2016 New Capacity Zone Study Report

January 15, 2016

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1. Introduction

The New Capacity Zone[1] (NCZ) Study is performed to determine whether any Highway interface(s) are constrained, which would trigger the Services Tariff requirement to file tariff revisions with the Commission to establish an NCZ(s).

The previous (2013) NCZ Study, which was performed for the 2017 Summer Capability Period, led to creation of the G-J Locality, encompassing Load Zones G through J.

This 2016 NCZ Study was performed for the 2020 Summer Capability Period and, since none of the Highway interfaces were found to be constrained, the conclusion of this 2016 NCZ Study is that there is no need to trigger the Services Tariff requirement to propose tariff revisions to establish an NCZ.

2. New Capacity Zone Study Methodology

2.1. Background

The NCZ Study is a deliverability study that is performed in accordance with the procedures and methodology set forth in Section 5.16 of the Services Tariff.

The NCZ Study rules require that it be performed using in large part the Deliverability test methodology in Attachment S of the OATT to determine if there is a constrained Highway interface into one or more Load Zones.

The scope of the NCZ Study is limited to the evaluation of Deliverability across the Highways, and not Byways in accordance with Section 5.16.1 of the Services Tariff.[2] The methodology for evaluating and measuring Deliverability across the Highways is described below.

2.2. Transfer Capability Across Highway Interfaces

The NCZ Study was conducted by testing the transfer capability across the Highway interfaces within the Rest of State (ROS) Capacity Region (Load Zones A through F) and across the UPNY-ConEd Highway interface located within the Lower Hudson Valley ("LHV") Capacity Region (Load Zones G through I). For the ROS, Generation-to-generation shifts are simulated for combinations of Load Zones within the Capacity Region, increasing generation "upstream" of an interface and reducing generation "downstream" of that interface (as such terms are used in the definition of "Highway" in Attachment S.) Transfer limit assessment determines the ability of the network to deliver capacity from generation in one (or more) surplus zone(s) to other deficient zone(s) within the Capacity Region. The transfer capability across the UPNY-ConEd interface is evaluated by increasing generation upstream of the interface (Load Zone G) and decreasing generation downstream of the interface (Load Zones H and I).

In the actual transfer limit assessment, all transmission facilities within the NYISO are monitored. Contingencies tested in the transfer limit assessment include all "emergency transfer criteria" contingencies defined by the applicable Northeast Power Coordinating Council (NPCC) Criteria and New York State Reliability Council (NYSRC) Reliability Rules.

The concept of First Contingency Incremental Transfer Capability (FCITC) is used in the determination of deliverable capacity across ROS Highway interfaces within the Capacity Region. The FCITC measures the amount of generation in the exporting zone that can be increased to load the interface to its

[1] Terms with initial capitalization used but not defined herein have the meaning set forth in the Market Administration and Control Area Services Tariff (Services Tariff), and if not defined therein, then as set forth in the Open Access Transmission Tariff (OATT). An NCZ is a "single Load Zone or group of Load Zones that is proposed as a new Locality…." *See* Services Tariff Section 2.14.

[2] Section 5.16.1 of the Services Tariff sets forth the NCZ Study Methodology.

transmission limit.[3] It is the *additional* generation capacity that could be exported from a given zone(s) above the base case dispatch level.

a. All generators in the exporting zone(s) are uniformly increased (scaled) in proportion to their maximum power limits (Pmax) while all generators in the importing zone(s) are decreased uniformly in proportion to the difference between their initial generation dispatch level (Pgen) and their minimum power limits (Pmin). The FCITC and Highway transmission constraint(s) for the exporting zone(s) are noted for each export/import combination.

b. The *net generation available*[4] is compared to the FCITC Highway transmission constraint(s) for the exporting zone(s) transfer. If the net generation available upstream is *greater* than the calculated FCITC, that amount of generation above the FCITC is considered to be constrained or "bottled" capacity and may not be fully deliverable under all conditions. (Byway constraints normally evaluated in an interconnection study are not evaluated in the NCZ Study.)

   If the net generation available upstream is *less* than the FCITC (that is, there is not sufficient available generation upstream to reach the transmission limit,) the difference is an indication of the available "transfer capability" to accommodate additional generation resources in the upstream area.

3. NCZ Study Case Modeling and Assumptions

This section of the report describes the assumptions and base case conditioning steps of the NCZ Study, consistent with Section 5.16.1 of the Services Tariff. (*See* presentation, **New Capacity Zone Study (NCZ) Inputs and Assumptions** presented by the NYISO at the September 28, 2015 Installed Capacity Working Group meeting.[5])

3.1. NCZ Study Assumption Matrix

The NCZ Study case setup utilizes results from extensive NYISO studies and reports. The sources for the parameters used in the NCZ study are summarized in Table 1.

[3] The amount of such generation is described in Services Tariff § 5.16.1.1.1, and in Table 1.

[4] The "net generation available" in any defined exporting zone is the difference between the sum of the zonal generators' Pmax and the sum of the zonal generators' actual MW output.

[5] This presentation is available at: <http://www.nyiso.com/public/webdocs/markets_operations/committees/bic_icapwg/meeting_materials/2015-09-28/agenda%206%20ICAPWG_09-28-2015_NCZ%20Study%20Inputs%20and%20Assumptions.pdf>.

Table 1: Parameters Established in NYISO Studies and Reports

#	Parameter	Description	Reference
1	Installed Capacity Requirement	NYCA Installed Capacity Requirement to achieve LOLE less than 0.1 day per year, which is based on the Installed Reserve Margin (IRM) identified by the New York State Reliability Council (NYSRC) and accepted by the PSC	2015 NYSRC IRM report for the period May 2015 to April 2016
2	IRM Emergency Transfer Limits	Emergency transfer limits on Highway interfaces corresponding to the interface limits used in the IRM study	
3	Locational Minimum Installed Capacity Requirements (LCRs)	The LCRs for the NYC (Zone J), Long Island (Zone K) and Zones G through J Localities approved by the Operating Committee.	2015 LCR report approved by Operating Committee on January 15, 2015
Load model			
4	Peak Load Forecast	NCZ Study Capability Period peak demand forecast contained in the latest NYISO Load and Capacity Data report (i.e., "Gold Book")	2020 Summer peak load conditions from 2015 Gold Book
5	Impact of Load Forecast Uncertainty (LFU)	Uncertainty in forecasting NYCA loads due to uncertainty in forecasted weather and economic conditions	2015 NYSRC IRM report
Generator model			
6	Existing CRIS generators and transmission facilities with UDRs	Generators with Capacity Resource Interconnection Service (CRIS) and transmission facilities with Unforced Capacity Deliverability Rights ("UDRs") in-service on the date of the latest Load and Capacity Data report	2015 Gold Book
7	Planned generation projects or Merchant Transmission Facilities	Projects that have accepted either (a) Deliverable MW or (b) a System Deliverability Upgrade cost allocation and provided cash or posted required security pursuant to Attachment S of the OATT, which for (a) and (b) is from a Class Year Final Decision Round that occurs prior to the NCZ Study Start Date, excluding any such projects subsequently withdrawn from the NYISO Interconnection Queue	
8	UCAP Derate Factor (UCDF)	Factor used to convert ICAP to Unforced Capacity (UCAP) based on historic availability data by resource type on a Capacity Region basis	2015 NYSRC IRM report and 2015 NYISO LCR report
9	Deactivated CRIS units	Units retaining CRIS rights for three years after being considered "deactivated" unless the ability to transfer those rights has been exercised or expired	Generator units deactivated before September 1, 2012
Transmission model			
10	Existing transmission facilities	Identified as existing in the NYISO Load and Capacity Data report most recently published prior to the NCZ Study Start Date, September 1 2015 for this study	2015 Gold Book
11	Firm plans for changes to transmission facilities by TOs	Planned changes of facilities in the latest Load and Capacity Data report that are scheduled to be in-service prior to the NCZ Study Capability Period, Summer 2020 for this study	
12	System Upgrade Facilities and System Deliverability Upgrades	Facilities associated with planned projects identified in (7) above, except that System Deliverability Upgrades will only be modeled if the construction is triggered	
Import/Export model			
13	External System Import/Export	NYCA scheduled imports from HQ/PJM/ISO-NE/IESO	NYISO Tariffs - OATT Section 25, Attachment S
14	Base case direct transfer schedules from ROS to other Capacity Regions	Actual flow scheduled from ROS to LHV, NYC and LI consistent with the IRM and the LCRs	ROS to LHV: 738 MW ROS to NYC : 2,548 MW ROS to LI: 780 MW Total from ROS: 4,066 MW

3.2. NCZ Study Base Case Creation

The NCZ Study base case is a five-year look-ahead of the New York Control Area (NYCA). The base case originates from the 2015 NYISO FERC 715 2020 Summer peak load case, and then is customized to meet the specific requirements of Section 5.16.1 of the Services Tariff. The conditioning steps are applied to the modeling of load, NYCA generation, and external system import/export.

3.2.1. Load Modeling

Load forecast is the baseline forecast of coincident Summer 2020 peak demand before reductions for Emergency Demand Response Providers. Load Forecast Uncertainty (LFU) based on the 2015 IRM study is applied individually to the peak load forecast MW for each of the four Capacity Regions:

- ROS 12.42%
- LHV 12.42%
- NYC 7.10%
- LI 9.10%

Table 2 shows a summary of baseline peak load forecast plus LFU.

Table 2: Summary of Baseline Peak Load Forecast plus LFU

Zone	Baseline	LFU	Total
ROS	12215	1518	13733
LHV	4449	553	5002
NYC	12251	870	13121
LI	5394	491	5885

3.2.2. NYCA Generator Modeling

The initial CRIS capability and available capacity resources are determined by the combination of various inputs, consistent with Section 5.16.1 of the Services Tariff:

I. The CRIS (MW) capability of approved generating units is modeled according to the CRIS cap listed in 2015 Gold Book.

II. CRIS rights terminate three years after deactivation pursuant to Attachment S to the OATT. Thus, based on the NCZ Study Start Date of September 1, 2015 of this NCZ Study, units deactivated in and before September 2012 are not modeled in the NCZ Study case. Generators deactivated after September 1, 2012 are modeled as in-service with their applicable CRIS levels, per the 2015 Gold Book.

III. The Pmax data for each respective resource within the NYCA Study base case power flow representation is the CRIS value derated by applicable equivalent forced outage rate below:

III.1. Derates are applied to specific types of intermittent generation resources:

a. Small hydro 45.00%
b. Large hydro 0.09%
c. Land-based Wind 85.50%
d. Landfill Gas 19.40%
e. Solar 47.30%
f. Pumped Storage hydro 0.0216%

III.2. Derates are applied to the aggregate of all remaining generation ("Uniform Capacity") within the exporting zone(s) for the purpose of determining the net capacity available for deliverability. These are the ICAP/UCAP translation factors for each Capacity Region consistent with the 2015 IRM study:

a. ROS 3.60%
b. LVH 12.50%
c. New York City 10.20%
d. Long Island 10.40%

III.3. The "derated capacity," or Pmax is available to supply load and losses within each Capacity Region and adjacent Capacity Region(s). When power transfers are simulated, all generation in the exporting zone(s) is uniformly increased to its Pmax.

III.4. Tables 3 and 4 summarize the Resource Capacity and Capacity Derates for the NCZ Study base case:

Table 3: Summary of Resource Capacity by Type

Zone	Landfill Gas	Large Hydro	Small Hydro	Pumped Storage	Wind	Solar	Uniform	Total CRIS
A	18.4	2,460.0	3.1	240.0	120.5		2,265.1	5,107.1
B	15.6		54.8				717.8	788.2
C	40.1		77.0		509.4		6,115.7	6,742.2
D	6.4	856.0	73.4		385.5		354.5	1,675.8
E	11.2		451.4		441.7		272.4	1,176.7
F	9.3		415.6	1,165.1			2,974.1	4,564.1
ROS	**101.0**	**3,316.0**	**1,075.3**	**1,405.1**	**1,457.1**	**0.0**	**12,699.6**	**20,054.1**
G	19.0		99.1				3,656.2	3,774.3
H							2,120.4	2,120.4
I								0.0
LHV	**19.0**	**0.0**	**99.1**	**0.0**	**0.0**	**0.0**	**5,776.6**	**5,894.7**
J							**10,239.9**	**10,239.9**
K	**2.6**					**31.5**	**5,399.9**	**5,434.0**
NYCA	**122.6**	**3,316.0**	**1,174.4**	**1,405.1**	**1,457.1**	**31.5**	**34,116.0**	**41,622.7**

Table 4: Summary of Capacity Derates by Resource Type

Zone	Total CRIS (MW)	Landfill Gas Derates	Large Hydro Derates	Small Hydro Derates	Pumped Storage Derates	Land based Wind Derates	Solar	Uniform Capacity Derates	Total Capacity Derates	Total UCAP (MW)
A	5,107.1	3.6	2.2	1.4	5.2	103.0	0.0	81.5	196.9	4,910.2
B	788.2	3.0	0.0	24.7	0.0	0.0	0.0	25.8	53.5	734.7
C	6,742.2	7.8	0.0	34.7	0.0	435.5	0.0	220.2	698.1	6,044.1
D	1,675.8	1.2	0.8	33.0	0.0	329.6	0.0	12.8	377.4	1,298.4
E	1,176.7	2.2	0.0	203.1	0.0	377.7	0.0	9.8	592.8	583.9
F	4,564.1	1.8	0.0	187.0	25.2	0.0	0.0	107.1	321.1	4,243.0
ROS	**20,054.1**	**19.6**	**3.0**	**483.9**	**30.4**	**1,245.8**	**0.0**	**457.2**	**2,239.8**	**17,814.3**
G	3,774.3	3.7	0.0	44.6	0.0	0.0	0.0	457.0	505.3	3,269.0
H	2,120.4	0.0	0.0	0.0	0.0	0.0	0.0	265.1	265.1	1,855.4
I	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LHV	**5,894.7**	**3.7**	**0.0**	**44.6**	**0.0**	**0.0**	**0.0**	**722.1**	**770.4**	**5,124.3**
J	**10,239.9**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1,044.5**	**1,044.5**	**9,195.4**
K	**5,434.0**	**0.5**	**0.0**	**0.0**	**0.0**	**0.0**	**14.9**	**561.6**	**577.0**	**4,857.0**
NYCA	**41,622.7**	**23.8**	**3.0**	**528.5**	**30.4**	**1,245.8**	**14.9**	**2,785.3**	**4,631.6**	**36,991.1**

Column descriptions:

- *"Total CRIS Capacity" is the total from Table 3.*
- *Each "Derate" column is the amount of capacity reduction based on the application of the derate factor to the represented capacity.*
- *Uniform Capacity Derate uses the specific ICAP/UCAP translation factor for the Capacity Region; hydro and wind use the technology-specific derate factors.*
- *"Total All Capacity Derates" is the sum of category derates by zone.*

3.2.3. Capacity Regions Import/Export Modeling

The initial generation and interchange schedules for the NYCA and the four Capacity Regions are determined via the combination of various inputs:

1. External Generation Source

I. Inter-Area external interchange schedules include the following grandfathered long-term firm power transactions for the NCZ Study base case by Tariff:

- External CRIS Right: Quebec (via Chateauguay) to NY 1090 MW
- Existing Transmission Capacity for Native Load (ETCNL): PJM to NYSEG 1080 MW

II. Generating capacity associated with firm export commitments are represented as follows:

- NYPA to AMP-Ohio, PA-RECs 182 MW
- NYPA to ISO-NE (Vermont) 91 MW

III. Grandfathered external firm capacity imports:

- ISO-NE to NY 0 MW
- Ontario (IESO) schedule 0 MW

IV. Generator reactive (MVAr) capabilities as determined by and applicable NERC, NPCC and NYSRC standards and NYISO procedures.

V. Wheeling contracts:

- ROS to NYC via ABC/JK through PJM 1,000 MW
- ROS to NYC via Lake Success/Valley Stream through LIPA 287 MW
- ROS to LIPA via Northport Norwalk Cable through ISO-NE 0 MW

The total external generation resources including items (I) to (V) are summarized in Table 5.

Table 5: Summary of External Generation Resources (MW)

From ↓ To →	ROS import	LHV import	NYC import	LI import	NYCA
Ontario	0	0	0	0	0
HQ	1090	0	0	0	1,090
PJM	-102[(1)]	0	1,000	0	898
ISO NE	-91	0	0	0	-91
Total External Generation Source	897	0	1,000	0	1,897

Note 1: ROS import from PJM is the sum of ETCNL 1080 MW into NYCA, 182 MW NYPA export to AMP-Ohio and PA-RECs, and 1000 MW from ROS flowed through LHV to PJM via J&K lines: (1080 MW – 182 MW – 1000 MW = – 102 MW)

2. ROS Direct MW Transfer

Actual base case interchange schedules between NYCA Capacity Regions are set consistent with the IRM and the LCRs:

- ROS (A-F) supply to LHV (G-I): 738 MW
- ROS (A-F) supply to NYC (J) through LHV (G-I): 2,548 MW
- ROS (A-F) supply to Long Island through LHV (G-I): 780 MW

  (combined with 287 MW wheeling contract, Y49/Y50 flow is scheduled to 1067 MW)

3. Unforced Capacity Deliverability Rights (UDR)

Controllable transmission projects with UDRs are represented at their respective UDR capacity from the External Control Area into the respective NYISO Load Zone.

- Cross-Sound Cable to Long Island 330 MW
- Neptune HVdc to Long Island 660 MW
- Linden VFT to New York City 315 MW
- Hudson Transmission Project to New York City 660 MW

The total import of each Capacity Region including items (1) to (3) is summarized in Table 6.

Table 6: Summary of Capacity Region Imports from External Sources (MW)

From ↓ To →	ROS Import (A-F)	LHV Import (G-I)	NYC Import (J)	LI Import (K)
Total External Source	897	0	1,000	0
ROS direct MW transfer	0	738	2,548	780
LHV direct MW transfer	0	0	0	0
Total UDR	0	0	975	990

All CRIS generation within each Capacity Region is placed in service and scaled proportional to the ratio of its Pmax to the sum of the Pmax in the respective exporting or importing zone(s) or Capacity Region. Actual generation is proportionally scaled (up or down) to match the demand.[6]

Phase Angle Regulators (PARs) controlling external tie lines are set consistent with NYISO Service Tariff, Attachment M-1, NYISO-PJM Joint Operating Agreement and applicable operating procedures and agreements.

[6] Demands include load (including load forecast uncertainty), transmission losses, and external schedule commitments

4. NCZ Study Results

Deliverability tests were performed for each of the five Highway interfaces located within the ROS Capacity Region and for the UPNY-ConEd Highway interface located within the LHV Capacity Region. The deliverability tests within the ROS Capacity Region (Zones A through F) are evaluated from west-to-east and north-to-south by exporting from one (or more) zones (exporting zones) to the remaining zone(s) within the ROS Capacity Region. The deliverability test for the UPNY-ConEd Highway within the LHV Capacity Region (Zones G through I) is evaluated by exporting from Zone G to Zones H and I.

The level of deliverability across each Highway interface is measured as either Additional Transmission Capacity (*i.e.*, deliverability "headroom"), or Bottled Generation Capacity, which is calculated as the First Contingency Incremental Transfer Capability (FCITC) of the interface less the amount of net available capacity in the exporting Zone(s). A summary of the Highway interface deliverability analysis for the NCZ Study case is presented in Table 7. As shown in the table, all Highway interfaces were determined to have Additional Transmission Capacity and, therefore, passed the Highway deliverability test.

Table 7: Highway Deliverability Test Results

Capacity Region	Highway Interfaces	Exporting Zone(s)	Importing Zone(s)	Load (incl. LFU and losses) (1)	Base Generation Dispatch (exporting zones) (2)	UCAP (3)	Net Available Capacity (4)	FCITC (export limit) (5)	Additional Transmission Capacity (+) or Bottled Generation Capacity (-) (6)	Constraint
				a	b	c	d = c - b	e	f = e - d	
ROS	Dysinger-East	A	BCDEF	2,948	4,740	4,910	170	1637.1	1,467	Lockport-Tele Rd 115 kV @ STE L/O Niagara - New Roch 345 kV
	West Central	AB	CDEF	5,267	5,449	5,645	195	1885.5	1,690	Farmington 4-Pannell 115 kV @ NOR
	Volney-East	ABC	DEF	8,557	11,284	11,689	405	2985.7	2,581	Edic-Porter 345/230 Transformer @ NOR
	Moses-South	D	ABCEF	879	1,252	1,298	46	1251.6	1,205	Adirondack B2-Moses 230 kV @ STE L/O Chat-Massena-Marcy 765 kV w/Rej HQ-NY
	Total East	ABCDE	F	11,037	13,102	13,571	470	786.1	316	Rock Tavern-CPV Valley 345 kV @ STE L/O Coopers Corners-Middletown tap
LHV	UPNY-ConEd	G	HI	2,560	2,731	3,269	538	670.5	132	Rock Tavern – CPV Valley 345 kV @ STE L/O Coopers Corners-Middletown tap

Column descriptions:

1. *"Load" includes the load forecast uncertainty and transmission losses within the exporting zone(s).*
2. *"Base Generation Dispatch" is the actual generation output in the exporting zone(s).*
3. *"UCAP" is the amount of UCAP in the exporting zone(s).*
4. *"Net Available Capacity" the excess UCAP in the exporting zone(s) available for export. It is the difference between UCAP (c) and Base Generation Dispatch (b).*
5. *"FCITC" is the incremental transfer limit corresponding to the most limiting FCTTC in the Highway interface analysis calculated by the thermal analysis software (PSS®MUST).*
6. *"Additional Transmission Capacity or Bottled Generation Capacity" is the available unused transfer capability (+) or the amount of UCAP that is bottled (-) by the interface transfer limit constraint. It is calculated by FCITC (e) less Net Available Capacity (d).*

5. Conclusion

All of the Highway interfaces were found to have positive Additional Transmission Capacity, *i.e.*, none of the Highway interfaces were found to be constrained. The conclusion of this 2016 NCZ Study is that there is no need to trigger the Services Tariff requirement for the filing of tariff revisions to establish an NCZ. In accordance with the Services Tariff, the NYISO will file its determination with the Commission by March 31, 2016.[7]

[7] *See* Services Tariff Section 5.16.4(b).