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Independent System Operator

2020 RNA Preliminary ("1st Pass") Reliability Needs

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Goals

- **This presentation summarizes the 2020 RNA preliminary, 1st pass, Base Case results**
  - No scenario results are complete at this time, other than Zonal Resource Adequacy Margin/compensatory MW
  - The scenarios will be finalized based on the preliminary ("1st pass") RNA Base Case
  - The 2020 RNA major assumptions were presented at ESPWG/TPAS meetings from February through June, 2020 and are documented in the assumptions matrix
- **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

- **In finalizing the Reliability Needs, changes that occurred since the 1st pass RNA assumptions will be considered, such as:**
  - Updated LTPs that may impact the Reliability Needs
    - If any pertinent LTP updates, then the Transmission Owners will present updates at either June 29, or July 6 ESPWG/TPAS meetings
    - The NYISO will present other updates at the same meetings
  - Changes in 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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2020 RNA Background

- **The RPP is part of the Comprehensive System Planning Process (CSPP) and is performed pursuant to the Attachment Y of the NYISO OATT; Section 31.1 and 31.2.**
  - Additional implementation details, including recently updated RNA Base Case inclusion rules, are captured in the RPP Manual #26
- **The 2020-2021 Reliability Planning Process (RPP) starts with the 2020 Reliability Needs Assessment (2020 RNA) followed by the Comprehensive Reliability Plan (CRP)**
  - 2020 RNA Study Period: year 4 (2024) through year 10 (2030)
- **Effective May 1, 2020, the Short Term Reliability Process (STRP) will address short term reliability needs through a quarterly Short Term Assessment of Reliability (STAR). The first quarterly STAR will commence on July 15, 2020.**
  - STAR Study Period: year 1 (2021) through year 5 (2025)

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2020 RNA Background, cont.

- Reliability evaluations consist of resource adequacy and transmission security evaluations of the New York Bulk Power Transmission Facilities (BPTFs) over the RNA Study Period
- The 2020 RNA is based on the information from the 2020 Gold Book, the 2020 FERC 715 filing (*i.e.,* power flow cases and auxiliary files), historical data, and market participant data

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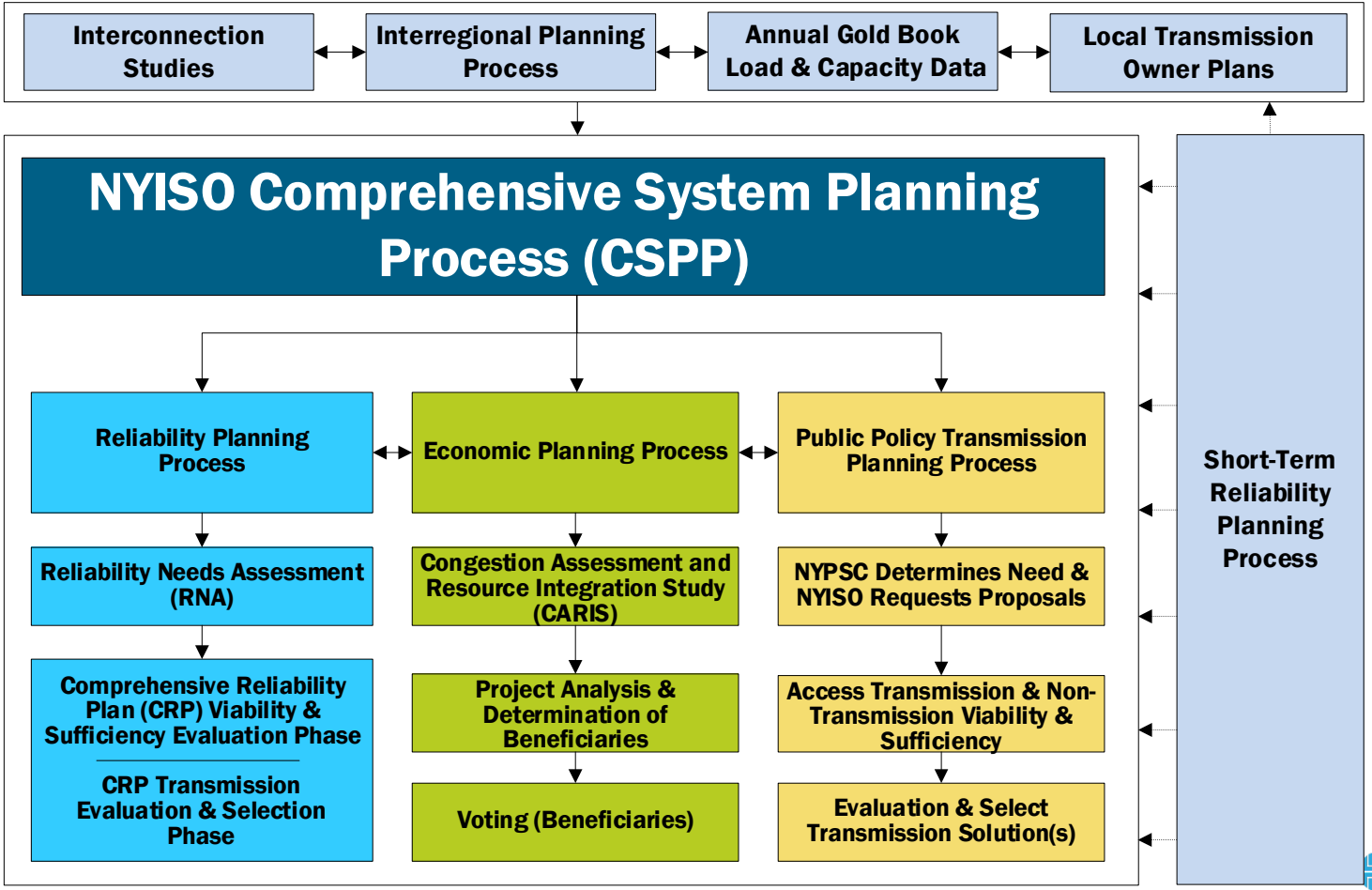

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2020 RNA: Base Case Development Background

- **Based on the RNA Base Case, the NYISO identifies Reliability Needs of the BPTFs in accordance with applicable Reliability Criteria (*i.e.*, NERC, NPCC, and NYSRC)**
- **2020 RNA Base Case:**
  - For the **transmission security** evaluations, the NYISO uses the 2020 FERC Form 715 filing and the information from the 2020 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 2020 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
- **An updated Reliability Planning Process Manual was approved on December, 2019, with certain changes related with the inclusion rules**
  - The inclusion rules are used to determine what proposed projects will be included in the RNA Base Case, and also how to treat generator deactivations

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2020 RNA
Major Assumptions

2020 RNA: Summer Peak Load Forecast Assumptions

High Load Scenario, Baseline and Adjusted Summer Peak Forecast

Annual MW	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
2020 High Load Scenario[1]	32,452	32,502	32,743	32,611	32,623	32,641	32,863	33,163	33,562	33,976	34,380
+ 2020 Solar PV (Impact on High Load)	539	658	779	904	1,006	1,101	1,176	1,229	1,260	1,271	1,268
2020 RNA High Load Scenario Case[3]	32,991	33,160	33,522	33,515	33,629	33,742	34,039	34,392	34,822	35,247	35,648
2020 Gold Book Baseline[2]	32,296	32,129	32,128	31,918	31,838	31,711	31,670	31,673	31,756	31,865	31,992
+ 2020 Solar PV (Impact on Baseline)	555	707	841	986	1,102	1,204	1,287	1,351	1,392	1,411	1,411
2020 RNA Base Case[3]	32,851	32,836	32,969	32,904	32,940	32,915	32,957	33,024	33,148	33,276	33,403

1. High Load forecast from 2020 Gold Book
2. The transmission security power flow RNA Base Cases use this Gold Book Baseline forecast
3. For the resource adequacy (RA) study RNA Base Case, the 2020 Gold Book Baseline and High Load forecast were modified by removing the behind-the-meter (BtM) solar PV impacts in order to model the solar PV explicitly as a generation resource to account for the intermittent nature of its availability

Note: The 2020 Gold Book contains additional details on the load forecast: https://www.nyiso.com/documents/20142/2226333/2020-Gold-Book-Final-Public.pdf

Comparison of Base Case Peak Forecasts - 2018 & 2020 RNA (MW)

Annual MW	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
2018 RNA Base Case[1]	33,344	33,423	33,318	33,225	33,182	33,173	33,204	33,262	33,332	33,420	33,507	NA	NA
2020 RNA Base Case[1]			32,851	32,836	32,969	32,904	32,940	32,915	32,957	33,024	33,148	33,276	33,403
Change from 2020 RNA	NA	NA	-467	-389	-213	-269	-264	-347	-375	-396	-359	NA	NA

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

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2020 Gold Book Load Forecast Components

Year	(a) End-Use Peak Demand	(b) (-) EE and C&S	(c) (-) Solar PV, BTM	(d) (-) Non-Solar DG, BTM	(e) (-) BTM Storage Peak Reductions	(f) (+) EV Peak Demand	(g) (+) Non-EV Electrification	(h) =a-b-c-d-e+f+g Baseline Summer Peak Forecast
2021	33,599	591	707	251	14	68	25	32,129
2022	33,978	943	841	189	26	103	46	32,128
2023	34,220	1,322	986	169	44	147	72	31,918
2024	34,555	1,709	1,102	148	63	201	104	31,838
2025	34,861	2,108	1,204	154	91	261	146	31,711
2026	35,208	2,488	1,287	158	125	333	187	31,670
2027	35,524	2,825	1,351	164	159	418	230	31,673
2028	35,848	3,116	1,392	170	206	513	279	31,756
2029	36,108	3,360	1,411	174	250	625	327	31,865
2030	36,324	3,579	1,411	177	292	748	379	31,992

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2020 RNA: Inclusion Rules Application

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

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Proposed Projects (Additions) Included in the 2020 RNA Base Case

also included in the 2018-2019 RPP Base Cases

Project Types	Queue #	Project Name	SP MW	Interconnection Status	2020RNA COD
Large Gens	387	Cassadaga Wind	126.5	CY17	12/2021
	396	Baron Winds	238.4	CY17	12/2021
	422	Eight Point Wind Energy Center	101.8	CY17	12/2021
	505	Ball Hill Wind	100.0	CY17	12/2022
	546	Roaring Brook Wind	79.7	CY19	12/2021
	678	Calverton Solar Energy Center	22.9	CY19	12/2021
Regulated Transmission Solutions	Q545A	Empire State Line	n/a	completed TIP Facility Study (Western NY PPTPP)	6/2022
	556	Segment A Double Circuit		TIP Facility Study in progress (AC PPTPP)	12/2023
	543	Segment B Knickerbocker-Pleasant Valley 345 kV		TIP Facility Study in progress (AC PPTPP)	12/2023
	430	Cedar Rapids Transmission Upgrade		CY17	10/2021
System Deliverability		Leeds-Hurley SDU	n/a	SDU triggered for construction in CY11	summer 2021

Acronyms:
CYxx: (Interconnection) Class Year (Facilities Studies) + last 2 digits of the year
TIP: Transmission Interconnection Process
AC PPTPP: Alternating Current Public Policy Transmission Planning Process
COD: Commercial Operation Date

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Generation Additions by Year

Summer of Year	New Unit Additions	Zone	MW (Summer)	Total Additions
Y2021	-	-	0	0
Y2022	Cassadaga Wind	A	126	126
Y2022	Baron Winds	C	238	364
Y2022	Eight Point Wind Enery Center	B	101	466
Y2022	Roaring Brook Wind	E	80	545
Y2022	Calverton Solar Energy Center	K	23	568
Y2023	Ball Hill Wind	A	100	668
Y2024	-	-	0	668
Y2025	-	-	0	668
Y2026	-	-	0	668
Y2027	-	-	0	668
Y2028	-	-	0	668
Y2029	-	-	0	668
Y2030	-	-	0	668

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Generation Deactivations

Notes:
*Consistent with deactivation dates

Other notes in this table are from the 2020 Gold Book, posted here

change in status

2020 GB Table	Owner/ Operator	Plant Name	Zone	CRIS	2020 RNA Base Case Status*	2018 RPP Base Case Status
Table IV-3: Deactivated Units with Unexpired CRIS Rights Not Listed in Existing Capacity Table III-2	International Paper Company	Ticonderoga [4]	F	7.6	out	out
	Helix Ravenswood, LLC	Ravenswood 09	J	21.7	out	out
	Binghamton BOP, LLC	Binghamton	C	43.8	out	out
	Helix Ravenswood, LLC	Ravenswood 2-1	J	40.4	out	out
		Ravenswood 2-2	J	37.6		
		Ravenswood 2-3	J	39.2		
		Ravenswood 2-4	J	39.8		
		Ravenswood 3-1	J	40.5		
		Ravenswood 3-2	J	38.1		
		Ravenswood 3-4	J	35.8		
	Cayuga Operating Company, LLC	Cayuga 2 [5]	C	154.7	out	out
	Lyonsdale Biomass, LLC	Lyonsdale	E	20.2	out	in
Table IV-4: Deactivated Units Listed in Existing Capacity Table III-2	Exelon Generation Company LLC	Monroe Livingston	B	2.4	out	in
	Innovative Energy Systems, Inc.	Steuben County LF	C	3.2	out	in
	Consolidated Edison Co. of NY, Inc	Hudson Ave 4	J	13.9	out	in
	New York State Elec. & Gas Corp.	Auburn - State St	C	5.8	out	in
	Cayuga Operating Company, LLC	Cayuga 1 [3]	C	154.1	out	in
	Consolidated Edison Co. of NY, Inc	Hudson Ave 3	J	16.0	out	in
Table IV-5: Notices of Proposed Deactivations as of March 15, 2020	Albany Energy, LLC	Albany LFGE	F	4.5	out	in
	Somerset Operating Company, LLC	Somerset	A	686.5	out	in
	National Grid	West Babylon 4	K	49.0	out	in
	Entergy Nuclear Power Marketing, LLC	Indian Point 2	H	1,026.5	out	in
		Indian Point 3		1,040.4		

Peaker Rule Status Change

Notes:
*Consistent with status change dates

** Certain peakers will be out of service in the ozone season only (details in following slides)

Other notes in this table are from the 2020GB, posted here

change in status

2020 GB Table	Owner/ Operator	Plant Name	Zone	CRIS	2020 RNA Base Case Status*	2018 RPP Base Case Status
Table IV-6: Proposed Staus Change to Comply with DEC Peaker Rule**	Central Hudson Gas & Elec. Corp.	Coxsackie GT	G	19.9	out	in
		South Cairo	G	19.8		
	Consolidated Edison Co. of NY, Inc.	74 St. GT 1 & 2	J	39.1	out	in
		Hudson Ave 5		15.1		
		59 St. GT 1		15.4		
	Helix Ravenswood, LLC	Ravenswood 01	J	8.8	out	in
		Ravenswood 10		21.2		
		Ravenswood 11		20.2		
	National Grid	Glenwood GT 1	K	14.6	out	in
		Northport GT		13.8		
		Port Jefferson GT 01		14.1		
	NRG Power Marketing, LLC	Astoria GT 2-1, 2-2, 2-3, 2-4	J	165.8	out	in
		Astoria GT 3-1, 3-2, 3-3, 3-4		170.7		
		Astoria GT 4-1, 4-2, 4-3, 4-4		167.9		
		Arthur Kill GT1		16.5		
	Astoria Generating Company, L.P.	Gowanus 1-1 through 1-8	J	138.7	out	in
		Gowanus 4-1 through 4-8		140.1		
		Astoria GT 01		15.7		
		Gowanus 2-1 through 2-8		152.8		
		Gowanus 3-1 through 3-8		146.8		
		Narrows 1-1 through 2-8		309.1		

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Deactivations and Peaker Rule Status Change by Year

Summer of Year	Retired Unit	Zone	MW (Summer)	Total Removal
Y2021	Somerset	A	676	676
Y2021	Albany LFG	F	5	681
Y2021	Indian Point 2	H	1,012	1,692
Y2021	West Babylon	K	49	1,741
Y2021	Indian Point 3	H	1,036	2,778
Y2022	-	-	0	2,778
Y2023	Zone A	A	0	2,778
	Zone G	G	38	2,816
	Zone J	**J**	**773**	3,589
	Zone K	K	36	3,625
Y2024	-	-	0	3,625
Y2025	Zone A	A	0	3,625
	Zone G	G	0	3,625
	Zone J	**J**	**605**	4,230
	Zone K	K	0	4,230
Y2026	-	-		4,230
Y2027	-	-		4,230
Y2028	-	-		4,230
Y2029	-	-		4,230
Y2030	-	-		4,230

Notes:

- 'MW Summer' is min(CRIS, DMNC) for individual units
- Plants impacted by the DEC Peaker Rule not specifically listed by name have not entered into the deactivation process identified in OATT Attachment FF at the time of this presentation
- Additional Peaker Rule details are in the following slides

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DEC Peaker Rule Impacts on the 2020 RNA Base Case

DEC Peaker Rule Background

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

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Status Change due to DEC Peaker Rule, Zone G

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

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

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Status Change due to DEC Peaker Rule, Zone J

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

Notes:

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

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Status Change due to DEC Peaker Rule, Zone K

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

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

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2020 RNA Load and Capacity Totals

2020 RNA Load and Capacity Summary

Year		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Peak Load (MW) - Gold Book 2020 NYCA Baseline											
	NYCA*	32,129	32,128	31,918	31,838	31,711	31,670	31,673	31,756	31,865	31,992
	Zone J*	11,460	11,559	11,523	11,557	11,552	11,609	11,667	11,747	11,836	11,924
	Zone K*	5,139	5,067	4,938	4,853	4,768	4,692	4,651	4,658	4,670	4,690
	Zone G-J*	15,660	15,757	15,705	15,733	15,715	15,772	15,831	15,916	16,015	16,116
Resources (MW)											
NYCA	Capacity**	37,334	37,902	37,155	37,155	36,551	36,551	36,551	36,551	36,551	36,551
	Net Purchases & Sales	1,812	1,816	1,794	1,954	1,954	1,954	1,954	1,954	1,954	1,954
	SCR	1,282	1,282	1,282	1,282	1,282	1,282	1,282	1,282	1,282	1,282
	Total Resources	40,429	41,001	40,231	40,391	39,787	39,787	39,787	39,787	39,787	39,787
	Cap+NetPurch+SCR/Load Ratio	125.8%	127.6%	126.0%	126.9%	125.5%	125.6%	125.6%	125.3%	124.9%	124.4%
Zone J	Capacity**	9,568	9,568	8,795	8,795	8,190	8,190	8,190	8,190	8,190	8,190
	Full UDR Rights	315	315	315	315	315	315	315	315	315	315
	SCR	479	479	479	479	479	479	479	479	479	479
	Total Resources	10,362	10,362	9,589	9,589	8,984	8,984	8,984	8,984	8,984	8,984
	Cap+fullUDR+SCR/Load Ratio	90.4%	89.6%	83.2%	83.0%	77.8%	77.4%	77.0%	76.5%	75.9%	75.3%
Zone K	Capacity**	5,226	5,249	5,213	5,213	5,213	5,213	5,213	5,213	5,213	5,213
	Full UDR Rights	990	990	990	990	990	990	990	990	990	990
	SCR	48	48	48	48	48	48	48	48	48	48
	Total Resources	6,264	6,287	6,251	6,251	6,251	6,251	6,251	6,251	6,251	6,251
	Cap+fullUDR+SCR/Load Ratio	121.9%	124.1%	126.6%	128.8%	131.1%	133.2%	134.4%	134.2%	133.8%	133.3%
Zone G-J	Capacity**	14,320	14,320	13,509	13,509	12,904	12,904	12,904	12,904	12,904	12,904
	Full UDR Rights	315	315	315	315	315	315	315	315	315	315
	SCR	605	605	605	605	605	605	605	605	605	605
	Total Resources	15,240	15,240	14,429	14,429	13,824	13,824	13,824	13,824	13,824	13,824
	Cap+fullUDR+SCR/Load Ratio	97.3%	96.7%	91.9%	91.7%	88.0%	87.7%	87.3%	86.9%	86.3%	85.8%

Notes:

***NYCA** load values represent baseline coincident summer peak demand (which includes reductions due to energy efficiency programs, building codes, BtM solar, and non-solar distributed energy generation). **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 retirements (including proposed retirements and mothballs). Capacity values reflect the **lesser of CRIS and DMNC values. NYCA resources include the net purchases and sales as per the Gold Book. Zonal totals reflect the full UDR rights for those capacity zones.

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ICAP vs. UCAP Comparison

Total Capacity vs Load Ratios (%) for 2030

Zone	ICAP	UCAP	Delta ICAP-UCAP
NYCA	124.4%	108.7%	15.7%
J	75.3%	68.5%	6.9%
K	133.3%	122.5%	10.8%
G-J	85.8%	77.2%	8.5%

Notes:

Total Capacity = Capacity* + full UDR + SCR

*Capacity = lesser of (CRIS, DMNC). NYCA resources include the net purchases and sales as per the Gold Book.

- **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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2020 RNA vs 2019 CRP: NYCA Load and Resources Comparison (Last Study Years)

NYCA

Study Year 10	2020 RNA (2020GB) Y2030	2019 CRP (2018GB) Y2028	Net Delta =TotalResDelta minus TotalLoadDelta
Baseline* Load	31,992	32,469	-477
Total Resources***	39,787	41,875	-2,089
Net Margin: Change in (netCapacity - netLoad)			**-1,612**

- Negative net margin shows deterioration in the relative capability to serve load, when comparing the two studies assumptions
- Compared to the 2019 CRP, the system has less overall net resources

Notes:
*includes the reductions due to projected energy efficiency programs, building codes and standards, distributed energy resources and behind-the-meter solar photovoltaic resources; it also reflects expected impacts (increases) from projected electric vehicle usage.

***includes the total Special Case Resources (SCR), and net capacity purchases and sales from the applicable Gold Book

New York ISO

2020 RNA vs 2019 CRP Peaker Scenario: Zone J Load and Resources Comparison (Last Study Years)

Zone J

Study Year 10	2020 RNA Y2030	2019 CRP Peaker Scenario Y2028	Net Delta =TotalResDelta minus TotalLoadDelta
Baseline* Load	11,924	11,429	495
Capacity****	8,190	8,139	51
Net Margin: Change in (netCapacity - netLoad)			-444

Notes:
*includes the reductions due to projected energy efficiency programs, building codes and standards, distribution energy resources and behind-the-meter solar photovoltaic resources; it also reflects expected impacts (increases) from projected electric vehicle usage.

****does not include the total Special Case Resources (SCR), and Unforced Deliverability Rights (UDR) from the Gold Book 2020.

- The 2019 CRP peaker scenario found that 660 compensatory MW was needed in Zone J;
- This 2020 RNA 1st pass results identified a minimum of 1,075 MW as needed in Zone J due to transmission security criteria violations:
- The difference is in part driven by the forecasted load growth in Zone J

Resource Adequacy
RNA 1st Pass Results

2020 RNA: LOLE Results

		Study Year	NYCA Baseline Summer Peak Load MW	Area J Peak Load MW	RNA Base Case NYCA LOLE days/year	Free Flow NYCA LOLE days/year
For Information Only*	y1	Y2021	32,129	11,300	0.02	0.02
	y2	Y2022	32,128	11,397	0.02	0.02
	y3	Y2023	31,918	11,362	0.04	0.03
2020 RNA Study Period (y4 and y5 common with STAR)	y4	Y2024	31,838	11,395	0.04	0.02
	y5	Y2025	31,711	11,390	0.08	0.03
	y6	Y2026	31,670	11,446	0.10	0.03
	y7	Y2027	31,673	11,504	0.12	0.03
	y8	Y2028	31,756	11,583	0.13	0.03
	y9	Y2029	31,865	11,670	0.17	0.04
	y10	Y2030	31,992	11,757	0.19	0.04

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

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

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NYCA and Zone J Summaries

	NYCA, MW				
Year	Additions	Reratings	Deactivations	Net capacity	Summer Coincident Baseline Load
Y2021	0	0	2,778	37,334	32,129
Y2022	568	0	2,778	37,902	32,128
Y2023	668	0	3,625	37,155	31,918
Y2024	668	0	3,625	37,155	31,838
Y2025	668	0	4,230	36,551	31,711
Y2026	668	0	4,230	36,551	31,670
Y2027	668	0	4,230	36,551	31,673
Y2028	668	0	4,230	36,551	31,756
Y2029	668	0	4,230	36,551	31,865
Y2030	668	0	4,230	36,551	31,992

	Zone J, MW				
Year	Additions	Reratings	Deactivations	Net capacity	Peak Load
Y2021	0	0	0	9,568	11,300
Y2022	0	0	0	9,568	11,397
Y2023	0	0	773	8,795	11,362
Y2024	0	0	773	8,795	11,395
Y2025	0	0	1,378	8,190	11,390
Y2026	0	0	1,378	8,190	11,446
Y2027	0	0	1,378	8,190	11,504
Y2028	0	0	1,378	8,190	11,583
Y2029	0	0	1,378	8,190	11,670
Y2030	0	0	1,378	8,190	11,757

- Removal of Zone J peakers, along with load increase in the outer years, drives the increase in LOLE

Net Capacity = capacity from GB+ addition + rerating -deactivations

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Compensatory MW Concept for Resource Adequacy

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

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Individual Zonal Compensatory MW

	Study Year	LOLE	ADJ_A	ADJ_B	ADJ_C	ADJ_D	ADJ_E	ADJ_F	ADJ_G	ADJ_H	ADJ_I	ADJ_J	ADJ_K
2020 RNA Study Period: y4 through y10	Y2024	0.038	-850	-850	-1500	-1500	-1500	-1500	-1500	-1250	-1250	-450	-1400
	Y2025	0.085	-400	-400	-400	-400	-400	-400	-400	-400	-400	-50	-550
	Y2026	0.097	-50	-50	-50	-50	-50	-50	-50	-50	-50	0	-150
	Y2027	0.118	700	700	700	700	700	700	700	700	700	100	∞
	Y2028	0.135	1700	1600	1650	2200	1650	1650	1650	1650	1650	150	∞
	Y2029	0.170	∞	∞	∞	∞	∞	∞	∞	∞	∞	300	∞
	Y2030	0.187	∞	∞	∞	∞	∞	∞	∞	∞	∞	350	∞

Notes:

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

(-) negative values are for those study years with NYCA LOLE still below the criterion, and the values represent the MW that can be removed from each zone before NYCA LOLE reaches 0.1 days/year

∞ - Either a large, or no amount of capacity added in the zone can bring NYCA LOLE below 0.1

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2020 RNA: Free Flow and Variations

Case	2030 NYCA LOLE	Notes
Base Case	0.187	I to J (Dunwoodie South) at 4350 MW G to H (UPNY-ConEd) at 7375 MW
Removing dynamic limit from J_to_J3	0.140	Increasing limit J to J3 from 200 MW to 815 MW for most loss of load events. However, only 420 MW can flow on the interface because the ABC interface limitations
I_to_J +450 MW	0.097	To bring LOLE just below 0.1 days/year
I_to_J unlimited	0.053	5660 MW max flow on I to J observed in this MARS simulation
G_to_H & I_to_J unlimited	0.049	
Free Flow	0.042	All NYCA internal limits removed

- **Free flow simulation: eliminating all NYCA internal limits** brings the NYCA LOLE to well below 0.1 d/y
- **Removing only the I to J (Dunwoodie South) limit brings the system to well below the LOLE criterion**
  - The maximum flow on I to J observed in this MARS was around 5,650 MW (the limit in the Base Case is 4,350 MW)
  - An increase of 450 MW to the transfer limit on I to J brings the NYCA LOLE just below its criterion
  - G to H (UPNY-ConEd) reaches its transfer limit some of the time; this is also reflected in the 0.01 decrease in LOLE when G to H is unlimited; this observation is additional to I to J.
- **Removing the dynamic limit on J to J3 (Staten Island interface)**
  - LOLE is 0.04 lower than the Base Case; however, still above the 0.1 d/y criterion

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Resource Adequacy Observations

- The LOLE violations are driven by the 1,400 MW generation removal from Zone J (Con Edison)
- The needs could potentially be met by combinations of solutions including generation, transmission, and load reduction (energy efficiency, demand management, *etc.*) measures

- Zone J is the only zone where adding MW can remove the deficiency:
  - A compensatory MW of 100 MW added in Zone J in 2027 and 350 MW in 2030 would bring the NYCA LOLE just below 0.1 days/year
- Increasing the limit on the I to J (*i.e.*, Dunwoodie-South) interface by a minimum of 450 MW (from the current 4,350 MW limit) would also bring the NYCA LOLE at or below 0.1 days/year criterion
- When removing the dynamic limit on J to J3 (Staten Island interface), LOLE is 0.04 d/y lower than the Base Case; however, still above the 0.1 d/y criterion
- Depending on the types of the solution(s) to address the transmission security needs, such solutions could fully or partially address the resource adequacy need

Transmission Security RNA 1st Pass Results: NYISO

2020 RNA: NYISO's Transmission Security BPTF Steady State Results Summary

- No steady state voltage Reliability Criteria violations identified on the BPTF
- No thermal Reliability Criteria violations for N-0, N-1 or N-1-0 conditions on the BPTF
- Thermal Reliability Criteria violations are identified starting in Year 5 (2025) on the BPTF for N-1-1 and N-1-1-0 conditions
  - The worst overload for each monitored element is presented in the following slides
- Dynamics Reliability Criteria violations identified in Year 4 (2024) on the BPTF for N-1 and N-1-1 conditions that are exacerbated as the system changes through Year 10 (2030)
- No short-circuit Reliability Criteria violations identified on the BPTF

New York ISO

2020 RNA: Transmission Security BPTF Steady State Results (N-1-1)

Zone	Owner	Monitored Element	Normal Rating (MVA)	Cont Rating (MVA)	Worst 1st Contingency	Worst 2nd Contingency	2025 Flow (%)	2030 Flow (%)
J	ConEd	Sprainbrook-W49th St 345 kV (51)	844	1029	Sprainbrook-Dunwoodie 345 kV (W75)	Tower F38 & F39	-	112
J	ConEd	Sprainbrook-W49th St 345 kV (52)	844	1029	Sprainbrook-Dunwoodie 345 kV (W75)	Tower F38 & F39	-	112
J	ConEd	Dunwoodie-Mott Haven 345 kV (71)	785	925	Dunwoodie-Mott Haven 345 kV (72)	Loss of Ravenswood 3	109	118
J	ConEd	Dunwoodie-Mott Haven 345 kV (72)	785	925	Dunwoodie-Mott Haven 345 kV (71)	Loss of Ravenswood 3	108	117
J	ConEd	Mott Haven-Rainey West 345 kV (Q12)	785	925	Mott Haven-Rainey 345 kV (Q11)	Loss of Ravenswood 3	-	108
J	ConEd	Mott Haven-Rainey East 345 kV (Q11)	785	925	Mott Haven-Rainey 345 kV (Q12)	Loss of Ravenswood 3	-	108
J	ConEd	Goethals-Gowanus 345 kV (26)	518	738	Loss of Ravenswood 3	Goethals Stuck Breaker (5)	114	130
J	ConEd	Goethals-Gowanus 345kV (25)	518	738	Loss of Ravenswood 3	Gowanus - Goethals 345 kV (26)	114	130
J	ConEd	Sprainbrook/Dunwoodie 345/138 kV (N7)	366	423	Loss of Ravenswood 3	Tower W89 & W90	105	109
J	ConEd	Sprainbrook/Dunwoodie 345/138 kV (S6)	309	438	Loss of Ravenswood 3	Tower W89 & W90	106	107
J	ConEd	Dunwoodie 345/138 kV (W73)	310	388	Loss of Ravenswood 3	Sprainbrook/Dunwoodie 345/138 kV (N7)	-	106

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2020 RNA: Transmission Security Steady State BPTF Results (N-1-1-0)

- N-1-1-0 Reliability Needs were identified starting in Year 5 (2025) and increase through Year 10 (2030)

Zone	Owner	Monitored Element	Normal Rating (MVA)	Cont Rating (MVA)	Worst 1st Contingency	Worst 2nd Contingency	2025 Flow (%)	2030 Flow (%)
J	ConEd	Dunwoodie-Mott Haven 345 kV (71)	785	925	Loss of Ravenswood 3	Dunwoodie-Mott Haven 345 kV (72)	135	149
J	ConEd	Sprainbrook-W49th St 345 kV (51)	844	1029	Loss of Ravenswood 3	Dunwoodie-Mott Haven 345 kV (72)	-	106
J	ConEd	Sprainbrook-W49th St 345 kV (52)	844	1029	Loss of Ravenswood 3	Dunwoodie-Mott Haven 345 kV (72)	-	106

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2020 RNA: NYISO's Transmission Security BPTF Stability Results Summary

- Starting in 2024 (y4), transient voltage recovery violations are observed on the BPTF as well as generator instability issues for several faults in the Con Edison area under N-1 and N-1-1 conditions

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Compensatory MW Concept for Transmission Security

- Transmission security related compensatory megawatt amounts are determined by adding generic resources to locations of need (or combination of locations) to define deficiencies
- The compensatory MW additions are not intended to represent specific solutions, as the impact of specific solutions can depend on the type of the solution and its location on the grid
- Resource needs could potentially be met by combinations of solutions including generation, transmission, energy efficiency, and demand response measures

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Transmission Security
RNA 1st Pass Results: ConEdison

see posted presentation

Transmission Security RNA 1st Pass Results: Central Hudson

see posted presentation

2020 RNA 1st Pass Conclusions

2020 RNA 1st Pass: BPTF Conclusions

- **Unavailability of Zone J peakers in summer:**
  - 779 MW in 2023, 2024; 1,385 MW in 2025 and beyond
- **Resource deficiency (LOLE > 0.1) beginning in 2026**
  - 350 MW deficiency in Zone J by 2030
- **Zone J 345 kV transmission overloads starting in 2025**
  - Sprainbrook/Dunwoodie South to Rainey; Staten Island
  - 1,075 MW deficiency in Zone J BPTF by 2030
- **Dynamic instability (transient voltage recovery and generator rotor instability) beginning in 2024 that is exacerbated as the system changes through 2030**
- **The needs can potentially be met by combinations of solutions including generation, transmission, and load reduction (energy efficiency, demand response, etc.) measures**

New York ISO

2020 RNA 1st Pass: non-BPTF Conclusions

For the non-BPTF (included for information only)

- **Central Hudson***
  - Various voltage constraint and reserve capability for local transformer outage concerns without the Coxsackie and South Cairo generators
- **Con Edison***
  - Deficiencies in the Astoria East/Corona 138 kV Transmission Load Area (TLA) starting in 2023 (year 3)
    - Deficiencies range from 110 MW in 2023 (year 3) to 180 MW in 2030 (year 10).
    - Duration of the deficiency ranges from 10 hours in 2023 (year 3) to 13 hours in 2030 (year 10)
  - Deficiencies in the Greenwood/Fox Hills 138 kV TLA starting in 2025 (year 5)
    - Deficiencies range from 360 MW in 2025 (year 5) to 370 MW in 2030 (year 10)
    - Duration of the deficiency is 14 hours
  - Astoria East/Corona 138 kV TLA and Greenwood/Fox Hills 138 kV TLA have transient voltage recovery violations for various faults within and without the TLA

***Additional details under the June 19, 2020 ESPWG/TPAS meeting materials**

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Next Steps

RNA Milestones

- June 19 ESPWG/TPAS: present preliminary ("1st pass") RNA results
- July 6 ESPWG/TPAS: Transmission Owners and NYISO's presentations of projects status updates, relevant to mitigating the identified 1st pass Reliability Needs, if any
- July 6, 2020: lock down assumptions for final RNA
- July 23 ESPWG/TPAS: RNA scenarios preliminary results, as available
- August-September ESPWG/TPAS: review final results and draft RNA
- October OC & MC: Market Monitoring Unit review and OC and MC votes
- November: NYISO's Board of Directors approval and publishing of final RNA Report

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Post-RNA Updates

- **Dec. 1, Dec. 11 ESPWG/TPAS, as needed:**
  - Stakeholders' presentations of 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 2020**
  - The NYISO re-evaluates the status updates and, if necessary, presents updated Reliability Needs
- **January 2021**
  - NYISO issues solicitation of solutions to remaining Reliability Needs; responses due within 60 days.

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Short-Term Reliability Timeline

Short-Term Reliability Process

- **Short-Term Assessment of Reliability (STAR)**
  - First quarterly assessment commences July 15, 2020
  - First STAR Report will be issued by October 13, 2020
  - Assessment will look at years 1 – 5 (2021-2025), but focus on years 1 – 3 (2021-2023)
- **RNA will assess years 4 – 10 (2024-2030)**

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Questions?

Appendix:
Resource Adequacy Event Analysis Details

NYCA Peak Load by Month and Load Level

NYCA Peak Load by Month and Load Level												
Load Level	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	29,553	30,174	28,079	22,831	30,780	32,199	40,462	37,971	27,113	24,640	26,043	28,532
2	26,742	25,876	25,281	30,493	25,137	34,288	37,093	38,037	31,518	26,964	24,141	27,401
3	26,450	27,881	27,192	20,863	27,707	34,439	34,994	35,318	31,486	26,638	23,249	26,363
4	25,509	26,889	26,224	20,121	26,197	32,563	33,087	33,393	29,772	25,186	22,422	25,425
5	24,664	25,999	25,356	19,455	24,536	30,507	30,995	31,272	27,897	23,588	21,680	24,583
6	23,917	25,211	24,588	18,865	22,804	28,370	28,817	29,059	25,950	21,921	21,023	23,838
7	23,269	24,528	23,922	18,354	21,207	26,394	26,805	27,022	24,151	20,389	20,453	23,193

- **Seven load forecast uncertainty (LFU) load levels are modeled in MARS.**
  - Additional LFU information is here.
- **For reference, 2030: 31,992 MW Baseline Load + 1,411 MW BtMPV = 33,403 MW**

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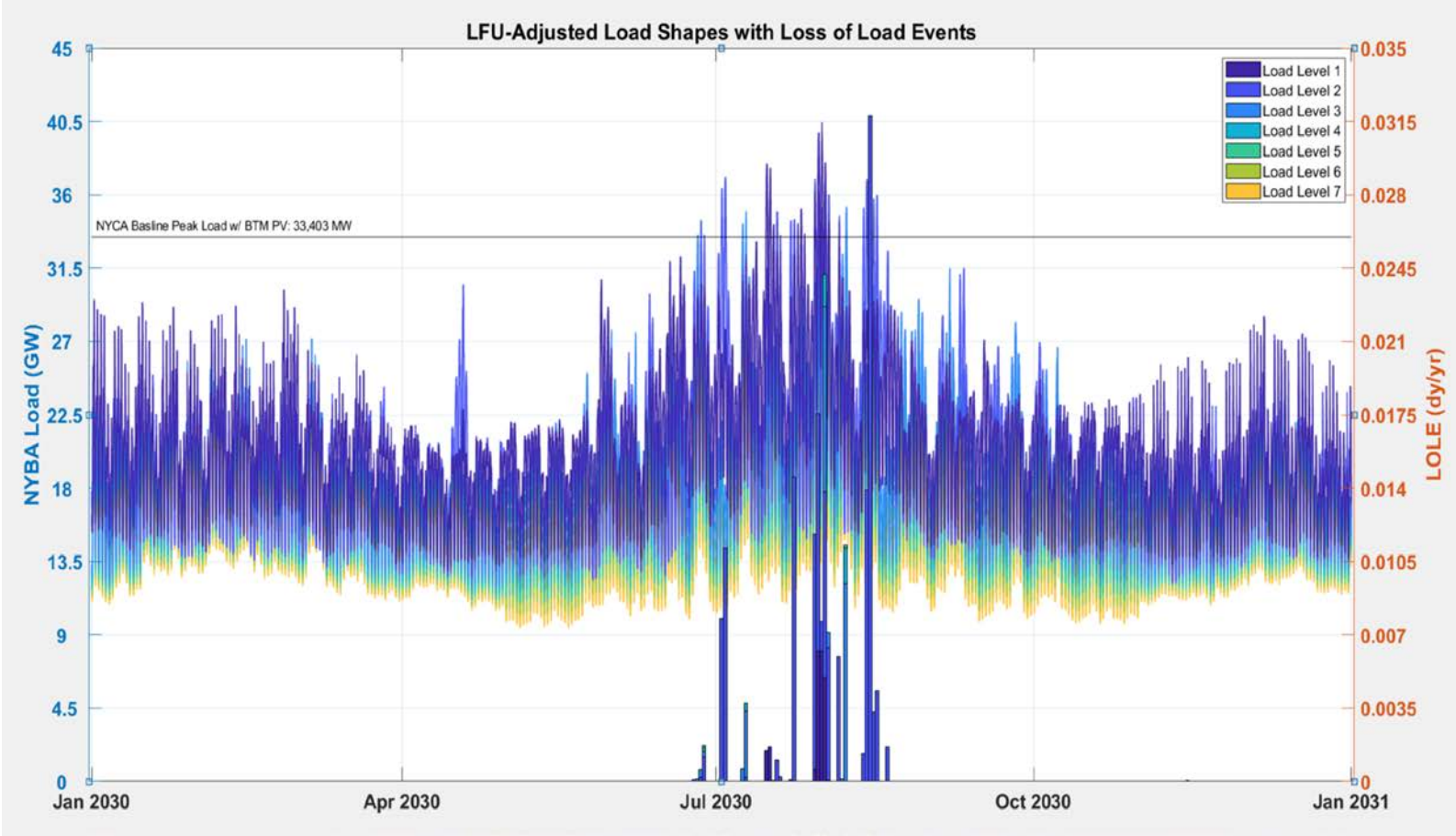
LFU-Adjusted Load Shapes with Loss of Load Events

Base Case LFU Adjusted Load Shapes for Y2030



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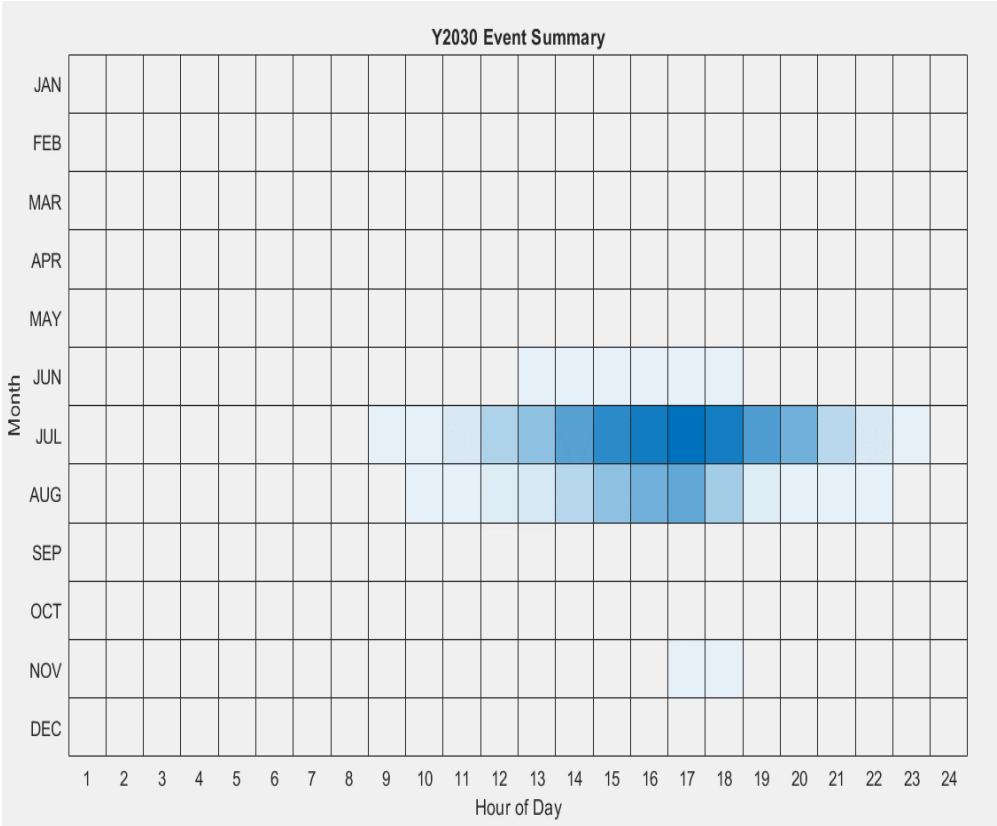
LOLE Event Analysis

LOLE by Month and Hour of the Day, Y2030



LOLE by Month and MARS Load Levels, Y2030

LOLE (dy/yr)

	1	2	3	4	5	6	7	Total
Jan								
Feb								
Mar								
Apr								
May								
Jun	0.0000	0.0015	0.0007	0.0002	0.0001			0.0025
Jul	0.0162	0.0591	0.0037	0.0004				0.0794
Aug	0.0050	0.0774	0.0191	0.0033	0.0001			0.1049
Sep								
Oct								
Nov	0.0001							0.0001
Dec								
Annual	0.0212	0.1380	0.0236	0.0038	0.0002			0.1869

Load Level

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

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

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