

CHANGE CONTROL FORM

ORIGINATOR'S NAME: NERC IDCWG
ORIGINATION DATE: 16 January 2003
SPONSOR: NERC IDCWG

MARK-UP BY:

MARK-UP DATE:

REVISION: I – 01/16/2003
II – 01/24/2003
III – 02/07/2003
IV – 02/20/2003
V – 05/09/2003
VI – 06/09/2003
VII – 06/24/2003
VIII – 06/30/2003
IX – 08/27/2003
X – 09/09/2003

CHANGE REQUEST SUMMARY: PJM-MISO Congestion Management Coordination in the IDC

CHANGE REQUEST DETAIL:

Revision I: January 16th, 2003

The growth of PJM market footprint to include AEP and DPL control areas and the initiation of the MISO market footprint later in the year will decrease the IDC ability to accurately represent e-tags that source or sink within the new PJM and MISO footprints. In addition, with the increase of the PJM and MISO market footprint dispatches, a large number of market transactions (NON-FIRM) will no longer be modeled in the IDC through e-tags, except perhaps as Native and Network Load (NNL) in TLR levels 5A and 5B as FIRM transactions. The loss of granularity and lack of representation of the PJM and MISO market NON-FIRM transactions reduces the IDC ability to perform transaction curtailments and NNL redispatch that are fair and equitable to market participants that use e-tags, and to control areas and RTOs that use NNL.

The objective of this change order is to assess the costs and implications of two proposed methodologies for modifying the IDC to more accurately represent market flows and e-tags on large footprint control areas and RTOs. It is understood that either of the two proposals may require changes to the NERC Policy 9. These alternatives are as follows:

Alternative A: Implementation of the recommendations proposed on the NERC IDC Granularity Task Force – Status Update – presentation by Lanny Nickell (SPP) to the CMS/ORS joint meeting on December 4th, 2002.

Alternative B: Implementation of the recommendations proposed in Option 3 of the PJM/MISO Congestion Management Seams Issue Whitepaper – Version 2A of January 14th, 2003. This document proposes three options, however the IDCWG in its meeting in Ft. Lauderdale, FL, on January 14th and 15th requested OATI to assess Option 3.

In this change order, NERC requests OATI to assess the efforts and costs associated with design, implementation, integration, testing and deployment of each of the two alternatives above, including any assumptions that are necessary for the evaluation of this change order due to the lack of details in the documents of Alternatives A and B. OATI is asked to, when necessary, to make the assumptions that preserve the current NERC Policy 9 principles of fairness and equitability for the curtailment of e-tags and redispatch of RTO and control area NNLs.

OATI is also requested to provide an assessment of the effort that will be required from other industry participants with respect to changes to:

- E-Tag systems
- Communication infrastructure between the IDC and control areas and RTOs
- Control Areas, Transmission Providers and RTOs backend systems
- NERC effort (NERC Master Registry, SDX, ISN, etc.)

Revision II: January 24th, 2003

In this Revision II, the following modifications have been made to this change order request:

- *Alternative A* is removed from the Change Order #114, and added to a separate Change Order #115. All comments related to this Alternative A are removed. (01/24/2003)
- *Alternative B* has been rejected by PJM, MISO and NERC on a conference call (01/24/2003)
- *Alternative C* is added – implementation of the recommendations proposed in Option 2 of the PJM/MISO Congestion Management Seams Issue Whitepaper – Version 2A of January 14th, 2003. This document proposes three options, per request of PJM and MISO; however at a conference call with PJM, MISO and NERC on January 24th, 2003, these entities have decided to only pursue a detailed assessment of Option 2 of the PJM-MISO whitepaper.

Revision III: February 7th, 2003

In this Revision III, the following modifications have been made to this change order request in regards to Alternative C:

- Unit ownership factors will not be transferred from the IDC to the PJM RTO. Instead, the PJM RTO will be responsible for updating the PJM's unit ownership factors in the IDC.
- PJM will provide the IDC with PJM marginal generators in the form of unit participation/weighting factors for the calculation of TDFs. PJM intends to transfer the IDC a set of unit participation factors at every LMP cycle (every 5 minutes) with different weighting factors for different flowgates. These could potentially include about 600 unit participation factors for each of the 400 or so coordinated flowgates.
- PJM will provide the IDC with their total NNL contribution, total market flow contribution and total economic dispatch contribution (different between the total market flow and total NNL contribution) on each of the 400 or so coordinated flowgates. This information includes the current and next cycle and next hour projections for these values, and will be provided to the IDC at every LMP cycle (every 5 minutes).
- PJM will provide the IDC with its control zone total load and net interchange at every LMP cycle (every 5 minutes). The IDC will provide this data to all other Reliability Coordinators in the form of a "Schedule Dump" similar in functionality to the current "Tag Dump".
- For the purpose of TLR calculations, the IDC will use the unit participation factors available at the time of the TDF/GSF calculation cycle.
- All data exchange communication between the IDC and PJM is to be performed through e-tag mechanisms (SOAP/XML) by creating new e-tag messages that PJM would be required to provide the

IDC. OATI is asked to provide a first-draft of the XML schema to be appended to the e-tag specification. The draft will go for modification and approval by the NERC OSC.

- When there are multiple possible options for providing the functionality described in this change order request, OATI is asked to estimate the option that would require the least amount of changes to the IDC and can be implemented in the shortest amount of time.
- Whenever necessary, OATI is asked to make the assumptions that would require the least amount of changes to the IDC and can be implemented in the shortest amount of time.

Revision IV: February 20th, 2003

In this Revision IV, the following modification has been made to this change order request in regards to Alternative C:

- PJM will provide the IDC with different zonal participation factors for import and export. However the zonal participation factors will be the same for all flowgates. The IDC should compute different TDFs for tags that source (export) and sink (import) into PJM, based on the import and export participation factors.

Revision V: May 9th, 2003

In this Revision V, the MISO LMP market has been added to the change order as another Market that will be participating in supplying the IDC with market flow information. All references to the PJM LMP market are now relevant to the MISO LMP market as well.

The following modifications have been made to this change order request in regards to Alternative C:

- The PJM and MISO markets will provide the IDC with market dispatch contribution values for priorities 1 through 5 as well as the previously stated 6 and 7. The IDC should use these values when performing curtailments in those priority buckets as the LMP market contribution. A determination of where the LMP value would best be put in the sub-priorities of the bucket will be made and brought to the necessary groups for approval.
- These market dispatch contribution values may be sent for Day-Ahead information as well as Real-Time.

Revision VI: June 9th, 2003

- This Revision VI is the result of clarifications from the June 9th, 2003 conference call.

Revision VII: June 24th, 2003

- This Revision VII is the result of clarifications from the June 24th, 2003 conference call between MISO, PJM, IDCWG and NERC.

Revision VIII: June 30th, 2003

- This Revision VIII is the result of clarifications from the June 30th, 2003 conference call between MISO, PJM, IDCWG and NERC.

Revision IX: August 27th, 2003

- This Revision IX is the result of additional requirement to incorporate Commonwealth Edison (CE) into the PJM market footprint, including the following:
 - The IDC will receive from PJM bi-directional market flow information for each coordinated flowgate for ED-6 (priority 6), ED-2 (priority 2) and NNL (priority 7) for the PJM-CA and the CE-CA.
 - The IDC will receive from PJM bi-directional unconstrained market flow information for each coordinated flowgate for ED-6, ED-2 and NNL for the PJM-CA and the CE-CA.
 - The IDC will receive from PJM the CE-PJM Pathway Dynamic Schedule value every 15 minutes, or more often.
 - The IDC will provide additional granularity of the PJM and CE control areas through the zonal modeling. PJM will provide the IDC the import and export zonal weighting factors for the PJM and CE control areas. The IDC will compute the individual zones TDFs and weight them accordingly to generate the PJM and CE import and export TDFs. The IDC will also calculate the PJM and CE TDFs for their historical footprint.
 - The IDC will model specific service points within the PJM and CE control areas to be used in specific tags. This modeling is similar to the pseudo control area model the IDC uses today. The will compute the TDFs of these service points.
 - The TDF of a tag on a given flowgate is determined according to the rule:
 - For tags that source in the PJM or CE control areas and the source point is mapped to a granular service point, the TDF of the source will be that of the granular service point. The TDF of the sink will be that of the sink CA. If the sink CA is PJM or CE, the sink TDF will be the PJM or CE import TDF.
 - For tags that source in PJM or CE and sinks in PJM or CE, and the source point is **not** mapped to a granular service point, the IDC will use the source and sink TDFs those computed from the PJM and CE historical footprint.
 - For tags that source in the PJM or CE control area and sinks outside of the PJM market footprint, the source TDF will be the PJM/CE export TDF.
 - For tags that sink in the PJM or CE control area and sources outside of the PJM market footprint, the sink TDF will be the PJM/CE import TDF.
 - The IDC will model the PJM-CE Pathway through the use of Dynamic Schedules. The Dynamic Schedules between the PJM and CE control areas will be tagged and updated every 15 minutes (or more often). Every time a TLR level 1 is issued on a coordinated flowgate for which the dynamic schedules impact the flowgate by 5% or more, the IDC notify the PJM market.
 - The IDC will **not** treat PJM/CE dynamic schedules any different than a regular tag during a TLR.
 - The IDC will provide the PJM market with a TLR output that will include the following:
 - Flowgate number
 - Direction of TLR (from-to or to-from)
 - TLR level
 - Effective time
 - Market flow input value used by the IDC for ED-2, ED-6 and NNL
 - Target market flow value (curtailment/reschedule output from the IDC)
 - The IDC will display all pertinent data associated with the PJM market flows on its user interface.

- This Revision X is the result of clarifications from the September 9th, 2003 conference call between MISO, PJM, IDCWG and NERC where the IDCWG approved the implementation of this Change Order.

EVALUATOR'S SECTION:

Evaluator's Name: OATI

Date: Revision I: January 19, 2003
Revision II: January 30, 2003
Revision III: February 8, 2003
Revision IV: February 20, 2003
Revision V: June 5, 2003
Revision VI: June 12, 2003
Revision VII: June 24, 2003
Revision VIII: June 30, 2003
Revision IX: August 27, 2003
Revision X: September 9, 2003

PROPOSED CHANGE DESCRIPTION:

1. Introduction

This Change Order response focuses on the Revision V of this request and the clarifications from the conference call of June 9th, that make up Revision VI. For a complete history of this change order, please refer to Revision IV of this Change Order response, dated February 20th, 2003. All the history of this change order has been removed from this document so as not to confuse the reader.

Note: *At the time this change order response is provided the merger of the ComEd control area into the PJM market footprint has not been finalized. In case ComEd does not join the PJM market the implementation of this change order will still be valid by regarding ComEd as any other control areas outside of the PJM market footprint. This change order also provides the foundation for the implementation of the incorporation other control areas into the PJM market.*

The implementation of this change order also assumes that the MISO market implementation with respect to the IDC will be identical to the PJM market implementation. Nevertheless, this change order does not support potential deviations of the IDC MISO market implementation from the PJM MISO market implementation.

2. Main Objectives

The objective of this Change Order #114 is to modify the IDC to provide a seams coordination methodology that handles the large footprint financial markets and their contributions to the flow on flowgates. The main changes proposed in this Change Order are:

- Modify the IDC to compute Transfer Distribution Factor (TDF) for zones within the large footprint RTOs, as well as the TDF for the RTO footprint.
- Model financial markets marginal generators whereby the IDC will compute different RTO TDFs for import and export using a dynamic set of generator participation factors that model the financial markets marginal generators. Currently, the IDC computes TDFs for the control areas defined in the base case, using the base case network model, transmission and generation outages provided through SDX, and static generation participation factors as the MBASE in the base case. Instead of one set of static generator participation factors used for import and exports, the IDC will receive from the RTOs periodic updates of the generator

participation factors for imports and exports, and it will use those to compute the RTO footprint TDFs.

- With the expansion of the RTO footprints all internal transactions that are currently tagged will now be modeled within the RTO Security Constrained Economic Dispatch (SCED) solution. With the reduction in tags the IDC may no longer be able to provide relief through tag curtailment and control area NNL redispatch. This Change Order requires the IDC to modify its TLR logic so as to model the RTOs Day-Ahead NNL contributions to the flow on the flowgates (priority 7), and the current flow and next-hour projected market dispatch contributions provided by the RTOs periodically during the hour (no more often than every 5 minutes). The IDC will make use of the market contributions at different priority levels provided by the RTO as a replacement for tags in its TLR calculations.
- Incorporate the expansion of Commonwealth Edison (ComEd or CE) control area into the PJM market footprint.
- Enhance the IDC model of specific generators within the PJM market footprint (PJM or CE control areas) to avoid double counting of energy transactions and provide additional granularity.

3. Data Inputs

The RTO markets will provide the IDC with the following input data:

- Hourly Day-Ahead expected NNL contribution on every coordinated flowgate in both directions. *This data will be provided to the IDC at least once a day but no more frequent than once an hour.*
- Market contributions on coordinated flowgates – PJM and/or MISO will provide the IDC the current and next hours projected market flow contributions from each service priority (priorities 7, 6 and 2) on every coordinated flowgate, and the estimated unconstrained market flow contributions on the coordinated flowgates for service priorities 7, 6 and 2 to be used as reload values for these priorities. These market flow contributions will be provided bi-directional. *This data will be provided to the IDC at most every 5 minutes.*
- Marginal generators on the markets' LMP solutions. Two sets of data will be provided for this purpose:
 - Individual generator participation factors. *This data will be provided to the IDC at most once an hour.*
 - Marginal market zone participation factors. *This data will be provided to the IDC at most at every 5 minutes.*
- The RTOs will provide the IDC with their control zone forecast load and inter-zone interchange for the next day. This data will be disseminated through the IDC Tag Dump for the control areas, reliability coordinators to perform contingency analysis studies for the next day. *This data will be provided to the IDC once a day.*
- The RTO will provide their next day hourly control zone load forecast and net interchange amounts at 12 PM CST and again updated as more accurate data is available for the next day. The current day net interchange and load forecast amounts should be sent no later than 12 AM CST and again updated as more accurate data is available.

- Every hour, the RTOs will provide the IDC with the current and next hours control zone forecast load and inter-zone net interchange. This data will be disseminated through the IDC Tag Dump for the control areas, reliability coordinators to *perform* contingency analysis. *This data will be provided to the IDC once every hour.*

4. IDC Changes to Support the RTO Markets

In order for the IDC to support the proposed approach for dealing with the RTO markets in this Change Order request the following issues are addressed:

- **IDC Base Case Model and Book of Flowgates Changes**

In this change order, the RTO markets will be partitioned into zones. PJM has indicated its footprint would be partitioned in approximately 25 zones, while MISO has indicated its footprint would be partitioned into roughly 50 zones. The IDC PSSE base case will be modified to model the market zones. The market zones will be modeled in the IDC as service points, just as all other PSSE base case control areas and pseudo control areas are modeled today.

Each RTO will model their market zones as PSSE base case control areas – the service points become the PSSE base case control areas. Special market footprint service points (import and export) would be created as the union of all the market zone service points with specific marginal zone weighting factors.

OATI will provide user interface facilities within the IDC to create IDC Service Points comprised of sets of generator buses that the IDC will compute TDFs for. In addition, the IDC user interface will allow for the mapping of specific Source Points in the NERC Master Registry to Service Points. Any tag that sources in these specific NERC Registry Source Points will be marked as sourcing from the Service Points instead of the traditional GCA of the tag. The mappings will be visible to all IDC users through the user interface, however edited only by the IDC Administrator.

- **TDF Calculation Changes**

The IDC will calculate TDFs for all defined service points – control areas, pseudo control areas, market. The calculation of the control areas, pseudo control areas and market zones service point TDFs will follow the same approach used in the current IDC, whereby the TDFs equal to the weighted sum of the generators' GSFs within each service point.

$$TDF^{CA/Zone} = \sum_n MBASE_n \times GSF^n / \sum_n MBASE_n$$

Where $TDF^{CA/Zone}$ represents the TDF of the control area, pseudo control area or market zone, $MBASE_n$ represents the generator n participation factor, and GSF^n is the generator shift factor of generator n in the control area/zone.

The generator MBASE for the control areas and pseudo control areas service points are static and defined in the PSSE base case; while the MBASE for the market zones are defaulted to the PSSE base case, however a messaging mechanism will enable the markets to update these MBASE to model marginal generators within each zone. The RTO markets may update the MBASE of their generators at most once every hour. The TDFs calculated by the IDC will reflect the modified market MBASE at its next calculation cycle (automatically at the top of the hour, or on demand at the 20 and 40 minute of the hour).

The RTO market footprint TDFs will be explicitly calculated as the weighted sum of the markets' zonal TDFs. That is,

$$TDF^{RTO} = \sum_n W_n \times TDF^{Zone}_n / \sum_n W_n$$

Where TDF^{RTO} is the RTO footprint TDF, W_n is the RTO zone n weighting factor, and TDF^{Zone}_n is the TDF of zone n in the RTO.

The zone weighting factor, W_n , models the RTO markets marginal zones. Furthermore, the RTO markets may provide different zone weighting factor for imports and exports. Thus, in essence, the IDC will calculate¹:

$$TDF^{import-RTO} = \sum_n W_{import-n} \times TDF^{Zone}_n / \sum_n W_{import-n}$$

$$TDF^{export-RTO} = \sum_n W_{export-n} \times TDF^{Zone}_n / \sum_n W_{export-n}$$

The TDF for a Point-to-Point transaction that source in the RTO is:

$$TDF^{Tag} = TDF^{export-RTO} - TDF^{sink}$$

While the TDF for a Point-to-Point transaction that sinks in the RTO is:

$$TDF^{Tag} = TDF^{source} - TDF^{import-RTO}$$

The TDF for transactions that source and sink outside the RTO markets are unaffected by the markets internal modeling.

The IDC will also compute the historical PJM control area and historical CE control area TDFs using the IDC base case MBASE values.

- **IDC handling of market contributions:**

The IDC will receive from the RTOs their real-time and hour-ahead market contributions to the flow on the flowgates for different priorities (7, 6 and 2). The IDC will also receive from the markets the unconstrained contributions for the current and next hours for priorities 7, 6 and 2.

The unconstrained contributions provide the basis for allocating the current and next-hour projected contributions on priorities 7, 6 and 2. This is a process similar to the IDC energy allocation on a transmission reservation stack for PTP transactions.

- **TLR NNL calculations and RTO markets priority 7 (FIRM) contributions:**

IDC currently supports of control area NNL calculations during FIRM curtailments; that is, in TLR levels 5A and 5B. The IDC TLR NNL calculations would be modified for handling priority 7 market contributions. The total NNL contribution calculation will be the sum of the existing NNL calculations for control areas outside of the markets, and the market contributions in priority 7, provided by the RTOs, as follows:

¹ OATI has indicated in the IDCWG meeting on May 6th, 2003, that different TDFs for import and export may cause a tag that sources and sinks in the RTO to have a TDF $\geq 5\%$, thus be subject to curtailment. In addition, the TLR curtailment model may not fully provide the expected relief – while the impact of a tag that sources in the market is represented by $TDF^{export} - TDF^{sink}$, the impact of the curtailment of such transaction (counter-flow) is represented by $TDF^{source} - TDF^{import}$.

$$\text{NNL}^{\text{contribution}} = \text{NNL}_{\text{market}}^{\text{contribution}} + \sum_n \text{MW}_n \times \text{GLDF}_n$$

Where:

$\text{NNL}_{\text{market}}^{\text{contribution}}$ is the market NNL contribution (priority 7)

$\sum_n \text{MW}_n \times \text{GLDF}_n$ applies to all contributing generators n with $\text{GLDF} \geq 5\%$ not in the markets

All remaining TLR NNL calculations are unchanged. The IDC will rely on the RTO markets to provide their current and next hours expected NNL (priority 7) contributions, as well as the unconstrained contribution amounts.

- **TLR and RTO markets priorities 2 and 6 (NON-FIRM) contributions:**

The calculation of the market economic dispatch (priorities 2 and 6) relief will be performed in similar manner as the FIRM calculations. The market economic dispatch relief would be computed as a proportional distribution of the total market economic dispatch contribution and the total contribution of the tags in the appropriate priority level.

The main advantage of using the calculations as above for Firm and Non-Firm Point-to-Point transactions and NNL, market flow and market economic dispatch calculations are:

- The IDC engine for calculating the markets' relief responsibilities are the same as used today for the calculation of NNL and Firm Point-to-Point transactions
- The non-firm market relief responsibilities are an extension of the NNL calculation that applies to priorities 7-F and 7-FN

The process for a TLR tag curtailment and RTO market contribution relief is as follows.

- A list of tags at the appropriate non-firm priority level n (2 and 6) eligible for curtailment is generated. This includes all tagged transactions with $\text{TDF} \geq 5\%$ contribution on the constrained flowgate with transmission reservation priority n .
- The total contribution of the tags eligible for curtailments on the constrained flowgate is calculated by:

$$\text{Tag}^{\text{contribution}} = \sum_k \text{MW}_k \times \text{TDF}_k \text{ for all tags } k \text{ in priority } n \text{ with } \text{TDF} \geq 5\%$$

- The total of all RTO market contributions at a priority level n is determined from the RTO provided values:

$$\text{RTO}^{\text{contribution}} = \sum_k \text{RTO}_k^{\text{contribution}} \text{ for all RTO markets } k$$

- The total relief required on the constrained flowgate is proportionally distributed between the eligible tags and contributing RTO markets by:

$$\text{Relief}_{\text{flowgate}}^{\text{Tag}} = \text{Relief}_{\text{flowgate}} \times \text{Tag}^{\text{contribution}} / (\text{Tag}^{\text{contribution}} + \text{RTO}^{\text{contribution}})$$

$$\text{Relief}_{\text{flowgate}}^{\text{RTO}} = \text{Relief}_{\text{flowgate}} \times \text{RTO}^{\text{contribution}} / (\text{Tag}^{\text{contribution}} + \text{RTO}^{\text{contribution}})$$

- A pro-rata curtailment of tags is calculated for a relief equal to $\text{Relief}_{\text{flowgate}}^{\text{Tag}}$.

$$\text{Tag}_k^{\text{Curtailment}} = \text{Relief}_{\text{flowgate}}^{\text{Tag}} \times \text{TDF}_k \times \text{MW}_k / \sum_n \text{MW}_n \times \text{TDF}_n^2$$

for a given eligible tag k and all other eligible tags n .

- f. The RTO market relief responsibility is calculated as the proportional distribution of the total RTO relief required among all the contributing RTO markets:

$$\text{Redispatch-Relief}_k^{\text{RTO}} = \text{Relief}_{\text{flowgate}}^{\text{RTO}} \times \text{RTO}_k^{\text{contribution}} / \text{RTO}^{\text{contribution}}$$

Where $\text{RTO}_k^{\text{contribution}}$ is the RTO k current market contribution at the priority level, and $\text{Redispatch-Relief}_k^{\text{RTO}}$ is the RTO relief responsibility.

- **Tag processing**

Every tag that sources or sinks in the PJM market footprint (PJM or CE control areas) will have its source and sink assigned to a specific IDC Service Point for the purpose of TLR curtailments, according to the following:

- A tag that source in either the PJM control area or the CE control area **and** its Source Point is mapped to an IDC Service Point, will have the IDC source assigned to the mapped service point. The sink service point for such tags will be the CA of the sink or the import-PJM/CE service point if the LCA of the tag is either PJM or CE.
- A tag that sources **and** sinks in the PJM market footprint (PJM or CE) and the Source Point is **not** mapped to an IDC Service Point will have its source **and** sink service point assigned to the historical PJM/CE control area Service Points.
- A tag that sources in PJM or CE and sinks on a CA other than PJM or CE will have its source Service Point assigned to the export-PJM/CE service point.
- A tag that sinks in PJM or CE and source on a CA other than PJM or CE will have its sink Service Point assigned to the import-PJM/CE service point.

- **Reloading and Reallocation of RTO market contributions**

In TLR levels 3A and 5A the IDC performs Point-to-Point transaction reload and reallocation. The current process of reallocating transactions will be expanded to include reloading of RTO market contributions. A given non-firm priority (2 and 6) is further partitioned into four sub-priorities, each of which to indicate action preference on for reloading and reallocation, as follows, from highest to lowest priority:

- S1: Maintain a transaction at its current level
- S2: Raise a transaction from its current level to the current hour schedule
- S3: Raise a transaction from its current hour schedule to its next hour schedule
- S4: Load new transactions

Since RTO market contributions are always present, sub-priority S4 is not applicable. A RTO market scheduled contribution is provided as their unconstrained amounts in priorities 2, 6 and 7. The process for assigning sub-priorities for the market contributions is as follows:

- For each priority level, allocate the market contributions into sub-priorities, such that:

- S1 contains the current market flow contributions.
- S2 contains the difference between the current hour unconstrained flow contribution and current market flow contribution. If the current hour unconstrained flow contribution is not available, the IDC will use the most recent flow contribution since the time the TLR was first issued or, if not available, the market flow contribution at the time the TLR was first issued.
- S3 contains the difference between the next hour and current hour unconstrained market flow contributions

As an example, suppose the unconstrained contributions for the current and next hours are as indicated below:

Unconstrained Contribution		
Priority	Current Hour	Next Hour
7	150 MW	150 MW
6	80 MW	60 MW
5	0	0
4	0	0
3	0	0
2	0	0
1	0	0
0	0	0
Total	230 MW	210 MW

Suppose now the following conditions:

Case →	1			2			3			4			5		
Priority →	7	6	2	7	6	2	7	6	2	7	6	2	7	6	2
CH contrib.	150	50	0	150	80	220	150	80	20	150	80	70	150	70	0
NH contrib.	150	60	40	150	60	270	150	60	90	150	60	40	150	60	5

The RTO market current and next hour projected contribution allocations, and the sub-priority allocations are as follows:

Priority	Case 1			Case 2			Case 3			Case 4			Case 5		
	CH	NH	Stack	CH	NH	Stack	CH	NH	Stack	CH	NH	Stack	CH	NH	Stack
7	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
6	50	60		80	60		80	60		80	60		70	60	
6-S1			50			60			60			60			60
6-S2			10			0			0			0			0
6-S3			0			0			0			0			0
2		40		220	270		20	90		70	40			5	
2-S1			0			220			20			40			0
2-S2			0			0			0			0			0
2-S3			40			50			70			0			5
Total	200	250	250	450	480	480	250	300	300	300	250	250	220	215	215

Once the sub-priorities are determined, the TLR calculations are done as indicated in the bullet items above "TLR NNL calculations and RTO markets priority 7 (FIRM) contributions" for market contributions in priority 7, and "TLR and RTO markets priorities 2 and 6 (NON-FIRM) contributions" for market contributions in priorities 2 and 6.

- **IDC data transfer support:**

Data provider and recipient, network infrastructure, protocol, format and payload content

Description: RTO markets Day-Ahead expected flowgate flow NNL contributions
 Sender: RTO market
 Recipient: IDC
 Network: OATI webData and OATInet²
 Periodicity: Once a day (no more frequent than once every hour)
 Protocol: OMP
 Contents: RTO name
 Submittal Date/Time in CST
 Effective Day
Repeated block:
 Flowgate Number
 Hour Ending (from 1 to 24)
 MW (for each Hour Ending and Flowgate)

Description: RTO markets current and next-hour projected flowgate flow contributions in each priority, as well as the unconstrained flowgate flow contribution in each priority
 Sender: RTO market
 Recipient: IDC
 Network: OATI webData and OATInet²
 Periodicity: Up to every market LMP cycle (5-15 minutes)
 Protocol: OMP

² Ultimately, this data may be provided through the public Internet or some other private connection using standard XML/SOAP mechanisms within the E-Tag infrastructure. OATI will implement the XML/SOAP interface upon request by NERC with a completion time of six weeks following a commitment by NERC that systems and data will be available for a complete end-to-end test.

Contents: RTO name
Submittal Date/Time in CST
Repeated block:
Flowgate number
Priority (2, 6 or 7)
Flow Direction
Current MW (for each Priority and Flowgate)
Projected next-hour MW (for each Priority and Flowgate)
Current hour unconstrained MW (for each Priority and Flowgate)
Next hour unconstrained MW (for each Priority and Flowgate)

Description: Marginal Generators
Sender: RTO market
Recipient: IDC
Network: OATI webData and OATInet²
Periodicity: On demand (no more frequent than once per hour)
Protocol: OMP
Contents: RTO name
Submittal Date/Time in CST
Repeated block:
Generator name in PSSE extended bus name & machine identifier
Weighting factor

Description: Marginal Zones
Sender: RTO market
Recipient: IDC
Network: OATI webData and OATInet²
Periodicity: On demand (no more frequent than the LMP cycle)
Protocol: OMP
Contents: RTO name
Submittal Date/Time in CST
Repeated block:
IDC zone/service point name
Import weighting factor
Export weighting factor

Description: RTO market relief responsibility
Sender: IDC
Recipient: RTO market
Network: OATI webData and OATInet²
Periodicity: On demand (at the time of a TLR)
Protocol: OMP
Contents: RTO name
Submittal Date/Time in CST
Flowgate number
Flowgate name
TLR level
Issuing RC
Start date and time
End date and time
Base net market flow contribution (current or next-hour projection,
depending on TLR level)
IDC calculated target market flow contribution

Description: TLR Level Notification
Sender: IDC
Recipient: RTO market
Network: OATI webData and OATInet²
Periodicity: On demand (at the time of a TLR)
Protocol: OMP
Contents: RTO name
Submittal Date/Time in CST
Contributing coordinated flowgate number
Contributing coordinated flowgate name
Issuing RC
Start date and time
TLR Level
Impacting Control Area (or Control Zone)

Description: Market control zone demand and net interchange
Sender: RTO market
Recipient: IDC
Network: OATI webData and OATInet²
Periodicity: On demand (no more frequent than once per hour)
Protocol: OMP
Contents: RTO name
Submittal Date/Time in CST
Repeated block for each control zone and time:
Market control zone name
Effective time
Forecast demand MW
Net interchange MW

5. IDC Change Summary

The following describe the IDC changes to support this change order:

- i. Receive and store the Market Flows (priorities 2 and 6) and NNL (priority 7) bi-directional contributions on about 700 coordinated flowgates, for current and next hour projection, and the expected Day-Ahead contributions every 5 minutes. This includes the definition (data format and transfer mechanisms), design, implementation, validation and integration with the markets. The IDC will receive this information in the form of a payload transported through OATI webData over OATInet.
- ii. Change the IDC TLR procedures to account for PJM and MISO NNL and market flows. These changes include modifications to the processing of TLR levels 2 and higher by the IDC, and it includes special exception handling for the markets and for the flowgates in the list of coordinated flowgates.
- iii. Calculation of historical TDF for PJM and CE. This change will require the IDC to model the PJM (and CE) historical footprint as service points that are made up of generator buses in the historical PJM (and CE) footprint. The PJM footprint will not be directly available in the IDC PSSE base case; its definition will require the IDC to group the control zones in PJM (and CE) modeled in the IDC base case as control areas.
- iv. Model specific PJM/CE Source Points in the NERC Registry as Service Points in the IDC base case model, through an IDC user interface that will allow to create the Service Points

from a set of generator buses and map these Service Points to the NERC Registry Source Points.

- v. Assign PJM/CE interchange transaction tags to the appropriate IDC source/sink Service Points (historical PJM, historical CE, import-PJM, import-CE, export-PJM, export-CE or specific Service Point)
- vi. Additional notification output to the PJM market footprint of TLR level 1 that for which the PJM or CE historical footprints market flows impact 5% or more.
- vii. Modification to the TLR processing for non-firm priorities 2 and 6.
- viii. Identification in IDC of the list of coordinated flowgates for special TLR handling
- ix. Create a process to modify the list of coordinated flowgates dynamically – add, modify and remove a coordinated flowgate.
- x. Receive from the markets the marginal generators on every market zone in the form of generator participation factors.
- xi. Receive from markets the marginal zones for import and export at every LMP cycle in the form of zone participation factor.
- xii. Calculate the market footprint TDF at every LMP cycle based on the market zone TDFs and the zonal participation factors. Different participation factors for import and export will be calculated.
- xiii. Publish the market footprint TDF values to the NERC site
- xiv. User interface changes to display all data provided by PJM, as well as the IDC Whole Transaction List and TLR results display.
- xv. Receive the market control zone load and inter-zone interchange and publish them through the Tag Dump.
- xvi. Integrations, testing, documentation and training

6. Communication Infrastructure

Two additional web/applications servers would be purchased to support the additional messages coming through the OATI webData and OATInet to the OATI primary site and one additional server to the OATI backup site.

7. E-Tag Impact

Initially, the proposed message mechanism for transferring all RTO related data to IDC is the OATI webData. As such, there is no impact on E-Tag operations.

8. NERC Impact

There may be potential modifications to the TDF viewer in its ability to receive data from IDC at a higher periodicity.

9. Industry Backend Processes Impact

There should be minimal industry backend process impact, except for the market RTOs, which are required to provide the data to the IDC. The industry may also need to modify their Tag Dump to receive and use the schedule dump with the market RTO control zone load and net interchanges.

10. Other Issues and Concerns

Although some policy changes may be necessary to support this alternative as described in this change order response, the basic principles of comparable treatment standards (fairness and equitability) between e-tag curtailments and market flows/NNL redispatches are supported.

11. Change Summary

The following table provides a summary of the changes and the responsibility for providing it or assessing it.

Item	Effort	Responsibility
NNL and market flows transfer	Low	IDC & Markets
IDC computation of NNL and market flows	Medium	IDC
Identification of coordinated flowgate list	Low	All
Process for updating coordinated flowgate list	Low	All
Modification to the TLR process of non-firm priorities	Low	IDC
NERC Registry processing by IDC	Low	IDC
Computation of zonal TDF (1)	Low	IDC
Computation of PJM footprint TDF (1)	Low	IDC
Retrieval of marginal zones/generators for coordinated flowgates	Medium	IDC & Markets
Modify TLR process to include dynamic marginal generator/zone	Medium	IDC
Processing of NNL and market flows in TLR	High	IDC
User interface	Medium	IDC
Integration, testing, documentation and training	High	IDC
Marginal zone/generator transfer to NERC	Medium	IDC & NERC
Tag processing for PJM/CE tags	Medium	IDC
Modeling of historical PJM and CE footprints	Medium	IDC & PJM
Modeling of specific service points in PJM/CE	Medium	IDC & PJM
Tag Dump changes	Low	All
Communication infrastructure (2)	Low	IDC & Markets
Industry backend processes (3)	Medium	All
Schedule Risk	Medium	All

1. Computation of zonal TDFs is minimal effort for the IDC that already performs similar calculations for pseudo control areas
2. The initial communication infrastructure is the OATI webData and OATInet. These may change in the future as additional markets and control areas take advantage of this change order, at which time a standard interface mechanism should be provided.

3. The only expected backend changes are on the markets that will need to support the additional data transfers, and the users of the Tag Dump that will need to support the additional data.

IMPACT OF REQUESTED CHANGE:

Project Schedule:

The tentative schedule for the development of this change order is four months after the August 11, 2003 execution of the NERC/PJM/MISO Letter of Commitment regarding this Change Order, whereby PJM and MISO committed to jointly fund this project implementation.³

Hardware and Third Party Software:

Additional analysis of the OMP data transfer requirements indicate that 2 additional servers for processing the webData messages will be required at the IDC primary site, and 1 additional server for processing the webData messages will be required at the IDC backup site. The price quoted for these servers includes hardware, 3rd party software, shipment, installation and configuration of these servers on the primary and backup sites.

Project Management: As per SSD

Acceptance Testing: As per SSD

Documentation: As per SSD

Training: As per SSD

Help Desk: As per SSD

Intellectual Property:

The design and implementation of "PJM-MISO Congestion Management Coordination in the IDC" was developed exclusively by OATI using public domain ideas and expressions. OATI claims exclusive ownership of and retains all intellectual property rights in this design, implementation and software. OATI agrees to waive only its "PJM-MISO Congestion Management Coordination in the IDC" software license fee with respect to NERC during the term of the IDC Operation Services Agreement, excluding any software license fee for other OATI supporting software required for this Change Order.

CONTRACT PRICE ADJUSTMENT:

IDC software build cost:

IDC hardware & 3rd party software:

Communication infrastructure:

³ The timely completion of the works in this Change Order depends on the requirements indicated in Revision X not to be further modified, on the speedy resolution of any issues that may arise during the implementation, and on the availability of dependent data, such as the IDC base case model, for which the development and testing of this Change Order depends on.

Revision Record

Date	Revision	Changes
01/19/2003	I	Initial Evaluation of the Change Order by OATI (Alternatives A and B)
01/30/2003	II	Evaluation of Change Order by OATI (Alternative C)
02/10/2003	III	2 nd evaluation of Change Order by OATI (Alternative C)
02/20/2003	IV	3 rd evaluation of Change Order by OATI (Alternative C)
06/05/2003	V	4 th evaluation of Change Order by OATI
06/12/2003	VI	5 th evaluation of Change Order by OATI
06/24/2003	VII	6 th evaluation of Change Order by OATI
06/30/2003	VIII	7 th evaluation of Change Order by OATI
08/26/2003	IX	8 th evaluation of Change Order by OATI
09/09/2003	X	9 th evaluations of Change Order by OATI