New York ISO
Independent System Operator

2022 NYSRC Long-Term Resource Adequacy Assessments

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Goal

- This presentation summarizes the 2022 NYSRC Long-Term Resource Adequacy Assessments (LTRAA) Report in support of the NYSRC certification
- The 2022 LTRAA report information is based on NYISO's:
  - 2022 RNA Base Case and scenarios results
  - 2022 Q3 STAR results

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Outline

- NYISO's Reliability Planning Process
- LTRAA Background
- 2022 RNA Resource Adequacy Base Case Results
- 2022 RNA Resource Adequacy Scenarios Results
  - Simulated on 2022 Reliability Needs Assessment Base Case
- 2022 RNA Policy Case Scenario 2 Resource Adequacy Results
  - Simulated on a model developed with input form the Outlook Policy Case Scenario 2
- Appendix A: Base Case Assumptions

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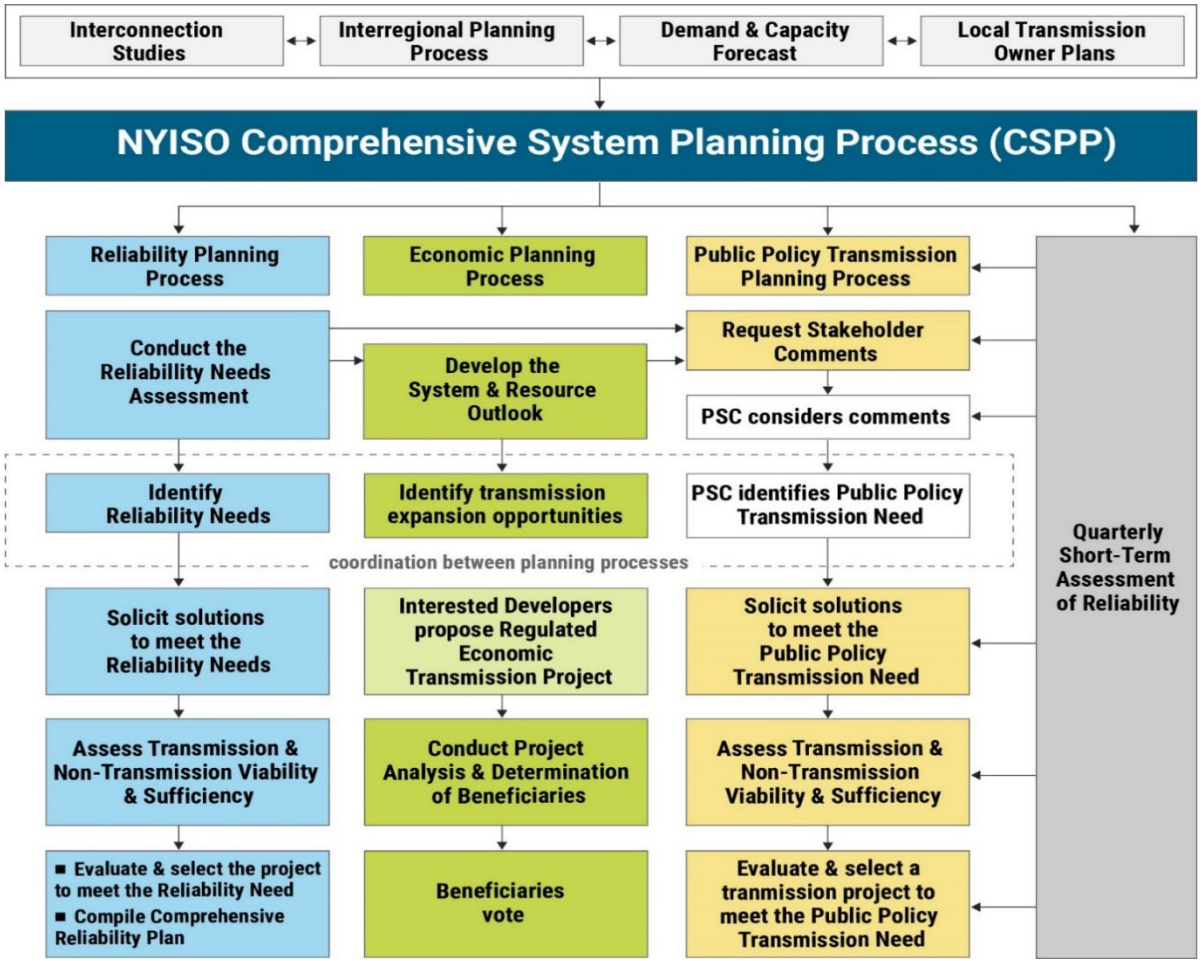
NYISO's Reliability Planning Process (RPP)



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Reliability Planning Studies

- **Short Term Assessments of Reliability (STARs)**
  - Conducted quarterly in direct collaboration with Transmission Owners
  - Five-year study, with a focus on addressing needs arising in the first three years
- **Reliability Needs Assessment (RNA)**
  - Conducted biennially to identify long-term reliability needs in years 4-10
  - Considers all Transmission Owner Local Transmission Owner Plans (LTPs) and updates throughout the process
  - If actionable reliability needs are identified, the NYISO issues a competitive solicitation for solutions, and TOs are required to propose Regulated Backstop Solutions
- **Comprehensive Reliability Plan (CRP)**
  - Biennial report that documents the plans for a reliable grid over the 10-year planning horizon
  - Includes evaluation and selection of transmission solutions to reliability needs in years 4-10

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2022 RNA: Base Case Development Background

- **Based on the RNA Base Case, the NYISO identifies Reliability Needs of the Bulk Power Transmission Facilities (BPTF) for the study period and in accordance with applicable Reliability Criteria (i.e., NERC, NPCC, and NYSRC)**
- **2022 RNA Base Case:**
  - For the **transmission security** evaluations, the NYISO uses the 2022 FERC Form 715 filing and the information from the 2022 Gold Book as a starting point for developing the base case system models with the application of the inclusion rules
  - For the **resource adequacy** evaluations, the models are developed starting with prior resource adequacy models and are updated with information from the 2022 Gold Book and historical production data, with the application of the inclusion rules.
    - Information on modeling of neighboring systems is based on the input received from the NPCC CP-8 working group.
    - Power flow evaluations are based on the models described under the transmission security evaluations.

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NYSRC 2022 LTRAA Background

2022 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 the resource adequacy related findings from the latest NYISO RNA or other comparable NYISO-approved resource adequacy reviews, such as the Short-Term Reliability Process (STRP) and its quarterly STAR.**
  - Note: for complete reliability criteria assessments, both the RNA and the STARs also include transmission security evaluations, which are not subject of this report
- **The 2022 LTRAA review report uses the information from the 2022 RNA for Study Years 2026 through 2032 (year 4 through year 10) and from the 2022 Q3 STAR for Study Years 2023 through 2027 (with a focus on year 1 through year 3)**
  - The NYISO prepares the 2022 LTRAA report utilizing the resource adequacy assessments from the below two reports to fulfill the NYSRC RR A.3. B. R2 requirement:
    1. 2022 RNA November 15, 2022, final report [link] and appendices [link]
    2. 2022 Q3 STAR October 13, 2022, final report [link]

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Reliability Indices Reporting Requirement

- **Starting with the NYSRC Reliability Rules (rev. 46), A.1:R2 requires the LTRAA to calculate and report LOLH and EUE metrics and the LOLE**
  - Otherwise, there is no criteria related with the two additional metrics at this time

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Resource Adequacy
2022 RNA Results

2022 RNA: Reliability Indices Results

- **Assuming there are no further resource deactivations or delays of entry into service of new resources and transmission, the NYCA LOLE does not violate the 0.1 event-day/year criterion throughout the study period**
  - This presentation focuses on the resource adequacy evaluations only
  - The RNA also included transmission security evaluations, which also identified no Reliability Need throughout the study period
- **LOLH (event-hour/year) and LOEE (or EUE in MWh/year) are provided for information**
- **Additional information and analysis: 2022 RNA November 15, 2022, final report [link] and appendices [link]**

Study Year	Baseline Forecast Load (MW)	RNA Base Case LOLE (days/year)
2023	32,018	0.025
2024	31,778	0.018
2025	31,505	0.024
2026	31,339	0.004
2027	31,292	0.005
2028	31,317	0.004
2029	31,468	0.005
2030	31,684	0.006
2031	31,946	0.010
2032	32,214	0.022

Study Year	LOLE	LOLH	LOEE
	event-days/year	event-hours/year	MWh/year
2023	0.025	0.061	23.860
2024	0.018	0.035	11.538
2025	0.023	0.048	18.399
2026	0.004	0.008	1.734
2027	0.005	0.010	2.529
2028	0.004	0.008	1.626
2029	0.005	0.009	1.799
2030	0.006	0.013	3.051
2031	0.010	0.020	5.095
2032	0.022	0.045	11.382

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LOLE Results After Each EOP

- **GE-MARS evaluates the need for using Emergency Operating Procedures (EOP) MW by calculating after each EOP step the expected number of days per year that the system is at a positive (surplus) and a negative (deficiency) MW margin. Each EOP's MW is used as needed and in sequential order.**
  - The LOLE results after each of the EOPs are below.

		NYCA LOLE (days/year) by Margin State									
Step	**EOP**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
1	Removing Operating Reserve	6.32	4.37	4.99	1.91	2.98	2.32	2.89	2.94	5.02	6.74
2	Require SCRs (Load and Generator)	3.30	2.72	3.16	0.94	1.46	1.38	1.54	1.72	2.73	4.12
3	5% Manual Voltage Reduction	3.12	2.59	3.01	0.88	1.34	1.32	1.47	1.64	2.60	3.94
4	30-Minute Reserve (*i.e.*, 655 MW) to Zero	2.01	1.42	1.89	0.41	0.79	0.55	0.65	0.76	1.20	2.05
5	5% Remote Controlled Voltage Reduction	1.36	1.00	1.32	0.27	0.52	0.37	0.44	0.51	0.81	1.47
6	Voluntary Load Curtailment	1.18	0.84	1.11	0.23	0.47	0.30	0.37	0.42	0.69	1.32
7	Public Appeals	1.13	0.78	1.06	0.21	0.44	0.27	0.33	0.38	0.63	1.23
8	Emergency Assistance	0.11	0.10	0.11	0.05	0.05	0.04	0.04	0.05	0.07	0.09
9	Part of 10-Minute Reserve (*i.e.* , 960 of 1310 MW) to Zero	**0.02**	**0.02**	**0.02**	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**	**0.01**	**0.02**

Note: **The results in bold font** represents the LOLE at the last step (9) and is the NYCA LOLE that is compared against the 0.1 days/year criterion.

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2022 RNA Base Case Conclusions

- The 2022 RNA concludes that the New York State BPTF, as planned, will meet all currently applicable reliability criteria from 2026 through 2032 for the assumed future system demand and with the assumed planned projects meeting their proposed in-service dates.
- While this RNA does not identify any long-term, actionable Reliability Needs, the resource adequacy and transmission security margins are tightening across the New York grid over time.
  - New York will likely experience even smaller margins if additional power plants become unavailable or if demand is greater than forecasted.
  - If the margins are totally depleted, the risk of a reliability violation is increased.
  - The margins for transmission security are narrower than the margins for resource adequacy.
- Additional risk factors beyond what is assumed in the 2022 RNA (e.g., climate, economic, regulatory, and policy drivers) may accelerate the narrowing or depletion of these reliability margins.

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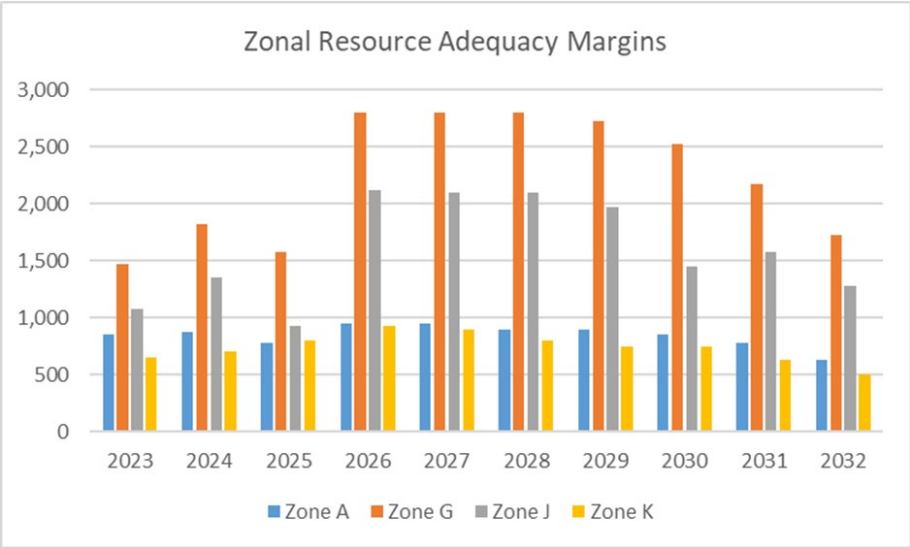
Key Findings – Resource Adequacy Margins

- **Resource adequacy margins are tightening across the New York grid over time.**
  - The Long Island margin is likely to increase as a result of the Long Island Offshore Wind Export Public Policy Transmission Need.
- **A growing reliance on assistance from neighboring regions outside New York increases the risk of loss of load.**
  - Without emergency assistance from neighboring regions, there would not be sufficient resources to serve demand within New York throughout the planning horizon.



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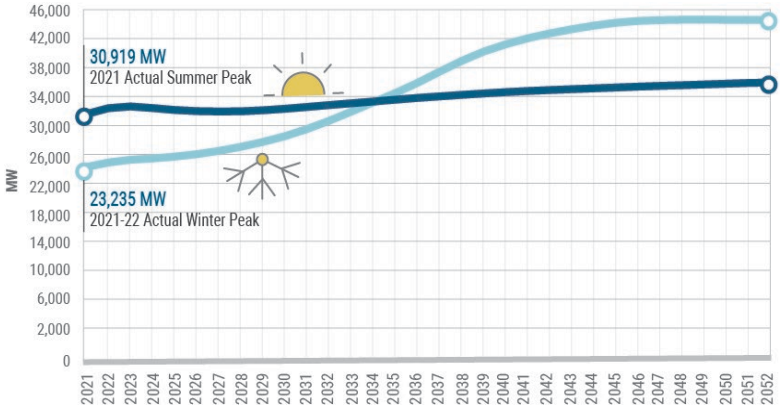
Key Findings – Winter Demand

- The NYCA is projected to become a winter-peaking system in the mid-2030s, primarily driven by electrification of space heating systems (e.g., installation of heat pumps and other potential electric heating systems).



- While no actionable reliability violations were found, it is important to note several upstate zones are projected to become winter peaking during the 10-year period.

2022 Gold Book Non-Coincident Peak Season - Within 5% Considered Both as Peak

Year	A	B	C	D	E	F	G	H	I	J	K
2022	S	S	S	W	S	S	S	S	S	S	S
2023	S	S	S	W	B	S	S	S	S	S	S
2024	S	S	B	W	B	S	S	S	S	S	S
2025	S	S	B	W	B	S	S	S	S	S	S
2026	S	S	B	W	B	S	S	S	S	S	S
2027	S	S	B	W	W	S	S	S	S	S	S
2028	S	S	B	W	W	S	S	S	S	S	S
2029	S	S	W	W	W	S	S	S	S	S	S
2030	S	S	W	W	W	B	S	S	S	S	S
2031	B	S	W	W	W	B	S	S	S	S	S
2032	B	S	W	W	W	B	S	S	S	S	S

2020 Gold Book Non-Coincident Peak Season - Within 5% Considered Both as Peak

Year	A	B	C	D	E	F	G	H	I	J	K
2022	S	S	S	W	B	S	S	S	S	S	S
2023	S	S	S	W	B	S	S	S	S	S	S
2024	S	S	S	W	B	S	S	S	S	S	S
2025	S	S	S	W	B	S	S	S	S	S	S
2026	S	S	S	W	B	S	S	S	S	S	S
2027	S	S	S	W	B	S	S	S	S	S	S
2028	S	S	S	W	W	S	S	S	S	S	S
2029	S	S	S	W	W	S	S	S	S	S	S
2030	S	S	S	W	W	S	S	S	S	S	S
2031	S	S	S	W	W	S	S	S	S	S	S
2032	S	S	S	W	W	S	S	S	S	S	S

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2022 Q3 STAR

2022 Q3 STAR Conclusion

- The 2022 Q3 STAR models are based on the 2022 RNA Base Case models with incremental changes presented at the July 26, 2022, ESPWG [link]
- The 2022 Q3 STAR was completed on Oct 13, 2022
- The 2022 Q3 STAR [link] concluded that the planned BPTF through the study period are within applicable reliability criteria based on expected weather and with the assumed planned projects meeting their proposed in-service dates.

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2022 RNA Scenarios

2022 RNA Scenarios

- One of the objectives of the RPP is to identify, through the development of appropriate scenarios, factors and issues that might adversely impact the reliability of BPTF.
- RNA scenarios are provided for information only and do not lead to the identification of Reliability Needs or required mitigation.
- The NYISO evaluated the following resource adequacy and transmission security scenarios as part of the RNA.
  1. High Load Forecast: Resource Adequacy
     - High load forecast from the 2022 GB
  2. Tipping Points: Resource Adequacy - Zonal Resource Adequacy Margins (ZRAM)
     - Identification of the maximum MW level of zonal "perfect capacity" that can be removed from each zone without either causing NYCA LOLE violations, or exceeding the zonal capacity
  3. Tipping Points: Transmission Security
     - Identification of the impact of plausible changes in conditions or assumptions that might adversely impact the reliability of the BPTF or "tip" the system into violation of a transmission security criterion
  4. "Status-quo": Transmission Security and Resource Adequacy
     - Removal of proposed major transmission and generation projects assumed in the RNA Base Case based on application of the inclusion rules
  5. Winter Gas Shortage: Transmission Security and Resource Adequacy
  6. CLCPA: Resource Adequacy
     - Based on input from the System & Resource Outlook: Policy Case Scenario S2 for 2030
- The following slides will focus on the resource adequacy scenarios only.

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2022 RNA Scenarios Key Findings

2022 RNA: High Load

High Load Forecast: Resource Adequacy

- High load forecast from the 2022 GB

	2022 RNA 1st Pass Base Case vs High Load Scenario					
Study Year	Baseline Forecast Load (MW)	High Load Scenario Forecast Load (MW)	Delta MW	RNA Base Case LOLE (days/year)	High Load Scenario LOLE (days/year)	Delta LOLE
2023	32,018	32,780	762	0.025	0.044	0.018
2024	31,778	32,849	1,071	0.018	0.039	0.021
2025	31,505	32,854	1,349	0.024	0.068	0.045
2026	31,339	32,946	1,607	0.004	0.027	0.023
2027	31,292	33,133	1,841	0.005	0.035	0.030
2028	31,317	33,464	2,147	0.004	0.052	0.047
2029	31,468	33,915	2,447	0.005	0.079	0.074
2030	31,684	34,475	2,791	0.006	0.149	0.143
2031	31,946	35,080	3,134	0.010	0.342	0.332
2032	32,214	35,698	3,484	0.022	0.676	0.654

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2022 RNA: Status Quo

- **“Status-quo” Scenario: Transmission Security and Resource Adequacy**
  - Removal of proposed major transmission and generation projects that the NYISO added in the 2022 RNA Base Case based on the RNA inclusion rules
    - RNA inclusion rules were presented at the April 26 ESPWG/TPAS [link]
    - Note: The Western NY and AC Transmission projects were kept in service due to their advanced status

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Status-Quo LOLE Results

Study Year		2022 RNA 1st Pass Base Case vs Status-Quo Scenario LOLE *(days/year)*			2022 RNA 1st Pass Base Case vs Remove CHPE Sensitivity LOLE *(days/year)*		
		RNA Base Case	Status Quo	Delta	RNA Base Case	TDI/CHPE Removed	Delta
y1	2023	0.025	0.028	0.003	0.025	0.025	0.000
y2	2024	0.018	0.024	0.007	0.018	0.018	0.000
y3	2025	0.024	0.033	0.010	0.024	0.024	0.001
y4	2026	0.004	0.022	0.018	0.004	0.017	0.013
y5	2027	0.005	0.026	0.021	0.005	0.019	0.014
y6	2028	0.004	0.020	0.015	0.004	0.015	0.011
y7	2029	0.005	0.021	0.017	0.005	0.016	0.012
y8	2030	0.006	0.042	0.036	0.006	0.037	0.031
y9	2031	0.010	0.041	0.031	0.010	0.034	0.024
y10	2032	0.022	0.068	0.046	0.022	0.056	0.034

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Resource Adequacy - Zonal Resource Adequacy Margins (ZRAM)

- **Tipping Points: Resource Adequacy - Zonal Resource Adequacy Margins (ZRAM)**
  - 2022 RNA Base Case: identification of the maximum MW level of zonal "perfect capacity" that can be removed from each zone without either causing NYCA LOLE violations, or exceeding the zonal capacity
    - "Perfect capacity" is capacity that is not derated (e.g., due to ambient temperature or unit unavailability), not subject to energy durations limitations (i.e., available at maximum capacity every hour of the study year), and not tested for transmission security or interface impacts

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ZRAM MW Results

Study Year	RNA 1st Pass Base Case LOLE *(days/year)*	Zone A	Zone B	Zone C	Zone D	Zone E	Zone F	Zone G	Zone H	Zone I	Zone J	Zone K
2023	0.025	-850	-850	-1,475	-1,425	-1,500	-1,500	-1,475	-1,375	-1,375	-1,075	-650
2024	0.018	-875	-875	-1,800	-1,675	-1,800	-1,800	-1,825	-1,700	-1,700	-1,350	-700
2025	0.024	-775	-775	-1,475	-1,475	-1,550	-1,550	-1,575	-1,475	-1,475	-925	-800
2026	0.004	-950	-950	-2,625	-1,925	-2,800	-2,800	-2,800	-2,575	-2,600	-2,125	-925
2027	0.005	-950	-950	-2,600	-1,925	-2,800	-2,800	-2,800	-2,575	-2,575	-2,100	-900
2028	0.004	-900	-900	-2,600	-1,925	-2,800	-2,800	-2,800	-2,575	-2,575	-2,100	-800
2029	0.005	-900	-900	-2,500	-1,925	-2,700	-2,700	-2,725	-2,450	-2,450	-1,975	-750
2030	0.006	-850	-850	-2,325	-1,925	-2,525	-2,525	-2,525	-2,175	-2,175	-1,450	-750
2031	0.010	-775	-775	-2,050	-1,775	-2,175	-2,175	-2,175	-1,975	-1,975	-1,575	-625
2032	0.022	-625	-625	-1,700	-1,450	-1,725	-1,725	-1,725	-1,625	-1,625	-1,275	-500

Note: the impacts of removing capacity on the reliability of the transmission system and on transfer capability are highly location dependent. In reality, the removal of lower amounts of capacity is likely to result in reliability issues at specific transmission locations.

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Winter Scenarios: Gas Shortage

- With input from NYISO's ongoing Fuel & Energy Security initiatives, approximately 6,300 MW of existing gas-fueled generation was identified as potentially at-risk under gas shortage conditions during winter peak conditions.
- The 2022 RNA performed a scenario to assess winter reliability for gas supply shortages by assuming that the at-risk generation would be unavailable for December through February in the winter of 2031-2032
  - This is classified as a beyond-design-criteria "extreme system condition" by the New York State Reliability Council.
- Under this winter scenario, the 2022 RNA found that reliability would be diminished but still within loss of load expectation (LOLE) criterion.
  - However, this gas shortage condition would not meet the transmission security statewide system reliability margins based on deterministic design criteria (N-1-1).

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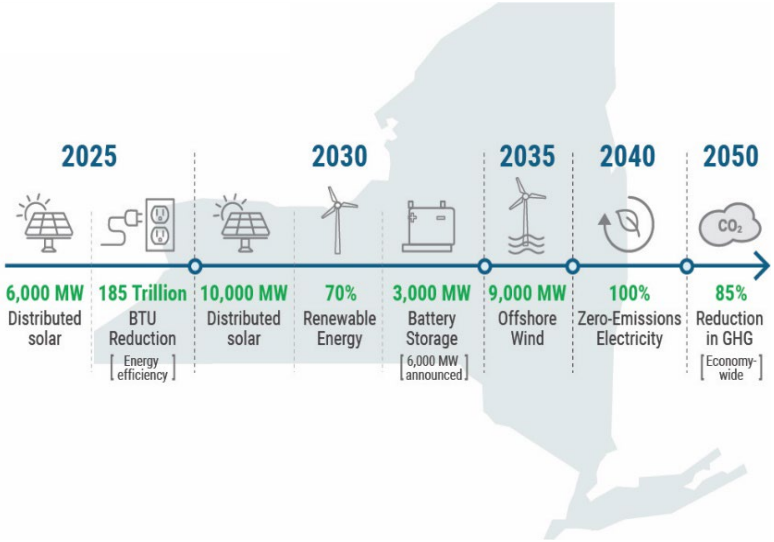
2022 RNA
Policy Case S2 for 2030
Background

Road to 2040 – Reliability and Resiliency Challenges

- The Climate Leadership and Community Protection Act (CLCPA) establishes resource targets driving a major transition in the New York grid.
- As part of the 2021-2040 System & Resource Outlook (the Outlook), the NYISO assessed several policy-driven futures.
  This 2022 RNA builds upon the findings with an analysis of the postulated 2030 system conditions and provides further insight focusing on system reliability aspects, such as resource adequacy.



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RNA Policy Case S2 for 2030 Resource Adequacy Scenario

- **The 2021-2040 System & Resource Outlook (the Outlook) Policy Case scenarios background:**
  - After discussions with stakeholders, including state agencies (NYSDPS and NYSERDA), the NYISO selected two scenarios from the Outlook to evaluate resource adequacy (Policy Cases), as follows:
    - Scenario 1 (S1) utilizes industry data and NYISO load forecasts, representing a future with high demand and assuming less restrictions in renewable generation buildout options.
    - Scenario 2 (S2) utilizes various assumptions consistent with the Climate Action Council Integration Analysis and represents a future with a moderate peak but a higher overall energy demand.

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RNA Policy Case S2 for 2030 Resource Adequacy Scenario

- **The 2022 RNA Policy Case S2 scenario builds upon the assumptions and findings from the Outlook Policy Case S2 scenario for year 2030 and provide further insight focusing on system reliability aspects, such as resource adequacy**
  - These analyses do not define the formula to calculate the percentage of renewable energy relative to end-use energy (i.e., how to account for a certain renewable energy target by 2030).
  - The Outlook Policy Case S2 utilizes various assumptions consistent with the Climate Action Council Integration Analysis and represents a future with a moderate peak but a higher overall energy demand (25,892 MW winter peak, 30,070 MW summer peak, and 164,256 GWh energy demand in 2030)
- **As policymakers advance the implementation plan of the CLCPA, the NYISO's assessments are intended to complement their efforts and are not intended to provide the specific steps that must be taken to achieve the policy goals**

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RNA Policy Case S2 for 2030 Resource Adequacy Scenario

2030 Outlook S2 Energy Details	A	B	C	D	E	F	G	H	I	J	K	NYCA
Net Load Energy (GWh)	14,547	9,438	14,955	4,802	6,305	10,183	7,732	2,632	5,769	53,937	19,518	149,817
+ BtM-PV Energy (GWh)	1,277	899	1,866	332	2,067	2,433	1,870	192	225	1,217	2,060	14,439
Total Energy (GWh)	15,824	10,337	16,821	5,134	8,372	12,616	9,602	2,824	5,993	55,155	21,578	164,256

2030 Outlook S2 Peak Details	A	B	C	D	E	F	G	H	I	J	K	NYCA
Net Load Peak (MW)	2,319	1,499	2,348	769	907	1,795	1,537	535	1,178	9,867	3,989	26,743
+ BtM-PV at NYCA Peak (MW)	293	208	429	79	475	562	432	45	51	280	475	3,327
Total Load Peak (MW)	2,612	1,706	2,777	847	1,382	2,357	1,969	579	1,229	10,147	4,464	30,070

Note:

- The gross load (Load + BtM PV) was used in the MARS model as BtM-PV was explicitly modeled

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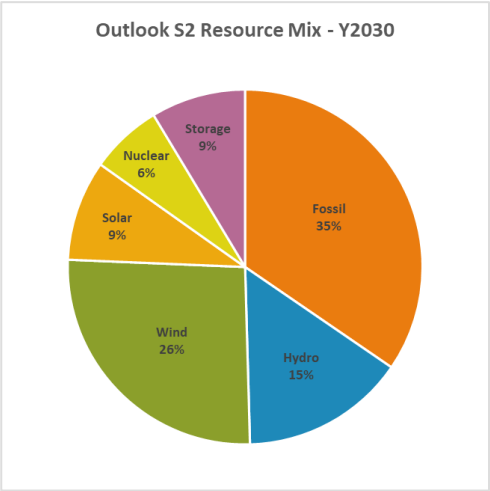
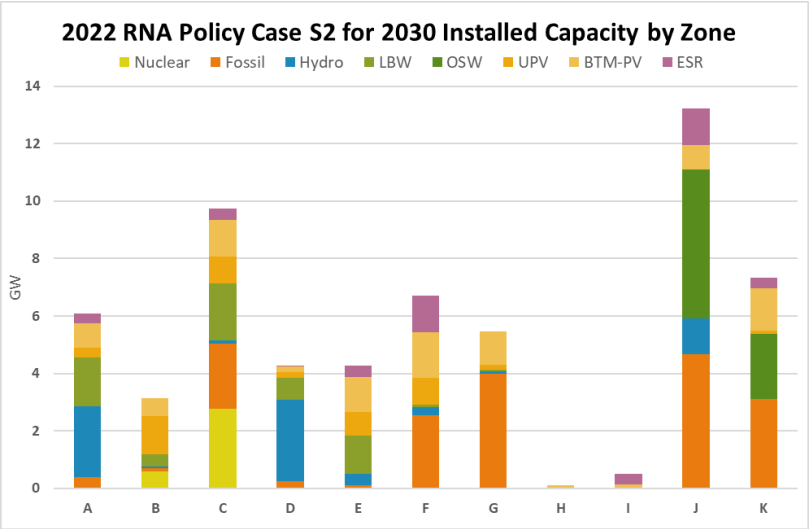
RNA Policy Case S2 for 2030 Resource Adequacy Scenario





2022 RNA Policy Case S2 for 2030 Installed Capacity (MW)

Zone/Type	Nuclear	Fossil	Hydro	LBW	OSW	UPV	BTM-PV	ESR	Total
A	0	395	2,440	1,707	0	330	863	345	6,079
B	581	110	64	366	0	1,350	608	0	3,079
C	2,765	2,313	110	1,695	0	865	1,278	379	9,405
D	0	250	2,984	778	0	180	212	15	4,419
E	0	107	392	1,175	0	794	1,204	396	4,068
F	0	2,552	312	101	0	887	1,592	1,275	6,719
G	0	3,930	109	69	0	170	1,160	0	5,438
H	0	0	0	0	0	0	119	0	119
I	0	0	0	0	0	0	144	349	493
J	0	4,848	1,250	0	5,166	0	861	1,286	13,411
K	0	3,145	0	0	2,270	99	1,482	365	7,362
Total	3,346	17,650	7,660	5,890	7,436	4,676	9,523	4,410	60,591

Note:

- No Dispatchable Emissions-Free Resources (DEFRs) were modeled for the resource adequacy simulations

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2022 RNA
Policy Case S2 for 2030
Results

RNA Policy Case S2 Results and ZRAM

NYCA Metric	Value
LOLE (days/year)	0.008
LOLH (hours/year)	0.020
EUE (MWH/year)	3.264

- Similar LOLE to the corresponding Base Case RNA year result
- Vastly different ZRAM values due to the large change in resource mix and location

Study Year 2030	NYCA LOLE	Zone A	Zone B	Zone C	Zone D	Zone E	Zone F	Zone G	Zone H	Zone I	Zone J	Zone K
Base Case	0.006	-850	-850	-2,325	-1,925	-2,525	-2,525	-2,525	-2,175	-2,175	-1,450	-750
Policy Case S2	0.008	-2,300	-2,300	-2,700	-1,150	-2,700	-2,725	-2,750	-2,700	-2,700	-1,900	-450

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RNA Policy Case S2 Age-Based Removal Scenario

- **Unlike MAPS, MARS does not utilize unit commitment and all generation is assumed to be available if the unit is not in an outage**
- **To compensate for this limitation in the program, this analysis evaluates the impact of the unavailability of select generation resources, using age as a proxy for the priority order when selected resources retire**
  - Unit Age is calculated using the In-Service Date from Table III-2 in the 2022 Gold Book, as compared to May 1, 2030
  - This analysis makes successive retirements until the LOLE exceeds the criterion
  - This analysis does not consider the impact of transmission or transfer limit changes that may result from the unit retirements

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RNA Policy Case S2 Age-Based Removal Results

	Total Thermal Capacity Left (MW)				Total Thermal Capacity Removed (MW)					
Cases (Age >=)	Zone J	Zone K	Other Zones	Total	Zone J	Zone K	Other Zones	Total	Total**	NYCA LOLE
2022 RNA Base	8,755	4,946	11,688	25,389	0	0	0	0	-	-
Outlook S2 Base	4,848	3,145	9,657	17,650	3,907	1,801	2,031	7,739	0	0.01
62	4,848	2,737	9,635	17,220	3,907	2,209	2,053	8,169	430	0.04
61*	4,848	2,499	9,635	16,982	3,907	2,447	2,053	8,407	668	0.10
61	4,848	2,341	9,616	16,805	3,907	2,605	2,072	8,584	845	0.19

*A special evaluation of Case 61 where the marginal unit was derated, instead of fully removed, to obtain an LOLE of close to 0.1 days/year

** Total removal compared to the Outlook S2 Case

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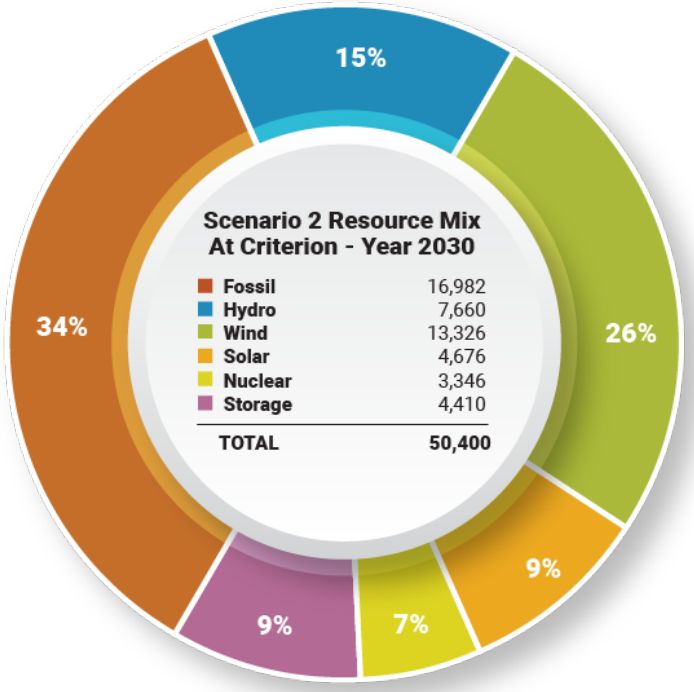
Key Findings – 70 x 30 Policy Case

- 2022 RNA Policy Case S2 shows that approximately 17,000 MW of existing fossil generation must be retained to reliably serve a net peak demand of 26,700 MW and to have an adequate system in 2030.
  - The necessary amount of fossil generation will be greater if the net peak demand approaches the NYISO's forecast of 31,700 MW.
- The resulting total capacity-to-load ratio in 2030 would be 188.5%, equivalent to an unforced capacity-to-load ratio of 135.8%.
- With high penetration of renewable intermittent resources, dispatchable emissions-free resources (DEFRs) will be needed beyond 2030 to balance intermittent supply with demand.



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Next Steps

Next Steps: 2023

- **Preparation of 2023-2032 Comprehensive Reliability Plan (CRP)**
  - Q1/Q2 2023: ESPWG/TPAS stakeholders communications on whether additional scenarios should be performed under the CRP
- **Preparation of Q1-Q4 STARs**

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Questions?

Appendix A
2022 RNA Base Case
Major Assumptions

2022 RNA: Summer Peak Load and Energy Forecast Assumptions

Baseline and Adjusted Baseline Energy Forecasts

Annual GWh	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
2022 Econometric Energy Forecast	159,065	162,750	164,563	165,064	166,282	167,490	168,320	169,296	170,130	171,242	171,863
-- Energy Efficiency and Codes & Standards	2,616	5,458	8,557	11,862	15,218	18,466	21,545	24,447	27,186	29,735	31,883
-- BTM Solar PV	4,635	5,605	6,616	7,559	8,532	9,462	10,298	11,016	11,538	11,853	12,108
-- BTM Non-Solar Distributed Generation	1,656	1,739	1,840	1,900	1,964	2,019	2,068	2,118	2,171	2,224	2,263
+ Storage Net Energy Consumption	47	70	117	184	275	383	510	645	786	891	980
+ Electric Vehicle Energy	567	868	1,263	1,795	2,523	3,503	4,762	6,313	8,151	10,240	12,518
+ Building Electrification	488	1,234	2,110	3,038	4,184	5,541	7,109	8,867	10,848	13,029	15,413
2022 Gold Book Baseline Forecast	151,260	152,120	151,040	148,760	147,550	146,970	146,790	147,540	149,020	151,590	154,520
+ BTM Solar PV	4,635	5,605	6,616	7,559	8,532	9,462	10,298	11,016	11,538	11,853	12,108
2022 RNA Base Case Forecast[1]	155,895	157,725	157,656	156,319	156,082	156,432	157,088	158,556	160,558	163,443	166,628

Baseline and Adjusted Baseline Summer Peak Forecasts

Peak MW	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
2022 Econometric Peak Demand Forecast	33,461	34,295	34,669	34,946	35,308	35,715	36,115	36,577	36,997	37,377	37,691
-- Energy Efficiency and Codes & Standards	365	769	1,213	1,696	2,197	2,687	3,160	3,610	4,044	4,451	4,786
-- BTM Solar PV (Net Peak Hour)	985	1,113	1,216	1,314	1,386	1,421	1,423	1,416	1,379	1,315	1,261
-- BTM Non-Solar Distributed Generation	288	304	319	330	342	352	359	369	376	386	394
-- BTM Storage Peak Reductions	148	244	365	416	469	528	583	640	697	755	812
+ Electric Vehicle Peak Demand	58	96	139	193	269	359	471	610	801	1,025	1,246
+ Building Electrification	32	57	83	122	156	206	256	316	382	451	530
2022 Gold Book Baseline Forecast[2]	31,765	32,018	31,778	31,505	31,339	31,292	31,317	31,468	31,684	31,946	32,214
+ BTM Solar PV	985	1,113	1,216	1,314	1,386	1,421	1,423	1,416	1,379	1,315	1,261
2022 RNA Base Case Forecast[1]	32,750	33,131	32,994	32,819	32,725	32,713	32,740	32,884	33,063	33,261	33,475

[1] For the resource adequacy study, the Gold Book baseline load forecast was modified by adding back BtM solar PV impacts in order to model 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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2022 RNA: Inclusion Rules Application

- **Proposed generation and transmission to be included:**
  - Next slide contains a list of projects
- **Generation deactivations: all plant deactivations listed in the 2022 Gold Book Section IV -3, -4, -5 will be out of service**
- **The peakers listed in the 2022 Gold Book Table IV-6 will be modeled with a status reflecting their latest compliance plans the owners filed with DEC under the Peaker Rule**
  - List in this presentation
- **Proposed Local Transmission Owner Plans (LTPs) to be included:**
  - All BPTF LTPs listed in the 2022 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 Projects Included in the Base Case: Transmission

Queue #	Project Name/(Owner)	Zone	Point of Interconnection	Type	COD or I/S Date	Summer Peak MW	Included Starting
Proposed Transmission Additions, other than Local Transmission Owner Plans							
0545A	Empire State Line	A	Dysinger - Stolle 345kV	AC Transmission (WNYPP)	I/S July 2022	n/a	2018-2019 RPP
0543	Segment B Knickerbocker-Pleasant Valley 345 kV	F,G	Greenbush - Pleasant Valley 345kV	AC Transmission (ACPPTPP)	12/2023	n/a	2020-2021 RPP
0556	Segment A Double Circuit	E, F	Edic - New Scotland 345kV		12/2023	n/a	
0430	Cedar Rapids Transmission Upgrade	D	Dennison - Alcoa 115kV	AC Transmission	I/S	+80	
0631	NS Power Express (CHPE)	J	Hertel 735kV (Quebec)-Astoria Annex 345kV (NYC)	HVDC Transmission	12/2025	1000	2022 RNA
0887	CH Uprate					250	
1125	Northern New York Priority Transmission Project (NNYPTP)	D, E	Moses/Adirondack/Porter Path	AC Transmission	12/2025	n/a	

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Proposed Projects Included in the Base Case: Large Generation

Note: All proposed large generators obtained, or are assumed to obtain, both Energy Resource Interconnection Service (ERIS) and CRIS and are modeled in both transmission security and resource adequacy Base Cases, unless otherwise noted as "ERIS only," in which case they are modeled only for the transmission security assessments.

Proposed Large Generation Additions							
396	Baron Winds	C	Hillside - Meyer 230kV	Wind	Dec-23	238.4	2020-2021 RPP
422	Eight Point Wind Enery Center	B	Bennett 115kV	Wind	Sep-22	101.8	
495	Mohawk Solar	F	St. Johnsville - Marshville 115kV	Solar	Nov-24	90.5	2022 RNA
505	Ball Hill Wind	A	Dunkirk - Gardenville 230kV	Wind	Nov-22	100.0	2020-2021 RPP
531	Number 3 Wind Energy	E	Taylorville - Boonville 115kV	Wind	Oct-22	103.9	2021 Q3 STAR
579	Bluestone Wind	E	Afton - Stilesville 115kV	Wind	Oct-22	111.8	2022 RNA
612	South Fork Wind Farm	K	East Hampton 69kV	Offshore Wind	Aug-23	96.0	
617	Watkins Glen Solar	C	Bath - Montour Falls 115kV	Solar	Nov-23	50.0	
618	High River Solar	F	Inghams - Rotterdam 115kV	Solar	Nov-22	90.0	
619	East Point Solar	F	Cobleskill - Marshville 69kV	Solar	Nov-22	50.0	
637	Flint Mine Solar	G	LaFarge - Pleasant Valley 115kV, Feura Bush - North Catskill 115kV	Solar	Sep-23	100.0	
678	Calverton Solar Energy Center	K	Edwards Substation 138kV	Solar	Jun-22	22.9	2020-2021 RPP
695	South Fork Wind Farm II	K	East Hampton 69kV	Offshore Wind	Aug-23	40.0	2022 RNA
720	Trelina Solar Energy Center	C	Border City - Station 168 115 KV	Solar	Nov-23	80.0	
721	Excelsior Energy Center	A	N. Rochester - Niagara 345 kV	Solar	Nov-22	280.0	
758	Independence GS1 to GS4 *+9MW ERIS only*	C	Scriba 345 kV	Gas	I/S	9.0	
					Total LG	**1,564**	

Proposed Projects Included in the Base Case: Small Generation

Notes:

- *Only these proposed small generators obtained Capacity Resource Interconnection Service (CRIS) and therefore are modeled for the resource adequacy Base Cases.
- All proposed large generators obtained, or are assumed to obtain, both Energy Resource Interconnection Service (ERIS) and CRIS and are modeled in both transmission security and resource adequacy Base Cases, unless otherwise noted as "ERIS only," in which case they are modeled only for the transmission security assessments.

Queue #	Project Name/(Owner)	Zone	Point of Interconnection	Type	COD or I/S Date	Summer Peak MW	Included Starting
Proposed Small Generation Additions							
545	Sky High Solar* (Sky High Solar, LLC)	C	Tilden -Tully Center 115kV	Solar	06/2023	20	2021 Q3 STAR
565	Tayandenega Solar* (Tayandenega Solar, LLC)	F	St. Johnsville - Inghams 115kV	Solar	10/2022	20	
570	Albany County 1* (Hecate Energy Albany 1 LLC)	F	Long Lane - Lafarge 115kV	Solar	12/2022	20	
572	Greene County 1* (Hecate Energy Greene 1 LLC)	G	Coxsackie - North Catskill 69kV	Solar	01/2023	20	
573	Greene County 2* (Hecate Energy Greene 2 LLC)	G	Coxsackie Substation 13.8kV	Solar	03/2023	10	
584	Dog Corners Solar* (SED NY Holdings LLC)	C	Aurora Substation 34.5kV	Solar	05/2022	20	
586	Watkins Road Solar* (SED NY Holdings LLC)	E	Watkins Rd - Ilion 115kV	Solar	06/2023	20	
590	Scipio Solar (Duke Energy Renewables Solar, LLC)	C	Scipio 34.5kV Substation	Solar	05/2023	18	
592	Niagara Solar (Duke Energy Renewables Solar, LLC)	B	Bennington 34.5kV Substation	Solar	05/2023	20	
598	Albany County 2* (Hecate Energy Albany 2 LLC)	F	Long Lane - Lafarge 115kV	Solar	12/2022	20	
638	Pattersonville* (Pattersonville Solar Facility, LLC)	F	Rotterdam - Meco 115kV	Solar	12/2022	20	
666	Martin Solar* (Martin Solar LLC)	A	Arcade - Five Mile 115kV	Solar	10/2022	20	

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Proposed Projects Included in the Base Case: Small Generation, cont.

Notes:

- *Only these proposed small generators obtained Capacity Resource Interconnection Service (CRIS) and therefore are modeled for the resource adequacy Base Cases.
- All proposed large generators obtained, or are assumed to obtain, both Energy Resource Interconnection Service (ERIS) and CRIS and are modeled in both transmission security and resource adequacy Base Cases, unless otherwise noted as "ERIS only," in which case they are modeled only for the transmission security assessments.

Queue #	Project Name/(Owner)	Zone	Point of Interconnection	Type	COD or I/S Date	Summer Peak MW	Included Starting
Proposed Small Generation Additions							
667	Bakerstand Solar* (Bakerstand Solar LLC)	A	Machias - Maplehurst 34.5kV	Solar	10/2022	20	2021 Q3 STAR
682	Grissom Solar* (Grissom Solar, LLC)	F	Ephratah - Florida 115kV	Solar	06/2022	20	
730	Darby Solar* (Darby Solar, LLC)	F	Mohican - Schaghticoke 115kV	Solar	12/2022	20	
731	Branscomb Solar* (Branscomb Solar, LLC)	F	Battenkill - Eastover 115kV	Solar	I/S	20	
735	ELP Stillwater Solar (ELP Stillwater Solar LLC)	F	Luther Forest - Mohican 115kV	Solar	09/2022	20	
748	Regan Solar* (Regan Solar, LLC)	F	Market Hill - Johnstown 69kV	Solar	06/2022	20	
768	Janis Solar* (Janis Solar, LLC)	C	Willet 34.5kV	Solar	04/2022	20	
775	Puckett Solar* (Puckett Solar, LLC)	E	Chenango Forks Substation 34.5kV	Solar	04/2022	20	
564	Rock District Solar* (Rock District Solar, LLC)	F	Sharon - Cobleskill 69kV	Solar	12/2022	20	
670	Skyline Solar* (SunEast Skyline Solar LLC)	E	Campus Rd - Clinton 46kV	Solar	04/2022	20	
581	Hills Solar (SunEast Hills Solar LLC)	E	Fairfield - Inghams 115kV	Solar	08/2023	20	2022 RNA
734	Ticonderoga Solar* (ELP Ticonderoga Solar LLC)	F	ELP Ticonderoga Solar LLC	Solar	8/1/2022	20	
759	KCE NY 6* (KCE NY 6, LLC)	A	Gardenville - Bethlehem Steel Wind 115kV	Storage	04/2022	20	
769	North County Energy Storage (New York Power Authority)	D	Willis 115kV	Storage	03/2022	20	
807	Hilltop Solar (SunEast Hilltop Solar LLC)	E	Eastover - Schaghticoke 115kV	Solar	07/2023	20	
848	Fairway Solar (SunEast Fairway Solar LLC.)	E	McIntyre - Colton 115kV	Solar	10/1/2023	20	
855	NY13 Solar (Bald Mountain Solar LLC)	F	Mohican - Schaghticoke 115kV	Solar	11/1/2023	20	
					Total SG	**568**	

Base Case Generation Deactivation Assumptions

Note: these tables do not include the peaker rule impacted units

2022 GB Table	Owner/ Operator	Plant Name	Zone	Summer Capability	2022 RNA Base Case Status	2020 RNA Base Case Status
Table IV-3: Deactivated Units with Unexpired CRIS Rights Not Listed in Existing Capacity Table III-2	International Paper Company	Ticonderoga	F	9.5	out	out
	Helix Ravenswood, LLC	Ravenswood 2-4	J	30.7	out	out
	Helix Ravenswood, LLC	Ravenswood 3-1	J	31.9	out	out
	Helix Ravenswood, LLC	Ravenswood 3-2	J	29.4	out	out
	Helix Ravenswood, LLC	Ravenswood 3-4	J	31.2	out	out
	Exelon Generation Company LLC	Monroe Livingston	B	2.4	out	out
	Innovative Energy Systems, Inc	Steuben County LF	C	3.2	out	out
	Consolidated Edison Co. of NY, Inc	Hudson Ave 4	J	14	out	out
	New York State Elec& Gas Corp.	Auburn - State St	C	4.1	out	out
	Cayuga Operating Company, LLC	Cayuga 1	C	151	out	out
	Albany Energy LLC	Albany LFGE	F	5.6	out	out
	Somerset Operating Company, LLC	Somerset	A	676.4	out	out
	Entergy Nuclear Power Marketing, LLC	Indian Point 2	H	1011.5	out	out
	Astoria Generating Company L.P.	Gowanus 1-8	J	16	out	out
Table IV-4: Deactivated Units Listed in Existing Capacity Table III-2	Entergy Nuclear Power Marketing, LLC	Indian Point 3	H	1036.3	out	out
	Helix Ravenswood, LLC	Ravenswood 01	J	7.7	out	out
		Ravenswood 11	J	16.1	out	out
Table IV-5: Notices of Proposed Deactivations as of March 15, 2022	National Grid	West Babylon 4	K	41.2	out	out
	Long Island Power Authority	Glenwood GT 01	K	13	out	out
	Seneca Power Partners. L.P.	Allegheny Cogen	B	62	out	in
		Sithe Batavia	B	48.7	out	in
		Sithe Sterling	B	49.2	out	in
	ENGIE Energy Marketing NA, Inc.	Nassau Energy Corporation	K	38.5	out	in
	Astoria Generating Company, L.P.	Gowanus 1-1 through 1-7	J	117.1	out	out
		Gowanus 4-1 through 4-8	J	138.8	out	out
	NRG Power Marketing LLC	Astoria GT 2-1 through 2-4	J	141.6	out	out
		Astoria GT 3-1 through 3-4	J	140.5	out	out
		Astoria GT 4-1	J	138.3	out	out
			Total	**4005.9**		

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Status Changes Due to DEC Peaker List

Note:
Some of the units are assumed out of service only in the May-September ozone season

2022 GB Table	Owner/ Operator	Plant Name	Zone	Summer Capability	Status Change Date 2022 RNA Base Case	2020 RNA Base Case Status
Table IV-6: Proposed Staus Change to Comply with DEC Peaker Rule	Central Hudson Gas & Elec. Corp.	Coxsackie GT	G	19.2	05/01/2023	same
		South Cairo	G	18.9	05/01/2023	same
	Consolidated Edison Co. of NY, Inc.	74 St. GT 1 & 2	J	39.3	05/01/2023	same
		Hudson Ave 3	J	13.6	05/01/2023	same
		Hudson Ave 5	J	12.3	05/01/2023	same
		59 St. GT 1	J	15.3	05/01/2025	same
	Helix Ravenswood, LLC	Ravenswood 10	J	16.0	05/01/2023	same
	National Grid	Northport GT	K	12.0	05/01/2023	same
		Port Jefferson GT 01	K	12.6	05/01/2023	same
		Shoreham 1	K	44.7	05/01/2023	in service
		Shoreham 2	K	15.7	05/01/2023	in service
		Glenwood GT 03	K	44.7	05/01/2023	in service
	NRG Power Marketing, LLC	Arthur Kill GT 1	J	13.1	05/01/2025	same
	Astoria Generating Company, L.P.	Astoria GT 01	J	12.1	05/01/2023	same
		Gowanus 2-1 through 2-8	J	145.5	05/01/2025	same
		Gowanus 3-1 through 3-8	J	137.4	05/01/2025	same
		Narrows 1-1 through 2-8	J	291.5	05/01/2025	same
			Total	863.9		

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Our Mission & Vision

Mission

Ensure power system reliability and competitive markets for New York in a clean energy future

Vision

Working together with stakeholders to build the cleanest, most reliable electric system in the nation

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