DRAFT – FOR DISCUSSION PURPOSES ONLY

ANNUAL ASSESSMENT
OF
RESOURCE ADEQUACY

COVERING THE

NEW YORK CONTROL AREA

For the years 2016–2018

In compliance with the NYSRC Reliability Rule A.3, Requirement R1

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

June 6, 2016

EXECUTIVE SUMMARY

This assessment was written in compliance with the New York State Reliability Council (NYSRC) Reliability Rule A.3 (*Review of Resource Adequacy)*, Requirement R1 over the assessment period of 2016-2018.

While this assessment is not a probabilistic (MARS) study, it compares forecast capacity and loads against current installed capacity requirements (IRM and LCRs) that are established based on probabilistic resource adequacy analyses, and projected over two future years (2017 and 2018).

The NYSRC conducts annual resource adequacy studies that establish the statewide Installed Capacity (ICAP) reserve margin (IRM study)[1] for the New York Control Area (NYCA) for the upcoming capability period. From the period of 1999 through 2016, these studies have resulted in the NYSRC adopting reserve margins ranging from 15% to 18%. For 2016, the Installed Reserve Margin (IRM) was established at 17.5% and was assumed to be the same value for 2017 and 2018 for purposes of this report.

For the analysis, three cases were evaluated against the baseline forecast of peak load set forth in the 2016 Gold Book.[2] The first case is referred to herein as the Class Year Study case, which includes the 2016 Gold Book's ICAP existing resources plus those that have completed their Class Year facilities study as identified in the 2016 Gold Book. The second case is referred to herein as the 2016 Reliability Need Assessment (RNA) case, which includes the 2016 Gold Book's existing units plus those that have been identified as meeting the inclusion criteria for the 2016 RNA base case. The third case is referred to herein as the "Extreme" case and assumes that there are no capacity additions over the assessment period. All of these cases only utilize resources situated within New York. The derivation of these cases is documented in the attached Appendices 1, 1A, and 1B.

In addition to the scenarios described above using the baseline forecast of peak load, the same three cases were also evaluated under the extreme scenario utilizing the 90th percentile forecast of peak load,[3] which represents an extremely high peak load demand.

With the baseline forecast of peak load, a projected 17.5% statewide IRM would be met throughout the assessment period, even if the proposed 2016-2018 resource additions are unavailable. Because NYSRC's annual IRM study has adopted the Load Forecast Uncertainty (LFU) in its probabilistic model, an extremely high peak load demand, including the 90th percentile forecast of peak load, has already been considered in the study using the baseline forecast data. To isolate the results of a specific forecast, such as the 90th percentile forecast of peak load, a deterministic assessment needs to be performed. Based on a deterministic assessment, a projected 17.5% IRM cannot be met

[1] *See, e.g.*, NYSRC Report titled, "New York Control Area Installed Capacity Requirement for the Period May 2016 to April 2017," December 4, 2015.
[2] The NYISO "Load & Capacity Data" publication is commonly referred to as the "Gold Book." The baseline forecast of peak load data is provided in the 2016 Gold Book under Tables I-2a, I-2b-1, and I-2b-2.
[3] The 90th percentile forecast of peak load data is provided in the 2016 Gold Book under Table I-2d. The 90th percentile forecast of peak load is one point within the range defined by the Load Forecast Uncertainty in the probabilistic model.

for the 90th percentile forecast of annual peak load during the years of 2016-2018 with only resources internal to New York.

The New York Independent System Operator, Inc. (NYISO) conducts an annual locational requirements study[4] that establishes minimum Locational Capacity Requirements (LCRs) for the New York City, Long Island, and the G-J Locality.[5] Currently, the New York City LCR is 80.5% of the New York City capability year peak load forecast. The Long Island LCR is currently 102.5% of the Long Island capability year peak load forecast. The G-J Locality LCR is currently 90.0% of the G-J Locality capability year peak load forecast.

With the baseline forecast of peak load and the proposed 2016-2018 resource additions, New York City would meet a projected LCR of 80.5% over the assessment period.

With the baseline forecast of peak load, Long Island would meet a projected LCR of 102.5% throughout the assessment period.

With the baseline forecast of peak load and the proposed 2016-2018 resource additions, the G-J Locality would meet a projected LCR of 90.0% over the assessment period.

It is worthy to note that even without the proposed 2016-2018 resource additions, New York City, Long Island, and the G-J Locality would still be able to meet their respective projected LCR requirements throughout the assessment period.

Similar to the IRM study, the probabilistic model in NYISO's annual LCR study has also adopted the Load Forecast Uncertainty (LFU) in the baseline forecast data. To consider a specific forecast, such as the 90th percentile forecast of peak load, a deterministic assessment needs to be performed. Based on a deterministic assessment of the 90th percentile forecast of peak load, New York City can still meet the projected LCR of 80.5% throughout the assessment period. Long Island can also meet the projected LCR of 102.5% over the assessment period. The G-J Locality would meet the projected 90.0% LCR requirement throughout the assessment period, unless the proposed resource additions could not materialize in 2018.

It is important to note that any deterministic assessment of extreme scenarios, including the Extreme case utilizing the baseline forecast of peak load and all three scenarios utilizing the 90th percentile forecast of peak load, only provide limited "what if" information and, without a probabilistic assessment, do not test resource adequacy. Only the cases including planned resources and interconnections with other regions and that utilize the baseline forecast of peak load can demonstrate whether NYCA or a Locality has adequate resources.

[4] *See, e.g.*, NYISO Report titled, "Locational Minimum Installed Capacity Requirements Study Covering the New York Balancing Authority Area for the 2016–2017 Capability Year," January 14, 2016.
[5] The G-J Locality encompasses Load Zones G, H, I, and J. The assessment of G-J Locality in this report is provided for information purposes only.

INTRODUCTION

This assessment is performed to satisfy NYSRC Reliability Rule A.3, Requirement R1,[6] which states:

R1. An *NYCA resource adequacy* assessment shall be conducted annually for the next summer period and two years beyond, for demonstrating that proposed NYCA *resources* meet NYCA statewide *IRM* and New York City and Long Island *locational capacity requirements* as determined by *NYSRC* and *NYISO* studies conducted in accordance with A.1 and A.2. The assessment shall be documented in a *resource* adequacy report, covering at a minimum, the evaluations and information below:

R1.1 The assessment shall evaluate a base case assuming proposed *resources* and the most likely *load* forecast, as well as alternate scenarios approved by RCMS.

R1.2 Any potential base case *resource* adequacy needs shall be addressed by *NYISO* procedures. The *NYISO* shall report to the *NYSRC* on identified needs and possible corrective actions consistent with *NYISO* procedures.

R1.3 The *resource* adequacy report shall include key assumptions and other factors considered in the assessment.

The statewide requirement is met under NYSRC Reliability Rule A.1, Requirement R1 which reads:

> The *NYSRC* shall establish the *IRM* requirement for the *NYCA* such that the probability (or risk) of disconnecting any *firm load* due to *resource* deficiencies shall be, on average, not more than once in ten years. Compliance with this criterion shall be evaluated probabilistically, such that the loss of *load* expectation (LOLE) of disconnecting *firm load* due to *resource* deficiencies shall be, on average, no more than 0.1 day per year. This evaluation shall make due allowance for *demand* uncertainty, scheduled outages and deratings, forced outages and deratings, assistance over interconnections with neighboring *control areas, NYS Transmission System emergency transfer capability,* and *capacity* and/or *load relief* from available *operating procedures*.

For the 2016 capability year, the NYSRC determined that this criterion will be met with an ICAP requirement of 117.5% of the forecast NYCA peak load. This assessment compares reserve margins derived from resource projections and the peak load forecast over the assessment period against an assumed 17.5% IRM requirement.[7]

[6] New York State Reliability Council Reliability Rules & Compliance Manual for Planning and Operating the New York State Power System, Version 36, March 11, 2016.
[7] New York State Reliability Council report titled, "New York Control Area Installed Capacity Requirement for the Period May 2016 to April 2017", December 4, 2015.

In addition to the NYSRC requirement on the NYCA IRM, the NYISO establishes the LCRs.[8] The NYISO defines a locational requirement as:

> A locational ICAP requirement specifies the minimum amount of installed capacity that must be procured from resources situated specifically within a Locality. It considers generation within the Locality as well as the transmission import capability to the Locality in order to meet the resource adequacy reliability criteria of the NYSRC and the Northeast Power Coordinating Council (NPCC). These criteria require that the NYCA Loss of Load Expectation (LOLE) shall be, on average, no more than 0.1 day per year. Further, NYISO's Market Administration and Control Area Services Tariff and the NYSRC Reliability Rules require the NYISO to establish locational ICAP requirements.

This assessment also examines the ratios of capacity to load for New York City, Long Island, and the G-J Locality[9] over the assessment period. These ratios are then compared to the existing LCRs in order to determine whether the planned resources are adequate for these Localities.

LOAD FORECAST

NYISO's forecast involves a two-step process. In the first step, the overall NYCA energy requirements are forecasted. The model used in the energy requirements forecast has considered the manufacturing employment share, education and health care employment share, total income, and other demographic variables. In the second step, the total NYCA peak demand is forecasted. The peak demand is derived, zone by zone, from the annual energy using load factors averaged over the previous five years. The annual energy and the peak demand are projected with the impact of statewide energy efficiency programs (including an estimate of the impact associated with certain behind-the-meter distributed generation resources) and behind-the-meter solar generation.

Figure 1 shows the peak load forecast for the NYCA from the 2016 Gold Book.[10] The solid line is the baseline forecast of peak load[11] and the dashed line represents the 90th percentile forecast of peak load.[12] The average annual growth rate of the NYCA peak load forecast over 2016-2018 assessment period is also identified.

[8] NYISO report titled, "Locational Minimum Installed Capacity Requirements Study Covering the New York Balancing Authority Area for the 2016–2017 Capability Year," January 14, 2016.
[9] The G-J Locality encompasses Load Zones G, H, I, and J. The assessment of G-J Locality in this report is provided for information purposes only.
[10] The NYISO "Load & Capacity Data" publication is commonly referred to as the "Gold Book."
[11] The baseline forecast of peak load data is provided in the 2016 Gold Book under Tables I-2a, I-2b-1, and I-2b-2.
[12] The 90th percentile forecast of peak load data is provided in the 2016 Gold Book under Table I-2d. The 90th percentile forecast of peak load is one point within the range defined by the Load Forecast Uncertainty in the probabilistic model.

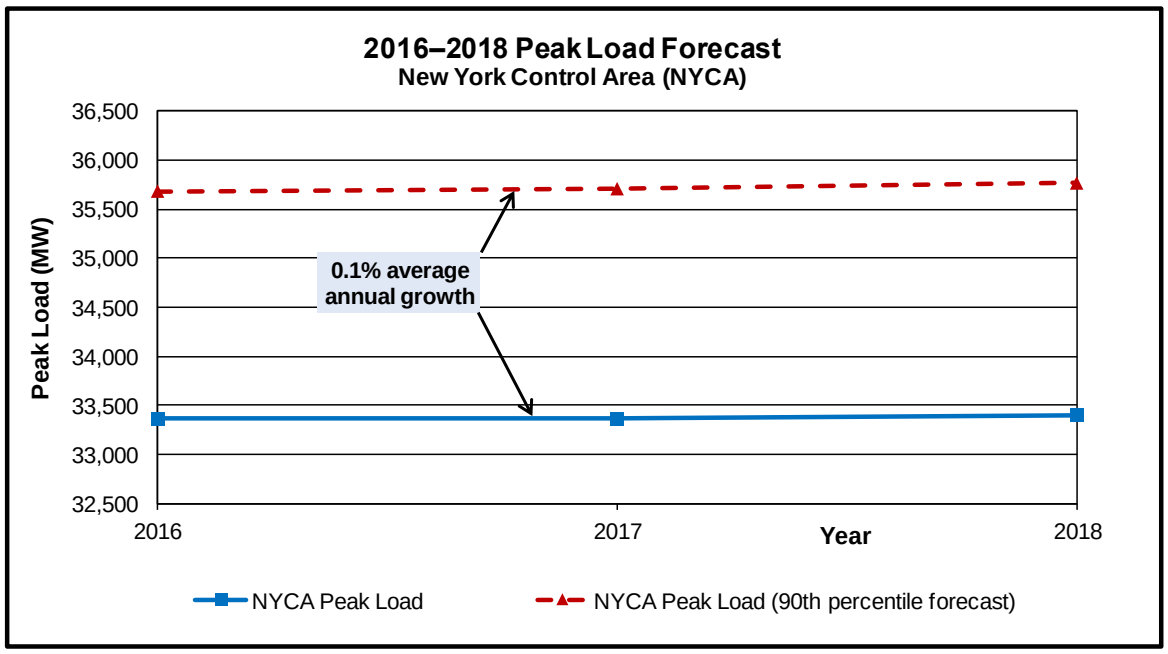

Figure 1. Peak load forecast for the New York Control Area

Figures 2, 3, and 4 show the peak load forecast for New York City (NYC), Long Island (LI), and the G-J Locality from the 2016 Gold Book, respectively, as well noting the average annual growth rate for each respective Locality during the 2016-2018 assessment period.

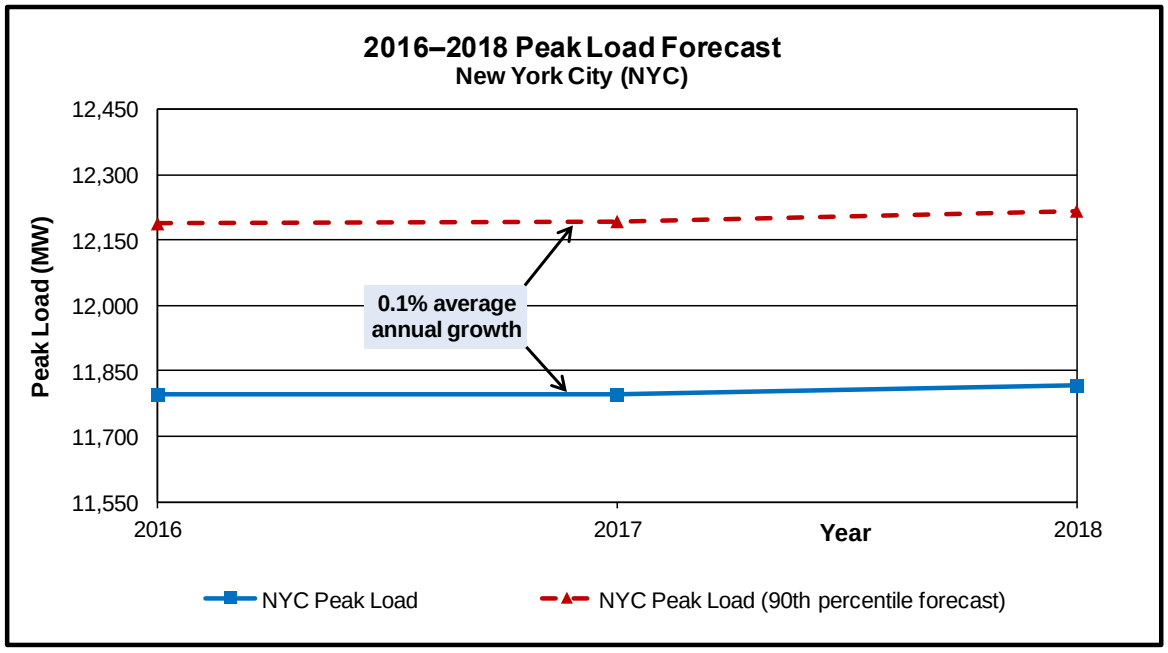

Figure 2. Peak load forecast for New York City

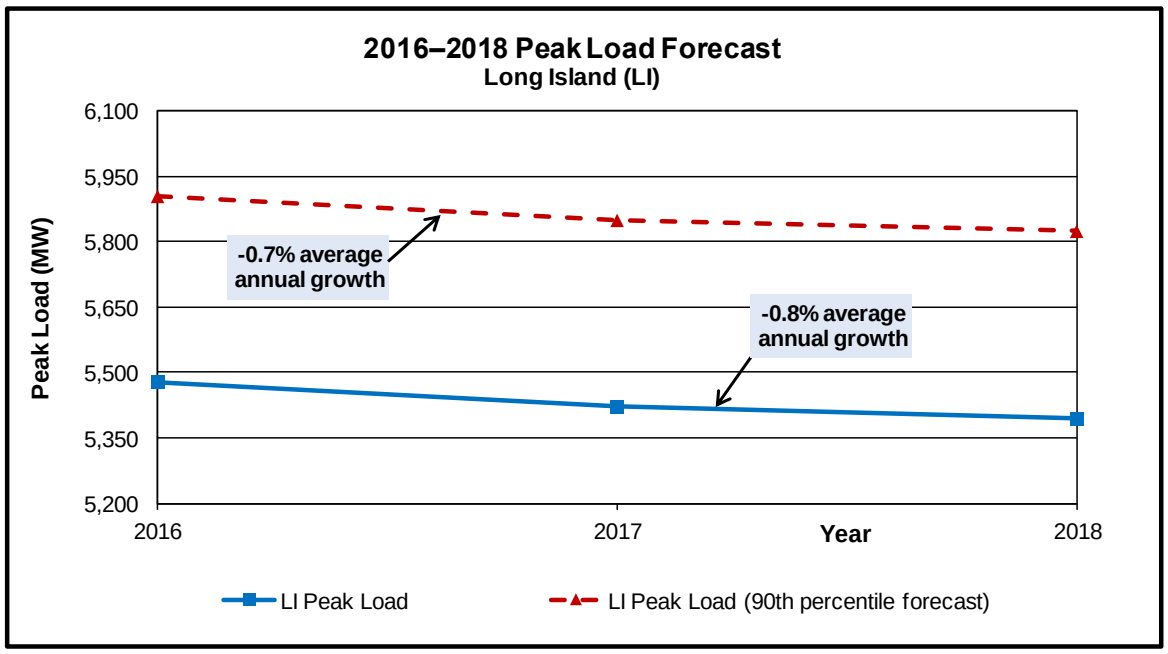

Figure 3. Peak load forecast for Long Island

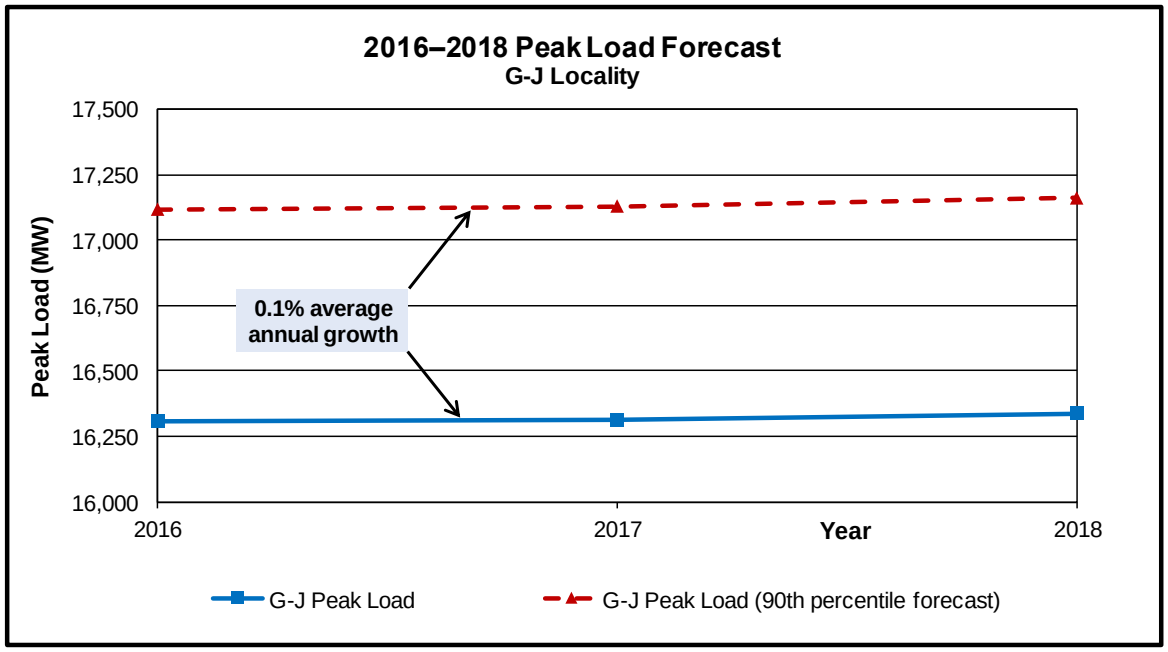

Figure 4. Peak load forecast for G-J Locality

CAPABILITY PROJECTIONS

The NYCA 2016-2018 capability projections from the 2016 Gold Book are shown in Figure 5.[13] This projection incorporates capacity additions, retirements, and reratings that are identified in the 2016 Gold Book and uses the lesser of the Capacity Resource Interconnection Service (CRIS) or summer Demonstrated Maximum Net Capability (DMNC) values for each unit. The statewide net purchases[14] and Special Case Resources (SCRs) are also included and match those found in Tables V-1 and V-2a of the 2016 Gold Book.

Capacity projections are broken into two curves in Figure 5. The first one labeled "RNA" contains project additions, retirements and reratings that have met the inclusion rules for the 2016 RNA base case. The second curve shows the projection of capacity assuming inclusion of projects that have completed their Class Year (CY) facilities study and have accepted their cost allocations.

Appendix 1 is based on the "Proposed Generator Additions & CRIS Requests" table (Table IV-1) of the 2016 Gold Book and has been revised to include retirements and reratings. The appendices, including appendices 1A and 1B, detail the units under consideration for the capability projections. The firm capacity backed contracts that are associated with UDRs are included under the net purchases.

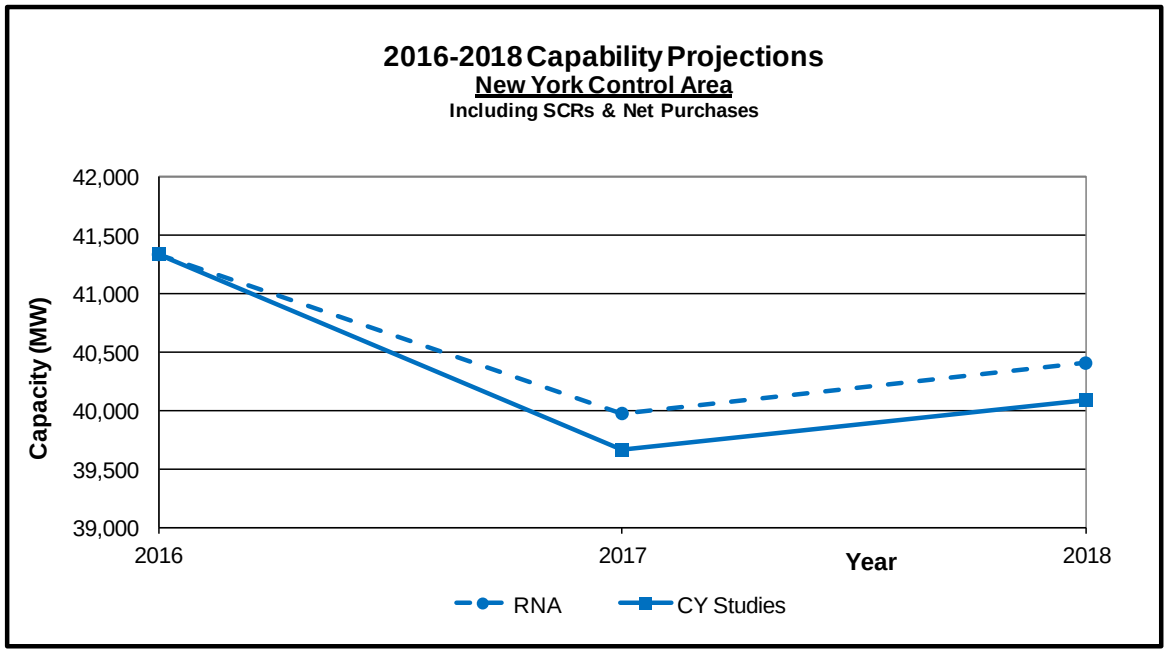

Figure 5. Capability projections for the New York Control Area

[13] The capacities listed include wind units at their full rated value as provided in the 2016 Gold Book under Table III-3a.

[14] Net purchases are long-term firm purchases less long-term firm sales. Firm purchases include grandfathered imports and Unforced Capacity Deliverability Rights (UDRs) with firm contracts.

Figures 6, 7, and 8 show the capability projections under the two cases as described above for New York City, Long Island, and the G-J Locality, respectively. It can be seen from Figure 7 that both cases for Long Island overlap. In addition, there are no capacity additions identified for Long Island.

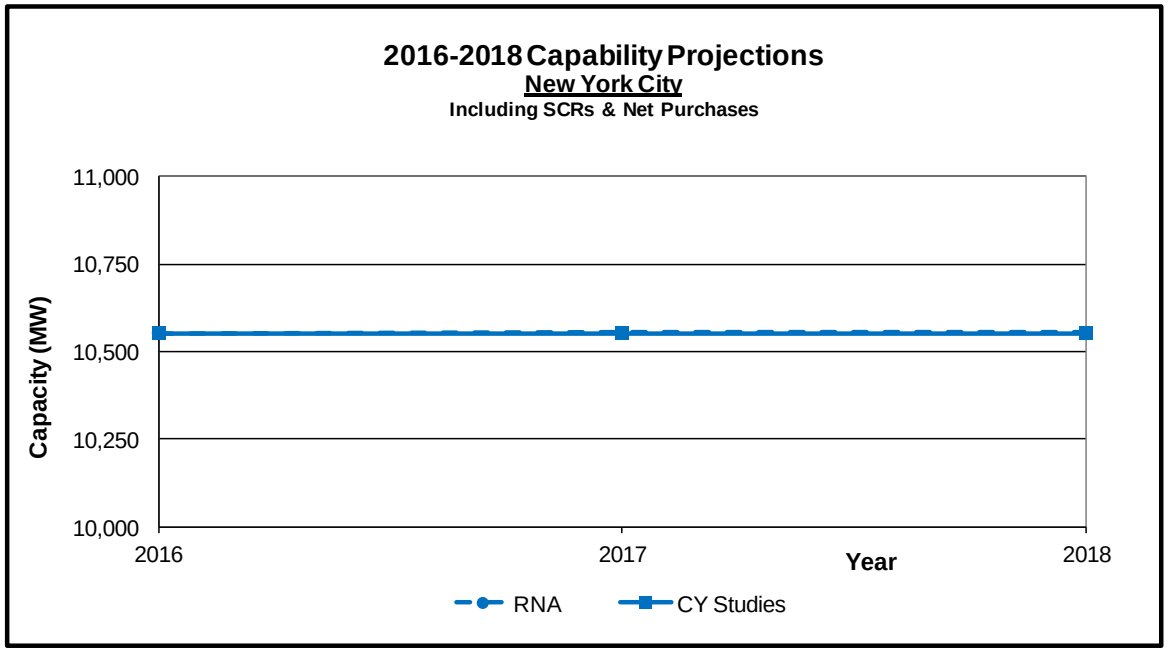

Figure 6. Capability projections for New York City

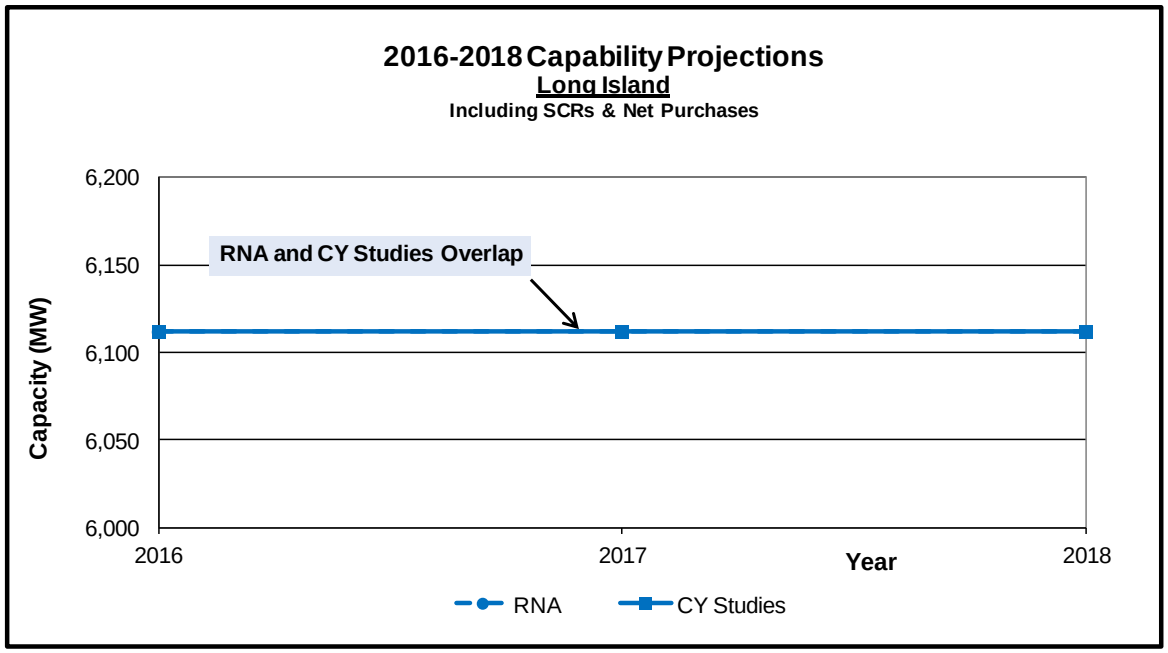

Figure 7. Capability projections for Long Island

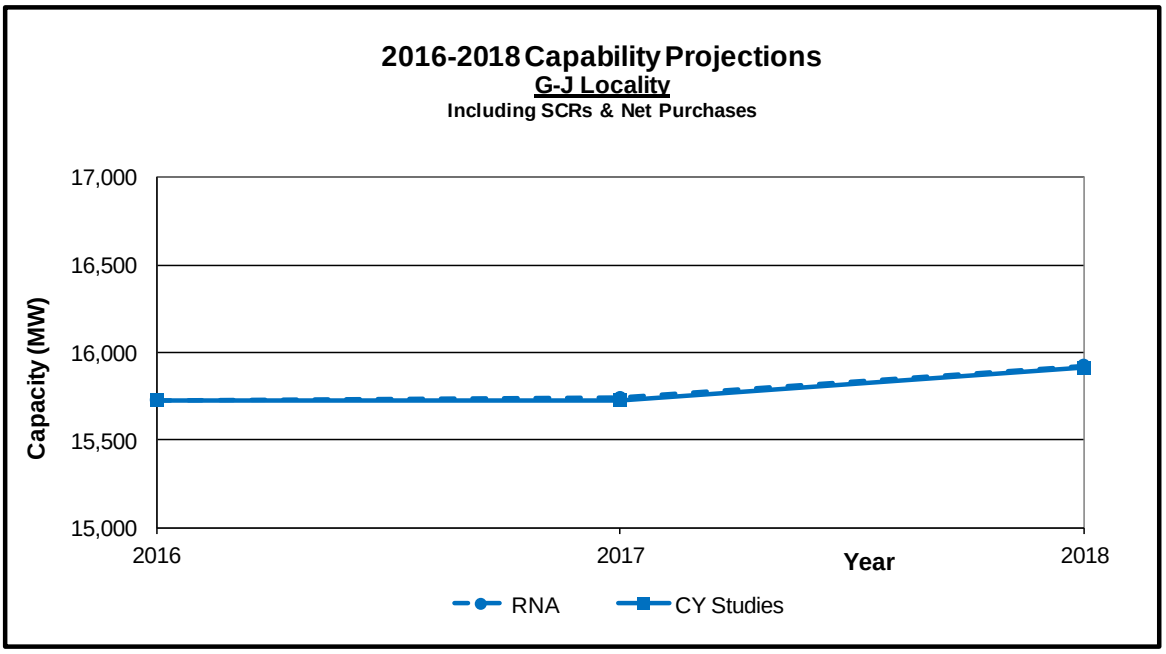

Figure 8. Capability projections for G-J Locality

RESERVE MARGIN LEVELS

From previous figures of projected load forecast and capability, the projections of NYCA installed capacity reserve margin and the capacity-to-load ratios for Localities are derived for the period of 2016-2018, as shown in Figures 9 through 16. In the analysis, three cases (*i.e.*, 2016 RNA base case, Class Year Study case, and Extreme case) are considered against the baseline forecast of peak load. The IRM and LCR projections over the assessment period are assumed to be the same as current requirements on NYCA IRM and on the LCRs for Localities, respectively.

In addition to the scenario with the baseline forecast of peak load, these three cases are also evaluated under the extreme scenario utilizing the 90th percentile forecast of peak load, which represents an extremely high peak load demand.

Figure 9 indicates that an assumed 17.5% projected NYCA IRM would be met for all three cases with the baseline forecast of peak load. In the scenario of a 90th percentile forecast of peak load, based on a deterministic assessment that only uses resources internal to New York, as shown in Figure 10, the 17.5% projected IRM cannot be met during the specific annual peak load of 2016-2018.

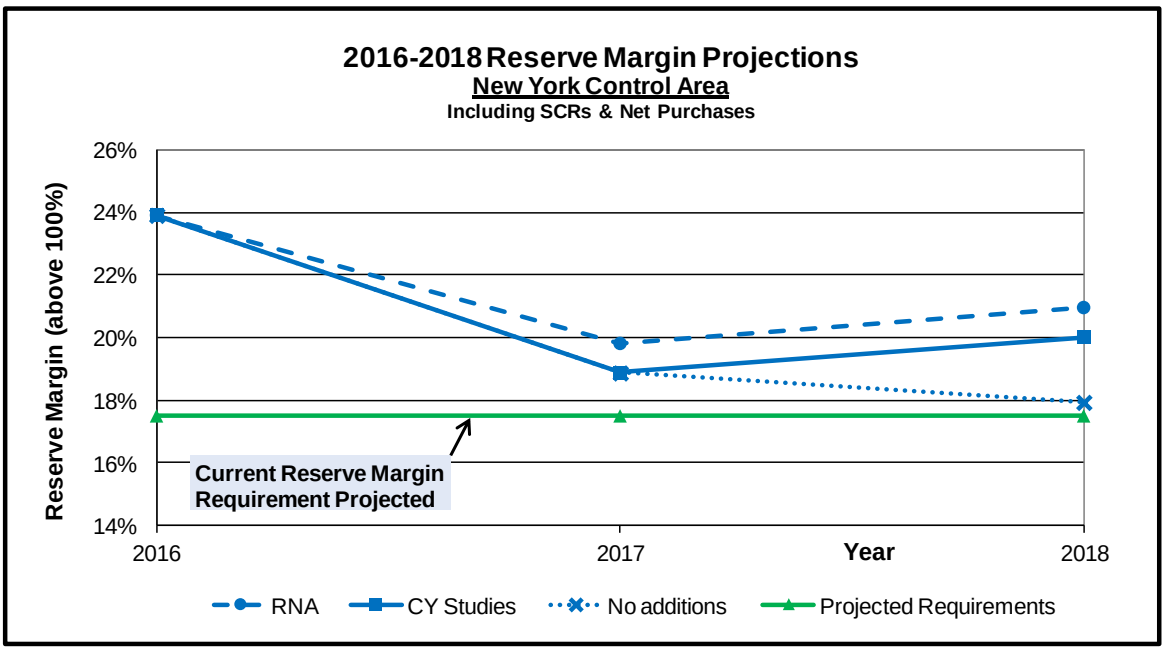

Figure 9. Reserve margin projections for the New York Control Area

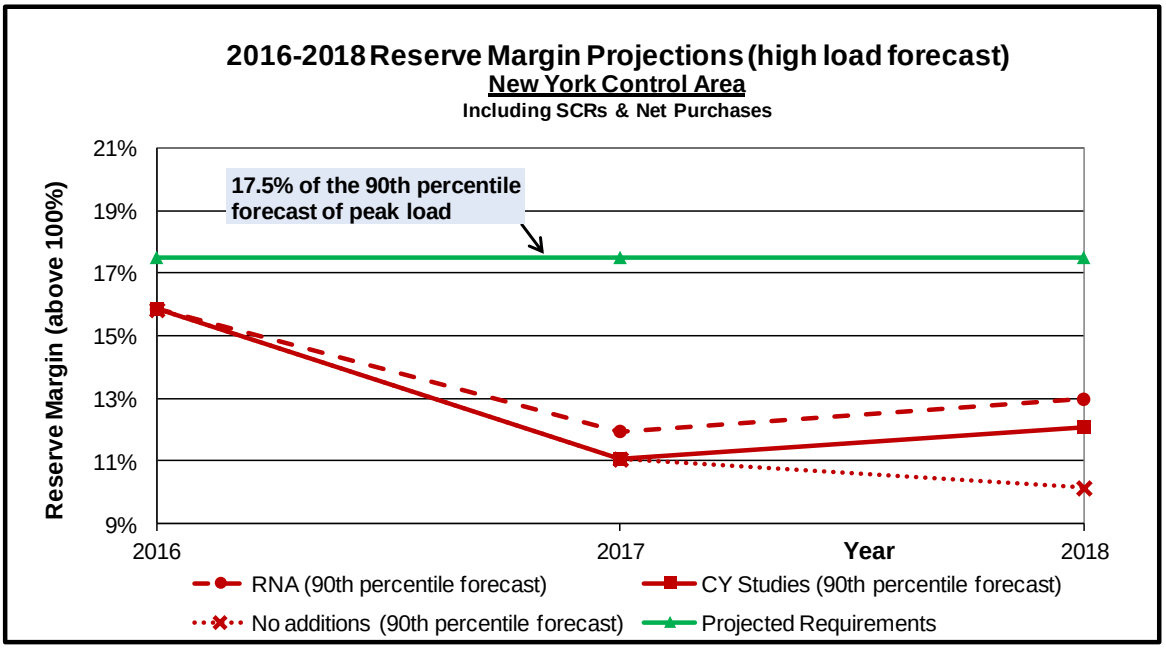

Figure 10. Reserve margin projections for the New York Control Area (high load forecast)

Figure 11 shows that New York City would meet a projected 80.5% LCR throughout the assessment period with the baseline forecast of peak load for all three cases. Under the scenario of a 90th percentile forecast of peak load, as shown in Figure 12, the 80.5% projected LCR for New York City can still be met for all three cases throughout the assessment period.

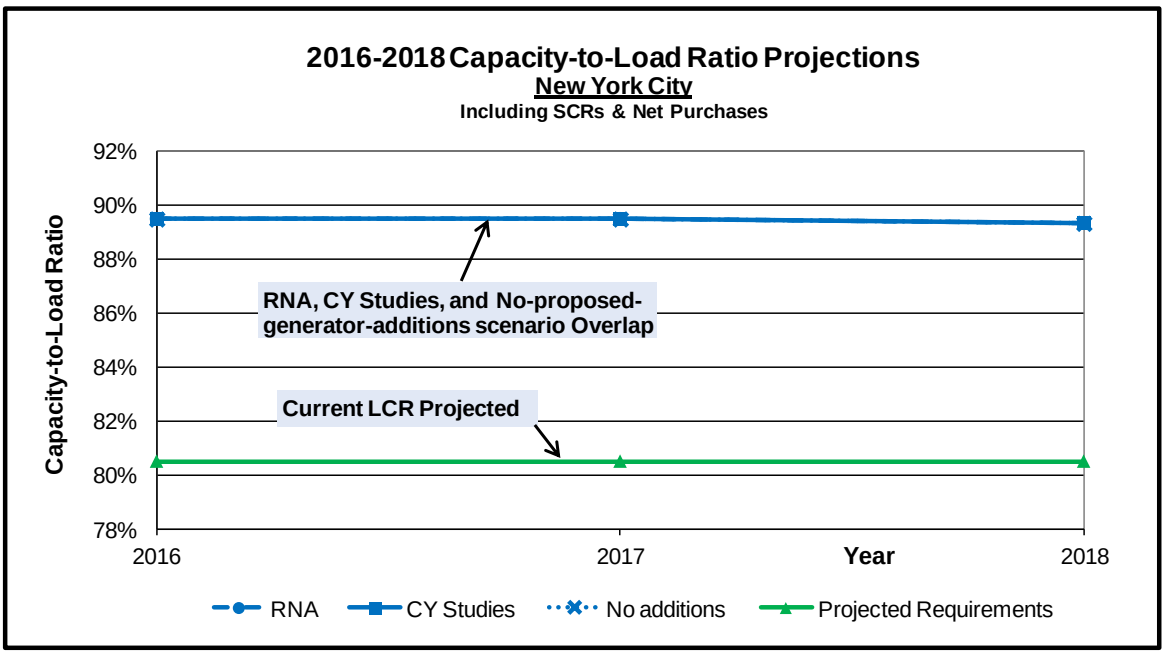

Figure 11. Capacity-to-Load Ratio Projections for New York City

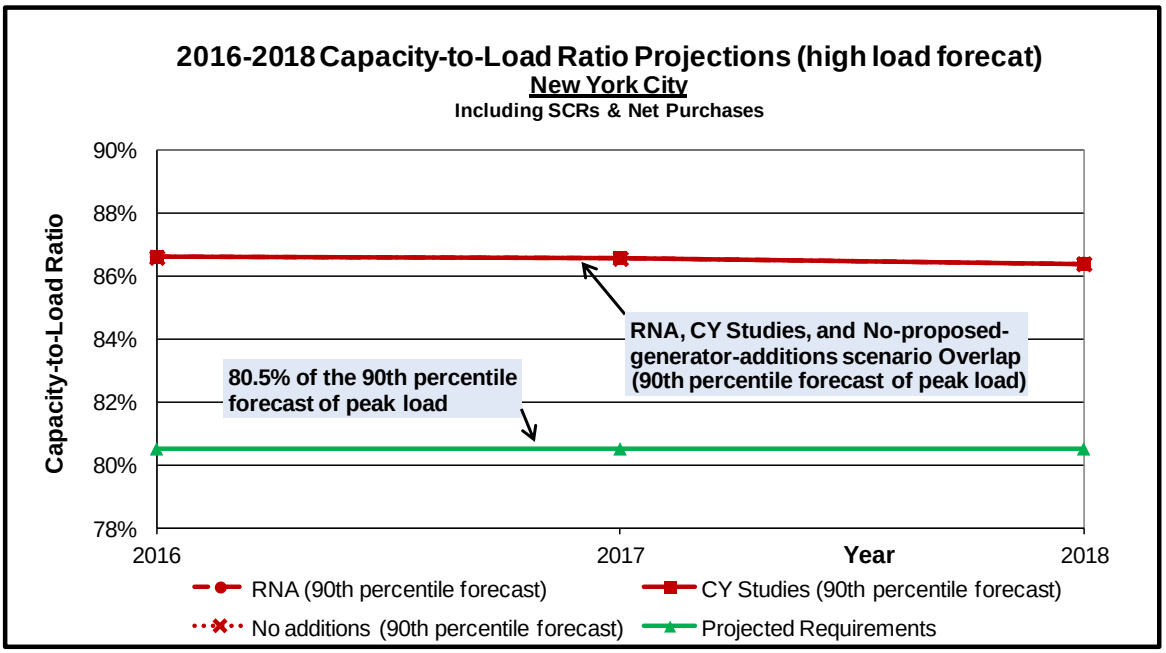

Figure 12. Capacity-to-Load Ratio Projections for New York City (high load forecast)

Figure 13 shows that Long Island would meet a projected 102.5% LCR throughout the assessment period with the baseline forecast of peak load for all three cases. Since there are no capacity additions indentified for Long Island during 2016-2018, all three cases are the same. Under the scenario of a 90th percentile forecast of peak load, as shown in Figure 14, the 102.5% projected LCR can still be met for all three cases throughout the assessment period.

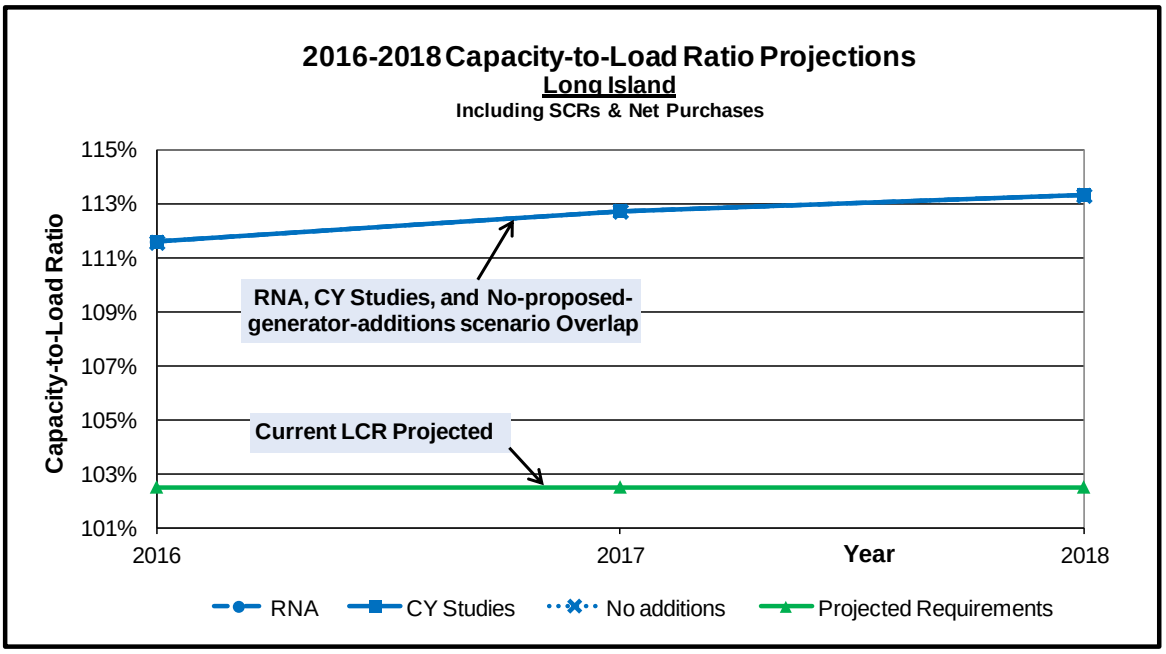

Figure 13. Capacity-to-Load Ratio Projections for Long Island

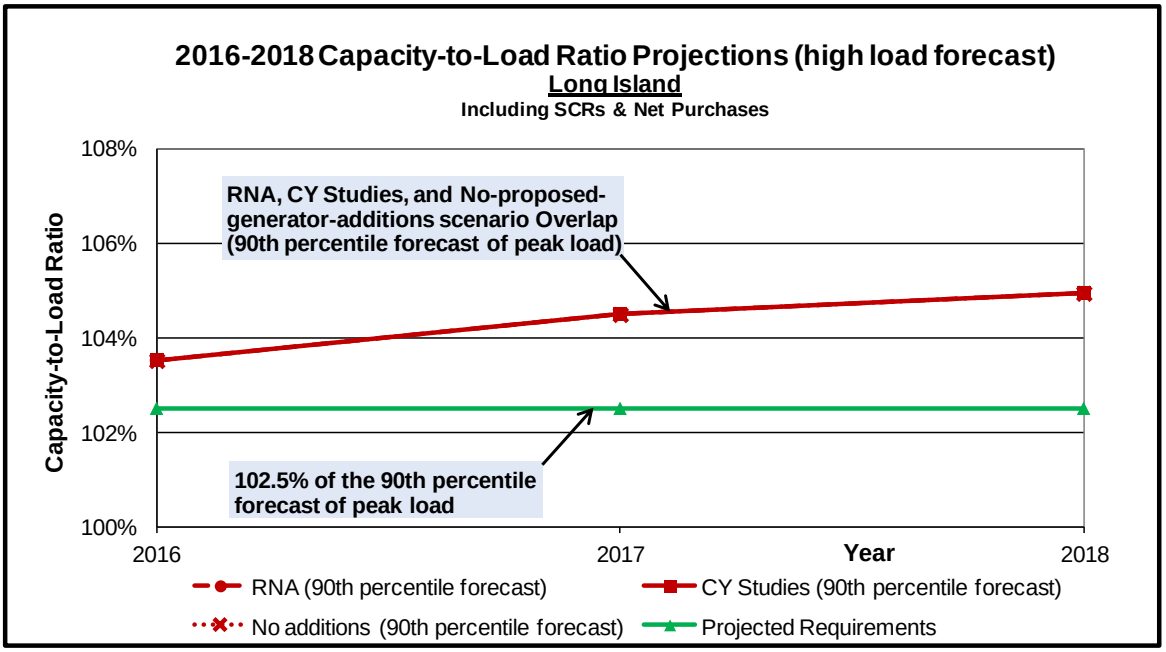

Figure 14. Capacity-to-Load Ratio Projections for Long Island (high load forecast)

Figure 15 shows that the G-J Locality would meet a projected 90.0% LCR throughout the assessment period for all three cases with the baseline forecast of peak load. Under the scenario of the 90th percentile forecast of peak load, as shown in Figure 16, the 90.0% projected LCR can still be met for both the Class Year Study and the RNA cases throughout the assessment period. If no proposed capacity additions were to materialize,

however, the G-J Locality would not meet the projected 90.0% LCR for 2018 based on the annual peak load associated with the 90th percentile forecast of peak load.

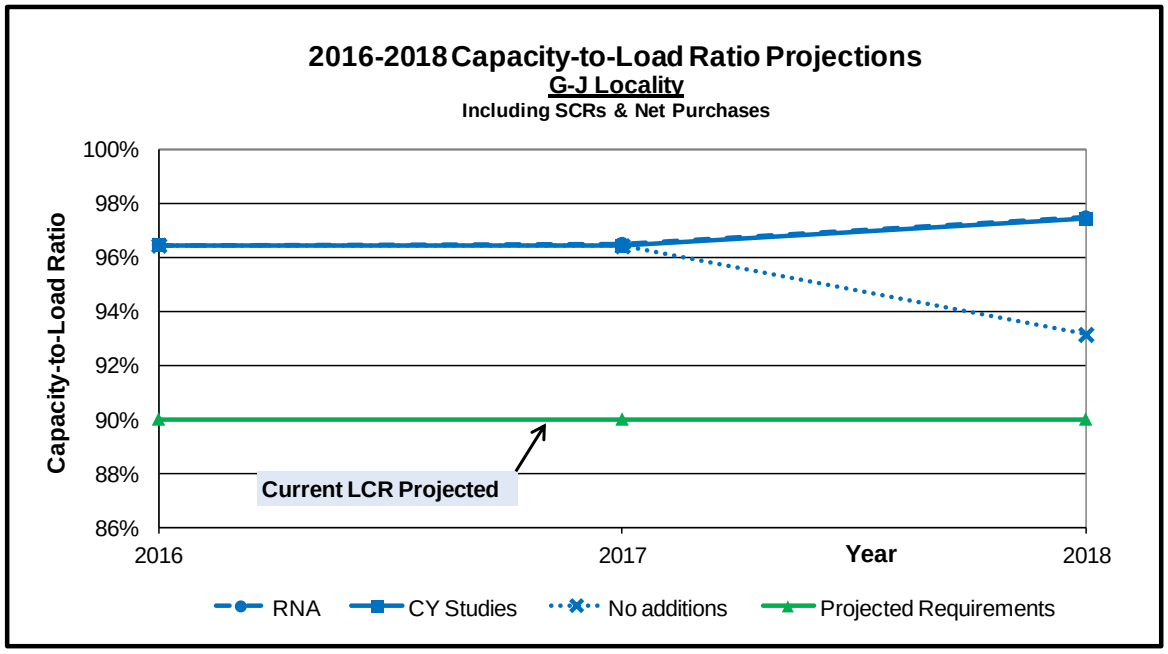

Figure 15. Capacity-to-Load Ratio Projections for G-J Locality

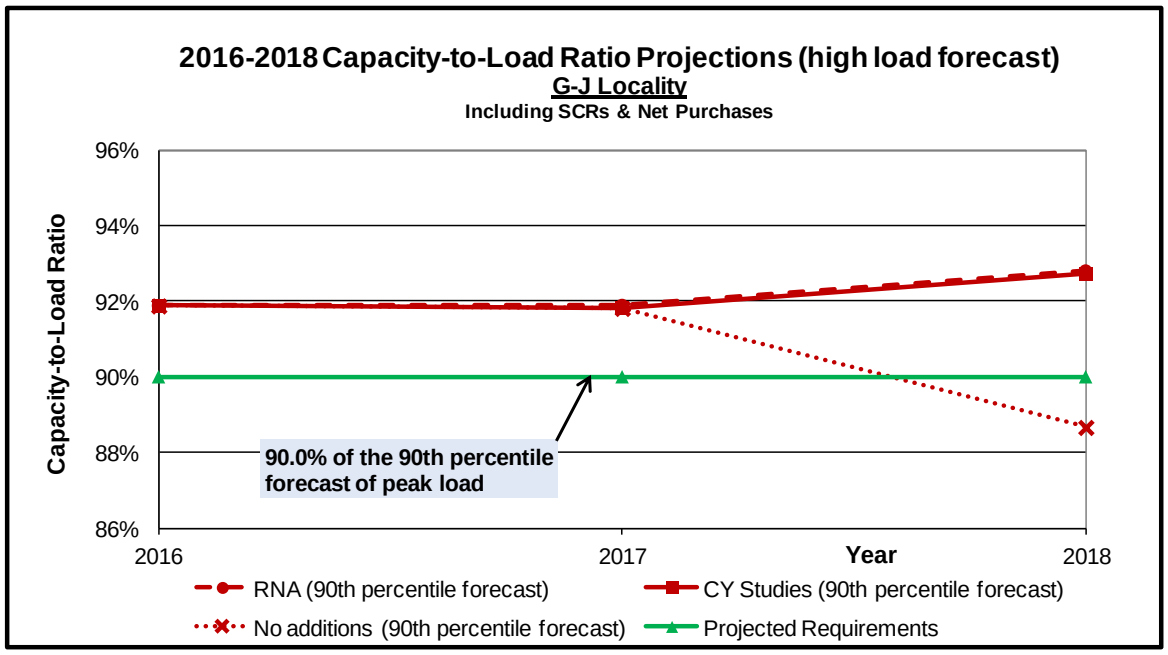

Figure 16. Capacity-to-Load Ratio Projections for G-J Locality (high load forecast)

CONCLUSION

With the baseline forecast of peak load, a projected 17.5% statewide IRM would be met throughout the assessment period, even if the proposed 2016-2018 resource additions are unavailable. Because NYSRC's annual IRM study has adopted the Load Forecast Uncertainty (LFU) in its probabilistic model, an extremely high peak load demand, including the 90th percentile forecast of peak load, has already been included in the study using the baseline forecast data. To consider the results for specific forecast, such as the 90th percentile forecast of peak load, a deterministic assessment needs to be performed. Based on a deterministic assessment, a projected 17.5% IRM cannot be met for the 90th percentile forecast of annual peak load during 2016-2018 with only resources internal to New York.

With the baseline forecast of peak load and the proposed 2016-2018 resource additions, New York City would meet a projected LCR of 80.5% over the assessment period.

With the baseline forecast of peak load, Long Island would meet a projected LCR of 102.5% throughout the assessment period.

With the baseline forecast of peak load and the proposed 2016-2018 resource additions, the G-J Locality would meet a projected LCR of 90.0% over the assessment period.

It is worthy to note that even without the proposed 2016-2018 resource additions for the baseline forecast of peak load, New York City, Long Island, and the G-J Locality would still be able to meet their respective projected LCR requirements throughout the assessment period.

Similar to the IRM study, the probabilistic model of NYISO's annual LCR study has also adopted the Load Forecast Uncertainty (LFU) in the baseline forecast data. To consider a specific forecast, such as the 90th percentile forecast of peak load, a deterministic assessment needs to be performed. Based on a deterministic assessment of the 90th percentile forecast of peak load, New York City can still meet the projected LCR of 80.5% throughout the assessment period. Long Island can also meet the projected LCR of 102.5% over the assessment period. The G-J Locality would meet the projected 90.0% LCR requirement throughout the assessment period, unless the proposed resource additions failed to materialize in 2018.

It is important to note that any deterministic assessment of extreme scenarios, including the Extreme case utilizing the baseline forecast of peak load and all three scenarios utilizing the 90th percentile forecast of peak load, only provide limited "what if" information and, without a probabilistic assessment, do not test resource adequacy. Only the cases including planned resources and interconnections with other regions and that utilize the baseline forecast of peak load can demonstrate whether NYCA or a Locality has adequate resources.

Appendix 1*

Proposed Resource Changes

QUEUE POS.	OWNER / OPERATOR	STATION UNIT	ZONE	DATE	CRIS (MW)	SUMMER (MW)	UNIT TYPE	CLASS YEAR	NOTES	Increase of Lessor of CRIS & Summer DMNC
Generator Additions										
349	Taylor Biomass Energy Mont., LLC	Taylor Biomass	G	2018/04	19.0	19.0	Solid Waste	2011	(1)	19.0
251	CPV Valley, LLC	CPV Valley Energy Center	G	2017/10	680.0	677.6	Combined Cycle	2011	(1)	677.6
395	Copenhagen Wind Farm, LLC	Copenhagen Wind	E	2016/10	79.9	79.9	Wind Turbines	2015	(1)	79.9
	Marble River, LLC	Marble River Wind	D	Summer 2017	215.2	215.2	Wind Turbines	2015	(1)	215.2
Generator Re-ratings										
	Consolidated Edison Co. of NY, Inc.	East River 1 Uprate	J	Summer 2017	160.5	150.9	Steam Turbine	2015	(1)	0.4
	Consolidated Edison Co. of NY, Inc.	East River 2 Uprate	J	Summer 2017	162.4	151.8	Steam Turbine	2015	(1)	0.0
	GenOn Energy Management, LLC	Bowline 2 Uprate	G	Summer 2017	567.4	569.0	Steam Turbine	2015	(1)	11.6
	Stony Creek Energy, LLC	Orangeville Wind Farm Uprate	C	Summer 2017	94.4	93.9	Wind Turbines	2015	(1)	5.4
Generator Retirements or Mothballing										
	Cayuga Operating Company, LLC	Cayuga 1	C	7/1/2017	154.1	150.1	Steam Turbine			-150.1
	Cayuga Operating Company, LLC	Cayuga 2	C	7/1/2017	154.7	150.4	Steam Turbine			-150.4
	Entergy Nuclear Power Marketing LLC	Fitzpatrick 1	C	1/1/2017	858.9	852.9	BWR Nuclear			-852.9
	R.E. Ginna Nuclear Power Plant, LLC	Ginna	B	4/1/2017	582.0	581.4	PWR Nuclear			-581.4
	TC Ravenswood, LLC	Ravenswood 04	J	4/30/2016	15.2	12.9	Combustion Turbine			-12.9
	TC Ravenswood, LLC	Ravenswood 05	J	4/30/2016	15.7	15.5	Combustion Turbine			-15.5
	TC Ravenswood, LLC	Ravenswood 06	J	4/30/2016	16.7	12.6	Combustion Turbine			-12.6
GRAND TOTAL										**-766.7**

* This table is modified from table IV-1, "Proposed Generator Additions & CRIS Requests" in the NYISO 2016 Gold Book.
(1) Projects that have met the inclusion rule for the 2016 RNA Base Case.

Appendix 1A – Determination of Annual Capacities

Units Completing Their Class Year Facilities Study

	2016				2017				2018			
	NYCA	NYC	LI	G-J	NYCA	NYC	LI	G-J	NYCA	NYC	LI	G-J
2016 Gold Book - full wind:	**38664.5**	**9597.0**	**5280.9**	**14353.4**	**38664.5**	**9597.0**	**5280.9**	**14353.4**	**38664.5**	**9597.0**	**5280.9**	**14353.4**
Lesser of CRIS & Summer DMNC	38359.0	9575.0	5286.5	14670.4	38359.0	9575.0	5286.5	14670.4	38359.0	9575.0	5286.5	14670.4
Taylor Biomass									19.0			19.0
CPV Valley Energy Center									677.6			677.6
Copenhagen Wind (CRIS requested)												
Marble River Wind (CRIS requested)												
Reratings												
East River 1 Uprate (CRIS requested)												
East River 2 Uprate (CRIS requested)												
Bowline 2 (CRIS requested)												
Orangeville Wind Farm Uprate (CRIS requested)												
Retirements / Mothballing												
Cayuga 1					-150.1				-150.1			
Cayuga 2					-150.4				-150.4			
Fitzpatrick 1					-852.9				-852.9			
Ginna					-581.4				-581.4			
Ravenswood 04	-12.9	-12.9		-12.9	-12.9	-12.9		-12.9	-12.9	-12.9		-12.9
Ravenswood 05	-15.5	-15.5		-15.5	-15.5	-15.5		-15.5	-15.5	-15.5		-15.5
Ravenswood 06	-12.6	-12.6		-12.6	-12.6	-12.6		-12.6	-12.6	-12.6		-12.6
Total:	38318.0	9534.0	5286.5	14629.4	36583.2	9534.0	5286.5	14629.4	37279.8	9534.0	5286.5	15326.0

Appendix 1B – Determination of Annual Capacities

RNA Inclusion

	2016				2017				2018			
	NYCA	NYC	LI	G-J	NYCA	NYC	LI	G-J	NYCA	NYC	LI	G-J
2016 Gold Book - full wind:	**38664.5**	**9597.0**	**5280.9**	**14353.4**	**38664.5**	**9597.0**	**5280.9**	**14353.4**	**38664.5**	**9597.0**	**5280.9**	**14353.4**
Lesser of CRIS & Summer DMNC	38359.0	9575.0	5286.5	14670.4	38359.0	9575.0	5286.5	14670.4	38359.0	9575.0	5286.5	14670.4
Taylor Biomass									19.0			19.0
CPV Valley Energy Center									677.6			677.6
Copenhagen Wind (CRIS requested)					79.9				79.9			
Marble River Wind (CRIS requested)					215.2				215.2			
Reratings												
East River 1 Uprate (CRIS requested)					0.4	0.4		0.4	0.4	0.4		0.4
East River 2 Uprate (CRIS requested)					0.0	0.0		0.0	0.0	0.0		0.0
Bowline 2 (CRIS requested)					11.6			11.6	11.6			11.6
Orangeville Wind Farm Uprate (CRIS requested)					5.4				5.4			
Retirements / Mothballing												
Cayuga 1					-150.1				-150.1			
Cayuga 2					-150.4				-150.4			
Fitzpatrick 1					-852.9				-852.9			
Ginna					-581.4				-581.4			
Ravenswood 04	-12.9	-12.9		-12.9	-12.9	-12.9		-12.9	-12.9	-12.9		-12.9
Ravenswood 05	-15.5	-15.5		-15.5	-15.5	-15.5		-15.5	-15.5	-15.5		-15.5
Ravenswood 06	-12.6	-12.6		-12.6	-12.6	-12.6		-12.6	-12.6	-12.6		-12.6
Total:	38318.0	9534.0	5286.5	14629.4	36895.7	9534.4	5286.5	14641.4	37592.3	9534.4	5286.5	15338.0