NYCA IRM Requirement Study

2021-2022 Preliminary Base Case (PBC)

Model Assumptions Matrix

June 23, 2020

Load Forecast Uncertainty

#	Parameter	2020 Model Assumptions	2021 Model Assumptions	Basis for Recommendation	Model Change	Est. IRM Impact*
1	Peak Load Forecast (Preliminary Base Case – Parametric & Sensitivities)	2019 Gold Book NYCA: 32,202MW[1] NYC: 11,651 MW LI: 5,134 MW G-J: 15,911 MW	2020 Gold Book NYCA: 32,129MW[1] NYC: 11,460 MW LI: 5,139 MW G-J: ~~15758 MW~~ 15,660 MW	Most recent Gold Book Forecast is used for Preliminary Base Case parametric study and sensitivity cases		Low (+/-)
2	Peak Load Forecast (Final Base Case)	October 2019 Fcst. NYCA: 32,393 MW[2] NYC: 11,503 MW LI: 5,384MW G-J: 15,795 MW	October 2020 Fcst. NYCA: xxxxx MW[2] NYC: yyyyy MW LI: zzzzz MW G-J: wwwww MW	Forecast based on examination of 2020 weather normalized peaks		TBD
3	Load Shape (Multiple Load Shape)	Bin 1: 2006 Bin 2: 2002 Bins 3-7: 2007	Bin 1: 2006 Bin 2: 2002 Bins 3-7: 2007	ICS Recommendation		None
4	Load Forecast Uncertainty (LFU)-	Zonal Model to reflect current data with input from Con Ed and LIPA. (Attachment A)	Zonal Model to reflect current data with input from Con Ed and LIPA. (Attachment A1)	Based on TO and NYISO data analyses		Medium (+)
5	LFU Winter	Attachment A1	Attachment A2	Based on TO and NYISO data analyses		None

*(-) indicates a reduction in IRM while (+) indicates an increase. Range: Low < 0.5%, Medium 0.5% - 1%, High > 1%, Minimal indicates there may be some movement but within 0 to +/- 0.1%.

New Capacity resources will continue to be tracked by the NYISO. The Final Base Case resource list is subject to change based on project status' by October 2020.

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[1] The loads associated with the BTM-NG program need to be added to these values.

[2] BTM-NG loads have been incorporated into these numbers.

Generation Parameters

#	Parameter	2020 Model Assumptions	2021 Model Assumptions	Basis for Recommendation	Model Change	Est. IRM Impact*
6	Existing Generating Unit Capacities	2019 Gold Book values. Use min. (DMNC vs. CRIS) capacity value	2020 Gold Book Values. Use min. (DMNC vs. CRIS) capacity value	Latest Gold Book publication		Low
7	Proposed New Units (Thermal) and re-ratings	MW 1,020 MW of new Thermal resources, plus 0 MW of project related re-ratings. (Attachment B1)	MW 0 MW of new Thermal resources, plus 56.6 MW of project related re-ratings. (Attachment B1)	Latest Gold Book publication, NYISO interconnection queue and generation notifications		TBD
8	Deactivations	1,205.9 MW of unit deactivations (Attachment B2)	1,104 MW of unit deactivations (Attachment B2)	Latest Gold Book publications and generator notifications		TBD
9	Forced and Partial Outage Rates	Five-years (2014-2018) GADS data for each unit represented. Those units with less than five years – use representative data. (Attachment C)	Five-year (2015-2019) GADS data for each unit represented. Those units with less than five years – use representative data. (Attachment C)	Transition Rates representing the Equivalent Forced Outage Rates (EFORd) during demand periods over the most recent five-year period		TBD
10	Planned Outages	Based on schedules received by the NYISO and adjusted for history	Based on schedules received by the NYISO and adjusted for history	Updated schedules		TBD

#	Parameter	2020 Model Assumptions	2021 Model Assumptions	Basis for Recommendation	Model Change	Est. IRM Impact*
11	Summer Maintenance	Nominal 50^4 MWs – divided equally between Zones J and K	Nominal xx MWs – divided equally between Zones J and K	Review of most recent data		TBD
12	Combustion Turbine Derates	Derate based on temperature correction curves provided	Derate based on temperature correction curves provided	Operational history indicates the derates are in-line with manufacturer's		None
13	Existing and Proposed New Wind Units*	0 MW of Wind Capacity additions totaling 1,891.7 MW of qualifying wind (Attachment B3)	126.0 MW of Wind Capacity additions totaling 1865.2 MW of qualifying wind (Attachment B3)	ICAP units based on RPS agreements, interconnection queue and ICS input.		TBD
14	Wind Shape	Actual hourly plant output over the period 2014-2018. New units will use zonal hourly averages or nearby units.	Actual hourly plant output over the period 2015-2019. New units will use zonal hourly averages or nearby units.	Program randomly selects a wind shape of hourly production from the most recent five- year period for each model iteration.		TBD
15	Existing and Proposed New Solar Resources*	Total of 51.5 MW of qualifying Solar Capacity. (Attachment B3)	0 MWof Solar Capacity additions totaling 31.5MW of qualifying Solar Capacity. (Attachment B3)	ICAP Resources connected to Bulk Electric System		TBD
16	Solar Shape	Actual hourly plant output over the period 2014-2018. New units will use zonal hourly averages or nearby units	Actual hourly plant output over the period 2015-2019. New units will use zonal hourly averages or nearby units.	Program randomly selects a solar shape of hourly production from the most recent five-year period for each model iteration.		TBD

*Units that did not participate in the Capacity Market have been removed from this year's study

#	Parameter	2020 Model Assumptions	2021 Model Assumptions	Basis for Recommendation	Model Change	Est. IRM Impact*
17	BTM- NG Program	No new BTM NG resources (Attachment B4)	One new BTM NG resource (Attachment B5)	Both the generation of the participating resources and the full host loads are modeled.		TBD
18	Small Hydro Resources	Actual hourly plant output over the period 2014-2018.	Actual hourly plant output over the period 2015-2019.	Program randomly selects a hydro shape of hourly production from the most recent five-year period for each model iteration.		TBD
19	Large Hydro	Probabilistic Model based on five years of GADS data (2014-2018)	Probabilistic Model based on five years of GADS data (2015-2019)	Transition Rates representing the Equivalent Forced Outage Rates (EFORd) during demand periods over the most recent five-year period.		TBD
20	Landfill Gas	Actual hourly plant output over the period 2014-2018.	Actual hourly plant output over the period 2015-2019.	Program randomly selects a LFG shape of hourly production from the most recent five-year period for each model iteration.		TBD
21	New ESR (Energy Storage Resources)*	0 MW of new battery storage resource scheduled (see attachment B3)	0 MW of new battery storage scheduled. 0MW of total battery storage modeled (see attachment B4)	Sensitivities on simplified model and GE software enhancement		Minimal

*Units that did not participate in the Capacity Market have been removed from this year's study

Transactions – Imports and Exports

#	Parameter	2020 Model Assumptions	2021 Model Assumptions	Basis for Recommendation	Model Change	Est. IRM Impact*
22	Capacity Purchases	Existing Rights: PJM – 1,080 MW HQ – 1,110 MW All contracts modeled as equivalent contracts	Existing Rights: PJM – 1,080 MW HQ – 1,110 MW All contracts modeled as equivalent	Grandfathered Rights, ETCNL, and other awarded long-term rights.		None
23	Capacity Sales	Long Term firm sales Summer 281.1 MW	Long Term firm sales Summer 265.9 MW	These are long term FERC-approved contracts.		Minimal
24	FCM Sales from a Locality[5]	No sales modeled within study period	No sales modeled within study period	White paper, NYISO recommendation		None
25	Wheels through NYCA	300 MW HQ to NE equivalent contract	300 MW HQ to NE equivalent contract			None
26	New UDRs (Unforced capacity Deliverability Rights)	No new UDR projects	Projects with expired CRIS will be modeled as Emergency Assistance Only: HTP	Existing UDR elections are made by August 1st and will be incorporated into the model.		None
27	New EDRs (External Deliverability Rights)	0 MWs for 2020 Study	0 MWs for 2021 Study			TBD

[5] Final FCM sales that will materialize are unknowable at the time of the IRM study. To reflect the impact these sales have on reliability, the NYISO applies a Locality Exchange Factor in the market.

Topology

#	Parameter	2020 Model Assumptions	2021 Model Assumptions	Basis for Recommendation	Model Change	Est. IRM Impact*
28	Interface Limits	Updated UPNY-SENY interface group, Jamaica ties (from J to K), and UPNY-ConEd interface. The Cedars bubble merged into the HQ bubble (Attachment E)	Removal of PJM-SENY Group Interface, PSEG-LI updates to increase Zone K Imports/Exports (Attachment E-E4)	Based on the most recent NYISO studies and processes, such as Operating Study, Operations Engineering Voltage Studies, Comprehensive System Planning Process, and additional analysis including interregional planning initiatives.		TBD
29	New Transmission	None Identified	None Identified	Based on TO provided models and NYISO's review		None
30	AC Cable Forced Outage Rates	All existing Cable EFORs for NYC and LI to reflect most recent five-year history (2014-2018)	All existing Cable EFORds for NYC and LI to reflect most recent five-year history (2015-2019)	TO provided transition rates with NYISO review.		TBD
31	UDR Line Unavailability	Five year history of forced outages (2014-2018)	Five year history of forced outages (2015-2019)	NYISO/TO Review		TBD

Emergency Operating Procedures

#	Parameter	2020 Model Assumptions	2021 Model Assumptions	Basis for Recommendation	Model Change	Est. IRM Impact*
32	Special Case Resources	July 2019 –1,282 MW based on registrations and modeled as 873 MW of effective capacity. Monthly variation based on historical experience*	July 2020 –xxxx MW based on registrations and modeled as YYY MW of effective capacity. Monthly variation based on historical experience*	SCRs sold for the program discounted to historic availability. Summer values calculated from July 2020 registrations. Performance calculation updated per ICS presentations on SCR performance. (Attachment F)		TBD
33	Other EOPs	692 MW of non-SCR/non-EDRP resources (Attachment D)	xxx MW of non-SCR/non-EDRP resources **(Attachment D)	Based on TO information, measured data, and NYISO forecasts		TBD
34	EOP Structure	12 EOP Steps Modeled	9 EOP steps modeled	Based on agreement with ICS, step 1 and 2 separated, step 3 removed, and step 7 and 8 combined	Y	Minimal

** NYISO proposes to model "General Public Appeals" MW using the same value as the 2020 IRM study unless a Transmission Owner presents analysis supporting an alternate MW value.

External Control Areas

| #	Parameter	2020 Model Assumptions	2021 Model Assumptions	Basis for Recommendation	Model Change	Est. IRM Impact*
35	PJM	Load and Capacity data provided by ISONE/NPCC CP-8 Data may be adjusted per NYSRC Policy 5 (Attachment E)	Load and Capacity data will be provided by ISONE/NPCC CP-8 Data may be adjusted per NYSRC Policy 5	Initial Review performed by the NPCC CP-8 WG prior to Policy 5 changes		TBD
36	ISONE, Quebec, IESO	Load and Capacity data provided by ISONE/NPCC CP-8 Data adjusted per NYSRC Policy 5 (Attachment E)	Load and Capacity data will be provided by ISONE/NPCC CP-8 Data adjusted per NYSRC Policy 5	Initial Review performed by the NPCC CP-8 WG prior to Policy 5 changes		TBD
37	External Adjustments per Policy 5	If needed, add load to externals proportional to existing excess capacity				TBD
38	Reserve Sharing	All NPCC Control Areas indicate that they will initially share reserves equally among all members and then among non-members	All NPCC Control Areas indicate that they will initially share reserves equally among all members and then among non-members	Per NPCC CP-8 WG		None
39	Emergency Assistance	Statewide Limit of 3,500 MW of emergency assistance allowed from neighbors.	Statewide Limit of 3,500 MW of emergency assistance allowed from neighbors.	White Paper on Modeling of Emergency Assistance for NYCA in IRM studies		None

Miscellaneous

#	Parameter	2020 Model Assumptions	2021 Model Assumptions	Basis for Recommendation	Model Change	Est. IRM Impact*
40	MARS Model Version	Version 3.22.6	3.29.1499	Per testing and ICS recommendation		None
41	Environmental Initiatives	Proposed rules would not take effect until after the summer of 2020	No new rules for 2021 Capability Year	Review of existing regulations and rules		TBD

Attachment A1
NYCA Summer Load Forecast Uncertainty Model
2020 and 2021 Summer LFU Models

Load Forecast Uncertainty Distributions
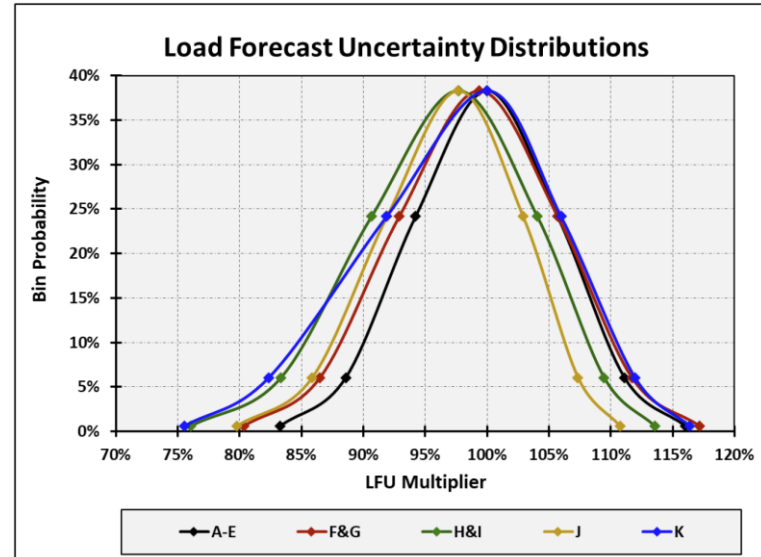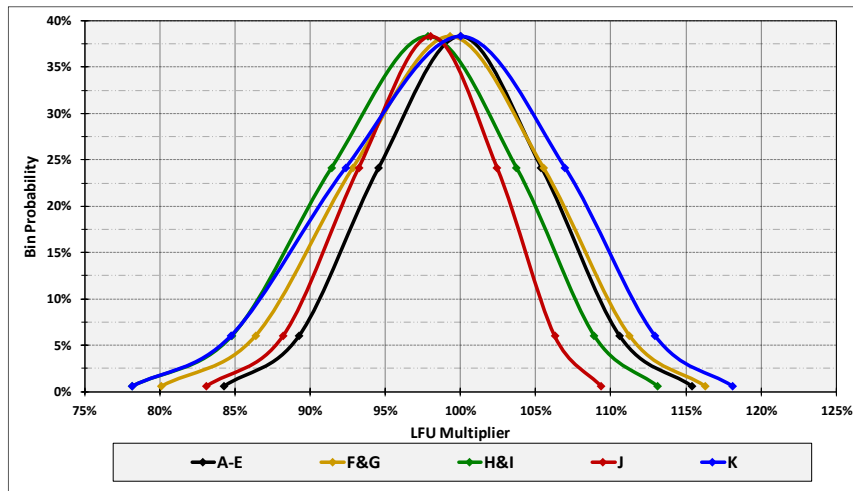
Bin	Probability	A-E	F&G	H&I	J	K
B7	0.62%	84.30%	80.12%	78.15%	83.07%	78.16%
B6	6.06%	89.29%	86.39%	84.79%	88.19%	84.73%
B5	24.17%	94.58%	92.86%	91.43%	93.24%	92.36%
B4	38.30%	100.00%	99.31%	97.82%	98.04%	100.00%
B3	24.17%	105.39%	105.52%	103.72%	102.45%	106.93%
B2	6.06%	110.57%	111.25%	108.90%	106.28%	112.92%
B1	0.62%	115.39%	116.28%	113.11%	109.38%	118.09%

Delta	A-E	F&G	H&I	J	K
Bin 7 - Bin 4	15.70%	19.19%	19.66%	14.97%	21.84%
Bin 4 - Bin 1	15.39%	16.97%	15.30%	11.34%	18.09%
Total Range	31.09%	36.16%	34.96%	26.31%	39.93%

Bin	Probability	A-E	F&G	H&I	J	K
B1	0.62%	116.02%	117.17%	113.56%	110.73%	116.38%
B2	6.06%	111.11%	111.70%	109.46%	107.33%	111.97%
B3	24.17%	105.70%	105.70%	104.06%	102.89%	105.98%
B4	38.30%	100.00%	99.36%	97.68%	97.67%	100.00%
B5	24.17%	94.22%	92.89%	90.66%	91.91%	91.88%
B6	6.06%	88.58%	86.48%	83.35%	85.86%	82.34%
B7	0.62%	83.28%	80.33%	76.06%	79.79%	75.52%

Delta	A-E	F&G	H&I	J	K
B1 - B4	16.02%	17.80%	15.88%	13.06%	16.38%
B4 - B7	16.72%	19.04%	21.62%	17.88%	24.48%
Total Range	32.74%	36.84%	37.50%	30.94%	40.87%

Attachment A2
NYCA Winter Load Forecast Uncertainty Model
2020 and 2021 Winter LFU Models
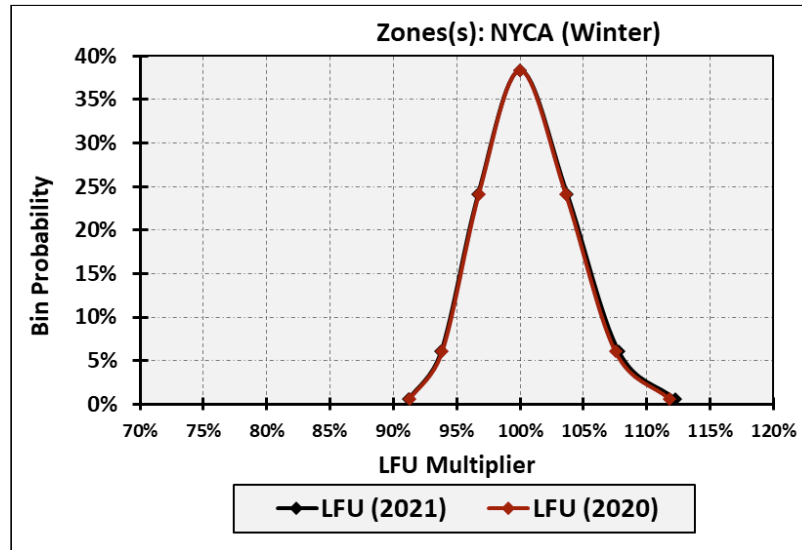
Zones(s): NYCA (Winter)					
Bin	**Probability**	**Wthr**	**MW**	**LFU (2021)**	**LFU (2020)**
B1	0.62%	53.75	25,593	112.22%	111.80%
B2	6.06%	47.98	24,577	107.77%	107.52%
B3	24.17%	42.20	23,648	103.69%	103.59%
B4	38.30%	36.43	22,806	100.00%	100.00%
B5	24.17%	30.66	22,051	96.69%	96.75%
B6	6.06%	24.89	21,383	93.76%	93.85%
B7	0.62%	19.12	20,802	91.22%	91.28%
Design		36.43	22,806		

Attachment B1
New Thermal Units and Unit Re-ratings[6]

B1 - Proposed Thermal Units and Unit Re-ratings (summer ratings)					
Project or Generator Name	Zone	2020 MARS Model (MW)	2020 Gold Book (MW)	New or Incremental (MW)	2021 MARS Model (MW)
New Units					
Sithe Independence	C	956.4	956.4	56.6	1013.0
Total New Units		956.4	956.4	56.6	1013.0

[6] Unit re-ratings are for generation facilities that have undergone uprate projects.

Attachment B2

Deactivations

Announced Unit Deactivations since 2020 IRM Study		
Generator Name	Zone	CRIS (MW)
West Babylon 4	K	49.0
Indian Point 3	H	1,040.4
Glenwood	K	14.6
Total Removals		1,104

Attachment B3
New Intermittent Resources

Wind				
Resource	**Zone**	**CRIS (MW)**	**Summer Capability**	**Lesser of Summer Capability VS Cris**
New Wind Units				
Cassadaga Wind, LLC	A	126.0	126.5	126.0
Total New Wind		126.0	126.5	126.0

Solar				
Resource	**Zone**	**CRIS (MW)**	**Summer Capability**	**Lesser of Summer Capability VS Cris**
New Solar Units				
Total New Solar				
Total New Intermittent		126.0	126.5	126.0

Attachment B4

New Energy Storage Resources

Energy Storage				
Resource	**Zone**	**CRIS (MW)**	**Summer Capability**	**Lesser of Summer Capability VS CRIS**
New Battery Units				
Total New Energy Storage				

Attachment B5
Resources in the Behind the Meter
Net Generation Program (BTM-NG)

Attachment B4 -Units in the Behind the Meter Net Generation Program*			
Generator Name	Zone	Resource Value (MW)[1]	Peak Load Adjustment (MW)[2,3]
Existing:			
Stony Brook	K	36.2	42.0
Greenidge 4	C	103.4	20.5
New:			
Lyons Falls Hydro	E	8.0	2.7
Total BTM-NG		147.6	65.2

* The IRM study independently models the generation and load components of BTM:NG Resources

1. Based on adjusted Dependable Maximum Gross Capability (DMGC) value
2. Based on Average Coincident Host Load (ACHL)
3. The load adjustment values need to be added to the load forecast

Attachment C
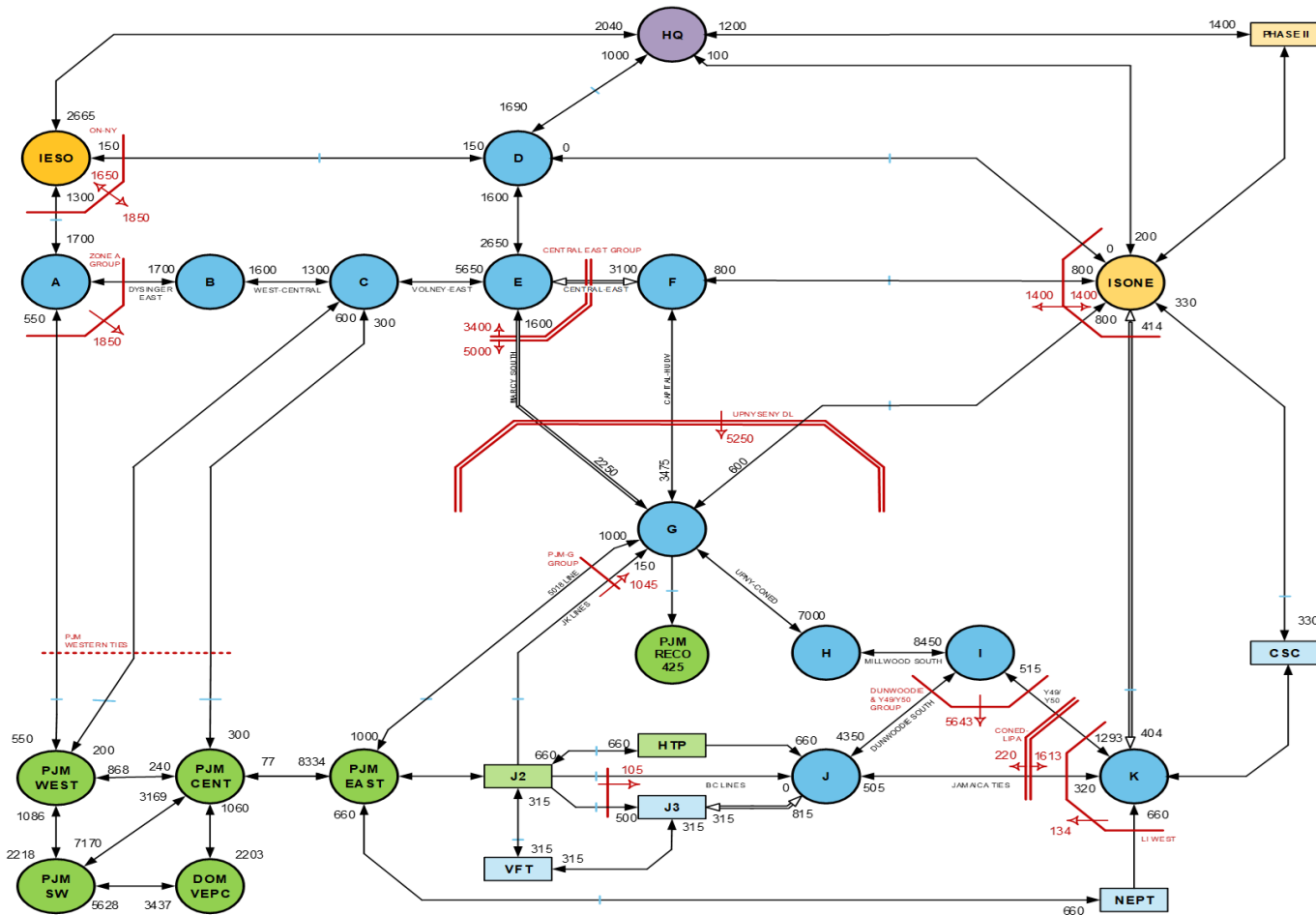
NYCA Five Year Derating Factors

Attachment D
Emergency Operating Procedures

Step	Procedure	2020 MW Value	2021 MW Value
1	Special Case Resources –Load, Gen	1,282 MW Enrolled/ 873 MW	
2	5% manual voltage Reduction	57 MW	
3	Thirty-minute reserve to zero	655 MW	
4	5% remote voltage reduction	347 MW	
5	Voluntary industrial curtailment, General Public Appeals	287 MW	
6	Emergency Purchases	Varies	
7	Ten-minute reserves to zero	1,310 MW	
8	Customer disconnections	As needed	
9	Adjustment used if IRM is lower than technical study margin	As needed	

Attachment E - IRM Topology

2021 IRM Topology (Summer Limits)

Draft Topology for 2021 IRM Study
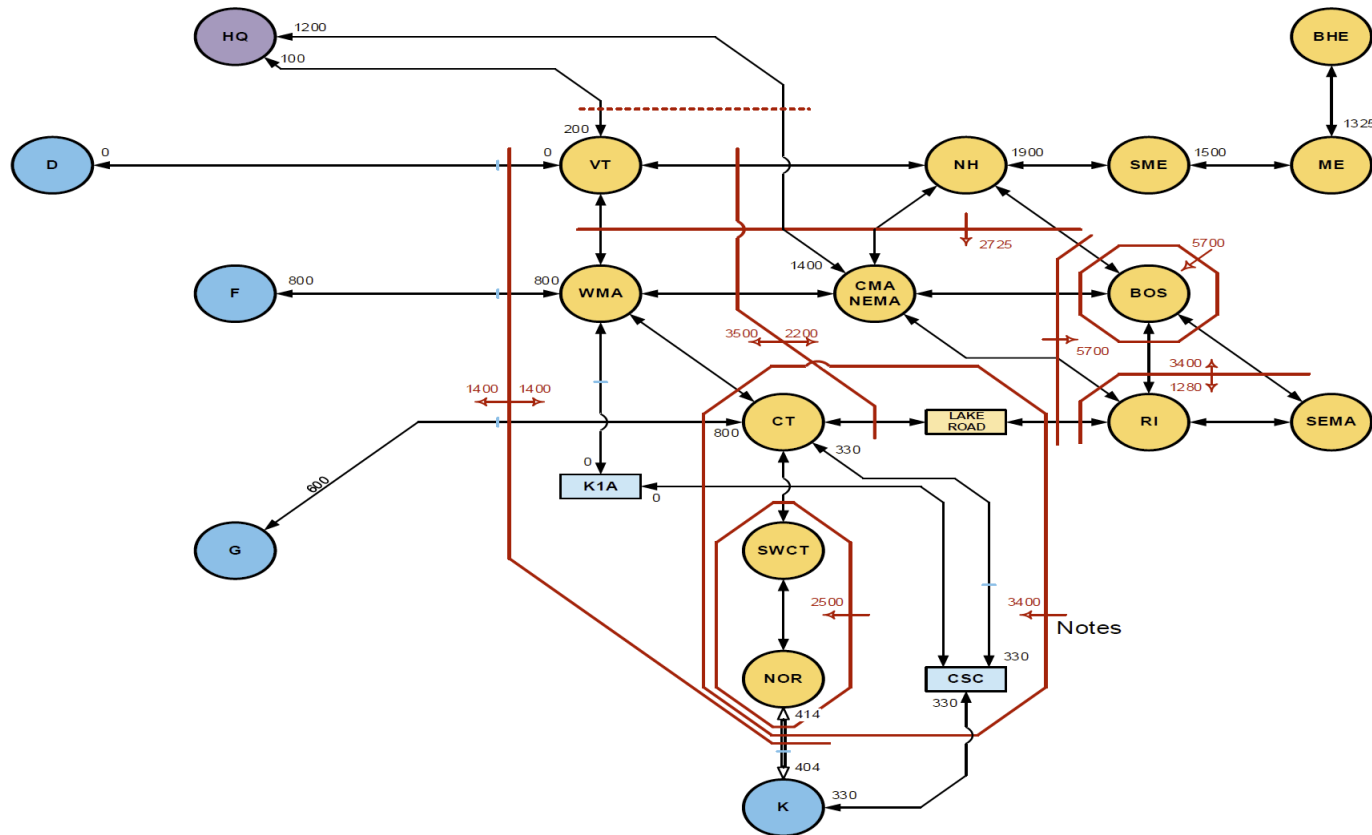

For Internal Discussions Only

Attachment E1
ISO-NE 14 Bubble Model

Attachment E2
Group Limits

	2021 IRM		2020 IRM	
NYCA Group Interfaces				
	Forward	Reverse	Forward	Reverse
UPNYSENY	5250	99999	5600	99999
UPNYSNY2	N/A	N/A	6950	99999
CE_GRP	N/A	N/A	5000	3400
CPV&E_G	N/A	N/A	2275	99999
LI_SUM	1593	104	1593	104
LI_WEST	99999	134	99999	18
DSY49Y50	5643	1999	5600	1999
A_EAST	1850	99999	1850	99999

Attachment E3
Interface Limits

NYCA Interface Limits				
	2021 IRM		2020 IRM	
	Forward	Reverse	Forward	Reverse
DYSINGER EAST	1700	1999	1700	1999
WEST CENTRAL	1300	1600	1300	1600
VOLNEY EAST	5650	1999	5650	1999
MOSES_SOUTH	2650	1600	2650	1600
CENTRAL EAST	3100	1999	3100	1999
MARCY SOUTH	2250	1600	2275	1600
CAPITAL HUDSON VALLEY	3475	1999	3475	1999
UPNY - CONED	7000	1999	6000	1999
MILLWOOD SOUTH	8450	1999	8450	1999
DUNWOODIE SOUTH	4350	1999	4400	1999
CONED LILCO	320	505	320	505
AREA I TO AREA K	1293	515	1293	342

Attachment E4
Dynamic Limits

Central East Voltage Limits, Oswego Complex Units								
	IRM2021				IRM2020			
Dependency	9MILP1, 9MILP2, FPNUC1, STHIND, OS05, OS06				9MILP1, 9MILP2, FPNUC1, STHIND, OS05, OS06			
Units Available	E_TO_F		E_TO_FG		E_TO_F		E_TO_FG	
	Forward	Reverse	Forward	Reverse	Forward	Reverse	Forward	Reverse
6	3100	1999	5000	3400	3100	1999	5000	3400
5	3050	1999	4925	3400	3050	1999	4925	3400
4	2990	1999	4840	3400	2990	1999	4840	3400
3	2885	1999	4685	3400	2885	1999	4685	3400
2	2770	1999	4510	3400	2770	1999	4510	3400
All Other Conditions	2645	1999	4310	3400	2645	1999	4310	3400

LI_NE: Northport Units 1-4				
Units Available	IRM2021		IRM2020	
	Norwalk to K	K to Norwalk	Norwalk to K	K to Norwalk
4	260	414	260	414
All Other Conditions	404	414	404	414

ConEd-LIPA: Barrett Units 1 & 2				
Units Available	IRM2021		IRM2020	
	IJ to K	K to IJ	IJ to K	K to IJ
2	1613	220	1593	104
1	1613	200	1593	74
0	1613	130	1593	0

Staten Island Import Limits, AK and Linden CoGen Units								
				IRM2021		IRM2020		
Unit Availability				J_TO_J3		J_TO_J3		
AK02	AK03	LINCOG1	LINCOG2	Forward	Reverse	Forward	Reverse	
A	A	A	A	315	200	315	200	
U	A	A	A	315	500	315	500	
A	U	A	A	315	700	315	700	
A	A	U	A	315	500	315	500	
A	A	A	U	315	500	315	500	
All Other Conditions				315	815	315	815	

UPNYSENY					
Units Available					
CPV	Cricket	Athens	IRM2021	IRM2021 (2020 Topology)	IRM2020
2	3	3	5250	5260	6950
2	3	2	5100	5060	6750
1	3	3	5350	5345	6700
2	2	3	5200	5200	6550
2	1	3	5150	5140	6150
1	1	3	5250	5275	5950
2	0	3	5100	5130	5800
All Other Conditions			5350		6600

E to G		
Units Available		
CPV	IRM2021	IRM2020
2	1750	N/A
1	2000	N/A
0	2250	N/A

Attachment F
SCR Determinations

Super Zones	SCR Performance for 2021 IRM Study					
	Enrollments (July 2020)	Forecast (2021)[1]	Performance Factor[2]	UCAP (2021)	Adjustment Factor[3]	Model Value
A-F						
G-I						
J						
K						
Totals						

Assumption Matrix History

Date	Ver	Preliminary Base Case	Date	Ver	Final Base Case
1/17/19	V0.0	Preliminary assumptions without attachments.			
2/21/20	V1.0	Preliminary assumptions without attachments.			
3/19/20	V2.0	Preliminary assumptions without attachments.			
4/15/20	V3.0	Added in LFU Models, Data from Draft of Gold Book A-B4 and E			
5/27/20	V4.0	Final Gold Book Data Update, Update Units, Update Topology			
6/23/20	V5.0	Change G-J Load forecast number, add ISO NE topology diagram, add Sithe Independence to rerate			