2018-2019 NYCA IRM Requirement Study

IRM Final Base Case Model Assumptions

Assumption Matrix

Approved by NYSRC EC on October 13, 2017

Load Parameters

#	Parameter	2017 Model Assumptions	2018 Model Assumptions	Basis for Recommendation	Model Change
1	Peak Load Forecast (Preliminary Base Case – Parametric & Sensitivities)	2016 Gold Book NYCA: 33,363 MW NYC: 11,795 MW LI: 5,422 MW G-J: 16,313 MW	2017 Gold Book NYCA: 33,078 MW NYC: 11,707 MW LI: 5,305 MW G-J: 16,070 MW	Gold Book Forecast is used for Preliminary Base Case parametric study and sensitivity cases	N
2	Peak Load Forecast (Final Base Case)	October 2016 NYCA: 33273 MW NYC: 11670 MW LI: 5450 MW G-J: 16073 MW	October 2017 NYCA: 32,868 MW NYC: 11,541 MW LI: 5,445 MW G-J: 15,890 MW	Forecast based on examination of 2017 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	N
4	Load Forecast Uncertainty	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.	N

Generation Parameters

#	Parameter	2017 Model Assumptions	2018 Model Assumptions	Basis for Recommendation	Model Change
1	Existing Generating Unit Capacities	2016 Gold Book values. Use min (DMNC vs. CRIS) capacity value	2017 Gold Book values. Use min (DMNC vs. CRIS) capacity value	2017 Gold Book publication	N
2	Proposed New Units (Non-Renewable) and re-ratings	0 MW of new non- wind resources. 66.9 MW of project related re-ratings. (Attachment B1)	784 MW of new non-wind resources, plus 52 MW of project related re-ratings. (Attachment B1)	2017 Gold Book publication, NYISO interconnection queue, and generator notifications	N
3	Retirements, Mothballed units, and ICAP ineligible units	260.7MW retirements or mothballs reported or Units in IIFO and IR (Attachment B2)	0 MW retirements or mothballs reported or Units in IIFO and IR[1] (Attachment B2)	2017 Gold Book publication and generator notifications	N
4	Forced and Partial Outage Rates	Five-year (2011-2015) GADS data for each unit represented. Those units with less than five years – use representative data. (Attachments C and C1)	Five-year (2012-2016) GADS data for each unit represented. Those units with less than five years – use representative data. (Attachments C and C1)	Transition Rates representing the Equivalent Forced Outage Rates (EFORd) during demand periods over the most recent five-year period (2012-2016)	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
6	Summer Maintenance	Nominal 50 MWs – divided equally between zones J and K	Nominal 50 MWs – divided equally between zones J and K	Review of most recent data	N

[1] ICAP Ineligible Forced Outage (IIFO) and inactive Reserve (IR)

#	Parameter	2017 Model Assumptions	2018 Model Assumptions	Basis for Recommendation	Model Change
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	221.1 MW of Wind Capacity additions totaling 1676.2 MW of qualifying wind (Attachment B3)	77.7 MW of Wind Capacity additions totaling 1733.4 MW of qualifying wind (Attachment B3)	Renewable units based on RPS agreements, interconnection queue, and ICS input.	N
9	Wind Shape	Actual hourly plant output over the period 2011-2015. New units will use zonal hourly averages or nearby units.	Actual hourly plant output over the period 2012-2016. New units will use zonal hourly averages or nearby units.	Program randomly selects a wind shape of hourly production over the years 2012-2016 for each model iteration.	N
10	Solar Resources (Grid connected)	31.5 MW Solar Capacity. Model chooses from 4 years of production data covering the period 2012-2015.	Total of 31.5 MW of qualifying Solar Capacity. (Attachment B3)	ICAP Resources connected to Bulk Electric System	N
11	Solar Shape	Actual hourly plant output over the period 2011-2015. New units will use zonal hourly averages or nearby units.	Actual hourly plant output over the period 2012-2016. New units will use zonal hourly averages or nearby units.	Program randomly selects a solar shape of hourly production over the years 2012-2016 for each model iteration.	N

#	Parameter	2017 Model Assumptions	2018 Model Assumptions	Basis for Recommendation	Model Change
12	BTM- NG Program	N/A	Change Stony Brook to its full 47 MW output (formerly modeled at 9.6 MW net of host load). Forecast Load adjusted to account for exposure of host load. (Attachment B5)	Both the generation of the participating resource and the full (former) host load is modeled.	Y
13	Small Hydro Resources	Derate by 46%	Actual hourly plant output over the period 2012-2016.	Program randomly selects a Hydro shape of hourly production over the years 2012-2016 for each model iteration.	Y
14	Large Hydro	Probabilistic Model based on 5 years of GADS data	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 (2012-2016)	N

Transactions – Imports and Exports

#	Parameter	2017 Model Assumptions	2018 Model Assumptions	Basis for Recommendation	Model Change
1	Capacity Purchases	Grandfathered amounts: PJM – 1080 MW HQ – 1090 MW HQ TO 1110 MW assuming awarded CRIS rights All contracts model as equivalent contracts	Existing Rights: PJM – 1080 MW HQ – 1110 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 284.9 MW	Long Term firm sales Summer 283.8 MW	These are long term federal contracts.	N
3	FCM Sales	No Sales within study period	No Sales within study period	White Paper	N
4	New UDRs	No new UDR projects	No new UDR projects	Existing UDR elections are made by August 1st and will be incorporated into the model.	N

Topology

#	Parameter	2017 Model Assumptions	2018 Model Assumptions	Basis for Recommendation	Model Change
1	Interface Limits	All changes reviewed and commented on by TPAS (Attachment E)	All changes reviewed and commented on by TPAS (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 updated for NYC and LI to reflect most recent five-year history	All existing Cable EFORs will be updated for NYC and LI to reflect most recent five-year history	TO provided transition rates with NYISO review.	N
4	UDR Line Unavailability	Five year history of forced outages	Five year history of forced outages	NYISO/TO review.	N

Emergency Operating Procedures

#	Parameter	2017 Model Assumptions	2018 Model Assumptions	Basis for Recommendation	Model Change
1	Special Case Resources	July 2016 –1192MW based on registrations and modeled as 841 MW of effective capacity. Monthly variation based on historical experience*	July 2017 –1219 MW based on registrations and modeled as 868 MW of effective capacity. Monthly variation based on historical experience*	SCRs sold for the program discounted to historic availability. Summer values calculated from July 2017 registrations. Performance calculation updated per ICS presentations on SCR performance. (Attachment F)	N
2	EDRP Resources	July 2016 75 MW registered model as 13 MW in July and proportional to monthly peak load in other months. Limit to five calls per month	July 2017 16 MW registered modeled as 3 MW in July and proportional to monthly peak load in other months. Limit to five calls per month	Those sold for the program discounted to historic availability. Summer values calculated from July 2017 registrations and forecast growth.	N
3	Other EOPs	665 MW of non-SCR/non-EDRP resources	609.6 MW of non-SCR/non-EDRP resources (Attachment D)	Based on TO information, measured data, and NYISO forecasts.	N

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

External Control Areas

#	Parameter	2017 Model Assumptions	2018 Model Assumptions	Basis for Recommendation	Model Change
1	PJM	Load and Capacity data provided by PJM/NPCC CP-8 Data may be adjusted per NYSRC Policy 5 (Attachment E)	Load and Capacity data provided by PJM/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	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
3	HQ	Load and Capacity data provided by HQ/NPCC CP-8 Data may be adjusted per NYSRC Policy 5 (Attachment E)	Load and Capacity data provided by HQ/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
4	IESO	Load and Capacity data provided by IESO/NPCC CP-8 Data may be adjusted per NYSRC Policy 5 (Attachment E)	Load and Capacity data provided by IESO/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

#	Parameter	2017 Model Assumptions	2018 Model Assumptions	Basis for Recommendation	Model Change
5	Reserve Sharing	All NPCC Control Areas indicate that they will share reserves equally among all 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
6	Emergency Assistance	No Limit	Statewide Limit of 3,500 MW of emergency assistance allowed from neighbors.	White paper on Modelling of Emergency Assistance for NYCA in IRM studies	Y

Miscellaneous

#	Parameter	2017 Model Assumptions	2018 Model Assumptions	Basis for Recommendation	Model Change
1	MARS Model Version	Version 3.20	Version 3.21.9	Per benchmark testing and ICS recommendation.	N
2	Environmental Initiatives	No estimated impacts based on review of existing rules and retirement trends	No estimated impacts based on review of existing rules and retirement trends	Review of existing regulations and rules.	N

Attachment A

NYCA Load Forecast Uncertainty Model

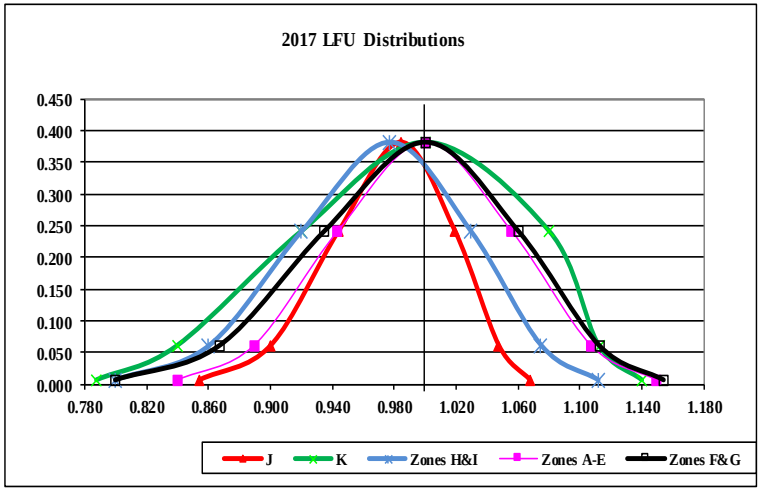
2017 and 2018 LFU Models

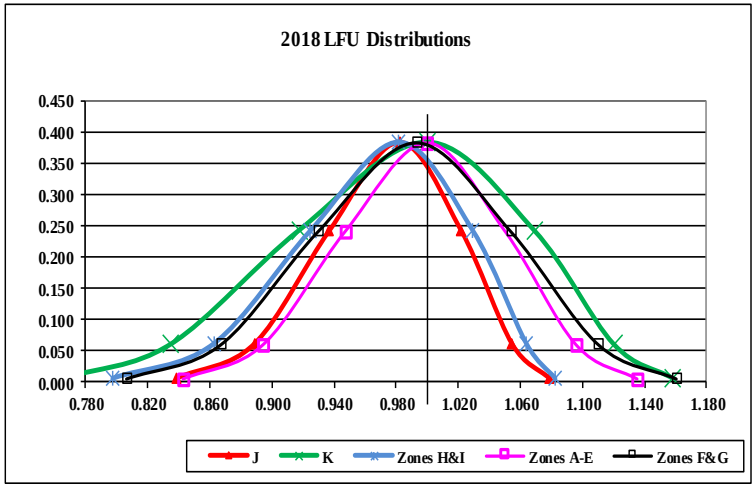
2017 Load Forecast Uncertainty Models

Step	Multiplier	Zones A-E	Zones F&G	Zones H&I	Con Ed (J)	LIPA (K)
1	0.0062	0.8399	0.7997	0.7992	0.8543	0.7874
2	0.0606	0.8892	0.8670	0.8598	0.9002	0.8396
3	0.2417	0.9434	0.9347	0.9197	0.9440	0.9198
4	0.3830	1.0000	1.0000	0.9768	0.9842	1.0000
5	0.2417	1.0559	1.0602	1.0291	1.0192	1.0802
6	0.0606	1.1073	1.1124	1.0746	1.0475	1.1123
7	0.0062	1.1494	1.1539	1.1113	1.0676	1.1400

2018 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





Attachment B1

New Non-Wind Units and Unit Re-ratings[2]

B1 - Proposed Non-wind Units and Unit Re-ratings (summer ratings)					
Project or Generator Name	**Zone**	**2017 MARS Model (MW)**	**2017 Gold Book (MW)**	**New or Incremental (MW)**	**2018 MARS Model (MW)**
New Units					
Greenidge 4	C	0	0	106.3	106.3
~~Taylor Biomass*~~	~~G~~	~~0~~	~~0~~	~~19.0~~	~~19.0~~
Competitive Power Ventures (CPV)	G	0	0	677.6	677.6
Total New Units		0		783.9	783.9
Existing Unit Re-ratings					
Bethlehem Energy Center	F	756.9	760.5	52.0	808.9
Total New Units + Re-rates				835.9	

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

Attachment B2

Retiring and Ineligible Generating Units

Attachment B2 -Announced Unit Retirements and ICAP Ineligible Forced Outage (IIFO)			
Generator Name	**Zone**	**CRIS (MW)**	**CRIS adusted value from 2017 Gold Book (MW)**
Retirements			
Shoreham GT 3	K	Retirement Notice Rescinded	
Shoreham GT 4	K	Retirement Notice Rescinded	
Freeport CT1	K	Retirement Notice Rescinded	
ICAP Ineligible		0.00	0.00
Total Retirements		0.00	**0.00**

Attachment B3

Existing and New Wind Resources

B3 - Wind Resources				
Wind Resouce	**Zone**	**CRIS (MW)**	**Summer Capability (MW)**	**CRIS adusted value from 2017 Gold Book (MW)**
ICAP Participating Wind Units				
Altona Wind Power	D	97.5	97.5	97.5
Bliss Wind Power	A	100.5	100.5	100.5
Canandaigua Wind Power	C	125.0	125.0	125.0
Chateaugay Wind Power	D	106.5	106.5	106.5
Clinton Wind Power	D	100.5	100.5	100.5
Ellenburg Wind Power	D	81.0	81.0	81.0
Hardscrabble Wind	E	74.0	74.0	74.0
High Sheldon Wind Farm	C	112.5	118.1	112.5
Howard Wind	C	57.4	55.4	55.4
Madison Wind Power	E	11.5	11.6	11.5
Maple Ridge Wind 1	E	231.0	231.0	231.0
Maple Ridge Wind 2	E	90.7	90.8	90.7
Munnsville Wind Power	E	34.5	34.5	34.5
Orangeville Wind Farm	C	94.4	93.9	93.9
Wethersfield Wind Power	C	126.0	126.0	126.0
Marble River	D	215.2	215.5	215.2
		1658.2	**1661.8**	**1655.7**
New and Proposed IRM Study Wind Units				
Jericho Rise	D	77.7	77.7	77.7
		77.7	**77.7**	**77.7**
Non - ICAP Participating Wind Units				
	Zone	**CRIS (MW)**	**Nameplate Capability (MW)**	**CRIS adusted value from 2017 Gold Book (MW)**
Erie Wind	A	0.0	15.0	0.0
Fenner Wind Farm	C	0.0	30.0	0.0
Steel Wind	A	0.0	20.0	0.0
Western NY Wind Power	C	0.0	6.6	0.0
		0.0	**71.6**	0.0
Total Wind Resources		1735.9	1811.1	**1733.4**

Attachment B4

Existing and New Solar Resources

B4 - Solar Resources				
Wind Resouce	**Zone**	**CRIS (MW)**	**Summer Capability (MW)**	**CRIS adusted value from 2017 Gold Book (MW)**
ICAP Participating Solar Units				
Long Island Solar	K	31.50	31.50	31.50
		31.50	31.50	31.50
Proposed IRM Study Solar Units				
		0.00	0.00	0.00
Total Solar Resources		31.50	31.50	**31.50**

Attachment B5

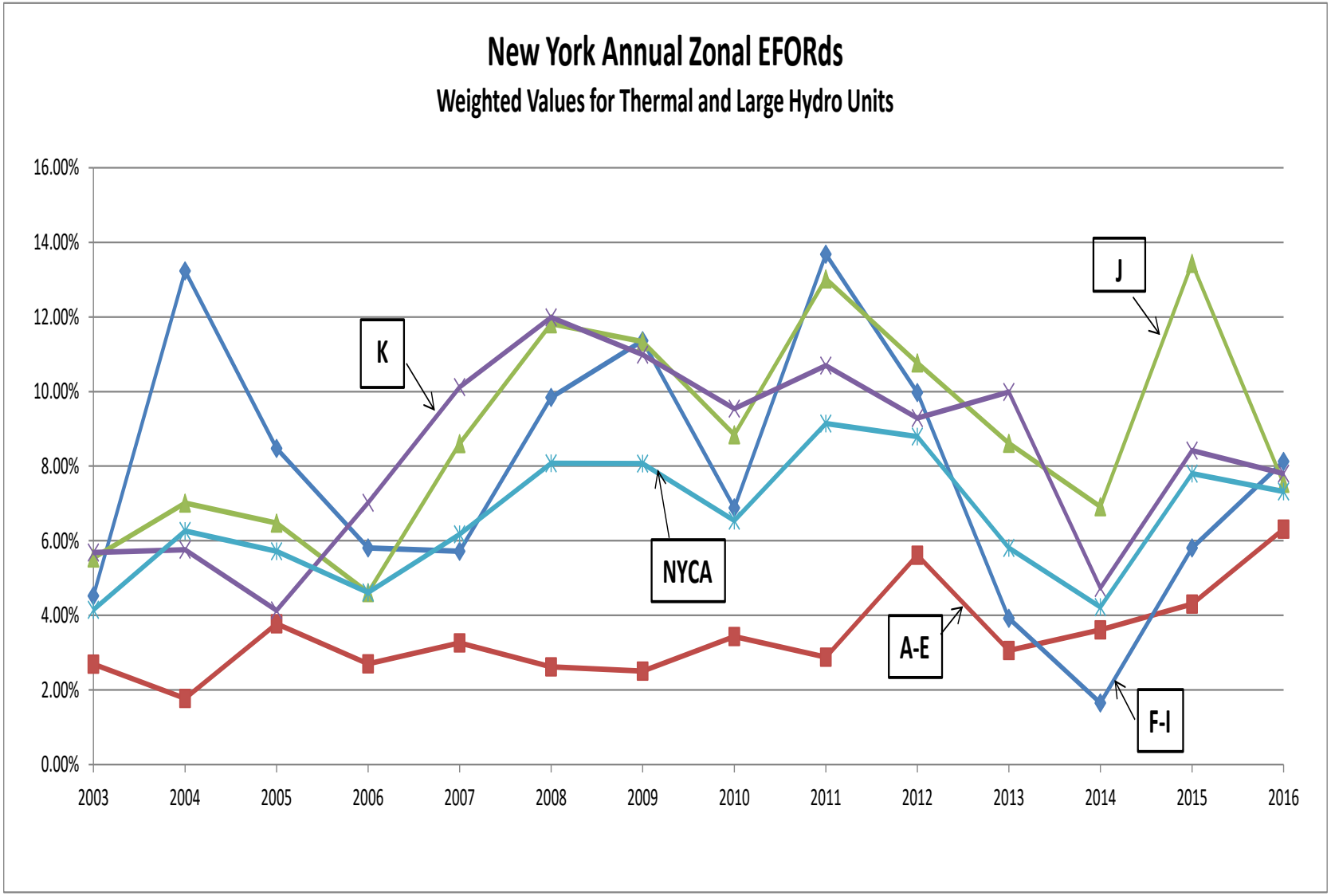
Resources and Peak Load Adjustment Modeled in the Behind the Meter Net Generation Program (BTM-NG)

Attachment B5 -Rources and Peak Load Ajustment Modeled in the Behind the Meter Net Generation Program*			
Generator Name	**Zone**	**Resource Value (MW)[1]**	**Peak Load Adjustment (MW)[2]**
Stony Brook[3]	K	47.0	39.1
Total BTM program Gen		47.0	39.1

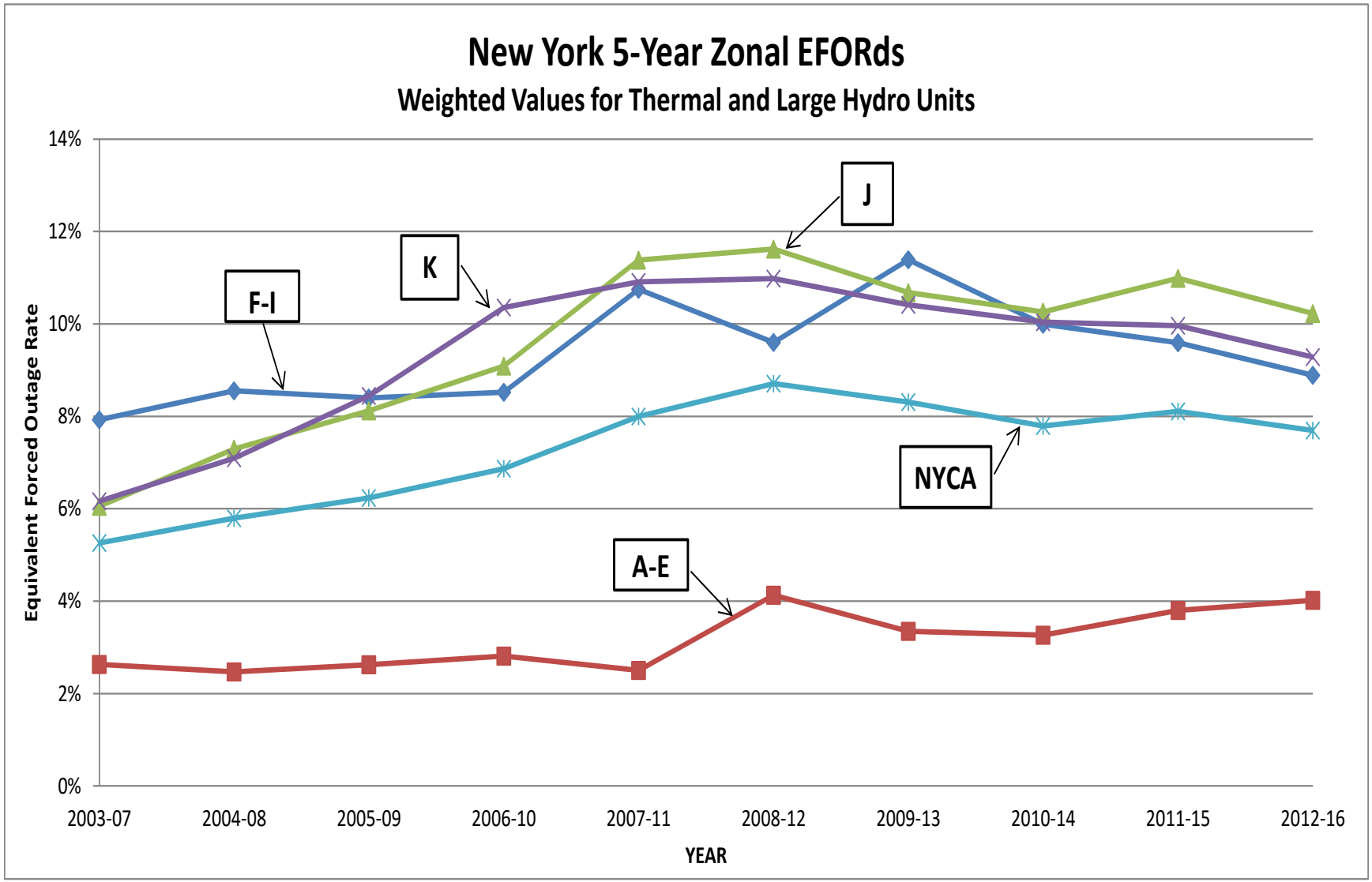
* The IRM study independently models the generation and load components of BTM:NG Resources

1. Based on adjusted DMGC value
2. Based on ACHL
3. Stony Brook formerly modeled at 9.6 MW (net of host load)

Attachment C



Attachment C1



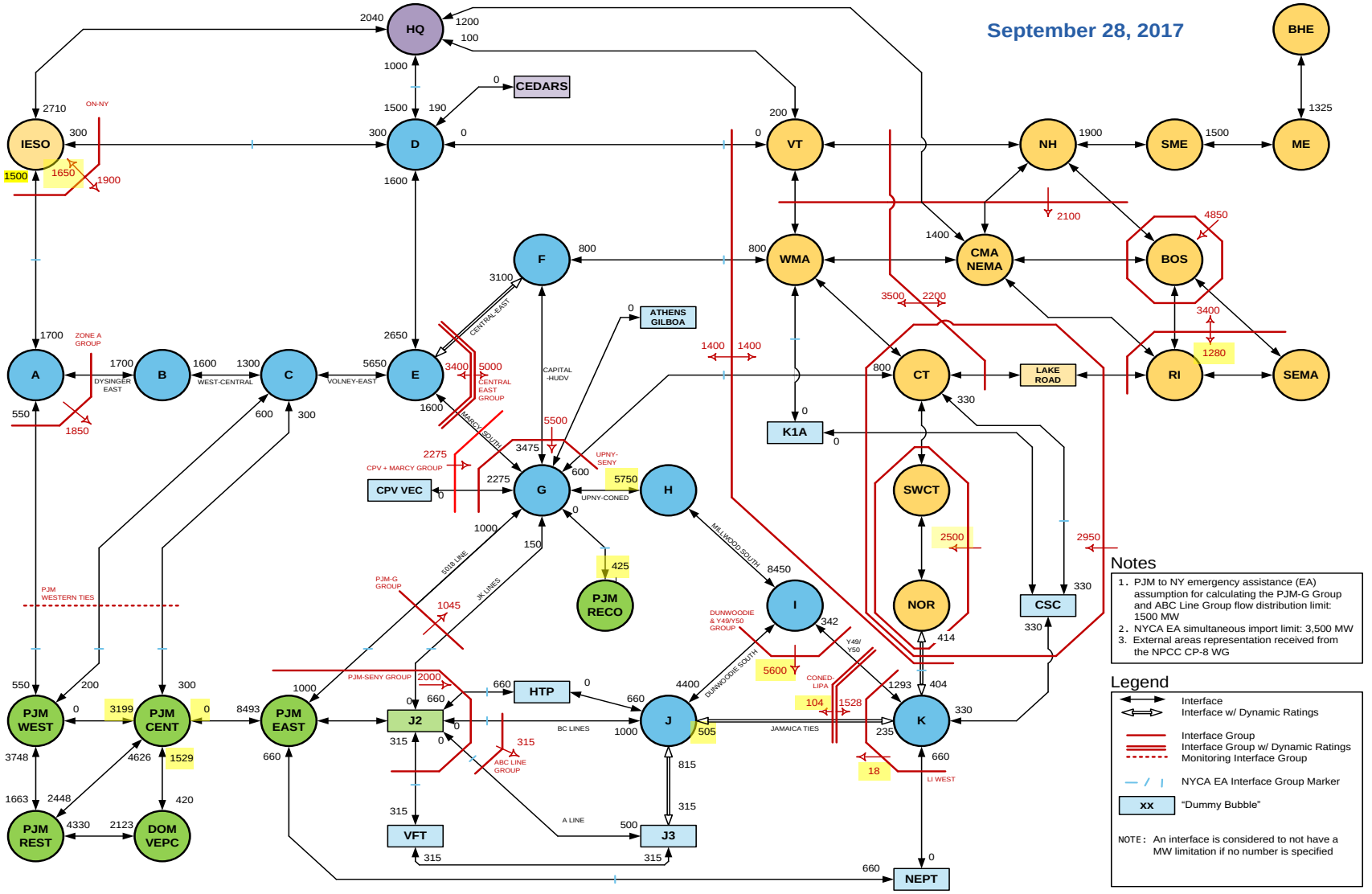
Attachment D

Emergency Operating Procedures

Step	Procedure	Effect	2017 MW Value	2018 MW Value
1	Special Case Resources	Load relief	1,192 MW Enrolled/ 841 MW modeled	1,219 MW Enrolled/ 868 MW modeled
2	Emergency Demand Response Program	Load relief	75 MW Enrolled/13 MW Modeled	16 MW Enrolled/3 MW Modeled
3	5% manual voltage Reduction	Load relief	66 MW	66 MW
4	Thirty-minute reserve to zero	Allow operating reserve to decrease to largest unit capacity (10-minute reserve)	655 MW	655 MW
5	5% remote voltage reduction	Load relief	386 MW	341 MW
6	Voluntary industrial curtailment	Load relief	125.5 MW	121.8 MW
7	General public appeals	Load relief	88 MW	80.8 MW
8	Emergency Purchases	Increase capacity	Varies	Varies
9	Ten-minute reserve to zero	Allow 10-minute reserve to decrease to zero	1,310 MW	1,310 MW
10	Customer disconnections	Load relief	As needed	As needed

Attachment E

2018 IRM Final Topology (Summer Ratings)



Attachment F
SCR Determinations

SCR Performance for 2018 IRM Study						
Super Zones	**Registrations (July 2017)**	**Forecast (2018)[1]**	**Performance Factor[2]**	**UCAP (2018)**	**Adjustment Factor[3]**	**Model Value**
A - F	696.1	696.1	0.859	597.9	0.900	538.1
G - I	82.7	82.7	0.710	58.7	0.900	52.8
J	392.2	392.2	0.701	275.1	0.900	247.6
K	48.1	48.1	0.671	32.3	0.900	29.1
Totals	1219.1	1219.1		964.0		**867.6**
	Notes				Overall Performance:	71.2%
	1. These values represent no growth from the July 2017 ICAP registrations					
	2. Performance Factor based on ACL methodology					
	3. The Adjustment Factor captures two different performance derates; 1) Translation Factor (TF) between ACL and CBL values, (TF=0.90); and 2) the Fatigue Factor (FF), (FF = 1.00)					

Assumption Matrix History

Date	Ver	Preliminary Base Case	Date	Ver	Final Base Case
2/1/17	V00	Preliminary assumptions without attachments.	8/22/17	V6.0	Added a BTM-NG resource, reinstated Shoreham GT 3 & 4, removed Copenhagen Wind, reduced output BEC due to 2 of 3 phases projected to be complete. Added "DRAFT" to each page.
3/1/17	V0.1	-BTM solar changed to BTM-NG program – see Page 4.	9/26/17	V7.0	Remove Taylor Biomass from new units. Freeport CT1 rescinded retirement notice (no units scheduled to retire). Typo, page 4. Update attachment B5.
4/3/17	V1.0	-Added draft attachments A and B. -Updated Gold Book load forecasts.	9/29/17	V7.1	Update Topology per letter to TPAS. Return LI interfaces due to retaining Freeport CT1. Update diagram to reflect several CP-8 interfaces. These updates were already captured in the database.
5/23/17	V2.0	-Added column on impacts. -Added attachments C, C1, and E.	10/4/17	V7.2	Fills in October IRM peak load forecast. Updates MARs version number.
6/27/17	V2.1	-Completed Attachments A, E, and F for PBC. -Updated Attachment B4.			
7/7/17	V3.0	-Incorporated ICS comments. -Completed attachments D and F (F contains preliminary values). -Added EA limit description.			
7/10/17	V4.0	-Attachment F values finalized.			
8/2/17	V5.0	-Added Row (page 4) to accommodate solar shape. -Attachment F correction. -Added words indicating EC approved version for PBC. -Removed "DRAFT" watermark from each page.			