## 35.23 Schedule D – Market-to-Market Coordination Process – Version 1.0

**NYISO & PJM**
**Market-to-Market Coordination Schedule**
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## 1 Overview of the Market-to-Market Coordination Process

The purpose of the M2M coordination process is to set forth the rules that apply to M2M coordination between PJM and NYISO and the associated settlements processes.

The fundamental philosophy of the PJM/NYISO M2M coordination process is to set up procedures to allow any transmission constraints that are significantly impacted by generation dispatch changes and/or Phase Angle Regulator ("PAR") control actions in both markets to be jointly managed in the security-constrained economic dispatch models of both RTOs. This joint management of transmission constraints near the market borders will provide the more efficient and lower cost transmission congestion management solution, while providing coordinated pricing at the market boundaries.

The M2M coordination process focuses on real-time market coordination to manage transmission limitations that occur on the M2M Flowgates in a more cost effective manner. Coordination between NYISO and PJM will include not only joint redispatch, but will also incorporate coordinated operation of the Ramapo PARs that are located at the NYISO – PJM interface. This real-time coordination will result in a more efficient economic dispatch solution across both markets to manage the real-time transmission constraints that impact both markets, focusing on the actual flows in real-time to manage constraints. Under this approach, the flow entitlements on the M2M Flowgates do not impact the physical dispatch; the flow entitlements are used in market settlements to ensure appropriate compensation based on comparison of the actual Market Flows to the flow entitlements.

## 2 M2M Flowgates

Only a subset of all transmission constraints that exist in either market will require coordinated congestion management. This subset of transmission constraints will be identified as M2M Flowgates. Flowgates eligible for the M2M coordination process are called M2M Flowgates. For the purposes of the M2M coordination process (in addition to the studies described in section 3 below) the following will be used in determining M2M Flowgates.

2.1 NYISO and PJM will only be performing the M2M coordination process on M2M Flowgates that are under the operational control of NYISO or PJM. NYISO and PJM will not be performing the M2M coordination process on Flowgates that are owned and controlled by third party entities.

2.2 The Parties will make reasonable efforts to lower their generator binding threshold to match the lower generator binding threshold utilized by the other Party. The generator and Ramapo PAR binding thresholds (the shift factor thresholds used to identify the resource(s) available to relieve a transmission constraint), will not be set below 3%, except by mutual consent. This requirement applies to M2M Flowgates. It is not an additional criterion for determination of M2M Flowgates.

2.3 For the purpose of determining whether a monitored element Flowgate is eligible for the M2M coordination process, a threshold for determining a significant GLDF or Ramapo ~~PAR OTDF~~PSF will take into account the number of monitored elements. Implementation of M2M Flowgates will ordinarily occur through mutual agreement.

2.4 All Flowgates eligible for M2M coordination will be included in the coordinated operations of the Ramapo PARs. Flowgates with significant GLDF will also be included in joint redispatch.

2.5 M2M Flowgates that are eligible for redispatch coordination are also eligible for coordinated operation of the Ramapo PARs. M2M Flowgates that are eligible for coordinated operation of the Ramapo PARs are not necessarily also eligible for redispatch coordination.

2.6 The NYISO shall post a list of all of the M2M Flowgates located in the NYCA on its web site. PJM shall post a list of all of the M2M Flowgates located in its Control Area on its web site.

## 3 M2M Flowgate Studies

To identify M2M Flowgates the Parties will perform an off-line study to determine if the significant GLDF for at least one generator within the Non-Monitoring RTO, or significant ~~PAR OTDF~~PSF for at least one Ramapo PAR, on a potential M2M Flowgate within the Monitoring RTO is greater than or equal to the thresholds as described below. The study shall be based on an up-to-date~~, common,~~ power flow model representation of the Eastern Interconnection, with all normally closed Transmission Facilities in-service. The transmission modeling assumptions used in the M2M Flowgate studies will be based on the same assumptions used for determining M2M Entitlements in Section 6 below.

3.1 Either Party may propose that a new M2M Flowgate be added at any time. The Parties will work together to perform the necessary studies within a reasonable timeframe.

3.2 The GLDF or Ramapo ~~PAR OTDF~~PSF thresholds for M2M Flowgates with one or more monitored elements are defined as:

i. Single monitored element, 5% GLDF/Ramapo ~~PAR OTDF~~PSF;

ii. Two monitored elements, 7.5% GLDF/Ramapo ~~PAR OTDF~~PSF; and

iii. Three or more monitored elements, 10% GLDF/Ramapo ~~PAR OTDF~~PSF.

3.3 For potential M2M Flowgates that pass the above Ramapo ~~PAR OTDF~~PSF criteria, the Parties must still mutually agree to add each Flowgate as an M2M Flowgate for coordinated operation of the Ramapo PARs.

3.4 For potential M2M Flowgates that pass the above GLDF criteria, the Parties must still mutually agree to add each Flowgate as an M2M Flowgate for redispatch coordination.

3.5 The Parties can also mutually agree to add a M2M Flowgate that does not satisfy the above criteria.

## 4 Removal of M2M Flowgates

Removal of M2M Flowgates from the systems may be necessary under certain conditions including the following:

4.1 A M2M Flowgate is no longer valid when (a) a change is implemented that effects either Party's generation impacts causing the Flowgate to no longer pass the M2M Flowgate Studies, or (b) a change is implemented that affects the impacts from coordinated operation of the Ramapo PARs causing the Flowgate to no longer pass the M2M Flowgate Studies. The Parties must still mutually agree to remove a M2M Flowgate, such agreement not to be unreasonably withheld. Once a M2M Flowgate has been removed, it will no longer be eligible for M2M settlement.

4.2 A M2M Flowgate that does not satisfy the criteria set forth in Section 3.2 above, but that is created based on the mutual agreement of the Parties pursuant to Section 3.5 above, shall be removed two weeks after either Party provides a formal notice to the other Party that it withdraws its agreement to the M2M Flowgate, or at a later or earlier date that the Parties mutually agree upon. The formal notice must include an explanation of the reason(s) why the agreement to the M2M Flowgate was withdrawn.

4.3 The Parties can mutually agree to remove a M2M Flowgate from the M2M coordination process whether or not it passes the coordination tests. A M2M Flowgate should be removed when the Parties agree that the M2M coordination process is not, or will not be, an effective mechanism to manage congestion on that Flowgate.

## 5 Market Flow Determination

Each RTO will independently calculate its Market Flow for all M2M Flowgates using the equations set forth in this section. The Market Flow calculation is broken down into the following steps:

- Determine Shift Factors for M2M Flowgates

- Compute RTO Load and Losses (less imports)
- Compute RTO Generation (less exports)
- Compute RTO Generation to Load impacts on the Market Flow
- Compute RTO interchange scheduling impacts on the Market Flow
- Compute PAR impacts on the Market Flow
- Compute Market Flow

~~The Rockland Electric Company ("RECo") load shall be excluded from the M2M Market Flows and M2M Entitlements until such time as the Parties reach agreement regarding how service to RECo load should be handled in the M2M coordination process. When the Parties reach an agreement, the Parties shall file for Commission acceptance the necessary revisions to this Agreement.~~

### 5.1 Determine Shift Factors for M2M Flowgates

The first step to determining the Market Flow on a M2M Flowgate is to calculate generator, load and PAR shift factors for the each of the M2M Flowgates. For real-time M2M coordination, the shift factors will be based on the real-time transmission system topology.

### 5.2 Compute RTO Load Served by RTO Generation

Using area load and losses for each load zone, compute the RTO Load, in MWs, by summing the load and losses for each load zone to determine the total zonal load for each RTO load zone.

$Zonal\_Total\_Load_{zone} = Load_{zone} + Losses_{zone}$, for each RTO load zone

Where:

| | |
|---|---|
| zone = | the relevant RTO load zone; |
| $Zonal\_Total\_Load_{zone}$ = | the sum of the RTO's load and transmission losses for the zone; |
| $Load_{zone}$ = | the load within the zone; and |
| $Losses_{zone}$ = | the transmission losses for transfers through the zone. |

Next, reduce the Zonal Loads by the scheduled line real-time import transaction schedules that sink in that particular load zone:

$$Zonal\_Reduced\_Load_{zone} = Zonal\_Total\_Load_{zone} - \sum_{scheduled\_lines=1}^{all} Import\_Schedules_{scheduled\_line,zone}$$

Where:

zone = the relevant RTO load zone;

scheduled_line = each of the ~~transmission facilities~~Transmission Facilities identified in Table 1 below;

$Zonal\_Reduced\_Load_{zone}$ = the sum of the RTO's load and transmission losses in a zone reduced by the sum of import schedules over scheduled lines to the zone;

$Zonal\_Total\_Load_{zone}$ = the sum of the RTO's load and transmission losses for the zone; and

$Import\_Schedules_{scheduled\_line,zone}$ = import schedules over a scheduled line to a zone.

The real-time import schedules over scheduled lines will only reduce the load in the sink load zones identified in Table 1 below:

**Table 1. List of Scheduled Lines**

| Scheduled Line | NYISO Load Zone | PJM Load Zone |
|---|---|---|
| Dennison Scheduled Line | North | Not Applicable |
| Cross-Sound Scheduled Line | Long Island | Not Applicable |
| Linden VFT Scheduled Line | New York City | Mid-Atlantic Control Zone |
| Neptune Scheduled Line | Long Island | Mid-Atlantic Control Zone |
| Northport – Norwalk Scheduled Line | Long Island | Not Applicable |

Once import schedules over scheduled lines have been accounted for, it is then appropriate to reduce the net RTO Load by the remaining real-time import schedules at the proxies identified in Table 2 below:

**Table 2. List of Proxies***

| Proxy | Balancing Authorities Responsible |
|---|---|
| PJM shall post and maintain a list of its proxies on its OASIS website. PJM shall provide to NYISO notice of any new or deleted proxies prior to implementing such changes in its M2M software. | PJM |
| NYISO proxies are the Proxy Generator Buses that are not identified as Scheduled Lines in the table that is set forth in Section 4.4.4 of the NYISO's Market Services Tariff. The NYISO shall provide to PJM notice of any new of deleted proxies prior to implementing such changes in its M2M software. | NYISO |

*Scheduled lines and proxies are mutually exclusive. Transmission Facilities that are components of a scheduled line are not also components of a proxy (and vice-versa).

$$RTO\_Net\_Load = \sum_{zone=1}^{all} Zonal\_Reduced\_Load_{zone}$$

Where:

zone = the relevant RTO load zone;

RTO_Net_Load = the sum of load and transmission losses for the entire RTO footprint reduced by the sum of import schedules over all scheduled lines; and

$Zonal\_Reduced\_Load_{zone}$ = the sum of the RTO's load and transmission losses in a zone reduced by the sum of import schedules over scheduled lines to the zone.

$$RTO\_Final\_Load = RTO\_Net\_Load - \sum_{proxy=1}^{all} Import\_Schedules_{proxy}$$

Where:

proxy = representations of defined sets of ~~transmission facilities~~Transmission Facilities that (i) interconnect neighboring Balancing Authorities, (ii) are collectively scheduled, and (iii) are identified in Table 2 above;

RTO_Final_Load = the sum of the RTO's load and transmission losses for the entire RTO footprint, sequentially reduced by (i) the sum of import schedules over all scheduled lines, and (ii) the sum of all proxy import schedules;

RTO_Net_Load = the sum of load and transmission losses for the entire RTO footprint reduced by the sum of import schedules over all scheduled lines; and

$Import\_Schedules_{proxy}$ = the sum of import schedules at a given proxy.

Next, calculate the Zonal Load weighting factor for each RTO load zone:

$$Zonal\_Weighting_{zone} = \left(\frac{Zonal\_Reduced\_Load_{zone}}{RTO\_Net\_Load}\right)$$

Where:

zone = the relevant RTO load zone;

$Zonal\_Weighting_{zone}$ = the percentage of the RTO's load contained within the zone;

RTO_Net_Load = the sum of load and transmission losses for the entire RTO footprint reduced by the sum of import schedules over all scheduled lines; and

$Zonal\_Reduced\_Load_{zone}$ = the sum of the RTO's load and transmission losses in a zone reduced by the sum of import schedules over scheduled lines to the zone.

Using the Zonal Weighting Factor compute the zonal load reduced by RTO imports for each load zone:

$$Zonal\_Final\_Load_{zone} = Zonal\_Weighting_{zone} \times RTO\_Final\_Load$$

Where:

zone = the relevant RTO load zone;

$Zonal\_Final\_Load_{zone}$ = the final RTO load served by internal RTO generation in the zone;

$Zonal\_Weighting_{zone}$ = the percentage of the RTO's load contained within the zone; and

RTO_Final_Load = the sum of the RTO's load and transmission losses for the entire RTO footprint, sequentially reduced by (i) the sum of import schedules over all scheduled lines, and (ii) the sum of all proxy import schedules.

Using the Load Shift Factors ("LSFs") calculated above, compute the weighted RTOLSF for each M2M Flowgate as:

$$RTO\_LSF_{M2M\_Flowgate-m} = \sum_{zone=1}^{all} \left( LSF_{(zone,M2M\_Flowgate-m)} \times \left( \frac{Zonal\_Final\_Load_{zone}}{RTO\_Final\_Load} \right) \right)$$

Where:

M2M_Flowgate-m = the relevant flowgate;

zone = the relevant RTO load zone;

$RTO\_LSF_{M2M\_Flowgate-m}$ = the load shift factor for the entire RTO footprint on M2M Flowgate m;

$LSF_{(zone,M2M\_Flowgate-m)}$ = the load shift factor for the RTO zone on M2M Flowgate m;

$Zonal\_Final\_Load_{zone}$ = the final RTO load served by internal RTO generation in the zone; and

RTO_Final_Load = the sum of the RTO's load and transmission losses for the entire RTO footprint, sequentially reduced by (i) the sum of import schedules over all scheduled lines, and (ii) the sum of all proxy import schedules.

### 5.3 Compute RTO Generation Serving RTO Load

Using the real-time generation output in MWs, compute the Generation serving RTO Load. Sum the output of RTO generation within each load zone:

$RTO\_Gen_{zone} = \sum_{unit=1}^{all} Gen_{unit,zone}$, for each RTO load zone

Where:

zone = the relevant RTO load zone;

unit = the relevant generator;

$RTO\_Gen_{zone}$ = the sum of the RTO's generation in a zone; and

$Gen_{unit,zone}$ = the real-time output of the unit in a given zone.

Next, reduce the RTO generation located within a load zone by the scheduled line real-time export transaction schedules that source from that particular load zone:

$$RTO\_Reduced\_Gen_{zone} = RTO\_Gen_{zone} - \sum_{scheduled\_line=1}^{all} Export\_Schedules_{scheduled\_line,zone}$$

Where:

zone = the relevant RTO load zone;

scheduled_line = each of the ~~transmission facilities~~Transmission Facilities identified in Table 1 above;

$RTO\_Reduced\_Gen_{zone}$ = the sum of the RTO's generation in a zone reduced by the sum of export schedules over scheduled lines from the zone;

$RTO\_Gen_{zone}$ = the sum of the RTO's generation in a zone; and

$Export\_Schedules_{scheduled\_line,zone}$ = export schedules from a zone over a scheduled line.

The real-time export schedules over scheduled lines will only reduce the generation in the source zones identified in Table 1 above. The resulting generator output based on this reduction is defined below.

$$Reduced\ Gen_{unit} = Gen_{unit,zone}\left(\frac{RTO\_Reduced\_Gen_{zone}}{RTO\_Gen_{zone}}\right)$$

Where:

unit = the relevant generator;

zone = the relevant RTO load zone;

$Gen_{unit,zone}$ = the real-time output of the unit in a given zone;

Reduced $Gen_{unit}$ = each unit's real-time output after reducing the RTO_Net_Gen by the real-time export schedules over scheduled lines;

| | |
|---|---|
| $RTO\_Reduced\_Gen_{zone}$ = | the sum of the RTO's generation in a zone reduced by the sum of export schedules over scheduled lines from the zone; and |
| $RTO\_Gen_{zone}$ = | the sum of the RTO's generation in a zone. |

Once export schedules over scheduled lines are accounted for, it is then appropriate to reduce the net RTO generation by the remaining real-time export schedules at the proxies identified in Table 2 above.

$$RTO\_Net\_Gen = \sum_{zone=1}^{all} RTO\_Reduced\_Gen_{zone}$$

Where:

| | |
|---|---|
| zone = | the relevant RTO load zone; |
| RTO_Net_Gen = | the sum of the RTO's generation reduced by the sum of export schedules over all scheduled lines; and |
| $RTO\_Reduced\_Gen_{zone}$ = | the sum of the RTO's generation in a zone reduced by the sum of export schedules over scheduled lines from the zone. |

$$RTO\_Final\_Gen = RTO\_Net\_Gen - \sum_{proxy=1}^{all} Export\_Schedules_{proxy}$$

Where:

| | |
|---|---|
| proxy = | representation of defined sets of ~~transmission facilities~~Transmission Facilities that (i) interconnect neighboring Balancing Authorities, (ii) are collectively scheduled, and (iii) are identified in Table 2 above; |
| RTO_Final_Gen = | the sum of the RTO's generation output for the entire RTO footprint, sequentially reduced by (i) the sum of export schedules over all scheduled lines, and (ii) the sum of all proxy export schedules; |

RTO_Net_Gen = the sum of the RTO's generation reduced by the sum of export schedules over all scheduled lines; and

$Export\_Schedules_{proxy}$ = the sum of export schedules at a given proxy.

Finally, weight each generator's output by the reduced RTO generation:

$$Gen\_Final_{unit} = Reduced\ Gen_{unit} \times \frac{RTO\_Final\_Gen}{RTO\_Net\_Gen}$$

Where:

unit = the relevant generator;

$Gen\_Final_{unit}$ = the portion of each unit's output that is serving the RTO Net Load;

Reduced $Gen_{unit}$ = each unit's real-time output after reducing the RTO_Net_Gen by the real-time export schedules over scheduled lines;

RTO_Final_Gen = the sum of the RTO's generation output for the entire RTO footprint, sequentially reduced by (i) the sum of export schedules over all scheduled lines, and (ii) the sum of all proxy export schedules; and

RTO_Net_Gen = the sum of the RTO's generation reduced by the sum of export schedules over all scheduled lines.

### 5.4 Compute the RTO GTL for all M2M Flowgates

The generation-to-load flow for a particular M2M Flowgate, in MWs, will be determined as:

$$RTO\_GTL_{M2M\_Flowgate-m} = \sum_{unit=1}^{all} Gen\_Final_{unit} \times \left(GSF_{(unit,M2M\_Flowgate-m)} - RTO\_LSF_{M2M\_Flowgate-m}\right)$$

Where:

M2M_Flowgate-m = the relevant flowgate;

unit = the relevant generator;

$RTO\_GTL_{M2M\_Flowgate\text{-}m}$ = the generation to load flow for the entire RTO footprint on M2M Flowgate m;

$Gen\_Final_{unit}$ = the portion of each unit's output that is serving RTO Net Load;

$GSF_{(unit,M2M\_Flowgate\text{-}m)}$ = the generator shift factor for each unit on M2M Flowgate m; and

$RTO\_LSF_{M2M\_Flowgate\text{-}m}$ = the load shift factor for the entire RTO footprint on M2M Flowgate m.

### 5.5 Compute the RTO Interchange Scheduling Impacts for all M2M Flowgates

For each scheduling point that the participating RTO is responsible for, determine the net interchange schedule in MWs. Table 3 below identifies both the participating RTO that is responsible for each listed scheduling point, and the "type" assigned to each listed scheduling point.

**Table 3. List of Scheduling Points**

| Scheduling Point | Scheduling Point Type | Participating RTO(s) Responsible |
|---|---|---|
| NYISO-PJM | common | NYISO and PJM |
| Linden VFT Scheduled Line | common | NYISO and PJM |
| Neptune Scheduled Line | common | NYISO and PJM |
| PJM shall post and maintain a list of its non-common scheduling points on its OASIS website. PJM shall provide to NYISO notice of any new or deleted non-common scheduling points prior to implementing such changes in its M2M software. | non-common | PJM |
| NYISO non-common scheduling points include all Proxy Generator Buses and Scheduled Lines listed in the table that is set forth in Section 4.4.4 of the NYISO's Market Services Tariff that are not identified in this Table 3 as common scheduling points. The NYISO shall provide to PJM notice of any new or deleted non-common scheduling points prior to implementing such changes in its M2M software. | non-common | NYISO |

$$RTO\_Transfers_{sched\_pt} = Imports_{sched\_pt} + WheelsIn_{sched\_pt} - Exports_{sched\_pt} - WheelsOut_{sched\_pt}$$

Where:

| | |
|---|---|
| sched_pt = | the relevant scheduling point. A scheduling point can be either a proxy or a scheduled line; |
| $RTO\_Transfers_{sched\_pt}$ = | the net interchange schedule at a scheduling point; |
| $Imports_{sched\_pt}$ = | the import component of the interchange schedule at a scheduling point; |
| $WheelsIn_{sched\_pt}$ = | the injection of wheels-through component of the interchange schedule at a scheduling point; |
| $Exports_{sched\_pt}$ = | the export component of the interchange schedule at a scheduling point; and |
| $WheelsOut_{sched\_pt}$ = | the withdrawal of wheels-through component of the interchange schedule at a scheduling point. |

The equation below applies to all non-common scheduling points that only one of the participating RTOs is responsible for. *Parallel_Transfers* are applied to the Market Flow of the responsible participating RTO. For example, the *Parallel_Transfers* computed for the IESO-NYISO non-common scheduling point are applied to the NYISO Market Flow.

$$Parallel\_Transfers_{\text{M2M\_Flowgate-m}} = \sum_{\text{nc\_sched\_pt}=1}^{all} RTO\_Transfers_{\text{nc\_sched\_pt}} \times PTDF_{(\text{nc\_sched\_pt,M2M\_Flowgate-m})}$$

Where:

| | |
|---|---|
| M2M_Flowgate-m = | the relevant flowgate; |
| nc_sched_pt = | the relevant non-common scheduling point. A non-common scheduling point can be either a proxy or a scheduled line. Non-common scheduling points are identified in Table 3, above; |

$Parallel\_Transfers_{M2M\_Flowgate\text{-}m}$ = the flow on M2M Flowgate m due to the net interchange schedule at the non-common scheduling point;

$RTO\_Transfers_{nc\_sched\_pt}$ = the net interchange schedule at the non-common scheduling point, where a positive number indicates the import direction; and

$PTDF_{(nc\_sched\_pt,\ M2M\_Flowgate\text{-}m)}$ = the power transfer distribution factor of the non-common scheduling point on M2M Flowgate m. For NYISO, the PTDF will equal the generator shift factor of the non-common scheduling point.

The equation below applies to common scheduling points that directly interconnect the participating RTOs. *Shared_Transfers* are applied to the Monitoring RTO's Market Flow only. NYISO to PJM transfers would be considered part of NYISO's Market Flow for NYISO-monitored Flowgates and part of PJM's Market Flow for PJM-monitored Flowgates.

$$Shared\_Transfers_{\text{M2M\_Flowgate-m}} = \sum_{\text{cmn\_sched\_pt}=1}^{all} RTO\_Transfers_{\text{cmn\_sched\_pt}} \times PTDF_{(\text{cmn\_sched\_pt,M2M\_Flowgate}-\text{m})}$$

Where:

M2M_Flowgate-m = the relevant flowgate;

cmn_sched_pt = the relevant common scheduling point. A common scheduling point can be either a proxy or a scheduled line. Common scheduling points are identified in Table 3, above;

$Shared\_Transfers_{M2M\_Flowgate\text{-}m}$ = the flow on M2M Flowgate m due to interchange schedules on the common scheduling point;

$RTO\_Transfers_{cmn\_sched\_pt}$ = the net interchange schedule at a common scheduling point, where a positive number indicates the import direction; and

$PTDF_{(cmn\_sched\_pt,\ M2M\_Flowgate\text{-}m)}$ = the generation shift factor of the common scheduling point on M2M Flowgate m. For NYISO, the PTDF will equal the generator shift factor of the common scheduling point.

### 5.6 Compute the PAR Effects for all M2M Flowgates

For the PARs listed in Table 4 below, the RTOs will determine the generation-to-load flows and interchange schedules, in MWs, that each PAR is impacting.

**Table 4. List of Phase Angle Regulators**

| PAR | Description | PAR Type | Actual Schedule | Target Schedule | Responsible Participating RTO(s) |
|---|---|---|---|---|---|
| 1 | RAMAPO PAR3500 | common | From telemetry | From telemetry* | NYISO and PJM |
| 2 | RAMAPO PAR4500 | common | From telemetry | From telemetry* | NYISO and PJM |
| 3 | FARRAGUT TR11 | common | From telemetry | From telemetry† | NYISO and PJM |
| 4 | FARRAGUT TR12 | common | From telemetry | From telemetry† | NYISO and PJM |
| 5 | GOETHSLN BK_1N | common | From telemetry | From telemetry† | NYISO and PJM |
| 6 | WALDWICK O2267 | common | From telemetry | From telemetry† | NYISO and PJM |
| 7 | WALDWICK F2258 | common | From telemetry | From telemetry† | NYISO and PJM |
| 8 | WALDWICK E2257 | common | From telemetry | From telemetry† | NYISO and PJM |
| 9 | STLAWRNC PS_33 | non-common | From telemetry | 0 | NYISO |
| 10 | STLAWRNC PS_34 | non-common | From telemetry | 0 | NYISO |

*****Pursuant to the rules for implementing the M2M coordination process over the Ramapo PARs that are set forth in this M2M Schedule.

†Consistent with Schedule C to the Joint Operating Agreement between the Parties.

Compute the PAR control as the actual flow less the target flow across each PAR:

$$PAR\_Control_{par} = Actual\_MW_{par} - Target\_MW_{par}$$

Where:

par = each of the phase angle regulators listed in Table 4, above;

$PAR\_Control_{par}$ = the flow deviation on each of the ~~pars~~PARs;

$Actual\_MW_{par}$ = the actual flow on each of the ~~pars~~PARs, determined consistent with Table 4 above; and

$Target\_MW_{par}$ = the target flow that each of the ~~pars~~PARs should be achieving, determined in accordance with Table 4 above.

When the Actual_MW and Target_MW are both set to "From telemetry" in Table 4 above, the *PAR_Control* will equal zero.

**Common PARs**

In the equations below, the Non-Monitoring RTO is credited for or responsible for *PAR_Impact* resulting from the common PAR effect on the Monitoring RTO's M2M Flowgates. The common PAR impact calculation only applies to the common PARs identified in Table 4 above.

Compute control deviation for all common PARs on M2M Flowgate m based on the $PAR\_Control_{par}$ MWs calculated above:

$$Cmn\_PAR\_Control_{M2M\_Flowgate-m} = \sum_{cmn\_par=1}^{all} \left(PAR\_OTDFSF_{(cmn\_par,M2M\_Flowgate-m)} \times PAR\_Control_{cmn\_par}\right)$$

Where:

M2M_Flowgate-m = the relevant flowgate;

cmn_par = each of the common phase angle regulators, modeled as Flowgates, identified in Table 4, above;

$Cmn\_PAR\_Control_{M2M\_Flowgate-m}$ = the sum of flow on M2M Flowgate m after accounting for the operation of common ~~pars~~PARs;

~~PAR_OTDF~~PSF$_{(cmn_par,M2M_Flowgate-m)}$ = the ~~outage transfer distribution factor~~PSF of each of the common ~~pars~~PARs on M2M Flowgate m; and

$PAR\_Control_{cmn\_par}$ = the flow deviation on each of the common ~~pars~~PARs.

Compute the impact of generation-to-load and interchange schedules across all common PARs on M2M Flowgate m as the Market Flow across each common PAR multiplied by that PAR's shift factor on M2M Flowgate m:

$$Cmn\_PAR\_MF_{M2M\_Flowgate-m} = \sum_{cmn\_par=1}^{all} \left(\begin{array}{c}\left(PAR\_OTDFSF_{(cmn\_par,M2M\_Flowgate-m)}\right) \times \\ \left(RTO\_GTL_{cmn\_par} + Parallel\_Transfers_{cmn\_par}\right)\end{array}\right)$$

Where:

M2M_Flowgate-m = the relevant flowgate;

cmn_par = the set of common phase angle regulators, modeled as Flowgates, identified in Table 4 above;

$Cmn\_PAR\_MF_{M2M\_Flowgate\text{-}m}$ = the sum of flow on M2M Flowgate m due to the generation to load flows and interchange schedules on the common ~~pars~~PARs;

$PAR\_OTDF_{(cmn\_par,M2M\_Flowgate\text{-}m)}$ = the ~~outage transfer distribution factor~~PSF of each of the common ~~pars~~PARs on M2M Flowgate m;

$RTO\_GTL_{cmn\_par}$ = the generation to load flow for each common par, computed in the same manner as the generation to load flow is computed for M2M Flowgates in Section 5.4 above; and

$Parallel\_Transfers_{cmn\_par}$ = the flow on each of the common ~~pars~~PARs caused by interchange schedules at non-common scheduling points.

Next, compute the impact of the common PAR effect for M2M Flowgate m as:

$$Cmn\_PAR\_Impact_{M2M\_Flowgate-m} = Cmn\_PAR\_MF_{M2M\_Flowgate-m} - Cmn\_PAR\_Control_{M2M\_Flowgate-m}$$

Where:

M2M_Flowgate-m = the relevant flowgate;

$Cmn\_PAR\_Impact_{M2M\_Flowgate\text{-}m}$ = potential flow on M2M Flowgate m that is affected by the operation of the common ~~pars~~PARs;

$Cmn\_PAR\_MF_{M2M\_Flowgate\text{-}m}$ = the sum of flow on M2M Flowgate m due to the generation to load and interchange schedules on the common ~~pars~~PARs; and

$Cmn\_PAR\_Control_{M2M\_Flowgate\text{-}m}$ = the flow deviation on each of the common ~~pars~~PARs.

**Non-Common PARs**

For the equations below, the NYISO will be credited or responsible for *PAR_Impact* on all M2M Flowgates because the NYISO is the participating RTO that has input into the operation of these devices. The non-common PAR impact calculation only applies to the non-common PARs identified in Table 4 above.

Compute control deviation for all non-common PARs on M2M Flowgate m based on the PAR control MW above:

$$NC\_PAR\_Control_{M2M\_Flowgate-m} = \sum_{nc\_par=1}^{all} P\sout{AR\_OTDF}SF_{(nc\_par,M2M\_Flowgate-m)} \times PAR\_Control_{nc\_par}$$

Where:

M2M_Flowgate-m = the relevant flowgate;

nc_par = each of the non-common phase angle regulators, modeled as Flowgates, identified in Table 4 above;

$NC\_PAR\_Control_{M2M\_Flowgate-m}$ = the sum of flow on M2M Flowgate m after accounting for the operation of non-common ~~pars~~PARs;

P~~AR_OTDF~~SF$_{(nc_par,M2M_Flowgate-m)}$ = the ~~outage transfer distribution factor~~PSF of each of the non-common ~~pars~~PARs on M2M Flowgate m; and

$PAR\_Control_{nc\_par}$ = the flow deviation on each of the non-common ~~pars~~PARs.

Compute the impact of generation-to-load and interchange schedules across all non-common PARs on M2M Flowgate m as the Market Flow across each PAR multiplied by that PAR's shift factor on M2M Flowgate m:

$$NC\_PAR\_MF_{M2M\_Flowgate-m} = \sum_{nc\_par=1}^{all} \left( \begin{matrix} \left(P\sout{AR\_OTDF}PSF_{nc\_par,M2M\_Flowgate-m}\right) \times \\ \left(RTO\_GTL_{nc\_par} + Parallel\_Transfers_{nc\_par}\right) \end{matrix} \right)$$

Where:

M2M_Flowgate-m = the relevant flowgate;

nc_par = the set of non-common phase angle regulators, modeled as Flowgates, identified in Table 4 above;

$NC\_PAR\_MF_{M2M\_Flowgate-m}$ = the sum of flow on M2M Flowgate m due to the generation to load flows and interchange schedules on the non-common ~~pars~~PARs;

P~~AR_OTD~~SF~~F~~$_{(nc\_par,M2M\_Flowgate-m)}$ = the outage transfer distribution factor of each of the non-common ~~pars~~PARs on M2M Flowgate m;

$RTO\_GTL_{nc\_par}$ = the generation to load flow for each non-common par, computed in the same manner as the generation to load flow is computed for M2M Flowgates in Section 5.4 above; and

Parallel_Transfers$_{nc_par}$ = the flow, as computed above where the M2M Flowgate m is one of the non-common ~~pars~~PARs, on each of the non-common ~~pars~~PARs caused by interchange schedules at non-common scheduling points.

Next, compute the non-common PAR impact for M2M Flowgate m as:

$$NC\_PAR\_Impact_{M2M\_Flowgate-m} = NC\_PAR\_MF_{M2M\_Flowgate-m} - NC\_PAR\_Control_{M2M\_Flowgate-m}$$

Where:

M2M_Flowgate-m = the relevant flowgate;

NC_PAR_Impact$_{M2M_Flowgate-m}$ = the potential flow on M2M Flowgate m that is affected by the operation of non-common ~~pars~~PARs;

NC_PAR_MF$_{M2M_Flowgate-m}$ = the sum of flow on M2M Flowgate m due to the generation to load and interchange schedules on the non-common ~~pars~~PARs; and

NC_PAR_Control$_{M2M_Flowgate-m}$ = the sum of flow on M2M Flowgate m after accounting for the operation of non-common ~~pars~~PARs.

**Aggregate all PAR Effects for Each M2M Flowgate**

The total impacts from the PAR effects for M2M Flowgate m is:

$$PAR\_Impact_{M2M\_Flowgate-m} = Cmn\_PAR\_Impact_{M2M\_Flowgate-m} + NC\_PAR\_Impact_{M2M\_Flowgate-m}$$

Where:

M2M_Flowgate-m = the relevant flowgate;

PAR_Impact$_{M2M_Flowgate-m}$ = the flow on M2M Flowgate m that is affected after accounting for the operation of both common and non-common ~~pars~~PARs;

Cmn_PAR_Impact$_{M2M_Flowgate-m}$ = potential flow on M2M Flowgate m that is affected by the operation of the common ~~pars~~PARs; and

NC_PAR_Impact$_{M2M_Flowgate-m}$ = the potential flow on M2M Flowgate m that is affected by the operation of non-common ~~pars~~PARs.

### 5.7 Compute the RTO Aggregate Market Flow for all M2M Flowgates

With the *RTO_GTL* and *PAR_IMPACT* known, we can now compute the *RTO_MF* for all M2M Flowgates as:

$$RTO\_MF_{M2M\_Flowgate-m} = RTO\_GTL_{M2M\_Flowgate-m} + Parallel\_Transfers_{M2M\_Flowgate-m} + Shared\_Transfers_{M2M\_Flowgate-m} - PAR\_Impact_{M2M\_Flowgate-m}$$

Where:

M2M_Flowgate-m = the relevant flowgate;

$RTO\_MF_{M2M\_Flowgate-m}$ = the Market Flow caused by RTO generation dispatch and transaction scheduling on M2M Flowgate m after accounting for the operation of both the common and non-common ~~pars~~PARs;

$RTO\_GTL_{M2M\_Flowgate-m}$ = the generation to load flow for the entire RTO footprint on M2M Flowgate m;

$Parallel\_Transfers_{M2M\_Flowgate-m}$ = the flow on M2M Flowgate m caused by interchange schedules that are not jointly scheduled by the participating RTOs;

$Shared\_Transfers_{M2M\_Flowgate-m}$ = the flow on M2M Flowgate m caused by interchange schedules that are jointly scheduled by the participating RTOs; and

$PAR\_Impact_{M2M\_Flowgate-m}$ = the flow on M2M Flowgate m that is affected after accounting for the operation of both the common and non-common ~~pars~~PARs.

## 6 ~~Preliminary~~ M2M Entitlement Determination Method

M2M Entitlements are the equivalent of financial rights for the Non-Monitoring RTO to use the Monitoring RTO's transmission system within the confines of the M2M redispatch process. The Parties worked together to develop the ~~preliminary~~ M2M Entitlement determination method set forth below. Given the PAR controlled nature of the interfaces between the two markets, the Parties' expectation is that the M2M Entitlements will be small on both systems. ~~Before M2M is implemented, both the method of determining M2M Entitlements and the initial M2M Entitlements must be verified by both Parties and vetted with stakeholders.~~

Each Party shall calculate a M2M Entitlement on each M2M Flowgate and compare the results on a mutually agreed upon schedule.

## 6.1 M2M Entitlement Topology Model and Impact Calculation

The M2M Entitlement calculation shall be based on a static topological model to determine a non-Monitoring RTO's share of a M2M Flowgate's total capacity based on historic dispatch patterns. The model must include the following items:

1. a static transmission and generation model;
2. generator, load, and PAR shift factors;
3. generator output, ~~and~~ load and interchange schedules from 2009 through 2011 or any subsequent three year period mutually agreed to by the Parties;
4. a PAR impact assumption that the PAR control is perfect for all PARs within the transmission model except the PARs at the Michigan-Ontario border; and
5. new or upgraded Transmission Facilities.

The Parties shall calculate the GLDFs using a transmission~~n IDC~~ model that contains a mutually agreed upon ~~static~~ set of: (1) transmission lines that are modeled as in-service; (2) generators; and (3) loads. Using these GLDFs, generator output data, load data and interchange schedules from the three year period agreed to by the Parties~~2009 through 2011, and load data from the three year period agreed to by the Parties2009 through 2011~~, the Parties shall calculate each Party's MW impact on each M2M Flowgate for each hour in the three year period agreed to by the Parties~~2009, 2010, and 2011~~. Using these impacts, the Parties shall create a reference year consisting of four periods ("M2M Entitlement Periods") for each M2M Flowgate. The M2M Entitlement Periods are as follows:

1. M2M Entitlement Period 1: December, January, and February;
2. M2M Entitlement Period 2: March, April, and May;
3. M2M Entitlement Period 3: June, July, and August; and
4. M2M Entitlement Period 4: September, October, and November.

For each of the M2M Entitlement Periods listed above the Non-Monitoring RTO will calculate its M2M Entitlement on each M2M Flowgate for each hour of each day of a week that will serve as the representative week for that M2M Entitlement Period. The M2M Entitlement for each day/hour, for each M2M Flowgate will be calculated by averaging the Non-Monitoring RTO's Market Flow on an M2M Flowgate for each particular day/hour of the week. To calculate the average the Non-Monitoring RTO shall use the Market Flow data for all of the like day/hours, that occurred in that day of the week and hour in the M2M Entitlement Period, in each of years contained within the three year period agreed to by the Parties~~the years 2009, 2010, and 2011~~. When determining M2M ~~Settlements~~ settlements each Party will use the M2M Entitlement that corresponds to the hour of the week and to the M2M Entitlement Period for which the real-time Market Flow is being calculated.

The Parties will use the M2M Entitlements that are calculated based on data from the 2009 through 2011 three year period for at least their first year of implementing the M2M coordination process.

### 6.2 M2M Entitlement Calculation

Each Party shall independently calculate the Non-Monitoring RTO's M2M Entitlement for all M2M Flowgates using the equations set forth in this section. The Parties shall mutually agree upon the initial M2M Entitlement calculations. Any disputes that arise in the M2M Entitlement calculations will be resolved in accordance with the dispute resolution procedures set forth in section 35.15 of the Agreement.

Eighty percent of ~~T~~the RECo load shall be excluded from the calculation of M2M Market Flows and M2M Entitlements~~, in order to allow for that portion of RECo Load to be accounted for over the NY/NJ PAR controllable facilities~~ and shall instead be reflected as a PJM obligation over the Ramapo PARs in accordance with Sections 7.2.1 and 8.3 of this M2M coordination process. The remaining 20% of RECo load shall be included in the M2M Entitlement and Market Flow calculations as PJM load. ~~until such time as the Parties reach agreement regarding how service to RECo load should be handled in the M2M coordination process. When the Parties reach an agreement, the Parties shall file for Commission acceptance the necessary revisions to this Agreement.~~

The following assumptions apply to the M2M Entitlement calculation:

1. the Parties shall calculate the values in this section using the M2M Entitlement Topology Model discussed in Section 6.1 above, unless otherwise stated; ~~and~~
~~1.~~2. the impacts from *Parallel Transfers* and *Shared Transfers* are excluded from the Market Flow;
3. perfect PAR Control exists for all PARs within the transmission model except the PARs at the Ontario/Michigan border; and
~~2.~~4. External Capacity Resources may be included in the Generation Pattern upon mutual agreement.

Once the reference year ~~raw entitlements~~ Market Flows (or Adjusted Market Flows from Section 6.3 below) have been calculated ~~(using a formula agreed upon by the Parties)~~ for each interval and subsequently time weighted to determine the hourly Market Flow for each hour~~hour~~ of the relevant three year period agreed to by the Parties~~the years 2009, 2010 and 2011~~, the new M2M Entitlement will be determined for a representative week in each M2M Entitlement Period using the method established in Section 6.1 above. In the event of new or upgraded Transmission Facilities, Section 6.3 below sets forth the rules that will be used to adjust M2M Entitlements.

#### 6.2.1 Treatment of Out-of-Area Capacity Resources and Representation of Ontario/Michigan PARs in the M2M Entitlement Calculation Process

### 6.2.1.1 Modeling of External Capacity Resources

External capacity resources ~~will not~~may be included in the M2M Entitlement calculation ~~until such time as the Parties reach agreement regarding how external capacity resources should be handled in the M2M coordination process~~when the Parties mutually agree to their inclusion.

For the initial implementation of this M2M coordination process that will use 2009 through 2011 data to develop M2M Entitlements, the Parties have agreed that PJM will be permitted to include capacity that PJM has purchased from designated external network resources in the M2M Entitlement calculation. NYISO has not requested inclusion of any external capacity resources in the M2M Entitlement calculation for the initial implementation of M2M. When the Parties decide to update the data used to determine M2M Entitlements, they must also agree on the treatment of external capacity resources.~~Instead, each Balancing Authority's load will be served by that Balancing Authority's internal resources in the system model that is used to calculate M2M Entitlements.~~

### 6.2.1.2 Modeling of the Ontario/Michigan PARs

The Ontario/Michigan PARs will be modeled as not controlling power flows in the M2M Entitlement calculation process. The Parties agree that this modeling treatment is only appropriate when it is paired with the rules for calculating Market Flows and M2M settlements that are set forth in Sections 5 and 8 of this Agreement. The referenced Market Flow and M2M settlement rules are necessary because they are designed to ensure that M2M settlement obligations based on M2M Entitlements and Market Flows will not result in compensation for M2M redispatch when no actual M2M redispatch occurs.

The Parties have agreed to reconsider their treatment of the Ontario/Michigan PARs when the transmission lines at the Ontario/Michigan interface are PAR controlled and sufficient operational data has been collected to permit the Parties to mutually agree ~~on~~if changes to improve the method of reflecting the Ontario/Michigan PARs' impact on the M2M coordination process are required.

~~Two sets of M2M Entitlements will be calculated. In the first set of M2M Entitlements, the Ontario/Michigan interface will be represented as regulating (conforming actual power flows to scheduled power flows at the interface). In the second set of M2M Entitlements, the Ontario/Michigan interface will be represented as not regulating. The RTOs will retain both sets of M2M Entitlement results for future use.~~

~~Thirty days prior to the beginning of each M2M Entitlement Period the Parties will review the actual operating history of the Ontario/Michigan PARs for the immediately prior 12 months to determine when the Ontario/Michigan PARs adequately controlled actual power flows to match scheduled power flows.~~

~~If the Ontario/Michigan PARs were out-of-service or bypassed for an extended, consecutive period of one month or longer within the immediately prior 12 months, then the period during which the Ontario/Michigan PARs were out-of-service or bypassed will be~~

~~excluded from the Ontario/Michigan PAR operating history and a determination regarding whether or not the PARs were regulating will be made based on the Ontario/Michigan PAR operating history that is available for the immediately prior 12 months. However, if the exclusion of period(s) during which the Ontario/Michigan PARs were out-of-service or bypassed results in less than six months operating history being available in the immediately prior 12 months, then the M2M Entitlement set that reflects the modeling of the Ontario/Michigan PARs as not regulating will be used until there is at least six months operating history available for evaluation on the date that the Ontario/Michigan PAR operating history evaluation commences (thirty days prior to an upcoming M2M Entitlement Period).~~

~~If the Ontario/Michigan PAR operating history demonstrates that actual power flows at the Ontario/Michigan Interface were within ***a mutually agreed upon bandwidth*** of scheduled power flows in ***a mutually agreed upon minimum percentage*** of hours, then the M2M Entitlement set that reflects the modeling of the Ontario/Michigan PARs as regulating will be used for the upcoming M2M Entitlement Period. Otherwise, the M2M Entitlement set that reflects the modeling of the Ontario/Michigan PARs as not regulating will be used for the upcoming M2M Entitlement Period.~~

~~If any of the PARs at the Ontario/Michigan interface are out-of-service and expected to continue to be out-of-service for one month or more of an upcoming three month M2M Entitlement period, then the M2M Entitlement set that reflects the modeling of the Ontario/Michigan PARs as non-regulating will be used for that entitlement period.~~

### 6.3 M2M Entitlement Adjustment for New Transmission Facilities or Upgraded Transmission Facilities

This section sets forth the rules for incorporating new or upgraded Transmission Facilities~~, added after the reference year M2M Entitlements have been established,~~ into the M2M Entitlement calculation.

If the cost of a new or upgraded Transmission Facility is borne solely by the Market Participants of the ~~Monitoring~~ building RTO for the new or upgraded Transmission Facility, the Market Participants of the ~~Monitoring~~ building RTO will exclusively benefit from the increase in transfer capability on the ~~Monitoring~~ building RTO's Transmission Facilities. Therefore, the ~~Non-Monitoring~~non-building RTO's M2M Entitlements shall not increase as result of such new or upgraded Transmission Facilities. ~~Moreover~~Reciprocally, a ~~Monitoring~~ building RTO's M2M Entitlements on the non-building RTO's M2M Flowgates shall not ~~decrease~~ increase as a result of such new or upgraded Transmission Facilities.

To the extent a building RTO's upgrade or new Transmission Facility reduces the non-building RTO's impacts on one or more of the building RTO's M2M Flowgates by redistributing the non-building RTO's modeled flows, the non-building RTO's M2M Entitlement will be redistributed to ensure that the non-building RTO's aggregate M2M Entitlements on the building RTOs transmission system, including both existing M2M Flowgates and upgraded or new Transmission Facilities that are not yet M2M Flowgates, is not decreased.

In assessing the impact of transmission upgrades or new Transmission Facilities the non-building RTO's revised total circulation through the building RTO shall not result in a net increase in M2M Entitlements for the non-building RTO on the building RTO's transmission system. The formulas below shall be used to determine the pro-rata adjustment that shall be applied to determine the redistributed interval level and subsequently time weighted hourly Market Flow (the "Adjusted Market Flow"). **[NEW DEFINED TERM.]** Once an Adjusted Market Flow that incorporates the topology adjustment and reallocation of flows has been calculated for each hour of the three year period agreed to by the Parties, the new M2M Entitlement will be determined for each hour and day of the week in each M2M Entitlement Period using the method established in Section 6.1 above.

If Transmission Facilities outside the Balancing Authority Areas of the Parties are added or upgraded and the new or upgraded Transmission Facilities would, individually or in aggregate, cause a change in either Party's aggregate M2M Entitlements of at least 10%, then the Parties may mutually agree to incorporate those Transmission Facilities into the static transmission model used to perform the M2M Entitlement calculations.

**M2M Entitlement Adjusted Market Flow~~ment~~ Calculation ~~for the Non-Monitoring RTO~~:**

For all M2M Entitlement adjustments, the ~~Non-Monitoring~~non-building RTO is the non-funding market, and the ~~Monitoring~~ building RTO is the funding market.

First, determine the reference set of Market Flows, called Reference Year Market Flows, **[NEW DEFINED TERM]** using a static transmission model before adding any upgraded or new Transmission Facilities.

Second, account for new or upgraded Transmission Facilities in order from the first completed new/upgraded facility to the last (most recently completed) new/upgraded facility. Reflect the new/upgraded facilities (grouped by building RTO) in the reference year model to determine the new set of Market Flows called New Year Market Flows **[NEW DEFINED TERM]**.

Third, compare the New Year Market Flows to the Reference Year Market Flows (or Adjusted Market Flows from a previous iteration of upgraded or new Transmission Facilities), in net across all M2M Flowgates and upgraded or new Transmission Facilities, to determine whether the New Year Market Flows have increased or decreased relative to the Reference Year Market Flows (or Adjusted Market Flows).

- The comparison process is performed on a step-by-step basis. In some cases it will be appropriate to aggregate the impacts of more than one new or upgraded Transmission Facility into a single "step" of the evaluation. See the example provided below.

- If the comparison indicates that the non-building RTO's New Year Market Flows increased on a net basis, use the *Net Increased Adjusted Market Flow* formula

below to determine the Adjusted Market Flows, accounting for the new or upgraded Transmission Facility or Facilities.

- If the comparison indicates that the non-building RTO's New Year Market Flows decreased on a net basis, use the *Net Decreased Adjusted Market Flow* formula below to determine the Adjusted Market Flows, accounting for the new or upgraded Transmission Facility or Facilities.

- If the comparison indicates that the building RTO's New Year Market Flows decreased on a net basis, the changed flows will be reflected and no further adjustment is necessary, as the Building RTO's impacts on the non-building RTO's M2M Flowgates have decreased due to the building RTO's upgraded or new Transmission Facilities considered in the evaluation step.

- When the building RTO's New Year Market Flows on the non-Building RTO's Transmission Facilities increase on a net basis, use the *Net Increased Adjusted Market Flow* formula below to determine the Adjusted Market Flows, accounting for the new or upgraded Transmission Facility or Facilities. The building RTO's net M2M Entitlements to use the non-building RTO's transmission system will not be permitted to increase, but may be reallocated across the non-building RTO's M2M Flowgates.

**Net Increased Adjusted Market Flow Formula:**

$$M2M\ Flowgate\ Adjusted\ Market\ Flow_{M2M\ Flowgate} = New\ Year\ Market\ Flow_{M2M\ Flowgate} - \Big((New\ Year\ Market\ Flow_{M2M\ Flowgate} - Ref\ Year\ Market\ Flow_{M2M\ Flowgate}) \times \Big(New\ Year\ Market\ Flow_{M2M\ Flowgate} / (\sum_{M2M\ Flowgate \in M2M\ Flowgates_{RTO}} New\ Year\ Market\ Flow_{M2M\ Flowgate})\Big)\Big)$$

Where:

| | |
|---|---|
| M2M_Flowgate = | the relevant M2M Flowgate; |
| $M2M\ Flowgates_{RTO}$ | set of M2M Flowgates, including the new or upgraded Transmission Facilities (which may not be M2M Flowgates), for the relevant RTO; |
| $New\ Year\ Market\ Flow_{M2M\ Flowgate}$ = | the flow on the M2M Flowgate or Transmission Facility, calculated using the M2M Entitlement assumptions in Section 6.1 of this M2M coordination process and based on a transmission topology that incorporates the new and/or upgraded |

Transmission Facilities included in the current, and any previous, evaluation step(s); and

$Ref\ Year\ Market\ Flow_{M2M\_Flowgate}$ = the flow on the M2M Flowgate or Transmission Facility, calculated using the M2M Entitlement assumptions in Section 6.1 of the M2M coordination process, and based on the transmission topology that existed prior to adding the new or upgraded Transmission Facility or Transmission Facilities that are being evaluated in the current evaluation step.

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**Net Decreased Adjusted Market Flow Formula:**

$$New\ Facility\ Adjusted\ Market\ Flow_{new\ facility} = \left(Max\left(\left(\sum_{M2M\ Flowgate\ \in\ M2M\ Flowgate_{RTO}} Ref\ Year\ Market\ Flow_{M2M\ Flowgate} - New\ Year\ Market\ Flow_{M2M\ Flowgate}\right), 0\right) \times \left(New\ Year\ Market\ Flow_{new\ facility} / \left(\sum_{new\ facility\ \in\ new\ facilities_{RTO}} New\ Year\ Market\ Flow_{new\ facility}\right)\right)\right)$$

Where:

M2M_Flowgate = the relevant M2M Flowgate;

$M2M\ Flowgates_{RTO}$ = set of M2M Flowgates, including the new or upgraded Transmission Facilities (which may not be M2M Flowgates);

new facility = the [each?] new or upgraded Transmission Facility that is being evaluated in the current step;

$new\ facility_{RTO}$ = the set of new of upgraded Transmission Facilities that are being evaluated in the current step;

$New\ Year\ Market\ Flow_{M2M\ Flowgate}$ = the flow on the M2M Flowgate or Transmission Facility calculated using the M2M Entitlement assumptions in Section 6.1 of this M2M coordination process and based on a transmission topology that incorporates the new and/or upgraded Transmission Facilities included in the current, and any previous, evaluation step(s);

$Ref\ Year\ Market\ Flow_{M2M\_Flowgate}$ = the flow on the M2M Flowgate or Transmission Facility, calculated using the M2M Entitlement

| | |
|---|---|
| | assumptions in Section 6.1 of this M2M coordination process, and based on the transmission topology that existed prior to adding the new or upgraded Transmission Facility [or Transmission Facilities?] that are being evaluated in the current evaluation step; |
| New Year Market Flow$_{\text{new facility}}$ = | the flow on the new or upgraded Transmission Facility [or Transmission Facilities?] added in the current evaluation step, calculated using the M2M Entitlement assumptions in Section 6.1 of this M2M coordination process, and based on a transmission topology that incorporates the new and/or upgraded Transmission Facilities included in the current, and any previous, evaluation step(s); and |
| Ref Year Market Flow$_{\text{new facility}}$ = | the flow on the new or upgraded Transmission Facility or Transmission Facilities, calculated using the M2M Entitlement assumptions in Section 6.1 of this M2M coordination process and based on the transmission topology that existed prior to adding the new or upgraded Transmission Facility or Transmission Facilities that are being evaluated in the current evaluation step. |

The process for incorporating new or upgraded Transmission Facilities into the process of determining and reallocating M2M Entitlements is best illustrated with an example. The example below illustrates the building and non-building RTO Market Flow adjustments that will feed into the final M2M Entitlement determination that is set forth in Section 6.1 above. The example below does not include changes in load or generation in either RTO. The rules for reflecting changes in RTO load and generation in M2M Entitlements are set forth in Section 6.4 of this M2M coordination process.

**Example**

The Reference Year Market Flows for a given interval is:

- Flowgate A – NYISO Flowgate (PJM MF = 50)
- Flowgate B – NYISO Flowgate (PJM MF = 40)
- Flowgate C – PJM Flowgate (NYISO MF = 35)
- Flowgate D – PJM Flowgate (NYISO MF = 25)

Adding facilities 1 and 2 to the Reference Year information provided above, compute the New Year Market Flows for the same interval:

- Flowgate A – NYISO Flowgate (PJM MF = 45)
- Flowgate B – NYISO Flowgate (PJM MF = 42)
- Flowgate C – PJM Flowgate (NYISO MF = 37)
- Flowgate D – PJM Flowgate (NYISO MF = 20)
- Facility 1 – New PJM Transmission Line (NYISO MF = 15)
- Facility 2 – Upgraded PJM Transmission Line (NYISO MF = 10)

**Evaluation of PJM Entitlements on NYISO M2M Flowgates**

The PJM Net Market Flow = (Flowgate A + Flowgate B)
The PJM Net Reference Year Market Flow = (50 + 40) = 90
The PJM Net New Year Market Flow = (45 + 42) = 87

Since 87 < 90, PJM's New Year Market Flows on NYISO's M2M Flowgates change to 45 MW on Flowgate A and 42 MW on Flowgate B. It is not necessary to apply the *Net Increased Adjusted Market Flow* formula because the building RTO's net use of the non-building RTO's M2M Flowgates did not increase on a net basis.

**Evaluation of NYISO Entitlements on PJM M2M Flowgates and New/Upgraded Transmission Facilities**

The NYISO Net Reference Year Market Flow = (Flowgate C + Flowgate D)
The NYISO Net Reference Year Market Flow = (35 + 25) = 60
The NYISO New Year Market Flow = (37 + 20) = 57

Since 57 < 60, the NYISO's New Year Market Flows on PJM's M2M Flowgates change to 37 MW on Flowgate C and 250 MW on Flowgate D. It is not necessary to apply the *Net Increased Adjusted Market Flow* formula because the non-building RTO's net use of the building RTO's M2M Flowgates did not increase on a net basis.

It is necessary to recognize and record the NYISO's flows on PJM's new and upgraded Transmission Facilities. If and when PJM's new Transmission Facilities become M2M Flowgates (or components of one or more new M2M Flowgates), the NYISO will have an entitlement on the new M2M Flowgates.

Since 60 – 57 = 3 > 0, distribute the remaining 3MWs of the NYISO's net Reference Year Market Flow on the new transmission paths using the *New Facility Adjusted Market Flow* formula:

Facility 1 – New PJM Transmission Line (NYISO MF = Max((60-57),0)*(15/(15+10))
= 3*(15/25) = 1.8)
Facility 2 – Upgraded PJM Transmission Line (NYISO MF = 3*(10/25) = 1.2)

The NYISO Adjusted Market Flow = (37 + 20 + 1.8 + 1.2) = 60

The Adjusted Market Flows below become the new Reference Year Market Flows for determining the adjustment for facility 3, the next new or upgraded Transmission Facility.

- Flowgate A – NYISO Flowgate (PJM MF = 45)
- Flowgate B – NYISO Flowgate (PJM MF = 42)
- Flowgate C – PJM Flowgate (NYISO MF = 37)
- Flowgate D – PJM Flowgate (NYISO MF = 20)
- Path 1 – New PJM Transmission Line (NYISO MF = 1.8)
- Path 2 – Upgraded PJM Transmission Line (NYISO MF = 1.2)

When all facilities have been applied, the Adjusted Market Flows are then used to determine the M2M Entitlements by applying the calculation described in Section 6.2 above.

**6.4 M2M Entitlement Adjustment for a New Set of Generation, Load and Interchange Data**

Section 6.3 above addresses how new or upgraded transmission facilities will be reflected in the determination of M2M Entitlements. This section explains how the Parties will update the model used to determine M2M Entitlements to reflect new/updated generation, load and interchange information.

When moving the initial 2009-2011 period generation, interchange and load data forward, the RTOs will need to gather the data specified in Sections 6.1, 6.2 and (where appropriate) 6.3, above for the agreed upon three year period. The Parties must also mutually agree on whether, and the extent to which, they will include external capacity resources in the M2M Entitlement calculation.

In accordance with the rules specified in Sections 6.1, 6.2 and (where appropriate) 6.3, above, the new set of data will be used to establish a new Reference Year Market Flow and subsequently New Year and Adjusted Market Flows based on the new Reference Year Market Flow. The rules set forth above can be used to establish the M2M Entitlements with or without new or ~~/~~upgraded Transmission Facilities.

~~To the extent a Monitoring RTO's upgrade or new Transmission Facility results in reduced Non-Monitoring RTO's impacts on a Monitoring RTO's M2M Flowgate, the Non-Monitoring RTO's M2M Entitlement will be redistributed to ensure that the Non-Monitoring RTO's aggregate M2M Entitlements on all the Monitoring RTO's M2M Flowgates is not decreased.~~

~~The total Non-Monitoring RTO's circulation through the Monitoring RTO shall not result in net increased M2M Entitlement on the Monitoring RTO's system. Therefore, a formula agreed upon by the Parties shall be computed for each hour of the years 2009, 2010, and 2011 to determine the pro-rata adjustment that shall be applied to each Monitoring RTO's M2M Flowgates. Once a new raw entitlement that incorporates the topology adjustment has been~~

~~calculated (using a formula agreed upon by the Parties) for each hour of the years 2009, 2010 and 2011, the new M2M Entitlement will be determined for each hour and day of the week in each M2M Entitlement Period using the method established in Section 6.1 above.~~

## 7 Real-Time Energy Market Coordination

Operation of the Ramapo PARs and redispatch are used by the Parties in real-time operations to effectuate this M2M coordination process. Operation of the Ramapo PARs will permit the Parties to redirect energy to reduce the overall cost of managing transmission congestion and to converge the participating RTOs' cost of managing transmission congestion. Operation of the Ramapo PARs to manage transmission congestion requires cooperation between the NYISO and PJM. Operation of the Ramapo PARs shall be coordinated with the operation of other PARs at the NYISO – PJM interface.

When a M2M Flowgate that is under the operational control of either NYISO or PJM and that is eligible for redispatch coordination, becomes binding in the Monitoring RTOs real-time security constrained economic dispatch, the Monitoring RTO will notify the Non-Monitoring RTO of the transmission constraint and will identify the appropriate M2M Flowgate that requires redispatch assistance. The Monitoring and Non-Monitoring RTOs will provide the economic value of the M2M Flowgate constraint (i.e., the Shadow Price) as calculated by their respective dispatch models. Using this information, the security-constrained economic dispatch of the Non-Monitoring RTO will include the M2M Flowgate constraint; the Monitoring RTO will evaluate the actual loading of the M2M Flowgate constraint and request that the Non-Monitoring RTO modify its Market Flow via redispatch if it can do so more efficiently than the Monitoring RTO (i.e., if the Non-Monitoring RTO has a lower Shadow Price for that M2M Flowgate than the Monitoring RTO).

An iterative coordination process will be supported by automated data exchanges in order to ensure the process is manageable in a real-time environment. The process of evaluating the Shadow Prices between the RTOs will continue until the Shadow Prices converge and an efficient redispatch solution is achieved. The continual interactive process over the following dispatch cycles will allow the transmission congestion to be managed in a coordinated, cost-effective manner by the RTOs. A more detailed description of this iterative procedure is discussed in Section 7.1 and the appropriate use of this iterative procedure is described in Section 8.

### 7.1 Real-Time Redispatch Coordination Procedures

The following procedure will apply for managing redispatch for M2M Flowgates in the real-time Energy market:

1. M2M Flowgates shall be monitored per each RTO's internal procedures.
    a. When (i) the PARs ~~on~~at the Michigan-Ontario border are not in-service, and (ii) an M2M Flowgate is constrained to a defined limit (actual or contingency flow) by a non-transient constraint, and (iii) Market Flows are such that the Non-

Monitoring RTO may be able to provide an appreciable amount of redispatch relief to the Monitoring RTO, then the Monitoring RTO shall reflect the monitored M2M Flowgate as constrained.

b. When (i) the PARs ~~on~~at the Michigan-Ontario border are in-service, and (ii) an M2M Flowgate is constrained to a defined limit (actual or contingency flow) by a non-transient constraint, and (iii) Market Flows are such that the Non-Monitoring RTO may be able to provide an appreciable amount of redispatch relief to the Monitoring RTO, then the Monitoring RTO shall reflect the monitored M2M Flowgate as constrained.

c. M2M Flowgate limits shall be periodically verified and updated.

**2. Testing for an Appreciable Amount of Redispatch Relief and Determining the Settlement Market Flow:**

When the PARs ~~on~~at the Michigan-Ontario border are not in-service, the ability of the Non-Monitoring RTO to provide an appreciable amount of redispatch relief will be determined by comparing the Non-Monitoring RTO's Market Flow to the Non-Monitoring RTO M2M Entitlement for the constrained M2M Flowgate. When the Non-Monitoring RTO Market Flow (also the Market Flow used for settlement) is greater than the Non-Monitoring RTO M2M Entitlement for the constrained M2M Flowgate, the Monitoring RTO will assume that an appreciable amount of redispatch relief is available from the Non-Monitoring RTO and will engage the M2M coordination process for the constrained M2M Flowgate.

When the PARs at the Michigan-Ontario border are in-service, the ability of the Non-Monitoring RTO to provide an appreciable amount of redispatch relief will be determined by comparing either (i) the Non-Monitoring RTO's unadjusted Market Flow, or (ii) the Non-Monitoring RTO Market Flow adjusted to reflect the expected impact of the PARs at the Michigan-Ontario border, to the Non-Monitoring RTO M2M Entitlement for the constrained M2M Flowgate. The rules for determining which Market Flow (unadjusted or adjusted) to compare to the Non-Monitoring RTO M2M Entitlement when the PARs at the Michigan-Ontario border are in-service are set forth below.

**a. Calculating the Expected Impact of the PARs at the Michigan-Ontario Border on Market Flows**

The Non-Monitoring RTO's unadjusted Market Flow is determined as *RTO_MF* in accordance with the calculation set forth in Section 5 above. The expected impact of the PARs at the Michigan-Ontario border is determined as follows:

$$MICH-OH\_PAR\_Impact_{M2M\_Flowgate-m} = \sum_{MICH-OH\ Path=1}^{4} \left( \begin{matrix} \left(PSF_{(MICH-OH\ Path, M2M\_Flowgate-m)}\right) \times \\ \left(RTO\_MF_{MICH-OH\ Path} - LEC/4\right) \end{matrix} \right)$$

Where:

M2M_Flowgate-m = the relevant M2M Flowgate;

MICH-OH Path = each of the four PAR paths connecting Michigan to Ontario, Canada;

$MICH\text{-}OH\_PAR\_Impact_{M2M\_Flowgate\text{-}m}$ = the expected impact of the operation of the PARs at the Michigan-Ontario border on the flow on M2M Flowgate m;

$PSF_{(MICH\text{-}OH\ Path, M2M\_Flowgate\text{-}m)}$ = the PSF of each of the four Michigan-Ontario PAR paths on M2M Flowgate m;

$RTO\_MF_{MICH\text{-}OH\ Path}$ = the Market Flow for each of the four Michigan-Ontario PAR paths, computed in the same manner as the Market Flow is computed for M2M Flowgates in Section 5 above; and

LEC = Actual circulation around Lake Erie as measured by each RTO.

The Non-Monitoring RTO's adjusted Market Flow, reflecting the expected impact of the PARs on the Michigan-Ontario border, can be determined by adjusting the *RTO_MF* from Section 5 to incorporate the *MICH-OH_PAR_Impact* calculated above.

$$Adjusted\ RTO\_MF_{M2M\_Flowgate-m} = RTO\_MF_{M2M\_Flowgate-m} - MICH-OH\_PAR\_Impact_{M2M\_Flowgate-m}$$

Where:

M2M_Flowgate-m = the relevant flowgate;

MICH-OH Path = each of the four PAR paths connecting Michigan to Ontario, Canada;

$MICH\text{-}OH\_PAR\_Impact_{M2M\_Flowgate\text{-}m}$ = the expected impact of the operation of the PARs at the Michigan-Ontario border on the flow on M2M Flowgate m;

$RTO\_MF_{M2M\_Flowgate\text{-}m}$ = the Market Flow caused by RTO generation dispatch and transaction scheduling on M2M Flowgate m after accounting for the operation of both the common and non-common PARs; and

$Adjusted\ RTO\_MF_{M2M\_Flowgate\text{-}m}$ = the Market Flow caused by RTO generation dispatch and transaction scheduling on M2M Flowgate m after accounting for the operation of the common PARs, the non-common PARs, and the PARs at the Michigan-Ontario border.

**b. Determining Whether to Use Unadjusted Market Flow or Adjusted Market Flow; Determining if Appreciable Redispatch Relief is Available**

1) When the Non-Monitoring RTO's adjusted Market Flow equals the Non-Monitoring RTO's unadjusted Market Flow and the Non-Monitoring RTO's Market Flow (also the Market Flow used for settlement) is greater than the Non-Monitoring RTO M2M Entitlement for the constrained M2M Flowgate, the Monitoring RTO will assume that an appreciable amount of redispatch relief is available from the Non-Monitoring RTO and will engage the M2M coordination process for the constrained M2M Flowgate.

2) When the Non-Monitoring RTO's unadjusted Market Flow is greater than the Non-Monitoring RTO's adjusted Market Flow, then the following calculation shall be performed to determine if an appreciable amount of redispatch relief is expected to be available:

A. Determine the maximum of (a) the Non-Monitoring RTO's unadjusted Market Flow, and (b) the Non-Monitoring RTO's M2M Entitlement, for the constrained M2M Flowgate
B. Determine the minimum of (x) the value from step A above, and (y) the Non-Monitoring RTO's adjusted Market Flow

When the value from B above (the Market Flow used for settlement), is greater than the Non-Monitoring RTO's M2M Entitlement for the

constrained M2M Flowgate, the Monitoring RTO will assume that an appreciable amount of redispatch relief is available from the Non-Monitoring RTO and will engage the M2M coordination process for the constrained M2M Flowgate.

3) When the Non-Monitoring RTO's unadjusted Market Flow is less than the Non-Monitoring RTO adjusted Market Flow, the following calculation shall be performed to determine if an appreciable amount of redispatch relief is expected to be available:

A. Determine the minimum of (a) the Non-Monitoring RTO's unadjusted Market Flow, and (b) the Non-Monitoring RTO M2M Entitlement, for the constrained M2M Flowgate

B. Determine the maximum of (x) the value from A above, and (y) the Non-Monitoring RTO's adjusted Market Flow

When the value from B above (the Market Flow used for settlement), is greater than the Non-Monitoring RTO's M2M Entitlement for the constrained M2M Flowgate, the Monitoring RTO will assume that an appreciable amount of redispatch relief is available from the Non-Monitoring RTO and will engage the M2M coordination process for the constrained M2M Flowgate.

~~1.~~3. The Monitoring RTO initiates M2M, notifies the Non-Monitoring RTO of the M2M Flowgate that is subject to coordination and updates required information.

~~2.~~4. The Non-Monitoring RTO shall acknowledge receipt of the notification and one of the following shall occur:

~~1.~~a. The Non-Monitoring RTO refuses to activate M2M:

~~1.~~i. The Non-Monitoring RTO notifies the Monitoring RTO of the reason for refusal; and

~~2.~~ii. The M2M State is set to "Refused"; or

~~2.~~b. The Non-Monitoring RTO agrees to activate M2M:

~~1.~~i. Such an agreement shall be considered an initiation of the M2M process for operational and settlement purposes; and

~~2.~~ii. The M2M State is set to "Activated".

~~3.~~5. The Parties have agreed to transmit information required for the administration of this procedure, as per section 35.7.1 of the Agreement.

6. As Shadow Prices converge and approach zero or the Non-Monitoring RTO's Market Flows and Shadow Prices are such that an appreciable amount of redispatch relief can no longer be provided to the Monitoring RTO, the Monitoring RTO shall be responsible for

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the continuation or termination of the M2M process. Current and forecasted future system conditions shall be considered.[1]

a. When the Monitoring RTO's Shadow Price is not approaching zero the Monitoring RTO can (1) use the procedure called *Testing for an Appreciable Amount of Relief and Determining the Settlement Market Flow* from step 2b above, and (2) compare the Non-Monitoring RTO's Shadow Price to the Monitoring RTO's Shadow Price, to determine whether there is an appreciable amount of market flow relief being provided.

When the *Testing for an Appreciable Amount of Relief and Determining the Settlement Market Flow* procedure indicates there is not an appreciable amount of relief being provided, and the Non-Monitoring RTO Shadow Price is not less than the Monitoring RTO Shadow Price, then the Monitoring RTO may terminate the M2M coordination process.

~~4.~~7. Upon termination of M2M, the Monitoring RTO shall

~~1.~~a. Notify the Non-Monitoring RTO; and

~~2.~~b. Transmit M2M data to the Non-Monitoring RTO with the M2M State set to "Closed". The timestamp with this transmission shall be considered termination of the M2M process for operational and settlement purposes.

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## 7.2 Real-Time Ramapo PAR Coordination

The Ramapo PARs will be operated to facilitate interchange schedules while minimizing regional congestion costs. When congestion is not present, the Ramapo PARs will be operated to achieve the target flow as established below in Section 7.2.1.

In order to preserve the long-term availability of the Ramapo PARs, a maximum of 20 taps per PAR per day, and a maximum of 400 taps per calendar month will normally be observed.

### 7.2.1 Ramapo Target Value

A Target Value for flow between the NYISO and PJM shall be determined for each Ramapo PAR (the 3500 PAR and the 4500 PAR) ("$Target_{Ramapo}$"). These Target Values shall be determined by a formula based on the net interchange schedule between the Parties plus the deviation of actual flows and desired flows across the ABC and JK interfaces and shall be used for settlement purposes as:

[1] Termination of M2M redispatch may be requested by either RTO in the event of a system emergency.

$$Target_{Ramapo} = (RamapoInterchangeFactor) + (Actual_{JK} + RECo\_Load - Actual_{ABC}) - (Auto\ Correction\ Factor_{JK} - Auto\ Correction\ Factor_{ABC}) ~~((RamapoInterchangeFactor) + (WheelImbalance)(\ \ ))~~$$

Where:

$Target_{Ramapo} =$ Calculated Target Value for the flow on each Ramapo PAR (PAR3500 and PAR4500);

$RamapoInterchangeFactor =$ 61% of the net interchange schedule from PJM to NYISO over the AC tie lines distributed evenly across the in-service Ramapo PARs;

$Actual_{JK} =$ Telemetered real-time flow over the JK interface. A positive value indicates flows from NYISO to PJM;

$Actual_{ABC} =$ Telemetered real-time flow over the ABC interface. A positive value indicates flows from PJM to NYISO;

$RECo\_Load =$ 80% of the telemetered real-time Rockland Electric Company Load;

$Auto\ Correction\ Factor_{JK} =$ The JK interface Auto Correction component of the JK interface real-time desired flow as described in Schedule C to the Agreement. A positive value indicates flows from NYISO to PJM; and

$Auto\ Correction\ Factor_{ABC} =$ The ABC interface Auto Correction component of the ABC interface real-time desired flow as described in Schedule C to the Agreement. A positive value indicates flows from PJM to NYISO.

~~$WheelImbalance =$ As described in the wheel imbalance formula below, 72% multiplied by the imbalance of the 600/400 MW transactions described in Schedule C to the Agreement distributed evenly across the in-service Ramapo PARs;~~

~~$RemainingImbalance =$ As described in the remaining imbalance formula below, 28% multiplied by the imbalance of the JK/ABC transactions described in Schedule C to the Agreement distributed evenly across the in-service Ramapo PARs.~~

~~The Participating RTOs agree to compute the *WheelImbalance* and *RemainingImbalance* terms above as set forth below.~~

In accordance with Appendix 3 of Schedule C to the Agreement, the Participating RTOs will mutually agree on the circumstances under which they will allow up to thirteen percent of PJM to New York interchange schedules to flow over the ABC and JK interfaces. When ~~thirteen percent~~a portion of PJM to New York interchange schedules ~~is~~ are allowed to flow over the ABC and JK interfaces, the ~~thirteen percent~~allowed scheduled interchange will be captured as a change to the $Actual_{JK}$ and $Actual_{ABC}$ terms ~~below~~above.

~~The *WheelImbalance* is the distribution of actual flows over Ramapo that is incorporated in the Ramapo PAR Target Value when the actual flows on the ABC and JK interfaces do not perfectly match the ABC and JK interfaces desired flow.~~

$$WheelImbalance = 72\% \times \left( \left( Actual_{JK} - \left( RTE + Auto\ Correction\ Factor_{JK} \right) \right) - \left( Actual_{ABC} - \left( RTE + Auto\ Correction\ Factor_{ABC} \right) \right) \right)$$

~~Where:~~

~~$Actual_{JK}$ = Telemetered real-time flow over the JK interface, where positive indicates flows from NYISO to PJM;~~

~~$Actual_{ABC}$ = Telemetered real-time flow over the ABC interface, where positive indicates flows from PJM to NYISO;~~

~~$RTE$ =Con Edison real-time election pursuant to Schedule C to the Agreement, where positive indicates flows from the JK interface to the ABC interface;~~

~~$Auto\ Correction\ Factor_{JK}$ = The JK interface Auto Correction component of the JK interface real-time desired flow as described in Schedule C to the Agreement, where positive indicates flows from NYISO to PJM; and~~

~~$Auto\ Correction\ Factor_{ABC}$ = The ABC interface Auto Correction component of the ABC interface real-time desired flow as described in Schedule C to the Agreement, where positive indicates flows from PJM to NYISO.~~

~~The *RemainingImbalance* is the distribution of actual flows over the western free flow ties that is incorporated in the Ramapo PAR Target Value when the actual flows on the ABC and JK interfaces do not perfectly match the ABC and JK interfaces desired flow.~~

$$RemainingImbalance = 28\% \times \left( \left( Actual_{JK} - \left( RTE + Auto\ Correction\ Factor_{JK} \right) \right) - \left( Actual_{ABC\ s} - \left( RTE + Auto\ Correction\ Factor_{ABC} \right) \right) \right)$$

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~~Where:~~

~~$Actual_{JK}$ = Telemetered real-time flow over the JK interface, where positive indicates flows from NYISO to PJM;~~

~~$Actual_{ABC}$ = Telemetered real-time flow over the ABC interface, where positive indicates flows from PJM to NYISO;~~

~~$RTE$ =Con Edison real-time election pursuant to Schedule C to the Agreement, where positive indicates flows from the JK interface to the ABC interface;~~

~~$Auto\ Correction\ Factor_{JK}$ = The JK interface Auto Correction component of the JK interface real-time desired flow as described in Schedule C to the Agreement, where positive indicates flows from NYISO to PJM; and~~

~~$Auto\ Correction\ Factor_{ABC\ PARs}$ = The ABC interface Auto Correction component of the ABC interface real-time desired flow as described in Schedule C to the Agreement, where positive indicates flows from PJM to NYISO.~~

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### 7.2.2 Determination of the Cost of Congestion at Ramapo

The incremental cost of congestion relief provided by each Ramapo PAR shall be determined by each of the Parties. These costs shall be determined by multiplying each Party's Shadow Price on each of its M2M Flowgates by each Ramapo PAR's OTDF for the relevant M2M Flowgates.

The incremental cost of congestion relief provided by each Ramapo PAR shall be determined by the following formula:

$$Congestion\$_{(Ramapo,RTO)} =$$

$$\sum_{M2M\ Flowgates-m \in M2M\ Flowgates_{RTO}} \left(\text{~~}OTDFPSF_{(M2M\ Flowgate-m,Ramapo)} \times Shadow\$_{M2M\ Flowgate-m}\right)$$

Where:

| | |
|---|---|
| $Congestion\$_{(Ramapo,RTO)} =$ | Cost of congestion at each Ramapo PAR for the relevant participating RTO; |
| $M2M\ Flowgates_{RTO} =$ | Set of M2M Flowgates for the relevant participating RTO; |
| ~~$OTDFPSF_{(M2M\ Flowgate-m,Ramapo)}$~~ = | The ~~PAR OTDF~~PSF for each Ramapo PARs on M2M Flowgate–m; and |

$Shadow\$_{M2M\ Flowgate-m}$ = The Shadow Price on the relevant participating RTO's M2M Flowgate m.

### 7.2.3 Desired PAR Changes

If the NYISO congestion costs associated with the Ramapo PAR are greater than the PJM congestion costs associated with the Ramapo PAR, then hold or take taps into NYISO.

If the PJM congestion costs associated with the Ramapo PAR are greater than NYISO congestion costs associated with the Ramapo PAR, then hold or take taps into PJM.

Any action on the Ramapo PARs will be coordinated between the Parties and taken into consideration other PAR actions.

## 8 Real-Time Energy Market Settlements

### 8.1 Information Used to Calculate M2M Settlements

For each M2M Flowgate there are two components of the M2M settlement, a redispatch component and a Ramapo PARs coordination component. Both M2M settlement components are defined below.

For the redispatch component, market settlements under this M2M Schedule will be calculated based on the following:

1. the Non-Monitoring RTO's real-time Market Flow, determined in accordance with Section 7.1 above, on each M2M Flowgate compared to its M2M Entitlement for M2M Flowgates eligible for redispatch on each M2M Flowgate; and
2. the *ex-ante* Shadow Price at each M2M Flowgate.

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For the Ramapo PARs coordination component, Market settlements under this M2M Schedule will be calculated based on the following:

1. actual real-time flow on each of the Ramapo PARs compared to its target flow ($Target_{Ramapo}$);
2. Ramapo ~~PAR OTDF~~PSF for each M2M Flowgate; and
3. the *ex-ante* Shadow Price at each M2M Flowgate.

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### 8.2 Real-Time Redispatch Settlement

If the M2M Flowgate is eligible for redispatch, then compute the real-time redispatch settlement for each interval as specified below.

When $RT\_MktFlow_{M2M\ Flowgate-m} > M2M\_Ent_{M2M\ Flowgate-m}$,

$$MonRTO\_Payment_{M2M\ Flowgate-m} = Mon\_Shadow\$_{M2M\ Flowgate-m} \times \left(RT\_MktFlow_{M2M\ Flowgate-m} - M2M\_Ent_{M2M\ Flowgate-m}\right)$$

When $RT\_MktFlow_{M2M\ Flowgate-m} < M2M\_Ent_{M2M\ Flowgate-m,}$,

$$Non\_Mon\_Payment_{M2M\ Flowgate-m} = Non\_Mon\_Shadow\$_{M2M\ Flowgate-m} \times \left(M2M\_Ent_{M2M\ Flowgate-m} - RT\_MktFlow_{M2M\ Flowgate-m}\right)$$

Where:

$Non\_MonRTO\_Payment_{M2M\ Flowgate-m}$ = M2M redispatch settlement, in the form of a payment to the Non-Monitoring RTO from the Monitoring RTO, for M2M Flowgate m;

$MonRTO\_Payment_{M2M\ Flowgate-m}$ = M2M redispatch settlement, in the form of a payment to the Monitoring RTO from the Non-Monitoring RTO, for M2M Flowgate m;

$RT\_MktFlow_{M2M\ Flowgate-m}$ = real-time RTO_MF, determined for settlement in accordance with Section 7.1 above, for M2M Flowgate m;

$M2M\_Ent_{M2M\ Flowgate-m}$ = Non-Monitoring RTO M2M Entitlement for M2M Flowgate m;

$Mon\_Shadow\$_{M2M\ Flowgate-m}$ = Monitoring RTO's Shadow Price for M2M Flowgate m; and

$Non\_Mon\_Shadow\$_{M2M\ Flowgate-m}$ = Non-Monitoring RTO's Shadow Price for M2M Flowgate m.

### 8.3 Ramapo PARs Settlement

For each M2M Flowgate, compute the real-time Ramapo PAR settlement for each interval as specified below.

For each M2M Flowgate, when $Actual_{Ramapo} > Target_{Ramapo}$,

$$PJMPayment_{M2M\ Flowgate-m} = Shadow\$_{M2M\ Flowgate-m} \times \text{~~OTDF~~}PSF_{(M2M\ Flowgate-m,Ramapo)} \times \left(Actual_{Ramapo} - Target_{Ramapo}\right)$$

For each M2M Flowgate, when $Actual_{Ramapo} < Target_{Ramapo}$,

$$NYPayment_{M2M\ Flowgate-m} = Shadow\$_{M2M\ Flowgate-m} \times \text{~~O~~}PSF\text{~~TDF~~}_{(M2M\ Flowgate-m,Ramapo)} \times \left(Target_{Ramapo} - Actual_{Ramapo}\right)$$

Where:

$Actual_{Ramapo} =$ Measured real-time actual flow on each of the Ramapo PARs. For purposes of this equation, a positive value indicates a flow from PJM to the NYISO;

$Target_{Ramapo} =$ Calculated Target Value for the flow on each Ramapo PAR (PAR3500 and PAR4500) as described in Section 7.2.1 above. For purposes of this equation, a positive value indicates a flow from PJM to the NYISO;

$Shadow\$_{M2M\ Flowgate-m} =$ Shadow Price, as computed by the payee, for M2M Flowgate m;

$PSF\text{~~OTDF~~}_{(M2M\ Flowgate-m,Ramapo)} =$ The ~~PAR OTDF~~PSF for each Ramapo PARs for M2M Flowgate m;

$PJMPayment_{M2M\ Flowgate-m} =$ Ramapo PARs settlement, in the form of a payment to PJM from NYISO, for M2M Flowgate m; and

$NYPayment_{M2M\ Flowgate-m} =$ Ramapo PARs settlement, in the form of a payment to NYISO from PJM, for M2M Flowgate m.

### 8.4 Calculating a Combined M2M Settlement

The M2M settlement for each M2M Flowgate shall be the sum of the real-time redispatch settlement and Ramapo PARs settlement

If NYISO is the Monitoring RTO for the M2M Flowgate:

$$M2M\ Settlement_{M2M\ Flowgate\ m_i} = \left(\begin{matrix} MonRTO\ Payment_{M2M\ Flowgate\ m_i} - \\ Non\ MonRTO\ Payment_{M2M\ Flowgate\ m_i} + NYPayment_{M2M\ Flowgate\ m_i} \end{matrix}\right) \times {}^{s_i}/_{3600sec}$$

If PJM is the Monitoring RTO for the M2M Flowgate:

$$M2M\ Settlement_{M2M\ Flowgate\ m_i} = \left( \begin{matrix} MonRTO\ Payment_{M2M\ Flowgate\ m_i} - \\ Non\ MonRTO\ Payment_{M2M\ Flowgate\ m_i} + PJMPayment_{\ M2M\ Flowgate\ m_i} \end{matrix} \right) \times {}^{s_i}/_{3600sec}$$

Where:

$M2M\ Settlement_{M2M\ Flowgate\ m_i} =$ M2M settlement, defined as a payment from the Non-Monitoring RTO to the Monitoring RTO, for interval *i*; and

$Non\ MonRTO\ Payment_{M2M\ Flowgate\ m_i} =$ Non-Monitoring RTO payment to Monitoring RTO for congestion on M2M Flowgate m for interval *i*;

$MonRTO\ Payment_{M2M\ Flowgate\ m_i} =$ Monitoring RTO payment to Non-Monitoring RTO for congestion on M2M Flowgate m for interval *i*;

$PJMPayment_{\ M2M\ Flowgate\ m_i} =$ Ramapo PARs settlement, in the form of a payment to PJM from NYISO, for M2M Flowgate m for interval *i*;

$NYPayment_{\ M2M\ Flowgate\ m_i} =$ Ramapo PARs settlement, in the form of a payment to NYISO from PJM, for M2M Flowgate m for interval *i*; and$s_i =$ number of seconds in interval *i*.

For the purpose of settlements calculations, each interval will be calculated separately and then integrated to an hourly value:

$$M2M\_Settlement_h = \sum_{M2M\ Flowgate\ m}^{all} \sum_{i=1}^{n} M2M\_Settlement_{M2M\ Flowgate\ m_i}$$

Where:

$M2M\_Settlement_h =$ M2M settlement for hour *h*; and

*n* = Number of intervals in hour *h*.

Section 10.1 of this M2M Schedule sets forth circumstances under which the M2M coordination process and M2M settlements may be temporarily suspended.

## 9 When One of the RTOs Does Not Have Sufficient Redispatch

Under the normal M2M coordination process, sufficient redispatch for a M2M Flowgate may be available in one RTO but not the other. When this condition occurs, in order to ensure an operationally efficient dispatch solution is achieved, the RTO without sufficient redispatch will redispatch all effective generation to control the M2M Flowgate to a "relaxed" Shadow Price limit. Then this RTO calculates the Shadow Price for the M2M Flowgate using the available redispatch which is limited by the maximum physical control action inside the RTO. Because the magnitude of the Shadow Price in this RTO cannot reach that of the other RTO with sufficient redispatch, unless further action is taken, there will be a divergence in Shadow Prices and the LMPs at the RTO border.

A special process is designed to enhance the price convergence under this condition. If the Non-Monitoring RTO cannot provide sufficient relief to reach the Shadow Price of the Monitoring RTO, the constraint relaxation logic will be deactivated. The Non-Monitoring RTO will then be able to use the Monitoring RTO's Shadow Price without limiting the Shadow Price to the maximum Shadow Price associated with a physical control action inside the Non-Monitoring RTO. With the M2M Flowgate Shadow Prices being the same in both RTOs, their resulting bus LMPs will converge in a consistent price profile.

## 10 Appropriate Use of the M2M Process

Under normal operating conditions, the Parties will model all M2M Flowgates in their respective real-time EMSs. M2M Flowgates will be controlled using M2M tools for coordinated redispatch and coordinated operation of the Ramapo PARs, and will be eligible for M2M settlements.

### 10.1 Qualifying Conditions for M2M Settlement

**10.1.1 Purpose of M2M**. M2M was established to address regional, not local issues. The intent is to implement the M2M coordination process and settle on such coordination where both Parties have significant impact.

**10.1.2 Minimizing Less than Optimal Dispatch**. The Parties agree that, as a general matter, they should minimize financial harm to one RTO that results from the M2M coordination process initiated by the other RTO that produces less than optimal dispatch.

**10.1.3 Use M2M Whenever Binding a M2M Flowgate**. During normal operating conditions, the M2M redispatch process will be initiated by the Monitoring RTO whenever an M2M Flowgate that is eligible for redispatch is constrained and therefore binding in its dispatch. Coordinated operation of the Ramapo PARs is the default condition and does not require initiation by either Party to occur.

**10.1.4 Most Limiting Flowgate**. Generally, controlling to the most limiting Flowgate provides the preferable operational and financial outcome. In principle and as much as practicable, the M2M coordination process will take place on the most limiting Flowgate, and to that Flowgate's actual limit (thermal, reactive, stability).

**10.1.5 Abnormal Operating Conditions**. A Party that is experiencing system conditions that require the system operators' immediate attention may temporarily delay implementation of the M2M redispatch process or cease an active M2M redispatch event until a reasonable time after the system condition that required the system operators' immediate attention is resolved.

**10.1.6 Transient System Conditions.** A Party that is experiencing intermittent congestion due to transient system conditions including, but not limited to, interchange ramping or transmission switching, is not required to implement the M2M redispatch process unless the congestion continues after the transient condition(s) have concluded.

**10.1.7 Temporary Cessation of M2M Coordination Process Pending Review.** If the net charges to a Party resulting from implementation of the M2M coordination process for a market-day exceed five hundred thousand dollars, then the Party that is responsible for paying the charges may (but is not required to) suspend implementation of this M2M coordination process (for a particular M2M Flowgate, or of the entire M2M coordination process) until the Parties are able to complete a review to ensure that both the process and the calculation of settlements resulting from the M2M coordination process are occurring in a manner that is both (a) consistent with this M2M Coordination Schedule, and (b) producing a just and reasonable result. The Party requesting suspension must identify specific concerns that require investigation within one business day of requesting suspension of the M2M coordination process. If, following their investigation, the Parties mutually agree that the M2M coordination process is (i) being implemented in a manner that is consistent with this M2M Coordination Schedule and (ii) producing a just and reasonable result, then the M2M coordination process shall be re-initiated as quickly as practicable. If the Parties are unable to mutually agree that the M2M coordination process was being implemented appropriately, or of the Parties are unable to mutually agree that the M2M coordination process was producing a just and reasonable result, the suspension (for a particular M2M Flowgate, or of the entire M2M coordination process) shall continue while the Parties engage in dispute resolution in accordance with section 35.15 of the Agreement.

**10.1.8 Suspension of M2M Settlement when a Request for Taps on Common PARs to Prevent Overuse is Refused.** If a Party requests that taps be taken on any Common PAR to reduce the requesting Party's overuse of the other Party's transmission system, refusal by the other Party or its Transmission Owner(s) to permit taps to be taken to reduce overuse shall result in the Ramapo PAR settlement component of M2M (*see* Section 8.3 above) being suspended for the requesting Party

until the tap request is granted. The refusing Party shall not be relieved of any of its M2M settlement obligations.

### 10.2 After-the-Fact Review to Determine M2M Settlement

Based on the communication and data exchange that has occurred in real-time between the Parties, there will be an opportunity to review the use of the market-to-market process to verify it was an appropriate use of the M2M coordination process and subject to M2M settlement. The Parties will initiate the review as necessary to apply these conditions and settlements adjustments.

### 10.3 Access to Data to Verify Market Flow Calculations

Each Party shall provide the other Party with data to enable the other Party independently to verify the results of the calculations that determine the M2M settlements under this M2M Coordination Schedule. A Party supplying data shall retain that data for two years from the date of the settlement invoice to which the data relates, unless there is a legal or regulatory requirement for a longer retention period. The method of exchange and the type of information to be exchanged pursuant to section 35.7.1 of the Agreement shall be specified in writing. The Parties will cooperate to review the data and mutually identify or resolve errors and anomalies in the calculations that determine the M2M settlements. If one Party determines that it is required to self report a potential violation to the Commission's Office of Enforcement regarding its compliance with this M2M Coordination Schedule, the reporting Party shall inform, and provide a copy of the self report to, the other Party. Any such report provided by one Party to the other shall be Confidential Information.

## 11 M2M Change Management Process

### 11.1 Notice

Prior to changing any process that implements this M2M Schedule, the Party desiring the change shall notify the other Party in writing or via email of the proposed change. The notice shall include a complete and detailed description of the proposed change, the reason for the proposed change, and the impacts the proposed change is expected to have on the implementation of the M2M coordination process, including M2M settlements under this M2M Schedule.

### 11.2 Opportunity to Request Additional Information

Following receipt of the Notice described in Section 10.1, the receiving party may make reasonable requests for additional information/documentation from the other Party. Absent mutual agreement of the parties, the submission of a request for additional information under this Section shall not delay the obligation to timely note any objection pursuant to Section 10.3, below.

### 11.3 Objection to Change

Within ten business days after receipt of the Notice described in Section 10.1 (or within such longer period of time as the parties mutually agree), the receiving Party may notify in writing or via email the other Party of its disagreement with the proposed change. Any such notice must specifically identify and describe the concern(s) that required the receiving party to object to the described change.

**11.4 Implementation of Change**

The Party proposing a change to its implementation of the M2M coordination process shall not implement such change until (a) it receives written or email notification from the other Party that the other Party concurs with the change, or (b) the ten business day notice period specified in Section 10.3 expires, or (c) completion of any dispute resolution process initiated pursuant to this Agreement.