2020 NYSRC Long-Term Resource Adequacy Assessments

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Goal

- This presentation summarizes the 2020 NYSRC Long-Term Resource Adequacy Assessments (LTRAA) Report in support of the NYSRC certification
- LTRAA report information is based on NYISO's:
  - 2020 RNA Base Case and scenarios results
  - 2020 Q3 STAR results

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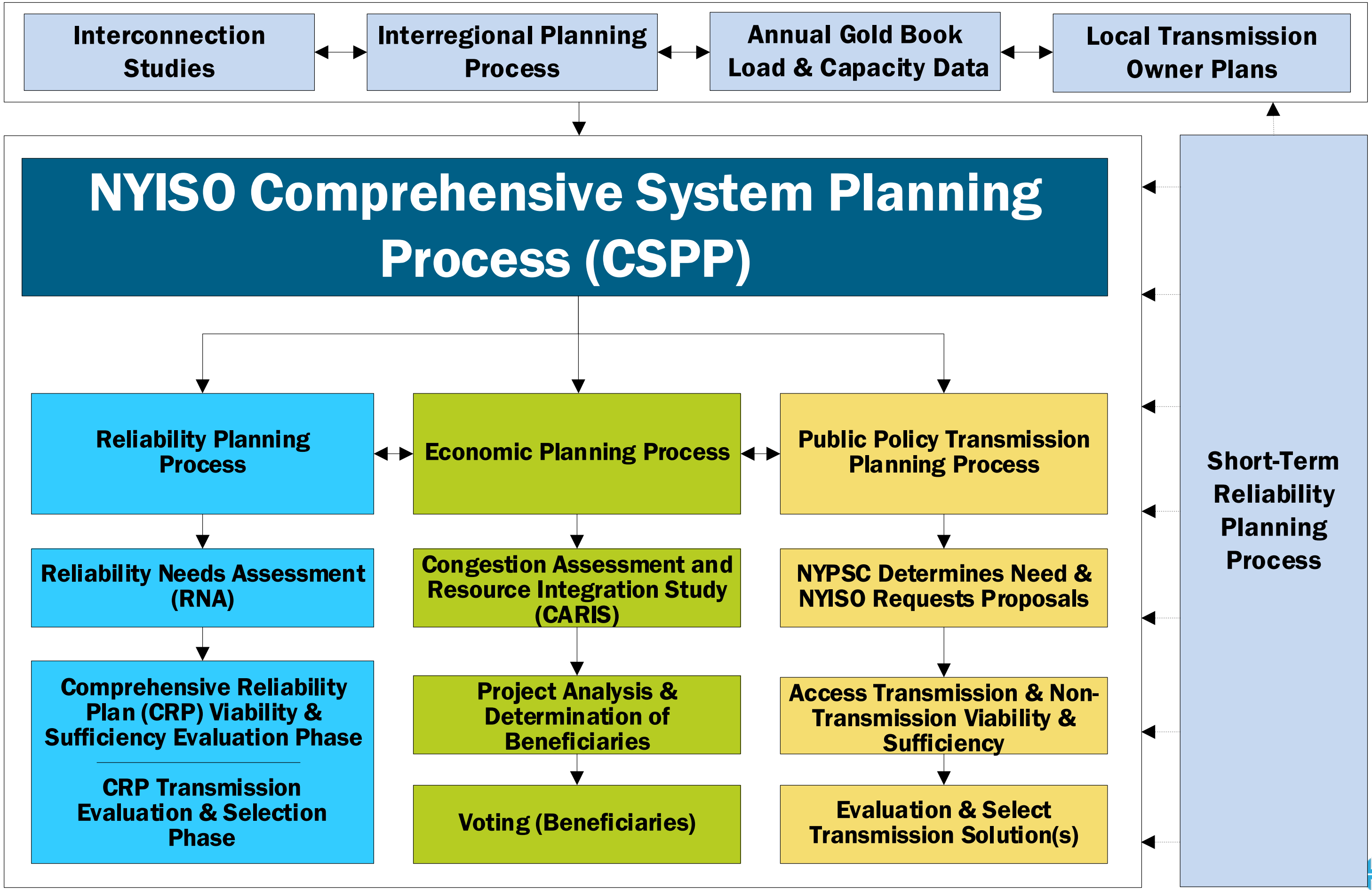

Interconnection Studies
Interregional Planning Process
Annual Gold Book Load & Capacity Data
Local Transmission Owner Plans
NYISO Comprehensive System Planning Process (CSPP)
Reliability Planning Process
Economic Planning Process
Public Policy Transmission Planning Process
Reliability Needs Assessment (RNA)
Congestion Assessment and Resource Integration Study (CARIS)
NYPSC Determines Need & NYISO Requests Proposals
Comprehensive Reliability Plan (CRP) Viability & Sufficiency Evaluation Phase
CRP Transmission Evaluation & Selection Phase
Project Analysis & Determination of Beneficiaries
Access Transmission & Non-Transmission Viability & Sufficiency
Voting (Beneficiaries)
Evaluation & Select Transmission Solution(s)
Short-Term Reliability Planning Process

2020 LTRAA Background

- The New York State Reliability Council's (NYSRC) Reliability Rule A.3. B. R2 requires the NYISO to prepare a biennial NYCA Long-Term Resource Adequacy Assessment (LTRAA) covering a ten-year look-ahead period
  - New requirement in the NYSRC Reliability Rules, starting with the July 17, 2020 version #45: http://www.nysrc.org/NYSRCReliabilityRulesComplianceMonitoring.html
- This assessment is designed to include findings from the latest NYISO Reliability Needs Assessment (RNA) or other comparable NYISO-approved resource adequacy reviews, such as the newly-defined Short-Term Reliability Process (STRP) and its quarterly Short-Term Assessment of Reliability (STAR)
- The 2020 LTRAA review report uses the information from the 2020 RNA for Study Years 2024 through 2030 (year 4 through year 10), and from the 2020 Q3 STAR for the 2021 through 2025 (with a focus on years 1 through year 3)
- The NYISO provides the 2020 LTRAA report summarizing these assessments to the NYSRC to fulfill the requirement

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2020 RNA Base Case Major Assumptions

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2020 RNA: Summer Peak Load and Energy Forecast Assumptions

Baseline and Adjusted Baseline Energy Forecasts

Annual GWh	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
2020 End-Use Energy Forecast	154,380	158,431	161,852	162,477	163,897	165,132	166,331	167,305	168,188	168,789	169,249
-- Energy Efficiency and Codes & Standards	1,885	3,959	6,200	8,599	11,081	13,582	15,937	18,057	19,921	21,563	23,016
-- BtM Solar PV	2,631	3,274	3,899	4,563	5,193	5,738	6,205	6,591	6,893	7,130	7,289
-- BtM Non-Solar Distributed Generation	1,252	1,416	1,059	940	818	852	877	900	931	956	973
+ Storage Net Energy Consumption	19	43	67	99	130	160	189	221	254	281	309
+ Electric Vehicle Energy	199	345	538	781	1,085	1,456	1,889	2,407	3,031	3,765	4,506
+ Non-EV Electrification	190	457	815	1,289	1,884	2,591	3,337	4,163	5,055	5,997	6,988
2020 Gold Book Baseline Forecast	149,020	150,627	152,114	150,544	149,904	149,167	148,727	148,548	148,783	149,183	149,774
+ BtM Solar PV	2,631	3,274	3,899	4,563	5,193	5,738	6,205	6,591	6,893	7,130	7,289
2020 RNA Base Case Forecast[1]	151,651	153,901	156,013	155,107	155,097	154,905	154,932	155,139	155,676	156,313	157,063

Baseline and Adjusted Baseline Summer Peak Forecasts

Annual MW	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
2020 End-Use Peak Demand Forecast	33,319	33,599	33,978	34,220	34,555	34,861	35,208	35,524	35,848	36,108	36,324
-- Energy Efficiency and Codes & Standards	296	591	943	1,322	1,709	2,108	2,488	2,825	3,116	3,360	3,579
-- BtM Solar PV	555	707	841	986	1,102	1,204	1,287	1,351	1,392	1,411	1,411
-- BtM Non-Solar Distributed Generation	218	251	189	169	148	154	158	164	170	174	177
-- BtM Storage Peak Reductions	5	14	26	44	63	91	125	159	206	250	292
+ Electric Vehicle Peak Demand	40	68	103	147	201	261	333	418	513	625	748
+ Non-EV Electrification	11	25	46	72	104	146	187	230	279	327	379
2020 Gold Book Baseline Forecast[2]	32,296	32,129	32,128	31,918	31,838	31,711	31,670	31,673	31,756	31,865	31,992
+ BtM Solar PV	555	707	841	986	1,102	1,204	1,287	1,351	1,392	1,411	1,411
2020 RNA Base Case Forecast[1]	32,851	32,836	32,969	32,904	32,940	32,915	32,957	33,024	33,148	33,276	33,403

[1] For the resource adequacy study, the Gold Book baseline load forecast was modified by removing the behind-the-meter solar PV impacts in order to model the solar PV explicitly as a generation resource to account for the intermittent nature of its availability.

[2] The transmission security power flow RNA base cases use this Gold Book baseline forecast.

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2020 RNA: Inclusion Rules Application

- **Proposed generation and transmission to be included:**
  - Next slide contains a list of added projects
- **Generation deactivations: all plant deactivations listed in the 2020 Gold Book Section IV are modeled out of service in the RNA Base Case**
  - Certain peaker units listed in Table IV-6 are assumed out-of-service during summer ozone season only (additional details in this presentation)
- **Proposed Local Transmission Owner Plans (LTP) to be included:**
  - All BPTF LTPs listed in the 2020 GB Section VII as firm, with consideration for the in-service date
  - All non-BPTF LTPs listed by the Transmission Owner as firm
- **Existing transmission facilities modeled out-of-service include:**
  - Con Edison's B3402 and C3403 345 kV cables for the entire study period

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Proposed Generation and Transmission Projects

Proposed Projects Included in the 2020 RNA Base Case

Queue #	Project Name	Zone	Point of Interconnection	Summer Peak (MW)	2020 RNA Commercial Operation Date
Proposed Transmission Additions, other than Local Transmission Owner Plans					
Q545A*	Empire State Line	A	Dysinger - Stolle 345kV	n/a	6/2022
556	Segment A Double Circuit	E,F	Edic - New Scotland 345kV	n/a	12/2023
543	Segment B Knickerbocker-Pleasant Valley 345 kV	F,G	Greenbush - Pleasant Valley 345kV	n/a	12/2023
430	Cedar Rapids Transmission Upgrade	D	Dennison - Alcoa 115kV	80	10/2021
System Deliverability Upgrades*	Leeds-Hurley SDU	F,G	Leeds- Hurley SDU 345kV	n/a	summer 2021
Proposed Generations Additions					
387*	Cassadaga Wind	A	Dunkirk - Moon Station 115 kV	126.5	12/2021
396	Baron Winds	C	Hillside - Meyer 230kV	238.4	12/2021
422	Eight Point Wind Energy Center	B	Bennett 115kV	101.8	12/2021
505	Ball Hill Wind	A	Dunkirk - Gardenville 230kV	100.0	12/2022
546	Roaring Brook Wind	E	Chases Lake Substation 230kV	79.7	12/2021
678	Calverton Solar Energy Center	K	Edwards Substation 138kV	22.9	12/2021
			MW Additions from 2019-2028 CRP	543	
			Total MW generation additions	669	

*also included in the 2019-2028 CRP Base Cases

DEC Peaker Rule Impacts on the 2020 RNA Base Case

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DEC Peaker Rule Background

- New York State Department of Environmental Conservation (DEC) adopted a regulation to limit nitrogen oxides (NOx) emissions from simple-cycle combustion turbines ("Peaking Units") (referred to as the "Peaker Rule")
- The Peaker Rule required all impacted plant owners to file compliance plans by March 2, 2020
- NYISO considered generators' compliance plans in the development of the 2020 Reliability Needs Assessment Base Case
- The following slides show zonal breakdown of the same related information from slide 16 (*i.e.* 2020 GB Table iV-6)

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Status Change due to DEC Peaker Rule, Zone G

Units	Nameplate MW	CRIS (MW)		Capability (MW)		2023 Ozone Season	2023 non-Ozone Season	2024 Ozone Season	2024 non-Ozone Season	2025 Ozone Season	2025 non-Ozone Season
		Summer	Winter	Summer	Winter	*May 2023 - September 2023*	*October 2023 - April 2024*	*May 2024 - September 2024*	*October 2024 - April 2025*	*May 2025 - September 2025*	*October 2025 - April 2026*
Coxsackie GT	22	20	26	20	24	O/S	O/S	O/S	O/S	O/S	O/S
South Cairo	22	20	26	18	23	O/S	O/S	O/S	O/S	O/S	O/S
Unavailable MW = Impacted MW	43	40	52	38	46						

O/S - Out-of-service

Notes:

1. The service pattern in the last two columns repeats in subsequent years of the RNA Study Period
2. Other compliance plans were submitted in addition to what is shown on this table. The table lists the plants with compliance plans that resulted in a change of status (*i.e.*, as also listed in the 2020 Gold Book Table iV-6)

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Status Change due to DEC Peaker Rule, Zone J

Units	Nameplate MW	CRIS (MW)		Capability (MW)		2023 Ozone Season	2023 non-Ozone Season	2024 Ozone Season	2024 non-Ozone Season	2025 Ozone Season	2025 non-Ozone Season
		Summer	Winter	Summer	Winter	*May 2023 - September 2023*	*October 2023 - April 2024*	*May 2024 - September 2024*	*October 2024 - April 2025*	*May 2025 - September 2025*	*October 2025 - April 2026*
Astoria GT1	16	16	21	14	19	I/S	I/S	I/S	I/S	O/S	I/S
Gowanus 1&4 (1-1 through 1-8, and 4-1 through 4-4)	320	279	364	274	365	O/S	I/S	O/S	I/S	O/S	I/S
Gowanus 2&3 (2-1 through 2-8 and 3-1 through 3-8)	320	300	391	278	373	I/S	I/S	I/S	I/S	O/S	I/S
Narrows 1&2 (1-1 through 1-8, and 2-1 through 2-8)	352	309	404	287	380	I/S	I/S	I/S	I/S	O/S	I/S
Ravenswood GTs (01, 10, 11)	69	50	64	41	57	O/S	O/S	O/S	O/S	O/S	O/S
Arthur Kill GT1	20	17	22	12	15	I/S	I/S	I/S	I/S	O/S	O/S
Astoria GTs (2-1 through 2-4, 3-1 through 3-4, 4-1 through 4-4)	558	504	621	415	543	O/S	O/S	O/S	O/S	O/S	O/S
Con Ed 59th St	17	15	20	16	20	I/S	I/S	I/S	I/S	O/S	O/S
Con Ed 74th St	37	39	49	35	41	O/S	O/S	O/S	O/S	O/S	O/S
Con Ed Hudson Ave 5	16	15	20	14	20	O/S	O/S	O/S	O/S	O/S	O/S
Unavailable MW *(Summer Capability)*						779	506	779	506	1,385	533
Available MW (Summer Capability)						606	880	606	880	0	852
Impacted MW	1,725	1,544	1,975	1,385	1,834						

O/S - Out-of-service

I/S - In-service

Notes:
1. The service pattern in the last two columns repeats in subsequent years of the RNA Study Period
2. Other compliance plans were submitted in addition to what is shown on this table. The table lists the plants with compliance plans that resulted in a change of status (*i.e.*, as also listed in the 2020 Gold Book Table iV-6)

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Status Change due to DEC Peaker Rule, Zone K

Units	Nameplate MW	CRIS (MW)		Capability (MW)		2023 Ozone Season	2023 non-Ozone Season	2024 Ozone Season	2024 non-Ozone Season	2025 Ozone Season	2025 non-Ozone Season
		Summer	Winter	Summer	Winter	*May 2023 - September 2023*	*October 2023 - April 2024*	*May 2024 - September 2024*	*October 2024 - April 2025*	*May 2025 - September 2025*	*October 2025 - April 2026*
Glenwood GT1	16	14.6	19.1	11.4	14.5	O/S	O/S	O/S	O/S	O/S	O/S
Northport GT	16	13.8	18.0	11.7	15.1	O/S	O/S	O/S	O/S	O/S	O/S
Port Jefferson GT1	16	14.1	18.4	12.9	16.6	O/S	O/S	O/S	O/S	O/S	O/S
Unavailable MW = Impacted MW	48	42.5	55.5	36.0	46.2						

O/S - Out-of-service
I/S - In-service

Notes:
1. The service pattern in the last two columns repeats in subsequent years of the RNA Study Period
2. Other compliance plans were submitted in addition to what is shown on this table. The table lists the plants with compliance plans that resulted in a change of status (*i.e.*, as also listed in the 2020 Gold Book Table iV-6)

Resource Adequacy RNA Results

2020 RNA: LOLE Results

Study Year	NYCA Baseline Summer Peak Load (MW)	Area J Peak Load (MW) (Non-coincident)	RNA Base Case NYCA LOLE (days/year)
2024	31,838	11,557	0.04
2025	31,711	11,552	0.08
2026	31,670	11,609	0.10
2027	31,673	11,667	0.12
2028	31,756	11,747	0.13
2029	31,865	11,836	0.17
2030	31,992	11,924	0.19

- 2026: LOLE at 0.10 (0.097) d/y is at criterion
- 2027: Criterion violation (*i.e.*, LOLE>0.1 days/year) observed through 2030
- Removal of Area J peakers drives the increase in LOLE
  - removed approximately 1,400 MW by 2025
- The LOLE increase from 2026 to 2030 is due to load growth

Note: The first Short-Term Assessment of Reliability (STAR) started on July 15, 2020. Its Study Period encompasses year 1 through year 5 following the STAR starting date. The study assumptions and results related with the STAR Study Period will be updated, as applicable at the time.

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Compensatory MW Concept for Resource Adequacy

- Resource adequacy compensatory megawatt amounts are determined by adding generic "perfect capacity" resources to zones (or combination of zones) to address the shortfall
  - "Perfect capacity" is capacity that is not derated (*e.g.*, due to ambient temperature or unit unavailability caused by factors such as equipment failures or lack of "fuel"), not subject to energy duration limitations, and not tested for transmission security or interface impacts. Actual resources would need to be larger in order to achieve the same impact as perfect-capacity resources.
- The compensatory MW additions are not intended to represent specific solutions, as the impact of specific solutions can depend on the type of the solution and its location on the grid
- Resource needs could potentially be met by combinations of solutions including generation, transmission, energy efficiency, and demand response measures
- No transmission constraints within Zones J or K are modeled in MARS

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Individual Zonal Compensatory MW

Study Year	NYCA LOLE (dy/yr)	Zones for Additions			
		Only in A-F	Only in G-I	Only in J	Only in K
2024	0.04	-	-	-	-
2025	0.09	-	-	-	-
2026	0.10	-	-	-	-
2027	0.12	700	700	100	not feasible
2028	0.14	1,600	1,650	150	not feasible
2029	0.17	not feasible	not feasible	300	not feasible
2030	0.19	not feasible	not feasible	350	not feasible

Notes:

(+) positive values are for those study years with NYCA LOLE above the criterion, and the values represent the MW that can be added to each zone to restore the NYCA LOLE to 0.1 days/year

"Not feasible" - Either a large, or no amount of capacity added in the zone can bring NYCA LOLE below 0.1

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RNA Resource Adequacy Observations

- Adequate compensatory MW must be located within, or injected into, Zone J because of transmission constraints into Zone J observed starting in 2029. This result is exemplified by the fact that no compensatory MW in any of the other NYCA zones will help bring the LOLE back below 0.1 days/year.
- Potential solutions to address the 350 compensatory MW resource adequacy deficiency in Zone J by 2030 (100 MW in 2027) could include a combination of additional transfer capability into Zone J and/or resources located within Zone J, and/or demand-side solutions. However, solutions would also need to address the Zone J local transmission load area deficiencies identified in the transmission security evaluations.
- Note: No local transmission load area limits are modeled for the resource adequacy assessment – deficiencies at this local level are identified in the transmission security assessments.

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2020 RNA Scenarios Based on the RNA Base Cases

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RNA Scenarios based on Base Cases

- **RNA scenarios are provided for information only, and do not lead to Reliability Needs identification or mitigation**
- **The NYISO evaluated the following scenarios as part of the RNA:**
  - High Load Forecast Scenario – Resource Adequacy
    - The 2020 Gold Book High Load forecast were used for the resource adequacy analysis.
  - Zonal Resource Adequacy Margins (ZRAM) - Resource Adequacy
    - Identification of the maximum level of zonal MW capacity that can be removed without either causing NYCA LOLE violations, or exceeding the zonal capacity.
  - "Status-quo" Scenario - Transmission Security and Resource Adequacy
    - Removal of proposed major transmission and generation projects assumed in the RNA Base Case.

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High Load Scenario

2020 Gold Book NYCA High Load vs. Baseline Summer Peak Forecast

Year	High Load	Baseline Load	Delta (High Load - Baseline Load)
2024	32,623	31,838	785
2025	32,641	31,711	930
2026	32,863	31,670	1,193
2027	33,163	31,673	1,490
2028	33,562	31,756	1,806
2029	33,976	31,865	2,111
2030	34,380	31,992	2,388

2020 Gold Book Zone J High Load vs. Non-coincident Summer Peak Forecast

Year	High Load	Baseline Load	Delta (High Load - Baseline Load)
2024	11,751	11,557	194
2025	11,775	11,552	223
2026	11,884	11,609	275
2027	12,009	11,667	342
2028	12,158	11,747	411
2029	12,315	11,836	479
2030	12,467	11,924	543

2020 RNA Resource Adequacy High Load Scenario NYCA LOLE Results

Study Year	2024	2025	2026	2027	2028	2029	2030
2020 RNA Base Case	0.04	0.08	0.10	0.12	0.14	0.17	0.19
High Load Scenario	0.07	0.15	0.19	0.26	0.35	0.49	0.63

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Zonal Resource Adequacy Margin (ZRAM)

Study Year	2024	2025	2026	2027	2028	2029	2030
LOLE	0.04	0.09	0.10*	0.12	0.14	0.17	0.19
Zone A	-850	-400	-50	-	-	-	-
Zone B	-850	-400	-50	-	-	-	-
Zone C	-1,500	-400	-50	-	-	-	-
Zone D	-1,500	-400	-50	-	-	-	-
Zone E	EZR	-400	-50	-	-	-	-
Zone F	-1,500	-400	-50	-	-	-	-
Zone G	-1,500	-400	-50	-	-	-	-
Zone H	EZR	EZR	-50	-	-	-	-
Zone I	EZR	EZR	-50	-	-	-	-
Zone J	-450	-50	0	-	-	-	-
Zone K	-1,400	-550	-150	-	-	-	-
Zones A-F	-1,500	-400	-50	-	-	-	-
Zones G-I	-1,500	-400	-50	-	-	-	-

Notes:
EZR - exceeds zonal resources (*i.e.,* all generation can be removed without causing a violation)
*LOLE for year 2026 is 0.097 days/year

- Determines the amount of "perfect capacity" in each zone that could be removed before the NYCA LOLE reaches 0.10 days/year, and offer another relative measure of how close the system is from violating reliability criteria
- This simulation is applicable to any RNA Study Years that have LOLE levels that are below criterion, *i.e.*, from 2024 through 2026.
- Note: the impacts of removing capacity on the reliability of the transmission system and on transfer capability are highly location dependent. Thus, in reality, lower amounts of capacity removal are likely to result in reliability issues at specific transmission locations.

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Status-quo Scenario

2020 RNA Resource Adequacy Status-quo Scenario NYCA LOLE Results

Study Year	2024	2025	2026	2027	2028	2029	2030
Base Case	0.04	0.08	0.10	0.12	0.14	0.17	0.19
Status-quo Scenario	0.07	0.13	0.14	0.17	0.19	0.23	0.25

- This scenario evaluates the reliability of the system under the assumption that no major transmission or generation projects come to fruition within the RNA Study Period
- This includes the removal of all proposed transmission and generation projects that have met 2020 RNA Base Case inclusion rules and removal of generators that require modifications to comply with the DEC's Peaker Rule
- From a resource adequacy perspective, this scenario indicates that if expected generation and transmission projects are not built, the criterion violation advances by two years to 2025

RNA Scenarios Based on the 2019 70x30 CARIS Scenarios

RNA 70x30 Scenario Background

- The CLCPA mandates that 70% of New York's end-use energy consumption be served by renewable energy by 2030 ("70x30"), including specific technology-based targets for distributed solar (6,000 MW by 2025), storage (3,000 MW by 2030), and offshore wind (9,000 MW by 2035)
- The RNA 70x30 scenario models are based on the 2019 CARIS 70x30 scenario assumptions and output information
  - The 2019 CARIS Report is available on the NYISO website [link]
- The CARIS 70x30 scenario analyzed the system congestion and constrained generation pockets that arise from implementing 70% renewable energy on the New York system by 2030
- The purpose of this analysis is to augment the effort with reliability perspectives on potential system changes undertaken to meet state policy goals
  - Additional assumptions details are in Appendix C of the August 20 ESPWG presentation

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Resource Adequacy Analysis Steps

1. **Model the CARIS 70x30 “Base Load” and “Scenario Load” along with their corresponding renewable resources mix and calculate NYCA LOLE**
    - Identify Zonal Resource Adequacy Margin (ZRAM)
2. **For each load model, if the system has surplus resources (LOLE less than 0.1) then remove fossil plants based on age until NYCA exceeds the LOLE criterion (“model at criterion”)**
    - This age-based approach is a simple analytical approach as a proxy to represent unit retirements that may occur as surplus resources increase. In reality many factors will affect specific generator status decisions
    - Quantify (MW) fossil plant removals that may be possible while maintaining resource adequacy
    - Additional Details in the August 20, 2020 ESPWG presentation: https://www.nyiso.com/documents/20142/14682221/04%20RNA_70x30ScenariosResults.pdf

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Fossil Removal on “Base Load”

	Total Thermal Capacity (MW)				Cumulative Capacity Removed (MW)				
Cases (Age >=)	Zone J	Zone K	Other Zones	Total	Zone J	Zone K	Other Zones	Total	NYCA LOLE
Total	8,190	3,962	15,012	27,165	0	0	0	0	0.00
70	6,978	3,564	14,616	25,160	1,212	398	396	2,005	0.02
68	6,601	3,371	14,616	24,590	1,589	591	396	2,575	0.05
67*	6,386	3,360	14,616	24,364	1,804	602	396	2,801	0.11
67	6,236	3,360	14,616	24,214	1,954	602	396	2,951	0.15

Observations

- NYCA meets the LOLE criterion with 2,575 MW removed
- NYCA exceeds the LOLE criterion when 2,801 MW are removed (67*)
  - The increase in LOLE is primarily driven by Zone J capacity removals

Notes:

- Case 67: most, but not all units age 67 years and older were retired in this case
- Case 67*: a special evaluation of Case 67 where the marginal unit was derated instead of fully removed to obtain an LOLE closer to 0.1 days/year

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Resource Adequacy Key Takeaways

- **The NYCA system is reliable when adding new resources, but:**
  - Becomes unreliable as existing fossil generators are removed from service
  - This analysis does not consider potential reliability impacts due to:
    - Intra-zonal constraints on the transmission system
    - Changes on the transmission system as a result of the resource additions or subtractions
    - Unit Commitment, ramp rate constraints, and other production cost modeling techniques
- **Retirement of nuclear units may require additional (or removal of less) fossil fuel generation in order to have a reliable system**
- **Modeling ESRs provides a benefit to the system by:**
  - Allowing for additional units to be retired, subject to the limitations identified above
- **Alleviating the local transmission constraints that cause renewable curtailments, while beneficial from an annual energy production perspective as shown in CARIS, does not offset the need for dispatchable generation to meet reliability requirements at peak load**
- **Additional details in the 2020 RNA Report and Appendices:** https://www.nyiso.com/documents/20142/2248793/2020-RNAReport-Nov2020.pdf

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Questions?

Our mission, in collaboration with our stakeholders, is to serve the public interest and provide benefit to consumers by:

- Maintaining and enhancing regional reliability
- Operating open, fair and competitive wholesale electricity markets
- Planning the power system for the future
- Providing factual information to policymakers, stakeholders and investors in the power system

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