

2016-2017 NYCA IRM Requirement Study

IRM Base Case Model Assumptions

Assumption Matrix V06

October xx, 2015

Draft Final Assumptions Matrix approved by NYSRC on October xx, 2015

Load Parameters

#	Parameter	2015 Model Assumptions	2016 Model Assumptions	Basis for Recommendation	Model Change	Possible IRM Impact ¹
1	Peak Load Forecast (Preliminary Base Case – Parametric & Sensitivities)	2014 Gold Book NYCA: 34,066 MW NYC: 12,050 MW LI: 5,543 MW G-J: 16,557 MW	2015 Gold Book NYCA: 33,636 MW NYC: 12,013 MW LI: 5,506 MW G-J: 16,441 MW	Gold Book Forecast is used for Preliminary Base Case parametric study and sensitivity cases	N	Low(-)
2	Peak Load Forecast (Final Base Case)	October 2014 NYCA: 33,587 MW NYC: 11,990 MW LI: 5,522 MW G-J: 16,387 MW	October 2015 NYCA: 33,378 MW NYC: 11,777 MW LI: 5,457 MW G-J: 16,375 MW	Forecast based on examination of 2015 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. Sensitivity with alternate shapes	N	None
4	Load Forecast Uncertainty	(Attachment A)	Zonal Model to reflect current data with input from Con Ed and LIPA. (Attachment A)	No change from last year’s model	N	None

¹ (-) indicates a reduction in IRM while (+) indicates an increase. Range: Low < 0.5%, Medium 0.5% - 1%, High > 1%

Generation Parameters

#	Parameter	2015 Model Assumptions	2016 Model Assumptions	Basis for Recommendation	Model Change	Possible IRM Impact
1	Existing Generating Unit Capacities	2014 Gold Book values. Use min (DMNC vs. CRIS) capacity value	2015 Gold Book values. Use min (DMNC vs. CRIS) capacity value	2015 Gold Book publication	N	Low
2	Proposed New Units (Non-Renewable)	743.0 MW of new or returning non- wind resources (Attachment B)	374.4 MW of new or returning non- wind resources (Attachment B1)	2015 Gold Book publication and generator notifications	N	Low (-)
3	Retirements and Mothballed units	111.7 MW retirements or mothballs reported (Attachment B)	0 MW retirements or mothballs reported (Attachment B2)	Policy 5 guidelines on retirement or mothball disposition in IRM studies.	N	None
4	Forced and Partial Outage Rates	Five-year (2009-2013) GADS data for each unit represented. Those units with less than five years – use representative data.	Five-year (2010-2014) 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 (2010-2014)	N	Med (-)
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	None
6	Summer Maintenance	Nominal 50 MWs – divided equally between upstate and downstate	Nominal 50 MWs – divided equally between upstate and downstate	Review of most recent data	N	None
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	None

#	Parameter	2015 Model Assumptions	2016 Model Assumptions	Basis for Recommendation	Model Change	Possible IRM Impact
8	Existing and Proposed New Wind Units	1457.1 MW Wind Capacity (Attachment B3)	1455.1 MW of qualifying wind for study year (Attachment B3)	Renewable units based on RPS agreements, interconnection Queue, and ICS input.	N	None
9	Wind Shape	Actual hourly plant output of the 2013 calendar year. Summer Peak Hour availability of 14%	Actual hourly plant output of the 2013 calendar year. Summer Peak Hour availability of 14%	Actual hourly plant output of the 2013 calendar year. Summer Peak capacity factor based on 2014 hourly production data: June 1 – Aug 31, hours HB14 – HB18	N	None
10	Solar Resources	31.5 MW of Solar modeled per 2013 production data summer availability factor of 47.3 %.	31.5 MW Solar Capacity per 2014 production data summer availability factor of 38.8 % (Attachment B4)	Actual hourly plant output of the 2014 calendar year. Summer Peak capacity factor based on 2014 hourly production data: June 1 – Aug 31, hours HB14 – HB18	N	Low (+)
11	Small Hydro Resources	Derate by 45%	Derate by 46%	Review of historic unit production.	N	Low(+)
12	Large Hydro	Probabilistic Model based on 30 years of operational data	Probabilistic Model based on 5 years of GADS data	Historical data submitted via GADS	N	Low(-)

Transactions – Imports and Exports

#	Parameter	2015 Model Assumptions	2016 Model Assumptions	Basis for Recommendation	Model Change	Possible IRM Impact
1	Capacity Purchases	Grandfathered amounts: PJM – 1080 MW HQ – 1090 MW All contracts model as equivalent contracts	Existing Rights: PJM – 1080 MW HQ – 1090 MW +20 MW if awarded through Class Year 2015. Total HQ 1110 MW All contracts model as equivalent contracts	Grandfathered Rights, ETCNL, and other awarded long-term rights including 20 MW CRIS potentially awarded to HQUS	N	Low (+)
2	Capacity Sales	Long Term firm sales Summer 281.8 MW	Long Term firm sales Summer 286.6 MW	These are long term federal contracts	N	None
2a	FCM Sales	None Modeled	No Sales within study period	Sensitivity based on Examination of Neighbor’s FCM auction results	N	None
3	New UDRs	No new UDR projects	No new UDR projects	Existing UDR elections are made by August 1 st and will be incorporated into the model	N	None

Topology

#	Parameter	2015 Model Assumptions	2016 Model Assumptions	Basis for Recommendation	Model Change	Possible IRM Impact
1	Interface Limits	All changes reviewed and commented on by TPAS	All changes reviewed and commented on by TPAS (Attachment E)	Based on 2015: Operating Study, Operations Engineering Voltage Studies, Comprehensive Planning Process, and additional analysis including interregional planning initiatives	N	
2	New Transmission	None Identified	Transmission Owner Transmission Solutions (TOTS)	Based on TO provided models and NYISO review	N	Low (-)*
3	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	Based on TO analysis	N	

- This assumes a small impact on IRM values. The impacts on LCRs are most likely larger.

Emergency Operating Procedures

#	Parameter	2015 Model Assumptions	2016 Model Assumptions	Basis for Recommendation	Model Change	Possible IRM Impact
1	Special Case Resources	July 2014 – 1132 MW based on registrations and modeled as 742 MW of effective capacity. Monthly variation based on historical experience (no Limit on number of calls)	July 2015 –1254 MW based on registrations and modeled as 961 MW of effective capacity. Monthly variation based on historical experience (no Limit on number of calls)*	Those sold for the program discounted to historic availability. Summer values calculated from July 2015 registrations (Attachment F)	N	Low(-) as currently shown
2	EDRP Resources	July 2014 86 MW registered model as 14 MW in July and proportional to monthly peak load in other months. Limit to five calls per month	July 2015 75 MW registered modeled as 12 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 2015 registrations and forecast growth.	N	Low (+)
3	Other EOPs	713 MW of non-SCR/non-EDRP resources	671 MW of non-SCR/non-EDRP resources (Attachment D)	Based on TO information, measured data, and NYISO forecasts	N	Low(+)

- The number of SCR calls is limited to 5/month when calculating LOLE based on all 8760 hours.

External Control Areas

#	Parameter	2015 Model Assumptions	2016 Model Assumptions	Basis for Recommendation	Model Change	Possible IRM Impact
1	PJM	<p>Load and Capacity data provided by PJM/NPCC CP-8</p> <p>Data may be adjusted per NYSRC Policy 5</p> <p>Include PJM Annual & Extended Demand Response Program MW [Extended: 4112 MW: Annual: 1505 MW: Total MW: 5617]</p>	<p>Load and Capacity data provided by PJM/NPCC CP-8</p> <p>Data may be adjusted per NYSRC Policy 5</p> <p>Include PJM Annual & Extended Demand Response Program MW [Extended 1119 MW: Annual: xxMW: Total MW: 1890], if needed per policy 5</p> <p>4 zone model See (Attachment E)</p>	<p>Initial review performed by the NPCC CP-8 WG prior to Policy 5 changes. White paper on external EOPs</p>	TBD	Low(-)
2	ISONE	<p>Load and Capacity data provided by ISONE/NPCC CP-8</p> <p>Data may be adjusted per NYSRC Policy 5</p>	<p>Load and Capacity data provided by ISONE/NPCC CP-8</p> <p>Data may be adjusted per NYSRC Policy 5 (See Attachment E)</p>	<p>Initial review performed by the NPCC CP-8 WG prior to Policy 5 changes.</p>	N	unknown
3	HQ	<p>Load and Capacity data provided by HQ/NPCC CP-8</p> <p>Data may be adjusted per NYSRC Policy 5</p>	<p>Load and Capacity data provided by HQ/NPCC CP-8</p> <p>Data may be adjusted per NYSRC Policy 5 (Attachment E)</p>	<p>Initial review performed by the NPCC CP-8 WG prior to Policy 5 changes.</p>	N	unknown

#	Parameter	2015 Model Assumptions	2016 Model Assumptions	Basis for Recommendation	Model Change	Possible IRM Impact
4	IESO	Load and Capacity data provided by IESO/NPCC CP-8 data may be adjusted per NYSRC Policy 5	Load and Capacity data provided by IESO/NPCC CP-8 data may be adjusted per NYSRC Policy 5 See (Attachment E)	Initial review performed by the NPCC CP-8 WG prior to Policy 5 changes.	N	unknown
5	Reserve Sharing	All NPCC Control Areas and PJM interconnection indicate that they will share reserves equally among all members	All NPCC Control Areas and PJM interconnection indicate that they will share reserves equally among all members	Per NPCC CP-8 WG	N	unknown

Miscellaneous

#	Parameter	2015 Model Assumptions	2016 Model Assumptions	Basis for Recommendation	Model Change	Possible IRM Impact
1	MARS Model Version	Version 3.18	Version 3.18	Per benchmark testing and ICS recommendation	N	None
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	None

Attachment A

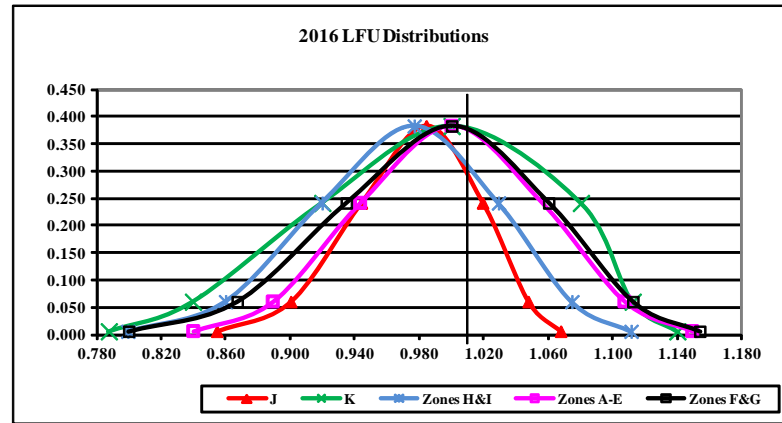
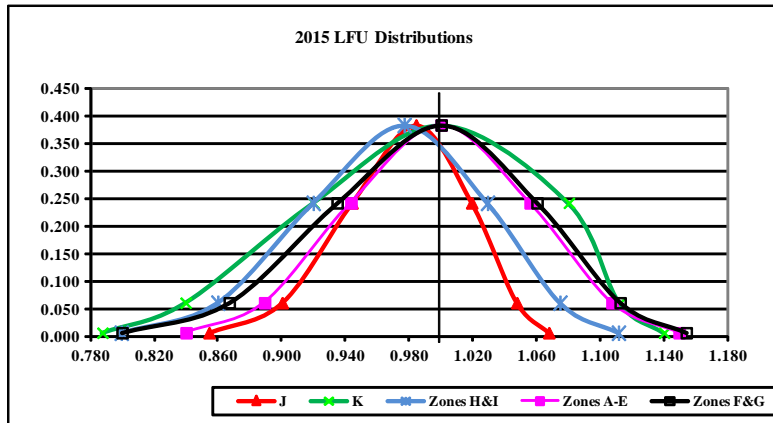
NYCA Load Forecast Uncertainty Model

2015 and 2016 LFU Models

<u>2015 Load Forecast Uncertainty Models</u>					
<u>Multiplier</u>	<u>Zones A-E</u>	<u>Zones F&G</u>	<u>Zones H&I</u>	<u>Con Ed (J)</u>	<u>LIPA (K)</u>
0.0062	0.8399	0.7997	0.7992	0.8543	0.7874
0.0606	0.8892	0.8670	0.8598	0.9002	0.8396
0.2417	0.9434	0.9347	0.9197	0.9440	0.9198
0.3830	1.0000	1.0000	0.9768	0.9842	1.0000
0.2417	1.0559	1.0602	1.0291	1.0192	1.0802
0.0606	1.1073	1.1124	1.0746	1.0475	1.1123
0.0062	1.1494	1.1539	1.1113	1.0676	1.1400

<u>2016 Load Forecast Uncertainty Models</u>					
<u>Multiplier</u>	<u>Zones A-E</u>	<u>Zones F&G</u>	<u>Zones H&I</u>	<u>Con Ed (J)</u>	<u>LIPA (K)</u>
0.0062	0.8399	0.7997	0.7992	0.8543	0.7874
0.0606	0.8892	0.8670	0.8598	0.9002	0.8396
0.2417	0.9434	0.9347	0.9197	0.9440	0.9198
0.3830	1.0000	1.0000	0.9768	0.9842	1.0000
0.2417	1.0559	1.0602	1.0291	1.0192	1.0802
0.0606	1.1073	1.1124	1.0746	1.0475	1.1123
0.0062	1.1494	1.1539	1.1113	1.0676	1.1400

2016 LFU remains unchanged from the 2015 LFU forecast



Attachment B

New and Retiring Generating Units

B1 - Proposed Thermal Units					
Project or Generator Name	Zone	In Service Date	CRIS (MW)	Summer Capability (MW)	MARS Model (MW)
Bowline 2 rerate	G	Summer 2015	557.40	374.40	374.40
Total New Units			557.40	374.40	374.40

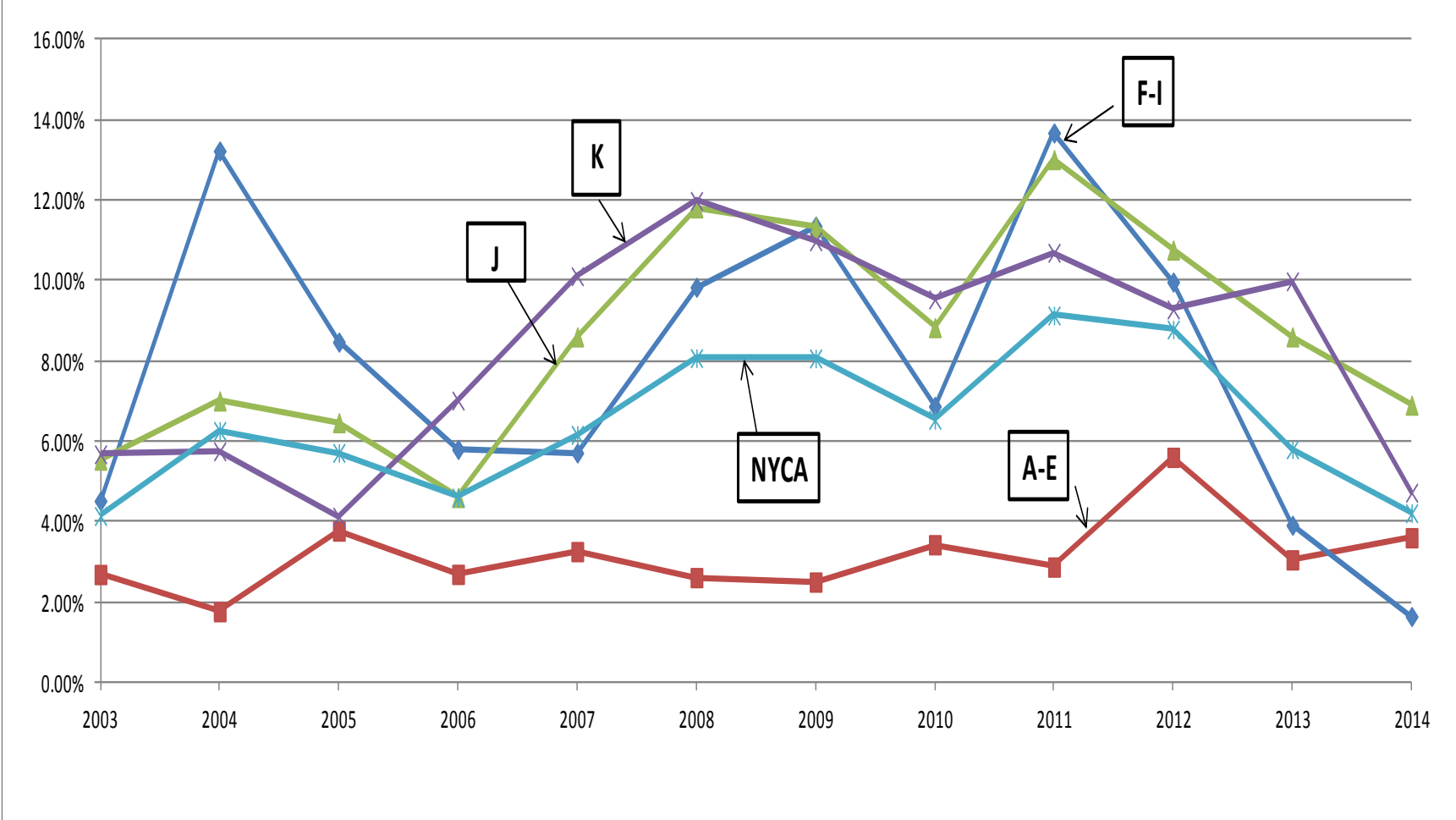
B2 - Retired or Mothballed Units					
Generator Name	Zone	Retire Date	CRIS (MW)	Summer Capability (MW)	MARS Model (MW)
None					
Total Retirements			0.00	0.00	0.00

B3 - Wind Resources					
Wind Resource	Zone	In Service Date	CRIS (MW)	Summer Capability (MW)	MARS Model (MW)
ICAP Participating Wind Units					
Altona Wind Power	D	09/23/2008	97.50	97.50	97.50
Bliss Wind Power	A	03/20/2008	100.50	100.50	100.50
Canandaigua Wind Power	C	12/05/2008	125.00	125.00	125.00
Chateaugay Wind Power	D	10/07/2008	106.50	106.50	106.50
Clinton Wind Power	D	04/09/2008	100.50	100.50	100.50
Ellenburg Wind Power	D	03/31/2008	81.00	81.00	81.00
Hardscrabble Wind	E	02/01/2011	74.00	74.00	74.00
High Sheldon Wind Farm	C	02/01/2009	112.50	112.50	112.50
Howard Wind	C	12/01/2011	57.40	55.40	55.40
Madison Wind Power	E	09/01/2000	11.50	11.60	11.50
Maple Ridge Wind 1	E	01/01/2006	231.00	231.00	231.00
Maple Ridge Wind 2	E	12/01/2007	90.70	90.80	90.70
Munnsville Wind Power	E	08/20/2007	34.50	34.50	34.50
Orangeville Wind Farm	C	12/01/2013	88.50	93.90	88.50
Steel Wind	A	01/23/2007	20.00	20.00	20.00
Wethersfield Wind Power	C	12/11/2008	126.00	126.00	126.00
		Totals	1457.10	1460.70	1455.10
Non - ICAP Participating Wind Units (Nameplate Capacity)					
Erie Wind		02/01/2012	0.00	15.00	0.00
Fenner Wind Farm		12/01/2001	0.00	30.00	0.00
Marble River		07/01/2012	0.00	215.50	0.00
Marsh Hill Energy Wind Farm		12/01/2014	0.00	16.20	0.00
Western NY Wind Power		10/01/2000	0.00	6.60	0.00
		Totals	0.00	283.30	0.00
Proposed IRM Study Wind Units					
		Totals	0.00	0.00	0.00
Total Wind Resources		Totals	1457.10	1744.00	1455.10

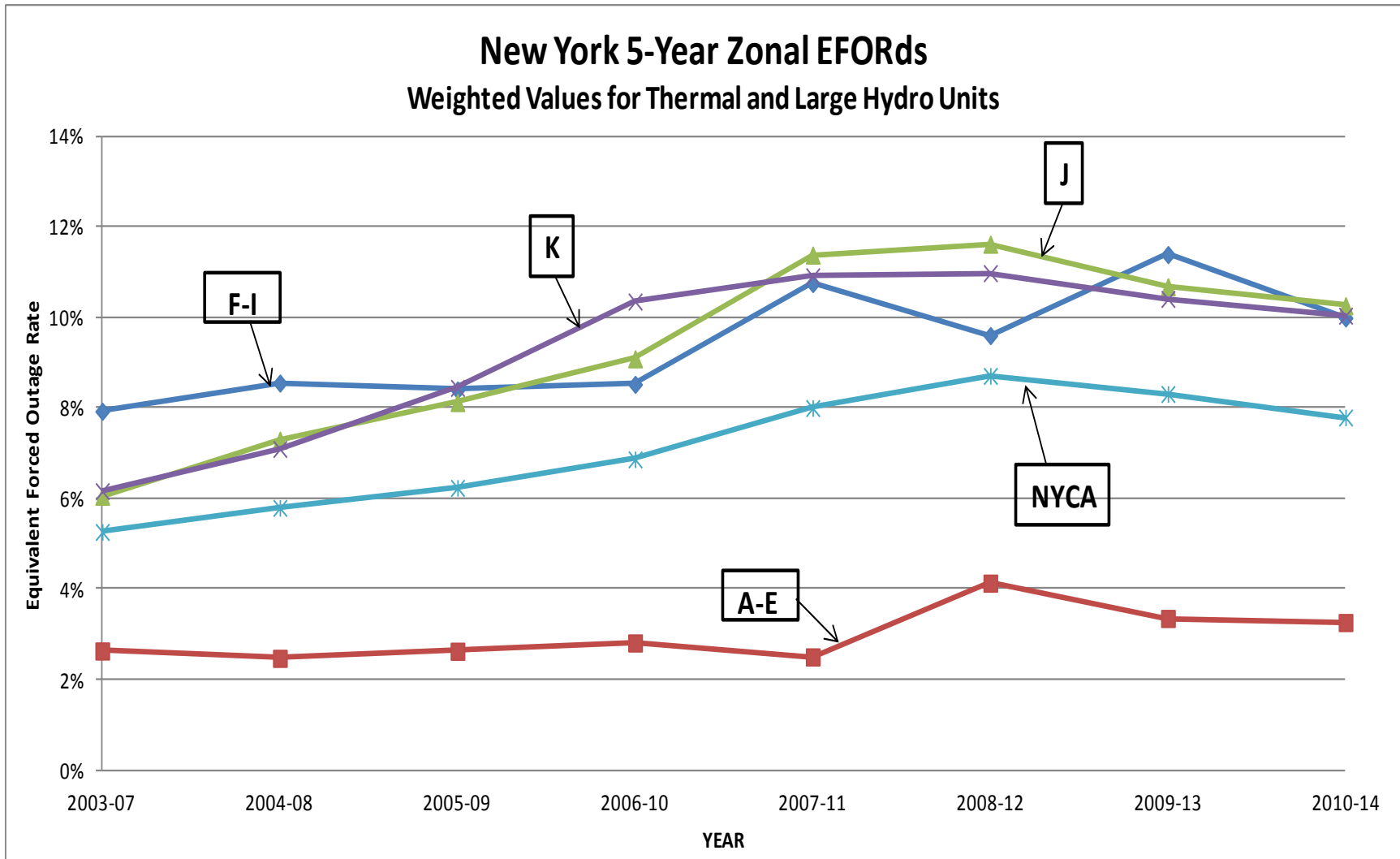
B4 - Solar Resources					
Wind Resource	Zone	In Service Date	CRIS (MW)	Summer Capability (MW)	MARS Model (MW)
ICAP Participating Solar Units					
Long Island Solar	K	11/01/2011	31.50	31.50	31.50
		Totals	31.50	31.50	31.50
Proposed IRM Study Solar Units					
		Totals	0.00	0.00	0.00
Total Solar Resources		Totals	31.50	31.50	31.50

Attachment C

New York Annual Zonal EFORDs Weighted Values for Thermal and Large Hydro Units



Attachment C1



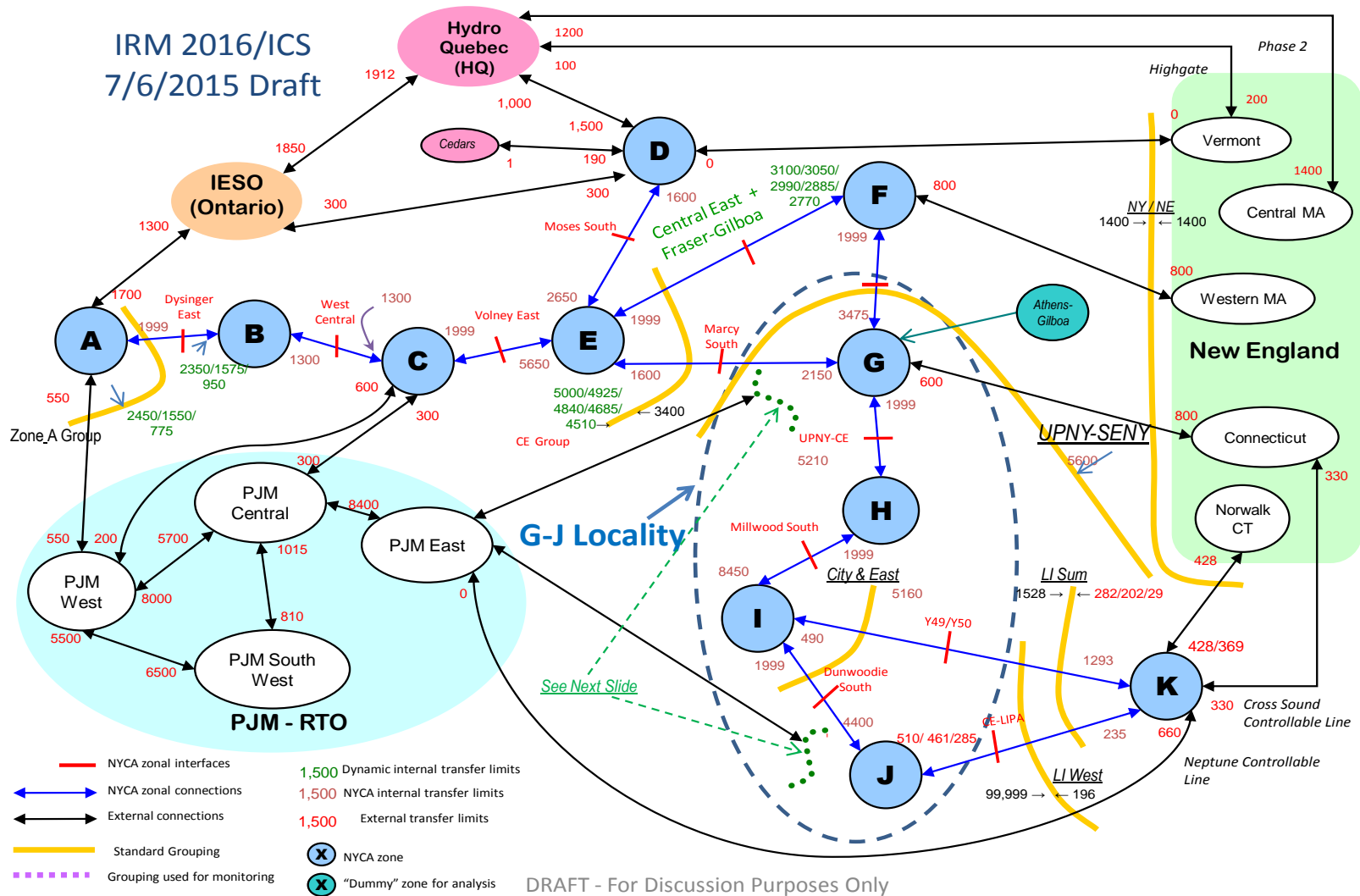
Attachment D

Emergency Operating Procedures

Step	Procedure	Effect	2015 MW Value	2016 MW Value
1	Special Case Resources	Load relief	1132 MW Enrolled/742 MW modeled	1254 MW Enrolled/ 961 MW modeled
/ 2	Emergency Demand Response Program	Load relief	86 MW Enrolled/14 MW Modeled	75 MW Enrolled/12 MW Modeled
3	5% manual voltage Reduction	Load relief	62 MW	65 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	441 MW	376 MW
6	Voluntary industrial curtailment	Load relief	122 MW	142 MW
7	General public appeals	Load relief	88 MW	88 MW
8	Emergency Purchases	Increase capacity	Varies	Varies
9	Ten-minute reserve to zero	Allow 10-minute reserve to decrease to zero	1310 MW	1310 MW
10	Customer disconnections	Load relief	As needed	As needed

Attachment E

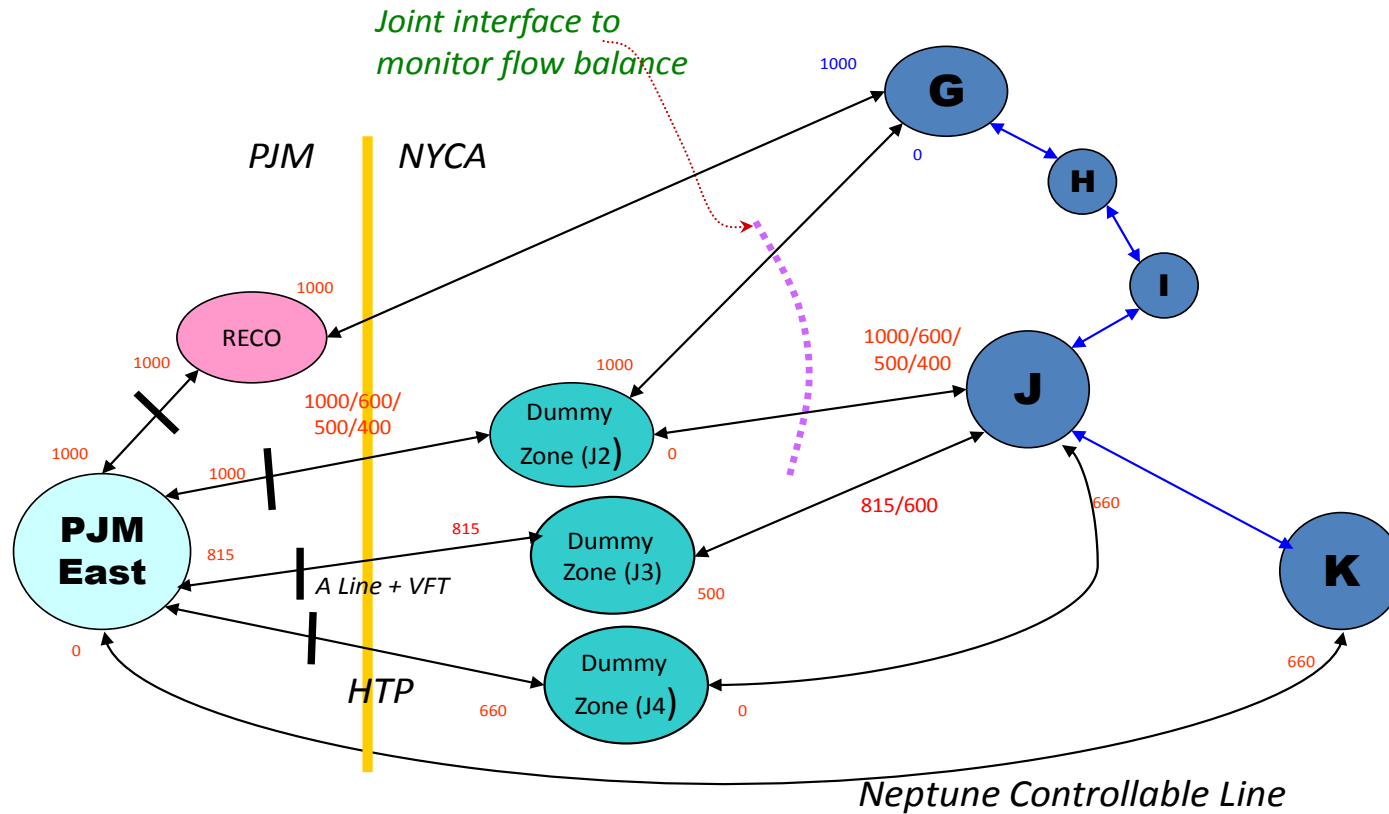
Transmission System Representation for Year 2016 - Summer Emergency Ratings (MW)



Attachment E1

Transmission System Representation for Year 2016 - Summer Emergency Ratings (MW)

PJM-SENY MARS Model
5/26/2015



$$(PJM\ East\ to\ RECO) + (PJM\ East\ to\ J2) + (PJM\ East\ to\ J3) + (PJM\ East\ to\ J4) = 3075\ MW$$

DRAFT - For Discussion Purposes Only

Attachment F
SCR Determinations

SCR Performance

	A	B	C	D	E	F
		=A*(100%)		=B*C		=D*E
	July 2015	2016	Performance	2016	Translation	In Model
C	<u>Registrations</u>	<u>Forecast</u>¹	<u>Factor</u>²	<u>UCAP</u>	<u>Factor</u>³	<u>Value</u>
A-F	719.1	719.1	0.9357	672.9	0.855	575.3
G-I	80.6	80.6	0.8783	70.8	0.855	60.5
J	386.1	386.1	0.8415	324.9	0.855	277.8
K	68.1	68.1	0.8115	55.3	0.855	47.3
Total	1253.9	1253.9		1123.8		960.9

1. These values represent no growth from July 2015 ICAP based registrations.
2. Based on ACL
3. This SCR Derate factor captures three different performance derates. These are; 1) the translation factor between ACL and CBL values (=0.90), 2) the Effective Capacity Value (ECU)(=0.95), and 3) the fatigue factor (=1.00).

Assumption Matrix History

Date	Version	Preliminary Base Case	Final Base Case
February 4, 2015	V0	Initial Assumptions	
February 13, 2015	V1	Changes from ICS 2/4 mtg.	
June 3, 2015	V2	Added attachment A; filled Added attachment B1 – B4; structure Added attachment D; structure, Update Tables B1 – B4, Added attachment E and E1; draft	
July 1, 2015	V3	Added attachment F; filled Updated attachment D; filled Updated attachment B; filled Updated attachment C & C1; filled Updated attachment E: 2 PJM interface updates	
July 5, 2015	V3.2	Updated changes from 7/1 ICS meeting Updated Topology, Updated Attachment F to show two scenarios, filled some possible impacts	
July 6, 2015	V3.3	Updated Impacts	
July 6, 2015	V3.4	Removed bubbles showing topology changes	
July 14, 2015	V4.0	Changed K to J limit from 530 to 490 MW// Added NYSRC “approval date” and “ICS work Product”//Removed attachment F alternate approach//corrected Small Hydro derate typo. These changes were approved by NYSRC on 7/10.	
August 4, 2015	V5.0	Changed SCR reference from 860 to 961 MW	
August 10, 2015	V5.1	Updated Attachment C1- 5 year EFORds	