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

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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 2020 to determine the IRM for the 2021-2022 Capability Year. The Executive Committee of the NYSRC approved the Capability Year 2021–2022 IRM at 20.7% on December 4,

2020[1], which met the required Loss of Load Expectation (LOLE) criteria of 0.1 days per year as specified in NYSRC Rule A.1, Requirement R1.1.

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 14, 2021[2] taking into consideration changes that occurred since the NYSRC approved the IRM base case on December 4, 2020. The only change for the 2021–2022 Capability Year required was to adjust the IRM base case with the 2021 ICAP/LCR peak load forecast. The LOLE resource adequacy criterion was maintained throughout this process. Based on these changes, the NYISO's calculations resulted in a New York City LCR of 80.3%, a Long Island LCR of 102.9%, and a G-J Locality LCR of 87.6%.

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 with regard to 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

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[1] http://www.nysrc.org/PDF/Reports/2021%20IRM%20Study%20Report%20Body%20Final.pdf

[2] https://www.nyiso.com/documents/20142/17462310/LCR2021-Report.pdf/9e390b73-99a7-0ee5-6466-bbd3f7e71af4

[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

Capacity Requirements. The ICAP Manual is available on the NYISO Web site.

The NYISO LCR study utilizes the NYSRC-approved IRM and associated database directed by the NYSRC as the starting point. The only other assumption changes from the IRM study consist of updating the ICAP load forecast and incorporating any material capability changes that occur after the IRM study but before the LCR study.

The LCR methodology of economic optimization[5] will result in continuing to meet 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 with the results of net Energy and Ancillary Services revenue offset[6]. 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 operation's 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. The New York City Locality and Zones G-J Locality LCRs exceeded their respective Transmission Security Limits, while the Long Island Locality LCR was set at its Security Limit.

Requirements for LSEs

The NYISO has forecast a NYCA peak load of 32,404.8 MW for the 2021–2022 Capability Year. The 20.7% statewide Installed Reserve Margin adopted by the NYSRC and the 32,404.8 MW peak load forecast produced an Installed Capacity Requirement for the NYCA of 39,112.6 MW.

The forecast peak load, existing capacity (based on CRIS-adjusted summer DMNC testing), 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

[5] https://www.nyiso.com/documents/20142/1408199/LCR-determination-process.pdf/2854dc25-301e-c506-1d88-2b13e0284ca1

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

be met with expected ICAP resources in 2021–2022 Capability Year.

Table 1 Capability Year 2021 – 2022 Peak Load and LCR Requirements

Locality	Peak Load (MW)	LCR (%)	ICAP LCR (MW)	Existing ICAP (MW) (1)	Expected ICAP (MW) (2)
New York City	11217.1	80.3	9007.3	9568.0	10310.3
Long Island	5285.8	102.9	5439.1	5234.2	5937.2
G-J Locality	15429.4	87.6	13516.2	14320.2	15164.5
NYCA	32404.8	120.7 (3)	39112.6 (4)	37557.2	40608.4

1. This is the sum of CRIS adjusted DMNC summer values for each unit based on the 2020 summer tested capacity.
2. This is the existing capacity plus expected unit additions, retirements, re-ratings, UDRs, SCRs and net imports using the best available information as of January 14, 2021.
3. This is the statewide Installed Capacity Requirement, expressed in terms of percentage of forecast peak load.
4. This is the statewide Installed Capacity Requirement, expressed in terms of MW of ICAP.

Appendix A: LCR 2021 Report

LOCATIONAL MINIMUM INSTALLED CAPACITY REQUIREMENTS STUDY

For the 2021–2022 Capability Year

Approved by NYISO OC, January 14, 2021

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 2021–2022 Capability Year beginning May 1, 2021.

The New York State Reliability Council ("NYSRC") approved the 2021–2022 Installed Reserve Margin ("IRM") at 20.7% on December 4, 2020. The NYISO then determined the LCRs taking into consideration a change in load forecast. This change was an update from the 2021 October Load Forecast to the 2021 ICAP/LCR load forecast.

Based on the NYSRC IRM base case for the 2021–2022 Capability Year and the changes identified above, the NYISO's calculations result in a New York City LCR of 80.3%, a Long Island LCR of 102.9%, and a G-J Locality LCR of 87.6%.

IRM	J LCR	K LCR	G-J LCR
20.7%	80.3%	102.9%	87.6%

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 2020 IRM Study base case maintains the Loss of Load Expectation ("LOLE") criterion at not more than 0.1 days/year with a statewide reserve margin of 20.7% and corresponding preliminary locational requirements of 82.6% and 95.1% 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 that procedure, the NYISO adjusts the final IRM Study base case to reflect the final 2021 ICAP/LCR load forecast. This forecast updated the October 2020 load forecast used in the IRM study. The forecasted NYCA system peak load, the G-J Locality peak load and the Zone K peak load increased by 161.8 MW, 44.1 and 3.8 MW, respectively, while the Zone J peak load decreased by 15.2 MW. Despite these values indicating

1 http://www.nysrc.org/NYSRC_NYCA_ICR_Reports.html

2 https://www.nyiso.com/documents/20142/1408199/LCR-determination-process.pdf/2854dc25-301e-c506-1d88-2b13e0284ca1

a higher load, the non-coincident values for all of the zones, when summed up, resulted in a total decrease of 115.2 MWs.

Area	Final 2021 IRM Study Load Forecast (MW) (10/2020)	Final 2021 ICAP/LCR Load Forecast (MW) (12/2020)	Change (MW)
Zone J (NYC)	11,232.2	11,217.1	-15.2
Zone K (LI)	5,282.0	5,285.8	3.8
The G-J Locality	15,385.3	15,429.4	44.1
NYCA	32,243	32,404.8	161.8

III. Changes from Previous (1/16/2020) LCR report

Notable changes between the previous study inputs include the retirement of the Indian Point Unit No. 3 nuclear facility, which resulted in an increase of the UPNY-ConEd Interface by 1,000 MW. There were also numerous updates to the Long Island import and export limits. Also included is the enhanced modeling of Energy Limited Resource Units.

This 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[3] , as shown in the cost curve table below.

[3] 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.

2021-2022 Capability Year LCRs: Net CONE Curves		
Location	LCR (%)	Net CONE ($/kW-yr)
NYCA	112.9%	78.82
	115.9%	80.45
	118.9%	81.83
	121.9%	83.14
	124.9%	83.69
G-J	84.0%	110.9
	87.0%	113.06
	90.0%	114.63
	93.0%	116.07
	96.0%	116.76
Zone J	80.6%	156.13
	83.6%	161.01
	86.6%	162.99
	89.6%	164.55
	92.6%	165.66
Zone K	97.4%	90.31
	100.4%	99.78
	103.4%	105.62
	106.4%	108.57
	109.4%	111.12

Under this methodology, the NYSRC's 0.1 days/year LOLE reliability standard will be met while respecting 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.

Transmission Security Limit Calculation	Formula	G-J	NYC	LI	Source
Load Forecast (MW)	[A] = Given	15429.4	11217.1	5285.8	[1]
Bulk Power Transmission Capability (MW)	[B] = Given	3400	3200	350	[2]
UCAP Requirement (MW)	[C] = [A]-[B]	12029.4	8017.1	4935.8	
UCAP Requirement Floor	[D] = [C]/[A]	77.96%	71.47%	93.38%	
5-Year derating factor	[E] = Given	10.07%	9.17%	9.24%	[3]
ICAP Requirement (MW)	[F] = [C] /(1-[E])	13376.4	8826.5	5438.3	
Transmission Security Limit	[G] = ROUND([F]/[A],1)	**86.7%**	**78.7%**	**102.9%**	

Source:

[1] 2021 Final ICAP Forecast (https://www.nyiso.com/documents/20142/17660272/2021_ICAP_V5a.pdf/bcce19c1-2af1-558a-c9b7-c0ea0c3acd8d)

[2] 2021 Transmission Security Limit (TSL) Report (https://www.nyiso.com/documents/20142/17462310/Summer2021-N-1-1-Analysis.pdf/ed9b287a-a484-4460-37c8-a923be6354e1)

[3] New York Control Area Installed Capacity Requirement Appendices, Figure A.4 (http://www.nysrc.org/PDF/Reports/2021%20IRM%20Study%20Appendices%2012_4_20%20(1).pdf)

IV. 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 20.7%, the NYISO's LCR study integrated the final 2021 ICAP/LCR load forecast to calculate the final LCRs for the three Localities.

Based on the NYSRC's final IRM base case for the 2021–2022 Capability Year and inclusion of ICAP load forecast updates, the LOLE criterion of 0.1 days/year is met with an LCR of 80.3% for the New York City Locality, an LCR of 102.9% for the Long Island Locality, and an LCR of 87.6% for the G-J Locality. The New York City Locality and G-J Locality LCRs exceed their respective Transmission Security Limits, while the Long Island LCR was set at its Transmission Security Limit.

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.

LCR Determination Process

$$Minimize:$$

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

$$Subject\ to:$$

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

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.

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 use the latest NYISO ICAP Load forecast.

3.2.1. The forecast will affect the load shapes used.

3.2.2. Update peak load data in the corresponding LCR software tables.

3.2.3. Run the LCR software.

3.3. The NYISO will identify any material capability changes.

3.3.1. 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. Introduce any material changes and run the LCR software.

3.3.3. Notify the NYSRC of any material capability changes.

4. Determination of the Final LCR Values

4.1. The LCR software returns results with two decimal point precision. 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.

4.2. 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.

4.3. 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%).

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

4.5. 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.