NEW YORK INDEPENDENT SYSTEM OPERATOR
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November 25, 2014

By Electronic Delivery

Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: *New York Independent System Operator, Inc.*, Docket No. ER15-___-000; Proposed Tariff Amendments to Revise Transmission Shortage Costs

Dear Secretary Bose:

In accordance with Section 205 of the Federal Power Act[1] and Part 35 of the Commission's regulations, the New York Independent System Operator, Inc. ("NYISO") respectfully submits proposed amendments to its Market Administration and Control Area Services Tariff ("Services Tariff") and Open Access Transmission Tariff ("OATT") to revise the Transmission Shortage Cost. [2] These proposed tariff amendments were approved by the NYISO's Management Committee with a show of hands on December 18, 2013. The NYISO is requesting a flexible effective date no earlier than February 18, 2015, which it proposes to provide to the Commission and its stakeholders through a compliance filing two weeks beforehand. The NYISO respectfully requests Commission action within 60 days of this filing letter.

I. <u>Documents Submitted</u>

1. This filing letter;
2. A clean version of the proposed revisions to the NYISO's Services Tariff ("Attachment I");
3. A clean version of the proposed revisions to the NYISO's OATT ("Attachment II");
4. A blacklined version of the proposed revisions to the NYISO's Services Tariff ("Attachment III");
5. A blacklined version of the proposed revisions to the NYISO's OATT ("Attachment IV"); and

[1] 16 U.S.C. §824d (2010).

[2] Capitalized terms not otherwise defined herein shall have the meaning specified in Section 1 of the OATT and Section 2 of the Services Tariff.

6. An Affidavit from David B. Patton of Potomac Economics, the NYISO's Market Monitoring Unit ("Attachment V").

II. **Background**

The NYISO first used a Transmission Shortage Cost in 2007.[3] The Transmission Shortage Cost, currently set at $4000, is used in the NYISO's Security Constrained Unit Commitment ("SCUC") and Real Time Scheduling ("RTS") scheduling and pricing software models as an upper bound on the Shadow Price incurred to resolve transmission constraints. A Shadow Price is the marginal value, or cost, of resolving a constraint.[4] An upper bound allows the software to produce efficient and timely commitment and dispatch results by closing its search for a solution and establishing a price in the face of a transmission constraint that cannot be solved at all, or only at a Shadow Price that is higher than the upper bound.

The NYISO's market software establishes scheduling and dispatch solutions to resolve transmission constraints. Currently, when the cost of dispatching a generator[5] to resolve a transmission constraint is higher than $4000, the software avoids dispatching that generator, treats the Transmission Shortage Cost as the shadow cost of resolving the constraint and sets the LBMP accordingly. If available dispatch within the market software is insufficient to resolve the constraint completely, the software will determine the constraint Shadow Price as the lower of (i) the Shadow Price produced by the partial solution dispatch, or (ii) the Transmission Shortage Cost of $4000.

As the NYISO explained in 2007, dispatching the system by incurring Shadow Costs higher than $4000 results in inefficient generation re-dispatch to meet transmission constraints given established operating practices and capabilities and can cause prices to inaccurately reflect system costs when an efficient dispatch is unavailable.

The NYISO's seven years of experience with the $4000 Transmission Shortage Cost has shown that $4000 is an effective upper bound, preventing inefficient re-dispatch, but one which could be improved. The current single-cost Transmission Shortage Cost sets a very high upper bound on the Shadow Cost to resolve even a five-minute / one MW transmission constraint if the software cannot resolve it for less than $4000.

The $4000 Transmission Shortage Cost can create very significant, although transient, real-time price spikes as the software searches for re-dispatch opportunities when generator ramp and other transient conditions may limit the availability of transmission constraint relief, leading to transmission

[3] *New York Independent System Operator, Inc.*, ER07-720-000, *Letter Order Accepting Compliance Filing Concerning the Transmission Shortage Cost*, January 11, 2008. The term Transmission Shortage Cost is a bit of a misnomer as the only "shortage" involved is the absence of available dispatch to relieve a transmission constraint for less than $4000. A term synonymous with Transmission Shortage Cost is "transmission demand curve" which correctly conveys the notion that costs of relieving constraints can be so high they do not represent actions an operator would take. In those instances, the constraint will not be resolved and the shadow price that will be established will be based on the appropriate price on the transmission demand curve. Using the transmission demand curve to price a constraint creates a 'shortage' in that the NYISO has gone 'short' of appropriately priced constraint relief.

[4] *See*: Section 2.9, NYISO Services Tariff

[5] The Day-Ahead software will relive constraints by dispatching Generators or scheduling Load reductions. Load reductions are not yet available in the real-time market dispatch.

constraint shortages, at costs less than $4000.[6] At times, these transient price spikes can go as high as the current Transmission Shortage Cost for a mere five minutes when prices in the intervals before and after the event are significantly lower. Moreover, proportionately large quantities of uplift from Balancing Market Congestion Revenue ("BMCR") and Day-Ahead Margin Assurance Payment ("DAMAP") arise from intervals when transient price spikes occur.[7]

The NYISO's Market Monitoring Unit ("MMU"), Potomac Economics advised in the 2012 State of the Market Report, that the current $4,000 Transmission Shortage Cost overstates the cost of securing the New York transmission system. As a result, he recommended that the NYISO implement a graduated transmission demand curve:

> [T]he reliability value of preventing many transmission shortages is lower than $4,000 per MWh. Therefore, we recommend that the NYISO consider the feasibility of using a graduated Transmission Demand Curve that would more accurately reflect the severity of the shortage condition.[8]

The NYISO agrees and is, therefore, proposing an amendment to the term "Transmission Shortage Cost" to introduce a graduated transmission demand curve. The graduated transmission demand curve would establish a series of upper bounds to a Shadow Price, based on the severity of the transmission constraint shortage (measured in MW). This design is supported by Dr. David Patton of Potomac Economics who explains that a multi-point demand curve will lead the real-time market model to make scheduling decisions and set market clearing prices that are more consistent with the operational needs of the system.[9]

The NYISO's proposed graduated transmission demand curve establishes a series of MW / Shadow Cost pairs that set gradually increasing Shadow Cost upper bounds as the extent of the transmission constraint relief that is necessary increases. This proposal would cap Shadow Prices at levels more closely reflecting the cost of securing the New York transmission system and reduce instances of inefficient dispatch to relieve small, often temporary transmission constraints. The graduated transmission demand curve proposed here would allow the NYISO to limit inefficient dispatch and set costs that match the severity of the transmission constraint shortage, unlike the single Transmission Shortage Cost used today, while maintaining efficient price signals during such shortages.

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[6] In its 2012 State of the Market Report, Potomac Economics defines 'transient" price spikes as "A spike in the shadow price of a particular transmission constraint is considered *"transient"* if it satisfies all of the following three criteria:

- It exceeds $300 per MWh;
- It increases by at least 400 percent from the previous interval; and
- It is at least 400 percent higher than in the most recent RTD "look ahead" interval."

[7] *See*: *State of the Market Report for the New York ISO Markets*, Potomac Economics, April 2013, ("2012 State of the Market Report"), Figure A-69 and discussion at pp. A-108 at http://www.nyiso.com/public/webdocs/markets_operations/documents/Studies_and_Reports/Reports/Market_Monitoring_Unit_Reports/2012/NYISO2012StateofMarketReport.pdf

[8] *Id.* p. 68 and discussion at p. 84

[9] Affidavit of David B. Patton, Ph.D., Attachment V to this filing letter, ("Patton Affidavit"), P 7

Operation of the New York transmission system will not change after implementation of the graduated transmission demand curve. Within the scheduling and dispatch software, the transmission system is modeled with a transmission facility reserve margin, typically 20 MW. The graduated transmission demand curve prices the use of this margin when generation, at shadow prices less than the particular upper bound on the transmission demand curve, are not available. Therefore, avoiding a costly and unnecessary dispatch solution by delaying transmission constraint relief, and using the Transmission Shortage Cost for pricing instead, does not present a reliability issue. The NYISO monitors all constraints and would continue to manage an overload impacting reliability.

As Dr Patton explains in his affidavit, the NYISO's proposed multi-point demand curve:

> [W]ill avoid extremely costly actions to resolve small constraint violations, since the multipoint demand curve is based on the 20 MW reliability margin that is already used to discount transmission limits in normal market operations.[10]

He continues by explaining that the NYISO's multi-point curve will set a Shadow Cost of $350 for a 4 MW transmission shortage, a price that is more reasonable than could be set if the NYISO had only the current single-value curve:

> [A] shadow price of $350/MWh [is] sufficiently high to ensure that nearby resources ramp quickly to secure the facility, but not so high that it would result in the commitment of expensive peaking resources or the re-dispatch of remote generation resources.[11]

As Dr. Patton's affidavit also illustrates, the NYISO's proposed multi-point Transmission Shortage Cost will also allow the software to appropriately prioritize between two transmission constraints that cannot be resolved simultaneously. [12]

III. <u>Tariff Proposal and Justification</u>

A. <u>The NYISO Proposal</u>

The NYISO proposes to add the following revisions (shown below) to the definition of the term *Transmission Shortage Cost* its Services Tariff and OATT:

> **Transmission Shortage Cost**: The maximum reduction in system costs resulting from an incremental relaxation of a particular Constraint that will be used in calculating LBMP. The Transmission Shortage Costs ~~is~~ <u>are</u> set at <u>$350/MWh for relaxation above zero and less than or equal to 5 MW, $1,175 for relaxation above 5 MW and less than or equal to 20 MW, and</u> $4000/MWh <u>for relaxation above 20 MW</u>.[13]

[10] Patton Affidavit at P 8

[11] *Id.*

[12] Patton Affidavit at P 9 and discussion at page 9 of this filing letter.

[13] The term 'relaxation' in this definition is used to mean relieving a constraint. Clarifying amendments to this definition are currently being reviewed by Market Participants for a future Section 205 filing on comprehensive shortage pricing reforms that the NYISO expects to make after the first of the year.

The NYISO also proposes to amend the reference in Section 17.1.4, the description of how the Transmission Shortage Cost works in setting the LBMP, as follows:

> The Transmission Shortage Costs represents the limit on system costs associated with efficient dispatch to meet a particular Constraint. It is the maximum Shadow Price that will be used in calculating LBMPs under various levels of relaxation. ~~The Transmission Shortage Cost is set at $4000/MWh.~~

For purposes of this filing letter, the NYISO presents the revised definition of Transmission Shortage[14] Costs in table form:

Shadow Price	MWs of transmission shortage
$350	When the MWs of shortage are >0 but <=5 MW
$1,175	When the MWs of shortage are >5 but <=20 MW
$4,000	When the MWs of shortage are >20 MW

As noted, the Shadow Price of resolving transmission constraints with shortages that are larger than 0 but no larger than 5 MW would be capped at $350/ MWh. Transmission constraints with shortages that are larger than 5 MW but no larger than 20 MW would not incur a Shadow Price to resolve them of more than $1,175/ MWh and transmission constraints with shortages that are larger than 20 MW would not incur a Shadow Price to resolve them of more than $4,000, the final point of the proposed shortage cost curve. These Shadow Price upper bounds prevent inefficient dispatch at levels consistent with prudent operation of the NYS Transmission System. The examples below explain how the revised Transmission Shortage Cost will be incorporated into the SCUC or RTS scheduling and pricing processes.

EXAMPLE ONE

Example 1A:
Impact of the Proposed Graduated Transmission Demand Curve on a 30 MW Transmission Constraint

Before Implementation of the Proposed Graduated Transmission Demand Curve

Resource	Shadow Price of Redispatch*	Maximum Amount of Relief the Generator could Provide^	Amount of Relief Provided	Shadow Price is:
Generator A	$345	3	3	$4,000
Generator B	$1,170	4	4	
Generator C	$3,500	6	6	
Current Transmission Demand Curve	$4,000	Not Capped	17	
Generator D	$4,300	5	None	

*The Shadow Price is the Generator's Incremental Cost divided by its Shift Factor for the constraint.
**The MW of relief provided by dispatching the Generator is the change in its dispatched MW times its Shift Factor for the constraint.

In Example 1A the dispatch software has four Generators available to resolve a 30 MW transmission constraint, each with varying levels of available relief and varying Shadow Prices that would result

[14] Refer to footnote 3 for the meaning of the term "shortage."

from dispatching that Generator to relieve the constraint. With the current Transmission Shortage Cost, a Shadow Price of $4,000 would result from dispatching Generators A, B, and C to provide their maximum available relief. Generator D would not be dispatched because the Shadow Price of doing so to relieve the transmission constraint would be higher than the $4,000 Transmission Shortage Cost.

Example 1B: Impact of the Proposed Graduated Transmission Demand Curve on a 30 MW Transmission Constraint				
After Implementation of the Proposed Graduated Transmission Demand Curve				
Resource	**Shadow Price of Redispatch***	**Maximum Amount of Relief the Generator could Provide****	**Amount of Relief Provided**	**Shadow Price is:**
Generator A	$345	3	3	$3,500
Graduated Transmission Demand Curve	$350	5	5	
Generator B	$1,170	4	4	
Graduated Transmission Demand Curve	$1,175	15	15	
Generator C	$3,500	6	3	
Graduated Transmission Demand Curve	$4,000	No MW Cap	None	
Generator D	$4,300	5	None	

Using the same assumptions, Example 1B shows the price that would result after the new graduated Transmission Shortage Cost is introduced. The proposed graduated Transmission Shortage Cost would produce a Shadow Cost to resolve the 30 MW transmission constraint of $3,500. Generator A would be dispatched to provide its maximum relief of 3 MW. Since the first point on the Transmission Shortage Cost curve has a Shadow Cost that is less expensive than dispatching Generator B and is available for up to 5 MW of relief, 5 MW of relief at $350 would be counted towards relieving the constraint. Because the Shadow Price of using relief from Generator B is less expensive than the second point on the curve, the maximum amount of available relief on Generator B, 4 MW, would be scheduled. The second point on the Transmission Shortage Cost curve, at a Shadow Price of $1,175 would then provide available relief of 15 MW. The last 3 MW to resolve the 30 MW transmission constraint would come from Generator C at its Shadow Price of $3,500.

EXAMPLE TWO

Example 2A: Impact of the Proposed Graduated Transmission Demand Curve on a 4 MW Transmission Constraint				
Before Implementation of the Proposed Graduated Transmission Demand Curve				
Resource	**Shadow Price of Redispatch***	**Maximum Amount of Relief the Generator could Provide****	**MW the Resource is Dispatched to Provide**	**Shadow Price is:**
Generator A	$345	3	3	$1,170
Generator B	$1,170	4	1	
Generator C	$3,500	6	None	
Current Transmission Demand Curve	$4,000	Not Capped	None	
Generator D	$4,300	5	None	

*The Shadow Price is the Generator's Incremental Cost divided by its Shift Factor for the constraint.
** The MW of relief provided by dispatching the Generator is the change in its dispatched MW times its Shift Factor for the constraint.

In Example 2A the dispatch software has four Generators available to resolve a 4 MW transmission constraint, each with varying levels of available relief and varying Shadow Prices that would result from using that Generator to provide relief. With the current Transmission Shortage Cost, the upper bound on Shadow Prices is never reached as Generators A and B are able to relieve the constraint at a Shadow Price of $1,170.

Example 2B: Impact of the Proposed Graduated Transmission Demand Curve on a 4 MW Transmission Constraint				
After Implementation of the Proposed Graduated Transmission Demand Curve				
Resource	**Shadow Price of Redispatch***	**Maximum Amount of Relief the Generator could Provide^**	**MW the Resource is Dispatched to Provide**	**Shadow Price is:**
Generator A	$345	3	3	$350
Graduated Transmission Demand Curve	$350	5	1	
Generator B	$1,170	4	None	
Graduated Transmission Demand Curve	$1,175	15	None	
Generator C	$3,500	6	None	
Graduated Transmission Demand Curve	$4,000	Not Capped	None	
Generator D	$4,300	5	None	

Example 2b provides the price that would be established to resolve this transmission constraint if the new Transmission Shortage Cost were in place. The dispatch software again has four Generators available to resolve a 4 MW transmission constraint but the Shadow Price of using Generator B now exceeds the first point on the transmission demand curve. Since the combination of relief available from Generator A and the first point of the transmission demand curve are sufficient to resolve the constraint, the Shadow price is $350.

While the proposed graduated Transmission Demand Curve will not consider the duration of transmission constraints, its three MW levels serve as a proxy for dealing with transient transmission shortage conditions and represent a step forward in addressing such conditions. As noted below, the majority of shadow prices above $350 were the result of transient price spikes or those lasting 15 minutes or less. The chart illustrates this by identifying that transmission constraints with shadow costs of $350 or more and lasting 15 minutes or more made up only .89% of all minutes in the data set.

Transmission Shortage Duration[15] (with shadow costs of $350 or more)	**Percent of All Minutes**[16]
>15 minutes	0.89%
>30 minutes	0.54%
>60 minutes	0.30%
>120 minutes	0.14%

Although modeling the graduated Transmission Demand Curve with shadow costs, quantities and duration would ideally handle transient transmission shortages, the software to accomplish this would be very costly to implement.

B. A Graduated Transmission Demand Curve Set at the Levels Proposed by the NYISO is Appropriate

As the NYISO's analysis[17] indicates, from 1/1/2010 to 12/31/2012, 97.47% of all transmission constraints were resolved by dispatching Generators with Shadow Costs of less than $350. Thus, the NYISO will continue to resolve the vast majority of transmission constraints with actual re-dispatch even after with the proposed multi-step transmission demand curve in place. At 5 MW, the first point on the Transmission Shortage Cost demand curve will cap re-dispatch costs in those limited instances where the shortage cost is above $350 and likely due to inefficient re-dispatch.

Avoiding the application of the Transmission Shortage Cost to Shadow Costs of less than $350 is consistent with analysis done by the NYISO's MMU. In its *2012 State of the Market Report* the NYISO's MMU stated that "transient shadow price spikes occurred in about 1% of all real-time intervals and 36% of the intervals when shadow prices exceeded $300/MWh in 2012."[18]

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[15] The NYISO analyzed the size and duration of transmission constraint shortages on the East Garden City to Valley Stream transmission facility, a facility which was constrained more often than any other facility in the NYCA during the timeframe analyzed.

[16] The number of five-minute intervals for which each transmission constraint with a shadow price greater than or equal to $350 persisted were counted and divided by the total number of 5 minute intervals from 10/20/2012 to 8/13/2013 to arrive at the percent of all minutes figure presented above. The chart also reveals that as the duration of shortages with shadow costs of $350 increase from 15 minutes to 120 minutes, the frequency with which they occur diminishes significantly.

[17] See Appendix to the 9/27/2013 presentation at the Market Issues Working Group titled "Graduated Transmission Demand Curve" at: http://www.nyiso.com/public/webdocs/markets_operations/committees/bic_miwg/meeting_materials/2013-09-27/Graduated%20Transmission%20Demand%20Curve%20MIWG%2020130927%20(9)%20(2).pdf

[18] *State of the Market Report* p. A-112

The NYISO's MW / Shadow Price pairs in the transmission demand curve were also chosen to coordinate with the prices in the Operating Reserve Demand Curve ("reserve demand curves") to ensure that the market tradeoffs between the proposed graduated transmission shortage prices curve and established reserve demand curves align with NYCA reliability criteria. The reserve demand curves work like the transmission demand curve and cap the Shadow Cost the NYISO would incur to maintain Operating Reserves in its various categories as shown in the Table below.

Cascading Shadow Prices			
Location/Product	*NYCA*	*East*	*LI*
10 Min Spin	**$1,150**	**$1,700**	**$1,775**
10 Min Total	**$650**	**$1,175**	**$1,225**
30 Min Total	**$200**	**$225**	**$250**

For instance, the NYISO would forego a re-dispatch to preserve 30-Minute Reserves in the NYCA, East of the Central East interface, and Long Island if the Shadow Cost of doing so equaled or exceeded $250. Generally, 30-Minute Reserves are relied on to protect the transmission system. By establishing the first point on the transmission demand curve above this, at $350 for transmission constraints >0 and <=5 MW, the NYISO's scheduling and pricing software would forgo scheduling 30-Minute Reserves when the shadow price reached $250 but continue to use generation dispatch to solve transmission constraints until the price reached $350.

The second MW/ Shadow Price pair on the proposed transmission demand curve, which would cap Shadow Costs at $1,175/ MWh for shortages greater than 5 MW but no greater than 20 MW, was chosen to ensure correct tradeoffs with the prices in the reserve demand curve for East of Central East 10-Minute Total Reserve.

Setting the second step at $1,175 is also based on the following situation. Dispatching for the Central East Voltage Collapse transmission constraint, which splits the NYCA between east and west, and fulfilling the East of Central East 10-Minute Total reserve requirement are equally important to maintaining NYCA reliability. The East of Central East 10-Minute Total reserve requirement was created to ensure the Central East Voltage Collapse constraint can be managed should there be a large loss of supply event in the eastern portion of the NYCA. Therefore, dispatching to maintain eastern 10-Minute Total reserves is as important to NYCA reliability as is dispatching to solve the Central East Voltage Collapse constraint. Setting the second MW / Shadow Price pair at $1,175, which is also the demand curve price for 10 minute total reserves, ensures the dispatch software implements these reliability requirements equally.

The NYISO proposes to retain the existing Transmission Shortage Cost price point for any transmission shortage above 20 MW at $4,000. The existing Transmission Shortage Cost continues to appropriately represent an upper limit of the costs of resolving transmission constraints larger than 20 MW.

IV. Effective Date

The NYISO requests a flexible effective date for the Tariff revisions proposed in this filing that will be no earlier than February 18, 2015. The NYISO will not be able to propose a precise effective date until the software changes needed to implement the proposed Tariff revisions are ready for deployment and testing is complete. The effective date for the Tariff revisions proposed in this filing will be the date that the NYISO is prepared to implement the revised Transmission Shortage Cost software.

The NYISO proposes to submit a compliance filing at least two weeks in advance of its proposed effective date specifying the date on which these Tariff revisions will take effect (the "2015 Compliance Filing"). Consistent with Commission precedent,[19] the NYISO's 2015 Compliance Filing will provide adequate notice to the Commission and to Market Participants of the implementation date that the revisions to the Transmission Shortage Cost are about to go into effect. However, the NYISO respectfully requests Commission action within sixty days of the date of this filing.

V. Requisite Stakeholder Approval

These amendments were approved by the NYISO Management Committee on December 18, 2013 with a show of hands, abstentions and an opposition. It was approved by the NYISO's Board of Directors on February 11, 2014. It has not been filed until now to match the effective date to the completed development and testing of the software that is being installed to effectuate this market change.

VI. Communications and Correspondence

All communications and service in this proceeding should be directed to:

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VII. Service

The NYISO will send an electronic link to this filing to the official representative of each of its customers, to each participant on its stakeholder committees, to the New York Public Service

[19] *New York System Operator, Inc.*, 106 FERC ¶ 61,111, PP 5, 10 (2004) ("We will allow NYISO to implement parts of the filing prior to September 2004, as such parts become ready for implementation, provided that NYISO adheres to the three steps identified above in Paragraph 5 of this order."); *New York Independent System Operator, Inc.*, Letter Order, Docket No. ER11-2544-000 (Feb. 10, 2011).

Commission, and to the New Jersey Board of Public Utilities. In addition, the complete filing will be posted on the NYISO's website at www.nyiso.com.

VIII. Conclusion

Wherefore, for the foregoing reasons, the New York Independent System Operator, Inc. respectfully requests that the Commission accept for filing the proposed Tariff revisions that are attached hereto within sixty days of the date of this filing with a flexible effective date not earlier than February 18, 2015, to be provided with two weeks' notice.

Respectfully submitted,

/s/ Mollie Lampi

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