Available Transfer Capability Implementation Document (North American Energy Standards Board WEQ-023)

Bonneville Power Administration
Transmission Services

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I. Purpose

This Available Transfer Capability Implementation Document (ATCID) addresses all of the requirements of North American Energy Standards Board (NAESB) Wholesale Electric Quadrant business practice standard 023 (WEQ-023), and includes BPA's Postback Methodology.

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, NAESB WEQ-000, or 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
- **Short-Term Reservation:** a confirmed reservation that has duration less than 365 days

[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, West of Hatwai, West of Garrison and La Grande paths.

[3] AC Intertie (NWACI), Pacific DC Intertie (PDCI), and Montana Intertie.

III. Overview

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

Methodology Selected

Rated System Path Methodology, WEQ-023-2.2

BPA has elected to use the Rated System Path Methodology to calculate Total Transfer Capability (TTC) and Available Transfer Capability (ATC) for all its paths. The description of how BPA implements this methodology for these paths is included in this ATCID.

ATC Calculations

ATC Calculation Periods

BPA calculates ATC values using the Rated System Path Methodology for the following time periods:

- 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.
- 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.
- 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.

Frequency of ATC Recalculation

BPA recalculates ATC on the following frequency, even if the calculated values identified in the ATC equation are unchanged:

- Hourly, at least once per hour
- Daily, at least once per day
- Monthly, at least once per day

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

IV. Allocation Processes

BPA allocates transfer capability among multiple owners or users of its 1:1 and flow-based paths.

Allocations - TTC:

For paths where allocation agreements exist, BPA allocates TTC according to the contractual rights of the various owners as defined in the agreements.

Allocation agreements do not exist for two of BPA's flow-based paths that have multiple owners: Columbia Injection N>S and Wanapum Injection N>S. For Columbia Injection N>S and Wanapum Injection N>S, BPA determines its share of TTC based on BPA-owned transmission lines that make up these paths when all lines are in service. During outage conditions, individual allocations exist for the loss of each transmission line in the line definitions for these paths.

Allocations - base ETC:

BPA allocates base ETC among some of its shared flow-based paths. To allocate base ETC for South of Allston N>S, BPA uses the contractual rights defined in the South of Allston allocation agreement. To allocate base ETC for the Columbia Injection N>S, Wanapum Injection N>S, and Cross Cascades North E>W paths, BPA only models the BPA-owned transmission lines that make up these paths in the base ETC cases. BPA does not allocate base ETC across any other shared flow-based paths.

Allocations - PTDFs:

BPA calculates PTDFs based on the full path definition of all paths with the exception of Columbia Injection N>S, Wanapum Injection N>S and Cross Cascades North E>W. For these three paths, BPA calculates PTDFs based on the BPA-owned transmission lines that make up these paths.

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.

Outage Planning

Outage plans and the policy are posted to the Outage Plans website at: Outage Coordination - Bonneville Power Administration (bpa.gov)

Outage Criteria for TTC Calculations

BPA incorporates outages into the TTC calculations after they have been studied by BPA or provided to BPA by another TOP. Generally, BPA studies outages 10 to 16 days prior to the outage start date.

The duration of an outage is not a criteria by which BPA determines which outages to incorporate in its daily and monthly TTC calculations. The most conservative hourly TTC calculated for a given outage or combination of outages becomes the governing TTC for the daily calculation period. Likewise, the most conservative daily TTC for a given outage or combination of outages becomes the governing TTC for the monthly calculation period.

VI. Priorities Used to Set TTC

BPA may update assumptions and calculate new TTCs 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 TTC values based on the time period being calculated and the reason for the change. This prioritization may then be used to revise the path TTC for a given time period if BPA determines that more recent assumptions to calculate TTC values better reflect updated System information:

- **Real-time limit (highest priority):** The "Real-time limit" priority governs when BPA updates the assumptions of System conditions to calculate TTCs during the Real-time horizon. A change to the TTC calculation with the Real-time priority governs 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 may update the assumptions for the TTC 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 for TTC calculations, the most recent TTC calculated governs.
- **Scheduling limit:** The "scheduling limit" priority may be used occasionally when the assumptions for the TTC are not governing or an actual scheduling limit has been imposed. If there is more than one scheduling limit, the lowest scheduling limit governs until a Real-time limit TTC is submitted.
- **Pre-schedule forecast:** The "pre-schedule forecast" TTC priority may be used for a path if the assumptions for the TTC calculations are updated for the pre-schedule period. For example, for TTCs calculated for flow-based paths that are derived using nomograms, if the assumptions are re-evaluated just prior to the pre-schedule day to incorporate updated data inputs, the TTC may be updated. The pre-schedule forecast TTC governs over the 'studied' priority.
- **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 evaluating assumptions for line outage system conditions, the TTCs in that report govern over any lower-priority TTCs for the duration of the line outage conditions.
- **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 a path 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, TTCs studied using normal conditions, TTCs calculated for the planning horizon, or all of the above. The lowest value resulting from the above calculations governs for the given time period and is used to set the TTC. For example, if under normal conditions the TTC for a path is 4410 MW, but the TTC calculated for the planning horizon is 4100 MW, the lower TTC of 4100 MW governs and is used to set the TTC for the 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 for BPA's Paths

This section describes how BPA implements the Rated System Path methodology for its paths.

BPA's Paths

The following tables list BPA's paths. BPA has a combination of 1:1 and flow-based paths, and uses the Rated System Path methodology to calculate ATC for both.

Table 1, BPA's 1:1 Paths

1:1 Path Name	Direction	1:1 OASIS Path Name
Northern Intertie	N>S	NI_TOTL_N>S
Northern Intertie	S>N	NI_TOTL_S>N
West of Garrison	E>W	WOGARR_E>W
West of Garrison	W>E	WOGARR_W>E
La Grande	W>E	LAGR_W>E
La Grande	E>W	LAGR_E>W
Montana Intertie	E>W	MI_E>W
Reno-Alturas	N>S	RATS_N>S
Reno-Alturas	S>N	RATS_S>N
AC Intertie (NWACI)	N>S	AC_N>S
AC Intertie (NWACI)	S>N	AC_S>N
Pacific DC Intertie (PDCI)	S>N	DC_S>N
Pacific DC Intertie (PDCI)	N>S	DC_N>S
Rock Creek Wind	Gen	ROCKCK_GEN
John Day Wind	Gen	JDWIND_GEN
Satsop Injection	Gen	SATSOP_GEN

148 **Table 2, BPA's Flow-Based Paths**

Flow-based Path Name	Direction	Flow-based OASIS Path Name	Transmission Line Components	Case used for base ETC calculation
North of Hanford	N>S	NOHANF	Vantage-Hanford #1 500-kV; Grand Coulee-Hanford #1 500-kV; and Shultz-Wautoma #1 500-kV	Heavy load
North of Hanford	S>N	NOHANF_S>N	Hanford-Vantage #1 500-kV; Hanford-Grand Coulee #1 500-kV; and Wautoma-Shultz #1 500-kV	Heavy load
South of Allston	N>S	SOALSN	**BPA-Owned Transmission Lines:** Allston-Keeler 500-kV; Lexington-Ross 230-kV; and Allston-St. Helens 115-kV; **Portland General Electric-Owned Transmission Lines:** Trojan-St. Marys 230-kV; and Trojan-Harborton 230-kV; **PacifiCorp-Owned Transmission Lines:** Merwin-St. Johns 115-kV; Astoria-Seaside 115-kV; and Clatsop 230/115-kV	Heavy load
Raver-Paul	N>S	RAVR_PAUL	Raver-Paul #1 500-kV **When Raver-Paul #1 500-kV is out of service, the following lines are monitored:** Raver-Paul #1 500-kV; St. Clair-South Tacoma #1 230-kV; Chehalis-Covington #1 230-kV; Frederickson-St. Clair 115-kV; and Electron Heights-Blumaer 115-kV	Heavy load
Cross Cascades North	E>W	C-CASC_N	**BPA-Owned Transmission Lines:** Schultz-Raver #1, #3, & #4 500-kV; Schultz-Echo Lake #1 500-kV; Chief Joseph-Monroe #1 500-kV; Chief Joseph-Snohomish #3 & #4 345-kV; Rocky Reach-Maple Valley #1 345-kV; Grand Coulee-Olympia #1 287-kV; and Bettas Road-Covington #1 230-kV; **Puget Sound Energy-Owned Transmission Line:** Rocky Reach-Cascade 230-kV	Heavy load

Flow-based Path Name	Direction	Flow-based OASIS Path Name	Transmission Line Components	Case used for base ETC calculation
Cross Cascades South	E>W	C-CACS_S	**BPA-Owned Transmission Lines:** Big-Eddy-Ostrander #1 500-kV; Ashe-Marion #2 500-kV; Buckley-Marion #1 500-kV; Knight-Ostrander #1 500-kV; John Day-Marion #1 500-kV; McNary-Ross #1 345-kV; Big Eddy-Chemawa #1 230-kV; Big Eddy-McLoughlin #1 & #2 230-kV; Midway-North Bonneville #1 230-kV; Jones Canyon-Santiam #1 230-kV; and Big Eddy-Troutdale #1 230-kV **PGE-Owned Transmission Line:** Round Butte-Bethel 230-kV	Heavy load
West of McNary	E>W	WOMCNY	Coyote Springs-Slatt #1 500-kV; McNary-Ross #1 345-kV; Harvalum-Big Eddy #1 230-kV; Jones Canyon-Santiam #1 230-kV; and McNary-John Day #2 500-kV	Heavy load
West of Slatt	E>W	WOSLATT	Slatt-Buckley #1 500-kV; and Slatt-John Day #1 500-kV	Heavy load
West of John Day	E>W	WOJD_E>W	John Day-Big Eddy #1 500-kV; John Day-Big Eddy #2 500-kV; and John Day-Marion #1 500-kV	Heavy load
South of Boundary	N>S	SBNDRY_N>S	Boundary-Bell #1 230-kV; Boundary-Bell #3 230-kV; Boundary-Usk #1 230-kV; and Boundary 230/115-kV Transformer #1	Heavy load
Columbia Injection	N>S	CLMBIA_N>S	**BPA-Owned Transmission Lines:** Columbia-Grand Coulee #1 230-kV; Columbia-Grand Coulee #3 230-kV; Columbia-Rocky Reach #1 230-kV; Columbia-Valhalla #1 115-kV; and Columbia-Valhalla #2 115-kV; **Chelan PUD-Owned Transmission Line:** Columbia-Rocky Reach #2 230-kV **Douglas PUD-Owned Transmission Line:** Rapids-Columbia #1 230k	Heavy load

Flow-based Path Name	Direction	Flow-based OASIS Path Name	Transmission Line Components	Case used for base ETC calculation
Wanapum Injection	N>S	WANAPM_N>S	**BPA-Owned Transmission Line:** Vantage-Midway #1 230-kV; **Grant PUD-Owned Transmission Line:** Priest Rapids-Midway #3 230-kV	Heavy load
West of Lower Monumental (West of LoMo)	E>W	W_LOMO_E>W	Lower Monumental-Ashe 500-kV; Lower Monumental-Hanford 500-kV; and Lower Monumental-McNary 500-kV	Heavy load
North of Echo Lake	S>N	N_ECOL_S>N	Echo Lake-Monroe-SnoKing Tap #1 500-kV; Echo Lake-Maple Valley #1 500-kV; Echo Lake-Maple Valley #2 500-kV; and Covington-Maple Valley #2 230-kV	Heavy load
South of Custer	N>S	SCSTER_N>S	Custer-Monroe #1 500-kV; Custer-Monroe #2 500-kV; Custer-Bellingham #1 230-kV; and Custer-Murray #1 230-kV	Heavy load
North of Grizzly	N>S	GRZN_N>S	Buckley-Grizzly #1 500-kV; John Day-Grizzly #1 500-kV; John Day-Grizzly #2 500-kV; and Maupin-Redmond #1 230-kV	Heavy load
North of Pearl	S>N	NOPE_S>N	**BPA-Owned Transmission Line:** Pearl-Keeler #1 500-kV; **BPA/Portland General Electric Jointly Owned Lines:** Pearl-Sherwood #1 & #2 230-kV; Pearl Tap to the Mcloughlin-Sherwood #1 230-kV	Heavy load
West of Hatwai	E>W	WOH_E>W	Hatwai-Lower Granite #1 500-kV; Bell-Grand Coulee #6 500-kV; Bell-Grand Coulee #3 230-kV; Bell-Grand Coulee #5 230-kV; Westside-Grand Coulee #1 230-kV; Dry Creek-Talbot 230-kV; North Lewiston-Tucannon River #1 115-kV; Devils Gap-Stratford 115-kV; Lind-Warden 115-kV; Creston-Bell #1 115-kV; and Dry Gulch-Pomeroy 69-kV	Light load

Calculating TTC

Data and Assumptions

When calculating TTC for its paths, BPA uses WECC base cases that utilize data and assumptions consistent with the time period being studied.

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

BPA models all existing System Elements, including but not limited to any transmission additions and retirements, in their normal operating condition for the assumed initial conditions, up to the time horizon in which BPA begins modeling planned outages.

The WECC base cases include generators and phase shifters that meet the guidelines set out in the WECC Data Preparation Manual.

BPA uses the seasonal Load forecasts contained in the WECC base cases for each BA.

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, as well as expected generation for the timeframe under study.

The WECC base cases include Facility Ratings as provided to WECC by the Transmission Owners and Generator Owners.

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.

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.

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 all paths, except West of Garrison and Northern Intertie South to North, BPA uses the all lines in service TTC from the relevant seasonal studies when there are no studied outages to set the TTC of the path for the corresponding seasonal time periods.

For West of Garrison, for the seasons or time periods in which the seasonal studies have not been completed, the most recent year's seasonal study results will be used for setting the TTC for the path.

For Northern Intertie South to North, for the seasons or time periods in which the seasonal studies have not been completed, the most recent year's seasonal study results will be used for setting the TTC. BPA uses the minimum TTC from the relevant seasonal studies to set the TTC of the path for periods from the next day and beyond. For the Real-time horizon, when there are no studied outages, BPA uses the maximum TTC from the relevant seasonal studies to set the TTC of the path.

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.

The WECC base cases include all series compensation for each line at the expected operating level.

BPA uses no other modeling requirements for calculating TTC in addition to those specified in this document.

Process to Determine TTC

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

BPA studies single and multiple contingencies that are relevant to the path being studied.

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. Any reliability constraints requested by another Transmission Operator will also be included.

BPA models contingencies as per the current version of "RC West System Operating Limits Methodology for the Operations Horizon" (RC West SOL Methodology) posted on RC West's website.

When modeling contingencies, BPA determines TTCs by stressing the system until flows exceed emergency Facility Ratings or voltages fall outside emergency system voltage limits (i.e., the post-Contingency state). BPA does this by simulating transfers performed through the adjustment of generation and load. If a facility does not have an emergency Facility Rating, the normal Facility Rating is used. If there is no emergency system voltage limit, the normal system voltage limit is used. By meeting the criteria in the RC West SOL Methodology, uncontrolled separation should not occur. BPA does not take into account expected transmission uses in the determination of TTC.

BPA's paths listed below are bi-directional and have studied TTCs in both the prevailing and non-prevailing direction of flow.

- Northern Intertie
- West of Garrison
- La Grande
- Reno-Alturas
- AC Intertie (NWACI)
- Pacific DC Intertie (PDCI)

- North of Hanford

All of BPA's other paths are one directional, in the prevailing direction of flow, and have studied TTCs that are established for the prevailing direction of flow.

For 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 paths.

BPA or the adjacent path TOP identifies when the new or increased TTC for a 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 path.

BPA has Transmission Ownership Agreements where multiple ownerships of Transmission rights exist on a path. TTC for the affected paths is allocated according to contractual ownership rights.

The ratings for BPA's paths whose ratings were established, known, and used in operation since January 1, 1994, have been re-established using updated methods. BPA studies its paths, with the exception of La Grande, on a periodic basis and reconfirms the rating of each path based on these studies. These ratings are then used to establish the TTC for the path.

For the La Grande path, BPA uses the Accepted Rating of the path as defined in the WECC Path Rating Catalog. BPA's La Grande path is part of the NW-Idaho path (WECC Path 14). The rating of Path 14 was reconfirmed through an updated study in 2010 when the path definition had to be modified due to the addition of the Hemingway Substation by PacifiCorp and Idaho Power.

BPA establishes the TTC at the lesser of the maximum allowable contractual allocation, or the reliability limit determined by the Transmission Operator. The reliability limit includes, but is not limited to, any System Operating Limit for an ATC path.

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. The RC West SOL Methodology document defines the steps taken and assumptions BPA used to determine TTC for each path. BPA creates a study report for each study it performs. The study report relies on the basic assumptions included in RC West SOL methodology and identifies any changes to those basic assumptions.

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 paths listed in Table 1 where there are multiple TSPs *prior* to limitations in TTCs.

A path for which BPA does not perform studies to determine the most current value of TTC is Reno – Alturas. For Reno-Alturas, NV Energy determines TTC. The TTC is provided to BPA and BPA then sends a Notice of Planned Path Limitation.

Calculating Firm Transmission Service for Paths

Calculating Firm Existing Transmission Commitments (ETC_F)

When calculating ETC_F for all time periods for its paths, BPA uses the following algorithm:

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

Where:

ETC_F is the firm ETC for the ATC path.

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

BPA does not have any NL_F, and thus sets NL_F at zero for all of its paths for all time periods. All of BPA's firm Transmission obligations are captured in the $NITS_F$, PTP_F, GF_F and ROR_F components of the ETC_F algorithm.

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

For BPA's 1:1 paths, BPA uses ten year maximum 1 in 10 coincidental peak load forecasts to encumber capacity for customers with a designated resource of FCRPS. For customers with a designated resource outside of FCRPS, BPA uses the capacity designated for the resource to encumber capacity across these paths.

On the La Grande W>E ATC path, BPA uses a different methodology to encumber capacity for customers with a designated resource of FCRPS. BPA encumbers firm capacity based on the coincidental 1 in 10 peak forecast, less critical water forecasts of the federal generation located in the Idaho BAA. Idaho Power then specifies what will be served across La Grande W>E and BPA encumbers this amount for this path.

For BPA's flow-based paths, BPA accounts for $NITS_F$ obligations with a combination of base ETC and interim ETC calculations, as described further in this document.

GF_F is the firm capacity set aside for grandfathered contracts for energy and/or Transmission Service, where executed prior to the effective date of a Transmission Service Provider's Open Access Transmission Tariff or "safe harbor tariff."

The amount of GF_F BPA encumbers across its 1:1 paths is based on the terms of each individual contract.

For BPA's flow-based paths, BPA accounts for GF_F obligations with base ETC calculations, as described further in this document.

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

In BPA's calculations for 1:1 paths, PTP_F is equal to the sum of the MW Demands of PTP_F reservations or schedules.

For BPA's flow-based paths, BPA accounts for PTP_F obligations with a combination of base ETC and interim ETC calculations, as described further in this document.

For Redirects from conditional short-term firm parent reservations, BPA's ETC accounts for the parent reservation until the Redirect is confirmed on OASIS. Once the Redirect is confirmed, BPA's ETC only accounts for the Redirect.

For Redirects from long-term firm parent reservations or unconditional short-term firm parent reservations, BPA's ETC accounts for both the parent reservation and the Redirect reservation until the Redirect itself is unconditional. Once the Redirect is unconditional, BPA's ETC only accounts for the Redirect.

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 encumbered for these cases does not exceed the total PTP_F rights 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. If a Transmission Customer chooses not to exercise its roll-over rights by the required deadline, BPA no longer encumbers 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 as specified in the ATCID.

BPA has no OS_F and thus sets OS_F at zero for all of its paths for all time periods. All of BPA's firm Transmission obligations are captured in the $NITS_F$, PTP_F, GF_F and ROR_F components of the ETC_F algorithm.

Although BPA uses the above algorithm to calculate ETC_F for all of its paths, BPA's ETC_F calculation methodology differs between its 1:1 and flow-based paths. For 1:1 paths, BPA calculates ETC_F by assuming that 1 MW of reserved firm capacity equals 1 MW of ETC_F across that path. The POR/POD combinations for 1:1 ATC paths that impact ETC_F can be found under the Transmission Availability section of BPA's website. For the flow-based paths, BPA calculates ETC_F by summing the base ETC from power-flow ETC studies with interim ETC_F calculated using PTDFs.

Determining base ETC for Flow-Based Paths

Use of WECC Base Cases to Determine Base ETC

BPA uses the WECC seasonal base cases and modifies them to calculate the base ETC for its flow-based paths. BPA refers to these base cases as ETC Cases.

Determining Base ETC for Heavy Load Base Cases

BPA creates monthly heavy load ETC Cases to calculate base ETC values. BPA's ETC cases are produced using a power flow model that computes how much power will flow over each flow-based path for the assumed Load and generation levels for each time period studied. Counterflows are inherently modeled in these base cases.

BPA uses the following assumptions to create heavy load ETC Cases for its base ETC calculations:

System topology: Normal operating conditions are used. BPA uses the WECC Winter seasonal case for its November through March ETC base cases, the WECC Spring seasonal case for its April and May ETC base cases, and the WECC Summer seasonal case for its June through October ETC base cases.

Load: BPA uses loads contained in the WECC seasonal 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$_F$**, **PTP$_F$** and **GF$_F$**: BPA assumes a 1-in-2 year monthly peak load forecast in all its monthly ETC cases

Generation: For the generators in BPA's BAA or directly interconnected to BPA, BPA uses the following generation assumptions:

FCRPS: For the FCRPS resources serving NITS$_F$, PTP$_F$, and GF$_F$ Long-Term Reservations, generation levels are set using a multiple-step process. For all time periods studied, 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 based on the 90th percentile rate case generation values for these projects. The generation levels at the Willamette Valley projects[4] are set at a monthly fleet-aggregate lower 10th percentile of Heavy Load Hour block generation from the planning period of record and adjusted as needed to accurately reflect operations that BPA knows are in place. **Nameplate Adjusted**

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

Method: When creating heavy load ETC Cases, generation levels for all other federal hydro projects[5] are set by first determining the nameplate for each project and then adjusting such nameplates by outages forecasted for the particular plants. Next in the month of August, the Lower Snake plants (Lower Granite, Lower Monumental, Little Goose, and Ice Harbor) are capped at the observed project outflow over the past ten Augusts. Then multiple generation scenarios are modelled by stressing one of three different "zones" of Federal hydro resources to the nameplate adjusted generation levels described above and scaling the generation at the remaining Federal hydro projects to match the sum of the demands for all contracts that call out non-specific Federal hydroelectric projects as PORs after adjusting these demands for the portion served by Columbia Generating Station, Libby, Hungry Horse, Dworshak, Albeni Falls, and the Willamette Valley projects. The Federal PTP demands at each project are then added to this result to obtain the final assumed generation level for each Federal hydro project.

Non-Federal Thermal Generators: Non-federal thermal generators associated with PTP_F, GF_F and $NITS_F$ Transmission Service for BPA's area and all adjacent TSP areas are set at up to the contract Demand.

Wind Generators:

- **PTP_F:** Wind generators associated with PTP_F Long-Term Reservations are set at the following depending on the scenarios being run:
  - Modeled on at 100 percent of the contract demand for the wind generator; or
  - Modeled off
- **$NITS_F$:** The flow-based path impacts of wind generators identified as designated network resources in $NITS_F$ contracts or in the NT Resources Memorandum of Agreement in BPA's area are determined on a flow-based path-by-flow-based path basis and set at the greater of the following:
  - The wind generators modeled on at the designated amount of the wind generators; or,
  - The wind generators modeled off and replaced by increasing the FCRPS generation level by the designated amount of the wind generators using the Nameplate Adjusted Method for all ETC cases described above.

  Wind generators designated as network resources in $NITS_F$ contracts for all adjacent TSPs are modeled up to the designated amount.
- **GF_F:** BPA and all of BPA's adjacent TSPs have no GF_F contracts for wind generators.

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

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 excess generation to bring generation and load into balance in order to solve the power flow model. This generation reduction is done by reducing all excess generation pro rata, except for the stressed FCRPS zone.

Starting with the November 2023 studies and going forward, BPA reduces all excess generation by aggregating generators by fuel type, and scaling the aggregated fuel type groups. Generation is then reduced based on how each generator participates as part of the scaled generation fleet, with the exception of the stressed FCRPS zone. Columbia Generation Station is always modeled on, in both methodologies.

When creating heavy load ETC cases, if there is more load and committed exports than generation in the ETC base case, BPA reduces exports on the AC Intertie and Pacific DC Intertie in the ETC base case. This is done to solve the power flow model.

Sensitivity Studies for Heavy Load Base Cases

In calculating its base ETC values, BPA runs ETC case scenarios for three different sensitivities: the Canadian Entitlement Return (CER) obligation modeled on or off, wind resources designated to serve PTP_F and $NITS_F$ on or off, and stressing the three different zones of the FCRPS.

For the FCRPS scenarios, the three "zones" that are stressed individually in the scenarios are made up of the following projects: (i) Upper Columbia zone includes Grand Coulee and Chief Joseph; (ii) Lower Snake zone includes Lower Monumental, Lower Granite, Little Goose, and Ice Harbor; and (iii) Lower Columbia zone includes McNary, John Day, The Dalles and Bonneville.

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 CER on scenarios, BPA models the exports to Canada at the Canadian Entitlement Agreement contract level. The FCRPS generation is modeled using the Nameplate Adjusted Method.

In the CER off scenarios, BPA models imports from Canada at the contract rights that customers have across the Northern Intertie N>S. The FCRPS generation is also modeled using the Nameplate Adjusted Method.

For the wind resource scenarios, see above for a description of the base ETC assumptions for wind generators serving PTP_F and $NITS_F$.

Therefore, in its heavy load base ETC sensitivity analysis, BPA models the following 6 scenarios:

1. Wind modeled off/Upper Columbia stressed
2. Wind modeled off/Lower Snake stressed
3. Wind modeled off/Lower Columbia stressed
4. Wind modeled on/Upper Columbia stressed
5. Wind modeled on/Lower Snake stressed
6. Wind modeled on/Lower Columbia stressed

All scenarios are run with CER modeled on and off for all months.

BPA uses the highest base ETC value calculated from these scenarios in its firm ATC calculations across the flow-based paths. BPA uses the lowest base ETC value from these scenarios in its non-firm ATC calculations across the flow-based paths.

Determining Base ETC and Sensitivities for Light Load Base Cases

BPA uses the WECC Winter seasonal light load case as the starting point for its Winter seasonal light load ETC base case. The ETC from this case is used as the base ETC for the months of November through March.

BPA uses the WECC Summer seasonal light load case as the starting point for its Summer light load ETC base case. The ETC from the Summer case is used as the base ETC for the months of June through October.

If a WECC Spring seasonal light load case is available, BPA uses that case as the starting point for its Spring seasonal light load ETC base case. The ETC from this case is used as the base ETC for the months of April and May. If the WECC Spring seasonal light load case is not available, the higher of the base ETCs from either the Winter or Summer case are used as the base ETC for April and May.

BPA uses the following assumptions in light load ETC base cases:

a. System topology: Normal operating conditions are used.
b. Loads: Loads from the WECC light load cases are used. For Montana loads only, BPA compares the loads in the WECC seasonal light load case with the seasonal light loads supplied by Montana Power, and uses the lowest of the two values in order to properly stress the light load case.
c. Generation: BPA uses generation assumptions from historical data. Canadian Entitlement is modeled as delivering energy to Canada in the amount specified in the Canadian Entitlement Agreement.

There are two sensitivity studies performed for the light load ETC base cases:

a. Federal generation east of the path is increased, and a corresponding amount of federal generation west of the path is reduced
b. Federal generation east of the path is reduced, and a corresponding amount of federal generation west of the path is increased

BPA uses the highest base ETC value calculated from these scenarios in its firm ATC calculations across the flow-based paths where light load cases are utilized. BPA uses the lowest base ETC value from these scenarios in its non-firm ATC calculations across the flow-based paths where light load cases are utilized.

Calculating Interim ETC_F for Flow-based Paths

To calculate the impacts for all $NITS_F$ and PTP_F reservations that were not modeled in the base ETC cases, BPA uses PTDF analysis on the demand in each reservation. PTDF analysis is the fraction of energy (expressed as a percentage or as a decimal) that will flow across BPA's monitored flow-based 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 flow-based path.

PTDF impacts are calculated as per BPA's Transmission Service Requests Evaluation business practice. If a reservation's impact on a flow-based path is determined to be *de minimis* per the Transmission Service Requests Evaluation business practice, then BPA deems the impact of the reservation to be zero when calculating ETC_F used in the ATC_F calculation.

The sum of these positive impacts is referred to as the interim ETC_F value, and is added to the base ETC values to produce a final ETC_F value for each time period for each flow-based path.

Outages in PTDF Calculations

BPA calculates PTDFs by adjusting the WECC base cases to include transmission outages in BPA's outage system for BPA's area and any adjacent TSP areas. 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.

When the Raver-Paul 500-kV line is out of service, the PTDFs that BPA calculates and uses for the Raver-Paul path are based on the monitored lines for this path that are outlined in Table 2. This allows BPA to properly manage the Raver-Paul path in this outage situation.

Outage Criteria in ETC Calculations

BPA uses the outage planning timeline described in the "Outages" section. The following criteria determine which outages are incorporated into BPA's hourly, daily and monthly ETC calculations:

Hourly ETC Calculations

For its hourly ETC calculations, BPA uses hourly PTDFs published at least once per day.

Daily ETC Calculations

For its daily ETC calculations, BPA uses the most recent PTDFs published for the hour ending 11 of each day, 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.

BPA includes Transmission outages in daily ETC calculations beyond the 10- to 16-day planned outage study period if the outage is officially scheduled in BPA's outage system.

Monthly ETC Calculations

For its monthly ETC calculations, BPA uses the most recent daily PTDFs published for the first Tuesday of that month. BPA includes Transmission outages in monthly ETC calculations beyond the 10- to 16-day planned outage study period if the outage is officially scheduled in BPA's outage system.

Source/POR and Sink/POD Identification and Mapping

In the ETC components of its flow-based 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.

BPA calculates weighted PTDFs for Sources/PORs as follows:

1. The PTDF weighting for the FCRPS/BPAPower PTDF varies by time period and path based on stress scenarios. The PTDF weighting is derived from generation forecasts of the federal resources, for calculations for the next hour through approximately two weeks. Beyond this time frame, BPA derives the weighting of the PTDF by applying the generation dispatch determined in the ETC Cases.
2. BPA derives the PTDF weighting for the Mid-Columbia bus point by applying the generation dispatch determined in the ETC Cases.
3. 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.

BPA calculates weighted PTDFs for Sinks/PODs as follows:

1. BPA has weighted PTDFs for loads in its adjacent BAAs based on the primary interface between each BAA and the load within that BAA. The weighting is based on how the load is distributed in the BAA.
2. BPA calculates a weighted PTDF to account for unscheduled Network Integration Transmission Service loads in BPA's BAA that are served from the FCRPS. The weighting is based on the individual load forecasts for the time period being calculated.
3. BPA calculates a weighted load for all of the BPA Power Services customers that are served via Network Integration Transmission Service agreements. The weighting is based on the individual load forecasts for the time period being calculated.
4. BPA calculates a weighted load for PNGC Power, which is a Joint Operating Entity made up of several cooperative utilities. The weighting is based on the individual load forecasts for the time period being calculated.

BPA calculates one weighted PTDF that applies to the following Source/POR and Sink/POD:

1. BPA calculates a weighed PTDF for the Western Energy Imbalance Market. This weighting is based on the percentage of Automatic Generation Control response (which could be zero) carried by each plant in the FCRPS.

Calculating Firm Available Transfer Capability (ATC_F)

When calculating ATC_F for its paths for all time periods, BPA uses the following algorithm:

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

Where:

ATC_F is the firm Available Transfer Capability for the ATC path for that period for which ATC_F is being calculated.

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

ETC_F is the sum of existing firm commitments for the ATC path as specified in WEQ-023 during that period for which ATC_F is being calculated.

For ATC_F calculations for all time periods, BPA divides ETC_F into the following variables within its ATC software:

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

Where:

LRES is the sum of positive impacts of BPA's Long-Term Reservations.

SRES is the sum of positive impacts of BPA's Short-Term Reservations.

LETC is used to ensure that the amount of $NITS_F$, GF_F, PTP_F and ROR_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 capacity specified in those contracts.

LETC is also used to align the ETC calculated in the power flow base case with additional PTDF calculations in order to balance to the standard OATI calculation. This adjustment is derived by comparing two values: a) the impacts of the confirmed PTP_F, GF_F, $NITS_F$ and ROR_F Long-Term Reservations derived from the base ETC Cases and b) the impacts of the same reservations calculated using PTDF Analysis for each flow-based path. The adjustment for each flow-based 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.

SADJ/ETC Adjustments is the variable BPA uses to make adjustments to ETC_F not captured in LRES or SRES.

BPA applies one 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 SADJ/ETC Adjustment to hold out capacity 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 SADJ/ETC Adjustment is modified to release the capacity for the fourth month out.

BPA uses a SADJ/ETC Adjustment to account for a portion of the firm TRM that BPA applies on the NI S>N.

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 are noted in the descriptions of the adjustments.

The following diagram illustrates how the variables in BPA's ATC software correspond to the variables in the ETC_F algorithm.

ETC_F =	$NITS_F$	+	GF_F	+	PTP_F	+	ROR_F
	↓		↓		↓		↓
	LRES		LRES		LRES		LRES
	+				+		
	SRES				SRES		
	+		+		+		+
	LETC		LETC		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 and thus sets CBM at zero for all of its paths for all time periods.

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

The description of how BPA implements TRM can be found in BPA's TRMID, which is posted on BPAs website.

Postbacks$_F$ are changes to firm Available Transfer Capability due to a change in the use of Transmission Service, as defined in WEQ-023.

BPA automatically recalculates ETC_F to account for changes to Transmission Service Requests (such as request types of Recall and Redirect and annulments). Since these types of changes to Transmission Service Requests are captured in ETC_F, BPA treats Postbacks$_F$ as zero for all time periods when calculating ATC_F.

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

BPA does not include confirmed Transmission reservations, expected interchange or internal flow counter to the direction of the path being calculated in its ATC_F calculations. BPA's rationale is that it does not want to offer firm ATC due to counterflow that may not be scheduled as this could lead to curtailments of Firm Transmission Service in the Real-time horizon. Therefore BPA sets Counterflows$_F$ at zero for all of its paths for all time periods.

For flow-based paths, counterflows are automatically modeled in the base ETC cases. In instances where the power flow study results in a negative base ETC value, BPA uses zero as the base ETC for purposes of calculating ATC_F. This is done to ensure that BPA does not make capacity available as a result of counterflows that may or may not materialize in real-time.

Calculating Non-Firm Transmission Service for BPA's Paths

BPA calculates ETC_{NF} and ATC_{NF} for each of its six non-firm Transmission products. The six non-firm products are: Secondary Network ($NITS_{NF6}$), Monthly Non-Firm PTP (PTP_{NF5}), Weekly Non-Firm PTP (PTP_{NF4}), Daily Non-Firm PTP (PTP_{NF3}), Hourly Non-Firm PTP (PTP_{NF2}) and Secondary Non-Firm Hourly PTP (PTP_{NF1}).

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

BPA calculates ETC_{NF} for all time periods and paths using the following algorithm:

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

ETC_{NF} is calculated for each of BPA's six non-firm Transmission products as follows:

1. ETC_{NF6}: includes the $NITS_{NF6}$ transmission product
2. ETC_{NF5}: includes the $NITS_{NF6}$ and PTP_{NF5} transmission products

3. ETC_{NF4}: includes the $NITS_{NF6}$, PTP_{NF5} and PTP_{NF4} transmission products

4. ETC_{NF3}: includes the $NITS_{NF6}$, PTP_{NF5}, PTP_{NF4}, and PTP_{NF3} transmission products

5. ETC_{NF2}: includes the $NITS_{NF6}$, PTP_{NF5}, PTP_{NF4}, PTP_{NF3} and PTP_{NF2} transmission products

6. ETC_{NF1}: includes the $NITS_{NF6}$, PTP_{NF5}, PTP_{NF4}, PTP_{NF3}, PTP_{NF2} and PTP_{NF1} transmission products

Where:

ETC_{NF} is the non-firm ETC for the ATC path.

$NITS_{NF}$ is the non-firm capacity reserved for Secondary Network Transmission Service, to include losses, and Load growth not otherwise included in Transmission Reliability Margin or Capacity Benefit Margin.

In BPA's calculations, this is comprised of the $NITS_{NF6}$ Transmission product. BPA's $NITS_{NF6}$ calculation does not include losses or Load growth, since losses and Load growth are already encumbered as firm capacity in $NITS_F$.

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

BPA does not have any grandfathered non-firm Transmission Service obligations and thus sets GF_{NF} at zero for all of its paths for all time periods.

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

Depending on the ETC_{NF} being calculated, PTP_{NF} will include the PTP_{NF5}, PTP_{NF4}, PTP_{NF3}, PTP_{NF2} and PTP_{NF1} Transmission products.

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

BPA has no OS_{NF} and thus sets OS_{NF} at zero for all of its paths for all time periods.

ETC_{NF} for 1:1 paths is calculated by assuming that 1 MW of reserved and/or scheduled capacity results in 1 MW of impact across the 1:1 path. The POR/POD combinations for 1:1 ATC paths that impact ETC_{NF} can be found under the Transmission Availability section of BPA's website.

When calculating ETC_{NF} for flow-based paths, BPA sums the positive impacts of reservations and/or schedules as determined by PTDF analysis, per BPA's Transmission Service Requests Evaluation business practice. The treatment of *de minimis* impacts in ETC_{NF} is covered within the Calculating Non-Firm Available Transfer Capability section below.

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

BPA calculates ATC_{NF} for its paths for two horizons: Real-time and Beyond Real-time. The Real-time horizon begins at 10 p.m. each day for the 24 hours in the next day. 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.

BPA calculates ATC_{NF} for all time periods and paths using the following algorithm:

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

ATC_{NF} is calculated for each of BPA's six non-firm Transmission products as follows:

1. $ATC_{NF6} = TTC - ETC_F - ETC_{NF6} - CBM_S - TRM_U + Postbacks_{NF} + Counterflows_{NF}$
2. $ATC_{NF5} = TTC - ETC_F - ETC_{NF5} - CBM_S - TRM_U + Postbacks_{NF} + Counterflows_{NF}$
3. $ATC_{NF4} = TTC - ETC_F - ETC_{NF4} - CBM_S - TRM_U + Postbacks_{NF} + Counterflows_{NF}$
4. $ATC_{NF3} = TTC - ETC_F - ETC_{NF3} - CBM_S - TRM_U + Postbacks_{NF} + Counterflows_{NF}$
5. $ATC_{NF2} = TTC - ETC_F - ETC_{NF2} - CBM_S - TRM_U + Postbacks_{NF} + Counterflows_{NF}$
6. $ATC_{NF1} = TTC - ETC_F - ETC_{NF1} - CBM_S - TRM_U + Postbacks_{NF} + Counterflows_{NF}$

Table 3 outlines the differences in how the ATC_{NF} algorithm components are calculated between the Beyond Real-time and Real-time time horizons.

Table 3, ATC_{NF} Calculation for Beyond Real-Time and Real-Time Horizons

Algorithm Component	Beyond Real-time	Real-time
TTC	As described in TTC section in the ATCID	Same
ETC_F	Calculated using reservations and base ETC cases for flow-based paths • *De minimis* impacts are treated as zero in ETC_F	Calculated using schedules • *De minimis* impacts are included in ETC_F
ETC_{NF}	Calculated using reservations • *De minimis* impacts are treated as zero in ETC_{NF}	Calculated using reservations until scheduled, then calculated using schedules • *De minimis* impacts are included in ETC_{NF} for both reservations and schedules
CBM_S	N/A	N/A
TRM_U	As described in the TRMID	Same
$Postbacks_{NF}$	Zero since ETC_{NF} is recalculated to capture changes to the Transmission Service Requests	Zero since ETC_{NF} is recalculated to capture changes to the Transmission Service Requests and/or schedules, with the exception of AC N>S
$Counterflows_{NF}$	Included with schedules	Same

Where:

ATC_{NF} is the non-firm Available Transfer Capability for the ATC path for that period for which ATC_{NF} is being calculated.

BPA calculates six ATC_{NF} values as described above.

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

ETC_F is the sum of existing firm commitments for the ATC path as specified in WEQ-023 during that period for which ATC_{NF} is being calculated.

The section below outlines how BPA calculates ETC_F for all of its paths for the beyond Real-time and the Real-time horizons.

ETC_F for the Beyond Real-Time Horizon

Reservations, and base ETC cases for flow-based paths, are used to calculate ETC_F for the Beyond Real-time horizon. When calculating ETC_F for this horizon, *de minimis* impacts of reservations across flow-based paths are deemed to be zero.

For ATC_{NF} calculations for the beyond Real-time horizon, BPA utilizes the following variables within its ATC software to calculate ETC_F:

ETC_F = LRES + SRES – SADJ/ETC Adjustments + NFETC

Where:

LRES is the sum of positive impacts of BPA's Long-Term Reservations.

SRES is the sum of positive impacts of BPA's Short-Term Reservations.

SADJ/ETC Adjustments is the variable used to make adjustments to ETC_F not captured in LRES or SRES.

BPA applies one 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 a SADJ/ETC Adjustment to hold out capacity 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 SADJ/ETC Adjustment is modified to add back capacity for the fourth month out.

BPA 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 are noted in the descriptions of the adjustments.

NFETC is used to ensure that the amount of $NITS_F$, GF_F, PTP_F and ROR_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 capacity specified in those contracts.

NFETC is also used to align the ETC calculated in the power flow base case along with additional PTDF calculations in order to balance to the standard OATI calculation.

This adjustment is derived by comparing two values: a) the impacts of the PTP_F, GF_F and $NITS_F$ Long-Term Reservations derived from the base ETC Cases and b) the impacts of the same reservations calculated using PTDF Analysis for each flow-based path. The adjustment for each flow-based 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.

The following diagram illustrates how the variables in BPA's ATC software correspond to the variables in the ETC_F algorithm for the Beyond Real-time horizon.

ETC_F =	$NITS_F$	+	GF_F	+	PTP_F	+	ROR_F
	↓		↓		↓		↓
	LRES		LRES		LRES		LRES
	+				+		
	SRES				SRES		
	+		+		+		+
	NFETC		NFETC		NFETC		NFETC
	-		-		-		-
	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, BPA divides ETC_F into the following variables within its ATC software:

$$ETC_F = SCH^{+}_{7} + ASC^{+}_{7} + RADJ/ETC\ Adjustment$$

Schedules are used to calculate ETC_F for the Real-time horizon. When calculating ETC_F for this horizon, *de minimis* impacts of schedules across flow-based paths are included in ETC_F.

Where:

SCH^{+}_{7} is the sum of the positive impacts of schedules that reference confirmed $NITS_F$, GF_F and PTP_F reservations for the ATC path for that period. The energy profile of the schedule is used except for the schedule types of Dynamic, Capacity and Pseudo-tie.

ASC^{+}_{7} is the sum of the positive impacts of dynamic schedules that reference confirmed $NITS_F$, GF_F and PTP_F reservations for the ATC path for that period. The transmission profile of the schedule is used for the schedule types of Dynamic, Capacity and Pseudo-tie.

RADJ/ETC Adjustment: BPA 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 in BPA's ATC software correspond to the variables in the ETC_F algorithm for the Real-time horizon. 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 as specified in WEQ-023 during that period for which ATC_{NF} is being calculated.

The section below outlines how BPA calculates ETC_{NF} for all of its paths for the beyond Real-time and the Real-time horizons.

ETC_{NF} for the Beyond Real-Time Horizon

For ATC_{NF} calculations for the beyond Real-time horizon, ETC_{NF} is reflected as the following variable within BPA's ATC software:

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

Reservations are used to calculate ETC_{NF} for the Beyond Real-time horizon. When calculating ETC_{NF} for this horizon, *de minimis* impacts of reservations across flow-based paths are deemed to be zero.

Where:

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

The following diagram illustrates how the variables in BPA's ATC software correspond to the variables in the ETC_{NF} algorithm for the Beyond Real-time horizon.

ETC_{NF} =	$NITS_{NF}$	+	PTP_{NF}
	↓		↓
	$RRES_{6}$		$RRES_{5,4,3,2,1}$

ETC_{NF} for the Real-Time Horizon

For ATC_{NF} calculations in the Real-time horizon, ETC_{NF} is reflected as the following variables within BPA's ATC software:

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

To calculate ETC_{NF} for the Real-time horizon, reservations are used until schedules are received, and then schedules are used. When calculating ETC_{NF} for this horizon, *de minimis* impacts across flow-based paths are included in ETC_{NF}, regardless of whether the reservation or schedule is being used in the calculation.

Where:

$SCH^{+}_{6,5,4,3,2,1}$ is the sum of the positive impacts 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 impacts of pending and 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}. The energy profile of the schedule is used except for the schedule types of Dynamic, Capacity and Pseudo-tie.

$ASC^{+}_{6,5,4,3,2,1}$ is the sum of positive impacts of dynamic schedules referenced to confirmed $NITS_{NF6}$, PTP_{NF5}, PTP_{NF4}, PTP_{NF3}, PTP_{NF2} and PTP_{NF1} reservations, plus the sum of the positive impacts of pending and 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}. The transmission profile of the schedule is used for the schedule types of Dynamic, Capacity and Pseudo-tie.

The following diagram illustrates how the variables in BPA's ATC software correspond to the variables in the ETC_{NF} algorithm for the Real-time horizon.

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

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

BPA does not maintain CBM and thus sets CBM_S at zero for all of its paths for all time periods.

TRM_U is the Transmission Reliability Margin for the ATC path that has not been released for sale (unreleased) as non-firm capacity by the Transmission Service Provider during that period.

The description of how BPA implements TRM can be found in BPA's TRMID, which is posted on BPAs website.

$Postbacks_{NF}$ are changes to non-firm Available Transfer Capability due to a change in the use of Transmission Service, as defined in WEQ-023.

The section below outlines how BPA calculates $Postbacks_{NF}$ for all of its paths for the beyond Real-time and the Real-time horizons.

$Postbacks_{NF}$ for the Beyond Real-time horizon

BPA automatically recalculates ETC_{NF} to account for changes to Transmission Service Requests (such as request types of Recall and annulments) for the Beyond Real-time horizon. Since these types of changes to Transmission Service Requests are captured in ETC_{NF}, BPA treats $Postbacks_{NF}$ as zero for this horizon.

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

BPA automatically recalculates ETC_{NF} to account for changes to Transmission Service Requests (such as request types of Recall and annulments) and/or schedules for the Real-time Horizon. Since these types of changes to Transmission Service Requests and/or schedules are captured in ETC_{NF}, BPA treats $Postbacks_{NF}$ as zero for this horizon for all paths with the exception of AC N>S.

For ATC_{NF} calculations for the AC N>S path in the Real-time horizon, BPA uses a $Postbacks_{NF}$, expressed as RADJ/ETC. For its hourly AC 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 AC N>S, if needed to prevent Curtailments.

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

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

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 path.

Counterflows are modeled in the ETC Cases used to determine ETC_F for BPA's flow-based paths. In instances where the power flow study results in a negative base ETC value, BPA uses zero as the base ETC for purposes of calculating ATC_{NF}. This is done to ensure that BPA does not make capacity available as a result of counterflows that may or may not materialize in real-time

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 TTC.

Adjustments to Flow-based Path ATC Values

There may be instances where BPA needs to perform testing in the production environment of BPA's ATC software, or add flow-based paths in advance of their effective date. In these instances, BPA will adjust its ATC values across the flow-based paths to ensure that Transmission Service Requests are not refused due to lack of ATC across the flow-based paths. BPA will notify customers prior to events that require these types of adjustments to ATC values.

VIII. Responding to Methodology/Documentation Clarifications and/or Data Requests

BPA will respond to all written requests for clarification of its TTC/TFC methodology, ATCID, CBMID, or TRMID from any registered entity that demonstrates a reliability need within 45 days of receiving the written request. Methodology and/or documentation clarification requests should be sent to nercatcstandards@bpa.gov with "**Methodology/Documentation Clarification**" in the subject line.

BPA will respond to written data requests from any Transmission Service Provider or Transmission Operator, solely for use in the requestor's ATC or AFC calculations, within 45 calendar days of receiving the written request. For a Transmission Service Provider or Transmission Operator to officially request data to use in ATC or AFC calculations, the requestor must fill out the **Data Request Form** found on BPA's ATC Methodology website. The completed request form must be sent to nercatcstandards@bpa.gov with **"Data Request Form"** in the subject line.

IX. ATCID Revisions

BPA posts this ATCID in accordance with NAESB Business Practice Standard WEQ-001.