SCHEDULE [#]

Market-to-Market Coordination Process

DRAFT

Version 1.0

NYISO & PJM
Market-to-Market Coordination Schedule
Table of Contents

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 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 re-dispatch, 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 or Ramapo Par binding threshold, the shift factor threshold used to identify the resource available for re-dispatch 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 criteria 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 will be based on 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 re-dispatch.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

a. 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 OTDF 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 with all normally closed Transmission Facilities in-service representation of the Eastern Interconnection.

3.1 Potential M2M Flowgates that are eligible for re-dispatch coordination are also eligible for coordinated operation of the Ramapo PARs. Potential M2M Flowgates that are eligible for coordinated operation of the Ramapo PARs are not necessarily also eligible for re-dispatch coordination.

3.2 The GLDF or Ramapo OTDF thresholds for M2M Flowgates with multiple monitored elements are defined as:

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

ii. Two monitored elements, 7.5% GLDF/OTDF; and

iii. Three or more monitored elements, 10% GLDF/OTDF.

3.3 For potential M2M Flowgates that pass the above OTDF 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 re-dispatch 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 effects the impacts from coordinated operation of the Ramapo PARs causing the Flowgate to no longer pass the M2M Flowgate Studies. The Parties must 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 their 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

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:

$$Zonal\_\mathrm{Reduced}\_Load_{zone} = Zonal\_Total\_Load_{zone} - \sum_{scheduled\_line=1}^{all} \left(\mathrm{Import\_Schedules}_{scheduled\_line}\right)$$

Where:

zone =	the relevant RTO load zone;
scheduled_line =	each of the 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
$Import\_Schedules_{scheduled\_line}$ =	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
IESO-NYISO		IESO and NYISO
HQT-NYISO		HQT and NYISO
ISONE-NYISO		ISONE and NYISO
MISO-PJM		MISO and PJM
NYISO-PJM		NYISO and PJM
TVA-PJM		PJM and TVA

*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.

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

Where:

proxy = representations of defined sets of 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 all proxy import schedules.

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:

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

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:

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

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} = the real-time output of the unit.

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:

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

Where:

zone = the relevant RTO load zone;

scheduled_line = each of the 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; and

RTO_Gen_{zone} = the sum of the RTO's generation in a zone; and

$Export\_Schedules_{scheduled\_line}$ = 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.

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.

$$RTO\_Net\_Gen = \sum_{zone=1}^{all} \left(RTO\_Reduced\_Gen_{zone} \right)$$

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.

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

Where:

proxy = representation of defined sets of 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 all proxy export schedules.

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

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

Where:

unit =	the relevant generator;
Gen_Final_{unit} =	the portion of each unit's output that is serving the RTO Net Load;
Gen_{unit} =	the real-time output of the unit;
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;
$RTO\_GTL_{M2M\_Flowgate-m}$ =	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;
$GSF_{(unit,M2M\_Flowgate-m)}$ =	the shift factor for each unit on M2M Flowgate m; and

$RTO\_LSF_{M2M\_Flowgate-m}$ = 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 the PJM OASIS website. PJM shall provide to NYISO notice of any new or deleted non-common scheduling points.	non-common	PJM
NYISO shall file with FERC as a compliance filing each new or deleted NYISO non-common scheduling point. The NYISO shall provide to PJM notice of such a compliance filing.	non-common	NYISO

$$RTO\_Transfers_{sched\_pt} = \text{Imports}_{sched\_pt} + WheelsIn_{sched\_pt} - \text{Exports}_{sched\_pt} - WheelsOut_{sched\_pt}$$

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.

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

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;

$Parallel\_Transfers_{M2M\_Flowgate-m}$ = 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; and

$GSF_{(nc\_sched\_pt,\ M2M\_Flowgate-m)}$ = the generation shift factor of the non-common scheduling point on M2M Flowgate m.

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.

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

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;

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

$\text{RTO\_Transfers}_{\text{cmn\_sched\_pt}}$ = the net interchange schedule at a common scheduling point; and

$\text{GSF}_{(\text{cmn\_sched\_pt, M2M\_Flowgate-m})}$ = the generation shift factor of the common scheduling point on M2M Flowgate m.

5.6 Compute the PAR Effects on 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 redirecting.

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

Comment [b1]: PJM and NYISO are still discussing this language.

Comment [b2]: PJM and NYISO are still discussing this language.

					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 JOA.

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 sum of flow on the pars due to the operation of the pars;

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

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

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.

Comment [b3]: PJM and NYISO continue to discuss these provisions.

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

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

Where:

M2M_Flowgate-m = the relevant flowgate;

cmn_par = each of the common phase angle regulators 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;

$PAR\_SF_{(cmn\_par,M2M\_Flowgate-m)}$ = the shift factor of each of the common pars on M2M Flowgate m; and

$PAR\_Control_{cmn\_par}$ = the sum of flow on each of the common pars after accounting for the operation of the common 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:

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

Where:

M2M_Flowgate-m = the relevant flowgate;

cmn_par = the set of common phase angle regulators identified in Table 4 above;

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

$PAR\_SF_{(cmn\_par,M2M\_Flowgate-m)}$ = the shift factor of each of the common pars on M2M Flowgate m;

$RTO\_GTL_{cmn\_par}$ = the generation to loadflow for the Non-Monitoring RTO's entire footprint on each of the common pars; and

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

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

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

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;

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

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

Comment [b4]: PJM and NYISO continue to discuss this language.

Comment [b5]: PJM and NYISO continue to discuss this language.

Comment [b6]: PJM and NYISO continue to discuss this language.

Comment [b7]: PJM and NYISO continue to discuss this language.

Comment [b8]: PJM and NYISO continue to discuss this language.

<u>Non-Common PARs</u>

For the equations below, the NYISO will be credited or responsible for *PAR_REDIRECT* 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:

$$NC\_PAR\_Control_{M2M\_Flowgate\text{-}m} = \sum_{nc\_par=1}^{ALL} \left(PAR\_SF_{(nc\_par, M2M\_Flowgate\text{-}m)}\right) \times PAR\_Control_{nc\_par}$$

Where:

M2M_Flowgate-m = the relevant flowgate;

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

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

$PAR\_SF_{(nc\_par,M2M\_Flowgate-m)}$ = the shift factor of each of the non-common pars on M2M Flowgate m; and

$PAR\_Control_{nc\_par}$ = the sum of flow on each of the non-common pars after accounting for the operation of the non-common 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:

$$NC\_PAR\_MF_{M2M\_Flowgate-m} = \sum_{nc\_par=1}^{ALL} \begin{pmatrix} (PAR\_SF_{(nc\_par,M2M\_Flowgate-m)}) \times \\ (RTO\_GTL_{nc\_par} + Parallel\_Transfers_{nc\_par}) \end{pmatrix}$$

Where:

M2M_Flowgate-m = the relevant flowgate;

nc_par = the set of non-common phase angle regulators 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;

$PAR\_SF_{(nc\_par,M2M\_Flowgate-m)}$ = the shift factor of each of the non-common pars on M2M Flowgate m;

$RTO\_GTL_{nc\_par}$ = the generation to load flow, as computed above where the M2M Flowgate m is one of the non-common pars, for the Non-Monitoring RTO's entire footprint on each of the non-common pars; and

$Parallel\_Transfers_{nc\_par}$ = the flow, as computed above where the M2M Flowgate m is one of the non-common pars, on each of the non-common pars caused by interchange schedules at non-common scheduling points.

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

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

Where:

M2M_Flowgate-m = the relevant flowgate;

$NC\_PAR\_Redirect_{M2M\_Flowgate-m}$ =	the potential flow on M2M Flowgate m that is redirected by the operation of non-common 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; and
$NC\_PAR\_Control_{M2M\_Flowgate-m}$ =	the sum of flow on M2M Flowgate m after accounting for the operation of non-common pars.

Aggregate all PAR Effects for Each M2M Flowgate

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

Comment [b9]: PJM and NYISO continue to discuss this language.

$$PAR\_IMPACT_{M2M\_Flowgate-m} = PAR\_MF_{M2M\_Flowgate-m} - PAR\_Control_{M2M\_Flowgate-m}$$

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;
$PAR\_MF_{M2M\_Flowgate-m}$ =	the sum of flow on M2M Flowgate m due to the generation to load and interchange schedules on both common and non-common pars; and
$PAR\_Control_{M2M\_Flowgate-m}$ =	the sum of flow on M2M Flowgate m after accounting for the operation of both common and non-common pars.

Comment [b10]: PJM and NYISO continue to discuss this language.

Comment [b11]: PJM and NYISO continue to discuss this language.

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_MFC* for all M2M Flowgates as:

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

or

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

Where:

M2M_Flowgate-m =	the relevant flowgate;
$RTO\_MFC_{M2M\_Flowgate-m}$ =	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;
$RTO\_GTL_{M2M\_Flowgate-m}$ =	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 redirected after accounting for the operation of both the common and non-common pars.

The addition or subtraction of *PAR_IMPACT* in the equations above depends on how the direction of flow is modeled for both the PARs and the M2M Flowgates in the RTOs' EMS systems.

6 M2M Entitlement Determination

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 loop flows. 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 from 2009 through 2011;

4. a PAR redirect assumption that the PAR control is perfect; and
5. new or upgraded Transmission Facilities.

The Parties shall calculate the GLDFs using an 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 from 2009 through 2011, and load data from 2009 through 2011, the Parties shall calculate each Party's MW impact on each M2M Flowgate for each hour in 2009, 2010, and 2011. Using these impacts, the Parties shall create a reference year consisting of four periods for each M2M Flowgate. The periods are as follows:

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

Each period will contain a Non-Monitoring RTO's MW impact on the subject M2M Flowgate for each hour of a week (*i.e.*, seven consecutive twenty-four hour periods) that will serve as the representative week for each month in the period. Each hourly MW impact value for a M2M Flowgate will be calculated by averaging each of a Party's MW impact values on the M2M Flowgate for the same hour and day of the week being calculated, for each week in the three-month period, for 2009, 2010, and 2011. Each Party will use the M2M Entitlement from the same day and hour of the day of the corresponding three-month period for which the Market Flow is also being calculated.

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.

M2M Entitlement Calculation:

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
2. perfect PAR Control exists for the calculations.

$$RawEntitlement_{M2M\_Flowgate-m} = TopologyAdjustedGTL + Parallel\_Transfers_{M2M\_Flowgate-m} + Shared\_Transfers_{M2M\_Flowgate-m} + PAR\_REDIRECT_{M2M\_Flowgate-m}$$

Where:

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

$$Shared\_Transfers_{M2M\_Flowgate\text{-}m} = 0$$

and

$$PAR\_REDIRECT_{M2M\_Flowgate-m} = PAR\_MF_{M2M\_Flowgate-m} - PAR\_Control_{M2M\_Flowgate-m}$$

By assuming perfect PAR control, the *PAR_Control* variable in the previous equation is equal to zero, and the PAR Impacts equation simplifies to:

$$PAR\_REDIRECT_{M2M\_Flowgate-m} = PAR\_MF_{M2M\_Flowgate-m}$$

Where:

M2M_Flowgate-m =	the relevant Flowgate;
$PAR\_MF_{M2M\_Flowgate\text{-}m}$ =	the generation-to-load across all PARs on M2M Flowgate m;
$Parallel\_Transfers_{M2M\_Flowgate\text{-}m}$ =	the flow on M2M Flowgate m due to the historic net interchange schedules associated with long-term firm transmission service at the non-common scheduling point; and

Comment [b12]: PJM and NYISO continue to discuss this language.

Comment [b13]: PJM and NYISO continue to discuss these provisions.

TopologyAdjusted GTL is defined in section 6.3 below.

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

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

M2M Entitlement Adjustment Calculation for the Non-Monitoring RTO:

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

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, the following pro-rata M2M Entitlement adjustment shall be applied to each Monitoring RTO's M2M Flowgates:

$$TopologyAdjustedGTL = Ref\ Yr\ Act\ Gen\ Output \times NewGLDF \times \frac{Ref\ Yr\ Circ}{New\ Circ}$$

Where:

New GLDF = the GSF-LSF from the January current year model;

Ref Yr Act Gen Output = the generation and load data from the reference year (2009 through 2011);

New Circ = the total calculated circulation through the Monitoring RTO that would occur on the new model if the reference year load and generator dispatch were applied; and

Ref Yr Circ = the total calculated Non-Monitoring RTO's circulation through the Monitoring RTO in the reference year.

The circulation is determined as follows:

1) Create a Flowgate for: (a) the tie lines without controllable devices between the PJM and NYISO interface; and (b) the tie lines without controllable devices between the NYISO and Ontario interface.

2) Calculate the impacts on all of the M2M Flowgates and the Flowgates created in the previous step.

    a. Reference Year Circulation:

        i. Calculate the impacts on the M2M Flowgates and Flowgates with the GLDFs described in section 6.1 above and the 2009 to 2011 generation and load data.

ii. Sum all of the absolute value of the impacts on the Flowgates created in step 1 above divided by 2.

b. New Circulation:

i. Compute the impacts on the M2M Flowgates and Flowgates with the current year GLDF (with any new or upgraded Transmission Facilities) and the 2009-2011 generation and load data.

ii. Sum all of the absolute value of the impacts on the Flowgates created in step 1 above divided by 2.

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. PAR movements at Ramapo will be made to re-direct power flows in order to minimize regional congestion costs for M2M Flowgates. Operation of the Ramapo PARs shall occur in coordination with other PARs at the NYISO – PJM interface.

Comment [b14]: PJM and NYISO continue to discuss this section.

When a M2M Flowgate that is under the operational control of either NYISO or PJM and that is eligible for re-dispatch 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 re-dispatch assistance. The Monitoring and Non-Monitoring RTOs will provide the economic value of the 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 transmission constraint; the Monitoring RTO will evaluate the actual loading of the transmission constraint and request that the Non-Monitoring RTO redispatch its Market Flow if it can do so more efficiently than the Monitoring RTO (i.e., the Non-Monitoring RTO has a lower Shadow Price 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 <u>Real-Time Redispatch Coordination Procedures</u>

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. When an M2M Flowgate is constrained to a defined limit (actual or contingency flow) by a non-transient constraint, the Monitoring RTO shall consider it as a M2M constraint; limits are verified and updated as required.
2. The Monitoring RTO initiates M2M, notifies the Non-Monitoring RTO of the M2M Flowgate that is subject to coordination and updates required information.
3. The Non-Monitoring RTO shall acknowledge receipt of the notification and one of the following shall occur:
    a. The Non-Monitoring RTO refuses to activate M2M:
        i. The Non-Monitoring RTO notifies the Monitoring RTO of the reason for refusal; and
        ii. The M2M State is set to "Refused"; or
    b. The Non-Monitoring RTO agrees to activate M2M:
        i. Such an agreement shall be considered an initiation of the M2M process for operational and settlement purposes; and
        ii. The M2M State is set to "Activated".
4. The Parties have agreed to transmit information required for the administration of this procedure, as per section 35.7.1 of the Agreement.
5. As Shadow Prices converge, the Monitoring RTO shall be responsible for the continuation or termination of the M2M process. Current and forecasted future system conditions shall be considered.[1]
6. Upon termination of M2M, the Monitoring RTO shall
    a. Notify the Non-Monitoring RTO; and
    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.

7.2 <u>Real-Time Ramapo PAR Coordination</u>

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

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

A Target Value for flow between the NYISO and PJM shall be determined for each Ramapo PAR (the 3500 PAR and the 4500 PAR) ("RamapoTar"). These Target Value shall be determined by a formula based on the net interchange schedule between the Parties and shall be used for settlement purposes as:

$$Target_{Ramapo} = Factor \times PJM\_NYISO\_Schedule$$

Where:

$Target_{Ramapo} =$	Calculated Target Value for the flow on each Ramapo PAR (PAR3500 and PAR4500);
$Factor =$	61% of the net interchange schedule between PJM and NYISO over the AC tie lines distributed evenly across the in-service Ramapo PARs plus 72% of the imbalance of the 600/400 MW transactions described in Schedule C to the Agreement; and
$PJM\_NYISO\_Schedule =$	the net interchange schedule between PJM and NYISO over the AC tie lines.

Comment [b15]: PJM and NYISO continue to discuss this language.

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:

$$Congestion\$_{(Ramapo,RTO)} = \sum_{RTO \in M2M\ Flowgates} \left(OTDF_{(M2M\ Flowgate-m,Ramapo)} \times Shadow\$_{M2M\ Flowgate-m}\right)$$

Where:

$Congestion\$_{(Ramapo,RTO)} =$	Cost of congestion at each Ramapo PAR for the relevant participating RTO;
$RTO \in M2M\ Flowgates =$	Set of M2M Flowgates for the relevant participating RTO;
$OTDF_{(M2M\ Flowgate-m,Ramapo)} =$	The OTDF 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 Redirect

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.

8 <u>Real-Time Energy Market Settlements</u>

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.

Market settlements under this M2M Schedule will be calculated based on the following for the re-dispatch component:

1. the Non-Monitoring RTO's real-time Market Flow on each M2M Flowgate compared to its M2M Entitlement for M2M Flowgates eligible for re-dispatch on each M2M Flowgate; and
2. the Shadow Price at each M2M Flowgate.

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

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

8.2 Real-Time Redispatch Settlement:

If the M2M Flowgate is eligible for re-dispatch, then compute the real-time re-dispatch 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 $RT\_MktFlow_{M2M\ Flowgate-m} < M2M\_Ent_{M2M\ Flowgate-m,}$,

$$Non_{MonRTO_{Payment}}{}_{M2M\ Flowgate-m} = Non_{Mon_{Shadow\$}}{}_{M2M\ Flowgate-m} \times \left(M2M\_Ent_{M2M\ Flowgate-m} - RT\_MktFlow_{M2M\ Flowgate-m}\right)$$

Where:

$Non\_MonRTO\_Payment_{M2M\ Flowgate-m} =$	M2M re-dispatch settlement, in the form of a payment (when positive) or charge (when negative) to the Non-Monitoring RTO, for M2M Flowgate m;
$MonRTO\_Payment_{M2M\ Flowgate-m} =$	M2M re-dispatch settlement, in the form of a payment (when positive) or charge (when negative) to the Monitoring RTO, for M2M Flowgate m;
$RT\_MktFlow_{M2M\ Flowgate-m} =$	real-time Market Flow 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 $Actual_{Ramapo} > Target_{Ramapo}$,

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

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

$$NYPayment_{\ M2M\ Flowgate-m} = Shadow\$_{M2M\ Flowgate-m} \times OTDF_{(M2M\ Flowgate-m,Ramapo)} \times \left(Target_{Ramapo} - Actual_{Ramapo}\right)$$

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). 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;

$OTDF_{(M2M\ Flowgate-m,Ramapo)}$ = The OTDF for each Ramapo PARs for M2M Flowgate m;

$PJMPayment_{\ M2M\ Flowgate-m}$ = Ramapo PARs settlement, in the form of a payment (when positive) or charge (when negative) to PJM, for M2M Flowgate m; and

$NYPayment_{\ M2M\ Flowgate-m}$ = Ramapo PARs settlement, in the form of a payment (when positive) or charge (when negative) to NYISO, 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:

$$M2M\_Settlement_{M2M\ Flowgate-m_i} = \left(MonRTO\_Payment_{M2M\ Flowgate-m_i} - Non\_MonRTO\_Payment_{M2M\ Flowgate-m_i} + NYPayment_{\ M2M\ Flowgate-m_i}\right) \times {}^{s_i}/_{3600sec}$$

If PJM is the Monitoring RTO for the M2M Flowgate:

$$M2M\_Settlement_{M2M\ Flowgate-m_i} = \left(MonRTO\_Payment_{M2M\ Flowgate-m_i} - Non\_MonRTO\_Payment_{M2M\ Flowgate-m_i} + PJMPayment_{\ M2M\ Flowgate-m_i}\right) \times {}^{s_i}/_{3600sec}$$

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 (when positive) or charge (when negative) to PJM, for M2M Flowgate m for interval *i*;

$NYPayment_{M2M\ Flowgate-m_i} =$ Ramapo PARs settlement, in the form of a payment (when positive) or charge (when negative) to NYISO, 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:

$$Settlement_h = \sum_{i=1}^{n} Settlement_i$$

$$M2M\_Settlement_h = \sum_{i=1}^{n} M2M\_Settltment_i$$

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 <u>Qualifying Conditions for M2M Settlement</u>

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 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.

10.1.8 Temporary Cessation of M2M Coordination Process Pending Review

a. 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 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 the Parties' investigation of the identified concerns indicates that the M2M coordination process is (a) being implemented in a manner that is consistent with this M2M Coordination Schedule and (b) producing a just and reasonable result, then the M2M coordination process shall be re-initiated as quickly as practicable.

10.1.9 Suspension of M2M Settlement when a Request for Ramapo PAR Taps to Prevent Overuse is Refused. If a Party requests that taps be taken on the Ramapo PARs 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 on the Ramapo PARs to reduce overuse may result in the Ramapo PAR settlement component of M2M being suspended for the requesting Party until the tap request is granted, if such refusal is unreasonable.

Comment [b16]: PJM and NYISO continue to discuss this language.

Comment [b17]: PJM and NYISO continue to discuss this language.

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 market-to-market 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.