MISO Marginal Zone Methodology
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I. Introduction

The concept of "Marginal Zones" is used by Interchange Distribution Calculator (IDC) to calculate the impacts of the tagged transactions between the external entities and the entity in the Market that uses centralized economic generation dispatch algorithms. Marginal Zones determine the participation of generators for the sources of tagged export transactions and for the sinks of tagged import transactions in the representation of the facilities actually contributing to the transactions. The Seams agreements necessitate the Market-Based Operating Entity to define a set of Marginal Zones which can each be aggregated into a common distribution factor that is representative of the zone. Two set of participation factors, one for export and one for import, are calculated using the same Marginal Zone definition. This information must be shared and coordinated with the IDC.

II. Calculation of Marginal Zone Participation Factors

1) Granularity of Marginal Zone:

   MISO defines Marginal Zones based on Local Balancing Authority (LBA) granularity of the MISO market footprint.

2) Frequency of Marginal Zone updates:

   MISO updates the Marginal Zone factors on a real-time basis, specifically; every 5 minutes which is in the same frequency as MISO real-time market flow calculation.

3) Actual system information:

   Each MISO LBA's actual generation and load (including transmission losses) data will be collected from the MISO State Estimator based on real-time system conditions.

4) Calculation of the Marginal Zone participation factors:

   i. Importing Marginal Zones factors

      The Marginal Zone participation factor for each importing Marginal Zone is set based on the calculation of actual load of each MISO LBA "*i"* with respect to the total load in the MISO market footprint using the formula below.

$$MZPF_{IMP\_i} = P_{load\_i} / \sum_{i=1}^{n} P_{load\_i}$$

where $i = 1, \dots, n$ is the number of MISO Marginal Zones. It is noted that all the MISO LBA loads are considered in the importing Marginal Zone factor calculations. P_{load_i} is the aggregated load amount of MISO LBA "i" (including losses).

Certain criteria apply while deriving these participation factors and they are described as follows:

a) Units with negative output (such as the pumped storage units while operating in the pumping mode) will be treated as loads and are included in the importing Marginal Zone factor calculation.
b) Negative individual load will be treated as generation and is not considered in the determination of importing Marginal Zone factors.
c) External pseudo-tied load physically located in MISO but pseudo-tied to external area is treated as external load and will not be included.
d) External pseudo-tied load physically located in external area but pseudo-tied to a MISO LBA will be included and treated as the LBA's load.
e) Internal pseudo-tied load will be treated as the load of the LBA where the load is pseudo-tied to.

ii. Exporting Marginal Zones factors

The Marginal Zone participation factor for each exporting Marginal Zone is set based on the calculation of online generation of each MISO LBA "i" with respect to the total online generation in the MISO market using the formula below.

$$MZPF_{EXP\_i} = P_{gen\_i} / \sum_{i=1}^{n} P_{gen\_i}$$

where $i = 1, \dots, n$ is the number of MISO Marginal Zones. It is noted that all the MISO LBA generation is considered in the exporting Marginal Zone factor calculations. P_{gen_i} is the aggregated generation amount of MISO LBA "i".

Certain criteria apply while deriving these participation factors and they are described as follows:

a) Negative individual load will be treated as generation and is included in the exporting Marginal Zone factor calculation.
b) Units that do not respond or move due to tag curtailment are not considered in the determination of Marginal Zone factors for exporting, such as any units cleared in the market where the economic minimum limit equals the economic maximum limit, and nuclear units.
c) Units with negative output will not be considered in the exporting Marginal Zone factor calculation since they are treated as loads.
d) External pseudo-tied generator physically located in MISO but pseudo-tied to external area is treated as external unit and will not be included.
e) External pseudo-tied generator physically located in external area but pseudo-tied to a MISO LBA will be included and treated as the LBA's generation.

f) Internal pseudo-tied generator will be treated as the generation of the LBA where the unit is pseudo-tied to.

III. IDC Use of Marginal Zone Factors

The Marginal Zones participation factors for importing and exporting are sent to the IDC for calculating the tagged transaction impacts and determining the tagged transaction curtailments during transmission loading relief (TLR) events. The transaction impacts (TDF*transaction MW) are determined as the weighted TDF using the Marginal Zone participation factor for each LBA.

For example,

Considering a transaction from MISO to TVA, the IDC will use the Marginal Zones factors for Exporting to determine the TDF as

$$TDF_{MISO \rightarrow TVA} = \sum_{i=1}^{n} (MZPF_{EXP\_i} * TDF_{LBA_i \rightarrow TVA}) \Big/ \sum_{i=1}^{n} MZPF_{EXP\_i}$$

Similarly, for a transaction from TVA to MISO, the IDC will use the Marginal Zones factors for Importing to determine the TDF as

$$TDF_{TVA \rightarrow MISO} = \sum_{i=1}^{n} (MZPF_{IMP\_i} * TDF_{TVA \rightarrow LBA_i}) \Big/ \sum_{i=1}^{n} MZPF_{IMP\_i}$$

where $TDF_{LBA_i \rightarrow TVA}$ and $TDF_{TVA \rightarrow LBA_i}$ are the TDFs between TVA and MISO LBA "i" that are calculated in the IDC.

IV. MISO Use of Marginal Zone Factors

MISO uses the Marginal Zone methodology described above to account for import and export tagged transactions in the Market Flow calculation process. Specifically, export tagged transactions, excluding tagged transactions associated with jointly owned units participating in more than one market (each of which report Market Flow to IDC), shall be accounted for by adjusting the MW output of the units in the Market-Based Operating Entity's Control Area, regions, or sub-regions within its Control Area by the total MW amount of all the Market-Based Operating Entity's export tagged transactions excluding tagged transactions associated with jointly owned units participating in more than one market (each of which report Market Flow to IDC) using: (1) Marginal Zone participation factors for exporting; and (2) the anticipated availability of a generator to participate in the interchange of the Marginal Zone. Import tagged transactions, excluding tagged transactions associated with jointly owned units participating in more than one market (each of which report Market Flow to the IDC), shall be accounted for by adjusting the MW load of the load buses in the in the Market-Based Operating Entity's Control Area, regions or subregions within the Control Area, by the total MW amount of all the Market-Based Operating Entity's import tagged transactions excluding tagged transactions associated with jointly owned units participating in more than one

market (each of which report Market Flow to IDC) using Marginal Zone participation factors for importing.

In the Available Flowgate Capability (AFC) calculation process, MISO also uses the Marginal Zone factors for the Drive-Out and Drive-In Transmission Service Request (TSR) evaluation. For example, for a Drive-Out reservation to TVA, MISO's Power Flow Model Building software calculates a weighted Distribution Factor to TVA. It is calculated as the distribution factor calculated for each MISO's LBA to TVA, weighted by the participation factor of each MISO's LBA for a Drive-Out transaction. To determine the internal export participation factors of MISO's subsystem, MISO uses the most recent exporting Marginal Zone factors available. To determine the internal import participation factors of MISO's subsystem, MISO uses the most recent importing Marginal Zone factors available.

Meanwhile, for the calculations of Firm Flow Limit (FFL), Firm Flow Entitlement (FFE), and transaction (tag) impacts by the IDC, MISO has chosen the Marginal Zone methodology and applied it consistently throughout each of these processes to account for import and export transactions in order to improve the granularity and consistency of calculations.