Hatwai On OASIS: WOH_E>W	(E>W)
Montana-Northwest West of Garrison On OASIS: WOGARR_E>W	(E>W)
Montana-Northwest West of Garrison On OASIS: WOGARR_W>E	(W>E)
La Grande On OASIS: LAGR_W>E	(W>E)
La Grande	(E>W)

Path Name	Direction
On OASIS: LAGR_E>W	
Montana Intertie On OASIS: MI_E>W	(E>W)
Reno-Alturas NW Sierra On OASIS: RATS_N>S	(N>S)
Reno-Alturas NW Sierra On OASIS: RATS_S>N	(S>N)
California-Oregon AC Intertie (COI) On OASIS: AC_N>S	(N>S)
California-Oregon AC Intertie (COI) On OASIS: AC_S>N	(S>N)
Pacific DC Intertie On OASIS: DC_S>N	(S>N)
Pacific DC Intertie On OASIS: DC_N>S	(N>S)
Rock Creek On OASIS: ROCKCK_GEN	Gen
John Day Wind On OASIS: JDWIND_GEN	Gen

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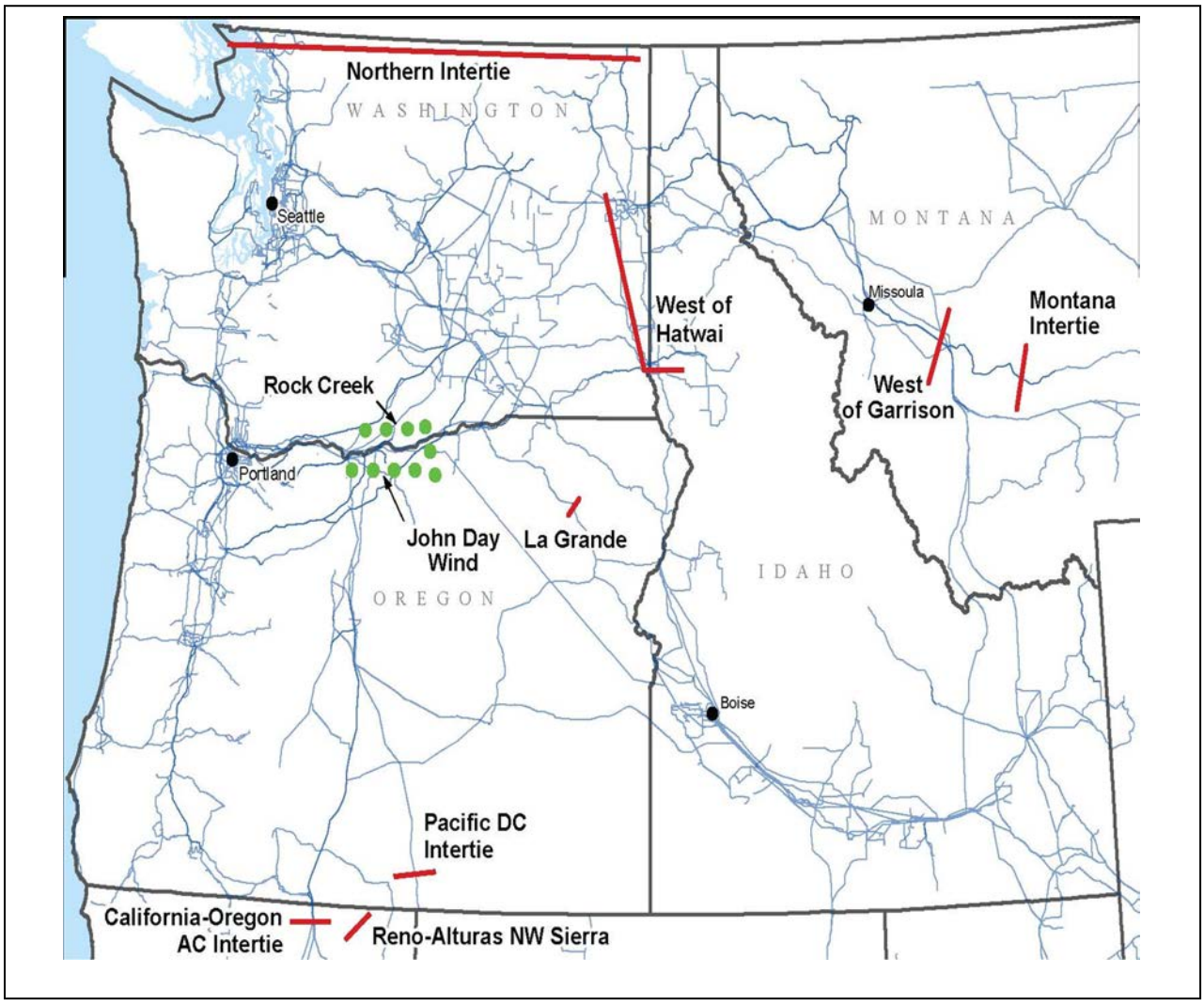
The following map shows the general geographic locations of the Paths listed in Table 1, above.

Figure 1
BPA Paths Map



Furthermore, BPA tracks and monitors the previous rolling 12 months of curtailments due to the issuance of generation limits. A report is created to show areas of the system that have exceeded the 24 cumulative hour threshold of such curtailments to be an ATC Path. (MOD-001 R1)

Once such paths have been implemented and ATC calculations have begun then Table 1 is updated to reflect the new ATC Paths. BPA will select Rated System Path Methodology for ATC Paths identified via this process. (MOD-001 R1)

Calculating Total Transfer Capability (TTC)

Data and Assumptions

When calculating TTC for its ATC Paths, BPA uses WECC base cases that utilize data and assumptions consistent with the time period being studied. (MOD-029 R1.1) In addition to BPA's TOP area, these WECC base cases model the entire Western Interconnection. Hence, the WECC base cases include all TOP areas regardless if they are either contiguous to BPA's TOP area or are linked to BPA's TOP area by a joint operating Agreement. (MOD-029 R1.1.1.2, R1.1.1.3)

TOP areas contiguous with BPA's TOP area include (MOD-029 R1.1.1.2):

- Avista Corporation (AVA)
- BC Hydro (BCH)
- California Independent System Operator (CAISO)
- City of Tacoma, Department of Public Utilities, Light Division
- Eugene Water and Electric Board (EWEB)
- Idaho Power Company (IPCO)
- Los Angeles Department of Water and Power (LADWP)
- NorthWestern Energy (NWMT)
- Sierra Pacific (doing business as NV Energy)
- PacifiCorp (PAC)
- Pend Oreille County Public Utility District No. 1
- Portland General Electric (PGE)
- Public Utility District No. 1 of Chelan County
- Public Utility District No. 1 of Clark County
- Public Utility District No. 1 of Snohomish County
- Public Utility District No. 2 of Grant County, Washington
- PUD No. 1 of Douglas County
- Puget Sound Energy, Inc. (PSEI)
- Seattle City Light (SCL)

BPA uses the following data and assumptions in the WECC base cases when calculating TTCs for its ATC Paths:

BPA models all existing System Elements in their normal operating condition for the assumed initial conditions, up to the time horizon in which BPA begins modeling outages (see Section V, "Outages," beginning on p. 5). (MOD-029 R1.1.2)

The WECC base cases include generators and phase shifters that meet the guidelines set out in the WECC Data Preparation Manual. (MOD-029 R1.1.3) (MOD-029 R1.1.4)

BPA uses the seasonal Load forecasts contained in the WECC base cases for each BA. (MOD-029 R1.1.5)

Generation and Transmission Facility additions and retirements within the WECC footprint are included in the WECC seasonal operating base cases for the season in which they are energized/de-energized, respectively. BPA engineers modify the WECC base cases to reflect the actual dates of energization/de-energization. (MOD-029 R1.1.6, R1.1.7)

The WECC base cases include Facility Ratings as provided to WECC by the Transmission Owners and Generator Owners. (MOD-029 R1.2)

If Facility changes are made by BPA or another entity, then the base cases will be updated to reflect these changes with a Mid-Season update. (MOD-029 R1.1, R1.2)

The approved seasonal operating base cases that include the Facility changes will not be used until 0 to 16 days prior to the energization or implementation of the Facility change. (MOD-029 R1.1, R1.2)

For periods beyond two weeks, the WECC base cases will be updated as necessary to perform seasonal studies for the current or upcoming season in accordance with the current BPA study processes. For the seasons or time periods in which the seasonal studies have not been completed, the last year's seasonal study results will be used for setting the TTC for the relevant Path. BPA uses the minimum SOL from the relevant seasonal studies to set the TTC of the Path for periods beyond two weeks. For periods within the next two weeks, when there are no studied outages, BPA uses the maximum SOL from the relevant seasonal studies to set the TTC of the Path. (MOD-029 R1.1, R1.2, R2.1)

BPA models Special Protection Systems (BPA uses the term Remedial Action Schemes or RAS) that currently exist or are projected for implementation within the studied time horizon. (MOD-029 R1.1.8)

The WECC base cases include all series compensation for each line at the expected operating level. (MOD-029 R1.1.9)

BPA uses no other modeling requirements for calculating TTC in addition to those specified in this document. (MOD-029 R1.1.10)

Process to Determine TTC

BPA adjusts generation and Load levels within the WECC power-flow base cases to determine the TTC that can be simulated for each of its ATC Paths, while at the same time satisfying all planning criteria contingencies, as follows:

When modeling normal conditions, BPA models all Transmission Elements in BPA's BAA and adjacent BAAs at or below 100 percent of their continuous Rating. (MOD-029 R2.1.1)

Refer to Appendix B of this ATCID, BPA Technical Operations System Operating Limits Methodology for the Operations Horizon (SOL Methodology) for a detailed description of how BPA determines SOLs used to set TTCs. (MOD-029 R2.1.2)

By meeting the criteria in Appendix B, uncontrolled separation should not occur. (MOD-029 R2.1.3)

All of the ATC Paths for which BPA uses the Rated System Path Methodology have reliability-based SOLs in both the prevailing and non-prevailing directions of flow except for two Paths listed below. BPA's TTC values are based on these SOLs.

For the West of Hatwai and Montana Intertie Paths, BPA uses the prevailing flow direction TTC as the non-prevailing flow direction TTC. The prevailing direction for both of these Paths is the east to west direction. (MOD-029 R2.2)

For ATC Paths where TTC varies due to simultaneous interaction with one or more other Paths, BPA develops a nomogram, represented either by an equation or its graphical representation, describing the interaction of the Paths and the resulting TTC under specified conditions. BPA then calculates a value, based on that nomogram and forecasted System conditions for the time period studied, to develop its TTC values for the affected ATC Paths. (MOD-029 R2.4)

BPA or the adjacent Path TOP identifies when the new or increased TTC for an ATC Path being studied by BPA or the adjacent Path TOP has an adverse impact on the TTC value of another existing Path by modeling the flow on the Path being studied at its proposed new TTC level, while simultaneously modeling the flow on the existing Path at its TTC level. In doing so, BPA or the adjacent Path TOP honors the reliability criteria described above. BPA or the adjacent Path TOP includes the resolution of this adverse impact in its study report for the ATC Path. (MOD-029 R2.5)

BPA has Transmission Ownership Agreements where multiple ownerships of Transmission rights exist on an ATC Path. TTC for the affected ATC paths is allocated according to contractual ownership rights. See section IV, "Allocation Processes" for further details. (MOD-029 R2.6)

BPA does not have any ATC Paths whose Ratings were established, known, and used in operation since January 1, 1994. (MOD-029 R2.7)

BPA creates a study report that describes the TTC applicable to the outages during the studied time period and includes the limiting Contingencies and the limiting cause for the calculated TTC. BPA's study assumptions document (SOL Methodology, Appendix B) defines the steps taken and Contingencies and assumptions BPA used to determine TTC for each ATC path. BPA creates a study report for each study it performs. The study report relies on the basic assumptions included in the SOL methodology and identifies any changes to those basic assumptions. (MOD-029 R2.8)

As described in Section III, "Overview," information regarding TTCs is shared electronically between the appropriate BPA organizations within seven calendar days of the finalization of the study report for the TTCs. BPA sends a notice to all TSPs for the ATC Paths listed in Table 1 where there are multiple TSPs *prior* to limitations in TTCs. (MOD-029 R4)

These notices are called Notices of Planned Path Limitation. Where BPA has performed a study, the notice states that the TTC study report is available to TSPs for the specific Path within seven calendar days upon request to nercatcstandard@bpa.gov with **TTC Study Report Request** in the subject line. Use the **TTC Study Report Request Form** found on BPA's website shown below to submit the request.

http://transmission.bpa.gov/business/atc_methodology/

An ATC Path for which BPA does not perform studies to determine the most current value of TTC is Reno – Alturas NW Sierra (RATS). For RATS, NV Energy determines TTC. The TTC Ratings are provided to BPA and BPA then sends a Notice of Planned Path Limitation. (MOD-029 R3)

Calculating Firm Transmission Service

Calculating Firm Existing Transmission Commitments (ETC_F)

When calculating ETC_F for all time periods for its ATC Paths, BPA uses the following algorithm as specified in MOD-029 R5:

$$\mathbf{ETC_F = NL_F + NITS_F + GF_F + PTP_F + ROR_F + OS_F}$$

Where:

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 Load growth not otherwise included in TRM or CBM.

BPA does not use the NL_F component of the ETC_F calculation for any of its ATC Paths. All of BPA's firm Transmission obligations are included in contracts, Agreements and obligations captured in the $NITS_F$, PTP_F and GF_F components of this algorithm. Therefore BPA sets NL_F at zero for all of its ATC Paths for all time periods.

$NITS_F$ is the firm capacity reserved for Network Integration Transmission Service serving Load, to include losses and Load growth.

For BPA's ATC Paths where $NITS_F$ commitments exist to serve Network Load outside BPA's BAA, the firm capacity set aside for $NITS_F$ is equal to the Load forecast, which includes losses and Load growth, minus generation outside BPA's BAA that is designated to serve that Load. For BPA's ATC Paths where $NITS_F$ commitments exist to serve Network Load inside BPA's BAA from a forecasted or designated network resource that impacts the ATC Path, the firm capacity set aside for $NITS_F$ is equal to the amount the resource is forecasted/designated for.

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 BPA's Open Access Transmission Tariff (OATT).

The amount of GF_F BPA sets aside is based on the terms of each individual contract.

PTP_F is the firm capacity reserved for confirmed Point-to-Point Transmission Service and is equal to the sum of the PTP_F contract Demands.

In BPA's calculations, PTP_F is equal to the sum of the MW Demands of PTP_F reservations or schedules. In some cases, BPA has PTP_F contracts that give customers the right to schedule between multiple Points of Receipt (PORs) and Points of Delivery (PODs). However, the customer can only schedule up to the MW amount specified in their contract. Multiple reservations are created for these special cases to allow BPA to model each POR-to-POD combination. The amount set aside for these cases does not exceed the total PTP_F capacity specified in the contracts.

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

BPA assumes that all of its Transmission Service Agreements eligible to roll-over in the future will be rolled over. Therefore, ROR_F is equal to the sum of the $NITS_F$, GF_F and PTP_F obligations that are eligible for roll-over rights. If a Transmission Customer chooses not to exercise its roll-over rights by the required deadline, BPA no longer holds out capacity for roll-over rights for that Transmission Customer.

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

BPA has no other services beyond those specified above. Therefore BPA sets OS_F at zero for all of its ATC Paths for all time periods.

As a result, BPA calculates ETC_F for its ATC Paths for all time periods as follows:

$$\mathbf{ETC_F = NITS_F + GF_F + PTP_F + ROR_F}$$

While BPA includes all of the components described above in ETC_F, BPA accounts for $NITS_F$, GF_F, PTP_F and ROR_F in its ATC calculations using different variables. Descriptions of the variables for ATC_F calculations begin on p. 154 and for ATC_{NF} calculations, p.18.

Calculating Firm Available Transfer Capability (ATC_F)

When calculating ATC_F for its ATC Paths for all time periods, BPA uses the following algorithm (MOD-029 R7):

$$\mathbf{ATC_F = TTC - ETC_F - CBM - TRM + Postbacks_F + Counterflows_F}$$

Where:

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

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

See "Process to Determine TTC" beginning on p. 111, for a description of how BPA determines TTC.

ETC_F is the sum of existing firm commitments for that ATC Path during that period.

For ATC_F calculations for all time periods, BPA further divides ETC_F into the following algorithm in order to capture both its firm Long-Term and Short-Term Reservations:

ETC_F = LRES + SRES + LETC - SADJ/ETC Adjustments

Where:

LRES is the sum of the $NITS_F$, PTP_F, ROR_F and GF_F Long-Term Reservations.

SRES is the sum of the PTP_F Short-Term Reservations.

LETC is used to make two different adjustments to ETC_F. The first adjustment is made to ensure that the amount of PTP_F capacity BPA sets aside in the LRES variable for contracts where BPA gives customers the right to schedule the capacity reserved between multiple PORs and PODs does not exceed the total PTP_F capacity specified in those contracts.

The second adjustment is made only on the West of Hatwai E>W Path. On this ATC Path, BPA uses LETC to hold out $NITS_F$ capacity for the Western Montana hydro projects (Albeni Falls, Libby, Hungry Horse and Dworshak) located east of West of Hatwai to serve Network Load west of West of Hatwai, since no reservation exists for this $NITS_F$ obligation.

SADJ/ETC Adjustments is the variable BPA uses to make adjustments to ETC_F not captured in LRES or SRES**.** On the West of Garrison Path, BPA has two PTP_F Long-Term Reservations, captured in LRES, that hold out capacity in the E>W direction. However, the energy associated with these reservations is affected by a parallel path and flows in the W>E direction as well. SADJ/ETC Adjustments is used to hold out capacity in the W>E direction to accurately account for this flow as an ETC_F adjustment.

BPA applies another such adjustment to allow for deferral competitions, as required in Section 17.7 of BPA's OATT. When a deferral reservation is confirmed, BPA applies an ETC adjustment to hold out transfer capability for the time period deferred, starting at the latter of five months out or the service commencement date of the original reservation, to allow for a competition. At four months out, if no competition is identified, the ETC adjustment is modified to post back transfer capability for the fourth month out.

BPA also uses SADJ/ETC adjustments to ensure accurate accounting of ETC_F. These adjustments may be performed to account for situations such as data modeling corrections, and will be noted in the descriptions of the adjustments.

The following diagram illustrates how the variables used in BPA's ETC_F calculations correspond to the variables contained in the ETC_F algorithm shown in "Calculating Firm Existing Transmission Commitments" beginning on p. 133.

ETC_F =	$NITS_F$	+	GF_F	+	PTP_F	+	ROR_F
	↓		↓		↓		↓
	LRES		LRES		LRES		LRES

	+				+		
					SRES		
					+		
	LETC				LETC		
	-		-		-		-
	SADJ/ETC Adjustments		SADJ/ETC Adjustments		SADJ/ETC Adjustments		SADJ/ETC Adjustments

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

BPA does not maintain CBM. Therefore BPA sets CBM at zero for all of its ATC Paths for all time periods.

TRM is the Transmission Reliability Margin for the ATC Path during that period.

BPA maintains TRM on the Northern Intertie Path as described in its TRMID for all time periods. BPA does not maintain TRM in its ATC calculation for any other ATC Paths. Therefore, BPA sets TRM at zero for all remaining ATC Paths for all time periods.

$Postbacks_F$ are changes to ATC_F due to a change in the use of Transmission Service for that period.

Because BPA automatically recalculates ETC_F whenever there is a reduction in LRES or SRES, BPA does not use $Postbacks_F$ for calculating ATC_F on any of its ATC Paths. Therefore BPA sets $Postbacks_F$ at zero for all of its ATC Paths for all time periods.

$Counterflows_F$ are adjustments to ATC_F.

BPA does not include confirmed Transmission reservations, expected interchange or internal flow counter to the direction of the ATC Path being calculated in its ATC_F calculations. BPA's rationale is that it does not want to offer firm transfer capability due to counterflow that may not be scheduled as this could lead to Curtailments of Firm Transmission Service in the Real-time horizon. (MOD-001 R3.2) Therefore BPA sets $Counterflows_F$ at zero for all of its ATC Paths for all time periods.

As a result, BPA calculates ATC_F for all of its ATC Paths, except the Northern Intertie Path, for all time periods as follows:

$$\mathbf{ATC_F = TTC - ETC_F}$$

BPA calculates ATC_F for the Northern Intertie Path for all time periods as follows:

$$\mathbf{ATC_F = TTC - ETC_F - TRM}$$

Calculating Non-Firm Transmission Service

BPA sells six non-firm Transmission products. Those products are:

1. **$NITS_{NF6}$**. This is a non-firm Transmission product available only to Transmission Customers with NITS Agreements. It is the highest quality of Non-Firm Transmission Service in that it is the last Non-Firm Transmission Service that would be Curtailed, if necessary.

2. **PTP_{NF5}**. This is a non-firm Transmission product available only to Transmission Customers with PTP service Agreements. PTP_{NF5} is the fifth Non-Firm Transmission Service that would be Curtailed, if necessary.

3. **PTP_{NF4}**. This is a non-firm Transmission product available only to Transmission Customers with PTP service Agreements. PTP_{NF4} is the fourth Non-Firm Transmission Service that would be Curtailed, if necessary.

4. **PTP_{NF3}**. This is a non-firm Transmission product available only to Transmission Customers with PTP service Agreements. PTP_{NF3} is the third Non-Firm Transmission Service that would be Curtailed, if necessary.

5. **PTP_{NF2}**. This is a non-firm Transmission product available only to Transmission Customers with PTP service Agreements. PTP_{NF2} is the second Non-Firm Transmission Service that would be Curtailed, if necessary.

6. **PTP_{NF1}.** This is a non-firm Transmission product available only to Transmission Customers with PTP service Agreements. PTP_{NF1} is the first Non-Firm Transmission Service that would be Curtailed, if necessary (i.e., this Transmission Service has the highest likelihood of being Curtailed).

BPA calculates ETC_{NF} and ATC_{NF} for each of these products.

Calculating Non-Firm Existing Transmission Commitments (ETC_{NF})

BPA calculates ETC_{NF} for all time periods for an ATC Path using the following algorithm as specified in MOD-029 R6:

$$\mathbf{ETC_{NF} = NITS_{NF} + GF_{NF} + PTP_{NF} + OS_{NF}}$$

Where:

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

In BPA's calculations, this is $NITS_{NF6}$. It does not include losses or Load growth, since losses and Load growth are already set aside as firm capacity in $NITS_F$.

GF_{NF} is the non-firm capacity set aside for grandfathered Transmission Service and contracts for energy and/or Transmission Service, where executed prior to the effective date of BPA's OATT.

BPA has no grandfathered Non-Firm Transmission Service obligations. Therefore BPA sets GF_{NF} at zero for all of its ATC Paths for all time periods.

PTP_{NF} is non-firm capacity reserved or scheduled for confirmed PTP Transmission Service.

In BPA's calculations, this includes PTP_{NF5}, PTP_{NF4}, PTP_{NF3}, PTP_{NF2} and PTP_{NF1}.

OS_{NF} is the non-firm capacity reserved for any other service(s), contract(s), or Agreement(s) not specified above using Non-Firm Transmission Service.

BPA has no other services beyond those specified above. Therefore BPA sets OS_{NF} at zero for all of its ATC Paths for all time periods.

As a result, BPA calculates ETC_{NF} for its ATC Paths for all time periods as follows:

$$\mathbf{ETC_{NF} = NITS_{NF} + PTP_{NF}}$$

While BPA includes all of the components described above in ETC_{NF}, BPA accounts for $NITS_{NF}$ and PTP_{NF} in its ATC_{NF} calculations using different variables. A description of the variables used begins on p.18.

Calculating Non-Firm Available Transfer Capability (ATC_{NF})

BPA uses different algorithms to calculate ATC_{NF}, ETC_F, ETC_{NF} and $Postbacks_{NF}$ for two time horizons for all of its ATC Paths: Real-time and beyond Real-time. The Real-time horizon begins at 10 p.m. on the pre-schedule day for the 24 hours in the next day. ETC_F and ETC_{NF} for the Real-Time horizon are calculated using schedules and reservations that have not yet been scheduled. The beyond Real-time horizon includes hourly for the hours after those included in the Real-time period as well as daily and monthly calculations. ETC_F and ETC_{NF} for the time horizon beyond Real-time are calculated using reservations.

BPA calculates ETC_{NF} and ATC_{NF} for the six non-firm Transmission products associated with NERC Curtailment priorities (described on p.17) as follows:

1. **ATC_{NF6}**: ATC_{NF6} is calculated for the $NITS_{NF6}$ product. ETC_{NF} in this equation only includes $NITS_{NF6}$.

2. **ATC_{NF5}**: ATC_{NF5} is calculated for the PTP_{NF5} product. ETC_{NF} in this equation includes $NITS_{NF6}$ and PTP_{NF5}.

3. **ATC_{NF4}**: ATC_{NF4} is calculated for the PTP_{NF4} product. ETC_{NF} in this equation includes $NITS_{NF6}$, PTP_{NF5} and PTP_{NF4}.

4. **ATC_{NF3}**: ATC_{NF3} is calculated for the PTP_{NF3} product. ETC_{NF} in this equation includes $NITS_{NF6}$, PTP_{NF5}, PTP_{NF4}, and PTP_{NF3}.

5. **ATC_{NF2}**: ATC_{NF2} is calculated for the PTP_{NF2} product. ETC_{NF} in this equation includes $NITS_{NF6}$, PTP_{NF5}, PTP_{NF4}, PTP_{NF3} and PTP_{NF2}.

6. **ATC_{NF1}:** ATC_{NF1} is calculated for the PTP_{NF1} product. ETC_{NF} in this equation includes $NITS_{NF6}$, PTP_{NF5}, PTP_{NF4}, PTP_{NF3}, PTP_{NF2} and PTP_{NF1}.

The following section describes how BPA calculates ATC_{NF} for each time period.

When calculating ATC_{NF} for its ATC paths for the two time horizons described above, BPA uses the following algorithm as specified in MOD-029 R8:

$$\mathbf{ATC_{NF} = TTC - ETC_F - ETC_{NF} - CBM_S - TRM_U + Postbacks_{NF} + Counterflow_{NF}}$$

Where:

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

As previously described, BPA calculates six ATC_{NF} values, one for each of its six non-firm Transmission products.

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

See "Calculating Total Transfer Capability" beginning on p. 100 for a description of BPA's process to determine TTC.

ETC_F is the sum of existing firm commitments for the ATC Path during that period.

BPA uses different algorithms to calculate ETC_F for all of its ATC Paths for the time horizon beyond Real-time and the Real-time horizon.

ETC_F for the Time Horizon Beyond Real-Time

For ATC_{NF} calculations for the time horizon beyond Real-time, BPA further divides ETC_F into the following algorithm in order to capture both its firm Long-Term and Short-Term Reservations:

$$\mathbf{ETC_F = LRES + SRES - SADJ/ETC\ Adjustments + LETC}$$

Where:

LRES is the sum of the $NITS_F$, PTP_F, ROR_F and GF_F Long-Term Reservations.

SRES is the sum of the PTP_F Short-Term Reservations.

SADJ/ETC Adjustments is the variable used to make adjustments to ETC_F not captured in LRES or SRES. On the West of Garrison Path, BPA has two PTP_F reservations, captured in LRES, that hold out capacity in the E>W direction. However, the energy associated with these reservations is affected by a parallel path and flows in the W>E direction as well. SADJ/ETC Adjustments is used to hold out capacity in the W>E direction to accurately account for this flow as an ETC_F adjustment.

BPA applies another such adjustment to allow for deferral competitions, as required in Section 17.7 of BPA's OATT. When a deferral reservation is confirmed, BPA applies an ETC adjustment to hold out transfer capability for the time period deferred, starting at the latter of five months out or the service commencement date of the original reservation, to allow for a competition. At four months out, if no competition is identified, the ETC adjustment is modified to add back transfer capability for the fourth month out.

BPA also uses SADJ/ETC adjustments to ensure accurate accounting of ETC_F. These adjustments may be performed to account for situations such as data modeling corrections, and will be noted in the descriptions of the adjustments.

LETC is used to make two different adjustments to ETC_F. The first adjustment is made to ensure that the amount of PTP_F capacity BPA sets aside in the LRES variable for contracts where BPA gives customers the right to schedule the capacity reserved between multiple PORs and PODs does not exceed the total PTP_F capacity specified in those contracts.

The second adjustment is made only on the West of Hatwai E>W Path. On this ATC Path BPA uses LETC to hold out $NITS_F$ capacity for the Western Montana hydro projects (Albeni Falls, Libby, Hungry Horse and Dworshak) located east of West of Hatwai to serve Network Load west of West of Hatwai, since no reservation exists for this $NITS_F$ obligation.

The following diagram illustrates how the variables used in BPA's ETC_F calculation correspond to the variables contained in the ETC_F algorithm shown in "Calculating Firm Existing Transmission Commitments" beginning on p.133.

ETC_F =	$NITS_F$	+	GF_F	+	PTP_F	+	ROR_F
	↓		↓		↓		↓
	LRES		**LRES**		**LRES**		**LRES**
					+		
					SRES		
	+				+		
	LETC				**LETC**		
	-		-		-		-
	SADJ/ETC Adjustments		**SADJ/ETC Adjustments**		**SADJ/ETC Adjustments**		**SADJ/ETC Adjustments**

ETC_F for the Real-Time Horizon

For ATC_{NF} calculations for the Real-time horizon, ETC_F is expressed as follows:

$$\mathbf{ETC_F = SCH^+_7 + ASC^+_7 + RADJ/ETC\ Adjustment}$$

Where:

SCH^+_7 is the sum of the positive schedules that reference confirmed $NITS_F$, GF_F and PTP_F reservations for the ATC Path for that period.

ASC^+_7 is the sum of the positive dynamic schedules that reference confirmed $NITS_F$, GF_F and PTP_F reservations for the ATC Path for that period.

RADJ/ETC Adjustment is used to adjust hourly ETC_F on the West of Hatwai E>W Path to account for a $NITS_F$ obligation (note that this obligation is accounted for in LETC in the time horizon beyond Real-time). The adjustment is equal to the difference between the BPA BAA Load estimate east of West of Hatwai and the average MW output of the western Montana hydro projects (Albeni Falls, Libby, Hungry Horse, Dworshak), located east of West of Hatwai. When this value changes +/- 50 MW in the Real-time horizon based on a change in the generation and Load estimates, for any given hour, BPA updates this ETC adjustment to reflect the new hourly value.

BPA also uses RADJ/ETC adjustments to ensure accurate accounting of ETC_F. These adjustments may be performed to account for situations such as data modeling corrections.

The following diagram illustrates how the variables used in BPA's ETC_F calculation correspond to the variables contained in the ETC_F algorithm shown in "Calculating Firm Existing Transmission Commitments" beginning on p.13. ROR_F is not included in ETC_F for the Real-time horizon because ROR_F is not relevant for the Real-time horizon.

ETC_F =	$NITS_F$	+	GF_F	+	PTP_F
	↓		↓		↓
	SCH^+_7		SCH^+_7		SCH^+_7
	+		+		+
	ASC^+_7		ASC^+_7		ASC^+_7
	+		+		+
	RADJ/ETC Adjustment		**RADJ/ETC Adjustment**		**RADJ/ETC Adjustment**

ETC_{NF} is the sum of existing non-firm commitments for the ATC Path during that period.

BPA uses different algorithms to calculate ETC_{NF} for all of its ATC Paths for the time horizon beyond Real-time and the Real-time horizon.

ETC_{NF} for the Time Horizon Beyond Real-Time

For ATC_{NF} calculations in the time horizon beyond Real-time, ETC_{NF} is expressed as follows:

$$ETC_{NF} = RRES_{6,5,4,3,2,1}$$

Where:

$RRES_{6,5,4,3,2,1}$ is the sum of all confirmed $NITS_{NF6}$, PTP_{NF5}, PTP_{NF4}, PTP_{NF3}, PTP_{NF2} and PTP_{NF1} reservations.

The following diagram explains how the variables used in BPA's ETC_{NF} calculation correspond to the variables contained in the ETC_{NF} algorithm shown in "Calculating Non-Firm Existing Transmission Commitments" beginning on p.17.

ETC_{NF} =	$NITS_{NF}$	+	PTP_{NF}

	↓		↓
	$RRES_{6,5,4,3,2,1}$		$RRES_{6,5,4,3,2,1}$

ETC_{NF} for the Real-Time Horizon

For ATC_{NF} calculations in the Real-time horizon, ETC_{NF} is expressed as follows:

$$ETC_{NF} = SCH^{+}_{6,5,4,3,2,1} + ASC^{+}_{6,5,4,3,2,1}$$

Where:

$SCH^{+}_{6,5,4,3,2,1}$ is the sum of the positive Demands of schedules referenced to confirmed $NITS_{NF6}$, PTP_{NF5}, PTP_{NF4}, PTP_{NF3}, PTP_{NF2} and PTP_{NF1} reservations, plus the sum of the positive Demands of confirmed $NITS_{NF6}$, PTP_{NF5}, PTP_{NF4}, PTP_{NF3}, PTP_{NF2} and PTP_{NF1} reservations that have not yet been scheduled. Once these reservations are scheduled, the schedule is used for ETC_{NF}, thereby adding back the difference between the reservation and schedule amounts to ATC_{NF}.

$ASC^{+}_{6,5,4,3,2,1}$ is the sum of positive Demands of dynamic schedules referenced to confirmed $NITS_{NF6}$, PTP_{NF5}, PTP_{NF4}, PTP_{NF3}, PTP_{NF2} and PTP_{NF1} reservations for the ATC Path.

The following diagram explains how the variables used in BPA's ETC_{NF} calculation correspond to the variables contained in the ETC_{NF} algorithm shown in "Calculating Non-Firm Existing Transmission Commitments" beginning on p.17.

ETC_{NF} =	$NITS_{NF}$	+	PTP_{NF}
	↓		↓
	$SCH^{+}_{6,5,4,3,2,1}$		$SCH^{+}_{6,5,4,3,2,1}$
	+		+
	$ASC^{+}_{6,5,4,3,2,1}$		$ASC^{+}_{6,5,4,3,2,1}$

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

BPA does not maintain CBM. Therefore BPA sets CBM_S at zero for all of its ATC Paths for all time periods.

TRM_U is the Transmission Reliability Margin for the ATC Path that has not been released for sale as non-firm capacity during that period.

BPA does not release TRM for the Northern Intertie Path as non-firm capacity, as described in BPA's TRMID. BPA does not maintain TRM in its ATC calculation for any other ATC Paths. Therefore BPA sets TRM_U for the Northern Intertie Path as described in its TRMID and at zero for all other ATC Paths for all time periods.

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

BPA uses different algorithms to calculate $Postbacks_{NF}$ for all of its ATC Paths for the time horizon beyond Real-time and the Real-time horizon.

$Postbacks_{NF}$ for the Time Horizon Beyond Real-time

BPA does not use $Postbacks_{NF}$ for calculating ATC_{NF} for any of the ATC Paths for the time horizon beyond Real-time. Therefore BPA sets $Postbacks_{NF}$ at zero for all of its ATC Paths for the time horizon beyond Real-Time.

$Postbacks_{NF}$ for the Real-time Horizon

For ATC_{NF} calculations in the Real-time horizon, there are circumstances in which BPA uses $Postbacks_{NF}$, expressed as RADJ/ETC.

One such postback is applied to hourly calculations on the West of Garrison E>W Path. In situations where schedules exceed the SOL on the West of Garrison E>W Path, BPA may post back up to 200 MW of capacity because of the RAS on that Path associated with Miles City Load. The exact capacity from Miles City available to be posted back to ATC_{NF} is determined by nomograms selected by BPA's RAS dispatcher for different System conditions.

Another postback is applied to the COI N>S Path. For its hourly COI N>S non-firm calculations, BPA posts back any unused share of non-firm capacity that is available to BPA by capacity ownership and other Agreements for the COI N>S, if needed to prevent Curtailments.

For all other ATC Paths, there are no other Postbacks expressed as RADJ/ETC.

$Counterflow_{NF}$ are adjustments to ATC_{NF}.

Since a schedule provides assurance that the transaction will flow, all counterflow resulting from firm and non-firm Transmission schedules, excluding tag types dynamic and capacity, are added back to ATC_{NF} in the $Counterflows_{NF}$ component. (MOD-001 R3.2)

In BPA's ATC_{NF} calculations, $Counterflows_{NF}$ is expressed as $SCH^{-}_{7,6,5,4,3,2,1}$, which is the sum of schedules flowing in the direction counter to the direction of the ATC Path.

As a result, BPA calculates ATC_{NF} for all of its ATC Paths, except the Northern Intertie Path, for all time periods as follows:

$$\mathbf{ATC_{NF} = TTC - ETC_{F} - ETC_{NF} + Postbacks_{NF} + Counterflows_{NF}}$$

BPA calculates ATC_{NF} for its Northern Intertie Path for all time periods as follows:

$$ATC_{NF} = TTC - ETC_{F} - ETC_{NF} - TRM_{U} + Postbacks_{NF} + Counterflows_{NF}$$

In some cases, the amount of $Counterflows_{NF}$ exceeds the sum of the ETC_F and ETC_{NF}, which, when added to TTC, results in ATC_{NF} greater than TTC.

Note: The variable RADJ/ETC is also used to respond to a BPA dispatcher order to change ATC values by a specified amount and thereby reduce schedules in-hour when the flow exceeds the SOL.

VIII. Network Path Methodology

This section describes in detail how BPA implements the Rated System Path Methodology for the ATC Paths listed in Table 2. It addresses all of the requirements in Standard MOD-029-1a.

BPA Network Paths

The following table shows the Network Paths for which BPA uses the Rated System Path Methodology:

Table 2

BPA Network Paths

Network Path	Direction	Transmission Line Components
North of Hanford On OASIS: NOHANF	(N>S)	Vantage-Hanford 500kV; Grand Coulee-Hanford 500kV; and Shultz-Wautoma 500kV
North of Hanford On OASIS: NOHANF	(S>N)	Vantage-Hanford 500kV; Grand Coulee-Hanford 500kV; and Shultz-Wautoma 500kV
South of Allston On OASIS: SOALSN	(N>S)	BPA -Owned Transmission Lines: Keeler-Allston 500kV; Lexington-Ross 230kV; and and St. Helens-Allston 115kV; Portland General Electric -Owned Transmission Lines: Trojan-St. Marys 230kV; and Trojan-River Gate 230kV; PacifiCorp-Owned Transmission Lines: Merwin-St. Johns 115kV; Astoria-Seaside 115kV; and and Clatsop 230/115kV
South of Allston On OASIS: SOALSN	(S>N)	BPA -Owned Transmission Lines: Keeler-Allston 500kV; Lexington-Ross 230kV; and St. Helens-Allston 115kV; Portland General Electric -Owned

Network Path	Direction	Transmission Line Components
		Transmission Lines: Trojan-St. Marys 230kV; and Trojan-River Gate 230kV; PacifiCorp-Owned Transmission Lines: Merwin-St. Johns 115kV; Astoria-Seaside 115kV; and Clatsop 230/115kV
North of John Day On OASIS: NOJDAY	(N>S)	Ashe-Marion 500kV; Ashe-Slatt 500kV; Wautoma-Ostrander 500kV; Wautoma-Rock Creek 500kV; Raver-Paul 500kV; and Lower Monumental-McNary 500kV
Paul-Allston On OASIS: PAUL_ALSN	(N>S)	Napavine-Allston #1 500kV; and Paul-Allston #2 500kV
Raver-Paul On OASIS: RAVR_PAUL	(N>S)	Raver-Paul 500 kV Line During outage conditions, the following lines are monitored: Raver – Paul #1 500-kV; St. Clair – South Tacoma #1 230kV; Chehalis – Covington #1 230kV; Puget Sound Energy-Owned Transmission Lines: Frederickson– St. Clair 115kV; Electron Heights – Blumaer 115kV
Cross Cascades North On OASIS: C-CASC_N	(E>W)	BPA-Owned Transmission Lines Schultz-Raver #1, 3, & 4 500kV; Schultz-Echo Lake #1 500kV; Chief Joseph-Monroe 500kV; Chief Joseph-Snohomish #3 & 4 345kV; Rocky Reach-Maple Valley 345kV; Grand Coulee-Olympia 287kV; Bettas Road - Covington #1 230kV. Puget Sound Energy-Owned Transmission Line Rocky Reach – Cascade 230 kV
Cross Cascades South On OASIS: C-CACS_S	(E>W)	Big-Eddy-Ostrander 500kV; Ashe-Marion 500kV; Buckley-Marion 500kV; Wautoma-Ostrander 500kV; John Day-Marion 500kV; McNary-Ross 345kV; Big Eddy-Chemawa 230kV;

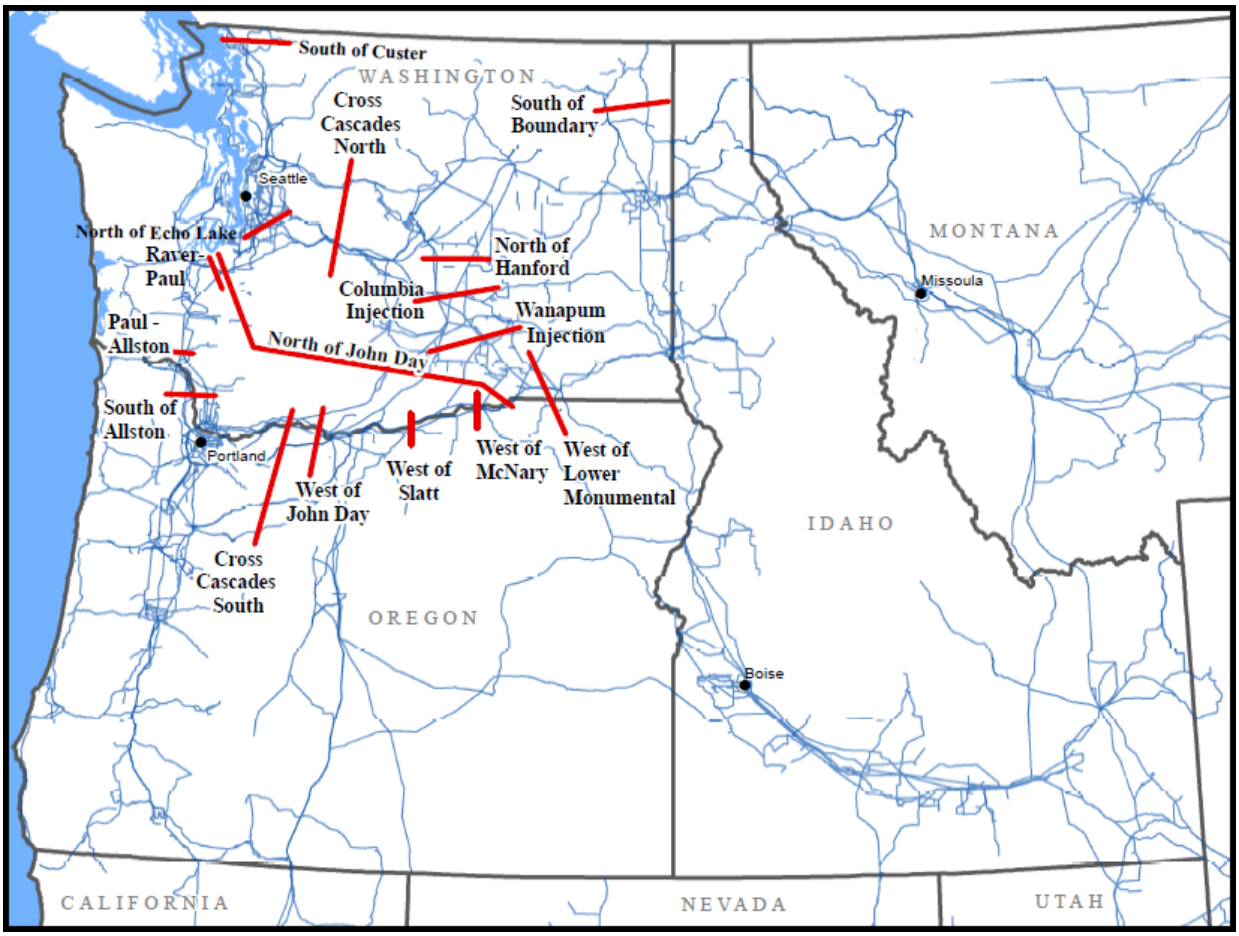
Network Path	Direction	Transmission Line Components
		Big Eddy-McLoughlin 230kV; Midway-North Bonneville 230kV; Jones Canyon-Santiam 230kV; and Big Eddy-Troutdale 230kV PGE-Owned Transmission Line Bethel – Round Butte 230 kV
West of McNary On OASIS: WOMCNY	(E>W)	Coyote Springs-Slatt #1 500kV; McNary-Ross #1 345kV; Harvalum – Big Eddy #1 230 kV; Jones Canyon-Santiam #1 230kV; and McNary-John Day #2 500kV
West of Slatt On OASIS: WOSLATT	(E>W)	Slatt-Buckley 500kV; and Slatt-John Day 500kV
West of John Day On OASIS: WOJD	(E>W)	John Day – Big Eddy No. 1 500-kV line (metered at John Day); John Day – Big Eddy No. 2 500-kV line (metered at John Day); and John Day – Marion No. 1 500kV
South of Boundary On OASIS: SBNDRY	(N>S)	Bell – Boundary #1 230kV; Bell – Boundary #3 230kV; Usk – Boundary #1 230kV; and Boundary 230/115kV Transformer #1
Columbia Injection On OASIS: CLMBIA	(N>S)	Columbia-Grand Coulee #1 230-kV (metered at Columbia); Columbia-Grand Coulee #3 230-kV (metered at Columbia); Rocky Reach-Columbia #1 230-kV (metered at Columbia); Rocky Reach-Columbia #2 230-kV (metered at Columbia); Columbia-Valhalla #1 115-kV (metered at Columbia); and Columbia-Valhalla #2 115-kV (metered at Columbia)
Wanapum Injection On OASIS: WANAPM	(N>S)	Midway-Vantage #1 230-kV; and Midway-Priest Rapids #3 230-kV
West of Lower Monumental On OASIS: W_LOMO	(E>W)	Ashe – Lower Monumental 500kV; Hanford – Lower Monumental 500kV; and McNary – Lower Monumental 500kV
North of Echo Lake On OASIS: N_ECOL	(S>N)	Echo Lake – Monroe - SnoKing Tap #1 500kV; Echo Lake – Maple Valley #1 500 kV; Echo Lake – Maple Valley #2 500kV; and Covington – Maple Valley #2 230kV

Network Path	Direction	Transmission Line Components
South of Custer On OASIS: SCSTER	(N>S)	Monroe - Custer #1 500kV; Monroe - Custer #2 500kV; Bellingham - Custer #1 230kV; and Murray - Custer #1 230kV Line

The following map shows the general geographic locations of the Network Paths listed in Table 2, above:

Figure 2

BPA Network Network Paths Map



Establishing Total Transfer Capability (TTC)

BPA calculates TTC for its Network Paths in the same manner as is described "Calculating Total Transfer Capability (TTC) and Process to Determine (TTC)". See "Calculating Total Transfer Capability" beginning on p. 10 for a description of BPA's process to determine TTC.

Determining Existing Transmission Commitments (ETC)

Use of WECC Base Cases to Determine ETC

BPA uses the WECC base cases and modifies them to calculate the ETC components of the ATC calculations for its Network Paths. BPA refers to these base cases as ETC Cases. The assumptions used in these ETC Cases include normal operating conditions, system topology, a 1-in-2-year seasonal heavy Load forecast (or seasonal light Load forecast depending on the Network Path being studied), and generation dispatches based on the firm Transmission rights associated with specific generators.

The WECC base cases include generation and Transmission expected to be in service or available for service for the time period considered. The WECC base cases reflect input from the WECC Significant Additions Report, which details retirements and new additions, including those from other TSPs. BPA models new Transmission additions for its own System in the WECC base cases as out of service until the energization date is within 0-16 days out, which is the time period BPA has determined to provide enough certainty about the date of energization.

The WECC base cases that BPA uses meet the following criteria:

The WECC base cases include generator data in the power flow with generation maximum (Pmax) reflecting the capability of the units. Under no circumstances is Pmax greater than the maximum capability of the unit. BPA always uses the power flow (Pgen) or optimal output of the generator at or within the Pmax and Pmin Ratings for generators that are in service. Within each base case, the individual Generator Owners are identified by numeric code.

The WECC base cases contain explicit modeling data and System topology for all Facilities within the Peak RC Area, including AC Transmission Lines 115kV and above and all DC Transmission Lines. Significant looped Transmission Lines rated at less than 115 kV are also included in the WECC base cases.

The Peak RC Area covers the entire Western Interconnection and therefore does not contain modeling data and System topology beyond the Peak RC Area.

BPA updates the relevant WECC base cases with equipment outages which are known and mapped to the WECC base case, as well as newly-energized generation and Transmission for ATC calculations at least once per day for intra-day, next day and days two through 30. Mapping of equipment to the WECC base case is contained in BPA's Outage to Base Case Mapping document.

BPA updates the relevant WECC base cases with equipment outages which are known and mapped to the WECC base case, as well as newly-energized generation and Transmission for ATC calculations at least once per month for months two through 13. Mapping of equipment to the WECC base case is contained in BPA's Outage to Base Case Mapping document.

Outages in ETC Calculations

Generation outages known to BPA at the time BPA creates its ETC Cases are incorporated into the generation dispatch assumptions in the base cases. See "Determining Base ETC_{Fi}" beginning on p. 33 for a description of how BPA develops its ETC Cases.

BPA adjusts the WECC base cases to include Transmission outages for BPA's area and all adjacent TSP areas to calculate PTDFs, which are used in BPA's ETC calculations. Note that BPA has no executed coordination Agreements with other TSPs. (MOD-001 R3.6)

Outage Criteria in ETC Calculations

BPA uses the outage planning timeline described in Section V, "Outages," beginning on p.5. The following criteria determine which outages are incorporated into BPA's hourly, daily and monthly ETC calculations: (MOD-001 R3.6)

Hourly ETC Calculations

For its hourly ETC calculations, BPA uses hourly PTDFs published daily. Transmission outages for Transmission Lines, sections of Transmission Lines, transformers and taps are used to set branches as *open* in the appropriate base case for the hour being calculated.

Daily ETC Calculations

For its daily ETC calculations, BPA uses the most recent PTDFs published for the hour ending 11, since hour ending 11 tends to have the highest coincidence of outages. Therefore all Transmission outages scheduled to occur during the hour ending 11, regardless of the duration of the outage, impact daily ETC calculations. (MOD-001 R3.6.1)

BPA does not generally consider generation or Transmission outages in daily ETC calculations beyond the 10- to 16-day planned outage study period because of the lack of certainty about planned outages scheduled for that period, unless the planned outage is scheduled to continue beyond the planned outage study period, or there is an outage that has been scheduled in BPA's outage system to begin beyond the 10- to 16-day period.

Monthly ETC Calculations

For its monthly ETC calculations, BPA uses the most recent daily PTDFs published for the first Tuesday of that month. BPA does not generally consider generation or Transmission outages in monthly ETC calculations beyond the 10- to 16-day planned outage study period because of the lack of certainty about outages scheduled for the period beyond the 10- to 16-day planned outage study period, unless the completion of an outage that begins in the 10- to 16-day planned outage study period is scheduled into the monthly horizon, or there is an outage that has been scheduled in BPA's outage system to begin beyond the 10- to 16-day period. (MOD-001 R3.6.2)

PTDF Analysis and *De Minimis*

BPA determines the impact of ETC on its Network Paths using PTDF analysis. PTDF analysis is the fraction of energy (expressed as a percentage or as a decimal) that will flow across BPA's monitored Network Paths as that energy is injected at a POR (or source) relative to a slack bus, and withdrawn at a POD (or sink) relative to a slack bus, for each Network Path. The Network Path impacts are determined using the following formula:

(POR PTDF – POD PTDF) * Demand = MW impact to Network Path

If a reservation's impact on a Network Path is less than or equal to 10 MW and the PTDF difference is less than or equal to 10 percent of the reserved demand, the reservation is deemed to have a *de minimis* impact on that Network Path. Ten percent is the percentage used to curtail in the Western Interconnection-wide congestion management procedure. When using reservations, BPA does not account for *de minimis* MW amounts in its ETC calculations.

Source/POR and Sink/POD Identification and Mapping

In the ETC components of its Network Path ATC calculations, BPA accounts for source and sink for Transmission Service through the following processes:

BPA maps the source/POR and sink/POD to the WECC base cases. In this mapping, BPA has assigned network bus points that represent the primary interface for Interconnection with specific generation projects, adjacent electrical Systems or Load-serving entities and trading hubs. Some adjacent electrical Systems have multiple Interconnection points deemed as PORs/sources or PODs/sinks. The mapping of these points is published in the Transmission Service Contract Points list on BPA's OASIS homepage.

The source used in BPA's Network Path ATC calculations of transactions within BPA's BAA is obtained from the POR field for Short-Term Reservations and the source field for Long-Term Reservations, as shown on the TSR template in OASIS. The source used in BPA's Network Path ATC calculations of transactions for all adjacent TSPs is obtained from the source field if a source is identified, or the POR field if only the POR is identified. BPA represents the impact of Transmission Service using the source or POR as follows:

- If the source or POR has been identified in the reservation and is discretely modeled in the WECC base cases, BPA uses the discretely modeled point as the source.
- In cases where the source or POR has been identified in the reservation and the point can be mapped to an "equivalent" or "aggregate" representation in the WECC base cases, BPA maps the source to the equivalence point in the WECC base cases. These points are published in the Transmission Service Contract Points List on BPA's OASIS home page.
- If the source or POR has been identified in the reservation and the point cannot be mapped to a discretely modeled point or an "equivalence" representation in the WECC base cases, BPA uses the immediately adjacent BA associated with the TSP from which the power is to be received as the source.

- BPA requires a specified source or POR to be identified for all reservations.

The sink used in BPA's Network Path ATC calculations of transactions within BPA's BAA is obtained from the POD field for Short-Term Reservations and the sink field for Long-Term Reservations, as shown on the TSR template in OASIS. The sink used in BPA's Network Path ATC calculations of transactions for all adjacent TSPs is obtained from the sink field if a sink is identified, or the POD field if only the POD is identified. BPA represents the impact of Transmission Service using the sink or POD as follows:

- If the sink or POD has been identified in the reservation and is discretely modeled in the WECC base cases, BPA uses the discretely modeled point as the sink or POD.
- In cases where the sink or POD has been identified in the reservation and the point can be mapped to an "equivalent" or "aggregate" representation in the WECC base case, BPA maps the sink or POD to the equivalence points in the WECC base cases. These points are published in the Transmission Service Contract Points list on BPA's OASIS home page.
- If the sink or POD has been identified in the reservation and the point cannot be mapped to a discretely modeled point or an "equivalence" representation in the WECC base cases, BPA uses the immediately adjacent BA associated with the TSP receiving the power as the sink or POD.
- BPA requires a specified sink or POD to be identified for all reservations.

BPA has grouped the FCRPS generators in BPA's BAA and the Mid-Columbia generators based on the primary interface between BPA and the generation projects. These groupings are assigned weighted PTDFs that represent how the generators participate in the group. The weighted PTDF for the FCRPS bus point is derived from a "weighted FCRTS" bus point. The PTDF weighting for this point varies across different time periods. For the daily and monthly calculations beyond 16 days out, BPA derives the weighting of the PTDF by applying the generation dispatch determined in the ETC Cases. For the hourly and daily calculations for the next hour out to day 16, the PTDF weighting is derived from generation forecasts of the federal resources produced for that time period. BPA derives the PTDF weighting for the Mid-Columbia bus point by applying the generation dispatch determined in the ETC Cases.

BPA has also grouped the FCRPS generators in the Idaho Power Company BAA based on the primary interface between Idaho Power Company and the generation projects. These groupings are assigned a weighted PTDF that represent how the generators participate in the group and are used to evaluate transactions within and between adjacent BAAs that do not include BPAT. BPA derives the PTDF weighting for this point by applying the generation dispatch determined in the ETC Cases. In the ETC Cases, these generators are modeled up to the long-term firm Transmission rights associated with the generators.

BPA has grouped the generators in its adjacent BAAs based on the primary interface between each BAA and the generation projects within that BAA (excluding some remote generators that are scheduled via NERC e-Tag). These groupings are assigned weighted PTDFs that represent how the generators participate in the group and are used to evaluate transactions within and between adjacent BAAs that do not include BPAT. BPA derives the PTDF weightings for these points from BAA-provided generation estimates or by applying the generation dispatch determined in the ETC Cases if generation estimates are not available. In

the ETC Cases, these generators are modeled up to the long-term firm Transmission rights associated with the generators.

Calculating Firm Transmission Service

Calculating Firm Existing Transmission Commitments (ETC_{Fi})

When calculating the impact of ETC_{Fi} for all time periods for a Network Path, BPA uses the following algorithm. (MOD-029 R5)

$$\mathbf{ETC_{Fi} = NITS_{Fi} + PTP_{Fi} + ROR_{Fi} + GF_{Fi} + OS_{Fi}}$$

Where:

$NITS_{Fi}$ is the impact of firm Network Integration Transmission Service, including impacts of generation to Load for BPA's area. This impact is based on the Load forecasts for Network Service Load for the time period being calculated and the generation dispatch, which includes forecasted and designated network resources.

$NITS_{Fi}$ also includes the impact of firm Network Integration Transmission Service, including impacts of generation to Load for all of BPA's adjacent TSP areas. This impact is based on the Load forecasts for Network Service Load for the time period being calculated and the generation dispatch, which includes designated network resources.

PTP_{Fi} is the impact of confirmed firm Point-to-Point Transmission Service expected to be scheduled in BPA's area.

PTP_{Fi} also includes the impact of confirmed Point-to-Point Firm Transmission Service expected to be scheduled for all of BPA's adjacent TSP areas.

There are no reservations using Transmission Service from multiple TSPs, and therefore no duplicate impacts, since reservations source and sink within the same TSP's area. A separate reservation is required to acquire Transmission Service over another TSP's area. When using schedules, BPA includes all schedules for all of its adjacent TSP areas, regardless of their PTDF analysis impact on BPA's Network Paths.

ROR_{Fi} is the impact of roll-over rights for Firm Transmission Service contracts for BPA's area. BPA assumes that all of its Transmission Service Agreements eligible to roll-over in the future will be rolled over. Therefore the impact of the roll-over rights for Transmission contracts in BPA's area is calculated based on the $NITS_{Fi}$, GF_{Fi} and PTP_{Fi} obligations that are eligible for roll-over rights. For reservations that are eligible for roll-over rights, BPA creates a reservation in the form of a Transmission Service Number (TSN), with a Demand equal to the amount eligible to roll-over. BPA models these reservations in its ETC Cases. For TSNs that were not modeled in the ETC Cases, BPA derives the Network Path impacts of these reservations using PTDF analysis. If BPA's customers choose not to exercise their roll-over rights by the required deadline, BPA no longer holds out capacity for roll-over rights for that customer.

ROR_{Fi} also includes roll-over rights for Firm Transmission Service contracts for all of BPA's adjacent TSPs. BPA assumes that all Long-Term Reservations for all of BPA's adjacent TSP areas will be rolled over.

GF_{Fi} is the impact of grandfathered firm obligations expected to be scheduled or expected to flow for BPA's area.

GF_{Fi} also includes the impact of grandfathered firm obligations expected to be scheduled or expected to flow for all of BPA's adjacent TSP areas.

OS_{Fi} is the impact of other firm services.

BPA has no other firm services beyond those specified above. Therefore BPA sets OS_{Fi} at zero for all of its Network Paths for all time periods.

BPA does not have coordination Agreements with other TSPs.

As a result, BPA calculates ETC_{Fi} for all of its Network Paths for all time periods as follows:

$$\mathbf{ETC_{Fi} = NITS_{Fi} + PTP_{Fi} + GF_{Fi} + ROR_{Fi}}$$

When using reservations, BPA further divides the ETC_{Fi} described previously into two components: the base ETC_{Fi} values determined using the ETC Cases, and interim ETC_{Fi} impacts determined using PTDF analysis. These components are added together to calculate a final ETC_{Fi}.

As described in "PTDF Analysis and *De Minimis*" on p.30, *de minimis* MW amounts of reservations that were not modeled in the ETC Cases are not accounted for when calculating ETC_{Fi} using reservations. However, all schedules are accounted for in ETC_{Fi} regardless of their PTDF analysis impact on BPA's Network Paths when calculating ETC_{Fi} using schedules.

While BPA includes all of the components described above in ETC_{Fi}, BPA accounts for $NITS_{Fi}$, GF_{Fi}, PTP_{Fi} and ROR_{Fi} in its Network Path ATC calculations using different variables. For descriptions of the variables used see p. 32.

Determining Base ETC_{Fi}

As indicated in "Use of the WECC Base Cases to determine ETC" beginning on p.28, BPA creates heavy load ETC Cases for the months of January, May, June, and August and light load ETC Cases for the month of January as representative seasons to calculate base ETC_{Fi} values. BPA's ETC Cases are produced using a power flow model that computes how much power will flow over each Network Path for the assumed Load and generation levels for each season. Counterflows are inherently modeled in these base cases.

In ETC Cases, BPA models all of its own $NITS_{Fi}$, GF_{Fi} and PTP_{Fi} Long-Term Reservations, as well as those of its adjacent TSPs, active at the time the ETC Cases are produced.

To model the impact of PTP_{Fi} long-term reservations for all of its adjacent TSPs, BPA queries a list of PTP_{Fi} long-term reservations from the OASIS of its adjacent TSPs. To model the impact of GF_{Fi} and $NITS_{Fi}$ long-term obligations for all of BPA's adjacent TSPs, BPA contacts its adjacent TSPs and requests a list of their GF_{Fi} obligations and a list of their $NITS_{Fi}$ with a list of designated network resources with the MW amounts designated to serve Network Service and Native Load.

BPA models the $NITS_{Fi}$, GF_{Fi} and PTP_{Fi} Long-Term obligations of all of its adjacent TSPs to the extent that there are sufficient firm Transmission rights on BPA's or its adjacent TSPs' Transmission Systems to serve the Load.

BPA uses the following assumptions to create ETC Cases for its ETC_{Fi} calculations:

System topology: Normal operating conditions are used.

Load: BPA uses Loads contained in the WECC base cases for the time periods being studied, along with any updates to those Loads BPA may have made after the WECC base cases were received from WECC.

- **$NITS_{Fi}$**: BPA assumes a 1-in-2 year seasonal heavy or light Load forecast, depending on the Network Path being studied.
- **PTP_{Fi}** and **GF_{Fi}**: For the PTP_{Fi} and GF_{Fi} Long-Term Reservations modeled in the ETC Cases, BPA assumes the lesser of the 1-in-2 year non-coincidental seasonal peak Load forecast or firm rights to deliver power to the Load.

Generation: BPA does not use the generation assumptions contained in the WECC base cases. Instead, BPA uses the following generation assumptions:

FCRPS: For the FCRPS resources serving $NITS_{Fi}$, PTP_{Fi}, and GF_{Fi} Long-Term Reservations, generation levels are set using a multiple-step process. For all seasons, BPA uses the following process:

- The Columbia Generating Station is assumed to be on-line at full Load in the ETC cases.
- Generation levels at the Libby, Hungry Horse, Dworshak, and Albeni Falls projects are set based on the requirements set forth in the 2000 Biological Opinion.
- In addition, the generation levels at the Willamette Valley projects[4] are set at the minimum levels seen by season during Calendar Year 2001.

[4] Willamette Valley projects include: Big Cliff, Cougar, Detroit, Dexter, Foster, Green Peter, Hills Creek, Lookout Point, and Lost Creek.

- **90th Percentile Method:** When creating heavy load ETC Cases, generation levels for all other federal hydro projects[5] are set by first determining each project's 90th percentile of historic generation by project and month. These values by project and month are then horizontally summed to produce a 'total' of each project's independent 90th percentile generation. Each project's monthly 90th percentile value is then divided by the total, resulting in a matrix of percentiles known as the FCRPS distribution pattern. This distribution pattern simply reflects where generation has historically occurred at federal projects. This matrix of percentiles is then multiplied by the $NITS_{Fi}$ Load obligation and GF_{Fi} contracts that have the FCRPS specified as the source, after adjusting these Demands for the portion served by Columbia Generating Station, Libby, Hungry Horse, Dworshak, Albeni Falls, and the Willamette Valley projects. The Demand of the PTP_F contracts served by each federal project is added to this result to determine the final generation level assumed for each federal hydro project. This overall method for modeling the federal resources is referred to as the "90th Percentile Method."
- When creating light load ETC Cases, a ratio (consisting of load within the Northwest) of the light Load to heavy Load cases is calculated and applied to all FCRPS obligations prior to the generation assumptions and application of the 90th Percentile Method.

Non-Federal Thermal Generators: Non-federal thermal generators associated with PTP_{Fi}, GF_{Fi} and $NITS_{Fi}$ Transmission Service for BPA's area and all adjacent TSP areas are set at up to the contract Demand.

Wind Generators:

- **PTP_{Fi}:** Wind generators associated with PTP_{Fi} Long-Term Reservations are modeled at up to 80 percent of the wind generators' contract Demands for BPA's area and all adjacent TSP areas.
- **$NITS_{Fi}$:** The Network Path impacts of wind generators identified as designated network resources in $NITS_{Fi}$ contracts or in the NT Resources Memorandum of Agreement in BPA's area are determined on a Network Path-by-Network Path basis and set at the greater of the following:
    - The wind generators modeled on at the designated amount of the wind generators; or,

[5] Federal hydro projects include: Grand Coulee, Chief Joseph, Lower Granite, Lower Monumental, Little Goose, Ice Harbor, McNary, John Day, The Dalles, Bonneville.

[6] Willamette Valley projects include: Big Cliff, Cougar, Detroit, Dexter, Foster, Green Peter, Hills Creek, Lookout Point, Lost Creek.

- The wind generators modeled off and replaced by increasing the FCRPS generation level by the designated amount of the wind generators using the "90th Percentile Method" for all seasons described on p. 35.

Wind generators designated as network resources in $NITS_{Fi}$ contracts for all adjacent TSPs are modeled up to the designated amount.

- **GF_{Fi}:** BPA and all of BPA's adjacent TSPs have no GF_{Fi} contracts for wind generators.

Behind the Meter Generators: Non-federal resources that do not require Transmission Service over the FCRTS and that are behind the meter are set up to levels used in BPA's process for power system planning studies.

Mid-Columbia Hydro Projects: Generation levels at the non-federal Mid-Columbia hydro projects are set up to 90 percent of their historical output by season.

When creating heavy load ETC Cases, if there is more generation than load plus committed exports in the base case, BPA reduces the Mid-Columbia Hydro Projects by 50 percent of the excess generation and FCRPS generation by the other 50 percent of the excess generation using the "90th Percentile Method" for all seasons; the exports modeled on the COI and Pacific DC Intertie in the base case are reduced to match BPA's obligation for firm export. The generation reduction is done to bring generation and load into balance in order to solve the power flow model.

When creating light load ETC Cases, if there is more generation than Load in the base case, BPA reduces excess generation using a merit order sequence of tiered generation groups that are assumed to be re-dispatched based on age, heat rate and past operation.

Sensitivity Studies

In calculating its base ETC_{Fi} values, BPA runs ETC Case Scenarios for two different sensitivities: the Canadian Entitlement Return (CER) obligation modeled on or off and wind resources designated to serve $NITS_{Fi}$ on or off.

For the CER Scenarios, BPA models the FCRPS generators delivering or not delivering energy to Canada in the amount specified in the Canadian Entitlement Agreement.

In the case where BPA models the FCRPS generators delivering energy to Canada, exports to Canada for the CER and the FCRPS generation level using the "90th Percentile Method" for all seasons (see p.35) is increased by the amount specified in the Canadian Entitlement Agreement.

In the case where BPA models the FCRPS generators not delivering energy to Canada, exports to Canada for the CER and the FCRPS generation levels using the "90th Percentile Method" for all representative seasons is reduced by the MW amount specified in the Canadian Entitlement Agreement.

For the $NITS_{Fi}$ wind resources Scenarios, see p. 39 for a description of the base ETC_{Fi} assumptions for wind generators serving $NITS_{Fi}$.

Therefore, in its base ETC_{Fi} sensitivity analysis, BPA models the following four Scenarios:

1. CER modeled on/$NITS_{Fi}$ wind modeled off

2. CER modeled on/$NITS_{Fi}$ wind modeled on
3. CER modeled off/$NITS_{Fi}$ wind modeled off
4. CER modeled off/$NITS_{Fi}$ wind modeled on

On a Network Path-by-Network Path basis, BPA uses the highest seasonal base ETC_{Fi} value calculated from these four Scenarios in its Network Path ATC calculations. Not all scenarios are run for all seasons or all Network Paths.

Since base ETC_{Fi} values are only produced for the representative months mentioned above, BPA derives a 12-month profile of base ETC_{Fi} values using weighted averages. The following table shows these weighted averages by month for heavy load ETC Cases.

Table 3

Weighted Average Base ETC_{Fi} Values

Month	Percentage Used	Base ETC Values Used
January	100	January
February	100	January
March	50 50	January May
April	100	May
May	100	May
June	100	June
July	100	August
August	100	August
September	75 25	August January
October	50 50	August January
November	100	January
December	100	January

For light load ETC Cases, the January ETC Case is used for all 12 months of the year.

Determining Interim ETC_{Fi} Using PTDF Analysis

To calculate the impacts for all $NITS_{Fi}$ and PTP_{Fi} reservations for BPA's area and all of BPA's adjacent TSP areas that were not modeled in the ETC Cases, BPA uses PTDF analysis on all of the Demand reserved (see "PTDF Analysis and *De Minimis*" on p.30). PTDFs are assigned and mapped to individual bus points in the WECC base cases (refer to "Source/Sink and POR/POD Identification and Mapping" beginning on p. 30). The sum of these impacts is referred to as the interim ETC_{Fi} value, and is added to the base ETC_{Fi} value to produce a final ETC_{Fi} value for each time period for each Network Path.

Calculating Firm Available Transfer Capability (ATC_F)

When calculating ATC_F for its Network Paths for all time periods, BPA uses the following algorithm. (MOD-029 R7)

$$\mathbf{ATC_F = TTC - ETC_{Fi} - CBM_i - TRM_i + Postbacks_{Fi} + Counterflows_{Fi}}$$

Where:

ATC_F is the firm Available Transfer Capability for the Network Path for a specific time period.

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

See "Establishing Total Transfer Capability" on p. 27 for a discussion of how BPA establishes TTCs.

ETC_{Fi} is the sum of impacts of existing firm commitments for the Network Path during that period.

In BPA's calculations, ETC_{Fi} is expressed as follows:

$$\mathbf{ETC_{Fi} = LRES + SRES - SADJ/ETC\ Adjustments + LETC}$$

Where:

LRES is the sum of the positive impacts of PTP_{Fi}, GF_{Fi}, ROR_{Fi} and $NITS_{Fi}$ Long-Term Reservations for BPA's area, plus the sum of the positive impacts of PTP_{Fi}, GF_{Fi}, ROR_{Fi} and $NITS_{Fi}$ Long-Term Reservations for all of BPA's adjacent TSP areas, filtered to reduce or eliminate duplicate impacts from transactions that were already included in the ETC Case or that impact another Transmission Service's Providers share of Transfer Capability.

SRES is the sum of the positive impacts of PTP_{Fi} Short-Term Reservations for BPA's area, plus the sum of the positive impacts of PTP_{Fi} Short-Term Reservations for all of BPA's adjacent TSP areas, filtered to reduce or eliminate duplicate impacts from transactions that were already included in the ETC Case or that impact another Transmission Service's Providers share of Transfer Capability.

SADJ/ETC Adjustments is the variable used to make adjustments to ETC_{Fi} not captured in LRES or SRES. One such adjustment is applied to allow BPA to conduct deferral competitions, as required in Section 17.7 of BPA's OATT. When a deferral reservation is confirmed, BPA applies an ETC adjustment to hold out Transfer Capability for the time period deferred, starting at the latter of five months out or the service commencement date of the original reservation, to allow for a competition. At four months out, if no competition is identified, the ETC adjustment is modified to add back Transfer Capability for the fourth month out.

BPA also uses SADJ/ETC adjustments to ensure accurate accounting of ETC_{Fi}. These adjustments may be performed to account for situations such as data modeling corrections, and will be noted in the descriptions of the adjustments.

LETC is the variable used to ensure that the amount of PTP_{Fi} and GF_{Fi} capacity BPA sets aside in the LRES variable does not exceed the total PTP_{Fi} and GF_{Fi} capacity specified in the contracts. Since BPA has PTP and GF contracts that give customers the right to schedule the capacity reserved between multiple PORs and PODs, this adjustment is necessary to ensure that ETC_{Fi} is not inflated.

LETC is also used to adjust the LRES variable to match the base ETC values BPA calculates when BPA develops its ETC Cases. This adjustment is derived by comparing two values: a) the impacts of the confirmed PTP_{Fi}, GF_{Fi} and $NITS_{Fi}$ Long-Term Reservations derived from the ETC Cases and b) the impacts of the same reservations calculated using PTDF Analysis for each Network Path. The adjustment for each Network Path is equal to the difference of these two values. Conditional firm reservations are not included in the ETC Cases and therefore are also not included in this comparison.

As described in "PTDF Analysis and *De Minimis*" on p. 30, *de minimis* MW amounts of reservations that were not included in the ETC Cases are not accounted for when calculating ETC_{Fi} using reservations.

The following diagram illustrates how the variables used in BPA's ETC_{Fi} calculation correspond to the variables contained in the ETC_{Fi} algorithm shown in "Calculating Firm Existing Transmission Commitments" beginning on p. 32.

ETC_{Fi} =	$NITS_{Fi}$	+	GF_{Fi}	+	PTP_{Fi}	+	ROR_{Fi}
	↓		↓		↓		↓
	LRES		**LRES**		**LRES**		**LRES**
	+				**+**		
	SRES				**SRES**		
	+		**+**		**+**		**+**
	LETC		**LETC**		**LETC**		**LETC**
	-		**-**		**-**		**-**
	SADJ/ETC Adjustments		**SADJ/ETC Adjustments**		**SADJ/ETC Adjustments**		**SADJ/ETC Adjustments**

CBM_i is the impact of the Capacity Benefit Margin on the Network Path during that period.

BPA does not maintain CBM. Therefore BPA sets CBM at zero for all of its Network Paths for all time periods.

TRM_i is the impact of the Transmission Reliability Margin on that Network Path during that period.

BPA does not maintain TRM on its Network Paths. Therefore BPA sets TRM at zero for all of its Network Paths for all time periods.

$Postbacks_{Fi}$ are changes to ATC_F due to a change in the use of Transmission Service for that period.

Because BPA automatically recalculates ETC_{Fi} whenever there is a reduction in LRES or SRES, BPA does not use $Postbacks_{Fi}$ for calculating ATC_F on any of its Network Paths. Therefore BPA sets $Postbacks_{Fi}$ at zero for all of its Network Paths for all time periods.

$Counterflows_{Fi}$ are adjustments to ATC_F

BPA does not include confirmed Transmission reservations, expected interchange or internal flow counter to the direction of the Network Path over and above the counterflow that is assumed in the ETC Cases. BPA's rationale is that it does not want to offer additional firm Transfer Capability due to counterflow that may not be scheduled, as it could lead to Curtailments of Firm Transmission Service in Real-time. (MOD-001 R3.2) Therefore BPA sets the $Counterflows_{Fi}$ component at zero for all of its Network Paths for all time periods.

As a result, BPA calculates ATC_F for its Network Paths for all time periods as follows:

$$\mathbf{ATC_F = TTC - ETC_{Fi}}$$

As described in "Determining Base ETC_{Fi}" on p. 32, counterflows are modeled in the ETC Cases. In some seasons, the amount of counterflows on particular Network Paths results in a negative ETC_{Fi} value, which, when subtracted from TTC, results in ATC_F greater than TTC.

Calculating Non-Firm Transmission Service

BPA sells six non-firm Transmission products. These products are:

1. **$NITS_{NF6i}$**. This is a non-firm Transmission product available only to Transmission Customers with NITS Agreements. It is the highest quality of Non-Firm Transmission Service in that it is the last Non-Firm Transmission Service that would be Curtailed, if necessary.

2. **PTP_{NF5i}**. This is a non-firm Transmission product available only to Transmission Customers with PTP Agreements. PTP_{NF5i} is the fifth Non-Firm Transmission Service that would be Curtailed, if necessary.

3. **PTP_{NF4i}**. This is a non-firm Transmission product available only to Transmission Customers with PTP Agreements. PTP_{NF4i} is the fourth Non-Firm Transmission Service that would be Curtailed, if necessary.

4. **PTP_{NF3i}**. This is a non-firm Transmission product available only to Transmission Customers with PTP Agreements. PTP_{NF3i} is the third Non-Firm Transmission Service that would be Curtailed, if necessary.

5. **PTP_{NF2i}**. This is a non-firm Transmission product available only to Transmission Customers with PTP Agreements. PTP_{NF2i} is the second Non-Firm Transmission Service that would be Curtailed, if necessary.

6. **PTP_{NF1i}.** This is a non-firm Transmission product available only to Transmission Customers with PTP Agreements. PTP_{NF1i} is the first Non-Firm Transmission Service that would be Curtailed, if necessary (i.e., this Transmission Service has the highest likelihood of being Curtailed).

BPA calculates ETC_{NFi} and ATC_{NF} for each of these products.

Calculating Non-Firm Existing Transmission Commitments (ETC_{NFi})

When calculating ETC_{NFi} for all time periods for a Network Path, BPA sums the positive impacts using PTDF analysis (see "PTDF Analysis and *De Minimis*" on p. 30 for further details). (MOD-029 R6)

$$\mathbf{ETC_{NFi} = PTP_{NFi} + GF_{NFi} + NITS_{NFi} + OS_{NFi}}$$

Where:

PTP_{NFi} is the impact of all confirmed non-firm Point-to-Point Transmission Service expected to be scheduled for BPA's area. In BPA's calculations, the PTP_{NFi} component includes PTP_{NF5i}, PTP_{NF4i}, PTP_{NF3i}, PTP_{NF2i} and PTP_{NF1i}.

PTP_{NFi} also includes the impacts of any confirmed non-firm PTP Transmission Service expected to be scheduled for all of BPA's adjacent TSP areas. There are no reservations using Transmission Service from multiple TSPs, and therefore no duplicate impacts, since reservations source and sink within the same TSP's area. A separate reservation is required to acquire Transmission Service over another TSP's area. Note that BPA does not have coordination Agreements with other TSPs.

GF_{NFi} is the impact of all grandfathered non-firm obligations expected to be scheduled or expected to flow for BPA's area. BPA does not have any grandfathered non-firm Transmission Service obligations.

GF_{NFi} also includes the impacts of any grandfathered non-firm obligations expected to be scheduled or expected to flow for all of BPA's adjacent TSPs. None of BPA's adjacent TSPs have any grandfathered Non-Firm Transmission Service obligations.

Therefore BPA sets GF_{NFi} at zero for all of its Network Paths for all time periods.

$NITS_{NFi}$ is the non-firm Network Integration Transmission Service serving Load within BPA's area (i.e., secondary service), to include losses, and Load growth not otherwise included in TRM or CBM.

In BPA's calculations, this is $NITS_{NF6i}$. BPA's $NITS_{NF6i}$ calculations do not include losses or Load growth, since losses and Load growth are already set aside as firm capacity in $NITS_{Fi}$.

$NITS_{NFi}$ also includes non-firm Network Integration Transmission Service (i.e., secondary service) for all of BPA's adjacent TSP areas. There are no transactions using Transmission Service from multiple TSPs, and therefore no duplicate impacts, since transactions source and sink within the same TSP's area. A separate reservation is required to acquire Transmission Service over another TSP's area. Note that BPA does not have coordination Agreements with other TSPs.

OS_{NFi} is the impact of other non-firm services.

BPA has no other non-firm services beyond those specified above. Therefore BPA sets OS_{NFi} at zero for all of its Network Paths for all time periods.

As a result, BPA calculates ETC_{NFi} for all time periods for its Network Paths as follows:

$$\mathbf{ETC_{NFi} = PTP_{NFi} + NITS_{NFi}}$$

As described in "PTDF Analysis and *De Minimis*" on p. 30, BPA does not account for *de minimis* MW amounts when calculating ETC_{NFi} using reservations. However, all schedules are accounted for in ETC_{NFi} regardless of their PTDF analysis impact on BPA's Network Paths when calculating ETC_{NFi} using schedules.

While BPA includes all of the components described above in ETC_{NFi}, BPA accounts for PTP_{NFi} and $NITS_{NFi}$ in its Network Path ATC calculations using different variables. For a description of the variables used see p. 45.

Calculating Non-Firm Available Transfer Capability (ATC_{NF})

BPA uses different algorithms to calculate ATC_{NF}, ETC_{Fi} and ETC_{NFi} for two time horizons for all of its Network Paths: Real-time and beyond Real-time. The Real-time horizon begins at 10 p.m. on the pre-schedule day for the 24 hours in the next day. The ETC_{Fi} and ETC_{NFi} for the Real-Time horizon are calculated using schedules and reservations that have not yet been scheduled. The time horizon beyond Real-time includes hourly for the hours after those included in the Real-time period as well as daily and monthly calculations. The ETC_{Fi} and ETC_{NFi} for the time horizon beyond Real-time is calculated using reservations.

BPA calculates ETC_{NFi} and ATC_{NF} for the six non-firm Transmission products (described beginning on p. 40) associated with NERC Curtailment priorities as follows:

1. **ATC_{NF6}**: ATC_{NF6} is calculated for the $NITS_{NF6i}$ product. ETC_{NFi} in this equation only includes $NITS_{NF6i}$.

2. **ATC_{NF5}**: ATC_{NF5} is calculated for the PTP_{NF5i} product. ETC_{NFi} in this equation includes $NITS_{NF6i}$ and PTP_{NF5i}.

3. **ATC_{NF4}**: ATC_{NF4} is calculated for the PTP_{NF4i} product. ETC_{NFi} in this equation includes $NITS_{NF6i,}$ PTP_{NF5i} and PTP_{NF4i}.

4. **ATC_{NF3}**: ATC_{NF3} is calculated for the PTP_{NF3i} product. ETC_{NFi} in this equation includes $NITS_{NF6i,}$ $PTP_{NF5i,}$ $PTP_{NF4i,}$ and PTP_{NF3i}.

5. **ATC_{NF2}**: ATC_{NF2} is calculated for the PTP_{NF2i} product. ETC_{NFi} in this equation includes $NITS_{NF6i}$, PTP_{NF5i}, PTP_{NF4i}, PTP_{NF3i} and PTP_{NF2i}.

6. **ATC_{NF1}:** ATC_{NF1} is calculated for the PTP_{NF1i} product. ETC_{NFi} in this equation includes $NITS_{NF6i}$, PTP_{NF5i}, PTP_{NF4i}, and PTP_{NF3i}, PTP_{NF2i} and PTP_{NF1i}.

BPA calculates ETC_{NFi} and ATC_{NF} for each of these products for each time period.

When calculating ATC_{NF} for its Network Paths for the two time horizons described above, BPA uses the following algorithm. (MOD-029 R8)

$$\mathbf{ATC_{NF} = TTC - ETC_{Fi} - ETC_{NFi} - CBM_{Si} - TRM_{Ui} + Postbacks_{NFi} + Counterflow_{NFi}}$$

Where:

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

BPA calculates six ATC_{NF} values (as described above), one for each of the six non-firm Transmission products.

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

See "Establishing Total Transfer Capability" on p. 27, for a description of how BPA establishes TTC.

ETC_{Fi} is the sum of the impacts of existing firm Transmission commitments for the Network Path during that period.

BPA uses different algorithms to calculate ETC_{Fi} for all of its Network Paths for the time horizon beyond Real-time and the Real-time horizon.

ETC_{Fi} for the Time Horizon Beyond Real-Time

For Network Path ATC_{NF} calculations for the time horizon beyond Real-time, ETC_{Fi} is expressed as follows:

$$\mathbf{ETC_{Fi} = LRES + SRES - SADJ/ETC\ Adjustments + LETC}$$

Where:

LRES is the sum of the positive impacts of PTP_{Fi}, GF_{Fi}, ROR_{Fi} and $NITS_{Fi}$ Long-Term Reservations for BPA's area, plus the sum of the positive impacts of PTP_{Fi}, GF_{Fi}, ROR_{Fi} and $NITS_{Fi}$ Long-Term Reservations for all of BPA's adjacent TSP areas, filtered to reduce or eliminate duplicate impacts from transactions that were already included in the ETC base case or that impact another Transmission Service's Providers share of Transfer Capability.

SRES is the sum of the positive impacts of PTP_{Fi} Short-Term Reservations for BPA's area, plus the sum of the positive impacts of PTP_{Fi} Short-Term Reservations for all of BPA's adjacent TSP areas, filtered to reduce or eliminate duplicate impacts from transactions that were already included in the ETC Case or that impact another Transmission Service's Providers share of Transfer Capability.

SADJ/ETC Adjustments is the variable used to make adjustments to ETC_{Fi} not captured in LRES or SRES. One such adjustment is applied to allow BPA to conduct deferral competitions, as required in Section 17.7 of BPA's OATT. When a deferral reservation is confirmed, BPA applies an ETC adjustment to hold out Transfer Capability for the time period deferred, starting at the latter of five months out or the service commencement date of the original reservation, to allow for a competition. At four months out, if no competition is identified, the ETC adjustment is modified to add back Transfer Capability for the fourth month out.

BPA also uses SADJ/ETC adjustments to ensure accurate accounting of ETC_{Fi}. These adjustments may be performed to account for situations such as data modeling corrections, and will be noted in the descriptions of the adjustments.

LETC is the variable used to ensure that the amount of PTP_{Fi} and GF_{Fi} capacity BPA sets aside in the LRES variable does not exceed the total PTP_{Fi} and GF_{Fi} capacity specified in the contracts. Since BPA has PTP and GF contracts that give customers the right to schedule the capacity reserved between multiple PORs and PODs, this adjustment is necessary to ensure that ETC_{Fi} is not inflated.

LETC is also used to adjust the LRES variable to match the base ETC values BPA calculates when BPA develops its ETC Cases. This adjustment is derived by comparing two values: a) the impacts of the PTP_{Fi}, GF_{Fi} and $NITS_{Fi}$ Long-Term Reservations derived from the ETC Cases and b) the impacts of the same reservations calculated using PTDF Analysis for each Network Path. The adjustment for each Network Path is equal to the difference of these two values. Conditional firm reservations are not included in the ETC Cases and therefore are also not included in this comparison.

As described in "PTDF Analysis and *De Minimis*" on p. 30, *de minimis* MW amounts of reservations that were not included in the ETC Cases are not accounted for in ETC_{Fi}.

The following diagram illustrates how the variables used in BPA's ETC_{Fi} calculation correspond to the variables contained in the ETC_{Fi} algorithm shown in "Calculating Firm Existing Transmission Commitments" beginning on p. 32.

ETC_{Fi} =	$NITS_{Fi}$	+	GF_{Fi}	+	PTP_{Fi}	+	ROR_{Fi}
	↓		↓		↓		↓
	LRES		**LRES**		**LRES**		**LRES**
	+				+		
	SRES				**SRES**		
	+		+				+
	LETC		**LETC**				**LETC**

	-		-		-		-
	SADJ/ETC Adjustments		**SADJ/ETC Adjustments**		**SADJ/ETC Adjustments**		**SADJ/ETC Adjustments**

ETC_{Fi} for the Real-Time Horizon

For Network Path ATC_{NF} calculations in the Real-time horizon, ETC_{Fi} is expressed as follows:

$$\mathbf{ETC_{Fi} = SCH^{+}_{7} + ASC^{+}_{7} + RETC}$$

Where:

SCH^{+}_{7} is the sum of the positive impacts of schedules referenced to confirmed PTP_{Fi}, GF_{Fi} and $NITS_{Fi}$ reservations for BPA's area, plus the sum of the positive impacts of PTP_{Fi}, GF_{Fi} and $NITS_{Fi}$ schedules for all of BPA's adjacent TSP areas.

ASC^{+}_{7} is the sum of the positive impacts of dynamic schedules that reference confirmed PTP_{Fi}, GF_{Fi} and $NITS_{Fi}$ reservations for BPA's area, plus the sum of the positive impacts of dynamic PTP_{Fi}, GF_{Fi} and $NITS_{Fi}$ schedules for all of BPA's adjacent TSP areas.

RETC is the sum of the impacts of unscheduled $NITS_{Fi}$ that has a PTDF Analysis impact of equal to or greater than ten percent for all of BPA's adjacent TSP areas.

The following diagram illustrates how the variables used in BPA's ETC_{Fi} calculation correspond to the variables contained in the ETC_{Fi} algorithm shown in "Calculating Firm Existing Transmission Commitments" beginning on p. 32. ROR_{Fi} is not included in ETC_{FI} for the Real-Time Horizon because ROR_{Fi} is not relevant for this time period.

ETC_{Fi} =	**$NITS_{Fi}$**	**+**	**GF_{Fi}**	**+**	**PTP_{Fi}**
	↓		↓		↓
	SCH^{+}_{7}		SCH^{+}_{7}		SCH^{+}_{7}
	+		**+**		**+**
	ASC^{+}_{7}		ASC^{+}_{7}		ASC^{+}_{7}
	+				
	RETC				

ETC_{NFi} is the sum of the impacts of existing non-firm Transmission commitments for the Network Path during that period.

BPA uses different algorithms to calculate ETC_{NFi} for all of its Network Paths for the time horizon beyond Real-time and the Real-time horizon.

ETC_{NFi} for the Time Horizon Beyond Real-time

For Network Path ATC_{NF} calculations in the time horizon beyond Real-time, ETC_{NFi} is expressed as follows:

$$\mathbf{ETC_{NFi} = RRES_{NF}}$$

Where:

$RRES_{NF}$ is the sum of the positive impacts of all confirmed PTP_{NF5i}, PTP_{NF4i}, PTP_{NF3i}, PTP_{NF2i}, PTP_{NF1i} and $NITS_{NF6i}$ reservations for BPA's area, plus the sum of the positive impacts of all confirmed PTP_{NFi} and $NITS_{NFi}$ reservations for all of BPA's adjacent TSP areas.

As described in "PTDF Analysis and *De Minimis*" on p. 30, *de minimis* MW amounts are not accounted for in ETC_{NFi} when using reservations.

The following diagram explains how the variables used in BPA's ETC_{NFi} calculation correspond to the variables contained in the ETC_{NFi} algorithm shown in "Calculating Non-Firm Existing Transmission Commitments" beginning on p. 41.

ETC_{NFi} =	$NITS_{NFi}$	+	PTP_{NFi}
	↓		↓
	$RRES_{NF}$		$RRES_{NF}$

ETC_{NFi} for the Real-time Horizon

For Network Path ATC_{NF} calculations in the Real-time horizon, ETC_{NFi} is expressed as follows:

$$\mathbf{ETC_{NFi} = SCH^{+}_{6,5,4,3,2,1} + ASC^{+}_{6,5,4,3,2,1}}$$

Where:

$SCH^{+}_{6,5,4,3,2,1}$ is the sum of the positive impacts of schedules referenced to confirmed PTP_{NF2i}, PTP_{NF1i} and $NITS_{NF6i}$ reservations for BPA's area, plus the sum of the positive impacts of PTP_{NFi} and $NITS_{NFi}$ schedules for all of BPA's adjacent TSP areas.

$ASC^{+}_{6,5,4,3,2,1}$ is the sum of positive impacts of dynamic schedules referenced to confirmed PTP_{NF2i}, PTP_{NF1i} and $NITS_{NF6i}$ reservations for BPA's area, plus the sum of the positive impacts of dynamic PTP_{NFi}, GF_{NFi} and $NITS_{NFi}$ schedules for all of BPA's adjacent TSP areas.

The following diagram illustrates how the variables used in BPA's ETC_{Fi} calculation correspond to the variables contained in the ETC_{Fi} algorithm shown in "Calculating Non-Firm Existing Transmission Commitments" beginning on p. 41.

ETC_{NFi} =	$NITS_{NFi}$	+	PTP_{NFi}
	↓		↓
	$SCH^{+}_{6,5,4,3,2,1}$		$SCH^{+}_{6,5,4,3,2,1}$

	+		+
	$ASC^{+}_{6,5,4,3,2,1}$		$ASC^{+}_{6,5,4,3,2,1}$

CBM_{Si} is the impact of any schedules during that period using Capacity Benefit Margin.

BPA does not maintain CBM. Therefore BPA sets CBM_{Si} at zero for all of its Network Paths for all time periods.

TRM_{Ui} is the impact on the Network Path of the Transmission Reliability Margin for the Network Path that has not been released for sale (unreleased) as non-firm capacity during that period.

BPA does not maintain TRM on its Network Paths. Therefore BPA sets TRM_{Ui} at zero for all of its Network Paths for all time periods.

$Postbacks_{NFi}$ are changes to non-firm Available Transfer Capability due to a change in the use of Transmission Service for that period.

Because BPA automatically recalculates ETC_{Fi} and ETC_{NFi} whenever there is a reduction in LRES, SRES, or RRES, BPA does not use $Postbacks_{NFi}$ for calculating ATC_{NF} for any of its Network Paths in the time horizon beyond Real-time.

BPA also does not use $Postbacks_{NFi}$ for any of its Network Paths for the Real-time horizon.

Therefore BPA sets $Postbacks_{NFi}$ at zero for all of its Network Paths for the time horizon beyond Real-time and the Real-time horizon.

$Counterflows_{NFi}$ are adjustments to non-firm Available Transfer Capability.

Counterflows resulting from firm and non-firm Transmission schedules, excluding dynamic schedules, are added back to ATC_{NF} in the $Counterflows_{NFi}$ component.

$Counterflows_{NFi}$ is the sum of the negative impacts of schedules referenced to confirmed firm and non-firm reservations in BPA's area, plus the sum of the negative impacts of schedules for all of BPA's adjacent TSP areas. In BPA's calculations, $Counterflows_{NFi}$ is expressed as $SCH^{-}_{7,6,5,4,3,2,1}$.

As a result BPA calculates ATC_{NF} for its Network Paths for all time periods as follows:

$$\mathbf{ATC_{NF} = TTC - ETC_{Fi} - ETC_{NFi} + Counterflows_{NFi}}$$

As described in "Determining Base ETC_{Fi}" on p. 32, counterflows are modeled in the ETC Cases used to determine ETC_{Fi}. In some cases, the amount of counterflows on particular Network Paths result in a negative ETC_{Fi} value, which, when subtracted from TTC, results in ATC_{NF} greater than TTC. In other cases, the amount of $Counterflows_{NFi}$ exceeds the sum of the ETC_{Fi} and ETC_{NFi}, which, when added to TTC, also results in ATC_{NF} greater than TTC.

IX. BA to BA Interconnection Methodology

This section describes in detail how BPA implements the Rated System Path Methodology for the ATC Paths listed below. It addresses all of the requirements in Standard MOD-029-1a.

BPA BA to BA Interconnections

The following list shows the BA to BA interconnections (with subsets) for which BPA uses the Rated System Path Methodology:

Avista Corporation

- AVA (Main System)
- AVA (Coyote Springs)

Chelan County Public Utility District No. 1

- Chelan (Main System)
- Chelan (Nine Canyon)

Douglas County Public Utility District No. 1

- Douglas (Main System)
- Douglas (Nine Canyon)

Grant County Public Utility District No. 2

- Grant (Main System)
- Grant (Nine Canyon)

Gridforce Energy Management (GEM)

- GEM (Calpine)

Idaho Power Company

- IPC (Boardman)

PacifiCorp

- PAC (Central OR)
- PAC (Chehalis Power)
- PAC (Goodnoe Hills)
- PAC (Hood River)
- PAC (McNary area)
- PAC (OR Coast)
- PAC (Portland)
- PAC (Southern OR)
- PAC (Willamette Valley)
- PAC (Yakima)

Portland General Electric

- PGE (Main System)
- PGE (Boardman)
- PGE (Coyote Springs)

Puget Sound Energy Inc.

PSE (Bellingham)
PSE (Ellensburg)
PSE (GEC)
PSE (Mint Farm)
PSE (Olympic Peninsula)
PSE (Seattle)
PSE (Snohomish)

Seattle City Light

SCL (Main System)
SCL (Boundary)
SCL (SCBID)

City of Tacoma Department of Public Utilities, Light Division

TPWR (Main System)
TPWR (Mayfield-Mossy Rock)
TPWR (SCBID)
TPWR (Tacoma Mutuals)
TPWR (Wynoochee)

Process to Determine TTC

BPA calculates TTC for its BA to BA Interconnections in a similar manner as is described in Section VII Calculating Total Transfer Capability (TTC) and Process to Determine (TTC). See "Calculating Total Transfer Capability" beginning on p. 10. Exceptions to this process are described below.

BPA uses the WECC-approved operational base case for the relevant season and year to compute the BA to BA TTC values. If the WECC-approved operational base case for the given season and year is not yet created, then BPA uses the WECC-approved operational base case for the relevant season from the prior year. The base cases are updated for transmission and generation outages that are expected during the time period under study. (MOD-029 R1.1)

BPA determines the BA to BA TTCs as follows:

If a BA to BA Interconnection is comprised of multiple subsets, as listed above, then the TTC for each subset is determined individually and the overall TTC is the aggregate of the subsets.

While adjusting base case generation and load levels BPA applies the applicable contingencies for the particular BA to BA interconnection, including any associated Remedial Action Schemes (RAS).

1. For BA to BA TTCs going from the BPA BA to the adjacent BA:

    a. BPA first reduces generation in the adjacent BA until all generators are off-line and then increases the load in the adjacent BA up to 150% of the original base case level. (MOD-029 R2.1)

b. If the particular BA to BA interconnection being analyzed is only a subset of the overall BA to BA boundary, then BPA adjusts the load and generation in that portion of the adjacent BA that will most directly influence the flow over the BA to BA interconnection.

c. If power cannot be made to flow from the BPA BA to the adjacent BA or if no reliability limit is found after all appropriate generation is taken off-line and loads are increased to 150% of the original base case level in the adjacent BA, then BPA sets the BA to BA TTC in that direction equal the greater of the maximum flow that can be simulated across the BA to BA interconnection or the BA to BA TTC found in 2. below without the use of RAS. (MOD-029 R2.2)

2. For BA to BA TTCs going from the adjacent BA to the BPA BA:

a. BPA first increases generation in the adjacent BA until all units are at nameplate capacity and then reduces the load in the adjacent BA down to 50% of the original base case level. (MOD-029 R2.1)

b. If the particular BA to BA interconnection being analyzed is only a subset of the overall BA to BA boundary, then BPA adjusts the load and generation in that portion of the adjacent BA that will most directly influence the flow over the BA to BA interconnection.

c. If power cannot be made to flow from the adjacent BA to the BPA BA or if no reliability limit is found after all appropriate generation is put on-line and loads are reduced to 50% of the original base case level in the adjacent BA, then BPA sets the BA to BA TTC in that direction equal the greater of the maximum flow that can be simulated across the BA to BA interconnection or the BA to BA TTC found in 1. above without the use of RAS. (MOD-029 R2.2)

Calculating Transmission Service

Every hour BPA analyzes all of the confirmed TSRs it has for the current hour and the next 48 hours with a POR or POD that matches any of the BA to BA Interconnections or subsets.

Every day BPA analyzes all of the confirmed TSRs it has for the current hour and the next 13 months with a POR or POD that matches any of the BA to BA Interconnections or subsets.

Calculating Firm Existing Transmission Commitments (ETC_F)

The TSRs with a Firm NERC Priority are used for calculating ETC_F.

The ETC_F for any BA to BA Interconnection is determined by summing all Firm TSRs that match the specific POR to POD combinations associated with the BA to BA Interconnection including all of its subsets.

When calculating ETC_F for all time periods for its BA to BA Interconnections, BPA uses the following algorithm. (MOD-029 R5)

$$\mathbf{ETC_F = NL_F + NITS_F + GF_F + PTP_F + ROR_F + OS_F}$$

All of BPA's firm Transmission obligations are included in contracts, Agreements and obligations captured in the $NITS_F$, PTP_F and GF_F components of this algorithm. Therefore BPA sets NL_F to zero for all of its BA to BA Interconnections for all time periods.

BPA assumes that all of its Transmission Service Agreements eligible to roll-over in the future will be rolled over. Therefore, ROR_F is equal to the sum of the $NITS_F$, GF_F and PTP_F obligations that are eligible for roll-over rights.

BPA has no other services beyond those specified above. Therefore BPA sets OS_F to zero for all of its BA to BA Interconnections for all time periods.

As a result, BPA calculates ETC_F for its BA to BA Interconnections for all time periods as follows:

$$\mathbf{ETC_F = NITS_F + GF_F + PTP_F + ROR_F}$$

Calculating Firm Available Transfer Capability (ATC_F)

When calculating ATC_F for its BA to BA Interconnections for all time periods, BPA uses the following algorithm. (MOD-029 R7)

$$\mathbf{ATC_F = TTC - ETC_F - CBM - TRM + Postbacks_F + Counterflows_F}$$

BPA does not maintain CBM or TRM on any of its BA to BA Interconnections. Therefore BPA sets CBM and TRM to zero for all of its BA to BA Interconnections for all time periods.

Because BPA automatically recalculates ETC_F with updated TSRs (including resales, redirects, etc.) BPA does not use $Postbacks_F$ for calculating ATC_F on any of its BA to BA Interconnections. Therefore BPA sets $Postbacks_F$ to zero for all of its BA to BA Interconnections for all time periods.

BPA does not include confirmed Transmission reservations, expected interchange or internal flow counter to the direction of the BA to BA Interconnection being calculated in its ATC_F calculations. Therefore BPA sets $Counterflows_F$ to zero for all of its BA to BA Interconnections for all time periods.

As a result, BPA calculates ATC_F for each of its BA to BA Interconnections for all time periods as follows:

$$\mathbf{ATC_F = TTC - ETC_F}$$

Calculating Non-Firm Existing Transmission Commitments (ETC_{NF})

The TSRs with a Non-Firm NERC Priority are used for calculating ETC_{NF}.

The ETC_{NF} for any BA to BA Interconnection is determined by summing all Non-Firm TSRs that match the specific POR to POD combinations associated with the BA to BA Interconnection including all of its subsets.

When calculating ETC_{NF} for all time periods for its BA to BA Interconnections, BPA uses the following algorithm. (MOD-029 R6)

$$\mathbf{ETC_{NF} = NITS_{NF} + GF_{NF} + PTP_{NF} + OS_{NF}}$$

In BPA's calculations, $NITS_{NF}$ is a non-firm Transmission product available only to Transmission Customers with NITS Agreements. It does not include losses or Load growth, since losses and Load growth are already set aside as firm capacity in $NITS_F$.

BPA has no grandfathered Non-Firm Transmission Service obligations. Therefore BPA sets GF_{NF} to zero for all of its BA to BA Interconnection s for all time periods.

BPA has no other services beyond those specified above. Therefore BPA sets OS_{NF} to zero for all of its BA to BA Interconnections for all time periods.

As a result, BPA calculates ETC_{NF} for its ATC Paths for all time periods as follows:

$$\mathbf{ETC_{NF} = NITS_{NF} + PTP_{NF}}$$

Calculating Non-Firm Available Transfer Capability (ATC_{NF})

When calculating ATC_F for its BA to BA Interconnections for all time periods, BPA uses the following algorithm. (MOD-029 R8)

$$\mathbf{ATC_{NF} = TTC - ETC_F - ETC_{NF} - CBM_S - TRM_U + Postbacks_{NF} + Counterflow_{NF}}$$

BPA does not maintain CBM or TRM on any of its BA to BA Interconnections. Therefore BPA sets CBM and TRM to zero for all of its BA to BA Interconnections for all time periods.

Because BPA automatically recalculates ETC_F with updated TSRs (including resales, redirects, etc.) BPA does not use $Postbacks_F$ for calculating ATC_F on any of its BA to BA Interconnections. Therefore BPA sets $Postbacks_F$ to zero for all of its BA to BA Interconnections for all time periods.

BPA does not include confirmed Transmission reservations, expected interchange or internal flow counter to the direction of the BA to BA Interconnection being calculated in its ATC_F calculations. Therefore BPA sets $Counterflows_F$ to zero for all of its BA to BA Interconnections for all time periods.

As a result, BPA calculates ATC_{NF} for all of its BA to BA Interconnections for all time periods as follows:

$$\mathbf{ATC_{NF} = TTC - ETC_F - ETC_{NF}}$$

X. Data Sources and Recipients

BPA receives data for use in its ATC calculations, and provides data for use in calculating transfer and Flowgate capabilities through the WECC base case process described beginning on p. 4. BPA also directly receives and provides data, such as outage information and specific Transmission commitments, from and to the following Transmission Service Providers and Transmission Operators: (MOD-001 R3.3, R3.4)

- Avista Corporation
- BC Hydro
- California Independent System Operator
- City of Tacoma, Department of Public Utilities, Light Division
- Eugene Water and Electric Board
- Fortis BC
- Idaho Power Company
- Los Angeles Department of Water and Power
- NV Energy
- NorthWestern Energy
- Pacific Gas & Electric
- PacifiCorp
- Pend Oreille County Public Utility District No. 1
- Portland General Electric
- Public Utility District No. 1 of Chelan County
- Public Utility District No. 1 of Clark County
- Public Utility District No. 1 of Douglas County
- Public Utility District No. 2 of Grant County, Washington
- Public Utility District No. 1 of Snohomish County
- Puget Sound Energy, Inc.
- Sacramento Municipal Utility District
- Seattle City Light
- Southern California Edison
- Transmission Agency of Northern California
- Western Area Power Administration – Sierra Nevada Region
- California Independent System Operator

XI. Responding to Data Requests

Upon official request from any Transmission Service Provider, Planning Coordinator, Reliability Coordinator, or Transmission Operator for any data from the list below, solely for use in the requestor's ATC or AFC calculations, BPA will begin to make the data available within 30 calendar days of receiving the request.

- Expected generation and Transmission outages, additions, and retirements
- Load forecasts
- Unit commitments and order of dispatch, to include all designated resources (BPA does not have resources that are committed or have the legal obligation to run)
- Firm NITS and non-firm NITS (i.e. Secondary Service)
- Firm and non-firm Transmission reservations
- Grandfathered obligations
- Firm roll-over rights
- Any firm and non-firm adjustments applied by BPA to reflect parallel path impacts
- Power flow models and underlying assumptions
- Contingencies, provided in one or more of the following formats:
    - o A list of Elements
    - o A list of Network Paths
    - o A set of selection criteria that can be applied to the WECC base cases used by BPA
- Facility Ratings
- Any other service that impact ETCs
- Values of CBM and TRM for all ATC Paths
- Values of TTC and ATC for all ATC Paths
- Source and sink identification and mapping to the WECC base cases

BPA will make this data available on the schedule specified by the requestor (but no more frequently than once per hour, unless mutually agreed to by the requestor and Bonneville).

For a Transmission Service Provider, Planning Coordinator, Reliability Coordinator, or Transmission Operator to officially request data to use in ATC or AFC calculations, the requestor must fill out the **Data Request Form** (MOD-001 R9) found on BPA's website http://transmission.bpa.gov/business/atc_methodology/. The completed request form must be sent to nercatcstandards@bpa.gov with **Data request Form** (MOD-001 R9) in the subject line. (MOD-001 R9)

XII. ATCID Revisions

BPA will notify the entities contained in ATCID TP Distribution List when implementing a new or revised ATCID and make its current ATCID available. (MOD-001 R4, R5)

XIII. Version History

ATCID Revision History			
Version	**Date Revised**	**Description of Changes**	**Prepared by**
1.0	03/30/2011	BPA ATCID FINAL	S Long L Trolese C Etheridge
2.0	05/11/2011	P.31 Table 2 BPA Flowgates: Corrected the definition of the West of McNary Flowgate by replacing McNary – Horse Heaven 230 kV line with Harvalum – Big Eddy #1 230 kV line in the West of McNary Flowgate Transmission Line Components	L Trolese
3.0	08/11/2011	P. 7 line 114: Revised frequency of hourly calculations from at least three times per hour to at least once per hour. P. 12-13 Table 1 BPA Paths: Added Montana-Northwest to the Path Name; added Garrison 500 kV 1 and 2 to the Transmission Line Components of the West of Garrison E>W and W>E Paths and revised the Montana Intertie Transmission Line Component from Broadview – Garrison 500 kV 1 and 2 to Townsend-Garrison 500 kV 1 and 2 to be effective October 1, 2011. P. 17 lines 395-397: Revised sentence to include Montana Intertie as an ATC Path that is limited by contract. P. 18 lines 440-445: Revised paragraph to include Montana Intertie as an ATC Path where another TOP sets the TTC. P. 19 line 483-486 and P. 40 line 1102: Added forecasted network resources to be included in Network Integration Transmission Service P. 20 line 517: corrected reference from ETC to ATC_{NF}.	L Trolese

ATCID Revision History			
		P. 20 line 531; P. 22 ETC_F variable diagram, P. 25 line 669, P. 26 ETC_F variable diagram, P. 47 line 1324, P. 49 ETC_F variable diagram, P. 53 line 1493 and P. 54 ETC_F variable diagram: Corrected ETC_F formula to subtract SADJ/ETC Adjustments instead of add it. P. 27 lines 724-726 and P. 55 lines 1549-1551: Updated reason for why ROR_F is not included in the real-time horizon. P. 29 line 789: Deleted "implemented" from which schedules impact counterflows. P. 30 lines 798-800: Added a note describing the variable RADJ/Congestion Management and how it impacts ATC calculations. P. 44: Corrected footnote 7 to align it with the reference. P. 47: Deleted language referring to including adjacent TSP reservations in interim ETC_{Fi}. P. 53 lines 1517-1521: Added paragraph describing LETC that was mistakenly left out in Version 1.0 and 2.0. P. 57 line 1604: Deleted "confirmed" from which schedules impact counterflows. P. 58: Replaced table delineating the NERC registered functions of the entities with a bulleted list of the entities. Appendix A: Updated List of Contracts and Specific Paths with Shared Ownership to indicate the Colstrip Project on the Montana Intertie Path will no longer be represented as an allocation agreement after October 1, 2011. Appendix C: Updated the SOL Methodology. Appendix D: Updated BPA's NITS, GF, and PTP Agreements to include the Colstrip Project and other contracts that have been added since February 3, 2011.	
4.0	09/30/2011	P. 27 lines 720 – 722 and ETC_F variable diagram: added new use for RADJ/ETC Adjustments variable.	L Trolese

ATCID Revision History			
5.0	10/20/2011	P. 39 lines 1068-1070, P. 40 lines 1077-1079 and lines 1087-1089: Removed language referring to the month of August. P. 40 lines 1103-1114, P. 41 lines 1118-1128 and P. 48 lines 1325-1331: added paragraph describing how BPA accounts for the impacts of its adjacent TSP firm NITS and PTP Transmission Service.	L Trolese
6.0	11/1/2011	P.31 Table 2 BPA Flowgates: Added the McNary – John Day #2 500 kV line to the West of McNary Flowgate definition. Appendix C: Updated the SOL Methodology.	L Beckman
7.0	11/10/2011	P. 40 line 1103 and P.41 line 1118: Changed effective date from November 8th to no later than November 15, 2011 for incorporating adjacent TSP TSRs into AFC calculations.	L Beckman
8.0	02/03/2012	P. 35 line 907: Added paragraph describing how BPA prepares for the addition of a flowgate.	L Beckman
9.0	02/13/2012	P. 5, P. 22, P. 29: Defined BPA's TRM practice for the Northern Intertie S>N Path. P. 20 line 528 and P. 23 line 597: Replaced NI Holdout in the ATC_F formula with TRM.	L Beckman

ATCID Revision History			
10.0	02/14/2012	P.30-31 Table 2 BPA Flowgates: Corrected the following flowgate definitions: South of Allston Flowgate: replaced Astoria-Seaside 115kV; and Lewis & Clark-Astoria Tap 115kV line with Astoria-Seaside 115kV; and Clatsop 230/115kV line in the South of Allston Flowgate Transmission Line Components. North of John Day Flowgate: replaced Wautoma-John Day 500kV line with Wautoma-Rock Creek 500kV line in the North of John Day Flowgate Transmission Line Components. Cross Cascades North Flowgate: Added the Anderson Canyon-Beverly Park 115 kV line to the Cross Cascades North Flowgate Transmission Line Components. Cross Cascades South Flowgate: replaced Hanford-Ostrander 500kV line with Wautoma-Ostrander 500kV line, replaced McNary-Santiam 230kV line with Jones Canyon-Santiam 230kV line, replaced Parkdale-Troutdale 230kV with Big Eddy-Troutdale 230kV, and added Bethel – Round Butte 230 kV line in the Cross Cascades South Flowgate Transmission Line Components. West of McNary Flowgate: replaced McNary-Santiam 230kV line with Jones Canyon-Santiam 230kV line in the West of McNary Flowgate Transmission Line Components.	L Beckman
11.0	02/22/2012	P. 8 line 166: Removed reference to Northwest Power Pool (NWPP) Outage Coordination Processes, dated 01/29/09.	L Beckman
12.0	03/01/2012	P. 32 Table 2 BPA Flowgates: Added the West of John Day Flowgate and Transmission Line Components. P. 32 Figure 3 BPA Network Flowgate Map: Added the West of John Day Flowgate.	L Beckman
13.0	03/27/2012	P. 31 Table 2 BPA Flowgates: Removed the Anderson Canyon-Beverly Park 115 kV line from the Cross Cascades North Flowgate Transmission Line Components. P. 4 line 52: Moved MOD 008-01 to the Methodologies Selected section.	L Beckman
14.0	04/11/2012	Appendix A: Updated Portland General Electric's Intertie Agreements to reflect the termination of the AC/DC Exchange Agreement that will be effective on 7/1/2012.	L Beckman
15.0	05/15/2012	P. 38 lines 1013-1015, P. 41 lines 1107-1115, P. 46 lines 1282-1289, P. 50 lines 1402-1407 and P. 50 lines 1422-1427: Moved language regarding the PTDF	L Beckman

ATCID Revision History			
		Analysis impact and percentage used in the Western Interconnection-wide Congestion Management Procedure. P. 40 lines 1084-1093: Added generation estimates as the source of the PTDF weightings. P. 42 lines 1157-1159 and P. 51 lines 1433-1436: Added description of how BPA accounts for schedules in ETC_{Fi}. P. 44-45: Removed the definition of and all reference to the "94th Percentile Method". P. 47 lines 1305-1315 and P. 52 lines 1476-1486: clarified that LRES and SRES include reservations for all of BPA's adjacent TSP areas, filtered to reduce duplicates.	L Trolese
16.0	06/27/2012	P. 40 lines 1084-1086: changed sentence to describe that BPA is grouping the generators for all of its adjacent BAAs instead of just a subset.	L Trolese
17.0	08/15/2012	P. 31 Table 2 BPA Flowgates: Added outage conditions flowgate definition for Raver-Paul (N>S). P. 29-30 lines 774,787,799: Replaced RADJ variable descriptions with RADJ/ETC.	L Beckman
18.0	09/20/2012	P. 12 line 299 Table 1 BPA Paths: Removed Transmission Line Components and RAS. P. 23-28 lines 599-607, 633, 750 and 752: Added new Non-firm products to formulas used for calculating Non-firm ETC and Non-firm ATC. P. 50-56 lines 1403-1411, 1428, 1479-1484 and 1604: Added new Non-firm products to formulas used for calculating Non-firm ETC and Non-firm AFC. Appendix C: Updated the SOL Methodology.	L Beckman
19.0	10/18/2012	P. 48 and 53, lines 1334 and 1513: Removed language on accounting for Conditional Firm products in the ETC Adjustment.	L Beckman
20.0	10/24/2012	P. 32 Table 2 BPA Flowgates: Added the South of Boundary Flowgate and Transmission Line Components. P. 33 Figure 3 BPA Network Flowgate Map: Added the South of Boundary Flowgate.	L Beckman

ATCID Revision History			
21.0	11/14/2012	P. 8, lines 159-167: Updated BPA's allocation processes for the Columbia Injection (N>S) and Wanapum Injection (N>S) flowgates. P. 31 Table 2 BPA Flowgates: Replaced Bettas Road - Covington #1 230kV with Bettas Road - Covington #1 230kV in the Cross Cascades North Flowgate Transmission Line Components. P. 31-33 Table 2 BPA Flowgates: Added the North of Hanford (S>N), South of Allston (S>N), Columbia Injection (N>S), Wanapum Injection (N>S) and West of Lower Monumental (E>W) Flowgates in Transmission Line Components, effective Nov. 30, 2012. P. 45 and 46, lines 1245-1248, 1286-1288 and 1318: Added documentation describing ETC calculation practices for light load ETC Cases. P. 55 and 56, lines 1564, 1574-1576 and 1580: Added RETC variable and definition to calculation formula for ETCFi for the Real-Time Horizon.	L Beckman
22.0	01/31/2013	Appendix A: Updated Seattle City Light's PNW AC Intertie Ownership Agreement to reflect shared ownership, effective 1/31/13.	L Wickizer
23.0	01/31/2013	P. 5 line 61, P. 22 line 579, P. 23 lines 594-596, P. 29 line 786: Removed BPA's TRM practice for the Northern Intertie S>N Path, effective Feb. 13, 2013. P. 31-33 Table 2 BPA Flowgates: Added the North of Echo Lake (S>N) and South of Custer (N>S) Flowgates and removed the Monroe-Echo Lake Flowgate in Transmission Line Components, effective Feb. 13, 2013. P. 32 Table 2 BPA Flowgates: Added John Day – Marion No. 1 500kV in the West of John Day Flowgate Transmission Line Components, effective Feb. 13, 2013. P.33 Figure 3 BPA Network Flowgate Map: Updated location of the North of Echo Lake (S>N) and South of Custer (N>S) Flowgates.	L Wickizer
24.0	02/12/2013	P. 5 lines 52-57, P. 22 lines 581-584, P. 23 lines 597-601, P. 29 lines 788-793, P. 30 lines 826-830: Added BPA's updated TRM practice for the Northern Intertie Path.	L Wickizer

ATCID Revision History			
25.0	03/04/2013	P. 58 lines 1651-1655: Added BPA's practice for Converting AFC to ATC.	L Wickizer
26.0	03/25/2013	P.32 Table 2 BPA Flowgates: Updated flowgate names on OASIS. P. 41 lines 1102-1112: Added documentation for Mid-Columbia generators in the weighted PTDF description.	L Wickizer
27.0	05/01/2013	P. 38-39 lines 993-1002: Updated BPA's process for mapping and incorporating outages into the WECC base case. Appendix A: Updated Avista's West of Hatwai Ownership Agreement number.	L Wickizer
28.0	05/15/2014	P. 7-8 lines 123-127, 131-134, 142-143, 149-150: Language clarification in Limiting Assumptions section. P. 9 lines 178-203: Updated BPA's process for outage planning. P. 10 lines 209 – 222: Language clarification on Daily and Hourly TTC and TFC Calculations. P. 10-11 lines 238 – 272: Language clarification on SOL Priorities Used to Set TTC and TFC. P. 37, lines 884-885, 892: Language clarification on SOL study process. P. 38, lines 952-953: Language clarification on SOL study process. P. 39, line 965: Language clarification on TFC calculation. Appendix C: Updated the SOL Methodology.	M Olczak
29.0	05/31/2014	P. 33 Table 2 BPA Flowgates: Added outage conditions flowgate definition for West of McNary.	M Olczak

ATCID Revision History			
30.0	7/24/2014	P. 32 Table 2 BPA Flowgates: Changed Olympia – South Tacoma 230kV to St. Clair – South Tacoma 230kV in the Raver-Paul section. P. 36 Table 3 Interfaces with BAs Adjacent to BPA: Added Gridforce Energy Management as a BA-BA interconnection. P. 36 Table 3 Interfaces with BAs Adjacent to BPA: Updated to show Portland General Electric and Seattle City Light also have connections accounted for with paths that use the Rated System Path Methodology. P. 5 Clarification on number of BAs within the WECC area	J Ofstead
31.0	09/13/2014	P. 33 Table 2 BPA Flowgates: Updated West of McNary flowgate definition during outages.	J Ofstead
32.0	10/21/2014	P. 7, lines 106-108: Language clarification on ATC and AFC hourly firm calculations	J Ofstead
33.0	12/05/2014	P. 18, lines 410-417: Language updated to reflect the current practice of setting TTCs in the non-prevailing flow direction on BPA's ATC Paths that use the Rated System Path Methodology.	L. Proctor
34.0	06/01/2015	P. 4, lines 32-38: Deleted lines regarding registration amongst other organizations other than NERC. P.5-6, lines 67-101: Deleted section on "BPA's Use of Western Electricity Coordinating Council Base Cases". P. 9, lines 179-238: Added "…and Criteria for TTC and TFC Calculations" to section title and deleted "Timeline" from title. Deleted all content in section except "Outage planned and the policy are posted to the Outage Plans website (http://www.oatioasis.com/bpat/index.html) (MOD-001 R3.6.1) (MOD-001 R3.6.2)" P15, lines 319-321: Added language to reflect the tracking and monitoring of the previous 12 months of curtailments due to the issuance of generation limits and inclusion of ATC calculations in Table 1. P.16, lines 347-349: Deleted language to reflect current practices. P. 16, line 350: Added "…and phase shifters".	L. Proctor

ATCID Revision History			
		P. 16, lines 352-359: Deleted language regarding phase shifters. P. 18, lines 362-363: Deleted language regarding BPA engineers running variations on WECC base cases. P.17, lines 371-373: Added language on base cases being updated with a Mid-Season update. P. 17, lines 388-389: Deleted reference to Table 1 for RAS. P. 17, line 391: Deleted language reference to BPA transmission lines with series compensation. P. 18, lines 401-404: Deleted language on modeling contingencies. P. 18, lines 416-417: Deleted language related to Montanan Intertie Path limitation by Colstrip Project and NorthWestern Energy is the TO and set TTC for this ATC Path. P. 18, lines 423-424: Deleted the reference to ATC paths for which BPA expresses TTC by nomongram. P. 18, lines 431-432: Deleted language related to the process defined by WECC's OTCPC. P. 18, line 437: Deleted reference to LaGrande Path. P. 18, lines 438-442: Deleted language related to path ratings. P. 19 lines 460-484: Updated language on TTC ratings. P. 21, lines 538: Deleted reference to Appendix D, which has been deleted from this document. P.30, lines 820-822: Deleted reference to DSO 319. P.31, lines 851-852: Table 2, BPA Flowgates: Deleted facilities monitored during outage conditions for West of McNary. P. 35, lines 863-866: Deleted "History or Flowgates". P. 35, line 873 and line 87: Replaced "included as" with "protected for by".	

ATCID Revision History			
		P. 36, lines 883-884: Deleted "Note" on multiple interfaces. P. 39-40, lines 1002, 1007 and 1008: Replaced "WECC" with "Peak". P. 40, lines 1032-1033: Updated language for accuracy. P. 40, lines 1037 and 1049: Replaced "calculated" with "published". P. 41, lines 1064: Added "…the PTDF difference is…". P. 44, lines 1164, 1175, 1190 and 1195: Deleted reference to BPA not having coordination agreements with other TSP. P.45, lines 1199: Added language to reflect BPA does not have coordination agreements with other TSPs. P. 45, line 1213: Deleted reference to Appendix D, which has been deleted. P. 63-64, line 1745 and chart: Deleted ATCID TP distribution list chart and updated language in line 1745 to reflect ATCID TP Distribution List. Appendix A: Updated chart listing contracts and specific paths with shared ownership, specifically Montana-NW/West of Garrison and added Montana Intertie and La Grande. Appendix B: Deleted – Significant Equipment Operating Bulletin 19. Appendix D: Deleted BPA NITS, GF and PTP Agreements list from 2011. Appendix E: Deleted DSO 319	
35.0	08/10/2015	Language updated to reflect completion of the bulk MOD-030 Mitigation Plan. P. 3, lines 7-8: Deleted "or Available Flowgate Capability (AFC)" P. 4, lines 29-36: Deleted "MOD-001-1, MOD-004-1, MOD-008-1, MOD-028-1, MOD-029-1, and MOD-030-02 variously apply to the Transmission Operator (TOP)	L. Proctor

ATCID Revision History			
		and Transmission Service Provider (TSP)", "Transmission Operator", and deleted lines 34-36; added "Transmission Operator", Transmission Service Provider" and "among other registrations"; added "a" to line 38; lines 39-47: deleted "described in NERC Standard as its methodology", "determine" and "interties, External interconnections and some Paths internal to BPA's Network"; added "calculate", "ATC Paths", "for these paths" and "VIII, and IX"; deleted lines 44-47; line 50: deleted "in its ATC calculation"; line 53: "in its ATC and AFC calculations" and "or Flowgates"; line 54: deleted "Not Selected"; line 55 deleted; lines 56-59: deleted "has elected", "to", "described in NERC Standard MOD-028-1 as its methodology to determine ATC for any of its ATC Paths" and "MOD-028-01", added "does", "(MOD-028-2), the Flowgate Methodology (MOD-030-2), or a Capacity Benefit Margin (CBM) (MOD-004-1)" and "these standards are"; deleted lines 60-63 P. 5: lines 64, 65, 66, 69, 72, 75, 77, 78, 79 and 84: deleted "and AFC"; line 66 deleted "and Flowgate"; line 79-80 "MOD-030-R10"; line 81 deleted "MOD-030 R10.1"; line 82 deleted "MOD-030 R10.2"; line 83 deleted "MOD-030 R10.3"; line 84 deleted "or TFC"; lines 88-89 deleted "The studied assumptions are also used in determining the", "for ATC purposes" and "and the TFC for AFC purposes"; added to line 89 "BPA uses these SOLs as the"; added to lines 97-100 "BPA may use more recent system condition information in its SOL calculations when the studies are updated after the ETC Cases are performed. However, this is not considered a difference in assumptions." P. 6: lines 102-120 deleted; deleted "Flowgate" in lines 122-140; added "Network Paths" to lines 130, 134 and 136; added "Transfer" to line 133 P. 7: lines 144, 147, 150, 152, 161, 178, and 186 deleted "and TFC"; deleted "or Flowgate" in line 173, 178 and 186; added "Network Paths" in line 174 P, 8: deleted "and TFCs" in lines 188, 194, 198; replaced "TFC" with "TTC" in lines 193 and 200; added "Network Path" in line 201; added "for the Paths listed in Table 1" in lines 207-208; deleted line 212 P. 11: added "NV Energy" in line 243, and deleted "Sierra Pacific Power Company (SPPC) in line 254	

ATCID Revision History			
		P. 12: line 284 deleted "MOD-029" P. 25: lines 693, 697, 698, 701 and in chart replaced "Flowgate" with "Network Path"; line 694 and 698-699 replaced "Flowgate" with "Rated System Path"; line 696 replaced "30" with "29" and "02" with "1a" P. 26, 27 and 28: replaced "Flowgate" with "Network Path" in chart P. 28: replaced "Flowgate" with "Network Path" in lines 703 and 706; changed "Figure 1" to "Figure 2"; deleted lines 708-712 P. 30: deleted lines 713-723 and chart P. 31: deleted lines 724-766 P. 32: deleted lines 767-796; replaced "Flowgate" with "Transfer" in line 797 and "TFC" with "TTC"; added lines 798-801; deleted line 801-802 beginning with "BPA establishes….."; deleted lines 803-806 P. 32: deleted lines 807-820; added "(ETC)" to line 821; replaced "AFC" with "ATC" I lines 824 and "Flowgates" with "Network Paths"; deleted "(MOD-030 R5.1) in lines 824; added "base" to line 825; added lines 825-829 beginning with "The assumptions…"; added "to" in line 835; deleted "(MOD-030 R5-2) in line 836; deleted "(MOD 030 R3.1)" in line 843; and deleted "(MOD 030 R3.4)" in line 847 P. 33: added "therefore does not" to line 848; deleted "(MOD 030 R3.5)" in line 849-850; replaced "AFC" with "ATC" in lines 853 and 858; deleted "(MOD 303 R3.2)" in line 855; deleted "(MOD 030 R3.3)" in lines 860; added "base" to line 863; and deleted "(MOD 303 R5.2)" in lines 867 and 872 P. 34: replaced "Flowgates" with "Network Paths" in lines 900, 902, 904, 906, 907 and 090; added "Network Path" to lines 914 and replaced "AFC" with "ATC"; and deleted "(MOD-030 R1.2.3)" in lines 922 P. 35: added "Network Path" and replaced "AFC" with "ATC: in lines 923, 926, 945 and 948; deleted "MOD" reference in lines 928, 932, 937, 942, 944, 950, 954, 959, 963 and 965 P. 36: deleted "MOD" references in lines 975-976, 983, 992 and 1003; replaced "Flowgate" with	

ATCID Revision History			
		"Network Path" in lines 995; deleted "as described in" in line 996 and replaced "MOD-030 R6" with "(MOD-030 R5) in line 996 P. 37: deleted references to MOD in lines 1008, 1010, 1012, 1030, 1033, 1035, 1037, 1040 and 1041-1042; and replaced "Flowgates" with "Network Paths" in lines 1017-1018, 1027 and 1040 P. 38: replaced "Flowgates" with "Network Paths" in lines 1043, 1053 and 1063; added "Network Path" and replaced "AFC" with "ATC" in line 1056; added "base" to line 1064; and deleted MOD references in lines 1066 and 1075 P. 39: replaced "Flowgates" with "Network Paths" in line 1082; deleted MOD references in lines 1082 and 1085-1086; deleted "power flow" from line 1093 and added "ETC" P. 40: replaced "Flowgates" with "Network Paths" in lines 1127 and 1129-113-; deleted MOD references in lines 1121-1122, 1126, 113601137, 1141, 1144-1145 and 1147-1149 P. 41: added "base" in lines 1151, 1154 and 1157; replaced "Flowgates" with "Network Paths" in lines 1181 and 1183; added "Network Path" in line 1182 and replaced "AFC" with "ATC"; and changed "Table 4" to "Table 3" in line 1187 P. 42: replaced "Flowgates" with "Network Paths" in lines 1197, 1200, 1204 and 1206; deleted references to MOD in lines 1198 and 1206; added "Transfer" in lines 1199, 1204 and 1206; replaced "AFC" with "ATC" in lines 1199, 1200, 1202 and 1204; added "(MOD-029 R7) in line 1201 P. 43: replaced "Flowgate" with "Transfer" in lines 1208, 1220, 1225, 1229 and 1233; replaced "TFC" with "TTC" in line 1209; replaced "Flowgates" with "Network Path" in lines 1210-1211; and deleted "base" I line 1219 P, 44: replaced "Flowgate" with "Network Path" in lines 1246, 1247, 1256, 1258-1259, 1260, 1262, 1263, 1267-1269 and 1269; deleted MOD reference in 1255' changed "AFC" to "ATC" in line 1264 and 1267 P. 45: changed "AFC" to "ATC" in lines 1271, 1278, 1280, 1283 and 1307; replaced "Flowgate" with "Network Path" in lines 1272, 1277, 1278 and 1282;	

ATCID Revision History			
		replaced “Flowgate” with “Transfer” in line 1274 P. 46: replaced “Flowgate” with “Network Path” in lines 1309 and 1330; deleted “as described in MOD-030 R7” in line1311; added “(MOD-029 R6)” to line 1311; and deleted references to MODs in lines 1316, 1322, 1325, 1327, 1337 and 1343 P. 47: replaced “Flowgate” with “Network Path” in lines 1346, 1348, 1353-1354 and 1360; removed “(MOD-030 R7.7)” in line 1345; added “Network Path” to line 1356 and replaced “AFC” with “ATC”; replaced “Flowgate” with “Transfer” in line 1358; replaced “AFC” with “ATC” in lines 1358, 1359, 1367, 1369, 1377, 1379 and 1381 P. 48: replaced “AFC” with “ATC” in lines 1382, 1385, 1387, 1389 and 1400; replaced “Flowgate” with “Network Path” in lines 1382, 1387-1388, 1391, 1396, 1397-1398; replaced “TFC” with “TTC” in line 1385; replaced “Flowgate” with “Transfer” in lines 1387, 1391, 1393, 1409 and 1414; added “Network Path” to line 1400; and deleted “base” from line 1413 P. 49: replaced “Flowgate” with “Transfer” in lines 1418 and 1422; replaced “Flowgate” with “Network Path” in lines 1435 and 1436 P. 50: added “Network Path” in lines 1445 and 1467 and changed “AFC” to “ATC”; deleted MOD reference in line 1451; replaced “Flowgate” with “Network Path” in lines 1463 and 1464 P. 51: added “Network Path” to line 1481 and replaced “AFC” with “ATC”; and replaced “Flowgate” with “Network Path” in line 1497 P. 52: replaced “Flowgate” with “Network Path” in lines 1498, 1499, 1501, 1502, 1507, 1508, 1510, 1519 and 1524; replaced “Flowgate” with “Transfer” in lines 1503 and 1512; replaced “AFC” with “ATC” in lines 1507, 1514, 1519, 1521, 1525, 1527; replaced “TFC” with “TTC” in lines 1521, 1525, 1526 and 1527; and deleted lines 1528-1532 P. 53-57: added lines 1339-1516 P. 58: deleted “and AFC” in line 1713; changed “Nevada Power” to “NV Energy” in line 1726; deleted “(PAC)” from line 1729; and deleted “Sierra Pacific Power Company” from line 1740	

ATCID Revision History			
		P. 59: replaced “Flowgates” with “Network Path” in line 1762; deleted “and Flowgates” in line 1766; and deleted line 1767	

Appendix A - List of Contracts and Specific Paths with Shared Ownership

PATH NAME	DIRECTION	CONTRACT DESCRIPTION	CONTRACT NUMBER	CONTRACT PARTY
SOUTH OF ALLSTON	**N>S**	ALLOCATION AGREEMENT - SOUTH OF ALLSTON TRANSMISSION PATH	06TX-12300	PACIFICORP
				PORTLAND GENERAL ELECTRIC
WEST OF CASCADES - NORTH	**E>W**	WHEELING AGREEMENT	DE-MS79-88BP92521	PUGET SOUND ENERGY
CALIFORNIA OREGON INTERTIE (COI)	**N>S** **S>N**	INTERTIE AGREEMENT AC/DC Exchange Agreement Terminated Effective: 7/1/2012	DE-MS79-87BP92340	PORTLAND GENERAL ELECTRIC
		AC INTERTIE AGREEMENT	DE-MS79-94BP94332	PACIFICORP
		PNW AC INTERTIE CAPACITY OWNERSHIP	DE-MS79-95BP94628	PACIFICORP
		PNW AC INTERTIE CAPACITY OWNERSHIP	DE-MS79-94BP94521	PUGET SOUND ENERGY
		PNW AC INTERTIE CAPACITY OWNERSHIP	13ZZ-15826 (formerly DE-MS79-94BP94522)	SEATTLE CITY LIGHT, EDF TRADING NORTH AMERICA LLC, and SOUTHERN CALIFORNIA EDISON COMPANY (Effective 1/31/2013)
		PNW AC INTERTIE CAPACITY OWNERSHIP	DE-MS79-94BP94523	POWER RESOURCES COOPERATIVE
		PNW AC INTERTIE CAPACITY OWNERSHIP	DE-MS79-94BP94524	TACOMA POWER
		PNW AC INTERTIE CAPACITY OWNERSHIP	DE-MS79-94BP94525	SNOHOMISH COUNTY PUD
		CONSENT AGREEMENT	10TX-15107	SEATTLE CITY LIGHT
PACIFIC DC INTERTIE (PDCI)	**N>S**	INTERTIE AGREEMENT AC/DC Exchange Agreement Terminated Effective: 7/1/2012	DE-MS79-87BP92340	PORTLAND GENERAL ELECTRIC
	S>N			
NORTHERN INTERTIE	**N>S**	WESTSIDE NORTHERN INTERTIE & AREA TRANSMISSION	DE-MS79-95BP93081	PUGET SOUND ENERGY
	S>N			
MONTANA-NW/WEST OF GARRISON				
	E>W	ALLOCATION WEST OF GARRISON	DE-MS79-94BP94298	AVISTA CORPORATION NORTHWESTERN CORP
		CAPACITY MANAGEMENT PROCEDURES AGREEMENT	09TX-14013	AVISTA CORPORATION
	W>E	CAPACITY MANAGEMENT PROCEDURES AGREEMENT	09TX-14013	AVISTA CORPORATION

WEST OF HATWAI	**E>W**	SETTLEMENT	04TX-11712 (formerly AV-TR02-0151)	AVISTA CORPORATION
Montana Intertie	**E>W**	UFT AGREEMENT	DE-M79-81BP90210	NORTHWESTERN CORP PACIFICORP PACIFIC POWER AND LIGHT PORTLAND GENERAL ELECTRIC AVISTA PUGET SOUND ENERGY
La Grande	**E>W**	ALLOCATION AGREEMENT	DE-MS79-90BP93116	PACIFICORP AVISTA IDAHO POWER COMPANY

Appendix B - BPA Technical Operations System Operating Limit Methodology for the Operations Horizon

Purpose

Bonneville Power Administration is committed to operating the Transmission System in a safe, reliable, available and compliant manner by setting appropriate System Operating Limits (SOLs). This document establishes the methods BPA will follow to do so.

The North American Electric Reliability Corporation (NERC) FAC-011 Standard requires the Reliability Coordinators to have a documented methodology for the development of SOLs within their Reliability Coordination area. This document describes how BPA applies the Peak Reliability Coordinator's (Peak RC) SOL Methodology to the BPA transmission grid in establishing SOLs for the Operations Horizon, as required by NERC FAC-014-2 R2. The Operations Horizon is defined as the time period from real-time (current operating time) up to one year.

Background

Reliability Standards

Applicable Reliability Standards

This document is based on the NERC Reliability Standards FAC-014-2 R2 and is consistent with the Peak RC's SOL Methodology for the Operations Horizon.

FAC-014-2 R2 states: "The Transmission Operator shall establish SOLs (as directed by its Reliability Coordinator) for its portion of the Reliability Coordinator Area that are consistent with its Reliability Coordinator's SOL Methodology."

Defined Terms

Unless otherwise specified capitalized terms are defined in the Peak RC SOL Methodology or NERC glossary.

Applicability

Applicability to BPA

BPA's SOL Methodology is applicable to the BPA Technical Operations (TOT) organization. BPA establishes SOLs to ensure acceptable Bulk Electric System (BES) performance throughout the Operations Horizon (including the Real-Time Sub-Horizon). An SOL exceedance results if any of the acceptable pre-or post-contingency system performance criteria stipulated in this Methodology are not being met.

SOLs and IROLs

All operating limits, including Facility Ratings, WECC Path Ratings, cut-plane ratings, and Total Transfer Capabilities (TTCs), are designated as SOLs in the Operations Horizon. Exceedence of one or more of these SOLs could cause severe impacts (i.e.; instability, uncontrolled separation, and cascading outages). A subset of these SOLs may also be designated as an Interconnection Reliability Operating Limit (IROL) by the Peak RC on BPA and neighboring Balancing Authorities (BAs) and/or Transmission Operators (TOPs). All IROLs will be coordinated with Peak RC and other TOPs.

Thermally limited SOLs and Associated Facility Ratings

BPA transmission line ratings are based on the maximum current carrying capability, at a particular ambient temperature range, that will not exceed the Maximum Operating Temperature (MOT) of the conductor itself. BPA Transmission Line Design provides continuous operating ratings for transmission lines for use by Planning and Operations in system studies (not emergency or Contingency ratings). However, study engineers utilize the ByLine Tool Time vs. Temperature Analysis Calculator to determine over current capability of lines where the over current can be mitigated by Dispatch within 20 minutes. This is explained further in section **3.1.1.** The 20-minute time horizon to reach the conductor MOT provides sufficient lead time for Dittmer or Munroe Dispatchers to take action to relieve the line over current condition. This 20-minute acceptable response time is a BPA Operations internal limit, and is not to be confused with the 30-minute time limit to mitigate an SOL or IROL violation.

The Thermal Rating for post-contingency operation is defined as the short-term emergency Thermal Rating for foreign Facilities. If an emergency rating is not available, BPA will utilize the normal/continuous rating.

Foreign utility lines are rated for normal (continuous) operation and emergency (or Contingency) operation. The WECC Planning and Operations base cases incorporate normal and Contingency ratings for all three seasons. Example – summer normal is the 'A' rating set, summer contingency is the 'B' rating set. In these cases the BPA 'A' and 'B' ratings are identical, per the BPA rating philosophy previously noted.

Both the normal and Contingency case rating set limits are intended as pre- and post-contingency limits that cannot be exceeded. However, these are continuous limits — in other words, there is no time limit for transmission line loading that reaches Contingency limits.

Methodology

Study Methodology

An SOL represents the value (such as MW, MVar, Amperes, Frequency, or Volts) that satisfies the most limiting of the prescribed operating criteria for a specified system configuration to ensure operation within acceptable operating criteria. These criteria include, but are not limited to, the following:

Thermal Limits

Following an outage condition, paths are screened for limitations caused by thermal equipment limits using the following methodology:

- The power flow base case will be checked for:
  - Accurate system topology
  - Reasonable load and generation levels for the time period of the study
  - Appropriate voltage profile
  - Load versus temperature analysis may be used to develop base cases for different operating conditions.
- The contingencies that need to be considered for determining thermal limits are described in **Section 3.1.6 and 3.1.7.**
- If an unplanned outage occurs affecting a thermally limited path, BPA Dispatchers have 30 minutes to identify and implement a SOL.
  - SOLs are based upon these new system conditions and to protect for the next, worst Contingency. The SOL is determined from Seasonal and Outage Planning studies performed by TOT or use of engineering judgment.
- When studies indicate potential post-contingency overloading, BPA can employ one of the following procedures for addressing an overload issue:
  - Option 1: BPA uses the continuous rating for the limiting element and reduces powerflows in the study so that the post contingency loading on the limiting element is at or below the continuous rating.
  - Option 2: The ByLine/DataBases & Utilities ToolBox/ByLine DataBases/Display & Navigation ByLine ToolBox/Temperature vs Time Analysis may be used to maximize limits, ensuring that the MOT on the Facility is not reached within 20 minutes.
  - This tool is able to calculate the amount of time to reach MOT (Facility Rating) for a line based upon pre and postcontingency current loading, along with ambient air temperature. The results are case specific, and may require multiple iterations.
  - The 20-minute window allows adequate time for manual Dispatcher response to reduce Facility loading issues through a planned procedure.
- Generation variations can be taken into account in cases where generator output can be monitored.
- Limiting elements within contingencies with Outage Transfer Distribution Factors (OTDF) below 3.0% may be ignored.
  - This allows the removal of limiting elements that are relatively insensitive to power transfers on a path for a contingency.
- Remedial Action Schemes (RAS), if applicable, are modeled and include:
  - Generation dropping
  - Shunt reactive device switching
  - Series capacitor switching phase shifter adjustment
  - Line and/or load tripping
  - DC line ramping or tripping

    - Area separation schemes
- For common tower and common adjacent circuits Credible MCs, in power flow and voltage stability analysis, the two circuits will be modeled as a common loss.
- For stuck/failed breaker Credible MCs, in power flow and voltage stability analysis, clear all circuits that would open due to the stuck failed breaker.

Voltage Limits

Paths are screened for voltage stability limits if previous studies have shown the path is sensitive to voltage stability problems or if the path has not been previously studied, using the following methodology:

- The contingencies that need to be considered for determining voltage limits are described in **section 3.1.6 and 3.1.7**.
    - Every studied path or Flowgate must meet criteria for all the Contingencies stated.
        - For outage studies (planned or unplanned) a reduced Contingency list of the worst performing Contingencies may be used to reduce study time.
        - If the path is historically not voltage stability limited, voltage stability screening will be conducted when there are major transmission changes that could impact the results, or if voltage stability screening is warranted in the judgment of TOT.
- RAS if applicable are modeled, including but not limited to:
    - Generation dropping
    - Shunt reactive device switching
    - Series capacitor insertion
    - Phase shifter adjustment
    - Line and/or load tripping
    - DC Line ramping or tripping
    - Area separation schemes
- BPA follows the Peak RC voltage stability analysis documented in the "Guide to WECC/NERC Planning standards I.D.: Voltage Support and Reactive Power" to ensure positive reactive margin is maintained for all Contingencies studied.
- If an unplanned outage occurs on a voltage stability limited path, BPA Dispatchers have 30 minutes to identify and implement a SOL.
    - SOLs are based upon these new system conditions and to protect for the next worst contingency. The SOL is determined from Seasonal and Outage Planning studies performed by TOT, or use of engineering judgment.
- BPA applies the following additional margin for determining the SOL on a voltage stability limited path:
    - 5.0% for an N-1 Contingency
    - 2.5% for an N-2 Contingency
    - 0.0% for an N-2 of any common mode outage of two generating units that are connected to the same switchyard or non-common mode double outage of any

nuclear power generating plant dependent upon Peak RC's list of regional critical Contingencies.

- BPA applies the following voltage deviation performance for determining the SOL on a path:
  - Not to exceed 5% post-transient voltage deviation at any bus for an N-1 Contingency as measured per Appendix 1 -TPL-001-WECC-RBP-2.1
  - Not to exceed 10% post-transient voltage deviation at any bus for an N-2 Contingency as measured per Appendix 1 -TPL-001-WECC-RBP-2.1
- For common tower and common adjacent circuits Credible MCs, in power flow and voltage stability analysis; the two circuits will be modeled as a common loss.
- For stuck/failed breaker Credible MCs, in power flow and voltage stability analysis; clear all circuits that would open due to the stuck failed breaker.

Transient Stability Limits

Paths are screened for transient stability limits if previous studies have shown that the path is sensitive to transient stability, or the path has not been studied before, using the following methodology:

- There are two approaches for transient stability studies:
  1. Transient Stability limited paths
     a. The Contingency list used for transient stability studies is a subset of the Contingencies used for thermal and voltage stability studies. They are chosen based on the following criteria:
        i. Any contingency that would set the SOL based on voltage stability criteria.
        ii. Additional contingencies based on historical system response, previous study responses or the judgment of TOT.
  2. Thermal or Voltage stability limited paths:
     a. Transient stability screening will be conducted when there are major transmission changes that could impact the results, or if transient stability screening is warranted in the judgment of TOT.
- Remedial Action Schemes (RAS), if applicable, are modeled and include but is not limited to:
  - Generation dropping
  - Shunt reactive device switching
  - Resistive brake insertion
  - Series capacitor insertion
  - Line and/or load tripping
  - DC line ramping or tripping
  - Area separation schemes
- Each Contingency is run for a 30-second simulation.
- If the unplanned outage occurs on a transient stability limited path, BPA Dispatchers have 30 minutes to identify and implement a SOL.

    - SOLs are based upon these new system conditions and to protect for the next worst Contingency. The SOL is determined from Seasonal and Outage Planning studies performed by TOT, or use of engineering judgment.
- Results are compared to the criteria in Appendix 1 -TPL-001-WECC-RBP-2.1
    - Acceptability is based on, but not limited to:
        - Maximum first swing voltage dip and duration
        - Low frequency dip
        - System damping
- For transient stability, assume a Fault on one line; apply appropriate relay timing, and then trip the adjacent circuit along with the last breaker opening on the Faulted circuit.
- For transient stability, assume a Fault on one line; apply appropriate relay timing, then trip all circuits that would be cleared as a result of the stuck/failed breaker and timed in accordance with the appropriate breaker failure relaying.

Overall Performance Criteria

All SOLs must meet these minimum criteria:

- All Facilities are operating within their acceptable post-contingency thermal, frequency and voltage ratings.
- Cascading outages do not occur
- Uncontrolled system separation does not occur
- The system demonstrates transient and voltage stability.
- Depending on system design and expected system impacts, the controlled interruption of electric supply to customers (load shedding) is allowed. The planned removal of certain generators and/or the curtailment of contracted firm electric power transfers may be necessary to maintain the overall security of the interconnected transmission system.
        - Interruption of firm transfer, load, or system reconfiguration is permitted through manual, automatic control, or protection actions.
    - To prepare for the next Contingency; system adjustments are permitted, including changes to generation, load, and the transmission system topology when determining limits.
        - A generator producing more than its nameplate rating is not an indicator of an SOL exceedance (although generator nameplate ratings must be respected when performing studies).
- BPA may use SOLs established in previous studies or perform new Seasonal and Outage Planning studies as the expected system conditions warrant in order to ensure acceptable BES performance, establish or update SOLs, or develop plans, processes, and procedures necessary to ensure acceptable BES performance.
- If agreement on the value of the SOL, among impacted TOPs cannot be reached, the TOPs shall default to the most conservative value for use until the issue is resolved per Peak RC instructions.

- For any transient or voltage stability SOL that, while not qualifying as an IROL, has been identified by BPA as; (a) impacting more than one TOP; or (b) having significant impact beyond a localized load pocket within BPA's Area, BPA, in coordination with impacted TOPs, shall develop and document plans, processes, and procedures to mitigate SOL exceedances within a predefined time duration. If TOPs cannot agree on predefined time duration, then a default 30-minute time duration shall be used. TOPs shall coordinate such plans, processes, and procedures with the Peak RC.

Pre-Contingency Analysis

In the pre-contingency state, under conditions that reflect current or expected system conditions and system topology; all Facilities shall be within their Facility Rating, thermal limits, system voltage limits, transient stability limits, and voltage stability limits.

Analysis for Single Contingency

Following a Single Contingency; all Facilities shall be operating within their Facility Rating, thermal limits, system voltage limits, transient stability limits, and voltage stability limits. In addition, cascading outages or uncontrolled separation shall not occur.

BPA's TOT include Single Contingencies that directly impact the SOL of a given path or Flowgate. The Single Contingencies are generally in the immediate vicinity of the path or Flowgate.

A Single Contingency is defined as any of the following

- All N-1 transmission lines (115kV and above), generators, transformers (non-generator step-up and low side at 115kV or above) for next and current day studies.
- N-1 transmission lines, generators, transformers (non-generator step-up and low side at 115kV or above), or shunt devices relevant to the path/Flowgate.
- Single pole block, with normal clearing, in a monopolar or bipolar high voltage direct current system as applicable.

In determining the system's response to a Single Contingency, the following shall be acceptable:

- Planned or controlled interruption of electric supply to radial customers, or some local network customers connected to, or supplied by the Faulted Facility, or by the affected area.
- Interruption of other network customers, only if the system has already been adjusted, or is being adjusted, following at least one prior outage, or if the real-time operating conditions are more adverse than anticipated in the corresponding studies (e.g. load greater than studied).
- System reconfiguration may occur through manual or automatic control or protection actions.
- To prepare for the next Single Contingency; system adjustments may be made, including but not limited to, changes to generation, uses of the transmission system, and transmission system topology, as required.

Analysis for Credible Multiple Contingency (MC)

BPA shall assess whether any of the MCs that have been determined by its Planning Coordinator (PC) to result in stability limits (provided to the Peak RC per FAC-014-R6) are Credible and thus applicable in the Operating Horizons. The TOP shall modify applicable SOLs (including SOLs that qualify as IROLs) based on the revised list of Credible MCs.

Following a Credible MC, all Facilities shall be operating within their Facility Rating, thermal limits, system voltage limits, transient stability limits, and voltage stability limits. In addition, cascading outages or uncontrolled separation shall not occur.

The following types of contingencies will be considered to be Credible Multiple Contingencies:

- BES common tower lines
- Common adjacent circuits: 500kV and 345kV based on TPL-001-WECC RBP regional criterion. Re-visit or eliminate when WECC modifies TPL-001-WECC RBP
- 500kV Breaker Failure (BFR's)
- G-2 – Double Palo Verde if Peak RC deems it regionally critical
- Bipole block, with normal clearing, in a bipolar high voltage direct current system as applicable.

The Study Engineer will determine which specific Credible Multiple Contingencies are relevant to the particular study they are performing. Only those specific Credible Multiple Contingencies need to be considered in the study.

The Study Engineer may deem additional multiple contingencies beyond those listed above to be credible based upon specific conditions or circumstances (for example, additional multiple generator losses).

The Credible MC list is utilized by BPA's TOT for studies that are applicable within the Operations Horizon. The comprehensive list of Credible MCs applicable to BPA will be provided to Peak RC per instructions.

Following any of the Credible MCs, the following may not occur:

- Voltage instability
- Cascading outages
- Uncontrolled separation.

In determining the system's response to a Credible MC, the following shall be acceptable:

- Depending on system design and expected system impacts, the following may be necessary to maintain the overall security of the interconnected transmission systems:
    - Controlled interruption of electric supply to customers (load shedding).
    - Planned removal from service of certain generators.
    - Curtailment of contracted firm (non-recallable reserved) electric power transfers.
- System topology changes are allowed.

- Interruption of firm transfer, load or system reconfiguration is permitted through manual or automatic control or protection actions.
- To prepare for the next Contingency; system adjustments are permitted, including changes to generation, load and the transmission system topology when determining limits.

BPA shall not consider inability to prevent or mitigate adverse impacts of an MC as an acceptable reason for changing credibility of the MC at any time in the Operations Horizon. BPA will coordinate in the determination of Credible MCs where multiple TOPs operate Facilities. If agreement on MC credibility cannot be reached by the TOPs that operate the Facilities, then the MC shall be considered Credible by all until agreement is reached.

Study Model

BPA utilizes WECC seasonal base cases for establishing and calculating path SOLs. These cases are updated to include expected system topology, expected generation, and load demand patterns based on known and reported Facility outages.

BPA reviews and validates its portion of the WECC operating base cases for accuracy prior to case approval and prior to each operating season.

Reliability Criteria and Guidelines

The following criteria and guidelines will be applied in determining acceptable system response following single and Credible MCs:

Criteria and Guidelines for Post-Contingency Steady State Assessment

Following a single or Credible MC, the flow on all Facilities must be within their Thermal Ratings. In addition, voltage instability, cascading outages and uncontrolled separation must not occur.

For single and multiple contingencies, the steady-state pre and post-contingency voltage performance that will be applied will be the voltage limits specified in the voltage limits table provided to Peak RC per their instructions.

In the post-Contingency steady-state assessment; system configuration through manual or automatic control or special protection scheme actions is allowed if it has been proven that adjustments can be done in a timely manner and will be sufficient to prevent the system from equipment damage, voltage collapse, cascading outages or uncontrolled separation. This includes automatic voltage regulators, automatic fast-switched shunt capacitors, and special protection scheme actions.

Criteria and Guidelines for Post-Transient and Voltage Stability Assessment

BPA performs transient stability simulations utilizing the WECC approved, seasonal case for areas and paths that that are known to have been post-transient stability limited or voltage stability limited.

Following single or Credible MC, transient instability, cascading outages and uncontrolled separation must not occur.

When performing voltage stability analysis, flows will be adjusted to provide a minimum 5% margin for the most limiting single Contingency and a minimum 2.5% margin for the most limiting double Contingency.

If a path is voltage stability limited; BPA will communicate limits and provide documentation per Peak RC instructions.

Criteria and Guidelines for Transient Stability Assessment

BPA performs transient stability simulations utilizing the WECC approved, seasonal case for areas that are known to have been transient stability limited. Following single or Credible MCs, transient instability, cascading outages and uncontrolled separation must not occur. In addition, the following Planning criteria should be evaluated as potential operating criteria: See Appendix 1 -TPL-001-WECC-RBP-2.1.

In the transient stability assessment, only system reconfigurations through automatic, fast-switched shunt capacitors and special protection scheme actions are allowed. Other automatic actions may be included. BPA will provide documentation of the capability of the device to automatically react within the transient/dynamic window per Peak RC instructions. This window is the time period from 0 to 30 seconds following initiation of the Disturbance.

For transient stability, BPA will apply a 5% margin for SC and 2.5% margin for Credible MCs.

Exception to the Criteria

Exception to the above criteria is allowed with permission of the owner of the impacted Facilities and if there is no wide-spread impact and do not conflict with the Peak RC SOL Methodology for the Operations Horizon and applicable NERC Reliability Standards.

Use of Engineering Judgment

In situations where there is not enough to run a study and there are no previous SOL's in BPA's Dispatcher's Standing Orders; then engineering judgment will be used per BPA's Use of Engineering Judgment guide to establish an SOL until a study can be run.

BPA Communication and Coordination

Communication and sharing of SOLs and any other limits required by the Peak RC SOL Methodology or deemed necessary by BPA for coordination to ensure reliable BES performance; will be provided to the operationally affected parties and Peak RC per the Peak RC instructions.

Seasonal studies are coordinated with Northwest Operational Planning Study Group and the Peak RC per Peak RC instructions. In all other horizons BPA shares study results with impacted TOPs as appropriate, and with the Peak RC per Peak RC instructions. This includes study results that indicate a potential IROL condition.

If the SOL for a path was set based on the use of the By-Line tool, BPA will provide the following data to the RC:

- Limiting element
- Pre-contingency flow on the limiting element
- Post contingency flow on the limiting element (effectively the emergency rating)
- The assumed ambient air temperature

If any sub-100kV Facilities are known or determined to significantly impact the BES, BPA shall communicate this information to affected parties and to the Peak RC. In addition, BPA will provide other supporting data used to establish SOLs as requested by Peak RC.

BPA provides RAS/Special Protection System scheme descriptions per the Peak RC's Data Requests.

System Voltage Limits

BPA has established operating voltage criteria for the BPA TOP footprint as specified in the table provided to the Peak RC.

The voltage criteria specified in the table provided to the Peak RC are to be used in the determination of SOLs in the Operations Horizon and are applied as is provided per Peak RC instructions.

List of Credible Multiple Contingency Outages for the Operations Horizon

BPA will provide lists of initial and subsequently revised Single Contingencies that result in the loss of multiple Facilities, or instability, and of Credible MCs, to the Peak RC and other TOPs per Peak RC instructions.

Version History and Signatures

Version	Issue Date	Action/Changes	Prepared By	Date Reviewed	Approved By Signature	Date Signed
1.0	8/24/09	Updated date of document and added language to clarify consistency with RC SOL Methodology	Signed MRV Mike Viles		Signed EGE *Edison G. Elizeh*	8/24/09
1.1	11/02/09	Revised Document title and 2nd bullet under 1.a.	Mike Viles		Edison G. Elizeh	

1.2	11/14/09	Added language to address study model used	Mike Viles		/s/ Edison G. Elizeh	11/16/09
2.0	09/08/10	Updated document to reflect studied contingencies, margins, and requirements for establishing SOLs.	Mike Viles		/s/ Edison G. Elizeh	09/08/10
2.1	07/18/11	Updated document to reflect SOL 30 minute threshold	/s/ James O'Brien		/s/ John S. Kerr for Melvin Rodrigues	07/18/10
2.2	09/30/11	Removed "transformer" from 1.a. 4th sub-bullet	/s/ James O'Brien		/s/ Melvin Rodrigues	10/3/11
2.3	10/20/11	Removed "A double pole loss of the PDCI is considered an N-1 contingency" from 1.a.1st sub-bullet. Added " PDCI bi-pole loss as 1.a. 5th sub-bullet.	James O'Brien		Melvin Rodrigues	10/20/11
2.4	8/23/12	Section 1, removed "WECC does not have Irols so they are not identified as a subset of SOLs in this methodology."	John Anasis		Margaret I. Albright	8/27/12
3.0	2/28/14	Updated the entirety per Peak RC SOL Methodology for the Operations Horizon effective 3/3/14	/s/John Anasis	2/28/14	/s/ Margaret Albright	2/28/14
3.1	4/16/14	Minor spelling corrections. Corrected MC definitions. Added monitoring steady state Voltage. Added Appendix TPL-001-0.1 System Performance Under Normal Conditions	/s/ John Anasis	4/16/14	/s/ Margaret Albright	4/16/14

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Appendix 1 – TPL-001-0.1System Performance Under Normal Conditions

Table I. Transmission System Standards – Normal and Emergency Conditions

Category	Contingencies	System Limits or Impacts		
	Initiating Event(s) and Contingency Element(s)	System Stable and both Thermal and Voltage Limits within Applicable Rating [a]	Loss of Demand or Curtailed Firm Transfers	Cascading Outages
A No Contingencies	All Facilities in Service	Yes	No	No
B Event resulting in the loss of a single element.	Single Line Ground (SLG) or 3-Phase (3Ø) Fault, with Normal Clearing: 1. Generator 2. Transmission Circuit 3. Transformer Loss of an Element without a Fault	Yes Yes Yes Yes	No [b] No [b] No [b] No [b]	No No No No
	Single Pole Block, Normal Clearing[e]: 4. Single Pole (dc) Line	Yes	No[b]	No
C Event(s) resulting in the loss of two or more (multiple) elements.	SLG Fault, with Normal Clearing[e]: 1. Bus Section 2. Breaker (failure or internal Fault)	Yes Yes	Planned/ Controlled[c] Planned/ Controlled[c]	No No
	SLG or 3Ø Fault, with Normal Clearing[e], Manual System Adjustments, followed by another SLG or 3Ø Fault, with Normal Clearing[e]: 3. Category B (B1, B2, B3, or B4) contingency, manual system adjustments, followed by another Category B (B1, B2, B3, or B4) contingency	Yes	Planned/ Controlled[c]	No
	Bipolar Block, with Normal Clearing[e]: 4. Bipolar (dc) Line Fault (non 3Ø), with Normal Clearing[e]: 5. Any two circuits of a multiple circuit towerline[f]	Yes Yes	Planned/ Controlled[c] Planned/ Controlled[c]	No No
	SLG Fault, with Delayed Clearing[e] (stuck breaker or protection system failure): 6. Generator 7. Transformer 8. Transmission Circuit 9. Bus Section	Yes Yes Yes Yes	Planned/ Controlled[c] Planned/ Controlled[c] Planned/ Controlled[c] Planned/ Controlled[c]	No No No No

D [d] Extreme event resulting in two or more (multiple) elements removed or Cascading out of service.	3Ø Fault, with Delayed Clearing [e] (stuck breaker or protection system failure): 1. Generator 2. Transmission Circuit 3. Transformer 4. Bus Section 3Ø Fault, with Normal Clearing [e]: 5. Breaker (failure or internal Fault) 6. Loss of towerline with three or more circuits 7. All transmission lines on a common right-of way 8. Loss of a substation (one voltage level plus transformers) 9. Loss of a switching station (one voltage level plus transformers) 10. Loss of all generating units at a station 11. Loss of a large Load or major Load center 12. Failure of a fully redundant Special Protection System (or remedial action scheme) to operate when required 13. Operation, partial operation, or misoperation of a fully redundant Special Protection System (or Remedial Action Scheme) in response to an event or abnormal system condition for which it was not intended to operate 14. Impact of severe power swings or oscillations from Disturbances in another Regional Reliability Organization.	Evaluate for risks and consequences. ▪ May involve substantial loss of customer Demand and generation in a widespread area or areas. ▪ Portions or all of the interconnected systems may or may not achieve a new, stable operating point. ▪ Evaluation of these events may require joint studies with neighboring systems.

a) Applicable rating refers to the applicable Normal and Emergency facility thermal Rating or system voltage limit as determined and consistently applied by the system or facility owner. Applicable Ratings may include Emergency Ratings applicable for short durations as required to permit operating steps necessary to maintain system control. All Ratings must be established consistent with applicable NERC Reliability Standards addressing Facility Ratings.

b) Planned or controlled interruption of electric supply to radial customers or some local Network customers, connected to or supplied by the Faulted element or by the affected area, may occur in certain areas without impacting the overall reliability of the interconnected transmission systems. To prepare for the next contingency, system adjustments are permitted, including curtailments of contracted Firm (non-recallable reserved) electric power Transfers.

c) Depending on system design and expected system impacts, the controlled interruption of electric supply to customers (load shedding), the planned removal from service of certain generators, and/or the curtailment of contracted Firm (non-recallable reserved) electric power Transfers may be necessary to maintain the overall reliability of the interconnected transmission systems.

d) A number of extreme contingencies that are listed under Category D and judged to be critical by the transmission planning entity(ies) will be selected for evaluation. It is not expected that all possible facility outages under each listed contingency of Category D will be evaluated.

e) Normal clearing is when the protection system operates as designed and the Fault is cleared in the time normally expected with proper functioning of the installed protection systems. Delayed clearing of a Fault is due to failure of any protection system component such as a relay, circuit breaker, or current transformer, and not because of an intentional design delay.

f) System assessments may exclude these events where multiple circuit towers are used over short distances (e.g., station entrance, river crossings) in accordance with Regional exemption criteria.

Appendix 2 – TPL-001-WECC-RBP-2.1

WECC DISTURBANCE-PERFORMANCE TABLE
OF ALLOWABLE EFFECTS ON OTHER SYSTEMS

NERC and WECC Categories	Outage Frequency Associated with the Performance Category (outage/year)	Transient Voltage Dip Standard	Minimum Transient Frequency Standard	Post Transient Voltage Deviation Standard (See Note 3)
A	Not Applicable	Nothing in addition to NERC.		
B	≥ 0.33	Not to exceed **25%** at load buses or **30%** at non-load buses. Not to exceed **20% for more than 20 cycles** at load buses.	Not below **59.6** Hz for 6 cycles or more at a load bus.	Not to exceed **5%** at any bus.
C	0.033 – 0.33	Not to exceed **30%** at any bus. Not to exceed **20% for more than 40 cycles** at load buses.	Not below **59.0** Hz for 6 cycles or more at a load bus.	Not to exceed **10%** at any bus.
D	< 0.033	Nothing in addition to NERC.		

Table W-1

Notes:

1. *The WECC Disturbance-Performance Table applies equally to either a system with all elements in service, or a system with one element removed and the system adjusted.*

2. *As an example in applying WECC's Disturbance-Performance Table, a Category B disturbance in one system shall not cause a transient voltage dip in another system that is greater than 20% for more than 20 cycles at load buses, or exceed 25% at load buses or 30% at non-load buses at any time other than during the fault.*

3. *If it can be demonstrated that post-transient voltage deviations that are less than the values in the table will result in voltage instability, the system in which the disturbance originated and the affected system(s) shall cooperate in mutually resolving the problem.*

4. *Refer to Figure W-1 for voltage performance parameters.*

5. *Load buses include generating unit auxiliary loads.*

6. *To reach the frequency categories shown in WECC's Disturbance-Performance Table for Category C disturbances, some planned and controlled islanding may occur. Underfrequency load shedding is expected to arrest this frequency decline and assure continued operation within the resulting islands.*

7. *For simulation test cases, the interconnected transmission system steady-state loading conditions prior to a disturbance shall be appropriate to the case. Disturbances shall be simulated at locations on the system that result in maximum stress on other systems. Relay action, fault clearing time, and reclosing practice shall be represented in simulations according to the planning and operation of the actual or planned systems. When simulating post-transient conditions, actions are limited to automatic devices, and no manual action is to be assumed.*