2016 RNA: Preliminary Results

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KCC

DRAFT – FOR DISCUSSION PURPOSES ONLY

Background and Process

- **This presentation summarizes the 2016 RNA preliminary *("1st pass")* Base Case results.**
  - ***Note: No scenarios results complete at this time.***
- **The objective of providing the stakeholders the preliminary *("1st pass")* Reliability Needs (RN) is to identify potential needs early and to encourage stakeholder feedback regarding firm changes prior to the final *("2nd pass")* assessment.**

Background and Process, cont.

- **In finalizing the RN, system changes that have occurred since the May 1, 2016 initial lock-down date will be considered, such as:**
  - ***Updated LTPs that may impact the RN, changes in BPTFs, and changes in resources (unit status, load forecast, and demand response).***
- **Notes on the "*2nd pass*" updates process:**
  - ***The new lock-down date is Tuesday, July 5, 2016.***
  - ***The NYISO will apply the inclusion rules on the updates in order to develop a final Base Case***
- **In parallel, the scenarios will be finalized based on the original Base Cases.**

2016 RNA Assumptions:
GB2016 Baseline Load Forecast

Forecast of Coincident Summer Peak Demand by Zone – MW

(Reflects Impacts of Energy Saving Programs & Behind -the -Meter Generation)

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2016	2,680	1,992	2,810	535	1,352	2,376	2,290	656	1,536	11,695	5,438	33,360
2017	2,684	1,997	2,828	543	1,358	2,391	2,293	656	1,536	11,696	5,381	33,363
2018	2,688	2,003	2,841	551	1,363	2,398	2,293	658	1,538	11,717	5,354	33,404
2019	2,692	2,006	2,855	554	1,367	2,404	2,291	660	1,544	11,756	5,348	33,477
2020	2,695	2,009	2,867	555	1,371	2,409	2,290	660	1,545	11,760	5,340	33,501
2021	2,697	2,011	2,874	555	1,374	2,414	2,294	660	1,545	11,761	5,370	33,555
2022	2,700	2,013	2,880	555	1,377	2,419	2,299	660	1,548	11,785	5,414	33,650
2023	2,702	2,015	2,886	555	1,379	2,423	2,304	662	1,551	11,807	5,464	33,748
2024	2,704	2,017	2,891	555	1,382	2,426	2,309	665	1,553	11,830	5,501	33,833
2025	2,706	2,018	2,896	555	1,384	2,430	2,314	665	1,557	11,851	5,550	33,926
2026	2,708	2,019	2,901	555	1,386	2,433	2,320	668	1,564	11,907	5,595	34,056

2016 RNA Assumptions:
GB2016 Baseline Solar PV BTM Impacts

Forecast of Reductions in Coincident Summer Peak Demand by Zone - MW

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2016	10	6	15	2	9	31	30	3	6	25	121	258
2017	14	7	20	2	13	41	37	5	8	43	173	363
2018	16	10	24	2	14	47	46	5	10	52	195	421
2019	18	12	28	3	16	52	54	5	11	62	210	471
2020	21	15	33	3	18	57	63	5	12	69	222	518
2021	24	18	37	4	20	62	71	7	13	78	231	565
2022	27	21	41	4	23	66	80	7	14	89	234	606
2023	30	24	45	4	25	69	87	7	16	101	237	645
2024	32	27	48	5	26	72	93	7	18	114	240	682
2025	34	29	51	5	28	74	98	10	20	128	243	720
2026	36	31	53	5	29	75	101	10	21	139	247	747

Note: The actual impact of solar PV varies considerably by hour of day. The hour of the NYCA coincident peak varies yearly. The solar PV peak impact reported here assumes that the NYCA coincident peak occurs from 4 pm to 5 pm EDT in late July.

2016 RNA Assumptions: GB2016 Baseline Load Forecast without Solar PV BTM Impacts

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2016	2,690	1,998	2,825	537	1,361	2,407	2,320	659	1,542	11,720	5,559	33,618
2017	2,698	2,004	2,848	545	1,371	2,432	2,330	661	1,544	11,739	5,554	33,726
2018	2,704	2,013	2,865	553	1,377	2,445	2,339	663	1,548	11,769	5,549	33,825
2019	2,710	2,018	2,883	557	1,383	2,456	2,345	665	1,555	11,818	5,558	33,948
2020	2,716	2,024	2,900	558	1,389	2,466	2,353	665	1,557	11,829	5,562	34,019
2021	2,721	2,029	2,911	559	1,394	2,476	2,365	667	1,558	11,839	5,601	34,120
2022	2,727	2,034	2,921	559	1,400	2,485	2,379	667	1,562	11,874	5,648	34,256
2023	2,732	2,039	2,931	559	1,404	2,492	2,391	669	1,567	11,908	5,701	34,393
2024	2,736	2,044	2,939	560	1,408	2,498	2,402	672	1,571	11,944	5,741	34,515
2025	2,740	2,047	2,947	560	1,412	2,504	2,412	675	1,577	11,979	5,793	34,646
2026	2,744	2,050	2,954	560	1,415	2,508	2,421	678	1,585	12,046	5,842	34,803

2016 vs 2014 RNA: Baseline Load Comparison

Comparison of Baseline NYCA Coincident Peak Forecasts - 2014 & 2016 RNA (MW)

Annual MW	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
2014 RNA Baseline Load	33,666	34,066	34,412	34,766	35,111	35,454	35,656	35,890	36,127	36,369	36,580		
2016 RNA Baseline Load			33,360	33,363	33,404	33,477	33,501	33,555	33,650	33,748	33,833	33,926	34,056
Change from 2014 RNA			**-1,052**	**-1,403**	**-1,707**	**-1,977**	**-2,155**	**-2,335**	**-2,477**	**-2,621**	**-2,747**	NA	NA

2016 RNA: Transmission Additions

- **Major firm transmission projects modeled in the 2016 RNA Base Case:**

Owner	Major Proposed Transmission Project	2016 RNA: I/S Year	2016 RNA Status	2014 RNA Status
NYPA/RGE	Station 255	2019/2020	I/S	I/S
NYPA/NYSEG/O&R/ConEd	TOTS *(except ConEd's cooling project)*	2016	I/S	I/S
O&R/ConEd	North Rockland	2018	I/S	O/S
Central Hudson	Leeds-Hurley 345kV Series Compensation	2018	I/S	O/S
National Grid	Packard Series Reactors	2016 (I/S)	I/S	O/S
RGE	Station 80/Pannell ("GRTA")	2017	I/S	I/S
ConEd	345 kV Rainey - 138 kV Corona PAR	2019	I/S	O/S

2016 RNA: Deactivations

OWNER / OPERATOR	STATION UNIT	ZONE	CRIS	2016 RNA Status	2014 RNA/CRP status
Erie Blvd. Hydro - Seneca Oswego	Seneca Oswego Fulton 1	C	0.7	O/S	O/S
Erie Blvd. Hydro - Seneca Oswego	Seneca Oswego Fulton 2	C	0.3	O/S	O/S
Long Island Power Authority	Montauk Units #2, #3, #4	K	6.0	O/S	O/S
NRG Power Marketing LLC	Dunkirk 1	A	**96.2**	**O/S**	I/S
NRG Power Marketing LLC	Dunkirk 3	A	**201.4**	**O/S**	I/S
NRG Power Marketing LLC	Dunkirk 4	A	**199.1**	**O/S**	I/S
ReEnergy Chateaugay LLC	Chateaugay Power	D	18.6	O/S	O/S
Rochester Gas and Electric Corp.	Station 9	B	15.8	O/S	O/S
Syracuse Energy Corporation	Syracuse Energy ST1	C	11.0	O/S	O/S
Syracuse Energy Corporation	Syracuse Energy ST2	C	58.9	O/S	O/S
TC Ravenswood, LLC	Ravenswood 07	J	16.5	O/S	O/S
TC Ravenswood, LLC	Ravenswood 3-3	J	37.7	O/S	O/S
Erie Blvd. Hydro - North Salmon	Hogansburg	D	**0.3**	**O/S**	I/S
Niagara Generation LLC	Niagara Bio-Gen	A	**50.5**	**O/S**	I/S
NRG Power Marketing LLC	Astoria GT 05	J	**16.0**	**O/S**	I/S
NRG Power Marketing LLC	Astoria GT 07	J	**15.5**	**O/S**	I/S
NRG Power Marketing LLC	Astoria GT 12	J	**22.7**	**O/S**	I/S
NRG Power Marketing LLC	Astoria GT 13	J	**24.0**	**O/S**	I/S
NRG Power Marketing LLC	Dunkirk 2	A	97.2	**O/S**	O/S starting May 2015
NRG Power Marketing LLC	Huntley 67	A	**196.5**	**O/S**	I/S
NRG Power Marketing LLC	Huntley 68	A	**198.0**	**O/S**	I/S
Cayuga Operating Company, LLC	Cayuga 1	C	154.1	O/S starting July 1, 2017	O/S starting July 1, 2017
Cayuga Operating Company, LLC	Cayuga 2	C	154.7	O/S starting July 1, 2017	O/S starting July 1, 2017
Entergy Nuclear Power Marketing LLC	Fitzpatrick 1	C	**858.9**	**O/S**	I/S
R.E. Ginna Nuclear Power Plant, LLC	Ginna	B	**582.0**	**O/S**	I/S
NRG Power Marketing LLC	Astoria GT 08	J	**15.3**	**O/S**	I/S
NRG Power Marketing LLC	Astoria GT 10	J	**24.9**	**O/S**	I/S
NRG Power Marketing LLC	Astoria GT 11	J	**23.6**	**O/S**	I/S
TC Ravenswood, LLC	Ravenswood 04	J	**15.2**	**O/S**	I/S
TC Ravenswood, LLC	Ravenswood 05	J	**15.7**	**O/S**	I/S
TC Ravenswood, LLC	Ravenswood 06	J	**16.7**	**O/S**	I/S
		Total	3,144		
	New deactivations from 2014 RNA		**2,573**		

2016 RNA: Generation Additions

Project Name	**Zone**	**Requested CRIS MW**	**Summer Peak MW**	***Min (CRIS, SummerPeak)***	**2016 RNA** *(1st year of Base Case inclusion)*	**2014 RNA** Status
CPV Valley Energy Center	**G**	680	677.6	677.6	2018	O/S
Taylor Biomass	G	19	19	19	2018	**I/S**
Copenhagen Wind	E	79.9	79.9	79.9	2018	O/S
East River 1 Uprate	J	12.1	12.1	12.1	2017	O/S
East River 1 Uprate	J	12.1	12.1	12.1	2017	O/S
Black Oak Wind	C	0	12.5	0	2017	O/S
Sithe Independence Uprate	C	43	43	43	2017	O/S
Marble River Wind	D	215.2	215.2	215.2	2017	O/S
HQ-US *(External CRIS Rights)*	E	20	20	20	2017	O/S
Stony Creek Uprate	C	5.9	5.9	5.9	2017	O/S
Bowline 2 Uprate	G	10	10	10	2017	O/S
	Total	**1,097**	**1,107**	**1,095**		
	Additions from 2014 RNA	**1,078**	**1,088**	**1,076**		

2016 RNA: Load and Capacity Table

	Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
	Peak Load (MW) - Table I-2a GB 2016										
	NYCA*	33,363	33,404	33,477	33,501	33,555	33,650	33,748	33,833	33,926	34,056
	Zone J*	11,696	11,717	11,756	11,760	11,761	11,785	11,807	11,830	11,851	11,907
	Zone K*	5,381	5,354	5,348	5,340	5,370	5,414	5,464	5,501	5,550	5,595
	Zone G-J	16,181	16,206	16,251	16,255	16,260	16,292	16,324	16,357	16,387	16,459
	Resources (MW)										
NYCA	Capacity**	36,867	37,644	37,644	37,644	37,644	37,644	37,644	37,644	37,644	37,644
	Net Purchases & Sales	1,849	1,584	1,593	2,255	2,255	2,255	2,255	2,255	2,255	2,255
	SCR	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248	1,248
	Total Resources	**39,965**	**40,476**	**40,485**	**41,147**	**41,147**	**41,147**	**41,147**	**41,147**	**41,147**	**41,147**
	Capacity/Load Ratio	110.5%	112.7%	112.4%	112.4%	112.2%	111.9%	111.5%	111.3%	111.0%	110.5%
	Cap+NetPurch/Load Ratio	116.0%	117.4%	117.2%	119.1%	118.9%	118.6%	118.2%	117.9%	117.6%	117.2%
	Cap+NetPurch+SCR/Load Ratio	119.8%	121.2%	120.9%	122.8%	122.6%	122.3%	121.9%	121.6%	121.3%	120.8%
Zone J	Capacity**	9,554	9,554	9,554	9,554	9,554	9,554	9,554	9,554	9,554	9,554
	UDR Awarded	975	975	975	975	975	975	975	975	975	975
	SCR	384	384	384	384	384	384	384	384	384	384
	Total Resources	**10,913**	**10,913**	**10,913**	**10,913**	**10,913**	**10,913**	**10,913**	**10,913**	**10,913**	**10,913**
	Capacity/Load Ratio	81.7%	81.5%	81.3%	81.2%	81.2%	81.1%	80.9%	80.8%	80.6%	80.2%
	Cap+UDR/Load Ratio	90.0%	89.9%	89.6%	89.5%	89.5%	89.3%	89.2%	89.0%	88.8%	88.4%
	Cap+UDR+SCR/Load Ratio	93.3%	93.1%	92.8%	92.8%	92.8%	92.6%	92.4%	92.2%	92.1%	91.7%
Zone K	Capacity**	5,287	5,287	5,287	5,287	5,287	5,287	5,287	5,287	5,287	5,287
	UDR Awarded	990	990	990	990	990	990	990	990	990	990
	SCR	67	67	67	67	67	67	67	67	67	67
	Total Resources	**6,343**	**6,343**	**6,343**	**6,343**	**6,343**	**6,343**	**6,343**	**6,343**	**6,343**	**6,343**
	Capacity/Load Ratio	98.2%	98.7%	98.9%	99.0%	98.4%	97.6%	96.8%	96.1%	95.3%	94.5%
	Cap+UDR/Load Ratio	116.6%	117.2%	117.4%	117.5%	116.9%	115.9%	114.9%	114.1%	113.1%	112.2%
	Cap+UDR+SCR/Load Ratio	117.9%	118.5%	118.6%	118.8%	118.1%	117.2%	116.1%	115.3%	114.3%	113.4%
Zone G-J	Capacity**	14,659	15,356	15,356	15,356	15,356	15,356	15,356	15,356	15,356	15,356
	UDR Awarded	975	975	975	975	975	975	975	975	975	975
	SCR	464	464	464	464	464	464	464	464	464	464
	Total Resources	16,099	16,795	16,795	16,795	16,795	16,795	16,795	16,795	16,795	16,795
	Capacity/Load Ratio	90.6%	94.8%	94.5%	94.5%	94.4%	94.3%	94.1%	93.9%	93.7%	93.3%
	Cap+UDR/Load Ratio	96.6%	100.8%	100.5%	100.5%	100.4%	100.2%	100.0%	99.8%	99.7%	99.2%
	Cap+UDR+SCR/Load Ratio	99.5%	103.6%	103.3%	103.3%	103.3%	103.1%	102.9%	102.7%	102.5%	102.0%

*NYCA load values represent baseline coincident summer peak demand. 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, reratings, 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 include the awarded UDRs for those capacity zones.

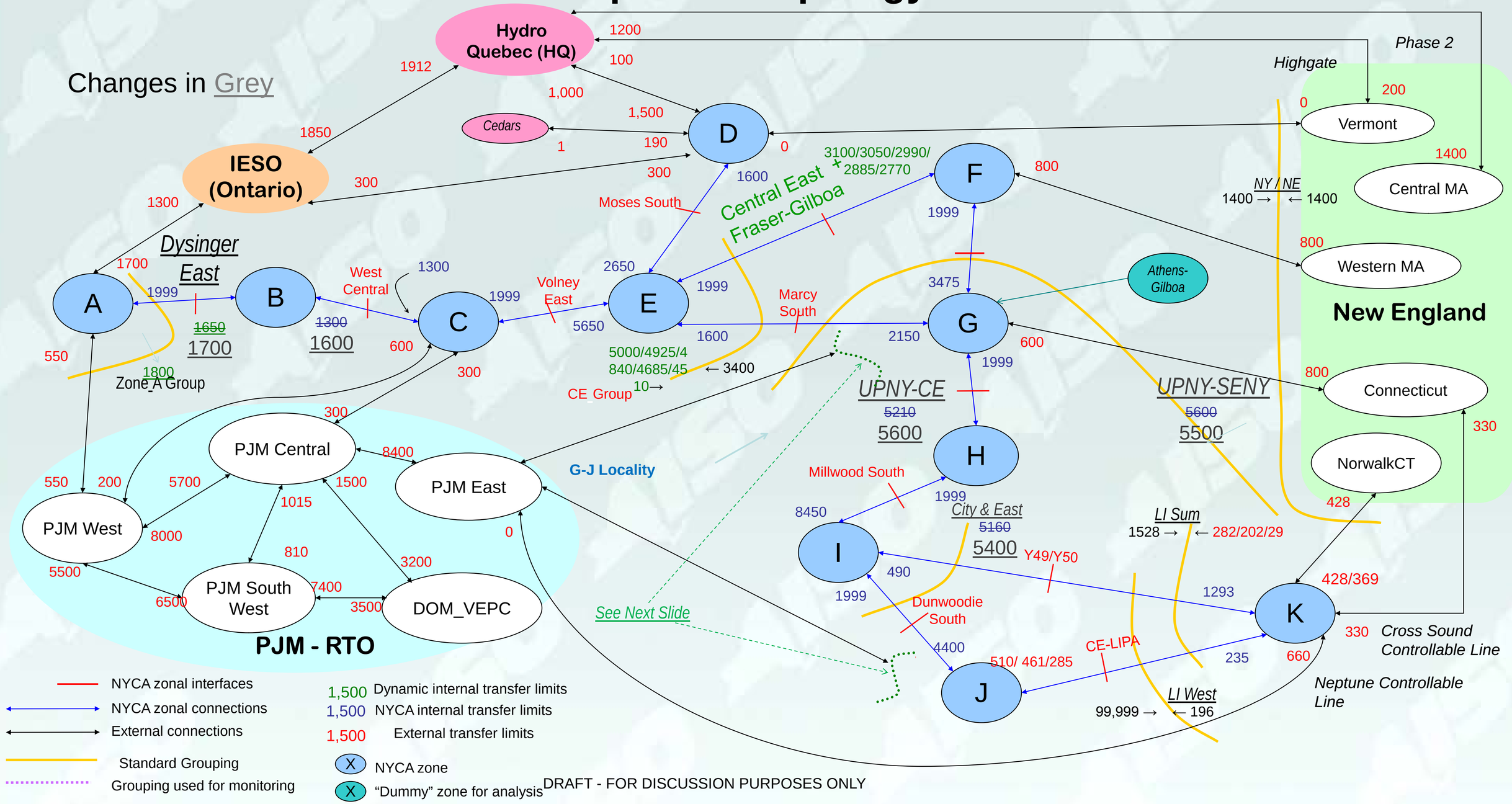
2016 RNA: Load and Resources Comparison for Year 5 (2021)

Year 2021	2016 RNA	2014 RNA	Delta
Baseline Load	33,555	35,890	-2,335
SCR	1,248	1,189	59
Total Capacity without SCRs	39,899	39,322	577
Net Change in Capacity less Load (MW)			**2,971**

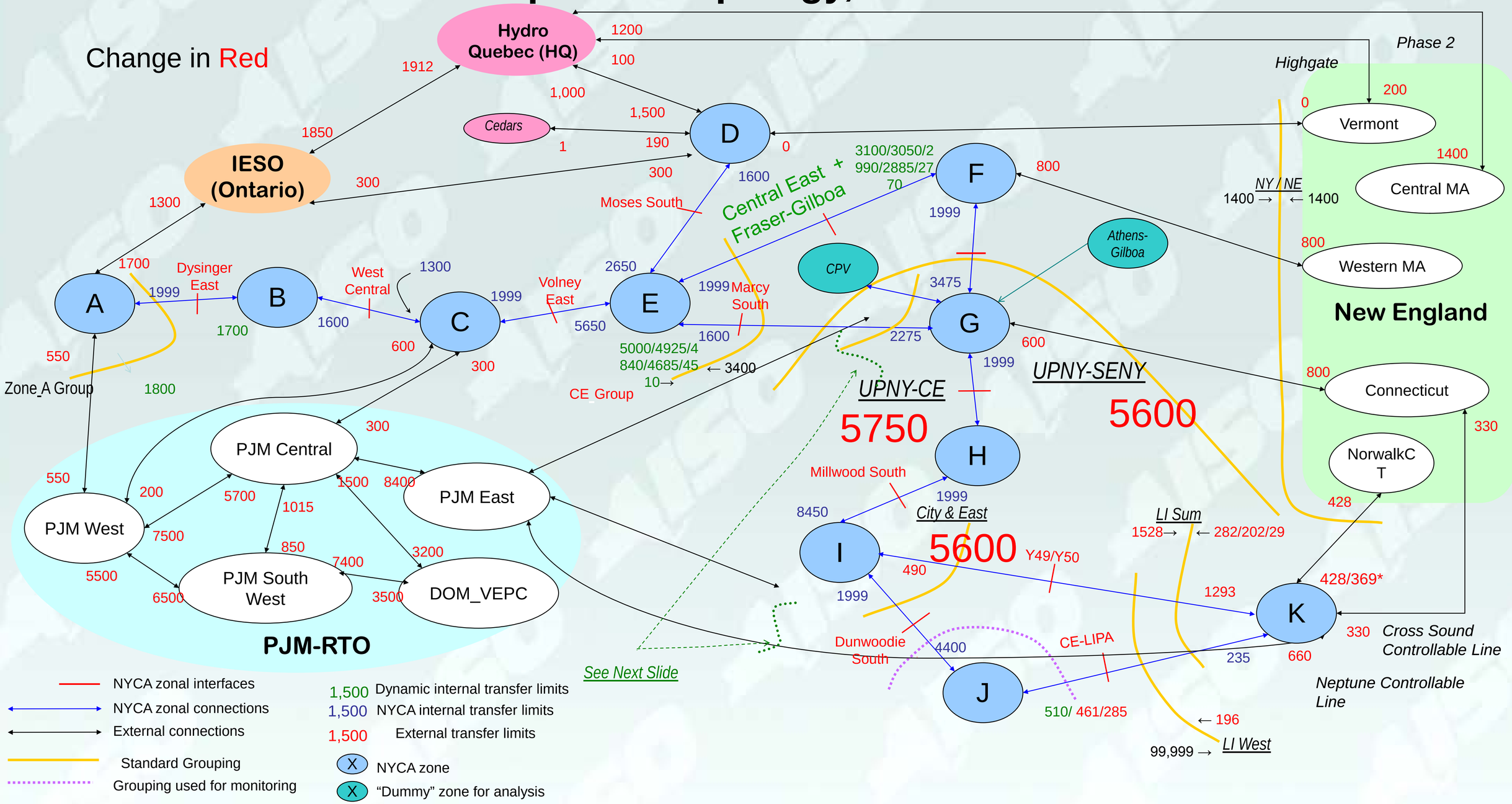
2016 RNA: Resource Adequacy (RA) Updates to Assumptions Matrix

#	Parameter	2016 IRM Model Assumptions	2017 IRM Model Assumptions	Basis for IRM Recommendation	2016 RNA Assumptions
Transaction - Imports / Exports					
1	Capacity Purchases	Existing Rights: PJM – 1080 MW HQ – 1090 MW +20 MW if awarded through Class Year 2015. Total HQ 1110 MW All contracts modeled as equivalent contracts	Grandfathered amounts: PJM – 1080 MW HQ – 1090 MW HQ TO 1110 MW All contracts modeled as equivalent contracts	Grandfathered Rights, ETCNL, and other awarded long-term rights including 20 MW CRIS potentially awarded to HQUS	Modeled as explicit contracts
2	Capacity Sales	Long Term firm sales Summer 286.6 MW	Long Term firm sales Summer yyy MW	These are long-term contracts filed with FERC	Modeled as equivalent contracts sold from ROS
3	FCM Sales	No Sales within study period	Xxxx MW	Sensitivity based on Examination of Neighbor's FCM auction results	Modeled as equivalent contracts sold from ROS
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	Same

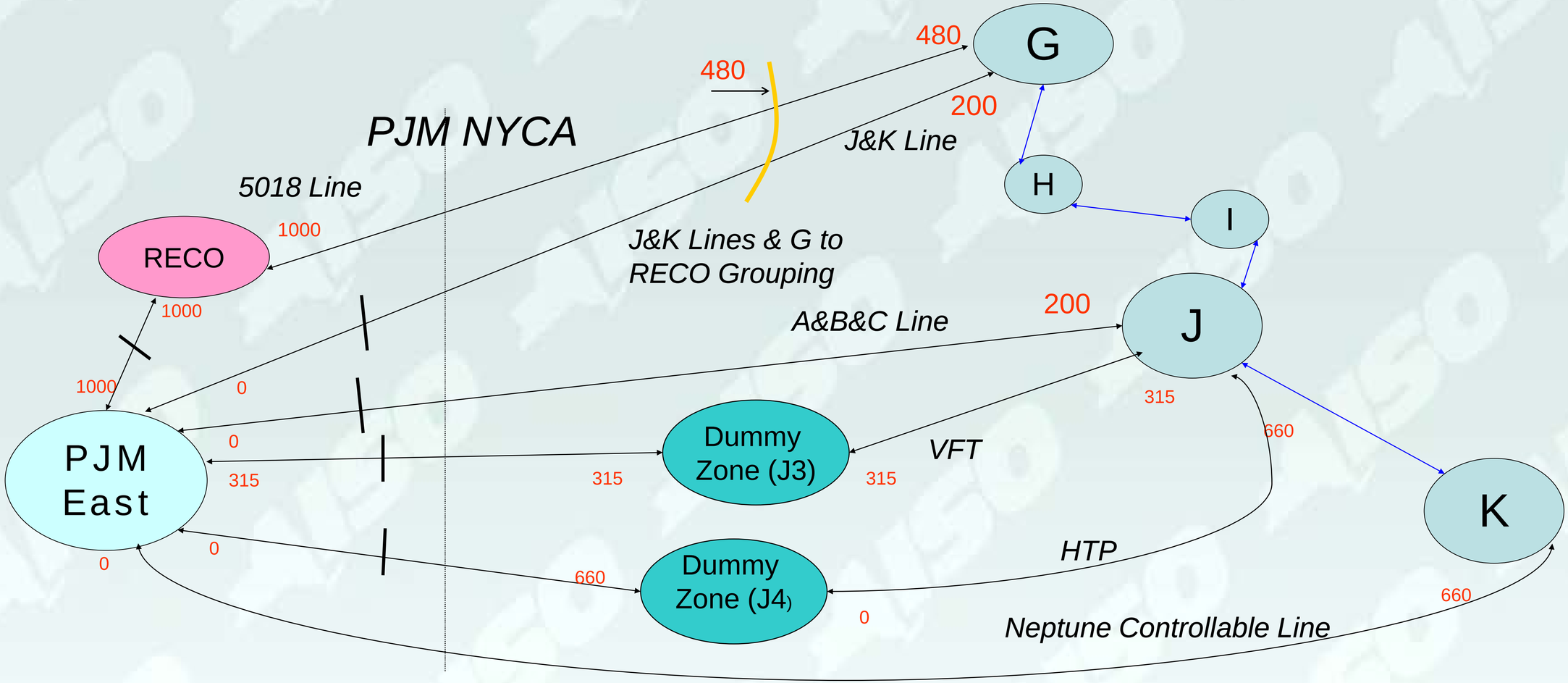
2016 RNA: RA Updated Topology Year 1 - NYCA



2016 RNA: RA Updated Topology, Year 2 to Year 10 - NYCA



2016 RNA: RA Updated Topology
Year 1 to Year 10 – Zones G to J Detail



(PJM East to RECO) + (PJM East to J) + (PJM East to J3) + (PJM East to J4) + (PJM East to G) Grouped Interface Limited to 2,000 MW

2016 RNA: RA Preliminary Results

- **Base Case LOLE Preliminary (“*1st pass*”) Results:**

RA Base Case Study Year	NYCA_LOLE
Y2017	0.039
Y2018	0.031
Y2019	0.035
Y2020	0.020
Y2021	0.022
Y2022	0.022
Y2023	0.028
Y2024	0.031
Y2025	0.034
Y2026	0.042

- **RA *1st pass* conclusion: LOLE < 0.1 criterion; therefore, no resource adequacy Reliability Needs identified as result of this assessment.**

2016 RNA: Preliminary Results
Transmission Security

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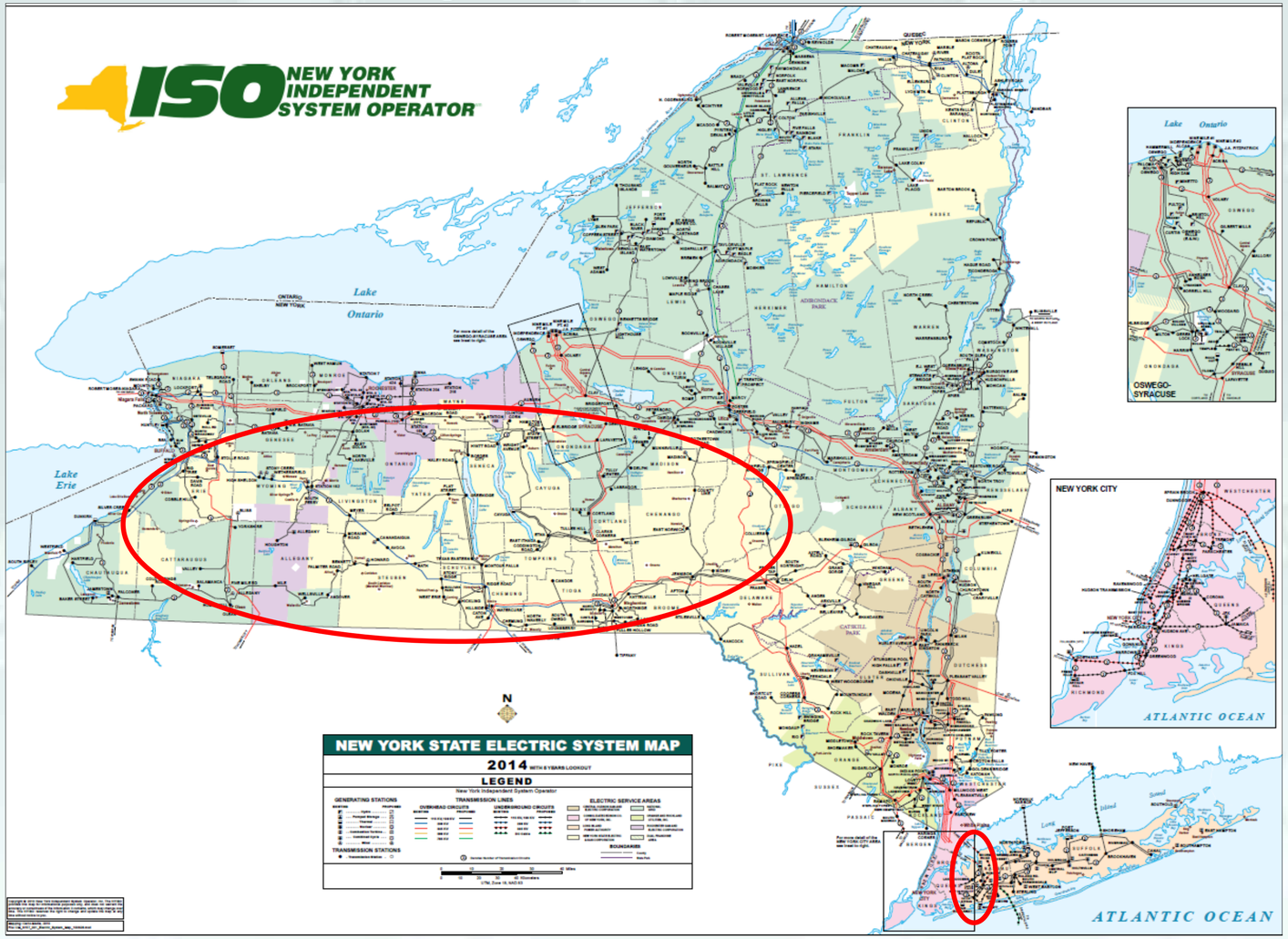
June 22, 2016

Rensselaer, NY

2016 RNA: Preliminary Transmission Security Reliability Needs

Year of Need	Transmission Security Violations (Transmission District/LBMP Zone/Transmission Owner)
2017	Buffalo Area in West (Zone A), served by NYSEG
	Binghamton Area in Central (Zone C), served by NYSEG
	Syracuse Area in Central (Zone C), served by N. Grid
	Utica Area in Mohawk Valley (Zone E), served by N. Grid
	Western Long Island Area in Long Island (Zone K), served by Long Island/PSEG
2018	No additional violations
2019	No additional violations
2020	No additional violations
2021	No additional violations
2022	Additional Syracuse Area in Central (Zone C), served by N. Grid
2023	No additional violations
2024	No additional violations
2025	Additional Syracuse Area in Central (Zone C), served by N. Grid
2026	No additional violations

Map of Transmission Security Preliminary Reliability Needs



Transmission Security: Thermal

Zone	Owner	Monitored Element	Normal Rating (MVA)	LTE Rating (MVA)	STE Rating (MVA)	2017 Flow (MVA)	2021 Flow (MVA)	2026 Flow (MVA)	First Contingency	Second Contingency
A	NYSEG	Stolle-Gardenville(#66) 230	474	478	478	509	515	520	Packard-Gardenville (#182) 115	TWR Packard-Huntley 230
A	N.Grid	Packard-Huntley (#77) 345	556	644	746	646	646	646	Stolle-Gardenville (#66) 230	SB Packard 230
C/B	NYPA, RG&E, N. Grid	Clay-Pannell (#1) 345	1195	1195	1195	1238	1245	1264	Stolle-Gardenville (#66) 230	SB Clay 345
C/B	NYPA, RG&E, N. Grid	Clay-Pannell (#2) 345	1195	1195	1195	1240	1247	1266	Stolle-Gardenville (#66) 230	SB Clay 345
C	NYSEG	Oakdale 345/115 2TR	428	556	600	565	586	605	Packard-Huntley (#77) 230	SB Oakdale 345
C	N.Grid	Elbridge 345/115 1TR	470	557	717			569	Pannell-Clay (#1) 345	SB Clay 345
C	N.Grid	Clay-Lockheed Martin (#14) 115 (Clay-Wetzel)	220	252	280			255	Clay-Woodard (#17) 115	SB Lafayette 345
C	N.Grid	Clay-Woodard (#17) 115 (Clay-Euclid)	220	252	280			256	Clay-Lockheed Martin (#14) 115	SB Lafayette 345
C	N.Grid	Clay-Teall (#10) 115 (Clay-Bartell Rd-Pine Grove)	116 220	120 252	145 280	126			Clay-Teall (#11) 115	SB Dewitt 345
C	N.Grid	Clay-Dewitt (#3) 115 (Clay-Bartell Rd)	116 220	120 252	145 280	131			Clay-Dewitt (#13) 345	Oswego-Lafayette (#17) 345
E	N.Grid	Porter-Yahnundasis (#3) 115 (Porter-Kelsey)	116	120	145	138			Stolle-Gardenville(#66) 230	Porter Bus D 115
E	N.Grid	Porter-Oneida (#7) 115 (Porter-W. Utica)	116	120	145	125			Porter-Yahnundasis (#3) 115	SB Oswego 345
K	Long Island	East Garden City-Valley Stream (262) 138	211	291	504	293	302	316	Barrett-Valley Stream (292) 138	Barrett-Valley Stream (291) 138

Transmission Security Reliability Need Year

Zone	Owner	Monitored Element	Year of Need
A	NYSEG	Stolle Road-Gardenville (#66) 230	2017
A	N.Grid	Packard-Huntley (#77) 345	2017
C/B	NYPA, RG&E, N. Grid	Clay-Pannell (#1) 345	2017
C/B	NYPA, RG&E, N. Grid	Clay-Pannell (#2) 345	2017
C	NYSEG	Oakdale 345/115 2TR	2017
C	N.Grid	Clay-Teall (#10) 115 (Clay-Bartell Rd-Pine Grove)	2017
C	N.Grid	Clay-Dewitt (#3) 115 (Clay-Bartell Rd)	2017
E	N.Grid	Porter-Yahnundasis (#3) 115 (Porter-Kelsey)	2017
E	N.Grid	Porter-Oneida (#7) 115 (Porter-W. Utica)	2017
K	Long Island	East Garden City-Valley Steam (#262) 138	2017
C	N.Grid	Elbridge 345/115 1TR	2022
C	N.Grid	Clay-Woodard (#17) 115 (Clay-Euclid)	2022
C	N.Grid	Clay-Lockheed Martin (#14) 115	2025

2016 RNA: Next Steps

- **Stakeholders to report updates before the new July 5, 2016 lock-down date.**
- **NYISO to evaluate the updates against the inclusion rules and their relevance to the preliminary *("1st pass")* RN identified in this presentation.**
- **NYISO to finalize the Base Cases and identify the final *("2nd pass")* RN.**
- **In parallel with the *2nd pass*, NYISO to finalize the scenarios on the original Base Cases.**

2016 RNA: Next Steps, cont.

- **July: NYISO to provide draft reports beginning in July to allow stakeholders the opportunity to comment.**

- **End of August: NYISO to provide final RN report, including scenarios, and start the approval process.**

The Mission of the New York Independent System Operator, in collaboration with its 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 policy makers, stakeholders and investors in the power system***

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