NY-PJM STABILITY LIMIT ANALYSIS FOR ALL LINES IN-SERVICE (NP-22)

A Report by the
New York Independent System Operator

October 2022

Executive Summary

This study was a joint NY and PJM analysis conducted to re-evaluate the stability limits for the New York – PJM interface and assess the continued need for the interface to be identified as a Stability Interconnection Reliability Operating Limit (IROL). The New York – PJM interface is defined in Table 2 and illustrated in Figure 1. The study provides updates to the all-lines-in-service limits associated with the New York - PJM interface and comparisons to the optimized emergency thermal transfer limits.

The limits recommended in this report are based on a stable system response at the highest transfer level tested. There were no instances of any system or unit instability observed, even at transfer levels well in excess of the optimized emergency thermal transfer limits.

Based on results of the tested stability transfer limits reported in Table 1, NYISO recommends removing the NY-PJM and PJM-NY Stability IROL limitation. NYISO will study this interface in the future as needed to determine whether a need for the Stability IROL limitation has reemerged.

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Summary of Proposed Limits

The proposed limit revisions and the magnitude of the changes are presented in Table 1, below:

Table 1.

Summary of proposed New York – PJM stability limit analysis for All lines in service

	New York – PJM		PJM – New York	
All lines in-service	**Emergency Thermal Limit**	**Margined Stability Limit**	**Emergency Thermal Limit**	**Margined Stability Limit**
Tested	2440 MW	3600 MW	3175 MW	4250 MW
Existing	N/A	3600 MW	N/A	3600 MW
Delta	N/A	0 MW	N/A	+650 MW

Introduction

This study serves as a joint NY and PJM review of NY-PJM stability limits for the retirement of Indian Point Units #2 &#3 and changes in the operating agreements between PJM and New York. This study examines the difference between the optimized emergency thermal transfers and stability limits for the NY-PJM interface.

This study recommends the removal of the NY-PJM and PJM-NY IROL limitation based on tested stability transfer limits for all-lines-in-service as per Table 1.

System Operating Limit Methodology

The "NYSRC Reliability Rules for Planning and Operating the New York State Power System" (NYSRC Reliability Rules) provides the methodology for developing System Operating Limits (SOLs) within the NYISO Reliability Coordinator Area. NYSRC Reliability Rules require compliance with all North American Electric Reliability Corporation (NERC) Standards and Northeast Power Coordinating Council (NPCC) Standards and Criteria. Rule C of the NYSRC Reliability Rules sets forth the contingencies to be evaluated and the performance requirements to be applied in developing SOLs. Rule C also incorporates NYISO Transmission Planning Guideline #3-1, the "Guideline for Stability Analysis and Determination of Stability-Based Transfer Limits" found in Attachment H to the NYISO "Transmission Expansion and Interconnection Manual.".

Interface Summary

The New York – PJM interface definition is given below in Table 2 and illustrated in Figure 1.

Table 2.
New York - PJM Interface Definition

Name	Line ID	Voltage (kV)
NYC (Zone J) – PJM East		
*Farragut – Marion	C3403	345
*Farragut – Hudson	B3402	345
*Goethals – Linden	A2253	230
Central (Zone C) – PJM West		
Watercure – Mainesburg*	30	345
Homer City – Mainesburg*	47	345
Mainesburg – Homer City*	47	345
*Hillside – E. Towanda	70	230
*Goudey – Laurel Lake	952	115
N. Waverly – E. Sayre*	956	115
West (Zone A) – PJM West		
Five Mile Road – Pierce Brook*	37	345
Homer City – Pierce Brook*	48	345
Pierce Brook – Homer City*	48	345
*South Ripley – Erie East	69	230
Falconer – Warren*	171	115
Hudson Valley (Zone G) – PJM East		
*Ramapo – Hopatcong	5018	500
S. Mahwah – Waldwick*	J3410	345
S. Mahwah – Waldwick*	K3411	345
Hudson Valley (Zone G) – PJM (Rockland Electric)		
Sparkill – Closter*	751	69
W. Nyack – Harings Corners*	701	69
Corporate Drive – Harings Corners*	703	138
Bluehill – Montvale*	44	69
Bluehill – Montvale*	43	69
Pearl River – Montvale*	491	69
Pearl River – Harings Corners*	45	34
Ramapo – S. Mahwah*	51	138
Hilburn – S. Mahwah*	65	69
S. Mahwah 138*/345	BK258	138/345

* indicates the metered end of the circuit

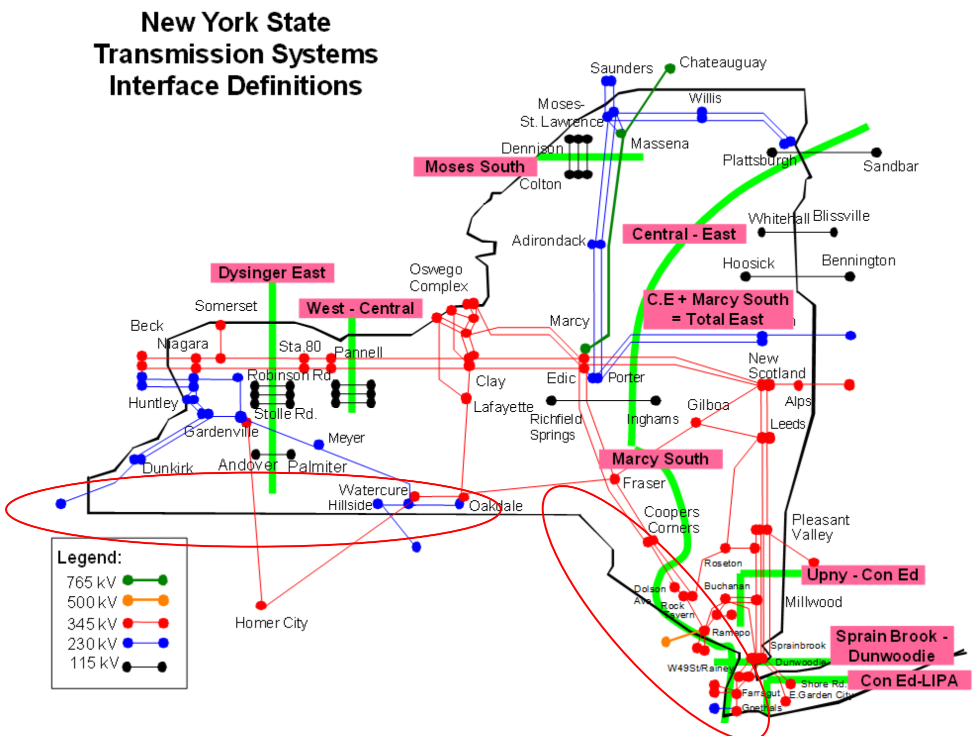

Figure 1. NYCA Transmission System Interface

System Representation and Transfer Case Development

The analysis was based on the 2020 NYISO Dynamics Base Case, which was developed from the 2020 MMWG Dynamics Base Case with the NYISO representation updated to reflect the retirement of Indian Point Units #2 & #3, retirement of Somerset and retirement of Cayuga units.

The base case model includes:

- the NYISO Transmission Operator area;
- all Transmission Operator areas contiguous with NYISO;
- all system elements modeled as in-service;
- all generation represented;
- phase shifters in the regulating mode;
- the NYISO Load Forecast;
- transmission facility additions and retirements;
- generation facility additions and retirements;
- Remedial Action Scheme (RAS) models currently existing or projected for implementation

within the studied time horizon;

- series compensation for each line at the expected operating level; and
- facility ratings as provided by the Transmission Owner and Generator Owner

Generation shifts between PJM, Oswego, Hudson, NYC, North and Capital zones were primarily used to adjust PJM-NY and NY-PJM transfer power flows.

This study was performed with Chateauguay HVDC terminals and the Marcy South Series Compensation in-service. The Fraser SVC, Leeds SVC and Marcy FACTs were modeled in-service, the base case load flow was solved with the SVCs/FACTs set to minimum (0MVAr) output by adjusting their respective voltage schedules in the pre-contingency case.

The Marion-Farragut 345 kV B and C cables were modeled out-of-service and the Hopatcong–Ramapo (5018) 500 kV, Linden-Goethals (A2253) 230 kV and Waldwick-S. Mahwah (J3410 & K3411) 345 kV circuits were scheduled in accordance with the "TCC Market PJM -NYISO Interconnection Scheduling Protocol", February 28th, 2020. The three tie lines, Warren-Falconer (171) 115 kV, Laurel Lake-Goudey (952) 115 kV and North Waverly-East Sayre (956) 115 kV were modeled out-of-service. NY-PJM merchant transmission (HTP, VFT and Neptune) was scheduled to maximize the merchant transmission flow in the direction of the transfer case. Table 3 provides the schedules utilized for the NY-PJM and PJM-NY transfer case development; values correspond with the direction of transfer.

Table 3.
NY-PJM Merchant Transmission Schedules

Merchant Transmission	NY-PJM Transfers	PJM-NY Transfers
Neptune	0 MW	685 MW
HTP	0 MW	673 MW
VFT	330 MW	315 MW

Tested NY Contingencies

Sixty-one (61) NY contingencies were tested for study. Table 4 provides the identification and description of these contingencies.

Table 4.
NY Contingencies Applied for Evaluating NY-PJM and PJM-NY Stability Transfer Limits

#	ID	Description
1	CE03	SLG-STK@EDIC345 (BKR R935) – L/O EDIC-N.SCOT #14 / BKUP CLR FE1
2	CE07	LLG@MARCY/EDIC - L/O MARCY-COOPERS (UCC2-41) & EDIC-FRASER (EF24-40) DCT
3	CE07AR	LLG@MARCY/EDIC - L/O MARCY-COOPERS (UCC2-41) & EDIC-FRASER (EF24-40) DCT W/RCL
4	CE08	LLG@COOPERS - L/O MARCY-COOPERS (UCC2-41)/FRASER-COOPERS (FCC33) DCT

5	CE08AR	LLG@COOPERS – L/O MARCY-COOPERS (UCC2-41)/FRASER-COOPERS (FCC33) DCT W/RCL
6	CE15	SLG-STK@MARCY345(BKR 3108) – L/O VOLNEY-MARCY (VU-19) / BKUP CLR#UE1-7
7	CE18	LLG@ROCK – L/O CPV (DOLSON) - ROCK TAVERN DCT
8	CE18AR	LLG@ROCK – L/O CPV (DOLSON) - ROCK TAVERN DCT W/ RCL
9	CE19	LLG@COOPERS – L/O COOPERS CORNERS- CPV_VALY(DOLSON) DCT
10	CE19AR	LLG@COOPERS – L/O COOPERS CORNERS-CPV_VALY(DOLSON) DCT W/ RCL
11	CE27	3PH-NC@COOPERS – L/O COOPERS CORNERS- ROCK TAVERN CCRT-34
12	CE27AR	3PH-NC@COOPERS – L/O COOPERS CORNERS-ROCK TAVERN CCRT-34 W/RCL
13	CE28	3PH-NC@COOPERS – L/O COOPERS CORNERS-CPV_VALY(DOLSON) CCRT-42
14	CE28AR	3PH-NC@COOPERS – L/O COOPERS CORNERS-CPV_VALY(DOLSON) CCRT-42 W/RCL
15	CE29	3PH-NC@CPV – L/O CPV_VALY(DOLSON AVE)- ROCK TAV DART-44
16	CE30	3PH-NC@ROCK – L/O ROCK TAVERN-CPV_VALY (DOLSON AVE) DART-44
17	CH04	SLG-STK@ROSETON (BKR 31152) – L/O ROSETON-ROCK TAVERN#311/ BKUP CLR ROSE GN2
18	CH05	SLG-STK@ROSETON (BKR 31151) – L/O ROSETON-HURLEY#303/ BKUP CLR#311
19	CH07	3PH-NC@FISHKILL – L/O ROSETON-FISHKILL#305
20	CH07AR	3PH-NC@FISHKILL – L/O ROSETON-FISHKILL#305 W/RCL
21	CH09	3PH-NC@HURLEY – L/O ROSETON-HURLEY#303
22	ConEd04	SLG @ BUCHANAN 138 kV WITH STUCK BREAKER BT2-7 – (BUCH_STB_BT2-7.idv)
23	ST02	3PH-NC@WATERCURE – L/O WATERCURE-OAKDALE 230KV
24	ST03	3PH-NC@WATERCURE – L/O WATERCURE-OAKDALE 345KV
25	ST04	3PH-NC@HILLSIDE – L/O HILLSIDE-E.TOWANDA 230KV
26	ST05	3PH-NC@WATERCURE345KV – L/O WATERCURE-MAINESBURG
27	ST05P	3PH-NC@WATERCURE345 – L/O WATERCURE-MAINESBURG W/ Z2 CLR
28	TE02	LLG@FISHKILL – L/O FISHKILL-PLEASANTVILLE DCT W/RCL
29	TE03	LLG@SPRAINBROOK – L/O MILLWOOD/BUCHANAN-SPRAINBROOK DCT W/RCL
30	TE05	SLG-STK@BUCHANAN (BKR#6) – L/O BUCHANAN-LADENTWN (Y88) / BKUP CLR#W97
31	TE10	SLG-STK@RAMAPO (BKR T77-94-2) – L/O RAMAPO-ROCK TAVERN (77) / BKUP CLR Y94
32	TE12	SLG-STK@RAMAPO500 (BRK T1500-W72-2) – L/O RAMAPO-HOPATCONG (5018) / BKUP CLR#W72
33	TE14	SLG-STK@LEEDS(BKR R395) – L/O LEEDS-GILBOA(GL3) / BKUP CLR#95 ATHENS
34	TE15	SLG-STK@LEEDS (BKR R9293) – L/O LEEDS-PV(92) / BKUP CLR#93 N.SCOT
35	TE16	SLG-STK@ROSETON (BKR 31151) – L/O ROSETON-ROCK TAVERN#311 / BKUP CLR#303
36	TE18Q429	LLG@LADENTOWN – L/O Y88/Y94 BUCHANAN RIVER CROSSING DCT W/RCL
37	TE20	LLG@DUNWOODIE – L/O W89/W90 PLEASANTVILLE-DUNWD DCT W/RCL
38	TE21	LLG@PLTVLLEY – L/O F30/F31 PLTVLLEY-MILLWOOD DCT W/RCL
39	TE27	SLG-STK@ROCK (BKR 376512) – L/O ROCK TAVN-DOLSON (DART-44) / BKUP CLR#76
40	TE29	3PH-NC@N.SCOT – L/O N.SCOT-LEEDS#93 W/HS RCL
41	TE30	3PH-NC@LEEDS – L/O GILBOA - LEEDS (GL-3)
42	TE31	3PH@GILBOA – L/O GILBOA - NEW SCOTLAND (GNS-1)
43	TE32	3PH-NC@NEW SCOTLAND – L/O NEW SCOTLAND 77 BUS

44	TE33	3PH-NC@NEW SCOTLAND – L/O NEW SCOTLAND 99 BUS
45	TE34	SLG-STK@GILBOA (BKR 3308) – L/O GILBOA-NSCOT (GNS-1) / BKUP CLR GILBOA#3,4
46	TE35	3PH-NC@LEEDS – L/O LEEDS-ATHENS#95 W/HS RCL
47	TE36	3PH-NC@LEEDS – L/O LEEDS - HURLEY AVENUE (301)
48	TE38	3PH-NC@ROCK TAVERN – L/O ROSETON - ROCK TAVERN #311
49	TE40	LLG@RAMAPO - L/O 69/J3410+70/K3411 DCT
50	TE42	3PH-NC@RAMAPO500 – L/O RAMAPO-HOPATCONG
51	TE44	LLG@RAMAPO - L/O RAMAPO - ROCK-TAVERN 77 & 76 / DCT
52	UC08	SLG-STK@LADENTOWN (BKR#1-56-2) - L/O RAMAPO-LADENTWN (W72) / BKUP CLR BOWL#1
53	UC22Q429	SLG-STK@LADENTWN (BKR#3-56-2) – L/O LADENTWN - NROCK (Y88) / BKUP CLR BOWL#1
54	UC23	SLG-STK@RAMAPO (BKR#T77-94-2) – L/O RAMAPO-BUCHANAN (Y94) / BKUP CLR#77
55	UC23B	SLG-STK@RAMAPO (BKR#T77-94-2) – L/O RAMAPO-BUCHANAN (Y94) / BKUP CLR#77
56	UC24	SLG-STK@ROCK (BKR#31153) – L/O ROCK TAVERN-ROSESTON (311) / BKUP CLR# CCRT-34
57	UC25A	3PH-NC@RAVENSWOOD#3 – L/O RAVENSWOOD#3
58	UC25B	3PH-NC@RAINEY – L/O RAVENSWOOD#3 60L CABLE
59	UC26	LLG@LADENTWN - L/O 67/68 DCT / REJECT BOWLINE
60	UC28	SLG-STK@COOPERS – L/O CCRT-42 (CPV) / BKUP CLR UCC2-41@MARCY
61	UC29Q429	SLG-STK@LADENTWN (BKR#6-56-2) – L/O LADENTWN-NROCK (Y88) / BKUP CLR BOWL#2

Tested PJM Contingencies

Sixty-eight (68) PJM contingencies were tested for this study. Table 5 provides the identification and description of these contingencies.

Table 5.
PJM Contingencies Applied for Evaluating NY-PJM and PJM-NY Stability Transfer Limits

#	ID	Description
1	PJM01_P1	3ph fault at Doubs on Doubs-Brighton 500kV line w/ normal clearing
2	PJM02_P1	3ph fault at Keystone on Keystone-Cabot 500kV line w/ normal clearing
3	PJM03_P1	3ph fault at Keystone on Keystone-South Bend 500kV line w/ normal clearing
4	PJM04_P1	3ph fault at Keystone on Keystone-Juniata 500kV line w/ normal clearing
5	PJM05_P1	3ph fault at Rice 500kV on Rice-Vinco 500kV line w/ normal clearing
6	PJM06_P1	3ph fault at Vinco 500kV on Vinco-Conemaugh 500kV line w/ normal clearing
7	PJM07_P1	3ph fault at Conemaugh on Conemaugh-Juniata 500kV line w/ normal clearing
8	PJM08_P1	3ph fault at Conemaugh on Conemaugh-Vinco 500kV line w/ normal clearing
9	PJM09_P1	3ph fault at Homer City on Homer City-Armstrong 345kV line w/ normal clearing
10	PJM10_P1	3ph fault at Handsome Lake on Handsome Lake-Wayne 345kV line w/ normal clearing
11	PJM11_P1	3ph fault at Homer City on Homer City-Pierce Brook 345kV line w/ normal clearing
12	PJM12_P1	3ph fault at Pierce Brook on Pierce Brook - Homer City 345kV line w/ normal clearing

13	PJM13_P1	3ph fault at Pierce Brook on Pierce Brook - Five Mile 345kV line w/ normal clearing
14	PJM14_P1	3ph fault at Homer City 345kV on Homer City-Mainesburg 345kV line w/ normal clearing
15	PJM15_P1	3ph fault at Mainesburg 345kV on Mainesburg-Homer City 345kV line w/ normal clearing
16	PJM16_P1	3ph fault at Mainesburg 345kV on Mainesburg-Watercure 345kV line w/ normal clearing
17	PJM17_P1	3ph fault at Erie South 345kV on Erie South-Erie West 345kV line w/normal clearing
18	PJM18_P1	3ph fault at E. Towanda on E. Towanda-Hillside 230kV line w/ normal clearing
19	PJM19_P1	3ph fault at E. Towanda on E. Towanda-Canyon-N. Meshoppen 230kV line w/ normal clearing
20	PJM20_P1	3ph fault at Hunterstown 500kV on Hunterstown-Conastone 500kV line w/ normal clearing
21	PJM21_P1	3ph fault at Hopatcong 500kV on Hopatcong-Ramapo 500kV line w/ normal clearing
22	PJM22_P1	3ph fault at Branchburg 500kV on Branchburg-Hopatchong 500kV line w/ normal clearing
23	PJM23_P1	3ph fault at Lackawanna 500kV on Lackawanna-Hopatcong 500kV line w/ normal clearing
24	PJM24_P1	3ph fault at Susquehanna 500kV on Susquehanna-Wescosville 500kV line w/ normal clearing
25	PJM25_P1	3ph fault at Alburtis 500kV on Alburtis-Branchburg 500kV line w/ normal clearing
26	PJM26_P1	3ph fault at Sunbury 500kV on Sunbury-Juniata 500kV line w/ normal clearing
27	PJM27_P1	3ph fault at Juniata on Juniata-Keystone 500kV line w/ normal clearing
28	PJM28_P1	3ph fault at Juniata on Juniata-Conemaugh 500kV line w/ normal clearing
29	PJM29_P1	3ph fault at the high side of Susquehanna unit 2 GSU w/ normal clearing. Drop Susquehanna unit 2
30	PJM30_P1	3ph fault at Lackawanna 230kV on Lackawanna-Oxbow-N.Meshoppen 230kV line w/ normal clearing
31	PJM31_P1	3ph fault at Elroy 500kV on Eloy-Hosensack 500kV line w/ normal clearing
32	PJM32_P1	3ph fault at Peach Bottom 500kV on Peach Bottom-Limerick 500kV line w/ normal clearing
33	PJM33_P1	3ph fault at Peach Bottom 500kV on Peach Bottom-Conastone 500kV line w/ normal clearing
34	PJM34_P1	3ph fault at the high side of Limerick unit 2 GSU w/ normal clearing. Drop Limerick unit 2
35	PJM35_P1	3ph fault at the high side of Peach Bottom unit 2 GSU w/ normal clearing. Drop Peach Bottom unit 2
36	PJM36_P1	3ph fault at Roseland 500kV on Roseland-Hopatcong 500kV line w/ normal clearing
37	PJM37_P1	3ph fault at Salem on Salem-New Freedom 500kV line w/ normal clearing
38	PJM38_P1	3ph fault at New Freedom 500kV on New Freedom-E. Windsor 500kV line w/ normal clearing
39	PJM39_P1	3ph fault at Salem 500kV on Salem-Orchard 500kV line w/ normal clearing
40	PJM40_P1	3ph fault at the high side of Salem unit 1 GSU w/ normal clearing. Drop Salem unit 1 generator
41	PJM41_P1	3ph fault at the high side of Hope Creek GSU w/ normal clearing. Drop Hope Creek generator
42	PJM42_P1	3ph fault at Bergen 230kV on Bergen-HTP 230kV line w/ normal clearing
43	PJM43_P1	3ph fault at Raritan River 230kV on Raritan River-Neptune 230kV line w/ normal clearing
44	PJM44_P1	3ph fault at Tosco 230kV on Tosco-Linden 230kV line w/normal clearing
45	PJM45_P1	3ph fault at Keeney 500kV on Keeney-Rock Springs 500kV line w/ normal clearing
46	PJM46_P1	3ph fault at Rock Springs 500kV on Rock Springs-Keeney 500kV line w/ normal clearing
47	PJM47_P1	3ph fault at Hope Creek 500kV on Hope Creek - Red Lion 500kV line w/ normal clearing
48	PJM48_P1	3ph fault at Limerick 500kV on Limerick - Whitpain 500kV line w/ normal clearing
49	PJM49_P1	3ph fault at Limerick 500kV on Limerick - Peach Bottom 500kV line w/ normal clearing

50	PJM50_P1	3ph fault at E. Towanda on E. Towanda-Scotch Hollow-Grover-Marshall 230kV line w/ normal clearing
51	PJM51_P1	3ph fault at Homer City on Homer City-Shelocta-Keystone 230kV line w/ normal clearing
52	PJM52_P1	3ph fault at Homer City on Homer City-Johnstown 230kV line w/ normal clearing
53	PJM53_P1	3ph fault at Lackawanna 500kV on Lackawanna-Shickshinny 500kV line w/ normal clearing
54	PJM54_P1	3ph fault at Shickshinny 500kV on Shickshinny-Lackawanna 500kV line w/ normal clearing
55	PJM55_P1	3ph fault at Susquehanna 500kV on Susquehanna-Shickshinny 500kV line w/ normal clearing
56	PJM56_P1	3ph fault at Shickshinny 500kV on Shickshinny-Susquehanna 500kV line w/ normal clearing
57	PJM57_P1	3ph fault at Susquehanna 500kV on Susquehanna-Sunbury 500kV line w/ normal clearing
58	PJM58_P1	3ph fault at Sunbury 500kV on Susquehanna - Susquehanna 500kV line w/ normal clearing
59	PJM59_P1	3ph fault at Glade on Glade-Lewis Run 230kV line w/ normal clearing
60	PJM60_P1	3ph fault at Glade on Glade-Warren 230kV line w/ normal clearing
61	PJM61_P1	3ph fault at Glade on Glade-Forest 230kV line w/ normal clearing
62	PJM62_P1	3ph fault at Glade on Warren-Erie South 230kV line w/ normal clearing
63	PJM63_P1	3ph fault at Glade on Erie South-Warren 230kV line w/ normal clearing
64	PJM64_P1	3ph fault at Perry on Perry-Ashtabula-Erie West 345kV line w/ normal clearing
65	PJM65_P1	3ph fault at Ashtabula on Perry-Ashtabula-Erie West 345kV line w/ normal clearing
66	PJM66_P1	3ph fault at Salem 500kV on Salem-Hope Creek 500kV line w/ normal clearing
67	PJM67_P1	3ph fault at Erie East 230kV on Erie East-South Ripley 230kV line w/ normal clearing
68	PJM68_P1	3ph fault at Fourmile 230kV on FourMile-Erie East 230kV line w/ normal clearing

Monitored Elements

To assess system stability response for the NY-PJM and PJM-NY power transfer scenarios, the following parameters were monitored and analyzed:

- generators' angles, power outputs, terminal voltages, and speeds in the following areas/zones (PJM, West, Oswego, Hudson, and Capital); and
- bus voltages and frequencies around NY-PJM interface.

The recommended limits in this report are all based on stable system response at the highest transfer level tested. There were no instances of any system or unit instability observed in any of the simulations.

Discussion

General Comments

Angle and Voltage Monitoring

Machine angles and bus voltages were employed in this analysis as the key indicators of system stability. The discussions that follow include representative plots of generation unit angle response for illustration purposes. Similar plots are included in the appendix for all simulations conducted. The recommended limits in this report are all based on stable system response at the highest transfer level tested. There were no instances of any system or unit instability observed in any of the simulations.

NY-PJM Stability Limit

Thermal Limit Results

Emergency transfer criteria, generation re-dispatch and winter ratings were utilized to achieve the highest possible emergency thermal transfer limit into PJM. The Emergency Thermal limit result for NY-PJM is found in Table 6 below:

Table 6.
NY-PJM Emergency Thermal Limit Result

Emergency Transfer Limit	Limiting Element	Rating	Limiting Contingency
2440 MW	Fraser – Delhi TAP (951) 115 kV	239 STE	Oakdale – Fraser (32) 345 kV

Stability Limit Results

NY-PJM transfers were increased 164% of the resultant emergency transfer limit to determine if any signs of instability were present. Stability limit results for NY-PJM are found in Table 7 and Figures 2 and 3 below:

Table 7.
NY-PJM Stability Limit Result

Direction	Proposed Limit	Studied Transfer Level	Most Severe Contingency
NY-PJM	3600 MW	4000 MW	CE18

Most Severe Contingency – CE18, LLG@ROCK – L/O CPV (DOLSON) - ROCK TAVERN DCT

The most severe system response among tested contingencies resulted from contingency CE18, a line to line to ground fault, at Rock Tavern 345 kV resulting in the loss of Dolson-Rock Tavern 345 kV, Dolson-Middletown TAP 345 kV and Middletown TAP-Coopers Corners 345 kV. As shown in Figures 2 and 3, the CE18 contingency stands out in its larger angle magnitude response compared to the other tested contingencies.

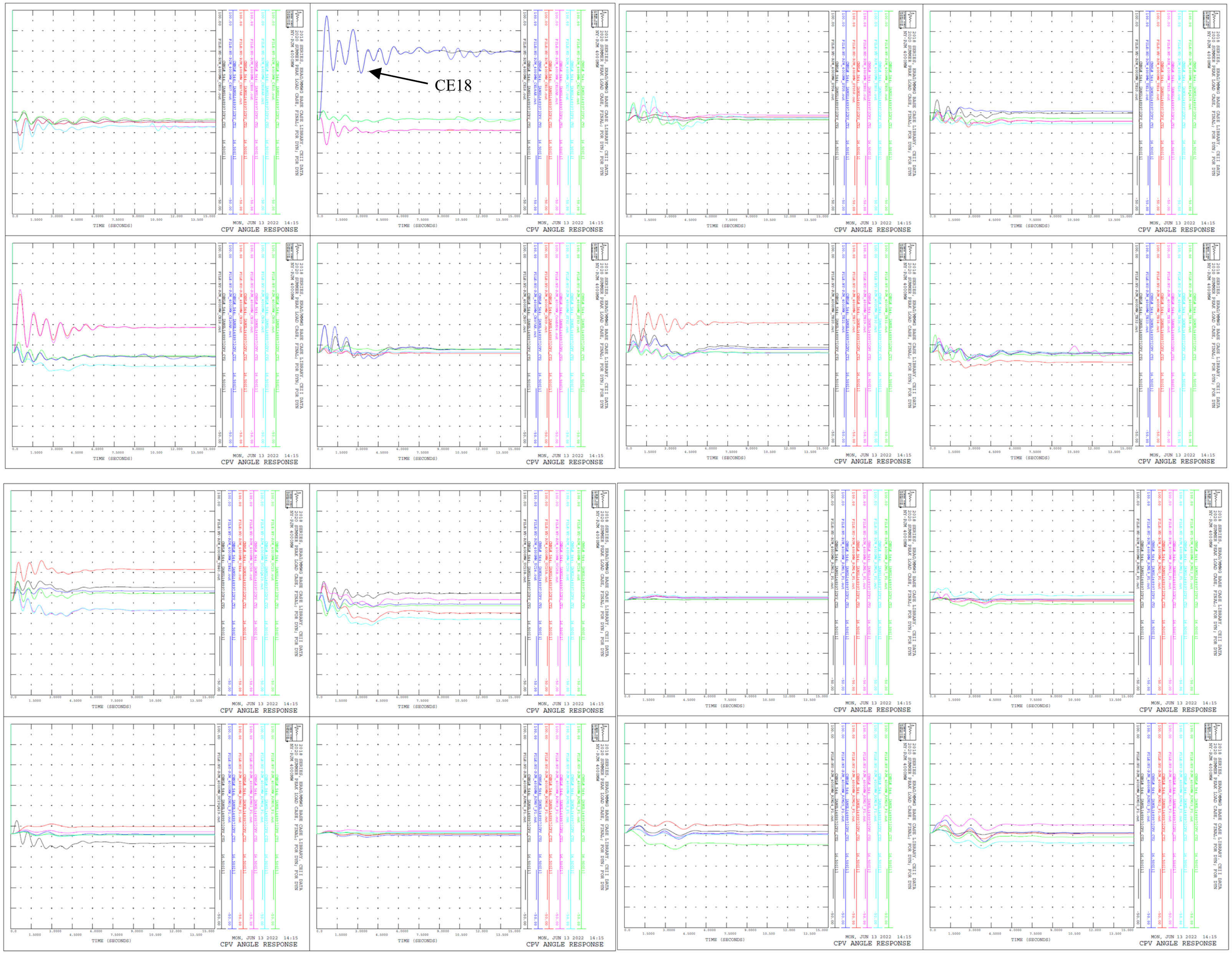

Figure 2: CPV Angular Response for NY-PJM 4000 MW Transfer

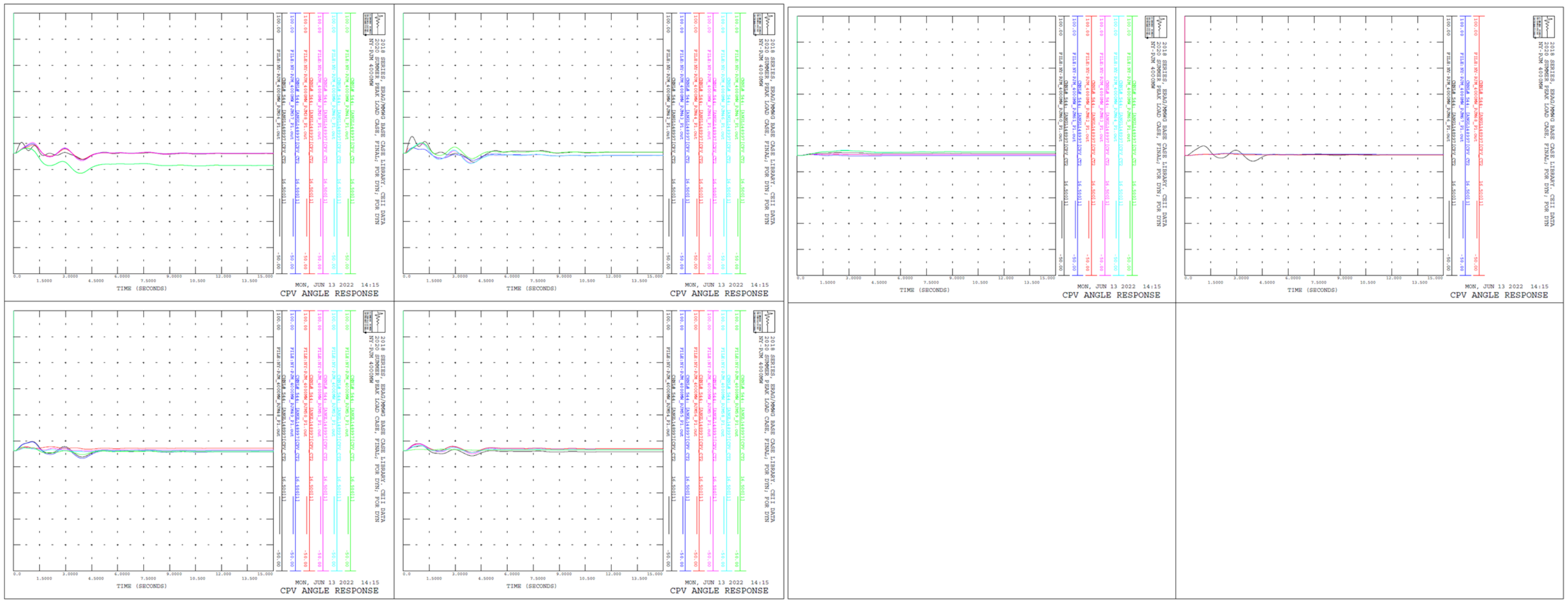

Figure 3: CPV Angular Response for NY-PJM 4000 MW Transfer (Continued)

The left graph in Figure 4 below shows six angle responses: Bowline, Jamestown, Salem, and Homer City to show the impact on major generators near the NY-PJM interface, along with Moses and Gilboa to show the broader impact of CE18 on the NYCA. The right graph in Figure 3 also shows the voltage response at major buses near the NY-PJM interface, Rock Tavern 345 kV, Oakdale 345 kV, East Towanda 230 kV, Homer City 345 kV, as well as Massena 230 kV and Gilboa 345 kV to show the broader impact of CE18.

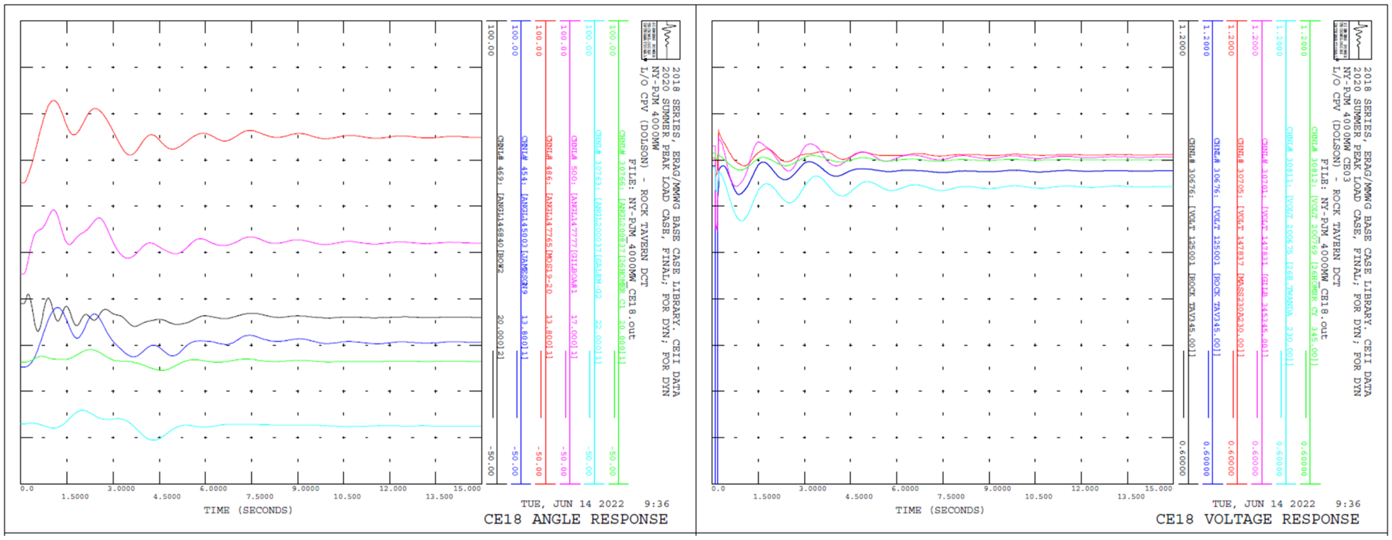

Figure 4: Contingency CE18 All-In-Service Plots of Angle/Voltage Responses

PJM-NY Stability Limit

Thermal Limit Results

Emergency transfer criteria, generation re-dispatch and winter ratings were utilized to achieve the highest possible emergency thermal transfer limit into NY. The Emergency Thermal limit result for PJM-NY is found in Table 8 below:

Table 8.
PJM-NY Emergency Thermal Limit Result

Emergency Transfer Limit	Limiting Element	Rating	Limiting Contingency
3175 MW	Hillside – East Towanda (70) 230 kV	670 MW STE	Lackawanna – Hopatcong (5063) 500kV

Stability Limit Results

PJM-NY transfers were increased 150% of the resultant emergency transfer limit to determine if any signs of instability were present. Stability limit results for PJM-NY are found in Table 9 and Figure 5 and 6 below:

Table 9.
PJM-NY Stability Limit Result

Direction	Proposed Limit	Studied Transfer Level	Most Severe Contingency
PJM-NY	4250 MW	4765 MW	CE18

Most Severe Contingency – CE18, LLG@ROCK – L/O CPV (DOLSON) - ROCK TAVERN DCT

The most severe system response among tested contingencies resulted from contingency CE18, a line to line to ground fault, at Rock Tavern 345 kV resulting in the loss of Dolson-Rock Tavern 345 kV, Dolson-Middletown TAP 345 kV and Middletown TAP-Coopers Corners 345 kV. As shown in Figures 5 and 6, the CE18 contingency stands out in its larger angle magnitude response compared to the other tested contingencies.

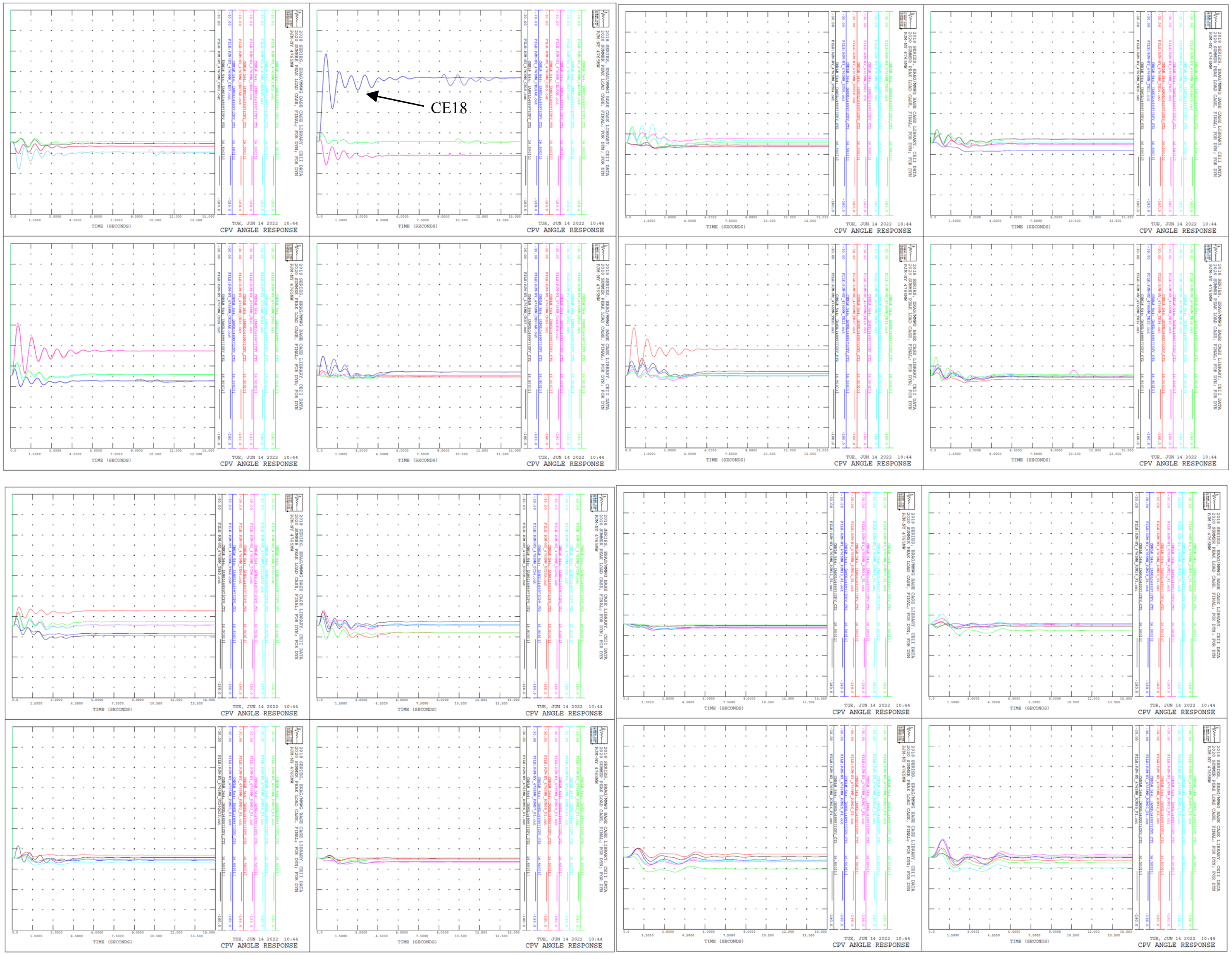

Figure 5: CPV Angular Response for PJM-NY 4765 MW Transfer

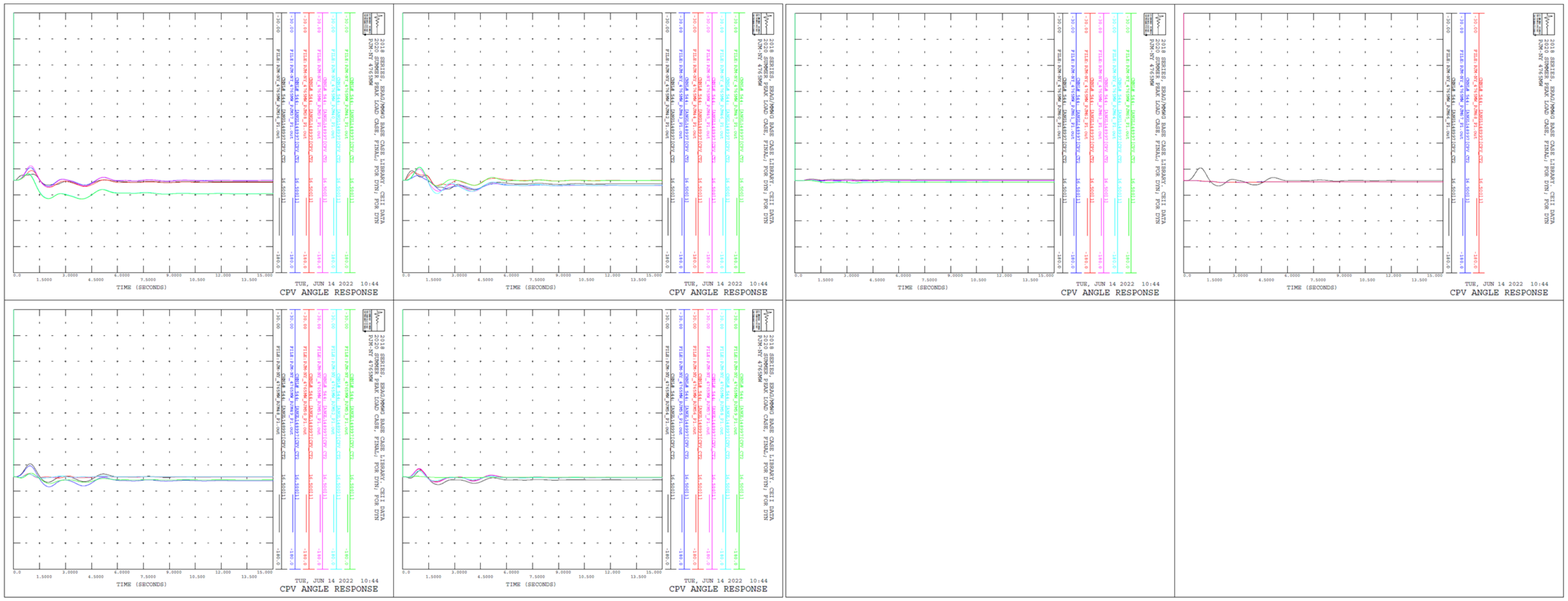

Figure 6: CPV Angular Response for PJM-NY 4765 MW Transfer (Continued)

The left graph in Figure 7 below shows six angle responses: Jamestown, Liberty, Salem, and Homer City to show the impact on major generators near the NY-PJM interface, along with Moses and Gilboa to show the broader impact of CE18 on the NYCA. The right graph in Figure 7 also shows the voltage response at major buses near the NY-PJM interface, Rock Tavern 345 kV, Oakdale 345 kV, East Towanda 230 kV, Homer City 345 kV, as well as Massena 230 kV and Gilboa 345 kV to show the broader impact of CE18.

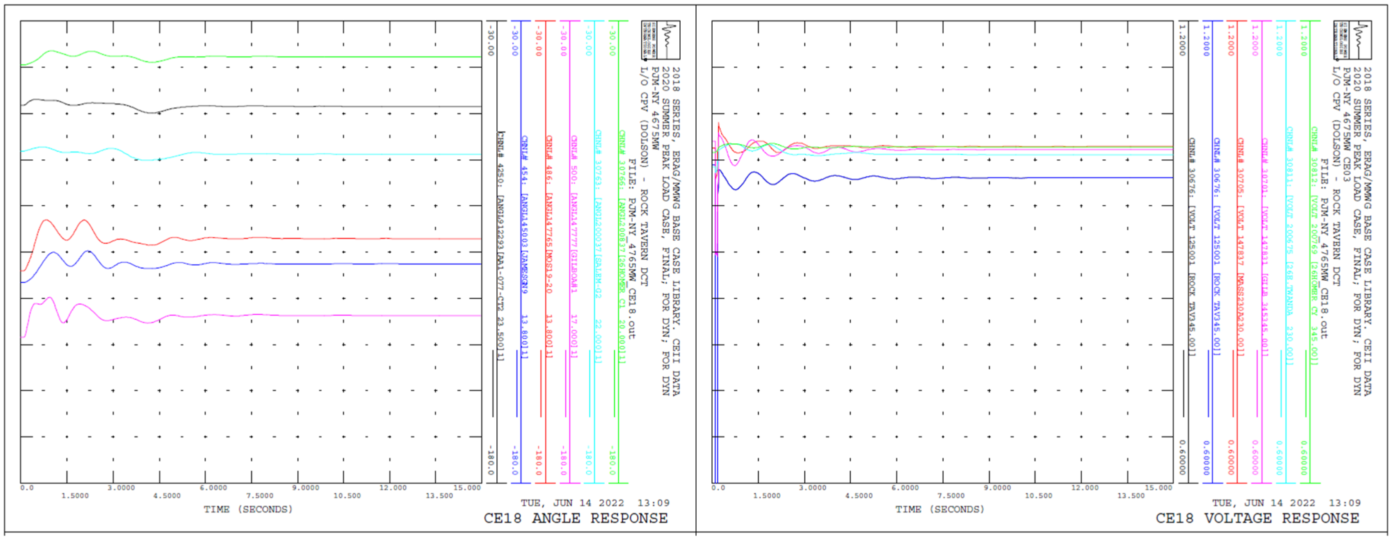

Figure 7: Contingency CE18 All-In-Service Plots of Angle/Voltage Responses