2020-2021 NYCA IRM Requirement Study

Final Base Case (FBC) Model Assumptions

Assumption Matrix

Draft V 3.0 - September 25, 2019

Load Parameters

#	Parameter	2019 Model Assumptions	2020 Model Assumptions	Basis for Recommendation	Model Change
1	Peak Load Forecast (Preliminary Base Case – Parametric & Sensitivities)	2018 Gold Book NYCA: 32,857MW NYC: 11,474 MW LI: 5,323 MW G-J: 15,815 MW	2019 Gold Book NYCA: 32,202MW[1] NYC: 11,651 MW LI: 5,134 MW G-J: 15,911 MW	Most recent Gold Book Forecast is used for Preliminary Base Case parametric study and sensitivity cases	N
2	Peak Load Forecast (Final Base Case)	October 2018 Fcst. NYCA: 32,488 MW NYC: 11,585 MW LI: 5,346 MW G-J: 15,831 MW	October 2019 Fcst. NYCA: 32,393 MW[2] NYC: 11,503 MW LI: 5,384MW G-J: 15,795 MW	Forecast based on examination of 2019 weather normalized peaks. Top three external Area peak days aligned with NYCA	N
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 remains unchanged after NYISO review presentations of 4/3 and 5/1	N
4	Load Forecast Uncertainty (LFU)- Summer	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 A)	Based on TO and NYISO data and analyses.[3]	N
5	LFU Winter	No update	Updated See (Attachment A1)	Existing Winter LFU may no longer be representative.	N

[1] The loads associated with the BTM-NG program need to be added to these values, see attachment B-4.
[2] BTM-NG loads have been incorporated into these numbers.
[3] As reviewed at the 7/30/19 ICS meeting.

Generation Parameters

#	Parameter	2019 Model Assumptions	2020 Model Assumptions	Basis for Recommendation	Model Change
1	Existing Generating Unit Capacities	2018 Gold Book values. Use min (DMNC vs. CRIS) capacity value	2019 Gold Book values. Use min (DMNC vs. CRIS) capacity value	Latest Gold Book publication	N
2	Proposed New Units (Non-Renewable) and re-ratings	MW 11.1 MW of new non- wind resources, plus 209.3 MW of project related re-ratings. (Attachment B1)	MW 1020 MW of new non- wind resources, plus 0 MW of project related re-ratings. (Attachment B1)	Latest Gold Book publication, NYISO interconnection queue, and generator notifications	N
3	Retirements, Mothballed units, and ICAP ineligible units	0 MW of retirements, 399.2 MW of unit deactivations, and 389.4 MW of IIFO and IR (Attachment B2)	1205.9 MW of unit deactivations (Attachment B2)	Latest Gold Book publication and generator notifications	N
4	Forced and Partial Outage Rates	Five-year (2013-2017) GADS data for each unit represented. Those units with less than five years – use representative data. (Attachment C)	Five-year (2014-2018) 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	N
5	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	N

#	Parameter	2019 Model Assumptions	2020 Model Assumptions	Basis for Recommendation	Model Change
6	Summer Maintenance	Nominal 50 MWs – divided equally between zones J and K	Nominal 50[4] MWs – divided equally between zones J and K	Review of most recent data	N
7	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 curves	N
8	Existing and Proposed New Wind Units	158.3 MW of Wind Capacity additions totaling 1891.7 MW of qualifying wind (Attachment B3)	0 MW of Wind Capacity additions totaling 1891.7 MW of qualifying wind (Attachment B3)	ICAP units based on RPS agreements, interconnection queue, and ICS input.	N
9	Wind Shape	Actual hourly plant output over the period 2013-2017. New units will use zonal hourly averages or nearby units.	Actual hourly plant output over the period 2014-2018. 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.	N
10	Solar Resources (Grid connected)	Total of 31.5 MW of qualifying Solar Capacity. (Attachment B3)	Total of 51.5 MW of qualifying Solar Capacity. (Attachment B3)	New 20 MW solar resource. ICAP Resources connected to Bulk Electric System	N
11	Solar Shape	Actual hourly plant output over the period 2013-2017. New units will use zonal hourly averages or nearby units.	Actual hourly plant output over the period 2014-2018. 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.	N

[4] As presented at the 7/30 ICS meeting

#	Parameter	2019 Model Assumptions	2020 Model Assumptions	Basis for Recommendation	Model Change
12	BTM- NG Program	Addition of Greenidge 4 to BTM NG program. 104.3 MW unit. Forecast load adjustment of 11.6 MW (Attachment B4)	No new BTM NG resources (Attachment B4)	Both the generation of the participating resources and the full host loads are modeled.	N
13	Small Hydro Resources	Actual hourly plant output over the period 2013-2017.	Actual hourly plant output over the period 2014-2018.	Program randomly selects a Hydro shape of hourly production from the most recent five-year period for each model iteration.	N
14	Large Hydro	Probabilistic Model based on 5 years of GADS data (2013-2017)	Probabilistic Model based on 5 years of GADS data (2014-2018)	Transition Rates representing the Equivalent Forced Outage Rates (EFORd) during demand periods over the most recent five-year period	N
15	Land Fill Gas	Actual hourly plant output over the period 2013-2017.	Actual hourly plant output over the period 2014-2018.	Program randomly selects a LFG shape of hourly production from the most recent five-year period for each model iteration.	N
16	New ESR (Energy Storage Resources)	None Modeled	5 MW of new battery storage resource scheduled (see attachment B3)	Existing 5 MW as load modifier, new 5 MWs as a resource	Y

Transactions – Imports and Exports

#	Parameter	2019 Model Assumptions	2020 Model Assumptions	Basis for Recommendation	Model Change
1	Capacity Purchases	Existing Rights: PJM – 1,080 MW HQ – 1,110 MW All contracts model as equivalent contracts	Existing Rights: PJM – 1,080 MW HQ – 1,110 MW All contracts model as equivalent contracts	Grandfathered Rights, ETCNL, and other awarded long-term rights.	N
2	Capacity Sales	Long Term firm sales Summer 279.3 MW	Long Term firm sales Summer 281.1 MW	These are long term federal contracts.	N
3	FCM Sales from a Locality[5]	No Sales modeled within study period	No Sales modeled within study period	White Paper, NYISO recommendation, and ICS discussions	N
4	Wheels through NYCA	None Modeled	300 MW HQ to NE equivalent contract	Developed model per ICS presentations	Y
5	New UDRs (Unforced capacity Deliverability Rights)	No new UDR projects	No new UDR projects	Existing UDR elections are made by August 1st and will be incorporated into the model.	N
6	New EDRs (External Deliverability Rights)	None	0 MWs for 2020 Study	80 MW scheduled for 2021 Study. Sensitivity to be performed.	N

[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	2019 Model Assumptions	2020 Model Assumptions	Basis for Recommendation	Model Change
1	Interface Limits	Update provided to TPAS with updated VFT return path. B and C lines out of service for base case. Par 33 from Ontario out of service. (Attachment E)	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)	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.	N
2	New Transmission	None Identified	None Identified	Based on TO provided models and NYISO's review.	N
3	AC Cable Forced Outage Rates	All existing Cable EFORs will be updated for NYC and LI to reflect most recent five-year history (2013-2017)	All existing Cable EFORs for NYC and LI to reflect most recent five-year history (2014-2018)	TO provided transition rates with NYISO review.	N
4	UDR Line Unavailability	Five year history of forced outages (2013-2017)	Five year history of forced outages (2014-2018)	NYISO/TO review.	N

Emergency Operating Procedures

#	Parameter	2019 Model Assumptions	2020 Model Assumptions	Basis for Recommendation	Model Change
1	Special Case Resources	July 2018 –1309 MW based on registrations and modeled as 903 MW of effective capacity. Monthly variation based on historical experience*	July 2019 –1,282 MW based on registrations and modeled as 873 MW of effective capacity. Monthly variation based on historical experience*	SCRs sold for the program discounted to historic availability. Summer values calculated from July 2019 registrations. Performance calculation updated per ICS presentations on SCR performance. (Attachment F)	N
2	Other EOPs	713.4 MW of non-SCR/non-EDRP resources (Attachment D)	692 MW of non-SCR/non-EDRP resources (Attachment D)	Based on TO information, measured data, and NYISO forecasts.	N
3	EOP Structure	10 EOP Steps Modeled	12 EOP Steps Modeled	Add one to separate EA from 10 min reserve. Add 2nd as placeholder for Policy 5, Appendix C	Y

* The number of SCR calls is limited to 5/month when calculating LOLE based on all 8,760 hours.

External Control Areas

#	Parameter	2019 Model Assumptions	2020 Model Assumptions	Basis for Recommendation	Model Change
1	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 provided by ISONE/NPCC CP-8 Data may be adjusted per NYSRC Policy 5 (Attachment E)	Initial review performed by the NPCC CP-8 WG prior to Policy 5 changes.	N
2	ISONE, Quebec, IESO	Load and Capacity data provided by ISONE/NPCC CP-8 Data may be adjusted per NYSRC Policy 5 (Attachment E)	Load and Capacity data provided by ISONE/NPCC CP-8 Data adjusted per NYSRC Policy 5 (Attachment E)	Initial review performed by the NPCC CP-8 WG prior to Policy 5 changes.	N
3	External Adjustments per Policy 5	If needed, add load to externals proportional to existing load	If needed, add load to externals proportional to existing excess capacity	White paper on external Control Area adjustments	Y
4	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.	N
5	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 Modelling of Emergency Assistance for NYCA in IRM studies	N

Miscellaneous

#	Parameter	2019 Model Assumptions	2020 Model Assumptions	Basis for Recommendation	Model Change
1	MARS Model Version	Version 3.22.6	Version 3.22.6	NYISO Vetting of new version 3.24.460 is ongoing	N
2	Environmental Initiatives	No estimated impacts based on review of existing rules and retirement trends	Proposed rules would not take effect until after the summer of 2020	Review of existing regulations and rules.	N

Attachment A

NYCA Summer Load Forecast Uncertainty Model

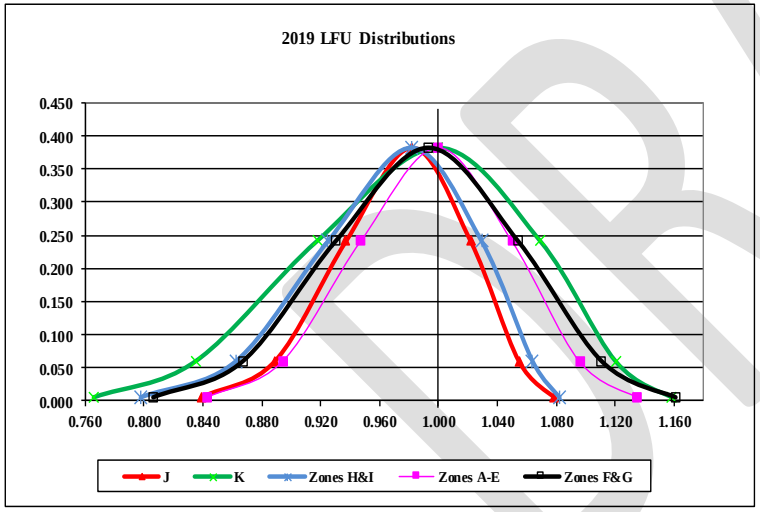
2019 and 2020 Summer LFU Models

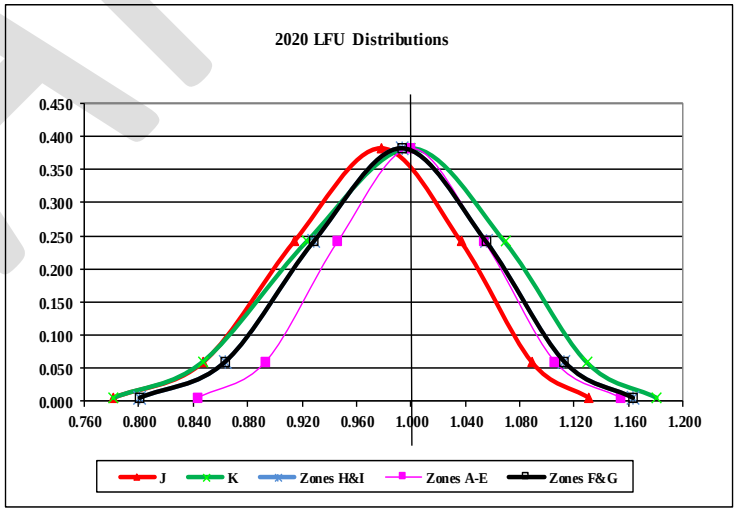
2019 Load Forecast Uncertainty Models

Step	Multiplier	Zones A-E	Zones F&G	Zones H&I	Con Ed (J)	LIPA (K)
1	0.0062	0.8431	0.8067	0.7978	0.8388	0.7659
2	0.0606	0.8944	0.8674	0.8624	0.8887	0.8351
3	0.2417	0.9474	0.9303	0.9249	0.9371	0.9175
4	0.3830	1.0000	0.9933	0.9817	0.9821	1.0000
5	0.2417	1.0502	1.0541	1.0293	1.0219	1.0695
6	0.0606	1.0959	1.1107	1.0639	1.0547	1.1206
7	0.0062	1.1351	1.1608	1.0822	1.0786	1.1586

2020 Load Forecast Uncertainty Models

Step	Multiplier	Zones A-E	Zones F&G	Zones H&I	Con Ed (J)	LIPA (K)
1	0.0062	0.8430	0.8012	0.7815	0.8307	0.7816
2	0.0606	0.8929	0.8639	0.8479	0.8819	0.8473
3	0.2417	0.9458	0.9286	0.9143	0.9324	0.9236
4	0.3830	1.0000	0.9931	0.9782	0.9804	1.0000
5	0.2417	1.0539	1.0552	1.0372	1.0245	1.0693
6	0.0606	1.1057	1.1125	1.0890	1.0628	1.1292
7	0.0062	1.1539	1.1628	1.1311	1.0938	1.1809





Attachment A1

NYCA Winter Load Forecast Uncertainty Model

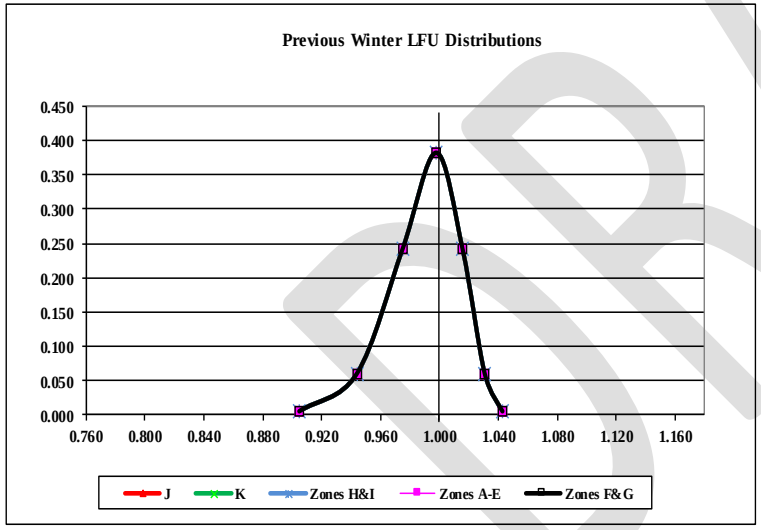
Previous and 2020 Winter LFU Models

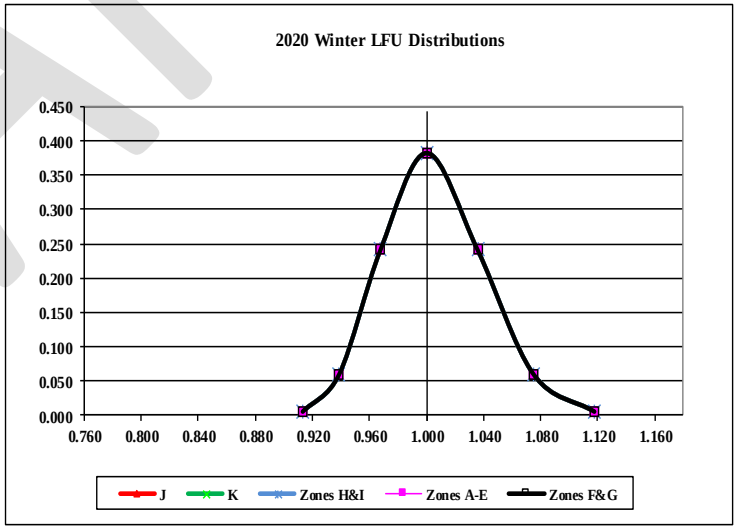
Previous Winter Load Forecast Uncertainty Models

Step	Multiplier	Zones A-E	Zones F&G	Zones H&I	Con Ed (J)	LIPA (K)
1	0.0062	0.9050	0.9050	0.9050	0.9050	0.9050
2	0.0606	0.9440	0.9440	0.9440	0.9440	0.9440
3	0.2417	0.9750	0.9750	0.9750	0.9750	0.9750
4	0.3830	0.9980	0.9980	0.9980	0.9980	0.9980
5	0.2417	1.0160	1.0160	1.0160	1.0160	1.0160
6	0.0606	1.0310	1.0310	1.0310	1.0310	1.0310
7	0.0062	1.0430	1.0430	1.0430	1.0430	1.0430

2020 Winter Load Forecast Uncertainty Models

Step	Multiplier	Zones A-E	Zones F&G	Zones H&I	Con Ed (J)	LIPA (K)
1	0.0062	0.9128	0.9128	0.9128	0.9128	0.9128
2	0.0606	0.9385	0.9385	0.9385	0.9385	0.9385
3	0.2417	0.9675	0.9675	0.9675	0.9675	0.9675
4	0.3830	1.0000	1.0000	1.0000	1.0000	1.0000
5	0.2417	1.0359	1.0359	1.0359	1.0359	1.0359
6	0.0606	1.0752	1.0752	1.0752	1.0752	1.0752
7	0.0062	1.1180	1.1180	1.1180	1.1180	1.1180





Attachment B1

New Non-Intermittent Units and Unit Re-ratings[6]

B1 - Proposed Non-Intermittant Units and Unit Re-ratings (summer ratings)					
Project or Generator Name	**Zone**	**2019 MARS Model (MW)**	**2019 Gold Book (MW)**	**New or Incremental (MW)**	**2020 MARS Model (MW)**
New Units					
Cricket Valley Energy Center, LLC	G	0	1,020.0	1,020.0	1,020.0
Total New Units		0	1,020.0	1,020.0	1,020.0

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

Attachment B2

Retiring and Ineligible Generating Units

Attachment B2 -Announced Unit Deactivations since 2019 IRM Study		
Generator Name	**Zone**	**CRIS (MW)**
Retirements:		
Cayuga Unit 1	C	154.1
Deactivations:		
Monroe Livingston	B	2.4
Steuben County LF	C	3.2
Auburn - State St.	C	5.8
Indian Point 2	H	1026.5
ICAP Ineligible:		
HUDSON AVE_GT_4	J	13.9
Total Removals		**1205.9**

Attachment B3

New Intermittent Resources

B3 - New Intermittent Resources				
Resouce	**Zone**	**CRIS (MW)**	**Summer Capability (MW)**	**CRIS adusted value from 2019 Gold Book (MW)**
New Wind Units				
Total New Wind				**0.0**
New Solar Units				
Riverhead Solar Farm, LLC	K	20.0	20.0	20.0
Total New Solar				**20.0**
Other Intermittent				
Montauk Battery Storage	K	5.0	5.0	5.0
Total New Other				**5.0**
Total New Intermittent				**25.0**

Attachment B4

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

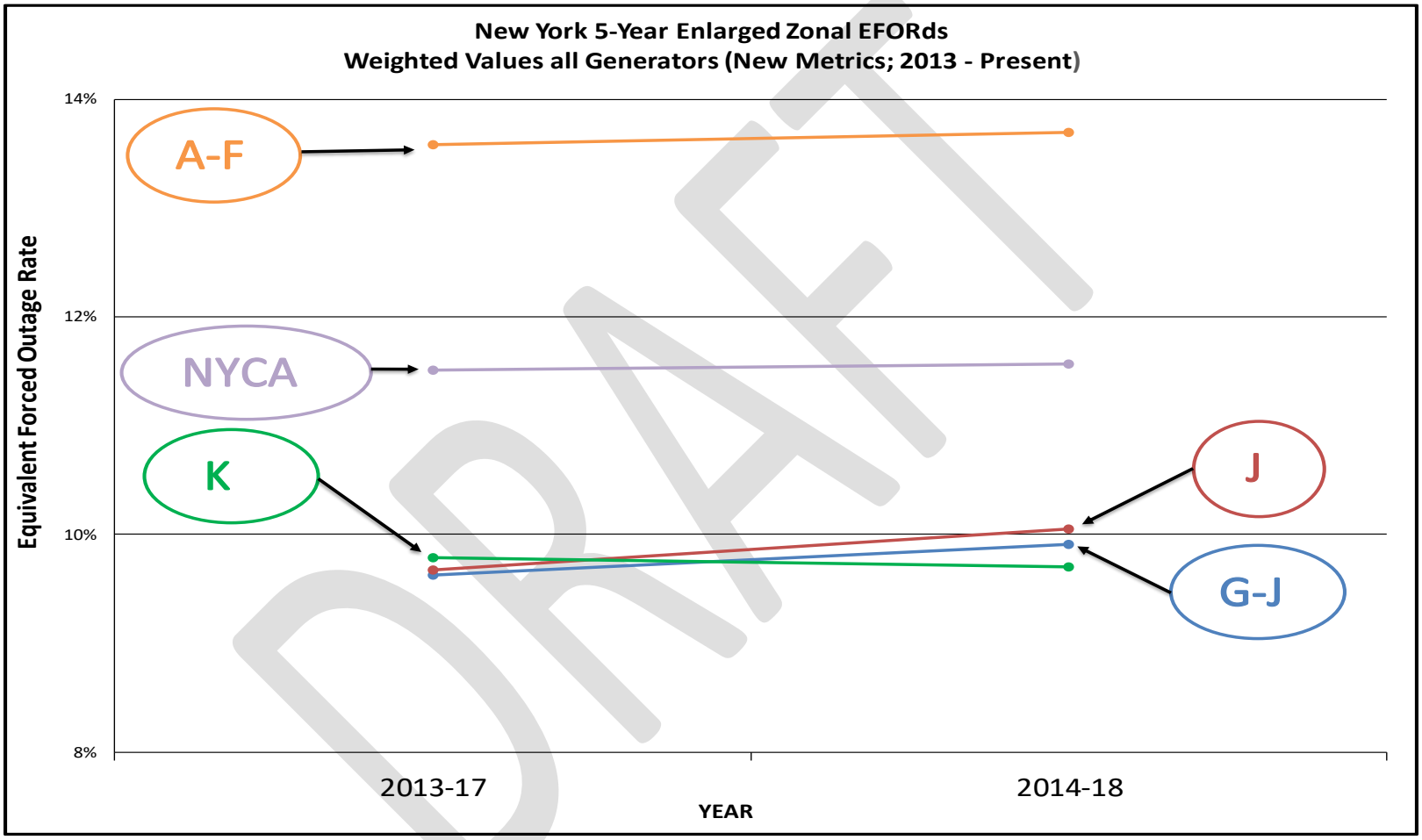
Attachment B4 -Units in the Behind the Meter Net Generation Program*			
Generator Name	**Zone**	**Resource Value (MW)[1]**	**Peak Load Adjustment (MW)[2,3]**
Existing:			
Stonybrook	K	39.8	38.9
Greenidge 4	C	104.0	11.6
Total BTM Gen		143.8	50.5

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

1. Based on adjusted DMGC value
2. Based on ACHL
3. The load adjustment values need to be added to the load forecast

Attachment C

NYCA Five Year Derating Factors



Attachment D

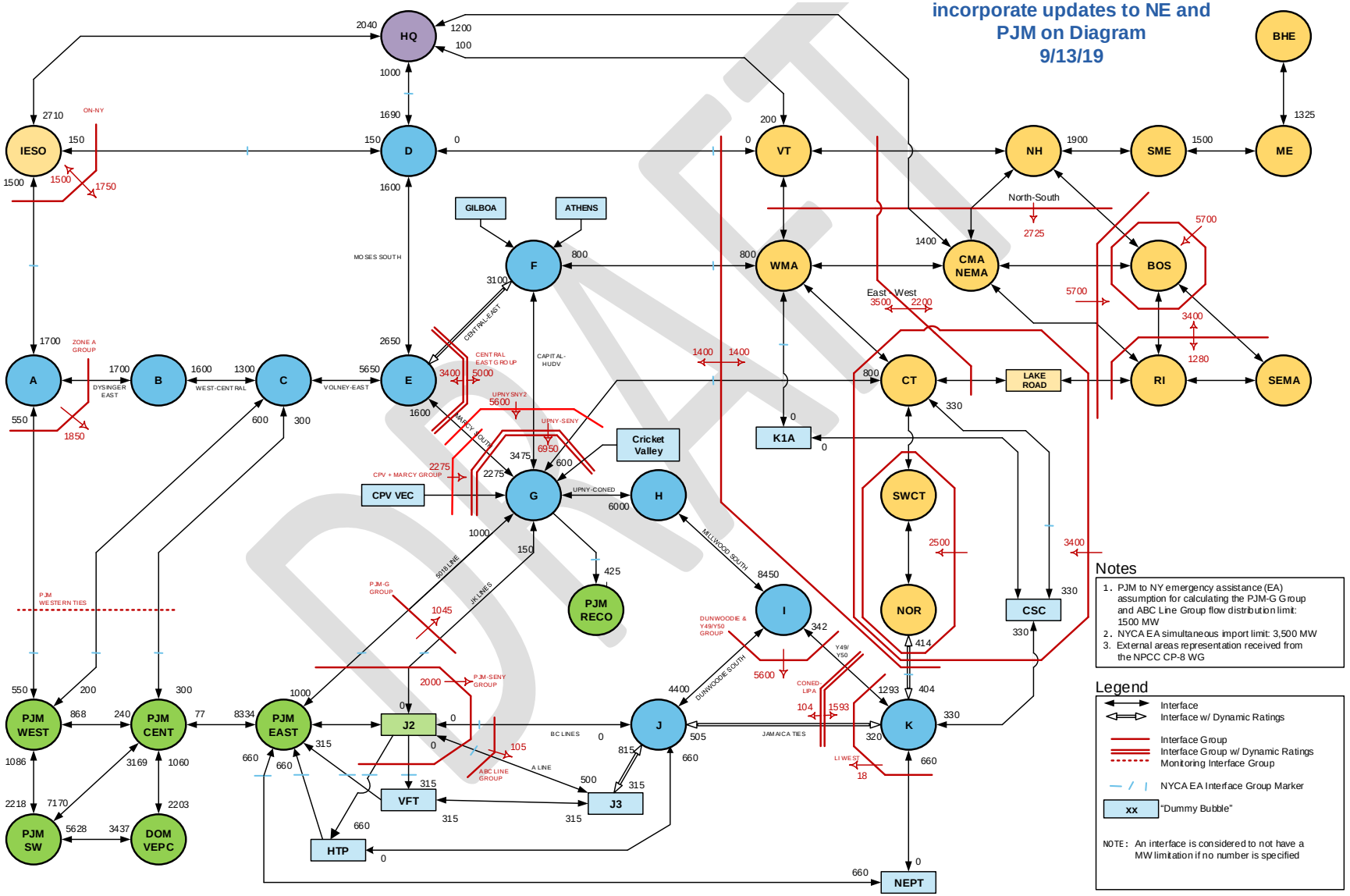
Emergency Operating Procedures

Step	Procedure	2019 MW Value	2020 MW Value
1,2	Special Case Resources –Load, Gen	1309 MW Enrolled/ 903 MW modeled	1282 MW Enrolled/ 873 MW modeled
3	Emergency Demand Response Program	6 MW Enrolled/1 MW Modeled	None Modeled
4	5% manual voltage Reduction	66 MW	57 MW
5	Thirty-minute reserve to zero	655 MW	655 MW
6	5% remote voltage reduction	401 MW	347 MW
7	Voluntary industrial curtailment	166 MW	207 MW
8	General public appeals	81 MW	80 MW
9	Emergency Purchases	Varies	Varies
10	Ten-minute reserve to zero	1,310 MW	1,310 MW
11	Customer disconnections	As needed	As needed
12	Adjustment used if IRM is lower than technical study margin	As needed	As needed

Attachment E - IRM Topology

2020 IRM Topology (Summer Limits)

Approved 5/1/19. Revised to incorporate updates to NE and PJM on Diagram 9/13/19



Notes

1. PJM to NY emergency assistance (EA) assumption for calculating the PJM-G Group and ABC Line Group flow distribution limit: 1500 MW
2. NYCA EA simultaneous import limit: 3,500 MW
3. External areas representation received from the NPCC CP-8 WG

Legend

- Interface
- Interface w/ Dynamic Ratings
- Interface Group
- Interface Group w/ Dynamic Ratings
- Monitoring Interface Group
- NYCA EA Interface Group Marker
- xx "Dummy Bubble"

NOTE: An interface is considered to not have a MW limitation if no number is specified

Attachment F
SCR Determinations

SCR Performance for 2020 IRM Study						
Super Zones	**Enrollments (July 2019)**	**Forecast (2020)[1]**	**Performance Factor[2]**	**UCAP (2020)**	**Adjustment Factor[3]**	**Model Value**
A - F	629.3	629.3	0.867	545.9	0.942	514.3
G - I	125.5	125.5	0.756	94.9	0.851	80.8
J	478.9	478.9	0.691	330.8	0.753	249.0
K	48.2	48.2	0.718	34.6	0.823	28.5
Totals	1281.9	1281.9		1006.1		**872.5**
	Notes				Overall Performance:	68.1%
	1. These values represent no growth from the July 2019 ICAP enrollments					
	2. Performance Factor based on ACL methodology					
	3. The Adjustment Factor captures two different performance derates; 1) Calculated Translation Factor (TF) between ACL and CBL values, and 2) the Fatigue Factor (FF), (FF = 1.00)					

Assumption Matrix History

Date	Ver	Preliminary Base Case	Date	Ver	Final Base Case
1/29/19	V0.0	Preliminary assumptions without attachments.	9/25/19	V3.0	Updated topology diagram for PJM and NE, combined Cedars bubble, changed attachment D to show 12 steps. Added proposed peak load forecast.
4/3/19	V0.1	Adds winter LFU update, removes EDRP in model-			
4/30/19	V1.0	Added GB forecast, added attachments A-B4,E. Added row for energy storage resources			
5/1/19	V1.2	Updated tables B1 through B4 per ICS meeting. Updates on pages 2, 5, 6, 7 (mostly clerical)			
6/26/19	V1.3	Filled out summary table (clerical)			
6/28/19	V1.4	New row to show policy 5 adjustments Table B1 and B3 updates Added ICS estimated impacts			
7/1/19	V1.5	Add Cayuga Retirement			
7/10/19	V2.0	Adds Attachments A,D, and F			
7/30/19	V2.1	Adds SCR, EOP, LFU, and EFORd values			