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Independent System Operator

2022 RNA Preliminary ("1st Pass") Reliability Needs

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Goals

- **This presentation summarizes the 2022 RNA preliminary, 1st pass, Base Case results**
  - No scenario results are complete at this time
  - The scenarios will be finalized based on the preliminary ("1st pass") RNA Base Case (unless otherwise specified)
  - The 2022 RNA study assumptions were presented at ESPWG/TPAS meetings from February through May 2022, and are documented in the assumptions matrix and presentations
- **The objective of providing stakeholders the 1st pass Reliability Needs is to offer an opportunity, prior to the final RNA, for stakeholders' input regarding updates in projects and plans, which may mitigate any identified 1st pass Reliability Needs**
  - To minimize unnecessary solutions solicitation

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Preliminary vs. Final Reliability Needs: Process Description

- **Modeling updates cut-off date: July 15**
  - Data needed for the NYISO to model updates in power flow, stability, short circuit models; all needed by **July 15**
- **In finalizing the Reliability Needs, changes that occurred since the 1st pass RNA assumptions will be considered, such as:**
  - Updated Local Transmission Plans (LTPs) that may impact the Reliability Needs
    - If there are any pertinent LTP updates, then the affected Transmission Owners will present updates at the **July 26** ESPWG/TPAS meeting
    - The NYISO will present any other updates, if any, at the same meetings
  - Changes in Bulk Power Transmission Facilities (BPTFs)
  - Change in resources such as generating unit status or authority to operate in current equipment configuration past a date certain (e.g., due to a new or amended environmental law or regulation)
  - Change in load forecast or demand response resources

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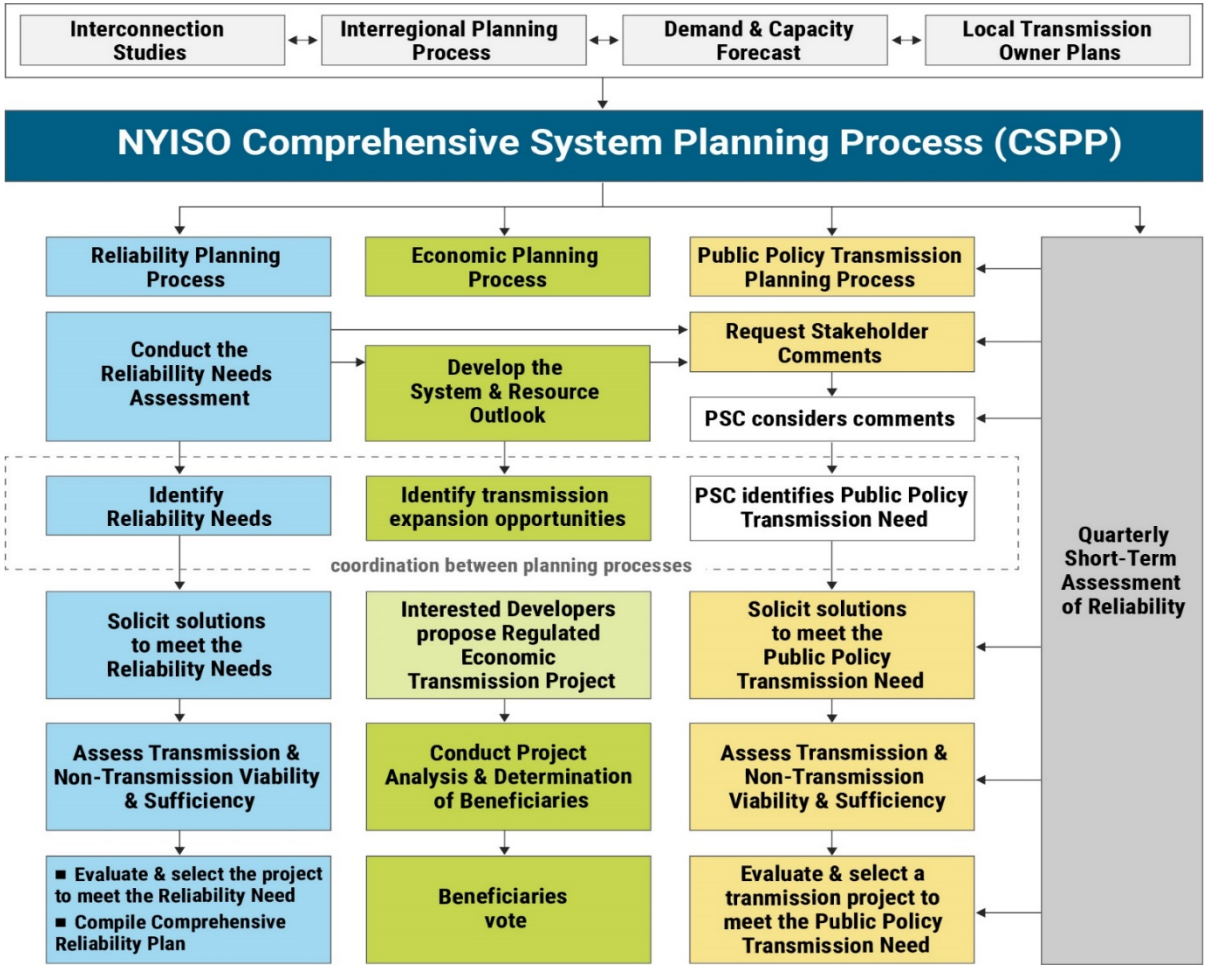
2022 RNA Background



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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 LTPs and updates throughout the process
  - If 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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2022-2023 RPP Background

- The 2022 Reliability Planning Process (RPP) starts with the 2022 Reliability Needs Assessment (2022 RNA) followed by the 2023-2032 Comprehensive System Plan (CRP)
  - 2022 RNA Study Period: year 4 = 2026 through year 10 = 2032
  - Note: year 1 through year 5 are assessed quarterly in the Short-Term Reliability Process (STRP)
- The RPP is part of the Comprehensive System Planning Process and is performed pursuant to the Attachment Y of the NYISO OATT (e.g., Sections 31.1. and 31.2)
  - Additional implementation details, including recently updated RNA Base Case inclusion rules, are captured in the RPP Manual
  - An updated Reliability Planning Process Manual was presented at the June 23, 2022 OC. Corresponding modeling changes are noted in the assumptions matrix.
- 2022 RNA will be based on the information from the Gold Book 2022, the 2022 FERC 715 filing (power flow cases and auxiliary files), historical data, and market participant data
- Reliability evaluations on the 2022 RNA Base Case: transmission security and resource adequacy
  - NERC, NPCC, NYSRC Reliability Rules application on the Bulk Power Transmission Facilities (BPTFs)

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2022 RNA: Base Case Development Background

- **Based on the RNA Base Case, the NYISO identifies Reliability Needs of the BPTFs 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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Reliability Metrics

- **Resource Adequacy**
  - The ability of the electric systems to supply the aggregate electrical demand and energy requirements of their customers at all times, taking into account scheduled and reasonably expected unscheduled outages of system elements
  - Measured against the Loss of Load Expectation (LOLE) of 0.1 event-days/year defined by NPCC and NYSRC
- **Transmission Security**
  - The ability of the electric system to withstand disturbances such as electric short circuits or unanticipated loss of one or more system elements without involuntarily disconnecting firm load
  - Measured against Reliability Criteria defined by reliability standards organizations: NERC, NPCC, and NYSRC

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2022 RNA Major Assumptions

2022 RNA: Summer Peak Load Forecast by Study Year

Baseline and Adjusted Summer Peak Forecast

Annual MW	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
2022 Gold Book Baseline[2]	32,018	31,778	31,505	31,339	31,292	31,317	31,468	31,684	31,946	32,214
+ 2022 Solar PV (Impact)	1,113	1,216	1,314	1,386	1,421	1,423	1,416	1,379	1,315	1,261
2022 RNA Base Case[3]	33,131	32,994	32,819	32,725	32,713	32,740	32,884	33,063	33,261	33,475

Comparison of Base Case Adjusted Summer Peak Forecasts - 2021-2030 CRP & 2022 RNA (MW)

Annual MW	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
2021-2030 CRP Base Case[3]	32,853	32,731	32,675	32,653	32,708	32,801	32,917	33,020	NA	NA
2022 RNA Base Case[3]	33,131	32,994	32,819	32,725	32,713	32,740	32,884	33,063	33,261	33,475
Change from CRP	278	263	144	72	5	-61	-33	43	NA	NA

Notes:
2. The transmission security power flow RNA Base Cases use this Gold Book baseline forecast
3. For the resource adequacy study, the Gold Book baseline load and the high load scenario load forecasts were modified by removing the behind-the-meter solar PV impacts in order to explicitly model the solar PV as a generation resource to account for the intermittent nature of its availability

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Baseline Summer Load Forecast Components

2022 Gold Book, Table I-1c: Summary of NYCA Baseline Summer Coincident Peak Demand Forecasts - MW									
Year	(a) Econometric Peak Demand	(b) (-) EE and C&S	(c) = a - b End-Use Peak Demand	(d) (-) Solar PV, BTM	(e) (-) Non-Solar DG, BTM	(f) (-) BTM Storage Peak Reductions	(g) (+) EV Peak Demand	(h) (+) Building Electrification	(i) = c-d-e-f+g+h Baseline Summer Peak Forecast
2022	33,461	365	33,096	985	288	148	58	32	31,765
2023	34,295	769	33,526	1,113	304	244	96	57	32,018
2024	34,669	1,213	33,456	1,216	319	365	139	83	31,778
2025	34,946	1,696	33,250	1,314	330	416	193	122	31,505
2026	35,308	2,197	33,111	1,386	342	469	269	156	31,339
2027	35,715	2,687	33,028	1,421	352	528	359	206	31,292
2028	36,115	3,160	32,955	1,423	359	583	471	256	31,317
2029	36,577	3,610	32,967	1,416	369	640	610	316	31,468
2030	36,997	4,044	32,953	1,379	376	697	801	382	31,684
2031	37,377	4,451	32,926	1,315	386	755	1,025	451	31,946
2032	37,691	4,786	32,905	1,261	394	812	1,246	530	32,214

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2022 RNA: Inclusion Rules Application

- As presented at the April 26 ESPWG/TPAS: [link]
- Resource adequacy and transmission security assumptions matrix and MARS topology are posted as a separate file for reference
- Additional modeling summaries are in the Appendix of this presentation

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Resource Adequacy
1st Pass Results

Highlights of the MARS Model Changes

- **Modeled new load shapes for the seven MARS load bins**
  - As presented at the March 24 LFTF/ESPWG/TPAS: [link] [link]
- **Maintained (*i.e.,* no longer depleting) 350 MW of the 1,310 MW 10-min operating reserves as part of the MARS emergency operating procedure steps (EOP)**
  - As presented at the May 5, 2022 ESPWG/TPAS [link]
- **Added 1,250 MW HVDC from Quebec to New York City (Champlain Hudson project) starting 2026**
  - 1,250 MW May through October, 0 MW November through Apr
- **Reflected an increase in Moses South limits (from 2,650 MW to 3,500 MW) due to the Q1125 Northern Path project starting 2026**

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Highlights of the MARS Model Changes, cont.

- **Using GE developed MARS functionality for Energy Limited Resources (ELRs)**
  - Resource output is aligned with the NYISO's peak load window when most loss-of-load events are expected to occur.
- **Large loads forecast and updated impacts reflected in the Dysinger East and Group A MARS limits (as reflected in the MARS topology from the posted assumptions matrix)**
  - Large loads are forecasted in the 2022 Gold Book Table I-14 [link]
- **West Central reverse emergency thermal limits increased mainly due to a rating increase on a limiting element**
  - Also identified in the 2022 Operating Study
- **Ontario – NY updated with input from Ontario ISO**
- **Updated Long Island limits with input from PSEG-Long Island**
- **Updated UPNY-ConEd to align with around 300 MW smaller delta associated in the 2021 Operations UPNY-ConEd Voltage Study with the status of the M51, M52, 71, 72 Series Rectors (assumed in service for this RNA and as presented at the April 1 ESPWG)**

Note: Additional modeling details are in the resource adequacy assumptions matrix posted for this meeting

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2022 RNA: LOLE Results

		Study Year	NYCA Baseline Summer Peak (MW)	2022 RNA Base Case NYCA LOLE (event-days/year)
For Information Only*	y1	2023	32,018	0.025
	y2	2024	31,778	0.018
	y3	2025	31,505	0.024
2022 RNA Study Period (y4 and y5 common with STAR)	y4	2026	31,339	0.004
	y5	2027	31,292	0.005
	y6	2028	31,317	0.004
	y7	2029	31,468	0.005
	y8	2030	31,684	0.006
	y9	2031	31,946	0.010
	y10	2032	32,214	0.022

- Assuming no further resource deactivations or delays of entry into service of new resources and transmission , the NYCA LOLE does not violate 0.1 event-day/year criterion throughout the study period

*The RNA Study Period is year 4 through year 10 while the quarterly-performed Short Term Assessment of Reliability (STAR) Study Period is y1 through y5 following the STAR starting date.

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2022 RNA: CHPE Sensitivities

Study Year		2022 RNA Base Case *(CHPE I/S 2026)*	CHPE Sensitivities	
			CHPE Hypothetical Delay to 12/2028	CHPE Removed
y4	2026	0.004	0.015	0.015
y5	2027	0.005	0.016	0.016
y6	2028	0.004	0.014	0.014
y7	2029	0.005	0.005	0.015
y8	2030	0.006	0.006	0.033
y9	2031	0.010	0.010	0.033
y10	2032	0.022	0.022	0.047

- The 1,250 MW HVDC Champlain Hudson Power Express (CHPE) from Hydro Quebec to New York City was assumed in service starting 2026
- Sensitivities were performed with the project either delayed to December 2028, or removed
- The impact of delay or failure to complete CHPE on NYCA LOLE are significant

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2022 RNA vs 2021-2030 CRP: NYCA Load and Resources Comparison (Last Study Years)

NYCA Study Year 10	2022 RNA *(2022GB)* *Y10 (2032)*	2021 CRP *(2020GB)* *Y10 (2030)*	Net Delta *=TotalResDelta minus TotalLoadDelta*
Baseline* Load	32,214	31,609	605
Total Resources***	41,977	39,787	2,190
Net Margin: Change in (netCapacity - netLoad)			**1,585**

Notes:
*Baseline Load includes the reductions due to projected energy efficiency programs, building codes and standards, distributed energy resources, behind-the-meter (BtM) storage impact at peak, BtM solar photovoltaic resources; it also reflects expected increases from projected electric vehicle impact at peak and buildings electrification (see slide 12).
***NYCA Total Resources = NYCA Capacity** + SCR + net transactions from the applicable Gold Book. The 2022 RNA total resources include the 1250 MW (summer) proposed HVDC from Hydro Quebec to New York City, starting 2026
**Capacity = lesser of CRIS or DMNC for resources electrically internal to NYCA, additions, re-ratings, and proposed deactivations and generation status changes (*e.g.*, peaker rule)

Key Observation:

- While the NYCA Baseline Load forecast for 2032 increases by 605 MW as compared with the last CRP, the total resources increases by 2,190 MW leading to a net positive resource margin
  - Positive net margin shows improvement in the relative capability to serve load, when comparing the two studies assumptions

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ICAP vs. UCAP Comparison

Total Capacity vs Load Ratio (%) for 2032			
Zone	ICAP	UCAP	Delta ICAP-UCAP
NYCA	130.3%	113.8%	16.5%
J	88.8%	84.0%	4.7%
K	122.2%	112.3%	9.9%
G-J	96.0%	89.2%	6.8%

Notes:

NYCA Total Capacity = = Capacity* + net transactions + SCR
Zonal Total Capacity = Capacity* + full UDR + SCR
*Capacity = lesser of (CRIS, DMNC)

- **UCAP calculation:**
  - For thermal units, average capacity derating factors from the MARS output are used
  - For renewables, installed capacity intermittent resources derating factors are used

ICAP = Installed Capacity
UCAP = Unforced Capacity

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Transmission Security RNA 1st Pass Results

2022 RNA: NYISO's Transmission Security BTPF Steady State Results Summary

- Under summer peak conditions, the NYISO identifies no BPTF steady state or dynamics Reliability Criteria violations
- Under winter peak conditions, the NYISO has evaluated winter 2032-33 and found steady state low voltages at the Porter 115 kV bus under N-1-1 as well as dynamic stability issues around the Niagara 345 kV substation (both N-1 and N-1-1)
- Under daytime light load conditions (details regarding this system condition are provided on the following slides) there are steady state high voltages in the PSEG-LI service territory under various combinations of contingencies (N-0, N-1, N-1-0, and N-1-1)
- No breaker-duty (short-circuit) Reliability Criteria violations are identified on the BPTF
- No reliability criteria "tipping point" violations are observed by NYISO.

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Daytime Light Load Conditions

- Historically, the light load condition used in NYCA assessments has been an overnight condition in the spring
- With the increased amount of distributed energy resources (DER), the light load condition over time may transition to midday during the spring

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Midday Light Load Forecast Components

Year	(a) Base Gross Load	(b) (+) EV Charging	(c) (+) Building Electrification	(d) (+) BTM Storage Charging	(e) = a + b + c + d Final Gross Load	(f) (-) BTM Solar Generation	(g) = e - f Net Load Forecast
2022	14,785	57	30	118	14,990	2,755	12,235
2023	14,925	88	53	195	15,261	3,329	11,932
2024	14,848	128	77	292	15,345	3,986	11,359
2025	14,667	183	114	333	15,297	4,656	10,641
2026	14,532	258	145	375	15,310	5,283	10,027
2027	14,416	353	192	422	15,383	5,872	9,511
2028	14,292	472	238	466	15,468	6,415	9,053
2029	14,200	615	294	512	15,621	6,878	8,743
2030	14,106	781	356	558	15,801	7,247	8,554
2031	14,032	965	420	604	16,021	7,487	8,534
2032	13,955	1,160	493	650	16,258	7,655	8,603

(a) - Base Gross Load - reflects projected load trends due to baseline impacts such as econometric growth, temperature trends, end-use saturations, and energy efficiency

(b) - Electric Vehicle charging during the light load hour

(c) - Building Electrification impacts during the light load hour

(d) - BTM storage charging during the light load hour, including potential storage charging from hybrid solar/storage systems

(e) - Final Gross Load - represents total demand

(f) - BTM Solar Generation - reflects solar generation during the NYCA midday light load hour and maximum BTM solar hour (2022 GB Table I-9d)

(g) - Net Load Forecast - represents metered load to be served by the wholesale market

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Midday Net Load by Zone

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2022	1,308	733	1,177	612	502	832	524	252	478	4,591	1,226	12,235
2023	1,230	765	1,122	638	407	758	491	252	478	4,619	1,172	11,932
2024	1,088	717	1,016	624	311	667	440	253	477	4,644	1,122	11,359
2025	935	670	898	613	214	567	385	246	463	4,605	1,045	10,641
2026	834	632	797	598	133	476	322	242	452	4,578	963	10,027
2027	740	600	707	586	60	393	275	239	441	4,564	906	9,511
2028	649	569	625	575	-7	319	234	236	432	4,562	859	9,053
2029	577	547	560	565	-57	263	211	236	432	4,585	824	8,743
2030	523	532	516	557	-96	222	202	240	433	4,625	800	8,554
2031	499	527	498	551	-114	205	207	245	438	4,684	794	8,534
2032	489	528	489	544	-119	201	211	246	445	4,760	809	8,603

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Summary of Transmission Security Margins – Expected Load Conditions

- For the statewide transmission security margin, the system is unable to maintain the full 2,620 MW of reserve for years 2023-2025
- The Lower Hudson Valley (Zones G-J) transmission security margin is sufficient for all years
- The New York City (Zone J) transmission security margin is sufficient for all years
  - In 2025 the margin is extremely narrow at 52 MW and in 2032 the margin is 117 MW
- The Long Island (Zone K) transmission security margin is sufficient for all years

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Transmission Security Margin - NYCA

Line	Item	Summer Peak - Baseline Expected Summer Weather, Normal Transfer Criteria									
		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
A	NYCA Generation (1)	34,205	34,274	33,679	33,665	33,652	33,639	33,625	33,612	33,598	33,585
B	External Area Interchanges (2)	1,844	1,844	1,844	3,094	3,094	3,094	3,094	3,094	3,094	3,094
C	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
D	**Total Resources (A+B+C) (3)**	36,049	36,118	35,523	36,759	36,746	36,733	36,719	36,706	36,692	36,679
E	Load Forecast	(32,018)	(31,778)	(31,505)	(31,339)	(31,292)	(31,317)	(31,468)	(31,684)	(31,946)	(32,214)
F	Largest Loss-of-Source Contingency	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)
G	**Total Capability Requirement (E+F)**	(33,328)	(33,088)	(32,815)	(32,649)	(32,602)	(32,627)	(32,778)	(32,994)	(33,256)	(33,524)
H	**Statewide System Margin (D+G)**	2,721	3,030	2,708	4,110	4,144	4,106	3,941	3,712	3,436	3,155
I	Unavailable Generation (3)	(1,876)	(1,876)	(1,814)	(1,814)	(1,814)	(1,814)	(1,814)	(1,814)	(1,814)	(1,814)
J	**Statewide System Margin with Generation Unavailability (H+I)**	845	1,154	894	2,296	2,330	2,292	2,127	1,898	1,622	1,341
K	Operating Reserve	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)
L	**Statewide System Margin with Full Operating Reserve (J+K)**	(465)	(156)	(416)	986	1,020	982	817	588	312	31

Notes:

1. Reflects the 2022 Gold Book existing summer capacity plus projected additions, deactivations, and de-rates. For this evaluation land-based wind generation is assumed to have a capability of 5% of of the total nameplate, off-shore wind at 10% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). De-rates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service.
2. Interchanges are based on ERAG MMWG values.
3. Includes de-rates for thermal resources based on NERC class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx)

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Transmission Security Margin – Lower Hudson Valley (Zones G-J)

Summer Peak - Baseline Expected Weather, Normal Transfer Criteria											
Line	**Item**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
A	G-J Load Forecast	(15,061)	(15,026)	(14,957)	(14,936)	(14,959)	(15,027)	(15,173)	(15,360)	(15,560)	(15,735)
B	RECO Load	(394)	(394)	(394)	(394)	(394)	(394)	(394)	(394)	(397)	(397)
C	**Total Load (A+B)**	(15,455)	(15,420)	(15,351)	(15,330)	(15,353)	(15,421)	(15,567)	(15,754)	(15,957)	(16,132)
D	UPNY-SENY Limit (3)	3,200	5,725	5,725	5,025	5,025	5,025	5,025	5,025	5,025	5,025
E	ABC PARs to J	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)
F	K - SENY	95	95	95	95	95	95	95	95	95	95
G	**Total SENY AC Import (D+E+F)**	3,284	5,809	5,809	5,109	5,109	5,109	5,109	5,109	5,109	5,109
H	Loss of Source Contingency	0	(980)	(980)	0	0	0	0	0	0	0
I	**Resource Need (C+G+H)**	(12,171)	(10,591)	(10,522)	(10,221)	(10,244)	(10,312)	(10,458)	(10,645)	(10,848)	(11,023)
J	*Resources needed after N-1-1 (C+G)*	(12,171)	(9,611)	(9,542)	(10,221)	(10,244)	(10,312)	(10,458)	(10,645)	(10,848)	(11,023)
K	G-J Generation (1)	13,520	13,541	12,940	12,939	12,937	12,935	12,933	12,932	12,931	12,931
L	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
M	Net ICAP External Imports	315	315	315	1,565	1,565	1,565	1,565	1,565	1,565	1,565
N	**Total Resources Available (K+L+M)**	13,835	13,856	13,255	14,504	14,502	14,500	14,498	14,497	14,496	14,496
O	*Resources available after N-1-1 (H+N)*	13,835	12,876	12,275	14,504	14,502	14,500	14,498	14,497	14,496	14,496
P	**Transmission Security Margin (I+N)**	1,664	3,265	2,733	4,283	4,258	4,188	4,040	3,852	3,648	3,473
Q	Unavailable Generation (2)	(988)	(988)	(927)	(927)	(927)	(927)	(927)	(927)	(927)	(927)
R	**Transmission Security Margin with Generation Unavailability (P+Q)**	676	2,277	1,806	3,356	3,331	3,261	3,113	2,925	2,721	2,546

Notes:

1. Reflects the 2022 Gold Book existing summer capacity plus projected additions, deactivations, and de-rates. For this evaluation land-based wind generation is assumed to have a capability of 5% of of the total nameplate, off-shore wind at 10% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). De-rates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service.
2. Includes de-rates for thermal resources based on NERC class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx)
3. Limits in 2022 and 2023 are based on limits from the summer peak 2023 representations evaluated in the post-2020 RNA updates. Limits for 2024 and 2025 are based on the summer peak 2025 representations evaluated in the post-2020 RNA updates. Limits for 2026 through 2032 are based on the summer peak 2032 represenations evalauted in the 2022 RNA.

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Transmission Security Margin – New York City (Zone J)

Summer Peak - Baseline Expected Weather, Normal Transfer Criteria											
Line	**Item**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
A	**Zone J Load Forecast**	(10,853)	(10,837)	(10,786)	(10,778)	(10,804)	(10,864)	(10,986)	(11,140)	(11,303)	(11,441)
B	I+K to J (3)	3,904	3,904	3,904	4,622	4,622	4,622	4,622	4,622	4,622	4,622
C	ABC PARs to J	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)
D	**Total J AC Import (B+C)**	3,893	3,893	3,893	4,611	4,611	4,611	4,611	4,611	4,611	4,611
E	Loss of Source Contingency	(980)	(980)	(980)	(2,230)	(2,230)	(2,230)	(2,230)	(2,230)	(2,230)	(2,230)
F	**Resource Need (A+D+E)**	(7,940)	(7,924)	(7,873)	(8,397)	(8,423)	(8,483)	(8,605)	(8,759)	(8,922)	(9,060)
G	*Resources needed after N-1-1 (A+D)*	(6,960)	(6,944)	(6,893)	(6,167)	(6,193)	(6,253)	(6,375)	(6,529)	(6,692)	(6,830)
H	J Generation (1)	8,796	8,796	8,197	8,197	8,197	8,197	8,197	8,197	8,197	8,197
I	Temperature Based Generation Derates (2)	0	0	0	0	0	0	0	0	0	0
J	Net ICAP External Imports	315	315	315	1,565	1,565	1,565	1,565	1,565	1,565	1,565
K	**Total Resources Available (H+I+J)**	9,111	9,111	8,512	9,762	9,762	9,762	9,762	9,762	9,762	9,762
L	*Resources available after N-1-1 (E+K)*	8,131	8,131	7,532	7,532	7,532	7,532	7,532	7,532	7,532	7,532
M	**Transmission Security Margin (F+K)**	1,171	1,187	638	1,365	1,339	1,279	1,157	1,003	839	701
N	Unavailable Generation (2)	(645)	(645)	(584)	(584)	(584)	(584)	(584)	(584)	(584)	(584)
O	**Transmission Security Margin with Generation Unavailability (M+N)**	526	542	54	780	754	694	572	418	255	117

Notes:

1. Reflects the 2022 Gold Book existing summer capacity plus projected additions, deactivations, and de-rates. For this evaluation land-based wind generation is assumed to have capability of 5% of the total nameplate, off-shore wind at 10% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). De-rates for run-of-river hydro is included as well as the Oswego Export limit for all lines in-service.
2. Includes de-rates for thermal resources based on NERC class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx)
3. The I+K to J flows in 2023, 2024, and 2025 are based on N-1-1-0 analysis in the post-2020 RNA updates utilizing the models representing summer peak 2030. The I+K to J flows in 2026 through 2032 are based on the N-1-1-0 analysis in the 2022 RNA utilizing models representing summer peak 2032.

New York ISO

Transmission Security Margin – Long Island (Zone K)

Summer Peak - Baseline Expected Weather, Normal Transfer Criteria										
Line	**Item**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
A	**Zone K Load Forecast**	(4,951)	(4,870)	(4,782)	(4,746)	(4,768)	(4,806)	(4,857)	(4,907)	(4,956)	(5,007)
B	I+J to K	929	929	929	929	929	929	929	929	929	929
C	New England Import (NNC)	0	0	0	0	0	0	0	0	0	0
D	**Total K AC Import (B+C)**	929	929	929	929	929	929	929	929	929	929
E	Loss of Source Contingency	(660)	(660)	(660)	(660)	(660)	(660)	(660)	(660)	(660)	(660)
F	**Resource Need (A+D+E)**	(4,682)	(4,601)	(4,513)	(4,477)	(4,499)	(4,537)	(4,588)	(4,638)	(4,687)	(4,738)
G	*Resources needed after N-1-1 (A+D)*	(4,022)	(3,941)	(3,853)	(3,817)	(3,839)	(3,877)	(3,928)	(3,978)	(4,027)	(4,078)
H	K Generation (1)	4,928	4,940	4,940	4,939	4,939	4,938	4,937	4,937	4,936	4,936
I	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
J	Net ICAP External Imports	660	660	660	660	660	660	660	660	660	660
K	**Total Resources Available (H+I+J)**	5,588	5,600	5,600	5,599	5,599	5,598	5,597	5,597	5,596	5,596
L	*Resources available after N-1-1 (E+K)*	4,928	4,940	4,940	4,939	4,939	4,938	4,937	4,937	4,936	4,936
M	**Transmission Security Margin (F+K)**	906	999	1,087	1,122	1,100	1,061	1,009	959	909	858
N	Unavailable Generation (2)	(428)	(428)	(428)	(428)	(428)	(428)	(428)	(428)	(428)	(428)
O	**Transmission Security Margin with Generation Unavailability (M+N)**	478	571	659	694	672	633	581	531	481	430

Notes:

1. Reflects the 2022 Gold Book existing summer capacity plus projected additions, deactivations, and de-rates. For this evaluation land-based wind generation is assumed to have capability of 5% of the total nameplate, off-shore wind at 10% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). De-rates for run-of-river hydro is included as well as the Oswego Export limit for all lines in-service.
2. Includes de-rates for thermal resources based on NERC class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx)

New York ISO

Sensitivity Analysis Evaluating the Impact of a 3-Year Delay for CHPE

Sensitivity Analysis Evaluating the Impact of a 3-Year Delay for CHPE

- As a sensitivity, transmission security margin ("tipping point") analysis was performed to evaluate the impact of a 3-year delay of the CHPE project (delayed from December 2025 until December 2028)
- For the NYCA transmission security margin, the system is unable to maintain full operating reserve from 2023 through 2028
- For the New York City transmission security margin the system "tips" into a reliability violation by 28 MW in 2028
  - Years 2025, 2026, and 2027 are also extremely narrow in margin

New York ISO

Transmission Security Margin – NYCA, CHPE 3-Year Delay (sensitivity)

Line	Item	Summer Peak - Baseline Expected Summer Weather, Normal Transfer Criteria									
		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
A	NYCA Generation (1)	34,205	34,274	33,679	33,665	33,652	33,639	33,625	33,612	33,598	33,585
B	External Area Interchanges (2)	1,844	1,844	1,844	1,844	1,844	1,844	3,094	3,094	3,094	3,094
C	Temperature Based Generation Derates	0	0	0	0	0	0	0	0	0	0
D	**Total Resources (A+B+C) (3)**	36,049	36,118	35,523	35,509	35,496	35,483	36,719	36,706	36,692	36,679
E	Load Forecast	(32,018)	(31,778)	(31,505)	(31,339)	(31,292)	(31,317)	(31,468)	(31,684)	(31,946)	(32,214)
F	Largest Loss-of-Source Contingency	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)
G	**Total Capability Requirement (E+F)**	(33,328)	(33,088)	(32,815)	(32,649)	(32,602)	(32,627)	(32,778)	(32,994)	(33,256)	(33,524)
H	**Statewide System Margin (D+G)**	2,721	3,030	2,708	2,860	2,894	2,856	3,941	3,712	3,436	3,155
I	Unavailable Generation (3)	(1,876)	(1,876)	(1,814)	(1,814)	(1,814)	(1,814)	(1,814)	(1,814)	(1,814)	(1,814)
J	**Statewide System Margin with Generation Unavailability (H+I)**	845	1,154	894	1,046	1,080	1,042	2,127	1,898	1,622	1,341
K	Operating Reserve	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)	(1,310)
L	**Statewide System Margin with Full Operating Reserve (J+K)**	(465)	(156)	(416)	(264)	(230)	(268)	817	588	312	31

Notes:

1. Reflects the 2022 Gold Book existing summer capacity plus projected additions, deactivations, and de-rates. For this evaluation land-based wind generation is assumed to have a capability of 5% of of the total nameplate, off-shore wind at 10% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). De-rates for run-of-river hydro are included as well as the Oswego Export limit for all lines in-service.
2. Interchanges are based on ERAG MMWG values.
3. Includes de-rates for thermal resources based on NERC class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx)

New York ISO

Transmission Security Margin – New York City (Zone J), CHPE 3-Year Delay (sensitivity)

Summer Peak - Baseline Expected Weather, Normal Transfer Criteria											
Line	**Item**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
A	**Zone J Load Forecast**	(10,853)	(10,837)	(10,786)	(10,778)	(10,804)	(10,864)	(10,986)	(11,140)	(11,303)	(11,441)
B	I+K to J (3)	3,904	3,904	3,904	3,904	3,904	3,904	4,622	4,622	4,622	4,622
C	ABC PARs to J	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)
D	**Total J AC Import (B+C)**	3,893	3,893	3,893	3,893	3,893	3,893	4,611	4,611	4,611	4,611
E	Loss of Source Contingency	(980)	(980)	(980)	(980)	(980)	(980)	(2,230)	(2,230)	(2,230)	(2,230)
F	**Resource Need (A+D+E)**	(7,940)	(7,924)	(7,873)	(7,865)	(7,891)	(7,951)	(8,605)	(8,759)	(8,922)	(9,060)
G	*Resources needed after N-1-1 (A+D)*	(6,960)	(6,944)	(6,893)	(6,885)	(6,911)	(6,971)	(6,375)	(6,529)	(6,692)	(6,830)
H	J Generation (1)	8,796	8,796	8,197	8,197	8,197	8,197	8,197	8,197	8,197	8,197
I	Temperature Based Generation Derates (2)	0	0	0	0	0	0	0	0	0	0
J	Net ICAP External Imports	315	315	315	315	315	315	1,565	1,565	1,565	1,565
K	**Total Resources Available (H+I+J)**	9,111	9,111	8,512	8,512	8,512	8,512	9,762	9,762	9,762	9,762
L	*Resources available after N-1-1 (E+K)*	8,131	8,131	7,532	7,532	7,532	7,532	7,532	7,532	7,532	7,532
M	**Transmission Security Margin (F+K)**	1,171	1,187	638	646	620	560	1,157	1,003	839	701
N	Unavailable Generation (2)	(645)	(645)	(584)	(584)	(584)	(584)	(584)	(584)	(584)	(584)
O	**Transmission Security Margin with Generation Unavailability (M+N)**	526	542	54	62	36	(24)	572	418	255	117

Notes:

1. Reflects the 2022 Gold Book existing summer capacity plus projected additions, deactivations, and de-rates. For this evaluation land-based wind generation is assumed to have capability of 5% of the total nameplate, off-shore wind at 10% of the total nameplate, solar generation is based on the ratio of solar PV nameplate capacity (2022 Gold Book Table I-9a) and solar PV peak reductions (2022 Gold Book Table I-9c). De-rates for run-of-river hydro is included as well as the Oswego Export limit for all lines in-service.
2. Includes de-rates for thermal resources based on NERC class average EFORd data (https://www.nerc.com/pa/RAPA/gads/Pages/Reports.aspx)
3. The I+K to J flows in 2023, 2024, and 2025 are based on N-1-1-0 analysis in the post-2020 RNA updates utilizing the models representing summer peak 2030. The I+K to J flows in 2026 through 2032 are based on the N-1-1-0 analysis in the 2022 RNA utilizing models representing summer peak 2032.

New York ISO

Next Steps

RNA Milestones

- July 1 ESPWG/TPAS: present preliminary ("1st pass") RNA results
- **Modeling updates cut-off: July 15**
    - Data needed for the NYISO to model updates in power flow, stability, short circuit models; all needed by July 15
- **July 26 ESPWG/TPAS: Transmission Owners and NYISO's presentations of projects status updates relevant to mitigating any identified 1st pass Reliability Needs**
- **August-September ESPWG/TPAS: review final results, including scenarios, and draft RNA reports**
- **October OC & MC: Market Monitoring Unit review and OC and MC votes**
- **November: NYISO Board of Directors approval and publishing of final RNA Report**

New York ISO

Post-RNA Updates

- **December ESPWG/TPAS:**
  - Stakeholders' presentations of any project status updates (e.g., local transmission plans, generation additions, demand changes), that may reduce or eliminate the Reliability Needs noted in the final RNA.
    - Updates must meet the inclusion rules
- **December 2022-January 2023**
  - The NYISO re-evaluates the status updates and, if necessary, presents updated Reliability Needs
- **January or February 2023**
  - NYISO issues solicitation of solutions to any remaining Reliability Needs; responses due within 60 days.

New York ISO

Short-Term Reliability Timeline

Short-Term Reliability Process

- **Short-Term Assessment of Reliability (STAR)**
  - 2022 Q2 STAR due July 14, 2022
  - 2022 Q3 STAR to commence July 15, 2022
  - Assessments look at years 1 – 5, but focus on years 1 – 3
  - RNA assesses years 4 – 10 (2026-2032)

New York ISO

Questions?

Appendix A
Additional Summaries

NYCA Additions and Deactivations Summaries

Summer of Year	Additions	Reratings	Deactivations	Net Capacity	Summer Coincident Baseline Load
Y2022	43	9	175	37,251	31,765
Y2023	445	9	1,107	36,721	32,018
Y2024	1,855	9	1,107	38,131	31,778
Y2025	1,945	9	1,704	37,625	31,505
Y2026	1,945	9	1,704	37,625	31,339
Y2027	1,945	9	1,704	37,625	31,292
Y2028	1,945	9	1,704	37,625	31,317
Y2029	1,945	9	1,704	37,625	31,468
Y2030	1,945	9	1,704	37,625	31,684
Y2031	1,945	9	1,704	37,625	31,946
Y2032	1,945	9	1,704	37,625	32,214

Net Capacity = existing capacity + addition + rerating – (deactivations and status changes)

New York ISO

2022 RNA Load and Capacity Summary

	Year	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Peak Load (MW) - Gold Book 2022 NYCA Baseline											
	NYCA*	32,018	31,778	31,505	31,339	31,292	31,317	31,468	31,684	31,946	32,214
	Zone J*	10,853	10,837	10,786	10,778	10,804	10,864	10,986	11,140	11,303	11,441
	Zone K*	4,951	4,870	4,782	4,746	4,768	4,806	4,857	4,907	4,956	5,007
	Zone G-J*	15,061	15,026	14,957	14,936	14,959	15,027	15,173	15,360	15,560	15,735
Resources (MW)											
NYCA	Capacity**	36,721	38,131	37,625	37,625	37,625	37,625	37,625	37,625	37,625	37,625
	Net Transactions	1,776	1,602	1,485	3,188	3,188	3,188	3,188	3,188	3,188	3,188
	SCR	1,164	1,164	1,164	1,164	1,164	1,164	1,164	1,164	1,164	1,164
	Total Resources***	39,662	40,897	40,273	41,977	41,977	41,977	41,977	41,977	41,977	41,977
	Capacity/Load Ratio	114.7%	120.0%	119.4%	120.1%	120.2%	120.1%	119.6%	118.8%	117.8%	116.8%
	Cap+NetPurch+SCR/Load Ratio	123.9%	128.7%	127.8%	133.9%	134.1%	134.0%	133.4%	132.5%	131.4%	130.3%
Zone J	Capacity**	8,780	8,780	8,183	8,183	8,183	8,183	8,183	8,183	8,183	8,183
	Full UDR Rights	315	315	315	1,565	1,565	1,565	1,565	1,565	1,565	1,565
	SCR	406	406	406	406	406	406	406	406	406	406
	Total Resources***	9,501	9,501	8,905	10,155	10,155	10,155	10,155	10,155	10,155	10,155
	Capacity/Load Ratio	80.9%	81.0%	75.9%	75.9%	75.7%	75.3%	74.5%	73.5%	72.4%	71.5%
	Cap+fullUDR+SCR/Load Ratio	87.5%	87.7%	82.6%	94.2%	94.0%	93.5%	92.4%	91.2%	89.8%	88.8%
Zone K	Capacity**	4,958	5,094	5,094	5,094	5,094	5,094	5,094	5,094	5,094	5,094
	Full UDR Rights	990	990	990	990	990	990	990	990	990	990
	SCR	37	37	37	37	37	37	37	37	37	37
	Total Resources***	5,985	6,121	6,121	6,121	6,121	6,121	6,121	6,121	6,121	6,121
	Capacity/Load Ratio	100.1%	104.6%	106.5%	107.3%	106.8%	106.0%	104.9%	103.8%	102.8%	101.7%
	Cap+fullUDR+SCR/Load Ratio	120.9%	125.7%	128.0%	129.0%	128.4%	127.4%	126.0%	124.7%	123.5%	122.2%
Zone G-J	Capacity**	13,548	13,648	13,052	13,052	13,052	13,052	13,052	13,052	13,052	13,052
	Full UDR Rights	315	315	315	1,565	1,565	1,565	1,565	1,565	1,565	1,565
	SCR	491	491	491	491	491	491	491	491	491	491
	Total Resources***	14,354	14,454	13,858	15,108	15,108	15,108	15,108	15,108	15,108	15,108
	Capacity/Load Ratio	90.0%	90.8%	87.3%	87.4%	87.2%	86.9%	86.0%	85.0%	83.9%	82.9%
	Cap+fullUDR+SCR/Load Ratio	95.3%	96.2%	92.7%	101.2%	101.0%	100.5%	99.6%	98.4%	97.1%	96.0%

Notes:

*__NYCA__ load values represent baseline coincident summer peak demand including reductions due to energy efficiency programs, building codes, storage impacts at peak, BtM solar, and non-solar distributed energy generation; as well as expected increases due to EVs and building electrification. __Zones J and K__ load values represent non-coincident summer peak demand. __Aggregate Zones G-J__ values represent G-J coincident peak, which is non-coincident with NYCA.

**NYCA Capacity values include resources electrically internal to NYCA, additions, re-ratings, and proposed deactivations (including proposed retirements and mothballs) and generation status changes (e.g., peaker rule). Capacity values reflect the __lesser of CRIS and DMNC values__. NYCA total resources include the net purchases and sales (transactions) from the Gold Book. Zonal totals reflect the full UDR rights for those capacity zones.

The 1,250 MW Champlain Hudson HVDC project from Quebec to New York City is included (starting 2026, May through October) in the full UDR for Zone J, and in the NYCA Net Transactions.

New York ISO

Roles of the NYISO

- **Reliable operation of the bulk electricity grid**
  - Managing the flow of power on 11,000 circuit-miles of transmission lines from hundreds of generating units
- **Administration of open and competitive wholesale electricity markets**
  - Bringing together buyers and sellers of energy and related products and services
- **Planning for New York's energy future**
  - Assessing needs over a 10-year horizon and evaluating projects proposed to meet those needs
- **Advancing the technological infrastructure of the electric system**
  - Developing and deploying information technology and tools to make the grid smarter

New York ISO

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

New York ISO