Congestion Management Process

DRAFT
Proposal

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Issued by: James P. Torgerson, President and CEO, Midwest ISO
Nick Brown, President and CEO, Southwest Power Pool.

Effective: _____, 2004

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Revision History

DATE	EDITOR	VERSION	SUMMARY OF CHANGES
4/16/04	Wayne Schug	Draft 1	Initial draft

Executive Summary

- *This is the first draft of the SPP/MISO Congestion Management Process document. This version is similar to the PJM-MISO Congestion Management Process, version 4.01, dated April 2, 2004, which provided significant detail in the areas of Market Flow Calculation; Firm Gen-to-Load Flow determination; the Tagging of Import and Export transactions; and Flowgate determination.*

As SPP and MISO expand and implement their respective markets, one of the primary seams issues that must be resolved is how different congestion management methodologies (market-based and traditional) will interact to ensure that parallel flows and impacts are recognized and controlled in a manner that consistently ensures system reliability. SPP and MISO will actively work with stakeholders in various forums in order to identify and address various concerns and issues. The proposed solution will greatly enhance current IDC granularity by utilizing existing real-time applications to monitor and react to Flowgates external to an Operating Entity's market footprint.

In brief, the process includes the following concepts:

- *Participating Operating Entities will agree to observe limits on an extensive list of coordinated external Flowgates*
- *Like all Control Areas, Market-Based Operating Entities will have Firm Gen-to-Load Flows upon those Flowgates.*
- *Market-Based Operating Entities will determine these Firm Gen-to-Load Flows using the published analysis process, and constrain their operations to limit Firm Gen-to-Load Flows on the Coordinated Flowgates to no more than the calculated Firm Gen-to-Load Limit established in the analysis.*
- *In real-time, Market-Based Operating Entities will calculate and monitor when the projected and actual flows exceed the Firm Gen-to-Load Limits established in the day-ahead process.*
- *Market-Based Operating Entities will post the Firm Gen-to-Load Flow and additional non-firm economic market flow, as well as the actual and projected market flow, to the IDC for both internal and external Coordinated Flowgates.*
- *Market-Based Operating Entities will provide to the IDC detailed representation of their marginal units, so that the IDC can continue to effectively compute the effects of all tagged transactions regardless of the size of the market area. These tagged transactions will include transactions into the market, transactions out of the market, and tagged grandfathered transactions within the market.*
- *When there is a TLR 3a or higher called on a Coordinated Flowgate, and the Market-Based Operating Entity's actual/projected Market Flows exceed the Firm Gen-to-Load Limits, Market-Based Operating Entities will redispatch in order to provide the required MW relief, per the IDC congestion management report.*

- *When there is a TLR 5a or 5b, all Transmission Providers will curtail or redispatch their respective systems to provide their shares of NNL reductions as directed by the IDC.*
- *Because the IDC will have the real-time/projected flows throughout the Market-Based Operating Entity's system (as represented by the impacts upon various Coordinated Flowgates), the effectiveness of the IDC will be greatly enhanced.*
- *The above processes refer to the "Congestion Management" portion of the paper, which will be implemented by Market-Based Operating Entities. SPP and the Midwest ISO will implement the Congestion Management portions of this process as each Operating Entity implements its respective market.*
- *Additional entities may choose to enter into similar reciprocal coordination agreements that describe how ATC/AFC, Firm Flows, and outage maintenance will be coordinated on a forward basis.*
- *The complete process will allow participating Operating Entities to address the reliability aspects of congestion management seams issues between all parties whether the seams are between market to non-market operations or market-to-market operations.*

Please direct all questions and comments to:

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Change Summary

Modified PJM-MISO "Congestion Management Process", April 2, 2004, Version 4.01, to reflect discussions between SPP and the Midwest ISO.

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Section 1 - Introduction

- As **Market-Based Operating Entities** expand and implement their respective markets, one of the primary seams issues that must be resolved is how congestion management will be implemented in coordination with other areas, both those that have similar markets and those that do not. This is the first draft of the SPP/MISO "Congestion Management Process". This revision is similar to the PJM-Midwest ISO "Congestion Management Process" dated April 2, 2004, Version 4.01. It provides significant detail in the areas of Market Flow Calculation; Firm Gen-to-Load Flow determination; the tagging of import and export transactions; and Flowgate determination.

It is the intention of SPP and the Midwest ISO to utilize the processes proposed within this document. It is further our intention to develop this process in a way that will allow other regional entities with similar concerns to utilize the concepts within this process to aid in the resolution of their own seams issues. SPP and MISO may recommend changes and improvements as operations continue and as each Operating Entity establishes independent markets.

Problem Definition

The Nature of Energy Flows

Energy flows are distinctly different from the manner in which the energy commodity is purchased, sold, and ultimately scheduled. In the current practice of "contract path" scheduling, schedules identify a source point for generation of energy, a series of wheeling agreements being utilized to transport that energy, and a specific sink point where that energy is being consumed by a load. However, due to the electrical reality of the Eastern Interconnection, energy flows are much different than what is described within that schedule. This disconnect becomes of concern when there is a need to take actions on contract-path schedules to effect changes on the physical system (for example, the curtailment of schedules to relieve transmission constraints).

In the Eastern Interconnection, much of this concern has been addressed through the use of the NERC Transmission Loading Relief (TLR) process. Through this process, Reliability Coordinators utilize the *Interchange Distribution Calculator (IDC)* to determine appropriate actions to provide that relief. The IDC bases its calculations on the use of transaction tags: electronic documents that specify a source and a sink, which can be used to estimate real power flows through the use of a network model. In order to change flows, the IDC is given a particular constraint and a desired change in flows. The IDC returns back all source to sink transactions that contribute to that constraint and specify schedule changes to be made that will effect that change in flows.

In other parts of the Eastern Interconnection, however, the use of centralized economic dispatch results in a solution that does not focus on changing entire transactions

(effectively redispatching through the use of imbalance energy), but rather redispatch itself. In this procedure, the party attempting to provide relief does not need to know that a balanced source to sink transaction should be adjusted; rather, they are aware of a net generation to load balance and the impacts of different generators on various constraints. Locational Marginal Pricing is a regional implementation of this practice.

Currently, these two practices are somewhat incompatible. Due to the electrical characteristics of the Interconnection and geographic scope of the regions, this incompatibility has been of limited concern. However, regional market expansion has begun to draw attention to this philosophical disjoint, as the expansion itself exacerbates the negative effects of the incompatibility.

Granularity in the IDC

The IDC uses an approximation of the Interconnection to identify impacts on a particular transmission constraint that are caused by flows between Control Areas. This approximation allows for a Reliability Coordinator to identify tagged transactions with specific sources and sinks that are contributing to the constraint. While tagged transactions may specify sources and sinks in a very specific manner, the IDC in general cannot respect this detail, and instead consolidates the impacts of several generators and loads into a homogenous representation of the impacts of a single Control Area. This is referred to as the *granularity* of the IDC. Current granularity is typically defined to the Control Area level; finer granularity is present in certain special situations as deemed necessary by NERC.

Reduced Data and Granularity Coarseness

As centrally dispatched energy markets expand their footprint, two related changes occur with regard to the above process. Some tags previously sent to the IDC are no longer sent due to the fact that transactions internal to the market footprint may no longer be tagged. Other transactions remain tagged, but the increased market footprint results in an increase in granularity coarseness within the IDC. [Need to better explain this sentence.]

In the first change, the transactions contained entirely within the market footprint are considered to be utilizing network service (even when the market spans multiple Control Areas). As such, there is no requirement for them to be tagged (or such requirement is waived), and therefore, no requirement that they be sent to the IDC. This is of concern from a reliability perspective, as the IDC no longer has a large a pool of transactions from which to provide relief, although the energy flows may remain consistent with those prior to the market expansion. In other words, flows subject to TLR curtailment prior to the market expansion are no longer available for that process.

In the second change, the expansion of the footprint itself results in a corruption of the approximation utilized by the IDC. When a market region is relatively small (or isolated), the approximation of that region's impact on transmission constraints is

acceptable; actions within the market footprint generally have a similar and consistent impact on all transmission facilities outside the footprint. However, when the market footprint expands significantly, the ability to utilize an electrically representative approximation becomes difficult. Impacts on external facilities can vary significantly depending on the dispatch of the resources within the market footprint. With regard to the IDC, this information is effectively lost within the expanded footprint, and results in an increase in the level of granularity coarseness, or a "loss of granularity."

Conclusion

The net effect of these changes is that reliability must be managed through different processes than those used before the market region's expansion. While relief can still be requested using the current process, both the ability to predict the ability of a transaction to provide that relief and the general pool of transactions available for curtailment are reduced. This process offers a strategy for eliminating this concern through a process that provides more information (finer granularity) to the NERC IDC. This new congestion management process will ensure that reliability is only increased as markets expand by providing information and relief opportunities previously unavailable to the IDC.

Process Scope and Limitations

Vision Statement

As Operating Entities become Market Based Operating Entities, and expand their various markets, one of the primary seams issues that must be resolved is how different congestion management methodologies (market-based and traditional TLR) will interact to ensure parallel flows and impacts are recognized and controlled in a manner that consistently ensures system reliability. For these entities, this process will offer a manner in which Market-Based Operating Entities can coordinate parallel flows with Operating Entities that have not yet implemented markets. Unlike the existing process, this process will provide more proactive management of transmission resources, more accurate information to Reliability Coordinators, and more candidates for providing relief when reliability is threatened due to transmission overload conditions.

Process Scope

While this process has been written specifically with the goal of coordinating seams between SPP and the Midwest ISO and their respective neighbors, this document may be beneficial to any operating entity facing similar seams issues related to congestion management. We offer this process as a way to achieve coordination between entities, and propose it as a potential option for any entities that wish to coordinate with each other.

Goals and Metrics

In preparing this document, we focused our solution on meeting the following goals and requirements:

1. Develop a congestion relief process whereby transmission overloads can be eliminated through a shared/effective reduction in Flowgate or constraint usage by MISO, SPP, and other Reliability Coordinators.
2. Agree on a predefined set of Flowgates or constraints to be considered by both organizations, and a process to maintain this set as necessary.
3. Determine the best way to calculate net flow due to one market's impact on a defined set of Flowgates.
4. Develop reciprocal agreements that establish how each Operating Entity will consider its own Flowgate or constraint usage as well as the usage of other Operating Entities when it determines the amount of Flowgate or constraint capacity remaining.
5. Develop a procedure for managing congestion when Flowgates are impacted by both tagged and non-tagged energy flow.
6. Develop a procedure for determining the priorities of untagged energy flows (created through parallel flows from the market).
7. Agree on steps to be taken by Operating Entities to unload a constraint on a shared basis.
8. Determine whether procedure(s) for managing congestion will differ based on where the Flowgate is located (i.e., inside SPP, inside MISO, outside both SPP and MISO).
9. Confirm that the solution will be equitable for all parties, auditable, and independent.

Assumptions

The following assumptions were made as we considered the possible solutions for addressing these issues:

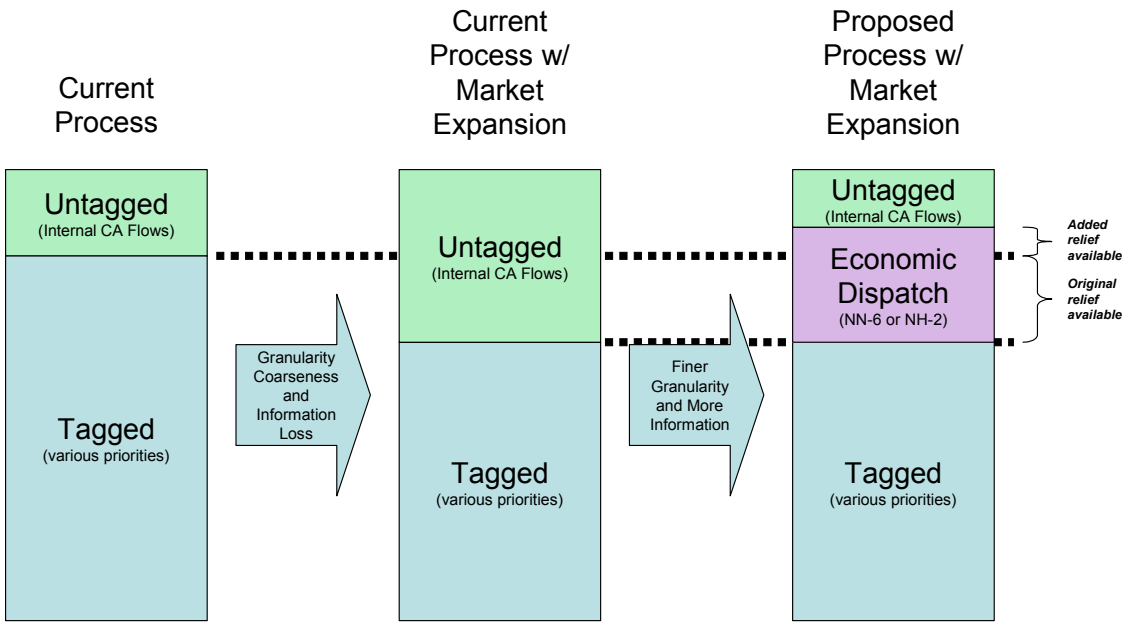
1. Point-to-Point schedules sinking in, sourcing from, or passing through a Market-Based Operating Entity will still be tagged.
2. The IDC is needed for at least the interim between the Interconnection's current state and full implementation of SMD.
3. The Market-Based Operating Entity can compute the impacts of the untagged market dispatch on the Flowgates as required by the IDC

4. The Market-Based Operating Entity's EMS has the capability to monitor and respond to real-time and projected flows created by its real-time dispatch
5. The Reliability Coordinator of the area in which a Flowgate exists will be responsible for monitoring the Flowgate, determining any amount of relief needed, and entering the required relief in the IDC.
6. The IDC can be modified to accept the calculated values of the impact of real-time generation in order to determine which schedules require curtailment in conjunction with the required Market-Based Operating Entity's redispatch
7. The IDC will calculate the total amount of MW relief required by the Market-Based Operating Entity (schedule curtailments required plus the relief provided by redispatch).

Section 2 - Process Overview

Summary of Process

In order to coordinate congestion management, a bridge must be established that provides for comparable actions between Operating Entities. Without such a bridge, it is difficult, if not impossible, to ensure reliability and system coordination in an efficient manner. To effect this coordination of congestion management activities, we propose a methodology for determining both firm and non-firm flows resulting from Market-Based Operating Entity dispatch on external parties' Flowgates.



Market Flows are defined as the flows generated from a Market-Based Operating Entity's dispatch that are not tagged, and ~~is equal to the sum of~~include firm and non-firm flows. The firm components consist of the untagged flows created both through serving native load in the market footprint~~and by those schedules flowing on firm point-to-point transmission reservations (7-F)~~. For the purposes of this process, ~~both~~ untagged firm ~~point-to-point~~ transmission ~~and~~ usage to supply market dispatch to native load ~~schedules~~ will be referred to as the **Firm Flow** component of Market Flows.

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The remainders of Market Flows, therefore, are non-firm. When the values of these flows are known, they can be treated as equivalent to non-firm transmission service. As such, Reliability Coordinators can request Market-Based Operating Entities provide relief under TLR based on these transmission priorities.

By applying the above philosophy to the problem of coordinating congestion management, we can determine not only the impacts of a Market-Based Operating Entity's dispatch on a particular Flowgate, we can also determine the appropriate firmness of those flows. This results in the ability to coordinate both proactive and reactive congestion management between operating entities in a way that respects the current TLR process, while still allowing for the flexibility of internal congestion management based on Market Prices.

There are two areas that must be defined in order for this process to work effectively:

- **Coordinated Flowgate Definition.** In order to ensure that impacts of dispatch are properly recognized, a list of Flowgates must be developed around which congestion management may be effected and coordination can be established.
- **Congestion Management.** By coordinating congestion management efforts and enhancing the TLR process to recognize both untagged internal flows and data of finer granularity, we can ensure that when TLR is called, the appropriate non-firm flows are reduced before Firm Flows. This will result in a reduction of TLR 5 events, as more relief will be available in TLR 3 to mitigate a constraint. We will accomplish this through the calculation of flows due to Economic Dispatch, as well as by providing Marginal Unit information to aid in Interchange transaction management.

The next sections of this document discuss each of these areas in detail.

Section 3 - Impacted Flowgate Determination

Flowgates

Flowgates are facilities or groups of facilities that may act as significant constraint points on the system. As such, they are typically used to analyze or monitor the effects of power flows on the bulk transmission grid. Operating Entities utilize Flowgates in various capacities to coordinate operations and manage reliability. For this purposes of this process, there are two kinds of Flowgates: Coordinated Flowgates, which are defined below, and Reciprocal Coordinated Flowgates, which are defined in Section 6. A diagram illustrating how these two categories of Flowgates are determined is included as Appendix M.

Coordinated Flowgates

An Operating Entity will conduct sensitivity studies to determine which Flowgates are significantly impacted by the Market Flows of the Operating Entity's Control Zones (currently the Control Areas that exist today in the IDC). An Operating Entity identifies these Flowgates by performing the following four studies to determine which Flowgates the Operating Entity will monitor and help control. A Flowgate passing any one of these studies will be considered a **Coordinated Flowgate (CF)**.

An Operating Entity may also specify additional Flowgates that have not passed any of the four studies to be Coordinated Flowgates. For Flowgates on which the Operating Entity expects to utilize the TLR process to protect system reliability, such specification is required. For a list of Coordinated Flowgates between SPP and MISO, please see Appendix F.

Coordinated Flowgates are defined to determine which Flowgates an entity impacts significantly. This set of Flowgates may then be used in the Congestion Management processes and/or Reciprocal Operations defined in this document.

SPP and MISO will work with NERC and the TLR history to validate this list of proposed Flowgates. This list will be reviewed by various Regional and NERC Committees (ORS/OC) to ensure its appropriateness. Use of a 5% threshold in the studies may not capture all Flowgates that experience a significant impact due to market operations. The Operating Entities have agreed to adopt a lower threshold at the time NERC implements the use of a lower threshold in the TLR process.

Study 1) – IDC Base Case

(using the IDC tool)

The IDC can provide a list of Flowgates for any user-specified Control Area whose GLDF (Generator to Load Distribution Factor (NNL)) impact is 5% or greater. The Operating Entity will use the IDC capabilities to develop a preliminary set of Flowgates. This list will contain Flowgates that are impacted by 5% or greater by the Control Areas

that will be joining the Operating Entity as Control Zones/areas. Using the present Control Area representation in the IDC (i.e., pre-Operating Entity expansion), if any one generator has a GLDF (Generator to Load Distribution Factor) greater than 5% as determined by the IDC, this Flowgate will be considered a Coordinated Flowgate.

Study 2) – IDC PSS/E Base Case

(no transmission outages – offline study)

In order to confirm the IDC analysis, and to provide a better confidence that the Operating Entity has effectively captured the subset of Flowgates upon which its generators have a significant impact, an offline study utilizing MUST capabilities will be conducted. The Operating Entity will perform off-line studies (using the IDC PSS/E base case) to confirm the IDC analysis.

Study 3) – IDC PSS/E Base Case

(transmission outage - offline study)

In order to determine outage conditions (if any) that may cause the Operating Entity's Control Zones/areas to have a significant impact on Flowgates, the Operating Entity will perform 2nd contingency (n-2) analysis, including both internal and external outages. This study will be performed offline utilizing MUST capabilities. If any additional Flowgates are found using this method, and they represent a 3% or greater impact when reexamined under Study 1 or 4, they will be added to the list of Coordinated Flowgates.

Study 4) – Control Area to Control Area

For those situations where one or more Control Areas are being incorporated into a market footprint, there will be a Flowgate analysis performed to determine which Flowgates impacted by those Control Areas will be included in the list of Coordinated Flowgates. The Operating Entity will analyze transactions between each CA and the existing market, as well as between each CA/CA permutation (if more than one CA is moving into the market). This study will use Transfer Distribution Factors (TDFs) from the IDC and offline studies utilizing MUST capabilities. Flowgates that are impacted by greater than 5% as determined by the IDC will be considered a Coordinated Flowgate.

Disputed Flowgates

If a Reliability Coordinator (RC) believes that a Market-Based Operating Entity implementing the congestion management portion of this process has a significant impact on one of their Flowgates, but that Flowgate was not included in the Coordinated Flowgate list, the involved parties will use the following process.

The RC conducts studies to determine the conditions under which a Market-Based Operating Entity's Market Flows would have a significant impact on the Flowgate in

question. The RC then submits these studies to the Market-Based Operating Entities implementing this process. The RC's studies should include each of the four studies described above, in addition to any other studies they believe illustrate the validity of their request. The Market-Based Operating Entities will review the studies and determine if they appear to support the request of the RC. If they do, the Flowgate will be added to the list of Coordinated Flowgates.

If, following evaluation of the supplied studies, any Market-Based Operating Entity still disputes the RC's request, the RC will submit a formal request to the NERC Operations Reliability Subcommittee (ORS) asking for further review of the situation. The ORS will review the studies of both the requesting RC and the Market-Based Operating Entities, and direct the participating Market-Based Operating Entities to take appropriate action.

Third Party Request Flowgate Additions

Each party shall provide in its stakeholder processes opportunities for third parties or other entities to propose additional Coordinated Flowgates and procedures for review of relevant non-confidential data in order to assess the merit of the proposal.

Dynamic Creation of Flowgates

For temporary Flowgates developed "on the fly," the IDC will utilize the current IDC methodology for determining NNL contribution until the Market-Based Operating Entity has begun reporting data for the new Flowgate. Interchange transactions into, out of, or across the Market-Based Operating Entity will continue to be E-tagged and available for curtailment in TLR 3, 4, or 5. Market-Based Operating Entities will endeavor to study the Flowgate in a timely manner and begin reporting Flowgate data within no more than two business days. This will ensure that the Market-Based Operating Entity has the time necessary to properly study the Flowgate using the four studies detailed earlier in this document and determine the Flowgate's relationship with the Market-Based Operating Entity's dispatch (based on the studies above). For Flowgates internal to either Operating Entity, the Market-Based Operating Entity will redispatch during a TLR 3 to manage the constraint as necessary until the Market-Based Operating Entity begins reporting the 7-FN, 6-NN, and 2-NH components; during a TLR 5, the IDC will request NNL relief in the same manner as today. Alternatively, either Operating Entity may utilize an appropriate substitute internal Coordinated Flowgate that has similar internal and external impacts as the temporary Flowgate. In this case, either Operating Entity would have to realize relief through redispatch and TLR 3. An example of an appropriate substitute would be a Flowgate with a monitored element directly in series with a temporary Flowgates monitored element and with the same contingent element.

If the Flowgate meets the necessary criteria, the Market-Based Operating Entity will begin to provide the necessary values to the IDC in the same manner as Market Flows ~~and Firm Gen-to-Load Flow values~~ are provided to the IDC for all other Coordinated Flowgates. If in the event of a system emergency (TLR 3b or higher) and the situation

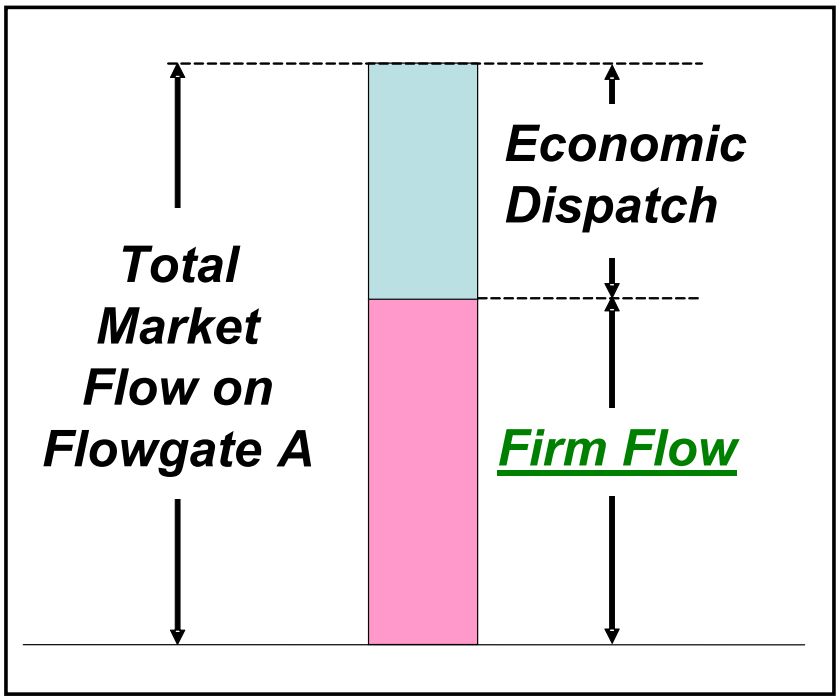
requires a response faster than the process may provide, the Market-Based Operating Entity's will coordinate respective actions to provide immediate relief until final review.

Note that the requirements for Market-Based Operating Entities only apply to MISO or SPP at the point at which that Operating Entity begins to operate a security constrained, bid based economic dispatch bounded by a clearly defined market area. Until that time, MISO or SPP will only be performing reciprocal operations on these Flowgates.

The present functionality of SPP's and MISO's real-time Security Analysis programs allows for the creation and activation of new contingencies or Flowgates in real-time within a matter of minutes. Data set builds or uploads are not necessary to add a new contingency or Flowgate to these real-time monitoring and control applications. With the Flowgate now included in the real-time system, SPP and MISO can then redispatch effective internal generation to provide the required/requested relief exactly as will be done for all other Coordinated Flowgates.

Section 4 - Flow Calculations: Market Flow, Firm ~~Gen-to-Load~~ Flow, and Economic Dispatch

When a Market-Based Operating Entity's dispatch creates untagged flows on a Coordinated Flowgate, those flows can be quantified and considered the directional **Market Flow.** Market Flow is then further designated into two components: **Firm ~~Gen-to-Load~~ Flow,** which is energy flow related to ~~contributions from the Network Native Load serving aspects of the dispatch~~the market's firm use of the transmission system, and **Economic Dispatch (ED) Flow,** which is energy flow related to the Market-Based Operating Entity's market ~~operations~~dispatch in excess of Firm Flow. ~~These distinctions are important, as the Firm Gen-to-Load Flows are considered firm, while t~~The Economic Dispatch Flows are ~~not~~considered non-firm.



Each Market-Based Operating Entity will calculate their actual real-time and projected directional Market Flows, as well as their directional Firm ~~Gen-to-Load~~ Flows, on each Coordinated Flowgate. These values will allow the Market-Based Operating Entity to determine the Economic Dispatch (ED) Flows created by the markets operations. The following sections outline how these flows will be computed.

Market Flow Determination

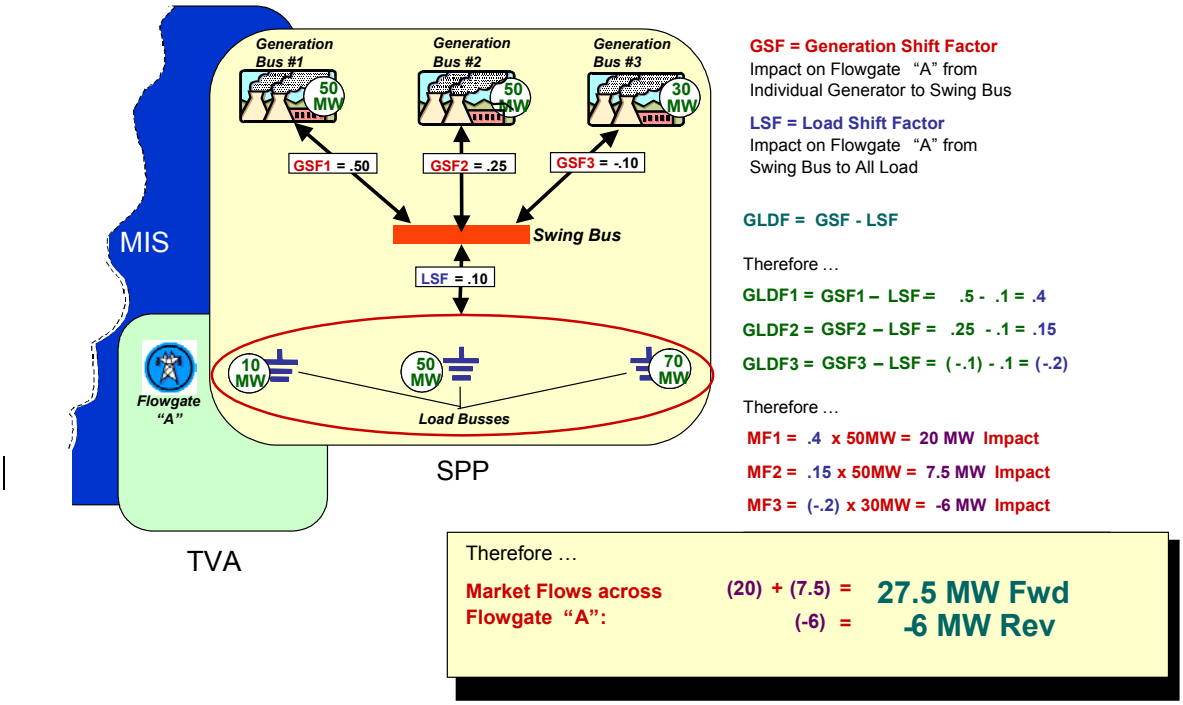
The determination of Market Flows builds on the "Per Generator" methodologies that were developed by the NERC Parallel Flow Task Force. The "Per Generator Method Without Counter Flow" was presented to and approved by both the NERC Security Coordinator Subcommittee (SCS) and the Market Interface Committee (MIC). [1] This methodology is presently used in the IDC to determine NNL contributions.

Similar to the Per Generator Method, the Market Flow calculation method is based on Generator Shift Factors (GSFs) of a market area's assigned generation and the Load Shift Factors (LSFs) of its load on a specific Flowgate, relative to a system swing bus. The GSFs are calculated from a single bus location in the base case (e.g. the terminal bus of each generator) while the LSFs are defined as a general scaling of the market area's load. The Generator to Load Distribution Factor (GLDF) is determined through superposition by subtracting the LSF from the GSF.

The determination of the Market Flow contribution of a unit to a specific Flowgate is the product of the generator's GLDF multiplied by the actual output (in megawatts) of that generator. The total Market Flow on a specific Flowgate is calculated in each direction; forward Market Flows is the sum of the positive Market Flow contributions of each generator within the market area, while reverse Market Flow is the sum of the negative Market Flow contributions of each generator within the market area.

[1] "Parallel Flow Calculation Procedure Reference Document," NERC Operating Manual. 11 Feb, 2003. <http://www.nerc.com/~oc/opermanl.html>

Calculating the Market Flow Illustration



The Market Flow calculation differs from the Per Generator method in the following ways:

- The contribution from all market area generators will be taken into account.
- In the Per Generator Method, only generators having a GLDF greater than 5% are included in the calculation. Additionally, generators are included only when the sum of the maximum generating capacity at a bus is greater than 20 MW. The Market Flow calculations will use all flows, in both directions, down to 0% with no threshold. Forward flows and reverse flows are determined as discrete values.
- The contribution of all market area generators is based on the present output level of each individual unit.
- The contribution of the market area load is based on the present demand at each individual bus.

By expanding on the Per Generator Method, the Market Flow calculation evolves into a methodology very similar to the "Per Generator Method," while providing granularity on the order of the most granular method developed by the IDC Granularity Task Force. Directional flows are required for this process to ensure a Market-Based Operating Entity can effectively select the most effective generation pattern to control the flows on both

internal and external constraints, but are considered as distinct directional flows to ensure comparability with existing NERC TLR processes. Under this process, the use of real-time values in concert with the Market Flow calculation effectively implements one of the more accurate and detailed method of the six IDC Granularity Options considered by the NERC IDC Granularity Task Force.

Units assigned to serve a market area's load do not need to reside within the market area's footprint to be considered in the Market Flow calculation. However, units outside of the market area will not be considered when those units will have tags associated with their transfers.

Additionally, there may be situations where the participation of a generator in the market may be less than 100% (e.g., a unit jointly owned in which not all of the owners are participating in the market). Such situations will need to be recognized and accounted for in the market's operations.

Finally, imports into or exports out of the market area, and tagged grandfathered transactions within the market area, must be properly accounted for in the determination of Market Flows. When the actual generation of the market area exceeds the total load of that area, the market area is exporting energy. These exports are tagged transactions that must be accounted for in the Market Flow calculation. This will be accomplished within the calculation by including a new term that offsets the MW output of the marginal unit(s) by the amount of the net market export. This ensures that the Market Flow calculation is measuring only the effect of internal generation serving internal load.

When the actual generation of the market area is less than the total load of the market area, that area is importing energy. These imports are tagged transactions that are inherently not included in the determination of Market Flows, as "Market Flows" are a measure of internal generation serving internal load determined based upon each generator's contribution as a product of its GLDF and actual output. The processes currently within IDC will address the counting of these transactions.

Below is a summary of the calculations discussed above.

For a specified Flowgate, the Market Flow impact of a market area is given as:

Total Directional "Market Flows" = ∑ (Directional "Market Flow" contribution of each unit in the Market-Based Operating Entity's area), grouped by impact direction

where,

"Market Flow" contribution of each unit in the Market-Based Operating Entity's area =

(GLDF) (Real-Time generator output) (Participation Percent/100)

and,

GLDF is the Generator to Load Distribution Factor

Real-Time generator output* is the present MW level of the generator

Participation Percent is the share of the unit participating in the Market-Based Operating Entity's market

(* if the Market-Based Operating Entity is a net exporter at the time of the calculation, the output level of the marginal unit(s) has been reduced by this export value)

The real-time and projected "Market Flows" will be calculated on-line utilizing the Market-Based Operating Entity's state estimator model and solution. This is the same solution presently used to determine real-time market prices as well as providing on-line reliability assessment and the periodicity of the Market Flow calculation will be on the same order. Inputs to the state estimator solution include the topology of the transmission system and actual analog values (e.g., line flows, transformer flows, etc…). This information is provided to the state estimator automatically via SCADA systems such as NERC's ISN link.

Using an on-line state estimator model to calculate "Market Flows" provides a more accurate assessment than using an off-line representation for a number of reasons. The calculation incorporates a significant amount of real-time data, including:

- **Actual real-time and projected generator output.** Off-line models often assume an output level based on a nominal value (such as unit maximum capability), but there is no guarantee that the unit will be operating at that assumed level, or even on-line. Off-line models may not reflect the impact of pumped-storage units when in pumping mode; these units may be represented as a generator even when pumping. A real-time calculation explicitly represents the actual operating modes of these units.
- **Actual real-time bus loads.** Off-line assessments may not be able to accurately account for changes in load diversity. Off-line models are often based on seasonal winter and summer peak load base cases. While representative of these peak periods, these cases may not reflect the load diversity that exists during off-peak and shoulder hours as well as off-peak and shoulder months. A real-time calculation explicitly accounts for load diversity. Off-line assessments may also reflect load reduction programs that are only in effect during peak periods.

- **Actual real-time breaker status.** Off-line assessments are often bus models, where individual circuit breakers are not represented. On-line models are typically node models where switching devices are explicitly represented. This allows for the real-time calculation to automatically account for split bus conditions and unusual topology conditions due to circuit breaker outages.

Additionally, the calculation rate of the on-line assessment is much quicker and accurate than an off-line assessment, as the on-line assessment immediately incorporates changes in system topology and generators. Facility outages are automatically incorporated into the real-time assessment.

In order to provide reliable and consistent flow calculations, entities utilizing this process as the basis for coordination must ensure that the modeling data and assumptions used in the calculation process are consistent. SPP and MISO will coordinate models to ensure similar computations and analysis. SPP and MISO will each utilize real-time ICCP and ISN data for observable areas in each of their respective state estimator models and will utilize NERC data for areas outside the observable areas to ensure their models stay synchronized with each other and the NERC IDC.

Calculating Firm Flows

For the Market-Based Operating Entity, Firm Flows include the impacts of any Financial Transmission Rights that have been granted. Firm Flows may also include the flows created by Network Load that is carved out of that market being served by Designated Network Resources in the same Control Area. These flows are referred to as Firm Grandfathered Gen-to-Load Flows. For purposes of determining the Firm Grandfathered Gen-to-Load Flows of the Market-Based Operating Entity, the Control Area structure that existed prior to implementation of the market will be maintained.

If the Market-Based Operating Entity does not offer Financial Transmission Rights, its firm flows are simply the directional sum of flows created by designated network resources serving designated network loads within a particular market area. These flows will be calculated similarly to Firm Grandfathered Gen-to-Load Flows.

Firm Gen-to-Load Flow Determination Overview

Firm Grandfathered Gen-to-Load Flows represent the directional sum of flows created by designated network resources serving designated network loads within a particular market area that have been carved out and considered to have grandfathered transmission rights. They are based primarily on the current and expected configuration of the system and its associated flow characteristics; utilizing current and expected generation and load values as its primary inputs. ~~Therefore, these Firm Gen-to-Load Flows can be determined based on expected usage and the Allocation of Flowgate capacity.~~

An entity can determine ~~firm network service~~Firm Grandfathered Gen-to-Load ~~flows~~ Flows on a particular Flowgate using the same process as utilized by the IDC. This process is summarized below:

1. Utilize a base case to determine the Generation Shift Factors for all generators in the current Control Areas' respective footprints to a specific swing bus with respect to a specific Flowgate.
2. Utilize the same base case to determine the Load Shift Factors for the Control Areas load to a specific swing bus with respect to that Flowgate.
3. Utilize superposition to calculate the Generation to Load Distribution Factors (GLDF) for the generators with respect to that Flowgate.
4. Multiply the expected output used to serve native load from each generator by the appropriate GLDF to determine that generator's flow on the Flowgate.
5. Sum these individual contributions by direction to create the directional ~~firm~~ Firm ~~network service~~Grandfathered Gen-to-Load impact on the Flowgate.

SPP and MISO will utilize the IDC Base Case (or other mutually agreed upon Base case) as the reference base case for these calculations.

~~Determining the Firm Gen-to-Load Limit~~

~~Given the Firm Gen-to-Load Flow determinations, Market-Based Operating Entities can assume them to be their **Firm Gen-to-Load Limits.** These limits defines the maximum value of their Market Flows that can be considered as Firm in each direction on a particular Flowgate. One day prior to real time, a calculation will be done based on updated hourly forecasted loads and topology. The results should be an hourly forecast of directional Firm Gen-to-Load Flows. This is a significant improvement over current IDC processes, which uses a peak load value instead of an hourly load more closely aligned with forecasted data.~~

~~*SPP and MISO have agreed to several rules for determining Firm Gen-to-Load Flows. These rules are based on the rules used by the IDC, and can be found in later in this Section.*~~

Firm Grandfathered Gen-to-Load Calculation Rules

The Firm Grandfathered Gen-to-Load Limits will be calculated based on certain criteria and rules. The calculation will include the effects of firm network service in both forward and reverse directions. The process will be similar to that of the IDC (but utilizing impacts down to 0%). The following points form the basis for the calculation.

~~Firm Network Service~~

1. The generation-to-load calculation will be made on a control-area basis. The impact of generation-to-load will be determined for Coordinated Flowgates.

2. The Flowgate impact will be determined based on individual generators serving aggregated CA load. Only generators that are designated network resources for the CA load will be included in the calculation.
3. All impacts on the Flowgate will be considered, including impacts of less than 5%.
4. Designated network resources located outside the CA will not be included in the generation-to-load calculation if OASIS reservations exist for these generators.
5. If a generator or a portion of a generator is used to make off-system sales that have an OASIS reservation, that generator or portion of a generator should be excluded from the generation-to-load calculation.
6. Generators that will be off-line during the calculated period will not be included in the generation-to-load calculation for that period.
7. CA net interchange will be computed by summing all firm PTP reservations and all designated network resources that are in effect throughout the calculation period. Designated network resources are included in CA net interchange to the extent they are located outside the CA and have an OASIS reservation. The net interchange will either be positive (exports exceed imports) or negative (imports exceed exports).
8. If the net interchange is negative, the period load is reduced by the net interchange.
9. If the net interchange is positive, the period load is not adjusted for net interchange.
10. The generation-to-load calculation will be made using generation-to-load distribution factors that represent the topology of the system for the period under consideration.
11. PMAX of the generators should be net generation (excluding the plant auxiliaries) and the CA load should not include plant auxiliaries.
12. The portion of JOUs that are treated as schedules will not be included in the generation-to-load calculation if an OASIS reservation exists.

Determining the Firm Market Flow and 6-NN Limits

For each hour of the following day, the Market-based Operating Entity will determine the Market Flows expected based on its Day-Ahead Unit Commitment. This is called the Day-Ahead Unit Commitment Flow. The following logic will then be followed to determine the 6-NN limit for the Market-based Operating Entity on each Coordinated Flowgate.

1. If the Day-Ahead Unit Commitment Flow exceeds the Firm Flows, then:
    - Firm Market Flow Limit = Firm Flows
    - 6-NN Limit = Day-Ahead Unit Commitment Flow - Firm Flows
2. If the Day-Ahead Unit Commitment Flow is less than or equal to the Firm Flows, then:
    - Firm Market Flow Limit = Day-Ahead Unit Commitment Flow
    - 6-NN Limit = Firm Flows - Day-Ahead Unit Commitment Flow

The Market-Based Operating Entity must respect the Firm Market Flow and 6-NN Limits as determined via the above process during its commitment of units.

Section 5 - Market-Based Operating Entity Congestion Management

Once there has been an establishment of the Firm ~~Gen-to-Load~~Market Flow Limit~~ that is possible given Firm Gen-to-Load Flow calculation~~, that data will be used in the operating environment in a manner that relates to real time energy flows.

Calculating Market Flows

On a periodic basis, the Market-Based Operating Entity will calculate directional Market Flows for all Coordinated Flowgates. These flows will represent the actual flows in each direction at the time of the calculation, and be used in concert with the previously calculated Firm ~~Gen-to-Load~~Market Flow Limits to determine the portion of those flows that should be considered firm and non-firm.

Providing Data for Reliability Analysis

Every fifteen minutes, the Market-Based Operating Entity will be responsible for providing to Reliability Coordinators the following information:

- Firm ~~Gen-to-Load~~ Flows for all Coordinated Flowgates in each direction
- Economic Dispatch Flows for all Coordinated Flowgates in each direction

The Firm ~~Gen-to-Load~~ Flow (Priority 7-FN) will be equivalent to the calculated Market Flow, up to the Firm ~~Gen-to-Load~~Market Flow Limit. Any Market Flow in excess of the Firm ~~Gen-to-Load~~ Market Flow Limit will be reported as Economic Dispatch (Priority 6-NN) (note that under reciprocal operations, some of this Economic Dispatch may be quantified as Priority 2-NH).

This information will be provided for both current hour and next hour, and is used in order to communicate to Reliability Coordinators the amount of flows to be considered firm service on the various Coordinated Flowgates in each direction. When the Firm ~~Gen-to-Load~~Market Flow Limit forecast is calculated to be greater than Market Flow for current hour or next hour, the actual Firm ~~Gen-to-Load~~ Market Flow Limit (used in TLR5) will be set equal to Market Flow.

Additionally, every hour the Market-Based Operating Entity will submit to the Reliability Coordinators a set of data describing the marginal units and associated participation factors for generation within the market footprint. The level of detail of the data may vary, as different Operating Entities will have different unique situations to address. However, this data will at a minimum be supplied for imports to and exports from the market area, and will contain as much information as is determined to be necessary to ensure system reliability. This data will be used by the Reliability Coordinators to

determine the impacts of schedule curtailment requests when they result in a shift in the dispatch within the market area.

Day-Ahead Operations Process

Any Market-Based Operating Entity that has a day-ahead market will execute a day-ahead unit commitment for all of the generators throughout the market footprint. ~~MISO's~~ This day-ahead unit commitment uses a network analysis model that mirrors the real-time model found within their state estimators. As such, the day-ahead commitment respects facility limits and forecasted system constraints. ~~SPP's design of a day-ahead market is uncertain at this time.~~

~~*Real-time Operations Process*~~

~~[to be added]~~

Operating Entity Capabilities

SPP's and MISO's real-time EMSs have very detailed state estimator and security analysis packages that are able to monitor both thermal and voltage contingencies every few minutes. State estimation models will be at least as detailed as the IDC model for all Coordinated and Reciprocal Coordinated Flowgates. Additionally, SPP, MISO, and OATI will be continually working to ensure model synchronization. SPP and MISO will also initiate similar coordination whenever the IDC model is updated. The data SPP and MISO will utilize in their models will be exchanged either via ICCP links or ~~-~~the NERC ISN.

The SPP and MISO state estimators, and a Market-Based Operating Entity's Unit Dispatch Systems (UDS), will utilize all of these real-time internal flows and generator outputs to calculate both the actual and projected hour-ahead flows (i.e., total Market Flows, Economic Dispatch, and Firm ~~Gen-to-Load Limit~~Flows) on all of the Coordinated Flowgates. Using real-time modeling, the Operating Entity's internal systems will be able to more reliably determine the impact on Flowgates created by dispatch than the NERC IDC. The reason for this difference in accuracy is that the IDC uses very static SDX data that models generators as either at full output or off. In contrast, the Operating Entity's calculations of system flows will utilize each unit's actual output, updated at least every 15 minutes on an established schedule.

Operating Entity Real-time Actions

Market-Based Operating Entities will have the list of Coordinated Flowgates modeled as monitored facilities in its EMS. The Firm limits a Market-Based Operating Entity will use for these ~~third party~~ Flowgates will be the Firm ~~Gen-to-Load~~ Market Flow Limits determined by the Firm ~~Gen-to-Load~~ Flow calculations.

The Market-Based Operating Entity will upload the real-time and projected Firm (7-FN) and Non-Firm (6-NN) flows on these Flowgates to the IDC every 15 minutes, as requested by the NERC IDCWG and OATI (note that under reciprocal operations, some of this 6-NN may be quantified as Priority 2-NH). When the real-time actual or projected flows exceed these Firm ~~Gen-to-Load~~ Flow values on a Flowgate and the Reliability Coordinator who has responsibility for that Flowgate has declared a TLR 3a or higher, the Market-Based Operating Entity will redispatch its system to the amount required by the IDC. The amount of redispatch will be calculated by the IDC. In a TLR 3, the Market-Based Operating Entity could be required to redispatch to the full amount of economic dispatch over the Firm ~~Gen-to-Load~~ Market Flow Limit. Note the Market-Based Operating Entity may provide relief through either 1.) a reduction of flows on the Flowgate in the direction required, or 2.) an increase of reverse flows on the Flowgate.

Market-Based Operating Entities will implement this redispatch by binding the Flowgate as a constraint in their Unit Dispatch System (UDS). UDS calculates the most economic solution while simultaneously ensuring that each of the bound constraints is resolved reliably. Additionally, the Market-Based Operating Entity will make any point-to-point transaction curtailments as specified by the NERC IDC.

SPP's and MISO's redispatch and relief will be faster than the 30 minutes required by TLR schedule curtailments, because when the bounds are applied, the systems are designed to provide relief within 15 minutes.

The Reliability Coordinator calling the TLR will be able to see the relief provided on the Flowgate as the Market-Based Operating Entity continues to upload its contributions to the real-time flows on this Flowgate.

Section 6 - Reciprocal Operations

The sections following provide detail regarding SPP's and MISO's AFC calculation procedures and reciprocal coordination practices utilized during the market-to-non-market and market-to-market operating environments.

~~Reciprocal agreements can be executed on a market-to-market basis, a market-to-non-market basis, and a non-market-to-non-market basis.~~ While the Congestion Management portions of this document are intended to apply specifically to Market-Based Operating Entities, the ~~agreement to~~ following portions of this document addressing coordination of ATC/AFC and proper recognition of flowgate limitations in the Parties' transmission service administration and day-ahead unit commitment processes ~~allocate Flowgate capability is not dependent on an entity~~ apply as specified for each Party when either Party begins operating a centralized energy market. ~~Rather, it simply requires that a set of Flowgates be defined upon which coordination shall occur and an agreement to perform such coordination.~~

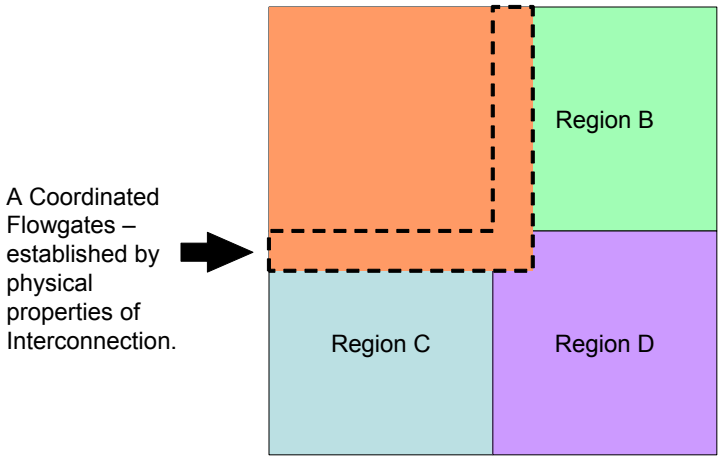
Reciprocal Coordinated Flowgates

In order to coordinate congestion management on a proactive basis, Operating Entities ~~may~~ agree to respect each other's Flowgate limitations during the determination of AFC/ATC and the calculation of firmness during real-time operations. ~~Entities agreeing to coordinate this future-looking management of Flowgate capacity are~~ **~~Reciprocal Entities.~~** The Flowgates used in that process are **Reciprocal Coordinated Flowgates (RCFs).**

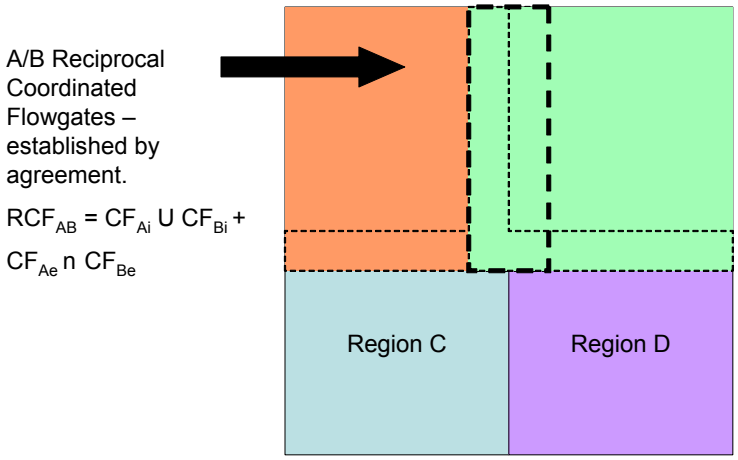
The Relationship Between CFs and RCFs

Coordinated Flowgates are associated with a specific entity's operational sphere of influence. Reciprocal Coordinated Flowgates are associated with the implementation of a ~~reciprocal~~ coordination agreement between two entities. When considering an implementation between two Market-Based Operating Entities, it is generally expected that the set of Reciprocal Coordinated Flowgates will be the mathematical intersection of the two entities' Coordinated Flowgates.

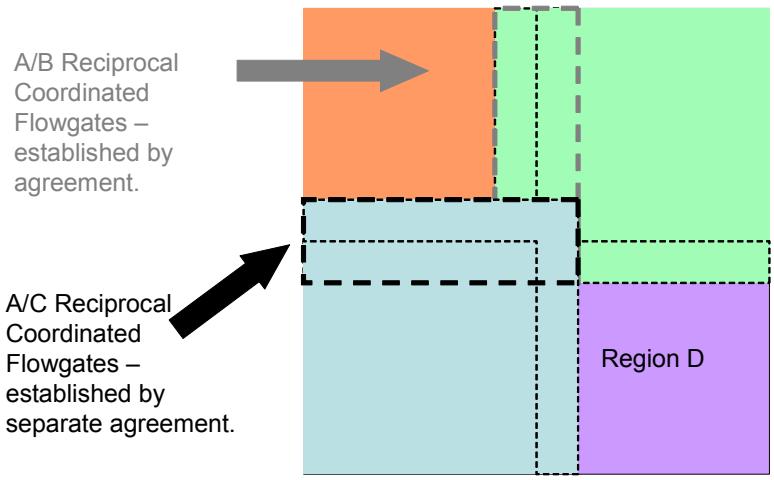
In the example below, there are four entities. The translucent red area represents the set of Coordinated Flowgates for market area A. Note that each area has it's own potential set of Coordinated Flowgates. As indicated, this set of Coordinated Flowgates is based only on the area's impact on Flowgates, not on coordination agreements. Market area A will report information to the IDC for these Flowgates to aid in curtailment procedures, but is not required to engage in any other coordination efforts ~~(e.g., AFC Coordination, Firm Flow Allocation, etc…)~~.



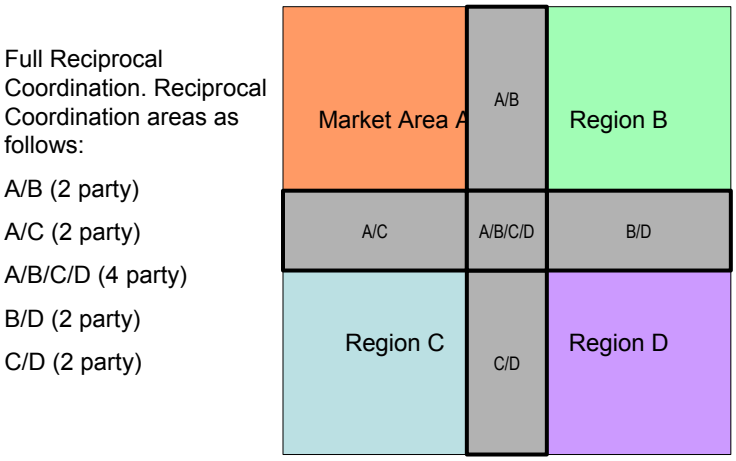
In the next example, note that both A and B have established their set of Coordinated Flowgates. A subset of the union of these sets of Flowgates establishes a baseline where ~~reciprocal~~ coordination can occur. This subset will include the union of all Coordinated Flowgates internal to the reciprocal entities and the intersection of all Coordinated Flowgates external to the reciprocal entities. If A and B choose to execute a ~~reciprocal~~ coordination agreement, the area bounded by the heavy line will become the set of Reciprocal Coordinated Flowgates. There are no coordination agreements with C and D.



If C wished to enter into a reciprocal coordination agreement with A, C would have to first establish their own set of Coordinated Flowgates. Following this, they would identify the set of Reciprocal Coordinated Flowgates, then agree to coordinate operations based on the Flowgates contained in that that set.



In the last example, we illustrate a fully coordinated set of entities and the agreements that would need to be established with each entity respecting each other's impacted Flowgates.



To the extent that entities other than Market-Based Operating Entities wish to enter into a reciprocal agreement, they may offer to coordinate on Flowgates that are Coordinated Flowgates (i.e., have passed one of the four tests defined within this document or otherwise been deemed to be a Coordinated Flowgate).

Coordination Process for Reciprocal Flowgates

SPP and MISO have established and finalized the following process and timing for coordinating the ATC/AFC calculations and Firm Flow Limit calculations/Allocations. Further, the process quantifies and limits Priority 6 – NN service on the RCFs, as well as determines priority 2-NH service. ~~It is expected each of the Reciprocal Entities will require a Tariff change and filing to FERC in order to implement this process. All reciprocal entities Firm Flow Limits will be calculated on the same basis.~~

Coordinating AFC/ATC Beyond Day Ahead

For time frames beyond day-ahead, the Parties will continue to coordinate AFC/ATC pursuant to Article V of the JOA. If the Market-Based Operating Entity is administering Financial Transmission Rights, the associated impacts on the reciprocal coordinated flowgates will be shared with the other party and included as part of the Party's firm commitments in the determination of AFC. If the Market-Based Operating Entity continues to administer grandfathered transmission rights for a portion of its Network Load that is carved out of the market, the associated Firm Grandfathered Gen-to-Load impacts on the reciprocal coordinated flowgates will also be shared with the other party

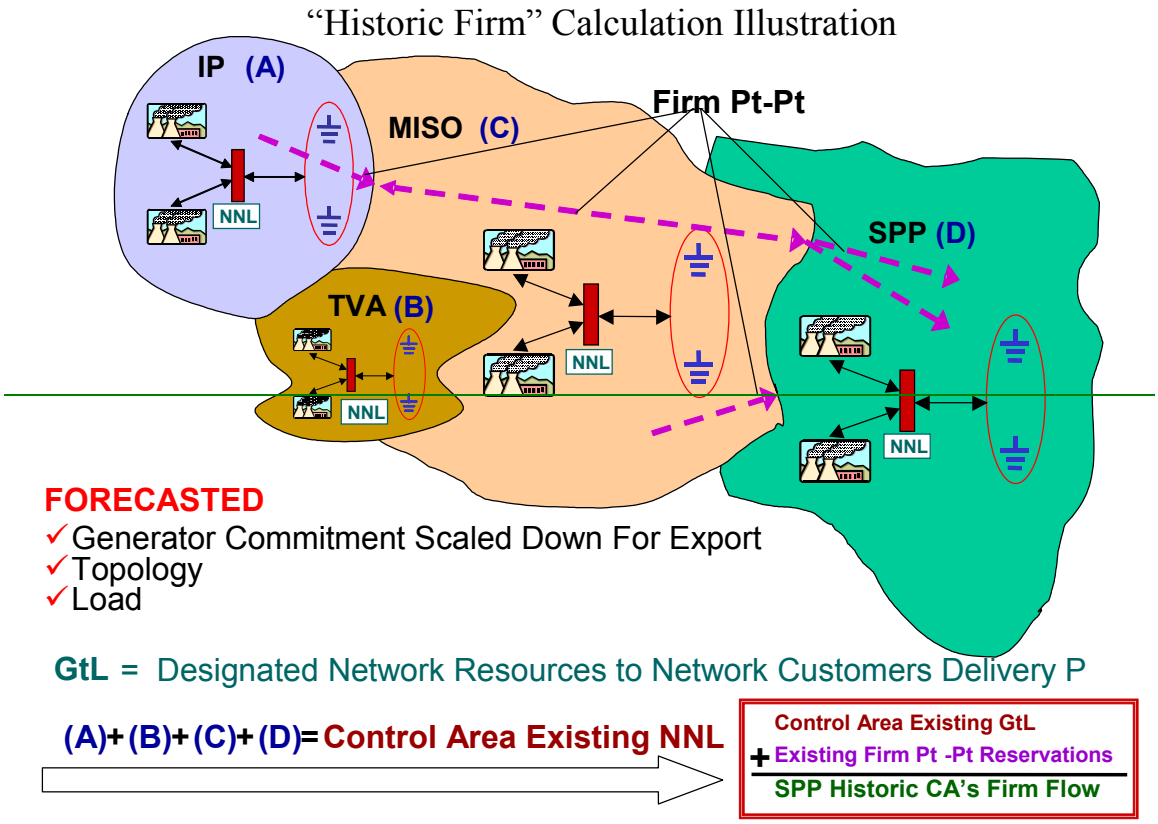
and included as part of the Party's firm commitments in the determination of AFC. The sum of these impacts will represent the Market-Based Operating Entity's Firm Market Flow Limit.

Day Ahead Coordination

The implementation of a day-ahead market will require closer coordination between the Parties on a day-ahead basis to ensure that the dispatch and/or scheduling requirements of both parties can be reasonably and equitably accommodated without exceeding flowgate limits. This will be accomplished through the determination of Day-Ahead Allocations of flowgate capacity.

Calculating ~~Historic~~ Firm Flows

As a starting point for identifying Day-Ahead Allocations, an understanding must be developed of what Firm Flows would be in ~~the existing Control Area~~both a market and non-market structure. In a non-market structure, Firm Flows consist of flows created by Network and Native Load flows and by interchange flows resulting from firm Point-to-Point and Network Service reservations posted on the OASIS. In a market structure, Firm Flows include the impacts of any Financial Transmission Rights that have been granted and the flows created by Network Load that is carved out of the market being served by Designated Network Resource in the same Control Area. The latter type of flows are referred to as Firm Grandfathered Gen-to-Load Flows. For purposes of determining the Firm Grandfathered Gen-to-Load flows of the Market-Based Operating Entity, the Control Area structure that existed prior to implementation of the market will be maintained ~~In other words, the Firm Flow values that would have occurred if all Control Areas maintained their current configuration and continued to serve their native load with their generation can be identified~~. ~~This flow is referred to as **Historic Firm Flow.**~~



~~SPP and MISO have developed specific processes for ensuring reasonably accurate data is utilized in this process.~~

~~*Recalculation of Initial Historic Firm Flow Values and Ratios*~~

~~The Firm Point-to-Point Service and Designated Resource to customer load defined by the Historic Firm Flow calculation will be updated in the recalculation of Historic Firm Flow utilizing any new Designated Resources, updated customer loads, and new transmission facilities. The original historic Control Areas will be retained for the recalculation of Historic Firm Flow. New Designated Resources will be included in the recalculation to the extent these new Designated Resources have been arranged for the exclusive use of load within the historic Control Areas and to the extent the total impact of all Designated Resources does not exceed the historic Control Area impact of Designated Resources as of a "freeze date" (to be defined by SPP and MISO in a Joint Operating Agreement). Any changes to Designated Resources and/or the transmission system that increase transmission capability will be assessed in accordance with MISO/SPP AFC Coordination procedures prior to the increasing of Historic Firm Flow related to those systems.~~

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Issued on: _____, 2004

~~The initial Historic Firm Flow calculated values and resulting Allocation ratios will be recalculated as seasonal cases are produced. This recalculation will utilize the same firm point-to-point reservations that were used in the initial Historic Firm Flow calculation. The same firm point-to-point reservations are used so that market-operating entities that have their firm point-to-point internalized, grant fewer internal firm service reservations, or have their original firm reservations end, because of their market operations, will retain at least the same level of firm point-to-point as in the initial Historic Firm Flow calculation. Therefore, the firm point-to-point component of the Historic Firm Flow will be frozen onthe "freeze date" at the initially calculated level for both market and non-market entities.~~

~~Any new Control Areas that are added to the Firm Flow calculation process for either SPP, MISO, or another Operating Entity, will use firm point-to-point reservations from the initial Historic Firm Flow calculation date to establish their firm point-to-point component of the Historic Firm Flow.~~

~~MISO and SPP will utilize this recalculation process until it is replaced by another process. It is anticipated that an enhanced, market-to-market, process will be developed to replace the Historic Firm Flow calculation process. The enhanced process may use a simultaneous deliverability type analysis rather than the Historic Firm Flow calculation process. MISO and SPP will update their respective Reliability Plans incorporating the new process and have them approved by NERC before the new process to quantify Firm Flow is implemented.~~

~~*Forward*~~ *Determining the Day-Ahead Allocations*~~*Coordination Processes*~~

1. For each Reciprocal Coordinated Flowgate, a manager ~~and an owner~~ will be defined. The manager will be responsible for all calculations regarding that Flowgate~~; the owner will define the set of point-to-point reservations to be utilized when determining point-to-point impacts on that Flowgate~~.
2. Managing entities will estimate ~~both Gen-to-Load Firm Impacts and Point-to-Point Firm Impacts~~the Firm Flows for all entities. ~~These impacts will be used to define the Historic Ratio and the Allocation of transmission capability.~~
3. The managing entity will utilize the current NERC IDC Base Case (or other mutually agreeable Base Case) to determine impacts. The case should be transformed with the most current set of outage data for the time period being calculated.
4. ~~4.~~Managing entities will calculate a set of 24 hourly Day-Ahead Allocations every day at Noon.~~on the following schedule:~~

~~Allocation Run Type~~	~~Allocation Process Start~~	~~Range Allocated~~	~~Allocation Process Complete~~	~~CBM/TRM/Limit Change Lockout~~
~~**April Seasonal**~~	~~Every April 1 at~~	~~Twelve monthly~~	~~April 1 at 12:00 EST~~	~~April 1 8:00 – 12:00~~

~~Firm~~	~~8:00 EST~~	~~values from October 1 of the current year through September 30 of the next year~~		~~EST~~
~~October Seasonal Firm~~	~~Every October 1 at 8:00 EST~~	~~Twelve monthly values from April 1 of next year through March 31 of the following year~~	~~October 1 at 12:00 EST~~	~~October 1 8:00 – 12:00 EST~~
~~Monthly Firm~~	~~Every month on the second day of the month at 8:00 EST~~	~~Six monthly values for the next six successive months~~	~~2nd of the month at 12:00 EST~~	~~2nd of the month 8:00 – 12:00 EST~~
~~Weekly Firm~~	~~Every Monday at 8:00 EST~~	~~Seven daily values for the next Monday through Sunday~~	~~Monday at 12:00 EST~~	~~Monday 8:00 – 12:00 EST~~
~~Two-Day Ahead Firm~~	~~Every Day at 17:00 EST~~	~~One daily value for the day after tomorrow~~	~~Current Day at 18:00 EST~~	~~Current Day 17:00 – 18:00 EST~~
~~Day Ahead Non-Firm~~	~~Every Day at 8:00 EST~~	~~Twenty four hourly values for the next 24-hour period (Next Day HE1-HE24 EST)~~	~~Current Day at 9:00 EST~~	~~Current Day 8:00 – 9:00 EST~~

4. ~~Historic~~ Day-Ahead Ratios are then determined for each Reciprocal Coordinated Flowgate~~defined during the seasonal runs the first time an impact is calculated. For example, the 2004 April Seasonal Firm run would define the Historic Ratio for April 2005 – September 2005 (October through March would have been calculated during the 2003 October Seasonal Firm run).~~ The ~~Historic~~ Day-Ahead Ratio is based on the total Firm Flow impacts of the reciprocal entity on the Flowgate ~~(Gen-to-Load Flows and Point-to-Point flows, down to 0%)~~ relative to the total Firm Flow impacts of all other reciprocal entities' impacts on the Flowgate. For example, if SPP had a 30MW Firm Flow impact on the Flowgate and MISO had a 70MW Firm Flow impact on the Flowgate, the ~~Historic~~ Day-Ahead Ratios would be 30% and 70%, respectively.

~~6.The same rules defined in the "Congestion Management" section of this document for use in determining Gen-to-Load impacts (NNL) shall apply when performing Allocations~~

~~6.5.Additional rules to be used when considering Point-to-Point impacts are defined later within this section.~~

~~7.~~6. For each ~~Firm Allocation run described above~~hour of the next day, the managing entity will take the following steps for each of the Reciprocal Coordinated Flowgates, in both the forward and reverse direction, they are assigned to manage:

   a. Retrieve the Flowgate Limit

b. Subtract the current CBM and TRM values (may be zero)
c. Subtract the sum of all ~~historically-determined~~ Firm Flow impacts for all entities based on impacts greater than or equal to 5%
d. If no capacity remains, entities' ~~Firm~~ Day-Ahead Allocation is limited to this amount (i.e., their Firm Flow impacts from impacts of 5% or greater). If capacity does remain, it is allocated to the reciprocal entities pro-rata based on their Firm Flow impacts due to impacts less than 5% up to the total amount of their Firm Impacts due to impacts less than 5%.
e. Any remaining capacity will be ~~considered Firm and~~ allocated to signatories of reciprocal agreements based on their ~~Historic~~ Day-Ahead Ratio (as described in step 5).

~~[Optional language to be considered:] If a signatory of a reciprocal agreement uses all of its Firm allocation and desires to obtain additional capacity from another signatory who has remaining capacity, that additional capacity may be obtained:~~

- ~~by making a request to, and obtaining the approval of, the signatory with remaining capacity,~~
- ~~by trading remaining capacity on flowgates with a signatory, or~~
- ~~upon agreeing to purchase excess capacity from the signatory with remaining capacity.~~

~~f. Upon completion of the Allocation process, the RTO will compare the current preliminary Allocation to the previous Allocations. For any given Flowgate, the larger of the Allocations will be considered the Allocation (i.e., an Allocation cannot decrease). Once all preliminary Allocations have been compared and the final Allocation determined, the managing entity will distribute the Allocations to the appropriate reciprocal signatories. This Allocation will consist of the Firm Gen-to-Load Limit and a portion of capability that can be used either for Point-to-Point service or additional Firm Gen-to-Load service.~~

~~9. For the non-firm Allocation run described above, the managing entity will take the following steps for each of the Flowgates, in both the forward and reverse direction, they are assigned to manage. For each hour:~~

~~a. Retrieve the Flowgate limit.~~
~~b. Subtract the current CBM and TRM values (may be zero).~~
~~c. Subtract the sum of all hourly historically-determined Firm Flow impacts for all entities based on impacts greater than or equal to 5%.~~
~~d. Subtract the sum of all hourly historically-determined Firm Flow impacts for all reciprocal entities based on impacts less than or equal to 5%.~~

~~e. Any remaining capacity will be allocated to signatories of reciprocal agreements based on their Historic Ratio (as described in step 5).~~

~~f. The Two-Day Ahead Firm Allocation is subtracted from the total entity Allocation (from steps c, d, and e).~~

- ~~If the result is positive, this value will be equivalent to the Priority 6-NN Allocation/limit, and the Firm Limit will the Two Day Ahead Firm Allocation.~~
- ~~If the result is negative or zero, the Priority 6-NN Allocation will be calculated by subtracting the total entity Allocation (from steps c, d, and e) from the Two-Day Ahead Firm Allocation. The Firm Limit will be the equivalent of thetotal entity allocation.~~

g. Upon completion of the Day-Ahead Allocation process, the managing entity will distribute the Allocations to the appropriate reciprocal signatories. ~~These Allocations will be considered Non-Firm Network service.~~

~~When a Market-Based Operating Entity is uploading Firm Gen-to-Load Flow contributions to the IDC, they will be responsible for ensuring that any Firm Allocations are properly accounted for. If Firm Allocations are used to provide additional Firm Network service, they should be included in the Firm Gen-to-Load contribution. If they are used to provide additional Firm Point-to-Point service, they should not be included in the Firm Gen-to-Load Flow contribution.~~

~~MISO, SPP, and all other entities participating in the Coordinated Process for Reciprocal Flowgates will maintain their Firm (Point to Point service and Network Designated) service and Network Non-Designated service impacts, including associated Market Flows, within their respective Firm and Priority 6 total Allocations.~~

~~Using the derived Firm Allocation value, the Market-Based Operating Entity may enter this value as a facility limit for the respective Flowgate. SPP and MISO will use this value to restrict unit scheduling for a Coordinated Flowgate when maintenance outage coordination indicates possible congestion and there is recent TLR activity on a Flowgate.~~

~~If bound, the Day-Ahead unit commitment will not permit flows to exceed this value as it selects units for this commitment.~~

~~As MISO and SPP gain more experience in this process, implement and enhance their systems to perform the Firm Flow calculations and Allocations, they may change the timing requirements for the Forward Coordination Process by mutual agreement.~~

~~Determining Point-to-Point Impacts~~

~~Additionally, Firm impacts used in the Allocation process incorporate the Firm Point-to-Point flows. Similar to the network service calculation described previously, to calculate each firm PTP transactions impact on the Flowgate, utilize the following process:~~

1. ~~Utilize a base case to determine the generation shift factor for the source Control Area with respect to a specific Flowgate.~~
2. ~~Utilize the same base case to determine the generation shift factor for the sink Control Area with respect to that Flowgate.~~
3. ~~Utilize superposition to calculate the transmission distribution factor (TDF) for that source to sink pair with respect to that Flowgate.~~
4. ~~Multiply the transactions energy transfer by the TDF to determine that transactions flow on the Flowgate.~~

~~Summing each of these impacts by direction will provide the directional firm point-to-point service impact on the Flowgate.~~

~~Combining the directional firm point-to-point service impacts with the directional firm network service impacts will provide the directional Firm Flows on the Flowgate.~~

~~Rules for considering Firm Point-to-Point Transactions~~

1. ~~Firm PTP transmission service and designated network resources that have an OASIS reservation are included in the calculation.~~
2. ~~A date will be selected as a freeze date. SPP and MISO will utilize a reference year of [to be defined] for determining the confirmed set of reservations that will be used in the Allocation process. Confirmed reservations received after the freeze date will not be considered.~~
3. ~~A potential for duplicate reservations exists if a transaction was made on individual CA tariffs (not a regional tariff) and both parties to the transaction (source and sink) are Reciprocal Entities. In this case, each Reciprocal Entity will receive 50% of the transaction impact.~~
4. ~~To the extent a partial path reservation is known to exist, it will have 100% of its impacts considered on Reciprocal Coordinated Flowgates owned by the party that sold the partial path service and 0% of its impacts considered on other Reciprocal Coordinated Flowgates.~~
5. ~~Because reservations that are totally within the footprint of the regional tariff do not have duplicate reservations, these reservations will have the full impact considered even though both parties to the transaction (source and sink) are within the boundaries of the regional tariff and could be considered Reciprocal Entities.~~

Similar to the firm network service calculation, the firm point-to-point service calculation:

- Will considered all reservations (including those with less than 5% impact)
- Will base response factors on the topology of the system for the period under consideration.
- In general, will not make a generation-to-load calculation where a reservation exists.

Limiting Point-to-Point Transmission Sales

The Flowgate Allocations will represent the share of total flowgate capacity (STFC) that a particular entity has been allocated. This STFC represents the maximum total impact that entity is allowed to have on that Flowgate.

In order to coordinate with the existing AFC process, it is necessary that this number be converted to an available STFC (ASTFC) which represents how much Flowgate capability remains available on that Flowgate for use as transmission service. In order to accomplish this, the entity receiving STFC will do the following:

Step	Example
1.) Start with the STFC	100
2.) Add all Forward Gen to Load Flow Impacts (down to 0%) and all Reverse Gen to Load Flow Impacts (down to 0%) to obtain the Net Gen to Load Flow Impacts. The Gen to Load Flow impacts should be based on the *best estimate* of Firm Gen-to-Load Flow for the time period being evaluated.	42 + (-20) = 22
3.) Subtract the Net Gen to Load Flow Impacts from the STFC to produce the Interim STFC	100 – 22 = 78
4.) Add all Forward Point to Point Flow Impacts (down to 0%) and 15% of all Reverse Point to Point Flow Impacts (down to 0%) to obtain the Weighted Net Point to Point Flow Impacts. The Point to Point Flow impacts should be based on the *current* set of reservations in effect for the time period being evaluated (*not* the historic reservation set)	58 + (0.15 (-45)) = 58 + (-6.75) ≈ 58 + (-7) = 51
5.) Subtract the Weighted Net Point to Point Flow Impacts from the Interim STFC. The result is the ASTFC	78 – 51 = 27

~~This ASTFC can then be compared with the AFC calculated through traditional means.~~

~~If the AFC value is LOWER than the ASTFC value, the AFC value should be utilized as the AFC for the purpose of posting ATC and approving/denying service. In this case, while the Allocation process might indicate that the entity has rights to a particular Flowgate through the Allocation process, current conditions on that Flowgate indicate that selling those rights would result in overselling of the Flowgate, introducing a reliability problem.~~

~~If the AFC value is HIGHER than the ASFTC value, the ASTFC value should be utilized as the AFC for the purpose of posting ATC and approving/denying service. In this case, while the AFC process might indicate that the entity can sell much more service than the Allocation might indicate, the entity is bound to not sell beyond their Allocation.~~

Day-Ahead Unit Commitment Process to Determine Firm and 6-NN Limits

The Day-Ahead Allocations will be used by the Market-Based Operating Entity to determine their 6-NN Limits for the next day on each Reciprocal Coordinated Flowgate. For each hour of the following day, the Market-based Operating Entity will determine the Market Flows expected based on the Day-Ahead unit commitment. This is called the Day-Ahead Unit Commitment Flow. The following logic will then be followed to determine the 6-NN limit for the Market-based Operating Entity.

3. If the Day-Ahead Unit Commitment Flow exceeds the Firm Flows, then:
    - Firm Market Flow Limit = Firm Flows
    - 6-NN Limit = the lesser of 1) Day-Ahead Unit Commitment Flow - Firm Flows or 2) the Day-Ahead Allocation
4. If the Day-Ahead Unit Commitment Flow is less than or equal to the Firm Flows, then:
    - Firm Market Flow Limit = Day-Ahead Unit Commitment Flow
    - 6-NN Limit = Firm Flows - Day-Ahead Unit Commitment Flow

The Market-Based Operating Entity must respect the Firm Market Flow and 6-NN Limits as determined via the above process during its commitment of units. The Market-Based Operating Entity must also supply the Operating Entity with its the Firm and 6-NN Day-Ahead Unit Commitment Flows for purposes of developing hourly non-firm AFC values on Reciprocal Coordinated Flowgates for the next-day.

Market-Based Operating Entities Providing Data for Reliability Analysis

In addition to the responsibilities described earlier in section 5 of this document, Reciprocal Market Based Operating Entities will have an additional obligation to further quantify their Non-Firm Flows into two (2) separate priorities: Non-Firm Network (6-NN), and Non-Firm Hourly (2-NH). Priorities will be determined as follows:

1.) If the Market Flow exceeds the sum of the Firm ~~Gen-to-Load~~Market Flow Limit and the 6-NN Allocation, then:
    2-NH = Market flow – (Firm ~~Gen-to-Load~~Market Flow Limit + 6-NN Allocation)
    6-NN = 6-NN Allocation
    7-FN = Firm ~~Gen-to-Load~~Market Flow Limit
2.) If the Market Flow exceeds the Firm ~~Gen-to-Load~~Market Flow Limit but is less than the 6-NN Allocation, then:
    2-NH = 0
    6-NN = Market Flow – Firm ~~Gen-to-Load~~Market Flow Limit
    7-FN = Firm ~~Gen-to-Load~~Market Flow Limit
3.) If the Market Flow does not exceed the Firm ~~Gen-to-Load~~Market Flow Limit, then
    2-NH = 0
    6-NN = 0
    7-FN = Market Flow

All other aspects of this data remain identical to those described in Section 5.

Real-time Operations Process for Market-Based Operating Entities

Market-Based Operating Entity Capabilities

Capabilities remain as described in Section 5.

Market-Based Operating Entity Real-time Actions

Procedures remain as described in Section 5. However, as described above, additional information regarding the firmness of those Economic Dispatch Flows will be communicated as well – a portion will be reported as 6-NN, while the remainder will be reported as 2-NH. This will provide additional ability for the IDC to curtail portions of the Economic Dispatch Flows earlier in the TLR process.

Section 7 - Conclusion

SPP and MISO have worked to reliably address the congestion management/parallel flow seams issue.

The processes stated in this paper address each of the three complexities of this critical seams issue. Highlighted in bold are these complexities – followed by a summary of how SPP and MISO have addressed each of these concerns.

In an energy imbalance or ancillary service market there are no internal transactions to tag. A security constrained economic dispatch is used to dispatch generation for the entire region. By calculating the economic flows caused by a large market's operations, the Market-Based Operating Entity is ensuring that all flows are still being accounted for both within and external to the Market-Based Operating Entity. Further, the Market-Based Operating Entity calculations will allow the tracing and control of flows previously not addressed within the existing tag-based system. Additionally, by using re-dispatch in conjunction with transaction curtailments, the impacting Market-Based Operating Entity will be able to provide more effective and timely relief to the constrained Reliability Coordinator.

The security constrained economic dispatch does not automatically honor external system constraints. Identifying and mitigating congestion impacts due to external system influences requires a different approach than contract path and use of TLR. This process sets a new standard for external coordination. Market-Based Operating Entities with expanding markets will ensure that they track and respond to the Market Flows they create over an extensive list of Coordinated Flowgates. Additionally, this process offers an option for Inter-regional AFC coordination between Operating Entities, and Market-Based Operating Entities. Through coordination of transmission service and by responding to real-time flows, Market-Based Operating Entities will have a new and effective way to manage parallel flows.

An effective coordination agreement between MISO and SPP is necessary to minimize the probability of Level 5 TLRs. MISO and SPP's initiative will minimize the probability of TLR 5's because far more flows are being accounted for than they have been in the past. Additionally, with changes to flow determination and tagging the IDC will be armed with far more granularity than it has in the past. This granularity will provide Reliability Coordinators far more effective processes to control flows within a TLR 3.

SPP and MISO are confident that the processes stated in this paper have addressed the MISO/SPP congestion management reliability seams issues and will greatly enhance reliable operations throughout the Eastern Interconnection.

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