2024 RNA MARS Assumptions Matrix

#	Parameter	2022 RNA (2022 Gold Book) Study Period: y4 (2026)-y10 (2032)	2024 RNA (2024 Gold Book) Study Period: y4 (2028)-y10 (2034)
Key Assumptions and Reports			
1	**Links to Key Assumptions Presentations and Final Reports**	Nov 15, 2022: NYISO Board approval and final 2022 RNA posting. 2022 RNA Report link 2022 RNA Appendix link	March 1 ESPWG/TPAS: Draft Schedule [link]
Load Parameters			
1	**Peak** Load Forecast	Adjusted 2022 Gold Book NYCA baseline peak load forecast. It includes large loads from the NYISO interconnection queue, with forecasted impacts. Baseline load represents coincident summer peak demand and includes the reductions due to projected energy efficiency programs, building codes and standards, BtM storage impacts at peak, distributed energy resources and BtM solar photovoltaic resources; it also reflects expected impacts (increases) from projected electric vehicle usage and electrification. The GB 2022 baseline peak load forecast includes the impact (reduction) of behind-the-meter (BtM) solar at the time of NYCA peak. For the BtM Solar adjustment, gross load forecasts that include the impact of the BtM generation will be used for the 2022 RNA, as provided by the Demand Forecasting Team which then allows for a discrete modeling of the BtM solar resources using 5 years of inverter data.	Adjusted 2024 Gold Book NYCA baseline peak load forecast. It includes large loads from the NYISO interconnection queue, with forecasted impacts. Baseline load represents coincident summer peak demand and includes the reductions due to projected energy efficiency programs, building codes and standards, BtM storage impacts at peak, distributed energy resources and BtM solar photovoltaic resources; it also reflects expected impacts (increases) from projected electric vehicle usage and electrification. The GB 2024 baseline peak load forecast includes the impact (reduction) of behind-the-meter (BtM) solar at the time of NYCA peak. For the BtM Solar adjustment, gross load forecasts that include the impact of the BtM generation will be used for the 2024 RNA, as provided by the Demand Forecasting Team which then allows for a discrete modeling of the BtM solar resources using 5 years of inverter data.
2	Load **Shapes** (Multiple Load Shapes)	**New Load Shapes** *(see March 24 LFTF/ESPWG):* Used Multiple Load Shape MARS Feature 8,760-hour historical gross load shapes were used as base shapes for LFU bins: Load Bins 1 and 2: 2013 Load Bins 3 and 4: 2018 Load Bins 5 to 7: 2017 Historical load shapes are adjusted to meet zonal (as well as G-J) coincident and non-coincident peak forecasts	Used Multiple Load Shape MARS Feature *(see March 24 LFTF/ESPWG).* Used Multiple Load Shape MARS Feature 8,760-hour historical gross load shapes were used as base shapes for LFU bins: Load Bins 1 and 2: 2013 Load Bins 3 and 4: 2018 Load Bins 5 to 7: 2017 Historical load shapes are adjusted to meet zonal (as well as G-J) coincident and non-coincident peak forecasts

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		(summer and winter), while maintaining the energy targets. For the BtM Solar discrete modeling, gross load forecasts that include the impact of the BtM generation are used (additional details under the BtM Solar category below).	(summer and winter), while maintaining the energy targets. For the BtM Solar discrete modeling, gross load forecasts that include the impact of the BtM generation are used (additional details under the BtM Solar category below).
3	Load Forecast Uncertainty (LFU) The LFU model captures the impacts of weather conditions on future loads.	2022 LFU Updated via Load Forecast Task Force (LFTF) process. Updated LFU values *(as presented at the April 21, 2022 LFTF [link])*	2024 LFU Updated via Load Forecast Task Force process. Same summer LFU values as the ones presented in 2023 *(as presented at the May 26, 2023 LFTF [link] and also presented at the April 18, 2024 LFTF)* **New Additional Method for Winter:** **Winter Dynamic Load Forecast Uncertainty (LFU)**: In order to reflect uncertainty stemming from electrification, electric vehicles (EVs), and large loads, the 2024 RNA will use a winter LFU multipliers model. Over the study period year 2 through year 10, dynamic winter LFU multipliers will be calculated, reflecting the increasing share and load behavior of EV charging load, heating electrification, and large load projects. The dynamic winter LFU multipliers increase over the study horizon, reflecting the increasing winter weather sensitivity due to additional EV charging and electric heating load. Note: the first winter of the study period (winter 2024-25) match those calculated using recent winter load and weather data. Additional details are available in the April 18 TPAS/ESPWG/LFTF presentation
Generation Parameters			
1	**Existing** Generating Unit Capacities (*e.g., thermal units, large hydro)*	2022 Gold Book values: Summer is min of (DMNC, CRIS). Winter is min of (DMNC, CRIS). Adjusted for RNA Base Case inclusion rules application.	2024 Gold Book values: Summer is min of (DMNC, CRIS). Winter is min of (DMNC, CRIS). Adjusted for RNA Base Case inclusion rules application
2	**Proposed New Units Inclusion** Determination	2022 Gold Book with RNA Base Case inclusion rules applied *See April 26, 2022 TPAS/ESPWG*	2024 Gold Book with RNA Base Case inclusion rules applied *See April 18, 2024 TPAS/ESPWG*

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3	Retirement, Mothballed Units, IIFO	2022 Gold Book with RNA Base Case inclusion rules applied *See April 26, 2022 TPAS/ESPWG*	2024 Gold Book with RNA Base Case inclusion rules applied *See April 18, 2024 TPAS/ESPWG*
4	Forced and Partial Outage Rates (*e.g., thermal units)*	Five-year (2017-2021) GADS data for each unit represented. Transition Rates representing the Equivalent Forced Outage Rates (EFORd) during demand periods over the most recent five-year period. For new units or units that are in service for less than three years, NERC 5-year class average EFORd data are used.	Five-year (2019-2023) GADS data for each unit represented. Transition Rates representing the Equivalent Forced Outage Rates (EFORd) during demand periods over the most recent five-year period. For new units or units that are in service for less than three years, NERC 5-year class average EFORd data are used.
5	Modeling of Non-firm Gas Unavailability During Winter Peak Conditions	N/A	**New:** In order to simulate anticipated risks from cold snaps on the gas availability, gas plants available MWs in NYCA are further derated, *i.e.,*: all gas-only units with non-firm gas within the NYCA are assumed unavailable**.** Also, certain dual-fuel units with duct-burn capability are derated. The forecasted winter coincident peak is used to determine when the gas derates are applied in the RNA Base Cases.
6	Planned Outages	Based on schedules received by the NYISO and adjusted for history.	Based on schedules received by the NYISO and adjusted for history.
7	Fixed and Unplanned Maintenance	Scheduled maintenance from Operations. Unplanned maintenance based on GADS data average maintenance time – average time in weeks is modeled.	Scheduled maintenance from Operations. Unplanned maintenance based on GADS data average maintenance time – average time in weeks is modeled.
8	Summer Maintenance	None	None
9	Combustion Turbine Derates	Derate based on temperature correction curves. Thermal derates are based on a ratio of peak load before LFU is applied and LFU applied load. For new units: used data for a unit of same type in same zone, or neighboring zone data.	Derate based on temperature correction curves. Thermal derates are based on a ratio of peak load before LFU is applied and LFU applied load. For new units: used data for a unit of same type in same zone, or neighboring zone data.
10	Existing Landfill Gas (LFG) Plants	Actual hourly plant output over the last 5 years. Program randomly selects an LFG shape of hourly production over the last 5 years for each model replication.	Actual hourly plant output over the last 5 years. Program randomly selects an LFG shape of hourly production over the last 5 years for each model replication.

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		Probabilistic model is incorporated based on five years of input shapes, with one shape per replication randomly selected in the Monte Carlo process.	Probabilistic model is incorporated based on five years of input shapes, with one shape per replication randomly selected in the Monte Carlo process.
11	Existing and Proposed **Wind** Units	Actual hourly plant output over the last 5 years (2017-2021). Probabilistic model is incorporated based on five years of input shapes with one shape per replication being randomly selected in Monte Carlo process.	New data source: Model-based hourly data over the past 5 years (developed by DNV-GL) Probabilistic model is incorporated based on five years of input shapes with one shape per replication being randomly selected in Monte Carlo process.
12	Proposed **Offshore Wind** Units	RNA Base Case inclusion rules Applied to determine the generator status. Power curves based on 2008-2012 NREL from 3 different sites: NY Harbor, LI Shore, LI East, and GE updates of the NREL curves reflecting derates.	RNA Base Case inclusion rules Applied to determine the generator status. New data source: 5 years of hourly model-based data as developed by DNV-GL
13	Existing and Proposed **Utility-scale Solar Resources**	Probabilistic model chooses from the production data output shapes covering the last 5 years. One shape per replication is randomly selected in Monte Carlo process.	New data source: Probabilistic model chooses from the model-based data shapes covering past 5 years, as developed by DNV-GL. One shape per replication is randomly selected in Monte Carlo process.
14	**BtM Solar Resources**	**Supply side:** Five years (2021-2017) of 8,760 hourly MW profiles based on sampled inverter data. The MARS random shape mechanism randomly picks ne 8,760 hourly shape (of five) for each replication year; similar with the past planning modeling and aligns with the method used for wind, utility solar, landfill gas, and run-of-river facilities. **Load side:** Gross load forecasts for the 2022 RNA, as developed by the NYISO forecasting team.	**Supply side:** Past five years of 8,760 hourly MW profiles based on sampled inverter data. The MARS random shape mechanism randomly picks one 8,760 hourly shape (of five) for each replication year; similar with the past planning modeling and aligns with the method used for wind, utility solar, landfill gas, and run-of-river facilities. **Load side:** Gross load forecasts for the 2024 RNA, as developed by the NYISO forecasting team.
15	Existing **BTM-NG Program**	These units are former load modifiers that sell capacity into the ICAP market. Modeled as cogen type 1 (or type 2 as applicable) unit in MARS. Unit capacity set to CRIS value, load modeled with weekly pattern that can change monthly.	These units are former load modifiers that sell capacity into the ICAP market. Modeled as cogen type 1 (or type 2 as applicable) unit in MARS. Unit capacity set to CRIS value, load modeled with weekly pattern that can change monthly.

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16	Existing **Small Hydro** Resources (*e.g.,* run of river)	Actual hourly plant output over the past 5 years period. Program randomly selects a hydro shape of hourly production over the 5-year window for each model replication. The randomly selected shape is multiplied by their current nameplate rating.	Actual hourly plant output over the past 5 years period. Program randomly selects a hydro shape of hourly production over the 5-year window for each model replication. The randomly selected shape is multiplied by their current nameplate rating.
17	Existing **Large Hydro**	Probabilistic Model based on 5 years of GADS data. Transition Rates representing the Equivalent Forced Outage Rates (EFORd) during demand periods over the most recent five-year period. Methodology consistent with thermal unit transition rates.	Probabilistic Model based on 5 years of GADS data. Transition Rates representing the Equivalent Forced Outage Rates (EFORd) during demand periods over the most recent five-year period. Methodology consistent with thermal unit transition rates.
18	Proposed front-of-meter **Battery Storage**	GE MARS 'ES' model is used. Units are given a maximum capacity, maximum stored energy, and a dispatch window.	GE MARS 'ES' model is used. Units are given a maximum capacity, maximum stored energy, and a dispatch window.
19	Existing Energy Limited Resources (**ELRs)**	**New method:** GE developed MARS functionality to be used for ELRs. Resource output is aligned with the NYISO's peak load window when most loss-of-load events are expected to occur.	GE developed MARS functionality to be used for ELRs. Resource output is aligned with the NYISO's peak load window when most loss-of-load events are expected to occur.
Transaction – Imports/ Exports			
1	Capacity Purchases	Grandfathered Rights and other awarded long-term rights Modeled using MARS explicit contracts feature.	Grandfathered Rights and other awarded long-term rights Modeled using MARS explicit contracts feature.
2	Capacity Sales	These are long-term contracts filed with FERC. Modeled using MARS explicit contracts feature. Contracts sold from ROS (Zones: A-F). ROS ties to external pool are derated by sales MW amount	These are long-term contracts filed with FERC. Modeled using MARS explicit contracts feature. Contracts sold from ROS (Zones: A-F). ROS ties to external pool are derated by sales MW amount

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3	FCM Sales	Model sales for known years Modeled using MARS explicit contracts feature. Contracts sold from ROS (Zones: A-F). ROS ties to external pool are derated by sales MW amount	Model sales for known years Modeled using MARS explicit contracts feature. Contracts sold from ROS (Zones: A-F). ROS ties to external pool are derated by sales MW amount
4	UDRs	Updated with most recent elections/awards information (VFT, HTP, Neptune, CSC) Added CHPE HTP (from Hydro Quebec into Zone J) at 1250 MW (summer only) starting 2026	Updated with most recent elections/awards information (VFT, HTP, Neptune, CSC) Added CHPE HVDC (from Hydro Quebec into Zone J) at 1250 MW (summer only) starting 2026.
5	External Deliverability Rights (EDRs)	**Cedars Uprate 80 MW**. Increased the HQ to D by 80 MW. Note: The Cedar bubble has been removed and its corresponding MW was reflected in HQ to D limit.	**Cedars Uprate 80 MW**. Modeled reflecting External CRIS rights.
6	Wheel-Through Contract	**300 MW HQ through NYISO to ISO-NE.** Modeled as firm contract; reduced the transfer limit from HQ to NYISO by 300 MW and increased the transfer limit from NYISO to ISO-NE by 300 MW.	**300 MW HQ through NYISO to ISO-NE.** Modeled as firm contract; reduced the transfer limit from HQ to NYISO by 300 MW and increased the transfer limit from NYISO to ISO-NE by 300 MW.
MARS Topology: a simplified bubble-and-pipe representation of the transmission system			
1	Interface Limits	Developed by review of previous studies and specific analysis during the RNA study process.	Developed by review of previous studies and specific analysis during the RNA study process.
2	New Transmission	Based on TO-provided firm plans (via Gold Book/LTP 2021-2020 process) and proposed merchant transmission facilities meeting the RNA Base Case inclusion rules.	Based on TO-provided firm plans (via Gold Book/LTP 2023-2024 processes) and proposed merchant transmission facilities meeting the RNA Base Case inclusion rules.
3	AC Cable Forced Outage Rates	All existing cable transition rates updated with data received from ConEd and PSEG-LIPA to reflect most recent five-year history.	All existing cable transition rates updated with data received from ConEd and PSEG-LIPA to reflect most recent five-year history.

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4	UDR unavailability	Five-year history of forced outages.	Five-year history of forced outages.
Emergency Operating Procedures (EOPs)			
1	EOP Steps Order	1. Removing Operating Reserve 2. Special Case Resources (SCRs) (Load and Generator) 3. 5% Manual Voltage Reduction 4. 30-Minute Operating Reserve to Zero 5. 5% Remote Controlled Voltage Reduction 6. Voluntary Load Curtailment 7. Public Appeals 8. Emergency Assistance from External Areas 9. Part of the 10-Minute Operating Reserve to Zero (960 MW of 1310 MW) to Zero	**New order:** Implementing NYSRC ICS/EC November 9, 2023 decision for the new EOP order recommendation: 1. Removing Operating Reserve 2. Special Case Resources (SCRs) (Load and Generator) 3. 5% Manual Voltage Reduction 4. 30-Minute Operating Reserve to Zero 5. Voluntary Load Curtailment 6. Public Appeals 7. 5% Remote Controlled Voltage Reduction 8. Emergency Assistance from External Areas 9. Part of the 10-Minute Operating Reserve (910 MW of 1310 MW) to Zero
2	Special Case Resources (SCR)	SCRs sold for the program discounted to historic availability ("effective capacity"). Monthly variation based on historical experience. Summer values calculated from the latest available July registrations (July 2022 SCR enrollment) held constant for all years of study. Modeling 15 calls/year. Generation and load zonal MW are combined into one step.	SCRs sold for the program discounted to historic availability ("effective capacity"). Monthly variation based on historical experience. Summer values calculated from the latest available July registrations (July 2023 SCR enrollment) held constant for all years of study. **New Method:** SCRs are modeled as energy-limited resources. The energy limited units are constrained to be called once in a day when a loss of load event occurs, and are invoked for a duration of 7 hours. The contribution by the SCRs are energy limited monthly for each year by zone, which is derived from historical behavior of these units. Additional details in the January 3, 2024 ICS/ICAP presentation [link].
3	EDRP Resources	Not modeled if the values are less than 2 MW.	Not modeled if the values are less than 2 MW.
4	Operating Reserves	655 MW 30-min reserve to zero **960** MW (of 1310 MW) 10-min reserve to zero Note: the 10-min reserve modeling method is updated per NYISO's recommendation (approved at the May 4, 2022 NYSRC ICS [link]) to maintain (or no longer deplete/use) 350 MW of the 1,310 MW 10-min operating reserve at	655 MW 30-min reserve to zero **910** MW (of 1310 MW) 10-min reserve to zero Note: the 10-min reserve modeling method is updated per NYISO's recommendation (approved at the Oct. 3, 2023 NYSRC ICS [link]) to maintain (or no longer deplete/use) 400 MW of the 1,310 MW 10-min operating reserve at

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		the applicable EOP step. Therefore, the 10-min operating reserve MARS EOP step will use, as needed each MARS replication: 960 MW (=1,310 MW–350 MW)	the applicable EOP step. Therefore, the 10-min operating reserve MARS EOP step will use, as needed each MARS replication: 910 MW (=1,310 MW–400 MW).
5	Other EOPs *(e.g., manual voltage reduction, voltage curtailments, public appeals, external assistance, as listed above)*	Based on TO information, measured data, and NYISO forecasts. Used 2022 elections, as available.	Based on TO information, measured data, and NYISO forecasts. Will use 2024 elections, as available.
External Control Areas Modeling Assumptions • External models (NE, HQ, Ontario, PJM) received via the NPCC CP-8 WG process. • The top three (changed to five starting 2024 RNA as an additional method to further limit reliance) summer and winter peak load days of an external Control Area is modeled as coincident with the NYCA top three peak load days. • Load and capacity fixed through the study years. • The renewable and energy limited shapes are removed. • EOPs are not represented for the external Control Area capacity models. • External Areas adjusted to be between 0.1 and 0.15 event-days/year LOLE by adjusting capacity pro-rata in all areas. • Implemented a statewide emergency assistance (from the neighboring systems) limit of 3500 MW. • LFU is applied to neighboring systems. • Same load historical years are used as NY.		
1	PJM	Simplified model: The 5 PJM MARS areas (bubbles) were consolidated into one starting 2020 RNA. As per RNA procedure.	Simplified model: The 5 PJM MARS areas (bubbles) were consolidated into one starting 2020 RNA. As per RNA procedure.
2	ISONE	Simplified model: The 8 ISO-NE MARS areas (bubbles) were consolidated into one starting 2020 RNA	Simplified model: The 8 ISO-NE MARS areas (bubbles) were consolidated into one starting 2020 RNA
3	HQ	As per RNA Procedure.	Per RNA Procedure.
4	IESO	As per RNA procedure.	Per RNA procedure.

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5	Reserve Sharing	All NPCC Control Areas indicate that they will share reserves **equally** among all members before sharing with PJM.	All NPCC Control Areas indicate that they will share reserves **equally** among all members before sharing with PJM.
6	NYCA Emergency Assistance Limit	Implemented a statewide limit of 3,500 MW, additional to the "pipe" limits.	Implemented a statewide limit of 3,500 MW, additional to the "pipe" limits.
Miscellaneous			
1	MARS Model Version	4.10.2035	4.14.2179