<u>Options in Adjusting External Area</u> <u>Representations in the 2019 IRM Study -</u> <u>Revised</u>

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NEW YORK INDEPENDENT SYSTEM OPERATOR

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Refresh

- Each year, the NYISO updates the external area representations (Ontario, Quebec, New England, and PJM interconnection) for the IRM study.
 - To start this process, the data is provided by each external control area.
 - This process includes removal of the neighbors EOP steps and then adjustments to the data in accordance with Policy 5 if the neighboring LOLEs are better (lower) than their loss of load criteria.
 - The adjustments are meant to prevent "over reliance" on the NYISO's neighbors when establishing the IRM study's calculated Installed Reserve Margin (IRM).
 - A total import limit of 3,500 MW has been placed on the amount of emergency assistance that New York can rely on from all external areas when setting the IRM.



Purpose

- During the 9/5/18 ICS meeting, the NYISO made a presentation on External Area Modeling. The purpose of the presentation was to provide additional detail and analysis regarding the impact of applying updates to the external area representations for the 2019/20 IRM.
 - The NYISO explained that updating the External Area Modeling produced a 1.1% decrease in the IRM that was not intuitive. The adjustment applied per policy 5 to ensure that the External Control Areas' LOLE is no better than their criteria, did not meaningfully reduce the reserve margins in certain External Control Areas. As a result, the reserve margins available in the External Control Areas could be delivered as emergency assistance to NYCA, decreasing the IRM.
- The ICS asked the NYISO to evaluate additional adjustments to the external areas that can be applied per Policy 5, and report on its findings.
- The purpose of today's presentation is for the NYISO to share the analysis completed to date and facilitate further discussion on the preferred path forward for the 2019/20 IRM and beyond.



Policy 5 Adjustments

- NYSRC Policy 5 Section 3.5.6 External Control Area Load and Capacity Models states in relevant part:
 - "In addition, an external Control Area's LOLE assumed in the IRM Study cannot be lower than its own LOLE criterion and its reserve margin can be no higher than the external Control Area's minimum requirement."
- The NYISO has annually had to adjust several of the External Control Areas, per policy 5, to ensure their LOLE is no better than their criteria.
- Adjustments to reserve margins, however, have not been needed in recent history.



Approach

- The NYISO worked with a NYSRC consultant, as requested by the ICS, to determine options for completing the external area replacement for this year.
- Policy 5 does not dictate what method would be used to drive neighbors LOLE to criterion or drive their reserve margin levels to the minimum requirement.
- Discussions with the NYSRC consultant focused on two items.
 - The order of changes to the externals, current practice is; a) remove EOPs,
 b) add load to get LOLE to criteria, if needed, and c) adjustments to reserve margins, if needed.
 - The current method for adding load to externals to complete items b and c of the previous bullet, is to add load proportional to existing load in each zone.
 - Five study cases were developed to test the impacts of the above parameters.



Study Cases

- 1. First, remove EOPs. Load is then scaled proportional to existing load to meet the LOLE criterion and adjust reserve margins if needed to be no higher than the published minimum requirement.
- 2. Same approach as Case 1. However, this analysis uses the mod-mdmw table to add loads. The modmdmw table is necessary to adjust multiple load shapes; which will be needed for the cases below.
- 3. Change the order of adjustment steps. Load is scaled proportional to existing load to meet the LOLE criterion first, then remove EOPs, lastly adjust reserve margins if needed to be no higher than the published minimum requirement.
- 4. First, remove EOPs. Load is then scaled proportional to <u>excess</u> capacity in each zone to meet the LOLE criterion and adjust reserve margins if needed to be no higher than the published minimum requirement.
- 5. Change the order of adjustment steps. Load scaled proportional to <u>excess</u> capacity in each zone to meet the LOLE criterion first, then remove EOPs, lastly adjust reserve margins if needed to be no higher than the published minimum requirement.



Target Reserve Margins

Control Area	Published Margin ¹	Source
New England ²	17.6%	ISO_NE ICR, LSR, & Capacity Requirement values, Jan/16
PJM Interconnect	15.9%	2017 PJM Reserve Requirement Study, 10/12/17
Ontario	17.7%	Ontario RM Requirements for 2018-2020, 12/21/17
Quebec	N/A	

- 1. The NYISO pulled this information as an approximation of minimum reserve margins. These reserve margins reflect the EOPs used by the External Control Areas. Similar to the NYCA IRM process, the reserve margins may also be dependent on locational requirements.
- 2. New England will publish an update to this Margin in the next few weeks.



Study Case Results (full details in Appendix A)

External Control Area LOLEs and Margin Levels												
Year:	2018	FBC				2019	PBC					
Case:	2018 (18.	FBC 2%)	Starting (15.	g Case* 0%)	Finish E Case 1	Existing - (15.6%)	Use Mod - Case 2	-MDMW (15.4%)	α to Exc Case 4	ess Cap - (16.4%)		
Area	Annual	Reserve	Annual	Reserve	Annual	Reserve	Annual	Reserve	Annual	Reserve		
Alea	LOLE	Level	LOLE	Level	LOLE	Level	LOLE	Level	LOLE	Level		
_PJM_MA_	0.146	116.0%	0.017	124.6%	0.467	115.9%	0.398	115.9%	0.145	115.2%		
ISONE	0.108	113.8%	0.000	145.4%	0.135	117.6%	0.108	117.0%	0.109	116.5%		
IESO	0.104	134.0%	0.000	143.5%	0.639	117.7%	0.560	117.7%	0.551	117.7%		
HQ	0.110	144.1%	0.000	148.0%	0.103	138.3%	0.103	131.7%	0.103	131.7%		
HQ(winter)	-	99.9%	-	107.9%	-	100.9%	-	100.5%	-	100.5%		

*The starting case is the parametric PBC with externals replaced, but prior to any Policy 5 adjustments.



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Study Case Results -continued

External Control Area LOLEs and Margin Levels												
Year:	2018	2018 FBC 2019 PBC										
Case:	2018 FBC (18.2%)		Startin (15.	g Case* 0%)	EOPs 2 load - (yy.	nd, α to Case 3 y%)	EOPs 2nd, α to Excess Cap - Case 5 (yy.y%)					
Area	Annual	Reserve	Annual	Reserve	Annual	Reserve	Annual	Reserve				
PJM_MA	0.146	116.0%	0.017	124.6%	LOLE	Level	LOLE	Level				
ISONE	0.108	113.8%	0.000	145.4%								
IESO	0.104	134.0%	0.000	143.5%								
HQ	0.110	144.1%	0.000	148.0%								
HQ(winter)	_	99. 9%	-	107.9%								

*The starting case is the parametric PBC with externals replaced, but prior to any Policy 5 adjustments



Preliminary Findings – Case 1 and 2

- Given the detailed topology models in the external areas, scaling proportional load to meet the LOLE criteria can create localized LOLE violations (for example in Boston) leaving excess reserves available to provide emergency assistance to the NYCA.
- Therefore, with the detailed topology models, significant additional adjustments to the reserve margins were needed to be applied as per policy 5.
- In addition, scaling proportional load to meet LOLE criteria and then adjusting to the reserve margin, may still result in higher levels of reserves from external areas being available to the NYCA as compared to case 4.



Preliminary Findings – Case 3

- The objective of the case is to evaluate changing the order of the adjustments to first adjust the LOLE, then remove EOPs, and lastly adjust the reserve margins.
- The NYISO is still running this case.
- However, it is expected that the following may be observed. This case is not expected to eliminate the need for the reserve margin adjustment or reduce the magnitude of reserve adjustment.



Preliminary Findings – Case 4

- Given the detailed topology models in the external areas, scaling load proportional to <u>excess</u> capacity to meet the LOLE criteria, helps to avoid localized LOLE violations reducing excess reserves available to provide emergency assistance to the NYCA.
- This case eliminated the need for the reserve margin adjustment for some external areas (ISO-NE and PJM) and reduced the magnitude of the reserve adjustment for the other areas.
- In addition, scaling load proportional to excess capacity to meet LOLE criteria and then (if necessary) adjusting to the reserve margin, may result in lower levels of reserves from external areas being available to the NYCA as compared to case 1.



Preliminary Findings – Case 5

The NYISO has not been able to complete this case.



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NYISO Recommendation for the IRM FBC

- For the 2019 IRM, the NYISO recommends that the ICS consider either
 - Keeping the 2018 external area representations to allow for further discussion on this matter, or
 - Updating the external area representations, by scaling load proportional to excess capacity as described in Case 4.
- If considered by ICS, the Case 4 methodology represents a change from past practice without the benefit of the ICS's normal review process.
- Regardless of the direction recommended by ICS for the 2019 IRM, the NYISO advises that additional discussion is needed to consider the preferred long term approach used for external Control Area modeling.



Appendix A

20: Annual OLE 0.146 0.108 0.104 0.100 - 0.077 0.000 0.001 0.145 0.000	18 IRM S Summer Capacity (MW) 193,267 32,894 31,870 34,929 40,708 35,065 34,258 4,946 92,108 26,891	Study Fina Summer Load (MW) 166,588 28,913 23,781 24,239 40,734 33,962 25,570 2,993 84,322 20,360	al Base C Reserve Level 116.0% 113.8% 134.0% 144.1% 99.9% 103.2% 134.0% 165.2% 109.2%	ase Reserve Margin (MW) 26,679 3,981 8,089 10,690 -26 1,103 8,688 1,953 7,792	IRM 20 Annual LOLE 0.017 0.000 0.000 	19 Draft PB Summer Capacity (MW) 189,205 37,094 31,588 34,165 41,866 PJ 32,608 36,888	C (pre-Poli Summer Load (MW) 151,792 25,511 22,016 23,077 38,782 M Areas 30,945 23,290	cy 5) (IRM Reserve Level 124.6% 145.4% 143.5% 148.0% 107.9%	= 15.0%) Reserve Margin (MW) 37,413 11,583 9,572 11,087 3,083	IRM 201 Annual LOLE 0.148 0.107 0.105 0.106 -	9 Draft PB Summer Capacity (MW) 189,205 37,094 31,588 34,165 41,866	C (post-Poli Adjusted Load (MW) 158,541 31,934 24,556 24,729 41,557	icy 5) (IRM Reserve Level 119.3% 116.2% 128.6% 138.2% 100.7%	E=15.2%) Reserve Margin (MW) 30,664 5,160 7,032 9,436 308
Annual OLE 0.146 0.108 0.104 0.110 - 0.007 0.000 0.001 0.145 0.000	Summer Capacity (MW) 193,267 32,894 31,870 34,929 40,708 35,065 34,258 4,946 92,108 26,891	Summer Load (MW) 166,588 28,913 23,781 24,239 40,734 7 33,962 25,570 2,993 84,322 20,360	Reserve Level 116.0% 113.8% 134.0% 144.1% 99.9% 103.2% 134.0% 165.2% 109.2%	Reserve Margin (MW) 26,679 3,981 8,089 10,690 -26 1,103 8,688 1,953 7,792	Annual LOLE 0.017 0.000 0.000 - - 0.000 0.000 0.000	Summer Capacity (MW) 189,205 37,094 31,588 34,165 41,866 PJ 32,608 36,888	Summer Load (MW) 151,792 25,511 22,016 23,077 38,782 M Areas 30,945 23,200	Reserve Level 124.6% 145.4% 143.5% 148.0% 107.9% 105.4%	Reserve Margin (MW) 37,413 11,583 9,572 11,087 3,083	Annual LOLE 0.148 0.107 0.105 0.106 -	Summer Capacity (MW) 189,205 37,094 31,588 34,165 41,866	Adjusted Load (MW) 158,541 31,934 24,556 24,729 41,557	Reserve Level 119.3% 116.2% 128.6% 138.2% 100.7%	Reserve Margin (MW) 30,664 5,160 7,032 9,436 308
0.146 0.108 0.104 0.110 - 0.077 0.000 0.001 0.145 0.000	193,267 32,894 31,870 34,929 40,708 35,065 34,258 4,946 92,108 26,891	166,588 28,913 23,781 24,239 40,734 33,962 25,570 2,993 84,322 20,360	116.0% 113.8% 134.0% 144.1% 99.9% 103.2% 103.2% 105.2% 109.2%	26,679 3,981 8,089 10,690 -26 1,103 8,688 1,953 7,792	0.017 0.000 0.000 - - 0.000 0.000 0.000	189,205 37,094 31,588 34,165 41,866 PJ 32,608 36,888	151,792 25,511 22,016 23,077 38,782 M Areas 30,945 22,200	124.6% 145.4% 143.5% 148.0% 107.9%	37,413 11,583 9,572 11,087 3,083	0.148 0.107 0.105 0.106 -	189,205 37,094 31,588 34,165 41,866	158,541 31,934 24,556 24,729 41,557	119.3% 116.2% 128.6% 138.2% 100.7%	30,664 5,160 7,032 9,436 308
0.108 0.104 0.110 0.0077 0.000 0.001 0.145 0.000	32,894 31,870 34,929 40,708 35,065 34,258 4,946 92,108 26,891	28,913 23,781 24,239 40,734 33,962 25,570 2,993 84,322 20,360	113.8% 134.0% 144.1% 99.9% 103.2% 103.2% 165.2% 109.2%	3,981 8,089 10,690 -26 1,103 8,688 1,953 7,792	0.000 0.000 - 0.000 0.000 0.000 0.000	37,094 31,588 34,165 41,866 PJ 32,608 36,888	25,511 22,016 23,077 38,782 M Areas 30,945	145.4% 143.5% 148.0% 107.9% 105.4%	11,583 9,572 11,087 3,083	0.107 0.105 0.106 -	37,094 31,588 34,165 41,866	31,934 24,556 24,729 41,557	116.2% 128.6% 138.2% 100.7%	5,160 7,032 9,436 308
0.104 0.110 - 0.077 0.000 0.001 0.145 0.000	31,870 34,929 40,708 35,065 34,258 4,946 92,108 26,891	23,781 24,239 40,734 33,962 25,570 2,993 84,322 20,360	134.0% 144.1% 99.9% 103.2% 134.0% 165.2% 109.2%	8,089 10,690 -26 1,103 8,688 1,953 7,786	0.000 0.000 - 0.000 0.000 0.000	31,588 34,165 41,866 PJ 32,608 36,888	22,016 23,077 38,782 M Areas 30,945 23,200	143.5% 148.0% 107.9% 105.4%	9,572 11,087 3,083	0.105 0.106 -	31,588 34,165 41,866	24,556 24,729 41,557	128.6% 138.2% 100.7%	7,032 9,436 308
0.110 0.0077 0.000 0.001 0.145 0.000	34,929 40,708 35,065 34,258 4,946 92,108 26,891	24,239 40,734 33,962 25,570 2,993 84,322 20,360	144.1% 99.9% 103.2% 134.0% 165.2% 109.2%	10,690 -26 1,103 8,688 1,953 7,786	0.000 - 0.000 0.000 0.000	34,165 41,866 PJ 32,608 36,888	23,077 38,782 M Areas 30,945 23,200	148.0% 107.9% 105.4%	11,087 3,083	0.106	34,165 41,866	24,729 41,557	138.2% 100.7%	9,436 308
- 0.077 0.000 0.001 0.145 0.000	40,708 35,065 34,258 4,946 92,108 26,891	40,734 33,962 25,570 2,993 84,322 20,360	99.9% 103.2% 134.0% 165.2% 109.2%	-26 1,103 8,688 1,953	- 0.000 0.000 0.000	41,866 PJ 32,608 36,888	38,782 M Areas 30,945	107.9% 105.4%	3,083	- 0.010	41,866	41,557	100.7%	308
0.077 0.000 0.001 0.145 0.000	35,065 34,258 4,946 92,108 26,891	33,962 25,570 2,993 84,322 20,360	103.2% 134.0% 165.2% 109.2%	1,103 8,688 1,953	0.000 0.000 0.000	PJ 32,608 36,888	M Areas 30,945	105.4%	1.663	0.010	22 (00	22.221		
0.077 0.000 0.001 0.145 0.000	35,065 34,258 4,946 92,108 26,891	33,962 25,570 2,993 84,322 20,360	103.2% 134.0% 165.2% 109.2%	1,103 8,688 1,953	0.000 0.000 0.000	32,608 36,888	30,945	105.4%	1.663	0.010	22 (00)	22,221		205
0.000 0.001 0.145 0.000	34,258 4,946 92,108 26,891	25,570 2,993 84,322 20,360	134.0% 165.2% 109.2%	8,688 1,953	0.000	36,888	22 200		-,	0.010	32,608	32,321	100.9%	287
0.001 0.145 0.000	4,946 92,108 26,891	2,993 84,322 20,360	165.2% 109.2%	1,953	0.000		23,299	158.3%	13,589	0.000	36,888	24,335	151.6%	12,553
0.145 0.000	92,108 26,891	84,322 20,360	109.2%	7 797		6,102	2,727	223.7%	3,375	0.000	6,102	2,848	214.2%	3,253
0.000	26,891	20,360		/,/80	0.017	86,345	76,832	112.4%	9,513	0.147	86,345	80,249	107.6%	6,096
			132.1%	6,531	0.000	27,262	18,551	147.0%	8,711	0.000	27,262	19,376	140.7%	7,886
						ISO	-NE Areas							
0.000	1,125	331	339.8%	794	0.000	1,156	292	395.7%	864	0.000	1,156	366	316.1%	790
0.076	926	1,038	89.2%	-112	0.000	1,009	916	110.2%	93	0.098	1,009	1,147	88.0%	-138
0.000	1,544	747	206.5%	796	0.000	1,600	660	242.7%	941	0.001	1,600	826	193.8%	775
0.002	4,291	2,172	197.6%	2,120	0.000	4,401	1,916	229.7%	2,485	0.003	4,401	2,399	183.5%	2,003
0.073	548	1,325	41.3%	-777	0.000	769	1,169	65.8%	-400	0.085	769	1,463	52.5%	-694
0.103	3,107	6,061	51.3%	-2,954	0.000	4,059	5,348	75.9%	-1,288	0.098	4,059	6,694	60.6%	-2,635
0.103	581	1,795	32.4%	-1,214	0.000	620	1,584	39.1%	-964	0.098	620	1,983	31.3%	-1,363
0.007	4,997	2,322	215.2%	2,674	0.000	5,331	2,049	260.2%	3,282	0.020	5,331	2,565	207.8%	2,766
0.092	3,616	3,066	117.9%	550	0.000	3,877	2,705	143.3%	1,172	0.105	3,877	3,386	114.5%	491
0.004	3,333	2,702	123.3%	631	0.000	3,522	2,384	147.7%	1,138	0.018	3,522	2,985	118.0%	537
0.015	5,376	3,727	144.3 <u>%</u>	1,649	0.000	5,702	3,288	173.4%	2,414	0.027	5,702	4,116	138.5%	1,586
0.103	2,447	2,478	98.7%	-31	0.000	3,996	2,186	182.7%	1,809	0.012	3,996	2,737	146.0%	1,259
0.103	253	1,382	18.3 <u>%</u>	-1,128	0.000	301	1,219	24.7%	-918	0.086	301	1,526	19.8%	-1,225
0.000	751	0	-	751	0.000	751	0	-	751	0.000	751	0	-	751
	0.002 0.073 0.103 0.103 0.007 0.092 0.004 0.015 0.103 0.103 0.000 produ	0.002 4,291 0.073 548 0.103 3,107 0.103 581 0.007 4,997 0.092 3,616 0.004 3,333 0.015 5,376 0.103 253 0.000 751 product - for disc	0.002 4,291 2,172 0.073 548 1,325 0.103 3,107 6,061 0.103 581 1,795 0.007 4,997 2,322 0.092 3,616 3,066 0.004 3,333 2,702 0.015 5,376 3,727 0.103 2,447 2,478 0.103 253 1,382 0.000 751 0 product - for discussion put 103	0.002 4,291 2,172 197.6% 0.073 548 1,325 41.3% 0.103 3,107 6,061 51.3% 0.103 581 1,795 32.4% 0.007 4,997 2,322 215.2% 0.004 3,333 2,702 123.3% 0.015 5,376 3,727 144.3% 0.103 253 1,382 18.3% 0.000 751 0 -	0.002 4.291 2,172 197.6% 2,120 0.073 548 1,325 41.3% -777 0.103 3,107 6,061 51.3% -2,954 0.103 581 1,795 32.4% -1,214 0.007 4,997 2,322 215.2% 2,674 0.092 3,616 3,066 117.9% 550 0.004 3,333 2,702 123.3% 631 0.015 5,376 3,727 144.3% 1,649 0.103 2,447 2,478 98.7% -311 0.103 2,531 1,382 18.3% -1,128 0.000 751 0 - 751 product - for discussion purposes only 501 - 751	0.002 4,291 2,172 197.6% 2,120 0.000 0.073 548 1,325 41.3% -777 0.000 0.103 3,107 6,061 51.3% -2.954 0.000 0.103 581 1.795 32.4% -1,214 0.000 0.007 4,997 2,322 215.2% 2,674 0.000 0.092 3,616 3,066 117.9% 550 0.000 0.004 3,333 2,702 123.3% 631 0.000 0.015 5,376 3,727 144.3% 1,649 0.000 0.103 2,447 2,478 98.7% -31 0.000 0.103 2,531 1,382 18.3% -1,128 0.000 0.000 751 0 - 751 0.000	0.002 4,291 2,172 197.6% 2,120 0.000 4,401 0.073 548 1,325 41.3% -777 0.000 769 0.103 3,107 6,061 51.3% -2,954 0.000 4,059 0.103 581 1,795 32.4% -1,214 0.000 620 0.007 4,997 2,322 215.2% 2,674 0.000 5,331 0.092 3,616 3,066 117.9% 550 0.000 3,877 0.004 3,333 2,702 123.3% 631 0.000 3,522 0.015 5,376 3,727 144.3% 1,649 0.000 5,702 0.103 2,447 2,478 98.7% -31 0.000 3,996 0.103 253 1,382 18.3% -1,128 0.000 301 0.000 751 0 - 751 0.000 751 product - for discussion purposes only	0.002 4,291 2,172 197.6% 2,120 0.000 4,401 1,916 0.073 548 1,325 41.3% -777 0.000 769 1,169 0.103 3,107 6,061 51.3% -2,954 0.000 4,059 5,348 0.103 581 1,795 32.4% -1,214 0.000 620 1,584 0.007 4,997 2,322 215.2% 2,674 0.000 5,331 2,049 0.092 3,616 3,066 117.9% 550 0.000 3,877 2,705 0.004 3,333 2,702 123.3% 631 0.000 3,522 2,384 0.015 5,376 3,727 144.3% 1,649 0.000 5,702 3,288 0.103 2,447 2,478 98.7% -31 0.000 3,01 1,219 0.000 751 0 - 751 0.000 301 1,219 0.000	0.002 4.291 2,172 197.6% 2,120 0.000 4,401 1,916 229.7% 0.073 548 1,325 41.3% -777 0.000 769 1,169 65.8% 0.103 3,107 6,061 51.3% -2,954 0.000 4,059 5,348 75.9% 0.103 581 1,795 32.4% -1,214 0.000 620 1,584 39.1% 0.007 4.997 2,322 215.2% 2,674 0.000 5,331 2,049 260.2% 0.004 3,333 2,702 123.3% 631 0.000 3,877 2,705 143.3% 0.015 5,376 3,727 144.3% 1,649 0.000 5,702 3,288 173.4% 0.103 2,447 2,478 98.7% -31 0.000 3,996 2,186 182.7% 0.103 253 1,382 18.3% -1,128 0.000 301 1,219 24.7%	0.002 4.291 2,172 197.6% 2,120 0.000 4,401 1,916 229.7% 2,485 0.073 548 1,325 41.3% -777 0.000 769 1,169 65.8% -400 0.103 3,107 6,061 51.3% -2,954 0.000 4,059 5,348 75.9% -1,288 0.103 581 1,795 32.4% -1,214 0.000 620 1,584 39.1% -964 0.007 4,997 2,322 215.2% 2,674 0.000 5,331 2,049 260.2% 3,282 0.092 3,616 3,066 117.9% 550 0.000 3,877 2,705 143.3% 1,172 0.004 3,333 2,702 123.3% 631 0.000 3,522 2,384 147.7% 1,138 0.015 5,376 3,727 144.3% 1,649 0.000 5,702 3,288 173.4% 2,414 0.103 2,447 2,478 98.7% -31 0.000 301 1,219 24.7%	0.002 4.291 2,172 197.6% 2,120 0.000 4,401 1,916 229.7% 2,485 0.003 0.073 548 1,325 41.3% -777 0.000 769 1,169 65.8% -400 0.085 0.103 3,107 6,061 51.3% -2,954 0.000 4,059 5,348 75.9% -1,288 0.098 0.103 581 1,795 32.4% -1,214 0.000 620 1,584 39.1% -964 0.098 0.007 4.997 2,322 215.2% 2,674 0.000 5,331 2,049 260.2% 3,282 0.020 0.092 3,616 3,066 117.9% 550 0.000 3,877 2,705 143.3% 1,172 0.105 0.004 3,333 2,702 123.3% 631 0.000 3,522 2,384 147.7% 1,138 0.018 0.015 5,376 3,727 144.3% 1,649 0.000 5,702 3,288 173.4% 2,414 0.027 0.103	0.002 4,291 2,172 197.6% 2,120 0.000 4,401 1,916 229.7% 2,485 0.003 4,401 0.073 548 1,325 41.3% -777 0.000 769 1,169 65.8% -400 0.085 769 0.103 3,107 6,061 51.3% -2.954 0.000 4,059 5,348 75.9% -1,288 0.098 4,059 0.103 581 1,795 32.4% -1,214 0.000 620 1,584 39.1% -964 0.098 620 0.007 4.997 2,322 215.2% 2,674 0.000 5,331 2,049 260.2% 3,282 0.020 5,331 0.007 4.997 2,332 215.2% 2,674 0.000 3,877 2,705 143.3% 1,172 0.105 3,877 0.004 3,333 2,702 123.3% 631 0.000 3,522 2,384 147.7% 1,138 0.018 3,522 0.015 5,376 3,727 144.3% 1,649 0.000	0.002 4,291 2,172 197.6% 2,120 0.000 4,401 1,916 229.7% 2,485 0.003 4,401 2,399 0.073 548 1,325 41.3% -777 0.000 769 1,169 65.8% -400 0.085 769 1,463 0.103 3,107 6,061 51.3% -2.954 0.000 4,059 5,348 75.9% -1,288 0.098 4,059 6,694 0.103 581 1,795 32.4% -1,214 0.000 620 1,584 39.1% -964 0.098 620 1,983 0.007 4,997 2,322 215.2% 2,674 0.000 5,331 2,049 260.2% 3,282 0.020 5,331 2,565 0.004 3,333 2,702 123.3% 631 0.000 3,522 2,384 147.7% 1,138 0.018 3,522 2,985 0.015 5,376 3,727 144.3% 1,649 0.000 3,996 2,186 182.7% 1,809 0.012 3,996 2,737 <	0.002 4,291 2,172 197.6% 2,120 0.000 4,401 1,916 229.7% 2,485 0.003 4,401 2,399 183.5% 0.073 548 1,325 41.3% -777 0.000 769 1,169 65.8% -400 0.085 769 1,463 52.5% 0.103 3,107 6,061 51.3% -2.954 0.000 4,059 5,348 75.9% -1.288 0.098 4,059 6,694 60.6% 0.103 581 1.795 32.4% -1,214 0.000 620 1,584 39.1% -964 0.098 620 1,983 31.3% 0.007 4.997 2,322 215.2% 2,674 0.000 5,331 2,049 260.2% 3,282 0.020 5,331 2,565 207.8% 0.004 3,333 2,702 123.3% 631 0.000 3,522 2,384 147.7% 1,138 0.018 3,522 2,985 118.0% 0.015 5,376 3,727 144.3% 1,649 0.000 5,702

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Appendix A- continued

]	Externa	l Contr	ol Area	LOLE	s with	summe	er capao	cities, lo	ads an	d resul	ting ma	rgins					
	Policy	5 adjustm	ent metho	d 1 (IRM	=15.6%)	Policy	olicy 5 adjustment method 2 (IRM=15.4%) Pol						Policy 5 adjustment method 4 (IRM=16.4%)					
Area	Annual LOLE	Summer Capacity (MW)	Adjusted Load (MW)	Reserve Level	Reserve Margin (MW)	Annual LOLE	Summer Capacity (MW)	Adjusted Load (MW)	Reserve Level	Reserve Margin (MW)	Annual LOLE	Summer Capacity (MW)	Adjusted Load (MW)	Reserve Level	Reserve Margin (MW)			
_PJM_MA_	0.467	189,205	163,248	115.9%	25,956	0.398	189,205	163,248	115.9%	25,957	0.145	189,205	164,292	115.2%	24,913			
ISONE	0.135	37,094	31,543	117.6%	5,552	0.108	37,094	31,711	117.0%	5,383	0.109	37,094	31,851	116.5%	5,243			
IESO	0.639	31,588	26,838	117.7%	4,750	0.560	31,588	26,838	117.7%	4,750	0.551	31,588	26,838	117.7%	4,750			
HQ	0.103	34,165	24,700	138.3%	9,464	0.103	34,165	25,942	131.7%	8,222	0.103	34,165	25,942	131.7%	8,222			
HQ(winter)	-	41,866	41,510	100.9%	356	-	41,866	41,647	100.5%	218	-	41,866	41,647	100.5%	218			
PJM Areas																		
PJM_EAST	0.029	32,608	33,281	98.0%	-673	0.022	32,608	33,272	98.0%	-664	0.060	32,608	31,509	103.5%	1,099			
PJM_CENT	0.000	36,888	25,057	147.2%	11,831	0.000	36,888	25,051	147.3%	11,837	0.000	36,888	27,909	132.2%	8,979			
PJM_WEST	0.000	6,102	2,933	208.0%	3,169	0.000	6,102	2,932	208.1%	3,170	0.001	6,102	3,872	157.6%	2,230			
PJM_SW	0.463	86,345	82,631	104.5%	3,714	0.396	86,345	82,609	104.5%	3,736	0.142	86,345	80,059	107.9%	6,286			
DOMVEPC	0.001	27,262	19,952	136.6%	7,310	0.001	27,262	19,946	136.7%	7,316	0.004	27,262	21,506	126.8%	5,756			
							ISO-NE	Areas										
BHE	0.000	1,156	361	320.0%	795	0.000	1,156	362	319.2%	794	0.000	1,156	658	175.7%	498			
ME	0.130	1,009	1,133	89.1%	-124	0.103	1,009	1,137	88.7%	-128	0.108	1,009	955	105.7%	54			
SME	0.000	1,600	815	196.3%	785	0.001	1,600	819	195.5%	782	0.004	1,600	1,059	151.2%	542			
NH	0.002	4,401	2,369	185.8%	2,032	0.002	4,401	2,378	185.1%	2,023	0.007	4,401	2,970	148.2%	1,431			
VT	0.126	769	1,445	53.2%	-676	0.098	769	1,451	53.0%	-682	0.107	769	1,169	65.8%	-400			
BOSTON	0.131	4,059	6,612	61.4%	-2,553	0.103	4,059	6,637	61.2%	-2,577	0.108	4,059	5,348	75.9%	-1,288			
CMA_NEMA	0.130	620	1,958	31.7%	-1,338	0.103	620	1,966	31.5%	-1,346	0.108	620	1,584	39.1%	-964			
WMA	0.015	5,331	2,533	210.4%	2,797	0.001	5,331	2,543	209.6%	2,788	0.023	5,331	3,441	154.9%	1,890			
SEMA	0.130	3,877	3,344	115.9%	533	0.102	3,877	3,357	115.5%	520	0.097	3,877	3,202	121.1%	675			
RI	0.016	3,522	2,948	119.5%	574	0.011	3,522	2,959	119.0%	563	0.005	3,522	2,867	122.8%	655			
CT	0.027	5,702	4,066	140.2%	1,636	0.017	5,702	4,081	139.7%	1,621	0.033	5,702	4,312	132.2%	1,390			
SWCT	0.011	3,996	2,703	147.8%	1,292	0.007	3,996	2,713	147.3%	1,282	0.016	3,996	2,953	135.3%	1,042			
NOR	0.126	301	1,507	20.0%	-1,206	0.098	301	1,513	19.9%	-1,212	0.108	301	1,219	24.7%	-918			
LAKEROAD	0.000	751	0	-	751	0.000	751	0	-	751	0.000	751	318	-	433			
Note:																		
Method 1 - adjus	st load by	ratio of ex	isting load	and keep	reserve ma	rgins no h	nigher than	published r	equirement	(LOD-DAT	A table)							
Method 2 - adjus	st load by	ratio of ex	isting load	and keep	reserve ma	rgins no h	nigher than	published r	equirement	(MOD-MD	MW table)			NEW			
Method 4 - adjus	st load by	ratio of ex	cess capa	city and ke	ep reserve	margins r	no higher th	an publishe	ed requireme	ent (MOD-N	MDMW ta	ble)						
															JIJIL			

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Questions?

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gdrake@nyiso.com



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The Mission of the New York Independent System Operator, in collaboration with its stakeholders, is to serve the public interest and provide benefits 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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