MAPP POLICIES AND PROCEDURES FOR TRANSMISSION OPERATIONS:

Appendix F: MAPP Regional AFC/ATC/ASTFC Calculation and Request Evaluation Process

April 3, 2013

Version 2.05

Document Change History

Issue	Reason for Issue	Date
2.0	References to Schedule F removed for the sunset of Schedule F effective April 1, 2011.	April 1, 2011
2.01	Addition of 5.2.3 MAPP Transmission Service Provider Flowgate Maintenance of Non-Contract Path Flowgates.	June 20, 2011
2.02	Modify AFC/ATC calculation to include DNF impacts in the Operating Horizon in Section 5.	September 15, 2011
2.03	Modify ETC Predictor documentation to reflect current process; Section 6.	February 6, 2012
2.04	Clarify language regarding Netting Impacts in the Operating Horizon and action required on permanent flowgates.	March 7, 2013
2.05	Additional clarification of language regarding Netting Impacts in the Operating Horizon.	April 3, 2013

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1 Introduction

This Total Transfer Capability (TTC), Available Transfer Capability (ATC), Available Share of Total Flowgate Capability (ASTFC), Capacity Benefit Margin (CBM), Transfer Reliability Margin (TRM), and Capacity Benefit Margin (CBM) MAPP Regional methodology document complies with NERC Modeling, Data, and Analysis Standards MOD-001 through MOD-009, MOD-029, and MOD-030 and Facilities Design, Connections, and Maintenance Standards FAC-008 through FAC-014, and other applicable NERC or regional standards as may be adopted.

Transmission Owning Members under the Second Restated MAPP Agreement will determine Total Transfer Capability (TTC), Available Transfer Capability (ATC), Capacity Benefit Margin (CBM) and Transmission Reliability Margin (TRM) in accordance with the NERC Standards, the MAPP Policies and Procedures for Transmission Operations, and FERC Orders 729, 888, 889, 890, and subsequent orders.

The MAPP Transmission Service Providers (TSP) use a flow-based approach to determine the committed use of the transmission system on a regional basis. Dynamic stability, voltage stability, steady-state voltage, as well as thermal constraints limit Total Transfer Capability within the MAPP Transmission System.

The term flowgate refers to a transmission facility(s) on which flow has been correlated with a limiting phenomenon. The AFC values posted for identified flowgates is the Available Flowgate Capability on a set of physical transmission facilities.

The MAPP TSPs may post contract path interfaces. These contract path interfaces are not limited by flow-based impacts but are posted because they provide service into and out of the MAPP Transmission System. The contract path TTC represents the total interconnection capability between a MAPP TSP and a non-MAPP TSP.

Transmission service under a MAPP Transmission Provider's Open Access Transmission Tariff (OATT) is granted on a regional basis according to these calculated AFC/ATC values. Transmission service is made available to eligible transmission customers on a non-discriminatory basis.

1.1 NERC Definitions

1.1.1 Total Transfer Capability (TTC)

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

1.1.2 Available Transfer Capability (ATC)

Available Transfer Capability (ATC) is a measure of the transfer capability remaining in the physical transmission network for further commercial activity over and above already committed uses. It is defined as Total Transfer Capability less Existing Transmission Commitments (including retail customer service), less a Capacity Benefit Margin, less a Transmission Reliability Margin, plus Postbacks, plus counterflows.

1.1.3 Available Flowgate Capability (AFC)

Available Flowgate Capability (AFC) is a measure of the flow capability remaining on a Flowgate for further commercial activity over and above already committed uses. It is defined as TFC less Existing Transmission Commitments (ETC), less a Capacity Benefit Margin, less a Transmission Reliability Margin, plus Postbacks, and plus counterflows.

1.1.4 Capacity Benefit Margin (CBM)

Capacity Benefit Margin (CBM) is the amount of firm transmission transfer capability preserved by the TSP for load-serving entities (LSEs), whose loads are located on that TSP's system, to enable access by the LSEs to generation from interconnected systems to meet generation reliability requirements. Preservation of CBM for an LSE allows that entity to reduce its installed generating capacity below that which may otherwise have been necessary without interconnections to meet its generation reliability requirements. The transmission transfer capability preserved as CBM is intended to be used by the LSE only in times of emergency generation deficiencies.

1.1.5 Transmission Reliability Margin (TRM)

Transmission Reliability Margin (TRM) is the amount of transmission transfer capability necessary to provide reasonable assurance that the interconnected transmission network will be secure. TRM accounts for the inherent uncertainty in system conditions and the need for operating flexibility to ensure reliable system operation as system conditions change.

2 ATC Flowgate Methodology

See MAPP OASIS site for individual Transmission Service Providers' ATCID documents https://www.oatioasis.com/mapp/.

3 Transmission Reliability Margin Methodology

See MAPP OASIS site for individual Transmission Operators' TRMID documents https://www.oatioasis.com/mapp/.

4 Capacity Benefit Margin (CBM) Methodology

See MAPP OASIS site for individual Transmission Service Providers' CBMID documents https://www.oatioasis.com/mapp/.

5 MAPP AFC/ATC/ASTFC Calculation Methodology

Flowgate AFC values are calculated using a flow-based approach. Therefore, the MAPP AFC calculation requires determination of the incremental impact of each reservation on each of flowgates for each time period. This calculation is performed utilizing an Interchange Distribution Calculator (IDC) developed by Open Access Technologies International, Inc. (OATI). The IDC uses linear network analysis to determine incremental flows on a set of flowgates due to each transmission reservation.

Contract path ATC values are calculated in a similar manner to ATC values for flowgates, except that a look-up table determines the percent impact. In this case, the percent impact is +100%, −100% or 0%, depending on the direction of the transaction and netting requirements determined by the border MAPP TSP.

The amount of Available Flowgate Capability (AFC) on a MAPP flowgate or contract path depends on the type of transmission service. For example, the amount of transmission capability available for monthly non-firm service does not include the impacts of weekly, daily and hourly non-firm service since monthly service is higher priority. In order to keep track of the transmission capability available for each type of service, 8 categories of flowgate or contract path AFC/ATC are calculated as defined below.

NATC: Transmission Capability Available for **Firm Service** under Member tariff service.

RATC: Transmission Capability Available for **Non-Firm Service** under Member tariff service.

AFC/ATC Category	Service Type*	OASIS Posting	TLR Priority
NAFC/NATC	Firm	NATC	**7**
RAFC6/RATC6	Network Non-Designated	RATC	**6**
RAFC5/RATC5	Monthly Non-firm	RATC	**5**
RAFC4/RATC4	Weekly Non-Firm	RATC	**4**
RAFC3/RATC3	Daily Non-Firm	RATC	**3**
RAFC2/RATC2	Hourly Non-Firm	RATC	**2**
RAFC1/RATC1	Secondary Non-firm	RATC	**1**

*All Member tariff transmission service types are associated with an AFC/ATC Category according to the transmission service type's NERC TLR priority.

Flowgate and contract path AFC/ATC values are calculated for each hour of the operating horizon, daily for one year, and monthly for two years in the planning horizon. Appropriate accounting of the transmission requests and outages that begin or end on any day of the month requires daily segmentation beyond the operating horizon. However, the daily AFC/ATC results are aggregated and posted on a calendar monthly basis to meet FERC and NERC posting requirements.

The posted RATC and NATC for a given month is the minimum daily value of NATC and RATC5 respectively over that calendar month.

Evaluation of the impacts on the MAPP flowgates and contract paths requires data beyond that provided by the MAPP OASIS.

The **Planning Horizon** AFC/ATC Calculation evaluates all transmission requests that have a curtailment priority of 3 or higher except for Hourly Non-designated Network service.

The **Operating Horizon** AFC/ATC Calculation evaluates all transmission requests with a curtailment priority of 3 or less, and Hourly Non-designated Network service. This includes Daily Non-firm, Hourly Non-firm, and Secondary Non-firm service. Operating Horizon calculates AFC/ATC values for a sliding 48-hour period.

5.1 Significantly Impacted

The definition of each flowgate must be specified in terms of branches in the MAPP Regional Request Evaluation process powerflow model. The Transmission Service Providers must supply this data to the MAPP Transaction Coordinator. The MAPP Regional Request Evaluation process monitors both PTDF and OTDF flowgates.

5.1.1 Pre-contingent Flowgate

A pre-contingent flowgate is considered to be Significantly Impacted if the Power Transfer Distribution Factor (PTDF) of the transmission request is greater than 5% on the flowgate.

5.1.2 Post-contingent Flowgate

A post-contingent flowgate is considered to be Significantly Impacted if the Outage Transfer Distribution Factor (OTDF) of the transmission request is greater than 3% on the flowgate.

5.1.3 Contract Path

A contract path is considered to be Significantly Impacted if the Distribution Factor of the transmission request is 100% on the contract path.

5.2 Flowgate Definition

5.2.1 MAPP Transmission Service Provider Flowgates

Approval is required from the Transmission Operating Subcommittee (TOS) and the Tariff Services Committee (TSC) for any new MAPP TSP permanent flowgates in the MAPP Request Evaluation process, or changes to the methodology or studies supporting the development of Reliability Components/AFC/ATC Components on an existing MAPP TSP permanent flowgate. A change in the definition of an existing MAPP TSP permanent flowgate is considered a new permanent flowgate. From time to time, MAPP Transmission Owners may decide a permanent flowgate is no longer needed and may request the TOS and TSC to approve removal of the permanent flowgate in the MAPP Request Evaluation process. Temporary flowgates may be added and deleted through requests made to the Reliability Coordinator by the MAPP Transmission Owner.

5.2.2 Non-MAPP Transmission Service Provider Coordinated or Reciprocally Coordinated Flowgates

Non-MAPP TSP flowgates are included in the MAPP Regional Request Evaluation processed based upon criteria in Section 3 of the CMP Baseline document.[1]

5.2.3 MAPP Transmission Service Provider Flowgate Maintenance of Non-Contract Path Flowgates

Upon TOS and TSC approval, at the request of the TSP, the MAPPCOR Tcoord will install and test new (and/or remove) non-contract path flowgates and flowgate changes in the MTA webTrans. The flowgate will also be installed in the NNL process if reciprocally coordinated.

Once the flowgate has been fully installed and tested, ongoing flowgate maintenance, such as AFC Components, will be assumed by the TSP.

5.3 Contract Path Definition

Border TSPs must work with the Contractor in order to set up the data necessary to define Contract Paths. This data includes the following:

- Associated border service points
- Netting requirements for the Operating and Planning Horizons
- Scheduling Participant associated with the border service points
- Existing reservations that impact the Contract Path
- ATC Components

5.4 Transmission Outages

The transmission outages entered into the NERC System Data Exchange (SDX) are used in the MAPP Regional Request Evaluation process. The MAPP Transmission Service Provider is responsible for submitting AFC/ATC Components on a MAPP Transmission Service Provider flowgates if the MAPP TSP submits an ETC component for that impacted flowgate and must maintain coordination between the AFC/ATC Components and the NERC System Data Exchange (SDX) as system conditions change.

5.5 Netting Impacts in the MAPP AFC/ASTFC/ATC

MAPP TSP flowgate counterflow methodologies are posted on the MAPP OASIS.

[1] The CMP Baseline document is Attachment LL, Congestion Management Process (CMP) Master Baseline, of the Midwest ISO Transmission and Energy Markets Tariff (TEMT). The CMP Baseline document replaced Attachment B to MAPPCOR-MISO Seams Operating Agreement, Congestion Management Process.

5.5.1 Netting Impacts on a MAPP Transmission Service Provider flowgate (non-coordinated)

A MAPP TSP may elect to use the counterflow methodology outlined in Attachment KK-2[2] of the Midwest ISO Transmission and Energy Markets Tariff (TEMT) for flowgates that are not identified as Reciprocally Coordinated Flowgate instead the methodology identified below.

5.5.1.1 Netting Impacts in the Planning Horizon

Simultaneous transmission reservations in the Planning Horizon may not have corresponding energy schedules associated with them in the Operating Horizon. In order to resolve this problem, for the approval of Non-recallable (firm) transmission service in the Planning Horizon, incremental impacts are added only in the direction of the flowgate when evaluating transmission reservations. Impacts in the opposite direction are added only if the PTDF of the reservation is greater than −5%. The −5% PTDF threshold was chosen because ±5% was considered to be within the error margin of the impact calculation. In order to avoid accumulating errors in one direction, impacts of reservations with less than 5% PTDF are added regardless of direction. The same logic applies for an OTDF flowgate except the impacts in opposite direction are added when the OTDF is greater than −3%.

For approval of non-firm service in the Planning Horizon, the Provider for each flowgate may choose to include all or part of the non-firm or firm counter-flow impacts that have a distribution factor less than the flowgate threshold.

5.5.1.2 Netting Impacts in the Operating Horizon

In the Operating Horizon, when the energy schedules are known, impacts of the energy schedules are added or subtracted to determine Recallable AFC. Recallable AFC in the Operating Horizon is based on the scheduled amount for all non-firm reservations, for the term of the schedule. The reserved amount is used for non-firm reservations if no schedule has been submitted. If a NERC e-tag has been submitted against a reservation, that amount is always used. This is done to account for approved hourly and daily reservations given the lag between the time the request is submitted and accepted on the OASIS, and the time a schedule is submitted to MAPP. If a schedule for secondary hourly non-firm service has not been received by 20 minutes prior to the hour for the next hour, the Recallable AFC values for the next hour do not include the impacts of those reservations. Regardless, impacts are always netted for Recallable AFC in the Operating Horizon.

Non-Recallable AFC is always based on transmission reservations rather than energy schedules in both the Planning and the Operating Horizons. Therefore the counterflow impacts are never included in the Non-Recallable AFC values.

5.5.2 Netting Impacts on a MAPP Transmission Service Provider Reciprocally Coordinated Flowgate

MAPP TSP Reciprocally Coordinated flowgates' counterflow factors shall be determined by a Seams Operating Agreement, if applicable.

[2] The Attachment to Attachment KK-2 is made part of the Interconnected Operations and Congestion Management Service by reference on page 3 of Midwest ISO's March 10, 2009 filing at FERC, Motion for Leave to Answer and Answer, in Docket No. ER09-592-000: "Pursuant to the [FERC's] Februrary 19 [2009] Order, the Midwest ISO informed the MAPP parties that the version of the TTC/ATC/AFC Protocols requiring the Midwest ISO to decrement available AFCs on its system for transactions on the MAPP transmission system in "study" mode will be accepted as an attachment to the Attachment KK-2 Service Agreement." The Attachment to Attachment KK-2 replaced Attachment A To MAPPCOR-MISO Seams Operating Agreement,

5.5.3 Netting Impacts on a Contract Path

The border POR and/or POD chosen in the request for transmission service determines the contract path impacted. A look-up table determines the percent impact of a transaction.

5.5.3.1 Netting Impacts in the Operating Horizon

In the Operating Horizon, when the energy schedules are known, impacts of the energy schedules are added or subtracted to determine Recallable ATC. Recallable ATC in the Operating Horizon is based on the scheduled amount for all non-firm reservations, for the term of the schedule. The reserved amount is used for non-firm reservations if no schedule has been submitted. If a NERC e-tag has been submitted against a reservation, that amount is always used. This is done to account for approved hourly and daily reservations given the lag between the time the request is submitted and accepted on the OASIS, and the time a schedule is submitted to MAPP. If a schedule for secondary hourly non-firm service has not been received by 20 minutes prior to the hour for the next hour, the Recallable ATC values for the next hour do not include the impacts of those reservations.

Non-Recallable ATC is always based on transmission reservations rather than energy schedules in both the Planning and the Operating Horizons. Therefore the counterflow impacts are never included in the Non-Recallable ATC values.

6 Existing Transmission Commitments (ETC)

The ETC value is used to account for committed use of a flowgate or contract path other than transmission reservations made after November 1, 1996. Both NETC and RETC are determined by the MAPP TSPs to account for the impacts on a flowgate due to load serving, losses, and transmission commitments grandfathered under the original MAPP Agreement. NETC only includes the effect of firm transmission commitments, and may reflect flows expected under the most limiting conditions for a given time period. RETC only includes the effects of non-firm transmission commitments, and may reflect average conditions for a given time period.

In addition, all service coming into, through, or out of MAPP will be reserved on the MAPP OASIS node and will not be included in ETC. All transmission requests will be made on the MAPP OASIS node and be evaluated through the MAPP Request Evaluation Process.

6.1 Planning Horizon Flowgate ETC

A MAPP TSP may elect to submit the ETC value for the Planning Horizon, or utilize a forecasted ETC value.

The Planning Horizon ETC value will be comprised of the generation-to-load impacts which are calculated using the most recent NERC SDX load forecast data, generating unit merit order information (block loading), designated network resource, and joint-owned unit information. In addition, MISO will provide expected market flow impacts on MAPP TSP reciprocally coordinated flowgates.

Generation-to-Load Distribution Factors are used to determine the balancing authority area load impact on each MAPP TSP flowgate.

6.2 Operating Horizon Flowgate ETC

A MAPP TSP can elect to submit the ETC value for the Operating Horizon or utilize a forecasted ETC value.

In the Operating Horizon, transmission schedules should be submitted on all MAPP to Non MAPP reservations, including “grandfathered” transactions; so hourly ETC values on contract paths should be zero.

6.2.1 Transmission Service Provider Submitted

It is very important that hourly ETC values are submitted if they are different than the daily and monthly values. Otherwise, if the MAPP Request Evaluation can’t find an hourly value, it will default to the daily or monthly values.

6.2.2 Forecasted ETC Values

6.2.2.1 Previous Hour ETC

The calculated ETC for any flowgate for the previous hour is based on the previous hours metered flow data and the previous hours transaction impacts. The ETC calculation depends on whether the flowgate is a Pre-Contingent Flowgate (PTDF) or a post-contingent flowgate (OTDF). The resulting ETC is used to accumulate profile data following the same process.

6.2.2.1.1 Previous Hour Pre-Contingent Flowgate ETC

In the Operating Horizon, an ETC value is calculated for the previous hour using the previous hour's real-time metered flow data and transaction impacts (as identified by schedules).

$$ETC = Flow - NSCH - RSCH$$

Where,

$$Flow = Real - time\ metered\ flow\ on\ the\ monitored\ interface\ (captured\ at\ five\ minute\ intervals\ and\ averaged)$$
$$NSCH = Total\ Non - Recallable\ impacts\ on\ the\ monitored\ interface$$
$$RSCH = Total\ Recallable\ impacts\ on\ the\ monitored\ interface$$

6.2.2.1.2 Previous Hour Post-Contingent Flowgate ETC

In the Operating Horizon, an ETC value is calculated for the previous hour using the previous hour's real-time metered flow data and transaction impacts (as identified by schedules) as well as impacts due to a possible outage of the contingent element.

$$ETC = Flow + (Flow_{CE} \times LODF_{CE}) - NSCH - RSCH$$

Where,

$$Flow = Real - time\ metered\ flow\ on\ the\ monitored\ interface\ (captured\ at\ five\ minute\ intervals\ and\ averaged)$$
$$Flow_{CE} = Real - time\ metered\ flow\ on\ the\ contingent\ element\ (captured\ at\ five\ minute\ intervals\ and\ averaged)$$
$$LODF_{CE} = Line\ Outage\ Distribution\ Factor\ of\ the\ monitored\ element\ for\ an\ outage\ of\ the\ contingent\ element$$
$$NSCH = Total\ Non - Recallable\ impacts\ on\ the\ monitored\ interface$$
$$RSCH = Total\ Recallable\ impacts\ on\ the\ monitored\ interface$$

6.2.2.2 Profiled ETC Values

The previous hour ETC values are accumulated in hourly profiles. The profiles are used to as the basis for making ETC predictions. The profiles are continuously updated and change as usage of the transmission system changes over time.

There are five profiles used in the process, the five are: Sunday, Monday, Tuesday – Thursday, Friday and Saturday. The profiles have been chosen with the expectation that the days that belong to a profile would look similar when compared to the rest of the profiles. The aggregation of Tuesday – Thursday is due to those days not being subject to major changes in transmission system usage due primarily to weekend loading differences.

The profiles are updated based on the following equation.

$$\boldsymbol{Profile_{k,h} = \alpha \times Profile_{k,h} + (1 - \alpha) * ETC}$$

Where,

$k = The\ day\ type\ (the\ index\ for\ Mon, Tue - Thu, Fri, Sat\ or\ Sun)$

$h = The\ hour\ of\ the\ day\ for\ the\ previous\ hour$

$ETC = The\ calculated\ ETC\ for\ the\ previous\ hour\ (h\ implied)$

$\alpha = The\ percent\ of\ historic\ usage\ to\ use\ when\ updating\ the\ profile$

$\alpha\ is\ a\ direct\ input\ and\ defaults\ to\ 0.75\ but\ can\ be\ adjusted\ as\ needed$

6.2.2.3 Forecasted ETC Values

The Flowgate Monitor forecasts flows and ETC on MAPP TSP flowgates for each hour of the Operating Horizon using historical flow information as calculated above. The forecasting algorithm uses metered flow from the previous hour and the comparable hour from the appropriated ETC profiles. These forecasts are updated hourly. Flowgate Monitor results can be used to evaluate expected flows on the transmission system and predict TLR events.

Forecasted ETC (FETC) values are calculated using the following methodology,

$$\boldsymbol{FETC_{dh} = \beta \times ETC + (1 - \beta) \times Profile_{kt,ht}}$$

Where,

$$t = The\ hour\ of\ the\ operation\ horizon\ being\ forecasted\ ranging\ from\ 1-48,\ t = 1\ is\ the\ current\ hour$$
$$dh = The\ day\ and\ hour\ being\ forecasted\ based\ on\ t$$
$$kt = The\ profile\ day\ type\ depending\ on\ the\ t\ being\ forecasted$$
$$ht = The\ hour\ of\ the\ day\ for\ depending\ on\ the\ t\ being\ forcasted$$
$$ETC = The\ calculated\ ETC\ for\ the\ prevous\ hour\ (metered, schedule\ adjusted)$$
$$\beta = The\ percent\ of\ historic\ usage\ to\ use\ when\ calculating\ FETC = \frac{(48-t)}{(48-1)}\ where\ 48\ is\ the\ number\ of\ hours\ in\ the\ operating\ horizon$$

Note: For t = 1, β = 1 and FETC = ETC (Current hour FETC = Last Hours ETC).
For t = 48, β = 0 and FETC = stored ETC profile for the day and hour being forecasted.
The MTA loads the predicted ETC values into either the RETC or NETC fields, by convention the predicted ETC is loaded into NETC with RETC set to 0 and FETC is then equal to NETC.

7 Power flow Model

The seasonal NERC IDC power flow model is used to determine the incremental impacts on the MAPP flowgates to assess transfer capability. Since this model is being used to calculate incremental flows only, the power flow model used in the impact calculation need only reflect the correct connectivity of the power system. There is no need to update transaction and generation dispatch data for this purpose.

8 Service Point Definition

The Source and Sink on the transmission service request are used, as the ultimate point of injection and extraction. The ultimate service points correspond to one or more generation or load busses in the power flow model. Each bus has a participation factor for an ultimate point; the sum of the participation factor for an ultimate point must sum to 1 and act as aliases to one or more generator or load buses in the power flow model. Each TSP must submit a list of Sources and Sinks to the MAPP Transaction Coordinator with their corresponding bus number definitions and participation factors. All non-MAPP balancing authority areas are modeled individually. The balancing authority area modeling is comparable to the modeling that NERC uses in the IDC.

Border service points, such as a Point of Receipt or Point of Delivery, are used for service entering or leaving the MAPP Transmission System region. They are used to identify which balancing authority area to balancing authority area interconnection capability is being used between any TSP. Border service points are used to determine the Contract Path used for the transaction, and the Member scheduling participant for the transaction.

9 Posting TTC, ATC, TRM and CBM values

The MAPP TSPs post TTC, AFC/ATC, TRM and CBM values on the MAPP Open Access Same-time Information System (OASIS) for two types of interfaces; flowgates and contract paths.

1. The flowgate methodology builds upon a flow-based analysis to determine the committed use of the transmission system on a regional basis.

2. The contract path interface represents the contractual or physical transfer limitations between MAPP TSPs and/or a non-MAPP TSP or local balancing authorities of a regional RTO.

Flowgate and contract path TTC, AFC/ATC, TRM and CBM values are posted under System Data on the OASIS. In addition, a summary of the individual impacts of all approved requests is available on the MAPP OASIS. Flowgate AFC values are posted on the MAPP OASIS for at least the next 48 hours, and contract path ATC values are posted on the TSP's OASIS page.

The Daily and longer AFC/ATC values are calculated and posted at least twice per day. Hourly Non-firm AFC/ATC values are calculated and posted at hourly.

10 AFC Coordination

10.1 OASIS Reservations

The MAPP Regional AFC Calculation process imports non-MAPP TSP confirmed OASIS reservations according to the criteria set forth in the applicable Seams Operating Agreement. The MAPP Regional AFC Calculation process will not include reservations that another TSP does not include in its own calculation.

The coordination process will not import a reservation if a transmission service request is required under at least one MAPP Member Tariff OATT.

10.1.1 Study status reservations

The MAPP Regional AFC Calculation process imports transmission service requests with a status of study under the non-MAPP OATT and which meet the reservation importing rules in the applicable Seams Operating Agreement. These transmission service requests are included in the AFC calculation on MAPP TSP Reciprocally Coordinated Flowgates.

10.1.2 Excluded reservations

The assumptions made in the Generation to Load forecast (ETC calculation) and the Projected Market Flow component already account for the impacts from MISO, SWPP and PJM internal

network OASIS reservations. The MAPP Regional AFC Calculation may exclude reservations in order to avoid double counting of impacts on MAPP flowgates.

10.2 Non-MAPP Flowgate AFC Values

The MAPP Regional AFC Calculation process imports AFC values for non-MAPP TSP flowgates.

11 On/Off Path Methodology

The MAPP Regional Request Evaluation process utilizes the POR/POD and Source/Sink information on the OASIS transmission service request to determine the set of flowgates that the transmission service request shall be evaluated against and decrement.

The determination of the flowgates is based upon the AFC Coordination OASIS reservation methodology of the Seams Operating Agreement, if applicable. The intent is to minimize the risk that a request for transmission service is evaluated twice against the same flowgate.

In general, the source MAPP TSP transmission service request is evaluated against its own and third party flowgates, a sink or wheel transmission service request is only evaluated against its own flowgates.

12 MAPP AFC Calculation

12.1 Non-Recallable AFC Computation for a Pre-contingent MAPP Transmission Service Provider Flowgate

The following equation describes the computation of Non-recallable Available Flowgate Capability (NAFC) for each Pre-contingent Constrained Flowgate for each time period.

$$NAFC_i^t = TFC_i^t - CBM_i^t - TRM_i^t - NETC_i^t - \left(MF_i^t\right)_n - NRES_i^t$$

Where,

$NAFC_i^t$ = Non - recallable (firm) AFC on interface *i* at time *t*

TFC_i^t = Total Flowgate Capability on interface *i* at time *t*

CBM_i^t = Capacity Benefit Margin value used for NAFC calculation on interface *i* at time *t*

TRM_i^t = Transmission Reliability Margin on interface *i* at time *t*

$NETC_i^t$ = Non - recallable Existing Transmission Commitments on interface *i* at time *t*

$\left(MF_i^t\right)_n$ = Market Flow for RTO *n* on interface *i* at time *t*

$NRES_i^t$ = Non - recallable (firm) transmission reservation impacts on interface *i* at time *t*

$NRES_i^t$ is calculated by summing all transmission reservation *r*, at each time *t*, on each interface *i* as follows

$$NRES_i^t = \underbrace{CNRES_i^t}_{Confirmed} + \underbrace{ANRES_i^t}_{Accepted} + \underbrace{SNRES_i^t}_{Study} + \underbrace{ROFRNRES_i^t}_{Rollover\ Rights}$$

$$CNRES_i^t = \left(CNRES_i^t\right)_1 + \left(CNRES_i^t\right)_2$$

Where,

$$\left(CNRES_i^t\right)_1 = \sum_r \left(\Delta P_i^t\right)_r \quad \text{if } \left(\Delta P_i^t\right)_r > 0 \text{ or } \left|PTDF_i^t\right|_r \le \textit{Flowgate Threshold}$$

$$\left(CNRES_i^t\right)_2 = \sum_r \left(\Delta P_i^t\right)_r * \left(d_i^{firm}\right)_{\text{NAFC}} \text{ if } \left(\Delta P_i^t\right)_r < 0 \text{ and } \left|PTDF_i^t\right|_r > \textit{Flowgate Threshold}$$

and

$$ANRES_i^t = \sum_r \left(\Delta P_i^t\right)_r \quad \text{if } \left(\Delta P_i^t\right)_r > 0$$

$$SNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r \quad \text{if } \left(\Delta P_i^t\right)_r > 0$$

$$ROFRNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r \quad \text{if } \left(\Delta P_i^t\right)_r > 0$$

The $\left(d_i^{firm}\right)_{\text{NAFC}}$ value is the directionality coefficient (between 0.0 and 1.0) for a flowgate. By varying this coefficient the MAPP TSP can choose to include all or none of the non-recallable counter-flow impacts.

12.1.1 Reciprocally Coordination Flowgate

$$CNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmFGPositiveFactor_{NAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

$$+ \sum_r \left(\Delta P_i^t\right)_r * FirmFGNegativeFactor_{NAFC} \text{ where } \left(\Delta P_i^t\right)_r < 0$$

$$ANRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmFGPositiveFactor_{NAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

$$SNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmFGPositiveFactor_{NAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

$$ROFRNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmFGPositiveFactor_{NAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

The $FirmFGPositiveFactor_{NAFC}$ value is a coefficient (between 0.0 and 1.0) for a flowgate. By varying this coefficient the MAPP TSP can choose to include all or none of the non-recallable positive impacts in the NAFC calculation. **Each Reservation Status Impact Category has its own factor**

The $FirmFGNegativeFactor_{NAFC}$ value is a coefficient (between 0.0 - 1.0) for a flowgate. By varying this coefficient the MAPP TSP can choose to include all or none of the non-recallable counter-flow impacts in the NAFC calculation. **Each Reservation Status Impact Category has its own factor**

Where,

$$\left(\Delta P_i^t\right)_r = \left(PTDF_i^t\right)_r \times \left(CAP^t\right)_r$$

And,

$\left(PTDF_i^t\right)_r$ = Power Transfer Distribution Factor of the transmission reservation *r*, at time *t* on interface *i*

$\left(CAP^t\right)_r$ = Megawatt capacity of the transmission reservation *r*, at time *t*

$CNRES_i^t$ = Committed (Confirmed) Non - recallable (firm) reservation impacts on interface *i* at time *t*

$ANRES_i^t$ = Accepted, Counteroffer, and Rebid Non - recallable (firm) reservation impacts on interface *i* at time *t*

$SNRES_i^t$ = Study Non - recallable (firm) reservation impacts on interface *i* at time *t*

$ROFRNRES_i^t$ = Right of First Refusal Impacts(Rollover Rights) Non - recallable (firm) reservation impacts on interface *i* at time *t*

And,

The formula to use is configured on a per flowgate basis.

12.2 Recallable AFC Computation for a Pre-contingent MAPP Transmission Service Provider Flowgate

For each Flowgate, six AFC values are calculated for the evaluation of Recallable service in order to determine the AFC within each service priority group. The following equations describe the computation of these Recallable Available Transfer Capability (RAFC) values for each Flowgate for each time period for each service priority.

Recallable Planning Horizon AFC Computation for a Pre-contingent Constrained Flowgate

$$RAFC6_i^t = TFC_i^t - \left(CBM_i^t \times CBMCOEF_i^t\right) - \left(TRM_i^t \times TRMCOEF_i^t\right) - RETC_i^t - NRES_i^t - \left(MF_i^t\right)_n - NETC_i^t - RRES6_i^t$$

$$RAFC5_i^t = RAFC6_i^t - RRES5_i^t$$

$$\vdots$$

$$RAFCN_i^t = RAFC[N+1]_i^t - RRESN_i^t$$

Where,

$RAFC_{N_i^t}$ = Recallable (firm) AFC on interface *i* at time *t* for TLR priority *N*

TFC_i^t = Total Flowgate Capability on interface *i* at time *t*

CBM_i^t = Capacity Benefit Margin value used for RATC calculation on interface *i* at time *t*

$CBMCOEF_i^t$ = Capacity Benefit Margin Coefficient on interface *i* at time *t*

TRM_i^t = Transmission Reliability Margin on interface *i* at time *t*

$TRMCOEF_i^t$ = Transmission Reliability Margin Coefficient on interface *i* at time *t*

$RETC_i^t$ = Recallable Existing Transmission Committments on interface *i* at time *t*

$NETC_i^t$ = Non - Recallable Existing Transmission Committments on interface *i* at time *t*

$\left(MF_i^t\right)_n$ = Market Flow for RTO *n* on interface *i* at time *t*

$NRES_i^t$ = Non - recallable (firm) transmission reservation impacts on interface *i* at time *t*

$RRES_{N_i^t}$ = Recallable (Non - firm) transmission reservation impacts on interface *i* at time *t* for TLR priority *N*

The $TRMCOEF_i^t$ component allows the MAPP TSP to sell all or a portion of the TRM as recallable transmission service.

The $CBMCOEF_i^t$ component allows the MAPP TSP to sell all or a portion of the CBM as recallable transmission service.

The computation of $NRES_i^t$ and $RRES_{N_i^t}$ is somewhat different from those of Non-recallable ATC computation.

$$NRES_i^t = \underbrace{CNRES_i^t}_{Confirmed} + \underbrace{ANRES_i^t}_{Accepted} + \underbrace{SNRES_i^t}_{Study} + \underbrace{ROFRNRES_i^t}_{Rollover\ Rights}$$

$$CNRES_i^t = \left(CNRES_i^t\right)_1 + \left(CNRES_i^t\right)_2$$

Where,

$$\left(CNRES_i^t\right)_1 = \sum_r \left(\Delta P_i^t\right)_r \quad \text{if } \left(\Delta P_i^t\right)_r > 0 \text{ or } \left|PTDF_i^t\right|_r \leq \textit{Flowgate Threshold}$$

$$\left(CNRES_i^t\right)_2 = \sum_r \left(\Delta P_i^t\right)_r * \left(d_i^{firm}\right)_{\text{RAFC}} \text{ if } \left(\Delta P_i^t\right)_r < 0 \text{ and } \left|PTDF_i^t\right|_r > \textit{Flowgate Threshold}$$

and

$$ANRES_i^t = \sum_r \left(\Delta P_i^t\right)_r \quad \text{if } \left(\Delta P_i^t\right)_r > 0$$

$$SNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r \quad \text{if } \left(\Delta P_i^t\right)_r > 0$$

$$ROFRNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r \quad \text{if } \left(\Delta P_i^t\right)_r > 0$$

Reciprocally Coordinated Flowgate

$$CNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmFGPositiveFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

$$+ \sum_r \left(\Delta P_i^t\right)_r * FirmFGNegativeFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r < 0$$

$$ANRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmFGPositiveFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

$$SNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmFGPositiveFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

$$ROFRNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmFGPositiveFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

The $FirmFGPositiveFactor_{RAFC}$ value is a coefficient (between 0.0 - 1.0) for a flowgate. By varying this coefficient the MAPP TSP can choose to include all or none of the non-recallable positive impacts in the RAFC calculation. **Each Reservation Status Impact Category has its own factor**

The $FirmFGNegativeFactor_{RAFC}$ value is a coefficient (between 0.0 - 1.0) for a flowgate. By varying this coefficient the MAPP TSP can choose to include all or none of the non-recallable counter-flow impacts in the RAFC calculation. **Each Reservation Status Impact Category has its own factor**

And,

$$RRES_{N_i^t} = \underbrace{CRRES_{N_i^t}}_{\textit{Committed}} + \underbrace{ARRES_{N_i^t}}_{\textit{Accepted}} + \underbrace{SRRES_{N_i^t}}_{\textit{Study}}$$

$$CRRES_{N_i^t} = (CRRES_{N_i^t})_1 + (CRRES_{N_i^t})_2$$

Where,

$$(CRRES_{N\,i}^{t})_1 = \sum_r \left(\Delta P_i^t\right)_r \quad \text{if } \left(\Delta P_i^t\right)_r > 0 \text{ or } \left|PTDF_i^t\right|_r \leq \textit{Flowgate Threshold}$$

$$(CRRES_{N\,i}^{t})_2 = \sum_r \left(\Delta P_i^t\right)_r \times \left(d_i^{nonfirm}\right)_{RAFC} \text{ if } \left(\Delta P_i^t\right)_r < 0 \text{ and } \left|PTDF_i^t\right|_r > \textit{Flowgate Threshold}$$

The summation of the recallable impacts is for all reservations with TLR priority level *N*.

The $\left(d_i^{firm}\right)_{\text{RAFC}}$ and $\left(d_i^{nonfirm}\right)_{RAFC}$ values are the directionality coefficients (between 0.0 and 1.0) for a flowgate. By varying this coefficient the MAPP TSP can choose to include all or none of the non-recallable and/or recallable counter-flow impacts.

Or for a Reciprocally Coordinated Flowgate

Reciprocally Coordinated Flowgate

$$CRRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * NonFirmFGPositiveFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

$$+ \sum_r \left(\Delta P_i^t\right)_r * NonFirmFGNegativeFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r < 0$$

$$ARRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * NonFirmFGPositiveFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

$$SRRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * NonFirmFGPositiveFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

The $NonFirmFGPositiveFactor_{RAFC}$ value is a coefficient (between 0.0 and 1.0) for a flowgate. By varying this coefficient the MAPP TSP can choose to include all or none of the recallable positive impacts in the RAFC calculation. **Each Reservation Status Impact Category has its own factor.**

The $NonFirmFGNegativeFactor_{RAFC}$ value is a coefficient (between 0.0 and 1.0) for a flowgate. By varying this coefficient the MAPP TSP can choose to include all or none of the recallable counter-flow impacts in the RAFC calculation. **Each Reservation Status Impact Category has its own factor.**

Recallable Operating Horizon AFC Computation for a Pre-contingent Constrained Flowgate

$$RAFC6_i^t = TFC_i^t - \left(CBM_i^t \times CBMCOEF_i^t\right) - \left(TRM_i^t \times TRMCOEF_i^t\right) - FETC_i^t - NSCH_i^t - \left(NMF_i^t\right)_n - RSCH6_i^t$$

$$RAFC5_i^t = RAFC6_i^t - RSCH5_i^t$$

$$\vdots$$

$$RAFCN_i^t = RAFC[N+1]_i^t - RSCHN_i^t$$

Where,

$RAFC_{N_i^t}$ = Recallable (firm) AFC on interface *i* at time *t* for LLR priority *N*

TFC_i^t = Total Flowgate Capability on interface *i* at time *t*

CBM_i^t = Capacity Benefit Margin value used for RATC calculation on interface *i* at time *t*

$CBMCOEF_i^t$ = Capacity Benefit Margin Coefficient on interface *i* at time *t*

TRM_i^t = Transmission Reliability Margin on interface *i* at time *t*

$TRMCOEF_i^t$ = Transmission Reliability Margin Coefficient on interface *i* at time *t*

$FETC_i^t$ = Forecasted Existing Transmission Commitments on interface *i* at time *t*

$\left(NMF_i^t\right)_n$ = Non - recallable (firm) Market Flow for RTO *n* on interface *i* at time *t*

$NSCH_i^t$ = Total impact of all Non - recallable energy schedules on interface *i* at time *t*

$RSCH_{N_i^t}$ = Total impact of all Recallable (Non - firm) energy schedules on interface *i* at time *t* for TLR priority *N*

And,

$$\underbrace{FETC_i^t}_{Forecasted} = \underbrace{NETC_i^t}_{Non-recallable} + \underbrace{RETC_i^t}_{\text{Re}callable}$$

The Forecasted ETC value can be based upon the sum of NETC and RETC values submitted by the TSP, or the TSP can rely on the ETC Forecaster to predict the ETC value in the Operating Horizon.

$$(NSCH_i^t)_1 = \sum_r \left(\Delta P_i^t\right)_r$$

$$(RSCH_{N_i^t})_2 = \sum_r \left(\Delta P_i^t\right)_r$$

Where,

$$\left(\Delta P_i^t\right)_r = \left(PTDF_i^t\right)_r \times \left(SCH^t\right)_r$$

$\left(PTDF_{i^t}\right)_r$ = Power Transfer Distribution Factor of the transmission reservation *r*, at time *t* on interface *i*

$\left(SCH^t\right)_r$ = Megawatt energy schedule of the transmission reservation *r* or capacity of the priority 2 and hourly priority 6 reservation *r* for which a schedule does not exist, at time *t*

The $TRMCOEF_i^t$ component allows the MAPP TSP to sell all or a portion of the TRM as recallable transmission service.

The $CBMCOEF_i^t$ component allows the MAPP TSP to sell all or a portion of the CBM as recallable transmission service.

12.3 Non-Recallable AFC Computation for a Post-contingent MAPP Transmission Service Provider Flowgate

A Monitored Interface and a Contingency interface pair define each Post-contingent flowgate. Each Monitored Interface and Contingency Interface may be made up of one or more transmission elements.

The following equation describes the computation of Non-recallable Available Flowgate Capability (NAFC) for each Post-contingent Flowgate for each time period.

$$NAFC_i^t = TFC_i^t - CBM_i^t - TRM_i^t - NETC_i^t - \left(NMF_i^t\right)_n - NRES_i^t$$

Where,

$NAFC_i^t$ = Non-recallable (firm) AFC on interface *i* at time *t*

TFC_i^t = Total Flowgate Capability on interface *i* at time *t*

CBM_i^t = Capacity Benefit Margin value used for NAFC calculation on interface *i* at time *t*

TRM_i^t = Transmission Reliability Margin on interface *i* at time *t*

$NETC_i^t$ = Non-recallable Existing Transmission Commitments on interface *i* at time *t*

$\left(NMF_i^t\right)_n$ = Non-recallable (firm) Market Flow for RTO *n* on interface *i* at time *t*

$NRES_i^t$ = Non-recallable (firm) transmission reservation impacts on interface *i* at time *t*

$NRES_i^t$ is calculated by summing all transmission reservation r, at each time t, on each interface i as follows,

$$NRES_i^t = \underbrace{CNRES_i^t}_{Confrimed} + \underbrace{ANRES_i^t}_{Accepted} + \underbrace{SNRES_i^t}_{Study} + \underbrace{ROFRNRES_i^t}_{Rollover\ Rights}$$

$$CNRES_i^t = \left(CNRES_i^t\right)_1 + \left(CNRES_i^t\right)_2$$

Where,

$$\left(CNRES_i^t\right)_1 = \sum_r \left(\Delta P_i^t\right)_r \quad \text{if } \left(\Delta P_i^t\right)_r > 0 \text{ or } \left|OTDF_i^t\right|_r \le \textit{Flowgate Threshold}$$

$$\left(CNRES_i^t\right)_2 = \sum_r \left(\Delta P_i^t\right)_r * \left(d_i^{firm}\right)_{\text{NAFC}} \text{ if } \left(\Delta P_i^t\right)_r < 0 \text{ and } \left|OTDF_i^t\right|_r > \textit{Flowgate Threshold}$$

and

$$ANRES_i^t = \sum_r \left(\Delta P_i^t\right)_r \quad \text{if } \left(\Delta P_i^t\right)_r > 0$$

$$SNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r \quad \text{if } \left(\Delta P_i^t\right)_r > 0$$

$$ROFRNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r \quad \text{if } \left(\Delta P_i^t\right)_r > 0$$

The $\left(d_i^{firm}\right)_{\text{NAFC}}$ value is the directionality coefficient (between 0.0 and 1.0) for a flowgate. By varying this coefficient the MAPP TSP can choose to include all or none of the recallable counter-flow impacts.

Reciprocally Coordinated Flowgate

$$CNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmFGPositiveFactor_{NAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

$$+ \sum_r \left(\Delta P_i^t\right)_r * FirmFGNegativeFactor_{NAFC} \text{ where } \left(\Delta P_i^t\right)_r < 0$$

$$ANRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmFGPositiveFactor_{NAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

$$SNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmFGPositiveFactor_{NAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

$$ROFRNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmFGPositiveFactor_{NAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

The $FirmFGPositiveFactor_{NAFC}$ value is a coefficient (between 0.0 and 1.0) for a flowgate. By varying this coefficient the MAPP TSP can choose to include all or none of the non-recallable positive impacts in the NAFC calculation. **Each Reservation Impact Category has its own factor**

The $FirmFGNegativeFactor_{NAFC}$ value is a coefficient (between 0.0 and 1.0) for a flowgate. By varying this coefficient the MAPP TSP can choose to include all or none of the non-recallable counter-flow impacts in the NAFC calculation. **Each Reservation Impact Category has its own factor**

Where,

$$\left(\Delta P_i^t\right)_r = \left(OTDF_i^t\right)_r \times \left(CAP^t\right)_r$$

And,

$\left(OTDF_i^t\right)_r$ = Outage Transfer Distribution Factor of the transmission reservation r, at time t on interface i

$\left(CAP^t\right)_r$ = Megawatt capacity of the transmission reservation r, at time t

$CNRES_i^t$ = Committed (Confirmed) Non - recallable (firm) reservation impacts on interface i at time t

$ANRES_i^t$ = Accepted, Counteroffer, and Rebid Non - recallable (firm) reservation impacts on interface i at time t

$SNRES_i^t$ = Study Non - recallable (firm) reservation impacts on interface i at time t

$ROFRNRES_i^t$ = Right of First Refusal Impacts(Rollover Rights) Non - recallable (firm) reservation impacts on interface i at time t

12.4 Recallable AFC Computation for a Post-contingent MAPP Transmission Service Provider Flowgate

For each Flowgate, six AFC values are calculated for the evaluation of Recallable service in order to determine the AFC within each service priority group. The following equations describe the computation of these Recallable Available Flowgate Capability (RAFC) values for each Flowgate for each time period for each service priority.

(Recallable Planning Horizon AFC Computation for a Post-contingent Constrained Flowgate

$$RAFC6_i^t = TFC_i^t - \left(CBM_i^t \times CBMCOEF_i^t\right) - \left(TRM_i^t \times TRMCOEF_i^t\right) - RETC_i^t - NRES_i^t - \left(NMF_i^t\right)_n - NETC_i^t - RRES6_i^t$$

$$RAFC5_i^t = RAFC6_i^t - RRES5_i^t$$

$$\vdots$$

$$RAFCN_i^t = RAFC[N+1]_i^t - RRESN_i^t$$

Where,

$RAFCN_i^t$ = Recallable (firm) AFC on interface i at time t for TLR priority N

TFC_i^t = Total Flowgate Capability on interface i at time t

CBM_i^t = Capacity Benefit Margin value used for RATC calculation on interface i at time t

$CBMCOEF_i^t$ = Capacity Benefit Margin Coefficient on interface i at time t

TRM_i^t = Transmission Reliability Margin on interface i at time t

$TRMCOEF_i^t$ = Transmission Reliability Margin Coefficient on interface i at time t

$RETC_i^t$ = Recallable Existing Transmission Committments on interface i at time t

$NETC_i^t$ = Non - Recallable Existing Transmission Committments on interface i at time t

$\left(NMF_i^t\right)_n$ = Non - recallable (firm) Market Flow for RTO n on interface i at time t

$NRES_i^t$ = Non - recallable (firm) transmission reservation impacts on interface i at time t

$RRESN_i^t$ = Recallable (Non - firm) transmission reservation impacts on interface i at time t for TLR priority N

The $TRMCOEF_i^t$ component allows the MAPP TSP to sell all or a portion of the TRM as recallable transmission service.

The $CBMCOEF_i^t$ component allows the MAPP TSP to sell all or a portion of the CBM as recallable transmission service.

The computation of $NRES_i^t$ and $RRES_{N}{}_i^t$ is somewhat different from those of Non-recallable AFC computation.

$$NRES_i^t = \underbrace{CNRES_i^t}_{Confirmed} + \underbrace{ANRES_i^t}_{Accepted} + \underbrace{SNRES_i^t}_{Study} + \underbrace{ROFRNRES_i^t}_{Rollover\ Rights}$$

$$CNRES_i^t = \left(CNRES_i^t\right)_1 + \left(CNRES_i^t\right)_2$$

Where,

$$\left(CNRES_i^t\right)_1 = \sum_r \left(\Delta P_i^t\right)_r \quad \text{if } \left(\Delta P_i^t\right)_r > 0 \text{ or } \left|OTDF_i{}^t\right|_r \leq Flowgate\ Threshold$$

$$\left(CNRES_i^t\right)_2 = \sum_r \left(\Delta P_i^t\right)_r * \left(d_i^{firm}\right)_{\text{RAFC}} \text{ if } \left(\Delta P_i^t\right)_r < 0 \text{ and } \left|OTDF_i{}^t\right|_r > Flowgate\ Threshold$$

and

$$ANRES_i^t = \sum_r \left(\Delta P_i^t\right)_r \quad \text{if } \left(\Delta P_i^t\right)_r > 0$$

$$SNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r \quad \text{if } \left(\Delta P_i^t\right)_r > 0$$

$$ROFRNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r \quad \text{if } \left(\Delta P_i^t\right)_r > 0$$

Reciprocally Coordinated Flowgate

$$CNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmFGPositiveFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

$$+ \sum_r \left(\Delta P_i^t\right)_r * FirmFGNegativeFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r < 0$$

$$ANRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmFGPositiveFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

$$SNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmFGPositiveFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

$$ROFRNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmFGPositiveFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

The $FirmFGPositiveFactor_{RAFC}$ value is a coefficient (between 0.0 and 1.0) for a flowgate. By varying this coefficient the MAPP TSP can choose to include all or none of the non-recallable positive impacts in the RAFC calculation. **Each Reservation Impact Category has its own factor**

The $FirmFGNegativeFactor_{RAFC}$ value is a coefficient (between 0.0 and 1.0) for a flowgate. By varying this coefficient the MAPP TSP can choose to include all or none of the non-recallable counter-flow impacts in the RAFC calculation. **Each Reservation Impact Category has its own factor**

And

$$RRES_{N_i}^t = \underbrace{CRRES_{N_i}^t}_{Committed} + \underbrace{ARRES_{N_i}^t}_{Accepted} + \underbrace{SRRES_{N_i}^t}_{Study}$$

$$CRRES_{N_i}^t = (CRRES_{N_i}^t)_1 + (CRRES_{N_i}^t)_2$$

Where,

$$(CRRES_{N_i}^t)_1 = \sum_r \left(\Delta P_i^t\right)_r \quad \text{if } \left(\Delta P_i^t\right)_r > 0 \text{ or } \left|OTDF_i^t\right|_r \leq Flowgate\ Threshold$$

$$(CRRES_{N_i}^t)_2 = \sum_r \left(\Delta P_i^t\right)_r \times \left(d_i^{nonfirm}\right)_{RAFC} \text{ if } \left(\Delta P_i^t\right)_r < 0 \text{ and } \left|OTDF_i^t\right|_r > Flowgate\ Threshold$$

The summation of the recallable impacts is for all reservations with TLR priority level N.

The $\left(d_i^{firm}\right)_{\text{RAFC}}$ and $\left(d_i^{nonfirm}\right)_{RAFC}$ values are the directionality coefficients (between 0.0 - 1.0) for a flowgate. By varying this coefficient the MAPP TSP can choose to include all or none of the non-recallable and/or recallable counter-flow impacts.

Or for a Reciprocally Coordinated Flowgate

$$CRRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * NonFirmFGPositiveFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

$$+ \sum_r \left(\Delta P_i^t\right)_r * NonFirmFGNegativeFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r < 0$$

$$ARRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * NonFirmFGPositiveFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

$$SRRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * NonFirmFGPositiveFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

The $NonFirmFGPositiveFactor_{RAFC}$ value is a coefficient (between 0.0 - 1.0) for a flowgate. By varying this coefficient the MAPP TSP can choose to include all or none of the recallable positive impacts in the RAFC calculation. **Each Reservation Impact Category has its own factor**

The $NonFirmFGNegativeFactor_{RAFC}$ value is a coefficient (between 0.0 - 1.0) for a flowgate. By varying this coefficient the MAPP TSP can choose to include all or none of the recallable counter-flow impacts in the RAFC calculation. **Each Reservation Impact Category has its own factor**

Recallable Operating Horizon AFC Computation for a Post-contingent Constrained Flowgate

$$RAFC6_i^t = TFC_i^t - \left(CBM_i^t \times CBMCOEF_i^t\right) - \left(TRM_i^t \times TRMCOEF_i^t\right) - FETC_i^t - NSCH_i^t - \left(NMF_i^t\right)_n - RSCH6_i^t$$

$$RAFC5_i^t = RAFC6_i^t - RSCH5_i^t$$

$$\vdots$$

$$RAFC_{N_i}^t = RAFC_{[N+1]_i}^t - RSCH_{N_i}^t$$

Where,

$RAFC_{N_i}^t$ = Recallable (firm) AFC on interface *i* at time *t* for LLR priority *N*

TFC_i^t = Total Flowgate Capability on interface *i* at time *t*

CBM_i^t = Capacity Benefit Margin value used for RATC calculation on interface *i* at time *t*

$CBMCOEF_i^t$ = Capacity Benefit Margin Coefficient on interface *i* at time *t*

TRM_i^t = Transmission Reliability Margin on interface *i* at time *t*

$TRMCOEF_i^t$ = Transmission Reliability Margin Coefficient on interface *i* at time *t*

$FETC_i^t$ = Forecasted Existing Transmission Commitments on interface *i* at time *t*

$\left(NMF_i^t\right)_n$ = Non - recallable (firm) Market Flow for RTO *n* on interface *i* at time *t*

$NSCH_i^t$ = Total impact of all Non - recallable energy schedules on interface *i* at time *t*

$RSCH_{N_i}^t$ = Total impact of all Recallable (Non - firm) energy schedules on interface *i* at time *t* for TLR priority *N*

And,

$$\underbrace{FETC_i^t}_{Forecasted} = \underbrace{NETC_i^t}_{Non-recallable} + \underbrace{RETC_i^t}_{\text{Re}callable}$$

The Forecasted ETC value can be based upon the sum of NETC and RETC values submitted by the TSP, or the TSP can rely on the ETC Forecaster to predict the ETC value in the Operating Horizon.

$$(NSCH_i^t)_1 = \sum_r \left(\Delta P_i^t\right)_r$$

$$(RSCH_{N_i}^t)_2 = \sum_r \left(\Delta P_i^t\right)_r$$

Where,

$$\left(\Delta P_i^t\right)_r = \left(OTDF_i^t\right)_r \times \left(SCH^t\right)_r$$

$\left(OTDF_i^t\right)_r$ = Outage Transfer Distribution Factor of the transmission reservation *r*, at time *t* on interface *i*

$\left(SCH^t\right)_r$ = Megawatt energy schedule of the transmission reservation *r* or capacity of the priority 2 and hourly priority 6 reservation *r* for which a schedule does not exist, at time *t*

The $TRMCOEF_i^t$ component allows the MAPP TSP to sell all or a portion of the TRM as recallable transmission service.

The $CBMCOEF_i^t$ component allows the MAPP TSP to sell all or a portion of the CBM as recallable transmission service.

12.5 Non-Recallable ATC Computation on a Contract Path

$$NATC_i^t = TTC_i^t - CBM_i^t - TRM_i^t - NETC_i^t - NRES_i^t$$

$NATC_i^t$ = Non-recallable (firm) ATC on contract path *i* at time *t*

TTC_i^t = Total Transfer Capability on contract path *i* at time *t*

CBM_i^t = Capacity Benefit Margin value used for NATC calculation on contract path *i* at time *t*

TRM_i^t = Transmission Reliability Margin on contract path *i* at time *t*

$NETC_i^t$ = Existing Transmission Commitment value used for NATC calculation on contract path *i* at time *t*

$NRES_i^t$ = Non-recallable (firm) transmission reservation impacts on contract path *i* at time *t*

$NRES_i^t$ is calculated by summing all transmission reservation r, at each time t, on each contract path i as follows

$$NRES_i^t = \underbrace{CNRES_i^t}_{Confirmed} + \underbrace{ANRES_i^t}_{Accepted} + \underbrace{SNRES_i^t}_{Study} + \underbrace{ROFRNRES_i^t}_{Rollover\ Rights}$$

$$CNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmCPPositiveFactor_{NAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$
$$+ \sum_r \left(\Delta P_i^t\right)_r * FirmCPNegativeFactor_{NAFC} \text{ where } \left(\Delta P_i^t\right)_r < 0$$
$$ANRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmCPPositiveFactor_{NAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$
$$SNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmCPPositiveFactor_{NAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$
$$ROFRNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmCPPositiveFactor_{NAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

The $FirmCPPositiveFactor_{NAFC}$ value is a coefficient (between 0.0 and 1.0) for a flowgate. By varying this coefficient the MAPP TSP can choose to include all or none of the non-recallable positive impacts in the NAFC calculation. **Each Reservation Impact Category has its own factor.**

The $FirmCPNegativeFactor_{NAFC}$ value is a coefficient (between 0.0 and 1.0) for a flowgate. By varying this coefficient the MAPP TSP can choose to include all or none of the non-recallable counter-flow impacts in the NAFC calculation. **Each Reservation Impact Category has its own factor.**

Where,

$$\left(\Delta P_i^t\right)_r = \left(DF_i^t\right)_r \times \left(CAP^t\right)_r$$

And,

$\left(DF_i^t\right)_r$ = DF is the percent impact, [0, 100, -100%] of the transmission reservation r, at time t on contract path i

$\left(CAP^t\right)_r$ = Megawatt capacity of the transmission reservation r, at time t

12.6 Recallable ATC Computation on a Contract Path

For each Contract Path, one ATC is calculated for the evaluation of Recallable service. The following equation describes the computation of these Recallable Available Transfer Capability (RATC) values for each Contract Path for each time period.

Recallable Planning Horizon ATC Computation for a Contract Path

$$RATC6_i^t = TTC_i^t - \left(CBM_i^t \times CBMCOEF_i^t\right) - \left(TRM_i^t \times TRMCOEF_i^t\right)$$
$$- RETC_i^t - NRES_i^t - NETC_i^t - RRES6_i^t$$
$$RATC5_i^t = RATC6_i^t - RRES5_i^t$$
$$\vdots$$
$$RATCN_i^t = RATC[N+1]_i^t - RRESN_i^t$$

Where,

$RATC_{N_i^t}$ = Recallable (firm) ATC on interface *i* at time *t* for TLR priority *N*

TTC_i^t = Total Contract Path Capability on interface *i* at time *t*

CBM_i^t = Capacity Benefit Margin on interface *i* at time *t*

$CBMCOEF_i^t$ = Capacity Benefit Margin Coefficient on interface *i* at time *t*

TRM_i^t = Transmission Reliability Margin on interface *i* at time *t*

$TRMCOEF_i^t$ = Transmission Reliability Margin Coefficient on interface *i* at time *t*

$RETC_i^t$ = Recallable Existing Transmission Committments on interface *i* at time *t*

$NETC_i^t$ = Non - Recallable Existing Transmission Committments on interface *i* at time *t*

$NRES_i^t$ = Non - recallable (firm) transmission reservation impacts on interface *i* at time *t*

$RRES_{N_i^t}$ = Recallable (Non - firm) transmission reservation impacts on interface *i* at time *t* for TLR priority *N*

The $TRMCOEF_i^t$ component allows the MAPP TSP to sell all or a portion of the TRM as recallable transmission service.

The $CBMCOEF_i^t$ component allows the MAPP TSP to sell all or a portion of the CBM as recallable transmission service.

The computation of $NRES_i^t$ and $RRES_{N_i^t}$ is somewhat different from those of Non-recallable ATC computation.

$$NRES_i^t = \underbrace{CNRES_i^t}_{Confrimed} + \underbrace{ANRES_i^t}_{Accepted} + \underbrace{SNRES_i^t}_{Study} + \underbrace{ROFRNRES_i^t}_{Rollover\ Rights}$$

$$CNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmCPPositiveFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

$$+ \sum_r \left(\Delta P_i^t\right)_r * FirmCPNegativeFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r < 0$$

$$ANRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmCPPositiveFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

$$SNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmCPPositiveFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

$$ROFRNRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * FirmCPPositiveFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

The $FirmCPPositiveFactor_{RAFC}$ value is a coefficient (between 0.0 and 1.0) for a flowgate. By varying this coefficient the MAPP TSP can choose to include all or none of the non-recallable positive impacts in the RAFC calculation. **Each Reservation Impact Category has its own factor.**

The $FirmCPNegativeFactor_{RAFC}$ value is a coefficient (between 0.0 and 1.0) for a flowgate. By varying this coefficient the MAPP TSP can choose to include all or none of the non-recallable counter-flow impacts in the RAFC calculation. **Each Reservation Impact Category has its own factor.**

And

$$RRESN_i^t = \underbrace{CRRESN_i^t}_{Committed} + \underbrace{ARRESN_i^t}_{Accepted} + \underbrace{SRRESN_i^t}_{Study}$$

$$CRRESN_i^t = (CRRESN_i^t)_1 + (CRRESN_i^t)_2$$

Where,

$$CRRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * NonFirmCPPositiveFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

$$+ \sum_r \left(\Delta P_i^t\right)_r * NonFirmCPNegativeFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r < 0$$

$$ARRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * NonFirmCPPositiveFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

$$SRRES_i^t = \sum_r \left(\Delta P_i^t\right)_r * NonFirmCPPositiveFactor_{RAFC} \text{ where } \left(\Delta P_i^t\right)_r > 0$$

The $NonFirmCPPositiveFactor_{RAFC}$ value is a coefficient (between 0.0 - 1.0) for a flowgate. By varying this coefficient the MAPP TSP can choose to include all or none of the recallable positive impacts in the RAFC calculation. **Each Reservation Impact Category has its own factor.**

The $NonFirmCPNegativeFactor_{RAFC}$ value is a coefficient (between 0.0 - 1.0) for a flowgate. By varying this coefficient the MAPP TSP can choose to include all or none of the recallable counter-flow impacts in the RAFC calculation. **Each Reservation Impact Category has its own factor.**

Where,

$$\left(\Delta P_i^t\right)_r = \left(DF_i^t\right)_r \times \left(CAP^t\right)_r$$

And,

$\left(DF_i^t\right)_r$ = DF is the percent impact, [0, 100, -100%] of the transmission reservation r, at time t on contract path i

$\left(CAP^t\right)_r$ = Megawatt capacity of the transmission reservation r, at time t

Recallable Operating Horizon ATC Computation for a Contract Path

$$RATC6_i^t = TTC_i^t - \left(CBM_i^t \times CBMCOEF_i^t\right) - \left(TRM_i^t \times TRMCOEF_i^t\right) - NETC_i^t - RETC_i^t - NSCH_i^t - RSCH6_i^t$$

$$RATC5_i^t = RATC6_i^t - RSCH5_i^t$$

$$\vdots$$

$$RATC_{N_i}^t = RATC_{[N+1]_i}^t - RSCH_{N_i}^t$$

$RATC_i^t$ = Recallable (firm) ATC on contract path *i* at time *t*

TTC_i^t = Total Transfer Capability on contract path *i* at time *t*

CBM_i^t = Capacity Benefit Margin value on contract path *i* at time *t*

$CBMCOEF_i^t$ = Capacity Benefit Margin Coefficient on interface *i* at time *t*

TRM_i^t = Transmission Reliability Margin on contract path *i* at time *t*

$TRMCOEF_i^t$ = Transmission Reliability Margin Coefficient on contract path *i* at time *t*

$NETC_i^t$ = Non - Recallable Existing Transmission Commitment value on contract path *i* at time *t*

$RETC_i^t$ = Recallable Existing Transmission Commitment value on contract path *i* at time *t*

$NSCH_i^t$ = Total impact of all Non - recallable energy schedules on icontract path *i* at time *t*

$RSCH_i^t$ = Total impact of all Recallable (Non - firm) energy schedules on contract path *i* at time *t*

And,

$$NSCH_i^t = \sum_r \left(\Delta P_i^t\right)_r$$

$$RSCH_i^t = \sum_r \left(\Delta P_i^t\right)_r$$

Where,

$$\left(\Delta P_i^t\right)_r = \left(DF_i^t\right)_r \times \left(SCH^t\right)_r$$

And,

$\left(DF_i^t\right)_r$ = DF is the percent impact, [0, 100, -100%] of the transmission reservation *r*, at time *t* on contract path *i*

$\left(SCH^t\right)_r$ = Megawatt energy schedule of the transmission reservation *r* or capacity of the priority 2 and hourly priority 6 reservation *r* for which a schedule does not exist, at time *t*

The $COEF_i^t$ component allows the MAPP TSP to sell all or a portion of the TRM and/or CBM as recallable transmission service.

13 ASTFC Calculation

All firm transmission service reserved under a MAPP Member OATT, with a Seams Coordination Agreement, is subject to the Forward Coordination Process under the CMP Baseline document[1]. Under this process, an allocation of flowgate capability between MAPP and MISO (as well as between other Reciprocal Entities such as PJM, SWPP, and TVA) is performed to determine each party's share of capability, to determine each party's Available Share of Total Flowgate Capability (ASTFC). The ASTFC is evaluated similarly to an AFC evaluation.

13.1 Any transmission service request, which passes the AFC/ATC evaluation, is then subjected to an ASTFC evaluation. Firm ASTFC Computation for a Pre-Contingent Constrained Flowgate

The following equation describes the computation of Firm ASTFC for each Pre-Contingent Constrained Flowgate for each time period:

$$ASTFC_{i,t} = STFC_{i,t} - MAPPNGLF_{i,t} - NRES_{i,t}$$

Where:

$ASTFC_{i,t}$ = *Firm* Shared Capacity For MAPP on the RCF Flowgate i at time t

$STFC_{i,t}$ = S*hared* Flowgate Capacity on interface *i* at time *t*.

$MAPPNGLF_{i,t}$ = Net Gen to Load Flow Impacts of interface *i* at time *t*.

$NRES_{i,t}$ = Non - Recallable (Firm) transmission reservation impacts on interface *i* at time *t*.

The Value of $MAPPNGLF_{i,t}$ on Reciprocal Coordinated Flow gate is calculated by summing all forward MAPP control area Gen to Load flow Impacts (Down to Zero %) and all reverse MAPP balancing authority area Gen to load flow impacts (down to 0 %) on the RCF interface I at time t.

The value of $NRES_{i,t}$ on Reciprocal coordinated Flowgate is calculated by summing all transmission reservation *r*, at each time *t*, on each interface *i* as follows:

$$NRES_{i,t} = \sum_{k} \left\{ NRES_{k,i,t} \mid k \in \left\{ confirmed,^{+}\ confirmed,^{-}\ accepted,\ study,\ rollover, \right\} \right\}$$

Where:

[1] The CMP Baseline document is Attachment LL, Congestion Management Process (CMP) Master Baseline, of the Midwest ISO Transmission and Energy Markets Tariff (TEMT). The CMP Baseline document replaced Attachment B to MAPPCOR-MISO Seams Operating Agreement, Congestion Management Process.

$$NRES_{confirmed^+,i,t} = \Phi NF_{confirmed^+,i} \times \sum_r \left\{ PTDF_{r,i,t} \times CAP_{r,t} \mid PTDF_{r,i,t} \geq 0 \text{ and } RT_r = confirmed \right\}$$

$$NRES_{confirmed^-,i,t} = \Phi NF_{confirmed^-,i} \times \sum_r \left\{ PTDF_{r,i,t} \times CAP_{r,t} \mid PTDF_{r,i,t} < 0 \text{ and } RT_r = confirmed \right\}$$

$$NRES_{accepted,i,t} = \Phi NF_{accepted,i} \times \sum_r \left\{ PTDF_{r,i,t} \times CAP_{r,t} \mid PTDF_{r,i,t} > 0 \text{ and } RT_r = accepted \right\}$$

$$NRES_{study,i,t} = \Phi NF_{study,i} \times \sum_r \left\{ PTDF_{r,i,t} \times CAP_{r,t} \mid PTDF_{r,i,t} > 0 \text{ and } RT_r = study \right\}$$

$$NRES_{rollover,i,t} = \Phi NF_{rollover,i} \times \sum_r \left\{ PTDF_{r,i,t} \times CAP_{r,t} \mid PTDF_{r,i,t} > 0 \text{ and } RT_r = rollover \right\}$$

And:

$NRES_{confirmed^+,i,t}$ = Positive Committed (Confirmed) Non - Recallable (Firm) reservation impacts on interface *i* at ti

$NRES_{confirmed^-,i,t}$ = Negative Committed (Confirmed) Non - Recallable (Firm) reservation impacts on interface *i* at t

$NRES_{accepted,i,t}$ = Accepted, Counteroffer, and Rebid Non - Recallable (Firm) reservation impacts on interface *i* at

$NRES_{study,i,t}$ = Study Non - Recallable (Firm) reservation impacts on interface *i* at time *t*.

$NRES_{rollover,i,t}$ = Right of First Refusal Impacts(Rollover Rights) Non - Recallable (Firm) reservation impacts on interface *i* at time *t*.

$\Phi NF_{k,i}$ = non - recallable (firm) directionality coefficient for reservation class *k* and interface *i*.

RT_r = type of transmission reservation *r*.

$PTDF_{r,i,t}$ = Power Transfer Distribution Factor for reservation *r*, on interface *i* at time *t*.

$CAP_{r,t}$ = Megawatt capacity of the transmission reservation *r*, at time *t*.

For Reciprocally Coordinated MAPP flow gates $\Phi NF_{k,i}$ can vary between 0.0 and 1.0

The MAPP TSP transmission reservation data set is used for calculating $NRES_{i,t}$ in the ASTFC calculation is same as that used for the AFC calculations, except that reservations source/sink are mapped to control area points. The reservation impacts are calculated using Control area to Control area definitions.

13.2 Firm ASTFC Computation for a Post-Contingent Flowgate

The following equation describes the computation of Firm ASTFC for each Pre-Contingent Constrained Flowgate for each time period:

$$ASTFC_{i,t} = STFC_{i,t} - MAPPNGLF_{i,t} - NRES_{i,t}$$

Where:

$ASTFC_{i,t}$ = *Firm* Shared Capacity For MAPP on the RCF Flowgate i at time t

$STFC_{i,t}$ = S*hared* Flowgate Capacity on interface *i* at time *t*.

$MAPPNGLF_{i,t}$ = Net Gen to Load Flow Impacts of interface *i* at time *t*.

$NRES_{i,t}$ = Non - Recallable (Firm) transmission reservation impacts on interface *i* at time *t*.

The Value of $MAPPNGLF_{i,t}$ on Reciprocal Coordinated Flow gate is calculated by summing all forward MAPP control area Gen to Load flow Impacts (Down to Zero %) and all reverse MAPP balancing authority area Gen to load flow impacts (down to 0 %) on the RCF interface I at time t.

The value of $NRES_{i,t}$ on Reciprocal coordinated Flowgate is calculated by summing all transmission reservation *r*, at each time *t*, on each interface *i* as follows:

$$NRES_{i,t} = \sum_{k} \left\{ NRES_{k,i,t} \mid k \in \left\{ confirmed,^{+}\ confirmed,^{-}\ accepted,\ study,\ rollover, \right\} \right\}$$

Where:

$$NRES_{confirmed^{+},i,t} = \Phi NF_{confirmed^{+},i} \times \sum_{r} \left\{ OTDF_{r,i,t} \times CAP_{r,t} \mid OTDF_{r,i,t} \geq 0 \text{ and } RT_{r} = confirmed \right\}$$

$$NRES_{confirmed^{-},i,t} = \Phi NF_{confirmed^{-},i} \times \sum_{r} \left\{ OTDF_{r,i,t} \times CAP_{r,t} \mid OTDF_{r,i,t} < 0 \text{ and } RT_{r} = confirmed \right\}$$

$$NRES_{accepted,i,t} = \Phi NF_{accepted,i} \times \sum_{r} \left\{ OTDF_{r,i,t} \times CAP_{r,t} \mid OTDF_{r,i,t} > 0 \text{ and } RT_{r} = accepted \right\}$$

$$NRES_{study,i,t} = \Phi NF_{study,i} \times \sum_{r} \left\{ OTDF_{r,i,t} \times CAP_{r,t} \mid OTDF_{r,i,t} > 0 \text{ and } RT_{r} = study \right\}$$

$$NRES_{rollover,i,t} = \Phi NF_{rollover,i} \times \sum_{r} \left\{ OTDF_{r,i,t} \times CAP_{r,t} \mid OTDF_{r,i,t} > 0 \text{ and } RT_{r} = rollover \right\}$$

And:

$NRES_{confirmed^{+},i,t}$ = Positive Committed (Confirmed) Non - Recallable (Firm) reservation impacts on interface *i* at ti

$NRES_{confirmed^{-},i,t}$ = Negative Committed (Confirmed) Non - Recallable (Firm) reservation impacts on interface *i* at

$NRES_{accepted,i,t}$ = Accepted, Counteroffer, and Rebid Non - Recallable (Firm) reservation impacts on interface *i* at

$NRES_{study,i,t}$ = Study Non - Recallable (Firm) reservation impacts on interface *i* at time *t*.

$NRES_{rollover,i,t}$ = Right of First Refusal Impacts(Rollover Rights) Non - Recallable (Firm) reservation impacts on interface *i* at time *t*.

$\Phi NF_{k,i}$ = non - recallable (firm) directionality coefficient for reservation class *k* and interface *i*.

RT_{r} = type of transmission reservation *r*.

$OTDF_{r,i,t}$ = Outage Transfer Distribution Factor for reservation *r*, on interface *i* at time *t*.

$CAP_{r,t}$ = Megawatt capacity of the transmission reservation *r*, at time *t*.

For Reciprocally Coordinated MAPP flow gates $\Phi NF_{k,i}$ can vary between 0.0 and 1.0

The MAPP TSP transmission reservation data set is used for calculating $NRES_{i,t}$ in the ASTFC calculation is same as that used for the AFC calculations, except that reservations source/sink are mapped to balancing authority area points. The reservation impacts are calculated using balancing authority area to balancing authority area definitions.

13.3 Evaluation of Reciprocal Coordinated Flowgates

The Reciprocal Flowgate check is required in the request evaluation process abide by the joint agreements with neighboring transmission organizations.

For MAPP Member OATTs, that have a Seams Coordination Agreement, Firm service shall be evaluated using the shared capacity ASFTC value on reciprocal flow gates.

Both ASTFC and AFC evaluation shall be performed for the time frame when a posted ASTFC values are available. If ASTFC values are is not available only an AFC evaluation is required.

A valid transmission service request will be evaluated through the AFC evaluation.

Reciprocal Coordinated Flowgates are treated same as Coordinated Flowgate for impact calculation process. The only difference between a Reciprocal Coordinated Flowgate and Coordinate Flowgate is that, the evaluation of a transmission service request should be done using the MAPP shared values on the Reciprocal Coordinated Flowgates.

If a transmission service request fails the ASTFC evaluation, then additional analysis will be performed to determine if there is adequate ASTFC from another reciprocal entity to either share or transfer allocation in order to grant the transmission service.

Allocation sharing is a manual process, which may increase the typical response time. Allocation sharing will be administered per the CMP Baseline document[2].

[2] The CMP Baseline document is Attachment LL, Congestion Management Process (CMP) Master Baseline, of the Midwest ISO Transmission and Energy Markets Tariff (TEMT). The CMP Baseline document replaced Attachment B to MAPPCOR-MISO Seams Operating Agreement, Congestion Management Process.