New York ISO
Independent System Operator

NYISO's Compliance Submittal for NYSRC Rule A.2 (R1)

Establishing Load Serving Entity Installed Capacity Requirements

A Report by the
New York Independent System Operator

Presented to the Reliability Compliance Monitoring Subcommittee of the New York State Reliability Council

March 30, 2023

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Statement of NYSRC Rule A.2

The NYSRC Reliability Rule A.2 has the following requirements:

"**R1.** The *NYISO* shall annually establish *Load Serving Entity* (LSE) *installed capacity* (ICAP) requirements, including *Locational Capacity Requirements* (LCRs), in accordance with *NYSRC* rules and *NYISO* tariffs. *NYISO* analyses for setting LCRs shall include the following requirements:

R1.1 The *NYISO* LCR analysis shall use the IRM established by the *NYSRC* as determined in accordance with Reliability Rule A.1.

R1.2 The *NYISO* LCR analysis shall maintain a LOLE of 0.1 days/year, as specified by the Requirement A.1: R1.1.

R1.3 The *NYISO* LCR analysis shall use the software, load and capacity data, and models consistent with that utilized by the NYSRC for its determination of the IRM, as described in Sections 3.2 and 3.5 of NYSRC Policy 5, 'Procedure for Establishing NYCA Installed Capacity Requirements.'

R1.4 The *NYISO* shall document the procedures used to calculate the LCRs.

R1.5 The *NYISO* shall prepare a report for the next *Capability Year* describing the analyses for establishing (1) *LSE ICAP* requirements, and (2) LCRs for applicable *NYCA zones*, prepared in accordance with R1.1 through R1.3. The report shall include the procedures, factors, and assumptions utilized by the *NYISO* to determine these *LSE ICAP* requirements and LCRs."

The following compliance measure serves to fulfill the NYSRC Reliability Rule A.2 requirement R1. This measure states that:

"**M1.** The *NYISO* conducted an annual analysis to establish *LSE* and Locational Capacity Requirements for the next *Capability Year* in accordance with R1.1, R1.2, and R1.3 requirements. The procedures used to calculate LCRs were documented in accordance with R1.4 and a report prepared in accordance with R1.5."

Establishment of the Installed Reserve Margin (IRM)

The Installed Capacity Subcommittee (ICS) of the New York State Reliability Council conducted a technical resource reliability study in 2022 to determine the IRM for the 2023-2024 Capability Year. The Executive Committee of the NYSRC approved the Capability Year 2023–2024 IRM at 20.0% on December 9, 2022[1], which met the required Loss of Load Expectation (LOLE) criterion of 0.1 days per year as specified in NYSRC Rule A.1, Requirement R1.1.

[1] https://www.nysrc.org/PDF/Reports/ICS%20Annual%20Reports/2023%20IRM%20Study%20Technical%20Report%2012-14-2022%20Final%20-%20rev%203.pdf

Establishment of LCRs

Using the approved IRM, the NYISO then determined the minimum Locational Capacity Requirements (LCRs). The NYISO's Operating Committee approved the LCRs on January 23, 2023.[2] The LOLE resource adequacy criterion was maintained throughout this process. The NYISO's calculations resulted in a New York City LCR of 81.7%, a Long Island LCR of 105.2%, and a G-J Locality LCR of 85.4%.

Locational Capacity and LSE References and Procedures

The NYISO Market Administration and Control Area Services Tariff ("Services Tariff")[3] provides the rules governing the NYISO markets. Capacity obligations for LSEs are contained in Section 5.11 and Locational Capacity Requirements are defined in Section 5.11.4. On October 5, 2018, FERC accepted proposed revisions to Section 5.11.4 of the NYISO Services Tariff, which provides the methodology that the NYISO uses for determining LCRs. This methodology utilizes an economic optimization algorithm to minimize the total cost of capacity for the NYCA.

The NYISO ICAP Manual[4] contains the procedures governing the Installed Capacity markets and auctions administered by the NYISO. Section 3 of the ICAP Manual addresses LSE requirements in procuring capacity to meet the NYSRC's annually set Installed Reserve Margin. Section 3.6.2, titled "Minimum Unforced Capacity Requirements for LSEs Serving Loads in a Locality," outlines the derivation of LSE locational Capacity Requirements. The ICAP Manual is available on the NYISO website.[5]

The NYISO LCR study utilizes the NYSRC-approved IRM and associated database directed by the NYSRC as the starting point.

The LCR methodology of economic optimization[6] meets the NYSRC's 0.1 days/year LOLE reliability standard while respecting the NYSRC-approved IRM as well as the Locality Transmission Security Limits, and minimizing the total cost for the procurement of required capacity for the NYCA. The optimizer is a linear program that minimizes capacity costs based on the cost curves established offset by net Energy and

[2] https://www.nyiso.com/documents/20142/35886565/2023-LCR-Report.pdf/ce034709-ddf4-d53d-6dec-8bd2fd54099f

[3] https://nyisoviewer.etariff.biz/ViewerDocLibrary/MasterTariffs/9FullTariffNYISOMST.pdf

[4] https://www.nyiso.com/documents/20142/2923301/icap_mnl.pdf/234db95c-9a91-66fe-7306-2900ef905338

[5] NYISO Home - NYISO

[6] https://www.nyiso.com/documents/20142/21537892/LCR-determination-process-2021.pdf/1bac4189-7bc1-5aa5-a00d-4f178074b5e8

Ancillary Services revenues[7]. These curves show the relationship between the magnitude of the requirement versus the cost in each of the Localities. Once a potential total cost solution is achieved in the program, it is tested by running the MARS software at the approved statewide IRM to determine the resulting LOLE. The least cost solution that satisfies all constraints is selected. Transmission security floors ensure that the program selects LCR requirements that are feasible from an operations perspective. These floors are called Transmission Security Limits and are based on the bulk power system transmission capability into each Locality as determined by power flow and contingency analysis. Each Locality LCR exceeded its respective Transmission Security Limit.

Requirements for LSEs

The NYISO has forecast a NYCA peak load of 32,246.0 MW for the 2023–2024 Capability Year. The 20.0% statewide Installed Reserve Margin adopted by the NYSRC and the 32,246.0 MW peak load forecast produced an Installed Capacity Requirement for the NYCA of 38,695.2 MW. The load forecast used is the peak value associated with the October Forecast for the IRM study. The ICAP market will employ a load forecast that has been updated further.

The forecast peak load, available capacity (based on CRIS-adjusted summer DMNC testing for existing units and currently available UDRs, SCRs and net imports), proposed resources, and the current statewide Installed Capacity Requirement produced the minimum LCRs for New York City, Long Island, and the G-J Locality, and the other values shown in Table 1.

Table 1 indicates that the statewide Installed Capacity Requirement for the New York Control Area (NYCA) and the Locational Capacity Requirements for New York City, Long Island, and the G-J Locality can be met with expected ICAP resources in 2023–2024 Capability Year.

Table 1 Capability Year 2023 – 2024 Peak Load and LCR Requirements

Locality	Forecast Peak Load (MW) (1)	LCR (%) (2)	ICAP LCR (MW) (3)	Available ICAP (MW) (4)	Expected ICAP (MW) (5)
New York City	11,285.0	81.7	9,219.8	10,300.5	9,436.3
Long Island	5,133.3	105.2	5,400.2	6,127.0	6024.0
G-J Locality	15,406.8	85.4	13,157.4	15,156.1	14,253.8
NYCA	32,246.0	120.0	38,695.2	40,867.4	40,597.8

1. This is the forecasted peak load associated with the October Forecast for the IRM study
2. This is the statewide Installed Capacity Requirement and Locational Capacity Requirements, expressed in terms of percentage of forecast peak load.
3. This is the statewide Installed Capacity Requirement and Locational Capacity Requirements, expressed in terms of MW of ICAP based on

[7] The term "offset" is defined in Section 5.14.1.2.2 of the *NYISO Market Administration and Control Area Services Tariff*.

the Forecast Peak Load values specified in Table 1

4. This is the sum of CRIS adjusted DMNC summer values for each existing unit based on the 2021 summer tested capacity plus UDRs, SCRs and net imports that are currently available.
5. This is the available capacity (4) plus expected additions, retirement, or re-rating of units, UDRs, SCRs and net imports using the best available information as of January 23, 2023.

Appendix A: LCR 2023 Report

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LOCATIONAL MINIMUM INSTALLED CAPACITY REQUIREMENTS STUDY

For the 2023–2024 Capability Year

Approved by NYISO OC, January 23, 2023

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I. Recommendation

This report documents a study conducted by the New York Independent System Operator ("NYISO") to determine Locational Minimum Installed Capacity Requirements ("LCRs") for the Localities of New York City (Load Zone J), Long Island (Load Zone K), and the G-J Locality (Load Zones G, H, I, and J) for the 2023–2024 Capability Year beginning May 1, 2023.

The New York State Reliability Council ("NYSRC") approved the 2023–2024 Installed Reserve Margin ("IRM") at 20.0% on December 9, 2022. The NYISO then determined the LCRs using the IRM study database and the approved IRM.

Based on the NYSRC IRM study base case for the 2023–2024 Capability Year, and the approved IRM identified above, the NYISO's calculations result in a New York City LCR of 81.7%, a Long Island LCR of 105.2%, and a G-J Locality LCR of 85.4%.

IRM	J LCR	K LCR	G-J LCR
20.0%	81.7%	105.2%	85.4%

II. LCR Values

As its starting point, the NYISO LCR study utilized the New York Control Area ("NYCA") IRM study directed by the NYSRC. The IRM study information is available on the NYSRC web site.[1] The final 2023 IRM Study base case maintains the Loss of Load Expectation ("LOLE") criterion at no more than 0.1 Event-Days/year with a statewide reserve margin of 19.9% and corresponding preliminary locational requirements of 78.2% and 107.4% for NYC and LI, respectively.

The NYISO follows the Locational Minimum Installed Capacity Requirements Determination Process to develop the LCRs for Zone J, Zone K, and the G-J Locality.[2] Pursuant to this procedure, the IRM study database is adjusted to the approved IRM (20.0%), and the target LOLE is the lesser of 0.1 Event-Days/year and the LOLE that results from the adjusted database. The adjusted database corresponding to the approved 20.0% IRM resulted in a decrease in the LOLE, leading to the target LOLE for this year's LCR study at 0.098 Event-Days/year.

[1] https://www.nysrc.org/NYSRC_NYCA_ICR_Reports.html

[2] https://www.nyiso.com/documents/20142/21537892/LCR-determination-process-2021.pdf/1bac4189-7bc1-5ae5-a00d-4f178074b5e8

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III. Changes from Previous (1/13/2022) LCR report

Three major modeling and assumption changes were implemented in the base case of this year's IRM study: the adoption of the GE ELR functionality[3], reserving 350 MW of Operating Reserve for load shedding[4], and updating the underlying load shapes in the IRM model[5]. On top of these modeling and assumption changes, this year's LCR study base case also reflects the deactivation of 1,205.2 MW of thermal units largely due to the New York State Department of Environmental Conservation (DEC) "Peaker Rule", as well as the addition of 539.3 MW of new wind capacity[6].

In addition to the changes in the base case, this year's Transmission Security Limit ("TSL") methodology was also updated to include generator outage rates as an input to the calculation, to be aligned with the Transmission Security Margin methodology in NYISO's planning study.[7]

[3] May 4th ICS Presentation:
https://www.nysrc.org/PDF/MeetingMaterial/ICSMeetingMaterial/ICS%20Agenda%20260/A.I.%207.1%20-%20ELR%20Modeling%20_ICS[4803].pdf

[4] March 29th ICS Presentation:
https://www.nysrc.org/PDF/MeetingMaterial/ICSMeetingMaterial/ICS%20Agenda%20259/A.I.9-Operating_Reserve_Study_Results_ICS03292022_V4[4097].pdf

[5] September 14th ICS Presentation:
https://www.nysrc.org/PDF/MeetingMaterial/ICSMeetingMaterial/ICS%20Agenda%20266/IRM23_New_Load_Shape_Sensitivity_ICS_09142022[7888].pdf

[6] Final IRM Assumptions Matrix:
https://www.nysrc.org/PDF/MeetingMaterial/ICSMeetingMaterial/ICS%20Agenda%20267/FINAL_Assumptions%20Matrix_FBC[9060].pdf

[7] October 4th ICAPWG Presentation:
https://www.nyiso.com/documents/20142/33562316/22_10_04_ICAPWG_Transmission_Security_Limit_Calculation.pdf/9c994999-4127-616e-9927-bacb2dbe0f30

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IV. LCR Determination Process

The LCR calculation methodology utilizes an economic optimization algorithm to minimize the total cost of capacity for the NYCA, taking into account the cost curves established accounting for the net Energy and Ancillary Services revenue offset[8], as shown in the cost curve table below.

2023-2024 Net CONE Curves		
Location	LCR (%)	Net CONE ($/kW-yr)
NYCA	112.9	71.12
	115.9	72.75
	118.9	74.13
	121.9	75.44
	124.9	75.99
G-J	84.0	80.41
	87.0	82.57
	90.0	84.14
	93.0	85.58
	96.0	86.27
Zone J	80.6	147.67
	83.6	152.55
	86.6	154.53
	89.6	156.09
	92.6	157.20
Zone K	97.4	50.95
	100.4	60.42
	103.4	66.26
	106.4	69.21
	109.4	71.76

Using this methodology, the NYSRC's LOLE reliability standard will be met while utilizing the NYSRC-approved IRM and maintaining capacity requirements greater than or equal to the applicable Transmission Security Limits, as shown in the TSL table below. The TSLs for both New York City Locality and G-J Locality were both binding.

[8] The term 'net Energy and Ancillary Services revenue offset' is defined in Section 5.14.1.2.2 of the NYISO Market Administration and Control Area Services Tariff.

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Transmission Security Limit Calculation	Formula	G-J	NYC	LI	Notes
Load Forecast (MW)	[A] = Given	15,407	11,285	5,133	[1]
Transmission Security Limit (MW)	[B] = Studied	3,425	2,875	325	[2]
UCAP Requirement (MW)	[C] = [A]-[B]	11,982	8,410	4,808	
UCAP Requirement Floor	[D] = [C]/[A]	77.8%	74.5%	93.7%	
5-Year Derating Factor	[E] = Given	5.4%	4.5%	6.3%	[3]
Special Case Resources (MW)	[F] = Given	496.6	417.5	33.7	[4]
ICAP Requirement (MW)	[G] = ([C]/(1-[E]))+[F]	13,162	9,224	5,165	
ICAP Requirement Floor (%)	[H] = [G]/[A]	85.4%	81.7%	100.6%	

[1] Final Fall Forecast:
https://www.nysrc.org/PDF/MeetingMaterial/ICSMeetingMaterial/ICS%20Agenda%20267/2023_NYSRC_IRM_Fcast_ICS_V04.pdf

[2]2023-24 TSL Report:
https://www.nyiso.com/documents/20142/34388803/Summer2023_N-1-1_Analysis_FINAL_DRAFT_20221018.pdf/08d25de2-4057-875e-5dfc-b6af53f035f2

[3] 5-Year Derating Factor:
5-year Market EFORd based on the generation mix in the 2023-2024 IRM study

[4] Final SCR Values:
https://www.nysrc.org/PDF/MeetingMaterial/ICSMeetingMaterial/ICS%20Agenda%20263/2022%20August%203%20ICS%20Final%20SCR%20Model%20Values%20-%20REPOST.pdf

V. Summary of Study

The calculations and analysis in this study utilize the NYISO process for setting the LCRs with the NYSRC-approved statewide IRM of 20.0%.

Based on the NYSRC's final IRM base case for the 2023–2024 Capability Year, the LOLE criterion is met with an LCR of 81.7% for the New York City Locality, an LCR of 105.2% for the Long Island Locality, and an LCR of 85.4% for the G-J Locality.

Appendix B: LCR Determination Process

Locational Minimum Installed Capacity Requirements Determination Process

1. Introduction

1.1. This document describes the process[1] that NYISO follows to determine the Locational Minimum Installed Capacity Requirements[2] (LCRs) for the Localities, presently Zone J – New York City, Zone K – Long Island, and the G-J Locality (Zones G, H, I, and J).

2. Initial Conditions

2.1. The database available from the Installed Reserve Margin (IRM) study is used, adjusted to the IRM value approved by the NYSRC for the upcoming Capability Year.

2.1.1. The NYISO will use a Loss of Load Expectation (LOLE) that is the lesser of (a) 0.100 days/year and (b) the LOLE that results from the NYSRC Installed Capacity Subcommittee's adjustment to the IRM database (specified with three decimal point precision). This LOLE is referred to as the "target LOLE".

2.2. All NYISO runs under this process occur with the NYCA Minimum Installed Capacity Requirement set using the approved IRM.

2.3. The NYISO will utilize LCR economic optimization software ("LCR software"), constructed as follows:

[1] On October 5, 2018, FERC accepted proposed revisions to Section 5.11.4 of the NYISO's Market Administration and Control Area Services Tariff ("Services Tariff") that provides the methodology that the NYISO uses for determining LCRs. This new methodology utilizes an economic optimization algorithm to minimize the total cost of capacity for the NYCA. This new methodology will result in continuing to meet the NYSRC's 0.1 days/year LOLE reliability standard while respecting the NYSRC-approved IRM.

[2] Capitalized terms not defined herein have the meaning set forth in the Services Tariff.

Minimize:

$$Cost\ of\ Capacity\ Procurement = [Q_J + LOE_J] \times P_J(Q_J + LOE_J) + [Q_K + LOE_K] \times P_K(Q_K + LOE_K)$$
$$+ [Q_{(G-J)} + LOE_{(G-J)} - Q_J - LOE_J] \times P_{(G-J)}(Q_{(G-J)} + LOE_{(G-J)})$$
$$+ [Q_{NYCA} + LOE_{NYCA} - Q_{(G-J)} - LOE_{(G-J)} - Q_K - LOE_K] \times P_{NYCA}(Q_{NYCA} + LOE_{NYCA})$$

Subject to:

$$NYCA\ system\ LOLE \leq target\ LOLE$$
$$Q_{NYCA} = NYCA\ system\ peak\ load\ forecast \times (1 + NYSRC\ approved\ IRM)$$
$$Q_J \geq Q_{TSL(J)}$$
$$Q_K \geq Q_{TSL(K)}$$
$$Q_{(G-J)} \geq Q_{TSL(G-J)}$$

Wherein

$Q_J, Q_K, Q_{(G-J)}$ are the quantity of capacity, expressed in megawatts, required in J Locality, K Locality, and G-J Locality, respectively, which is the product of the Locality's non-coincident peak load forecast and the corresponding LCR values.

$Q_{TSL(J)}, Q_{TSL(K)}, Q_{TSL(G-J)}$ are the quantity of LCR floor restriction, expressed in megawatts, due to the transmission security limit for J Locality, K Locality, and G-J Locality, respectively.

Q_{NYCA} is the quantity of capacity, expressed in megawatts, required for NYCA, which is the product of NYCA system peak load forecast and the value of (1 + NYSRC approved IRM).

$LOE_J, LOE_K, LOE_{(G-J)}, LOE_{NYCA}$ are the quantity of level of excess condition, expressed in megawatts, for J Locality, K Locality, G-J Locality, and NYCA, respectively.

$P_J(Q_J + LOE_J), P_K(Q_K + LOE_K), P_{G-J}(Q_{(G-J)} + LOE_{(G-J)}), P_{NYCA}(Q_{NYCA} + LOE_{NYCA})$ are the price of capacity for the given quantity of capacity in J Locality, K Locality, G-J Locality, and NYCA, respectively (noting that the ICAP Demand Curve reset process calculates Net CONE at the level of excess condition).

2.3.1.1. These equations are used to determine LCRs such that the cost of capacity is minimized, while at the same time holding unchanged the NYSRC approved IRM, maintaining an LOLE of less than or equal to 0.100 days/year, and maintaining capacity requirements greater than or equal to the applicable Transmission Security Limit, the foregoing described herein.

2.3.2. The additional tables used to run the optimizer are appended to the IRM database referenced in step 2.1. The data and zonal capacity shifting specified in these tables will be consistent with those present in the final IRM database.

2.3.3. When identifying the price of capacity at the level of excess prescribed in Section 5.11.4(a) of the Services Tariff, cost curves established (a) in a Demand Curve Reset Filing Year will use the results of net Energy and Ancillary Services revenues determined in the quadrennial ICAP Demand Curve tariff processes and (b) in Demand Curve annual update years, all points on each cost curve will be determined by changing each point on the current Capability Year's cost curve to reflect the difference between the upcoming Capability Year's Net CONE value and the current Capability Year's Net CONE value.

2.3.4. Transmission Security Limits are determined using the equations and inputs specified in the table below

Transmission Security Limit Calculation	Units	Formula	G-J Locality	NYC	LI
Load forecast for the LCR Study	MW	[A] = User Input			
Bulk Power Transmission Capability	MW	[B] = User Input			
UCAP Requirement (MW)	MW	[C] = [A]-[B]			
UCAP Requirement Percent	(%)	[D] = [C]/[A]			
Locality derating factor	(%)	[E] = User Input			
ICAP Requirement (MW)	MW	[F] = [C]/(1-[E])			
Transmission Security Limit	**%**	**[G] = ROUND([F]/[A], to 0.1% increments)**			

2.4. The NYISO will present to stakeholders informational draft LCRs and accompanying preliminary input information, as available (such as the IRM Load forecast, bulk power transmission capability, derating factors, Transmission Security Limits, and Net CONE Curves), in the 4th quarter of the calendar year. This presentation will include discussion of the factors causing year-over-year changes in LCRs.

3. LCR Case Adjustments

3.1. The NYISO will solve for the target LOLE. That is, the NYISO will use a Loss of Load Expectation (LOLE) that is the lesser of (a) 0.100 days/year and (b) the LOLE that results from the NYSRC Installed Capacity Subcommittee's adjustment to the IRM database (specified with three decimal point precision).

3.2. The NYISO will identify any material capability changes.

3.2.1. Material capability changes, as used in this process, means individual changes that would increase or decrease generation, CRIS MW, or transmission transfer capability by 200 MW or greater.

3.3.2. Notify the NYSRC of any material capability changes.

3.3.3 If the NYSRC chooses to adopt the material capability change for the IRM, the same update will be made in the assumptions used by the NYISO to calculate the LCRs.

4. Determination of the Final LCR Values

4.1. Using the final LCR case, Net CONE Curves, and TSLs, run the LCR software to determine unrounded LCRs.

4.2. The LCR software returns results with multiple decimal point precision (i.e, unrounded LCRs). LCRs are set in 0.1 percentage point increments in order to be converted to Locational Minimum Unforced Capacity Values allocated to LSEs and implemented in the ICAP AMS. Therefore, in order to set the LCR values, there may be a need to round those values up or down to the neighboring 0.1 percentage point.

4.3. If rounding is utilized, the NYISO will test these resulting values by running the MARS model and verifying the LOLE achieves the target LOLE value in Section 2.

4.4. If necessary to achieve at least the LOLE, the NYISO will adjust the LCR values in 0.1 percentage point increments. For such adjustments, the NYISO will first adjust Localities whose LCRs were rounded downward in the step 4.1 above (e.g., a Locality whose LCR was rounded downward from 90.14% to 90.1%).

4.5. The NYISO will present the resulting LCRs to the NYISO Operating Committee.

4.6. The NYISO will post to its website the final LCRs, LCR Report, Transmission Security Limits, Net CONE Curves, and other applicable supporting data for the upcoming Capability Year.