New York ISO
Independent System Operator

CENTRAL EAST STABILITY LIMIT ANALYSIS FOR ALL LINES IN SERVICE AND OUTAGE CONDITIONS (CE-23)

A Report by the
New York Independent System Operator

September 2023

Executive Summary

This study was conducted to examine the stability limits of the Central East interface to determine the impact of commissioning of the Edic-Princetown 345 kV (351 and 352) transmission lines as part of the Segment A project. The new Central East interface is defined in Table 2 and illustrated in Figure 1.

This analysis focused on the impact of the previously stated upgrades on the Central East all lines in service limit and major transmission line outages scenarios. Sensitivities were examined for various operation levels of the Knickerbocker series compensation, and the Marcy South Series Capacitors. The Knickerbocker series compensation was found to have negligible impact on the limits found in this report. The statuses of the Marcy South Series Capacitors and voltage controlling devices such as Marcy StatCom, Fraser SVC, and Leeds SVC were impactful to the Central East limits proposed in this report.

The outages of the Oakdale – Fraser (32) 345 kV line, the Clarks Corners – Oakdale (36) 345 kV line, and the Lafayette – Clarks Corners (4-46) 345 kV lines were studied and found to have the same limits as the all lines in service scenario, and thus it is recommended that the existing limits for these outage conditions be removed. 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.

It is recommended that the Central East stability transfer limits be updated as reported in Tables 1-7.

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Summary of Proposed Limits

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

All Lines in Service													
Oswego	Sithe	Marcy South Series Capacitors Bypassed						Marcy South Series Capacitors I/S					
		Marcy StatCom O/S			Marcy StatCom I/S			Marcy StatCom O/S			Marcy StatCom I/S		
		Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta
5	5	2700	4150	1450	2800	4250	1450	2450	3950	1500	2550	4050	1500
5	3	2650	4100	1450	2700	4200	1500	2400	3900	1500	2450	4000	1550
5	0	2550	3850	1300	2600	3950	1350	2300	3650	1350	2350	3750	1400
4	5	2650	4150	1500	2700	4250	1550	2400	3950	1550	2450	4050	1600
4	3	2600	4100	1500	2650	4200	1550	2350	3900	1550	2400	4000	1600
4	0	2400	3850	1450	2500	3950	1450	2150	3650	1500	2250	3750	1500
3	5	2550	4000	1450	2600	4100	1500	2300	3800	1500	2350	3900	1550
3	3	2500	3850	1350	2600	3950	1350	2250	3650	1400	2350	3750	1400
3	0	2200	3650	1450	2450	3750	1300	1950	3450	1500	2200	3550	1350
2	5	2450	3850	1400	2550	3950	1400	2200	3650	1450	2300	3750	1450
2	3	2350	3650	1300	2500	3750	1250	2100	3450	1350	2250	3550	1300
2	0	2150	3450	1300	2300	3550	1250	1900	3250	1350	2050	3350	1300
1	5	2350	3350	1000	2500	3450	950	2100	3150	1050	2250	3250	1000
1	3	2200	3150	950	2350	3250	900	1950	2950	1000	2100	3050	950
1	0	1950	2850	900	2100	2950	850	1700	2650	950	1850	2750	900
0	5	2000	2850	850	2150	2950	800	1750	2650	900	1900	2750	850
0	3	1850	2650	800	2000	2750	750	1600	2450	850	1750	2550	800
0	0	1600	2300	700	1750	2400	650	1350	2100	750	1500	2200	700

Table 1: Proposed All Lines In-Service Limit

Massena – Marcy (MSU1) 765 kV Line Out-of-Service													
Oswego	Sithe	Marcy South Series Capacitors Bypassed						Marcy South Series Capacitors I/S					
		Marcy StatCom O/S			Marcy StatCom I/S			Marcy StatCom O/S			Marcy StatCom I/S		
		Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta
5	5	N/A	3150		N/A	3250		N/A	2950		N/A	3050	
5	3	N/A	3000		N/A	3100		N/A	2800		N/A	2900	
5	0	N/A	2750		N/A	2850		N/A	2550		N/A	2650	
4	5	N/A	3150		N/A	3250		N/A	2950		N/A	3050	
4	3	N/A	3000		N/A	3100		N/A	2800		N/A	2900	
4	0	N/A	2750		N/A	2850		N/A	2550		N/A	2650	
3	5	2050	2900	850	2150	3000	850	1800	2700	900	1900	2800	900
3	3	2000	2750	750	2000	2850	850	1750	2550	800	1750	2650	900
3	0	1850	2450	600	1850	2550	700	1600	2250	650	1600	2350	750
2	5	1950	2700	750	1950	2800	850	1700	2500	800	1700	2600	900
2	3	1850	2550	700	1850	2650	800	1600	2350	750	1600	2450	850
2	0	1650	2200	550	1650	2300	650	1400	2000	600	1400	2100	700
1	5	N/A	2150		N/A	2250		N/A	1950		N/A	2050	
1	3	N/A	2000		N/A	2100		N/A	1800		N/A	1900	
1	0	N/A	1650		N/A	1750		N/A	1450		N/A	1550	
0	5	N/A	1650		N/A	1750		N/A	1450		N/A	1550	
0	3	N/A	1450		N/A	1550		N/A	1250		N/A	1350	
0	0	N/A	1100		N/A	1200		N/A	900		N/A	1000	

Table 2: Proposed Massena – Marcy (MSU1) 765 kV Line Out-of-Service Limits

Marcy – New Scotland (18) 345 kV Line Out-of-Service													
Oswego	Sithe	Marcy South Series Capacitors Bypassed						Marcy South Series Capacitors I/S					
		Marcy StatCom O/S			Marcy StatCom I/S			Marcy StatCom O/S			Marcy StatCom I/S		
		Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta
4	5	N/A	3650		N/A	3750		N/A	3450		N/A	3550	
4	3	N/A	3600		N/A	3700		N/A	3400		N/A	3500	
4	0	N/A	3450		N/A	3550		N/A	3250		N/A	3350	
3	5	1650	3575	1925	1700	3675	1975	1400	3375	1975	1450	3475	2025
3	3	1650	3475	1825	1650	3575	1925	1400	3275	1875	1400	3375	1975
3	0	1550	3250	1700	1600	3350	1750	1300	3050	1750	1350	3150	1800
2	5	1650	3500	1850	1650	3600	1950	1400	3300	1900	1400	3400	2000
2	3	1600	3350	1750	1650	3450	1800	1350	3150	1800	1400	3250	1850
2	0	1600	3050	1450	1600	3150	1550	1350	2850	1500	1350	2950	1600
1	5	N/A	3050		N/A	3150		N/A	2850		N/A	2950	
1	3	N/A	2900		N/A	3000		N/A	2700		N/A	2800	
1	0	N/A	2600		N/A	2700		N/A	2400		N/A	2500	
0	5	N/A	2600		N/A	2700		N/A	2400		N/A	2500	
0	3	N/A	2450		N/A	2550		N/A	2250		N/A	2350	
0	0	N/A	2150		N/A	2250		N/A	1950		N/A	2050	

Table 3: Proposed Marcy – New Scotland (18) 345 kV Line Out-of-Service Limits

Edic – Gordon Road (14) 345 kV Line Out-of-Service													
Oswego	Sithe	Marcy South Series Capacitors Bypassed						Marcy South Series Capacitors I/S					
		Marcy StatCom O/S			Marcy StatCom I/S			Marcy StatCom O/S			Marcy StatCom I/S		
		Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta
4	5	N/A	3650		N/A	3750		N/A	3450		N/A	3550	
4	3	N/A	3650		N/A	3750		N/A	3450		N/A	3550	
4	0	N/A	3500		N/A	3600		N/A	3300		N/A	3400	
3	5	1800	3500	1700	1850	3600	1750	1550	3300	1750	1600	3400	1800
3	3	1750	3475	1725	1800	3575	1775	1500	3275	1775	1550	3375	1825
3	0	1400	3275	1875	1650	3375	1725	1150	3075	1925	1400	3175	1775
2	5	1750	3350	1600	1900	3450	1550	1500	3150	1650	1650	3250	1600
2	3	1650	3300	1650	1750	3400	1650	1400	3100	1700	1500	3200	1700
2	0	1400	3050	1650	1650	3150	1500	1150	2850	1700	1400	2950	1550
1	5	N/A	3000		N/A	3100		N/A	2800		N/A	2900	
1	3	N/A	2900		N/A	3000		N/A	2700		N/A	2800	
1	0	N/A	2600		N/A	2700		N/A	2400		N/A	2500	
0	5	N/A	2650		N/A	2750		N/A	2450		N/A	2550	
0	3	N/A	2500		N/A	2600		N/A	2300		N/A	2400	
0	0	N/A	2200		N/A	2300		N/A	2000		N/A	2100	

Table 4: Proposed Edic – Gordon Road (14) 345 kV Line Out-of-Service Limits

Princetown – New Scotland (55 or 361 or 362) 345 kV Line Out-of-Service													
Oswego	Sithe	Marcy South Series Capacitors Bypassed						Marcy South Series Capacitors I/S					
		Marcy StatCom O/S			Marcy StatCom I/S			Marcy StatCom O/S			Marcy StatCom I/S		
		Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta
4	5	N/A	4000		N/A	4100		N/A	4000		N/A	4100	
4	3	N/A	4000		N/A	4100		N/A	4000		N/A	4100	
4	0	N/A	3800		N/A	3900		N/A	3800		N/A	3900	
3	5	2750	3925	1175	2850	4025	1175	2500	3725	1225	2600	3825	1225
3	3	2550	3850	1300	2650	3950	1300	2300	3650	1350	2400	3750	1350
3	0	2450	3650	1200	2500	3750	1250	2200	3450	1250	2250	3550	1300
2	5	2650	3850	1200	2700	3950	1250	2650	3850	1200	2700	3950	1250
2	3	2550	3700	1150	2600	3800	1200	2550	3700	1150	2600	3800	1200
2	0	2450	3500	1050	2500	3600	1100	2450	3500	1050	2500	3600	1100
1	5	N/A	3300		N/A	3400		N/A	3300		N/A	3400	
1	3	N/A	3150		N/A	3250		N/A	3150		N/A	3250	
1	0	N/A	2900		N/A	3000		N/A	2900		N/A	3000	
0	5	N/A	2800		N/A	2900		N/A	2800		N/A	2900	
0	3	N/A	2650		N/A	2750		N/A	2650		N/A	2750	
0	0	N/A	2350		N/A	2450		N/A	2350		N/A	2450	

Table 5: Proposed Princetown – New Scotland (55 or 361 or 362) 345 kV Line Out-of-Service Limits

Princetown – Gordon Road (371) 345 kV Line Out-of-Service													
Oswego	Sithe	Marcy South Series Capacitors Bypassed						Marcy South Series Capacitors I/S					
		Marcy StatCom O/S			Marcy StatCom I/S			Marcy StatCom O/S			Marcy StatCom I/S		
		Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta
4	5	N/A	4050		N/A	4150		N/A	3850		N/A	3950	
4	3	N/A	3950		N/A	4050		N/A	3750		N/A	3850	
4	0	N/A	3800		N/A	3900		N/A	3600		N/A	3700	
3	5	2450	3900	1450	2600	4000	1400	2200	3700	1500	2350	3800	1450
3	3	2400	3800	1400	2500	3900	1400	2150	3600	1450	2250	3700	1450
3	0	2000	3575	1575	2400	3675	1275	1750	3375	1625	2150	3475	1325
2	5	2400	3750	1350	2450	3850	1400	2150	3550	1400	2200	3650	1450
2	3	2350	3650	1300	2400	3750	1350	2100	3450	1350	2150	3550	1400
2	0	2000	3350	1350	2250	3450	1200	1750	3150	1400	2000	3250	1250
1	5	N/A	3250		N/A	3350		N/A	3050		N/A	3150	
1	3	N/A	3150		N/A	3250		N/A	2950		N/A	3050	
1	0	N/A	2850		N/A	2950		N/A	2650		N/A	2750	
0	5	N/A	2800		N/A	2900		N/A	2600		N/A	2700	
0	3	N/A	2650		N/A	2750		N/A	2450		N/A	2550	
0	0	N/A	2350		N/A	2450		N/A	2150		N/A	2250	

Table 6: Proposed Princetown – Gordon Road (371) 345 kV Line Out-of-Service Limits

Edic – Princetown (351 or 352) 345 kV Line Out-of-Service													
Oswego	Sithe	Marcy South Series Capacitors Bypassed						Marcy South Series Capacitors I/S					
		Marcy StatCom O/S			Marcy StatCom I/S			Marcy StatCom O/S			Marcy StatCom I/S		
		Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta
4	5	N/A	3650		N/A	3750		N/A	3450		N/A	3550	
4	3	N/A	3600		N/A	3700		N/A	3400		N/A	3500	
4	0	N/A	3450		N/A	3550		N/A	3250		N/A	3350	
3	5	N/A	3550		N/A	3650		N/A	3350		N/A	3450	
3	3	N/A	3475		N/A	3575		N/A	3275		N/A	3375	
3	0	N/A	3275		N/A	3375		N/A	3075		N/A	3175	
2	5	N/A	3450		N/A	3550		N/A	3250		N/A	3350	
2	3	N/A	3350		N/A	3450		N/A	3150		N/A	3250	
2	0	N/A	3100		N/A	3200		N/A	2900		N/A	3000	
1	5	N/A	3050		N/A	3150		N/A	2850		N/A	2950	
1	3	N/A	2900		N/A	3000		N/A	2700		N/A	2800	
1	0	N/A	2650		N/A	2750		N/A	2450		N/A	2550	
0	5	N/A	2650		N/A	2750		N/A	2450		N/A	2550	
0	3	N/A	2450		N/A	2550		N/A	2250		N/A	2350	
0	0	N/A	2200		N/A	2300		N/A	2000		N/A	2100	

Table 7: Proposed Edic – Princetown (351 or 352) 345 kV Line Out-of-Service Limits

Introduction

This study serves as an analysis of Central East stability limits after the commissioning of the Edic-Princetown 345 kV (351/352) lines as part of the Segment A project. The all-lines-in-service and a variety of outage conditions were reviewed along the interface. Sensitivities regarding the status of the Knickerbocker series capacitor path and the Marcy South Series Capacitors were examined, with the former causing no degradations to Central East limits. This study provides recommendations to update the Central East stability transfer limits for outage conditions as per Tables 1A-H.

System Operating Limit Methodology

The NYSRC Reliability Rules for Planning and Operating the New York State Power System (NYSRC Reliability Rules) provide 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.1 of the NYSRC Reliability Rules sets forth the contingencies to be evaluated and the performance requirements to be applied in developing SOLs. Rule C.1 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 Central East interface definition is given below in Table 4 and illustrated in Figure 1. Please note that the new Edic-Princetown (351 and 352) 345 kV lines are new additions to the Central East interface.

Central East		
Mohawk Valley (Zone E) – Capital (Zone F)		
Name	**Line ID**	**Voltage (kV)**
Edic-Gordon Rd.*	14	345
Marcy-New Scotland*	18	345
East Springfield-Inghams*	7-942	115
Inghams PAR*	PAR	115
Inghams Bus Tie*	R81	115
Edic*-Princetown	351	345
Edic*-Princetown	352	345
North (Zone D) – ISONE (Zone N)		
*Plattsburgh-Sand Bar	PV20	115

Figure 1: Central East Interface Definition

* Indicates the metered end of the circuit

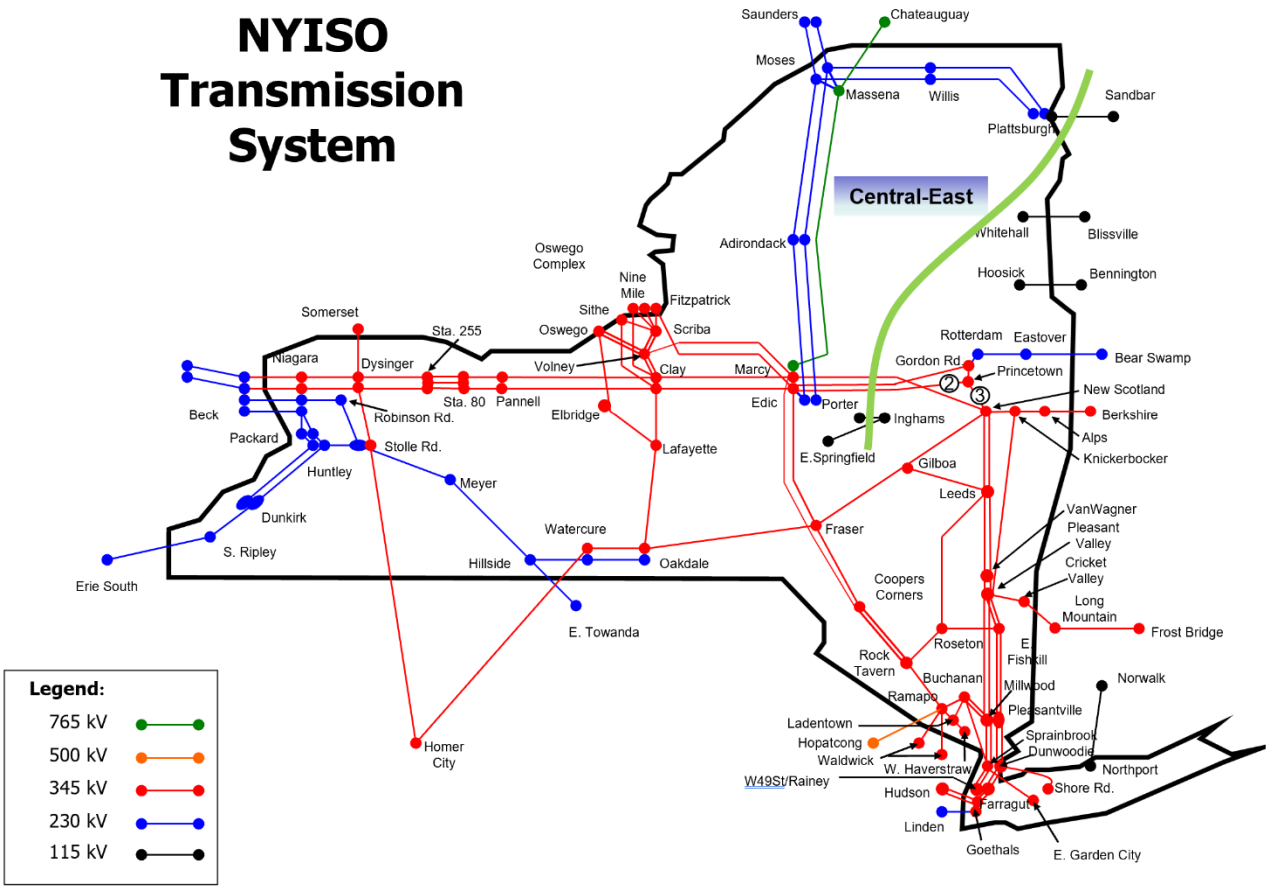

Figure 2: NYCA Transmission System Interface (Central East inset)

System Representation and Transfer Case Development

The analysis was based on the 2022 NYISO Dynamics Base Case, which was developed from the 2022 MMWG Dynamics Base Case with the NYISO representation updated to reflect the results of the NYISO 2022 Summer Operating Study. The Summer 2022 Operating Study was updated to include the summer 2023 network configuration of the Segment A and Segment B projects, including the additions of the Princetown 345 kV substation, the new Edic-Princetown 345 kV lines (351 and 352), the Princetown-New Scotland 345 kV lines (361 and 362), the Knickerbocker 345 kV substation, the Knickerbocker series compensation connection to Pleasant Valley 345 kV, the Van Wagner 345 kV substation, which taps the 345 kV lines of Leeds – Pleasant Valley (91) and Athens – Pleasant Valley (92). The Leeds-Hurley smart wire, replacing existing equipment on the Leeds – Hurley (301) 345 kV line, was also placed in service for this analysis.

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

Central East transfers were developed from generation shifts between IESO and NYISO West (Zone A) through Central (Zone C) to Capital (Zone F), and ISO New England, as well as transfers from PJM into Capital (Zone F) and Hudson (Zone G) along the terms of the joint operating agreement between NYISO and PJM. The base case was established with a high transfer on Dysinger East (> 2900 MW), Moses South (> 2900 MW) and NY-ISO-NE (1800 MW).

The units included in the Oswego Complex are Nine Mile 1, Nine Mile 2, Fitzpatrick, Oswego 5 and Oswego 6. When this report refers to Oswego units, it is referring to these units. The large combined cycle plant in the Oswego area is referred to as Sithe and is accounted for separately.

This study was performed with Chateauguay HVDC terminals taken out-of-service with the Chateauguay transfers maintained with the Beauharnois units. When the Fraser SVC, Leeds SVC and Marcy FACTs were modeled in-service, the base case load flow were solved with the SVCs/FACTs set to minimum (0MVAr) output by adjusting their respective voltage schedules in the pre-contingency case.

This study placed the Knickerbocker series compensation in service at 0% compensation. Sensitivities were examined for various operation levels of the Knickerbocker series compensation and the status of the Marcy South Series Capacitors (MSSC). The Knickerbocker series compensation was not found to cause a degradation of any limits found in this report. The status of the MSSC devices was found to have an impact on Central East limits which can be observed in the summary of the proposed limit tables.

Tested Contingencies

One hundred and four (104) contingencies were tested for each Central East transfer case scenario. Table 3 on the following pages provides the identification and description of these contingencies.

All Central East contingencies listed were tested for each Oswego scenario, with 0, 3 and 5 Sithe units in-service for Marcy StatCom sensitivity and Marcy South Series Capacitors sensitivity. The contingencies that resulted in the largest oscillation of machine angles or caused instability were employed to determine all the proposed limits presented on Table 9.

The most severe contingency related to Central East stability is CE99, a single line to ground fault at Scriba 345 kV which results in the loss of Scriba – Volney (21) 345 kV and the back-up clearing of the Fitzpatrick – Scriba (FS-10) 345 kV line. Other than CE99, we found the following twenty-three contingencies merit monitoring: CE01_AC-SegA_SUM2027, CE01AR_AC-SegA_SUM2027, CE03_AC-SegA_SUM2027, CE05, CE06, CE09_AC-SegA_SUM2027, CE15, CE20, CE22, CE22AR, CE36, NE01, NE03. NYPA02_2022, NYPA150, P4-2-F31_SLG_NSCOT_KNKBKR_#R2, SA01_Q556, SA02_Q556_SUM2023. SA07_Q556_SUM2022, SA11_Q556_SUM2027, SA24_Q556_SUM2027, SA25_Q556_SUM2027, and SA27_Q556_SUM2027.

Contingencies Applied for Evaluating Central East Stability Transfer Limits		
#	**ID**	**Description**
1	CE01_AC-SEGA_SUM2027	3PH-NC@EDIC345 – L/O EDIC-PRINCETOWN #351
2	CE01AR_AC-SEGA_SUM2027	3PH-NC@EDIC345 – L/O EDIC-PRINCETOWN #351 W/AUTO RCL
3	CE02	3PH-NC@MARCY345 – L/O MARCY-N.SCOTLAND (UNS-18) W/RCL
4	CE03_AC-SEGA_SUM2027	SLG-STK@EDIC345 (BKR R935) – L/O EDIC-PRINCETOWN #351 / BKUP CLR FE1
5	CE05	3PH-NC@EDIC345 – L/O EDIC-MARCY UE1-7
6	CE06	3PH-NC@MARCY345 – L/O EDIC-MARCY (UE1-7)
7	CE07	LLG@MARCY/EDIC - L/O MARCY-COOPERS (UCC2-41) & EDIC-FRASER (EF24-40) DCT
8	CE07AR	LLG@MARCY/EDIC - L/O MARCY-COOPERS (UCC2-41) & EDIC-FRASER (EF24-40) DCT W/RCL
9	CE08	LLG@COOPERS - L/O MARCY-COOPERS (UCC2-41)/FRASER-COOPERS (FCC33) DCT
10	CE08AR	LLG@COOPERS – L/O MARCY-COOPERS (UCC2-41)/FRASER-COOPERS (FCC33) DCT W/RCL
11	CE09_AC-SEGA_SUM2027	SLG-STK@EDIC345KV (BKR R10)– L/O FITZ-EDIC #FE-1/BKUP CLR#351
12	CE10	SLG-STK@MARCY345 (BKR3308) – L/O MARCY-N.SCOT (UNS-18)
13	CE11	SLG-STK@FRASER345 (BKR B1/3562) – L/O FRASER-GILBOA (GF-5)
14	CE12_AC-SEGA_SUM2027	3PH-NC@PRINCETOWN345 – L/O EDIC-PRINCETOWN #351 W/H.S RCL
15	CE13	3PH-NC@VOLNEY345 – L/O VOLNEY-MARCY (VU-19)
16	CE14	3PH-NC@MARCY345 – L/O VOLNEY-MARCY (VU-19)
17	CE15	SLG-STK@MARCY345(BKR 3108) – L/O VOLNEY-MARCY (VU-19) / BKUP CLR#UE1-7
18	CE16	SLG-STK@EDIC345 (BKR R915) – L/O EDIC-FRASER (EF24-40) / BKUP CLR#2-15
19	CE17	SLG-STK@MARCY(BKR 3208)- L/O MARCY-COOPERS(UCC2-41)
20	CE18AR-UC30AR	LLG@ROCK – L/O CPV (DOLSON) - ROCK TAVERN DCT W/ RCL
21	CE18-UC30	LLG@ROCK – L/O CPV (DOLSON) - ROCK TAVERN DCT
22	CE19	LLG@COOPERS – L/O COOPERS CORNERS- CPV_VALY(DOLSON) DCT
23	CE19AR	LLG@COOPERS – L/O COOPERS CORNERS-CPV_VALY(DOLSON) DCT W/ RCL
24a	CE20a	SLG-STK@EDIC345 (BKR R70) – L/O EDIC-MARCY UE1-7/ BKUP CLR EDIC T4 (WithT2 Moved)
24b	CE20-R955	SLG-STK@EDIC 345 (BKR R955)-L/O EDIC-MARCY UE1-7/ BKUP CLR EDIC T3 and CapBank
25	CE21	SLG-STK@FRASER – L/O FRASER-COOPERS 33 / BKUP CLR#32@OAKDALE
26	CE21OAK	TEXT, SLG-STK@FRASER – L/O FRASER-COOPERS 33 / BKUP CLR#32@OAKDALE
27	CE22	3PH-NC@EDIC345 – L/O EDIC-FRASER EF-24/40
28	CE22AR	3PH-NC@EDIC345 – L/O EDIC-FRASER EF-24/40 W/RCL@FRASER
29	CE23	LLG@FRASER – L/O MARCY-COOPERS(UCC2-41)/EDIC-FRASER(EF24-40) DCT

30	CE23AR	LLG@FRASER – L/O MARCY-COOPERS(UCC2-41)/EDIC-FRASER(EF24-40) DCT W/RCL
#	**ID**	**Description**
31	CE24	3PH-NC@FRASER – L/O FRASER-COOPERS CORNERS FCC-33
32	CE24AR	3PH-NC@FRASER – L/O FRASER-COOPERS CORNERS FCC-33 W/RCL
33	CE25	3PH-NC@COOPERS – L/O FRASER-COOPERS CORNERS FCC-33
34	CE25AR	3PH-NC@COOPERS – L/O FRASER-COOPERS CORNERS FCC-33 W/RCL
35	CE26	3PH-NC@COOPERS – L/O MARCY-COOPERS CORNERS UCC-2/41
36	CE26AR	3PH-NC@COOPERS – L/O MARCY-COOPERS CORNERS UCC-2/41 W/RCL
37	CE27	3PH-NC@COOPERS – L/O COOPERS CORNERS- ROCK TAVERN CCRT-34
38	CE27AR	3PH-NC@COOPERS – L/O COOPERS CORNERS-ROCK TAVERN CCRT-34 W/RCL
39	CE28	3PH-NC@COOPERS – L/O COOPERS CORNERS-CPV_VALY(DOLSON) CCRT-42
40	CE28AR	3PH-NC@COOPERS – L/O COOPERS CORNERS-CPV_VALY(DOLSON) CCRT-42 W/RCL
41	CE29	3PH-NC@CPV – L/O CPV_VALY(DOLSON AVE)- ROCK TAV DART-44
42	CE30	3PH-NC@ROCK – L/O ROCK TAVERN-CPV_VALY (DOLSON AVE) DART-44
43	CE32	3PH-NC@FRASER – L/O EDIC - FRASER EF-24/40
44	CE32AR	3PH-NC@FRASER – L/O EDIC - FRASER EF-24/40 W/RCL
45	CE33	3PH-NC@FITZ – L/O EDIC - FITZPATRICK FE-1
46	CE34	3PH-NC@SCRIBA 345KV JA FITZP-SCRIBA #10 NORMALLY CLEARED
47	CE35	3PH-NC@JA FITZP 345KV JA FITZP-SCRIBA #10 NORMALLY CLEARED
48	CE36	SLG--STK@SCRIBA345 (BKR R100)/SCRIBA-FITZ #10/ BKUP CLR SCRIBA 345-SCRIBA 115 XFMR
49	CE37_NM2-L23	3PH@Nine Mile 2 on line 23 from Nine Mile 2 to Scriba with failure of A Package Protection - Using conservative B Package clearing times
50	CE99	SLG-STK@SCRIBA345 (BKR R935) – L/O SCRIBA-VOLNEY 21 / BKUP CLR FITZ-SCRIBA #10
51	NYPA02	3PH-NC@MOSES230 – L/O MOSES-ADIR W/NO REJ.
52	NYPA150	LLG@MOSES230 – L/O MOSES-ST.LAWRENCE L33/34P DCT W/NO REJ
53	NE01	3PH-NC@SEABROOK345 – L/O SEABROOK G1
54	NE03	L/O PHASE II INTERCONNECTION W/O FAULT (N-1)
55	P1-2-F14_3PH_KNKBKR_ALPS	3PH fault at KNICKERBOCKER on KNICKERBOCKER - ALPS 345kV CKT 1
56	P1-2-F15_3PH_ALPS_KNKBKR	3PH fault at ALPS on ALPS - KNICKERBOCKER 345kV CKT 1
57	P1-2-F20_3PH_KNKBKR_PLSVLY	3PH fault at KNICKERBOCKER on KNICKERBOCKER - PLEASANT VALLEY 345kV CKT 1
58	P1-2-F21_3PH_PLSVLY_KNKBKR	3PH fault at PLEASANT VALLEY on PLEASANT VALLEY - KNICKERBOCKER 345kV CKT 1
59	P1-2-F31_3PH_NSCOT77-KNKBKR	3PH fault at N.SCOT77 on N.SCOT77 - KNICKERBOCKER 345kV CKT 1
60	P1-2-F32_3PH_KNKBKR_NSCOT77	3PH fault at KNICKERBOCKER on N.SCOT77 - KNICKERBOCKER 345kV CKT 1

61	P4-2-F13_SLG_KNKBKR_NSCOT_#4_POST	SLG fault at KNICKERBOCKER on KNICKERBOCKER - NEW SCOTLAND 345kV CKT 1 W/ STUCK BRK #4

#	ID	Description
62	P4-2-F13_SLG_KNKBKR_NSCOT_#7_POST	SLG fault at KNICKERBOCKER on KNICKERBOCKER - NEW SCOTLAND 345kV CKT 1 W/ STUCK BRK #7
63	P4-2-F14_SLG_KNKBKR_ALPS_#5_POST	SLG fault at KNICKERBOCKER on KNICKERBOCKER - ALPS 345kV CKT 1 W/ STUCK BRK #5
64	P4-2-F14_SLG_KNKBKR_ALPS_#7_POST	SLG fault at KNICKERBOCKER on KNICKERBOCKER - ALPS 345kV CKT 1 W/ STUCK BRK #7
65	P4-2-F15_SLG_ALPS_KNKBKR_#R2	SLG fault at ALPS on ALPS - KNICKERBOCKER 345kV CKT 1 W/ BRK# R2 STUCK
66	P4-2-F20_SLG_KNKBKR_PLSVLY_#4_POST	SLG fault at KNICKERBOCKER on KNICKERBOCKER - PLEASANT VALLEY 345kV CKT 1 W/ STUCK BRK #4
67	P4-2-F20_SLG_KNKBKR_PLSVLY_#5_POST	SLG fault at KNICKERBOCKER on KNICKERBOCKER - PLEASANT VALLEY 345kV CKT 1 W/ STUCK BRK #5
68	P4-2-F21_1PH_PLSVLY_KNKBKR_#RNS3	1PH fault at PLEASANT VALLEY on PLEASANT VALLEY - KNICKERBOCKER 345kV CKT 1 W/ BRK# RNS3 STUCK
69	P4-2-F31_SLG_NSCOT_KNKBKR_#R2	3PH fault at N.SCOT77 on N.SCOT77 - KNICKERBOCKER 345kV line with stuck BRK#R2, Q542+Q543
70	P7_F1_KNKBKR-PLSVLY_FTORNG-VLKN	Double Circuit Tower Contingency on Knickerbocker-Pleasant Valley 345kV and Fort Orange-Valkin 115kV lines
71	P7_F5_KNKBKR-PLSVLY_ADMML-CHRCHTWN	Double Circuit Tower Contingency on Knickerbocker-Pleasant Valley 345kV and ADM Milling-Churchtown 115kV lines
72	P7_F6_KNKBKR-PLSVLY_CHRCHTWN-BLSTRS	Double Circuit Tower Contingency on Knickerbocker-Pleasant Valley 345kV and Churchtown-Blue Stores 115kV lines
73	P7_F8_KNKBKR-PLSVLY_MLN-PLSVLY	Double Circuit Tower Contingency on Knickerbocker-Pleasant Valley 345kV and Blue Milan-Pleasant Valley 115kV lines
74	NYT-DV01-P1-2	3PH fault at Dover on Dover - Cricket Valley 345 kV line
75	NYT-DV02-P1-2	3PH fault at Dover on Dover - Long Mountain 345 kV line
76	NYT-DV03-P4-3	SLG fault at Dover on Dover PARS w/Stuck Bkr R1 trips Dover - Cricket Valley 345 kV line
77	NYT-DV04-P4-3	SLG fault at Dover on Dover PARS w/Stuck Bkr R2 trips Dover - Long Mountain 345 kV line
78	SA01_Q556	SLG-STK@EDIC345 (BKR R915) – L/O EDIC-FRASER (EF24-40) / BKUP CLR#2-15
79	SA02_Q556_SUM2023	SLG-STK@N.SCOTLAND 345KV (BKR R55) – L/O N.SCOTLAND-PRINCETOWN
80	SA03_Q556_SUM2023	3PH-NC@EDIC345 – L/O EDIC-GORDON_ROAD
81	SA04_Q556_SUM2023	3PH-NC@GORDON ROAD345 – L/O EDIC-GORDON ROAD
82	SA05_Q556_SUM2023	3PH-NC@NSCOT345 – L/O PRINCETOWN-N.SCOT W/H.S RCL
83	SA06_Q556_SUM2023	3PH-NC@PRINCETOWN – L/O N.SCOT - PRINCETOWN W/RCL
84	SA07_Q556_SUM2022	3PH-NCN.SCOTLON.SCOT-LEEDS93WHSRCL

#	ID	Description
85	SA08_Q556_SUM2032	SLG-STK@GORDON ROAD 345 (BKR 2) – L/O EDIC - GORDON ROAD
86	SA09_Q556_SUM2023	SLG-STK@GORDON ROAD (BKR 5) – L/O PRINCETOWN - GORDON ROAD
87	SA10_Q556_SUM2027	SLG-STK@EDIC345 (BKR R3510) – L/O EDIC - PRINCETOWN
88	SA11_Q556_SUM2027	3PH-NC@EDIC - L/O EDIC - PRINCETOWN
89	SA12_Q556_SUM2027	SLG-STK@PRINCETOWN (BKR 5) – L/O EDIC - PRINCETOWN
90	SA13_Q556_SUM2027	SLG-STK@PRINCETOWN (BKR 8) – L/O EDIC - PRINCETOWN
91	SA14_Q556_SUM2023	SLG-STK@PRINCETOWN (BKR 2) – L/O GORDON_ROAD-PRINCETOWN
92	SA15_Q556_SUM2027	3PH-NC@PRINCETOWN – L/O EDIC - PRINCETOWN
93	SA16_Q556_SUM2023	3PH-NC@PRINCETOWN – L/O PRINCETOWN-GORDON ROAD
94	SA17_Q556_SUM2023	3PH-NC@PRINCETOWN – L/O PRINCETOWN-N.SCOTLAND 66
95	SA18_Q556_SUM2023	3PH-NC@PRINCETOWN – L/O PRINCETOWN - N.SCOT
96	SA19_Q556_SUM2023	SLG-STK@N. SCOTLAND 66 345KV (BKR R361) – L/O N.SCOTLAND - PRINCETOWN
97	SA20_Q556_SUM2023	3PH-NC@GORDON ROAD – L/O PRINCETOWN-GORDON ROAD
98	SA21_Q556_SUM2023	3PH-NC@N.SCOTLAND 66 – L/O PRINCETOWN-N.SCOTLAND 66
99	SA22_Q556_SUM2023	3PH-NC@N.SCOT 77– L/O PRINCETOWN - N.SCOT
100	SA23_Q556_SUM2023	LLG-DCT@PRINCETOWN – L/O PRINCETOWN - N.SCOT66 (361) & PRINCETOWN - N.SCOT (362)
101	SA24_Q556_SUM2027	LLG-DCT@PRINCETOWN – L/O PRINCETOWN - EDIC (351) & PRINCETOWN - EDIC (352)
102	SA25_Q556_SUM2027	LLG-DCT@MARCY/EDIC - L/O MARCY-COOPERS (UCC2-41) & EDIC-PRINCETOWN (351)
103	SA26_Q556_SUM2027	LLG-DCT@PRINCETOWN/EDIC - L/O EDIC-FRASER (EF24-40) & EDIC-PRINCETOWN (352)
104	SA27_Q556_SUM2027	SLG-STK@EDIC345 (BKR R915) – L/O EDIC-Princetown / BKUP CLR2-15

Table 8: Contingencies Applied for Evaluating Central East Stability Transfer Limits

Monitored Elements

In order to assess system stability response for the Central East power transfer scenarios including contingencies, the following parameters were monitored and analyzed:

- generators' angles, power outputs, terminal voltages, and speeds in the following areas/zones (West, Central, Capital, Hudson, North); and
- bus voltages and frequencies around Central East, Moses South, Dysinger East and NYISO-ISO-NE interfaces.

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.

Central East Stability Limit with All Lines in Service

All Lines in Service Stability Limit Results

All Lines in Service													
Oswego	Sithe	Marcy South Series Capacitors Bypassed						Marcy South Series Capacitors I/S					
		Marcy StatCom O/S			Marcy StatCom I/S			Marcy StatCom O/S			Marcy StatCom I/S		
		Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta
5	5	2700	4150	1450	2800	4250	1450	2450	3950	1500	2550	4050	1500
5	3	2650	4100	1450	2700	4200	1500	2400	3900	1500	2450	4000	1550
5	0	2550	3850	1300	2600	3950	1350	2300	3650	1350	2350	3750	1400
4	5	2650	4150	1500	2700	4250	1550	2400	3950	1550	2450	4050	1600
4	3	2600	4100	1500	2650	4200	1550	2350	3900	1550	2400	4000	1600
4	0	2400	3850	1450	2500	3950	1450	2150	3650	1500	2250	3750	1500
3	5	2550	4000	1450	2600	4100	1500	2300	3800	1500	2350	3900	1550
3	3	2500	3850	1350	2600	3950	1350	2250	3650	1400	2350	3750	1400
3	0	2200	3650	1450	2450	3750	1300	1950	3450	1500	2200	3550	1350
2	5	2450	3850	1400	2550	3950	1400	2200	3650	1450	2300	3750	1450
2	3	2350	3650	1300	2500	3750	1250	2100	3450	1350	2250	3550	1300
2	0	2150	3450	1300	2300	3550	1250	1900	3250	1350	2050	3350	1300
1	5	2350	3350	1000	2500	3450	950	2100	3150	1050	2250	3250	1000
1	3	2200	3150	950	2350	3250	900	1950	2950	1000	2100	3050	950
1	0	1950	2850	900	2100	2950	850	1700	2650	950	1850	2750	900
0	5	2000	2850	850	2150	2950	800	1750	2650	900	1900	2750	850
0	3	1850	2650	800	2000	2750	750	1600	2450	850	1750	2550	800
0	0	1600	2300	700	1750	2400	650	1350	2100	750	1500	2200	700

Table 9: Proposed All Lines In-Service Limit

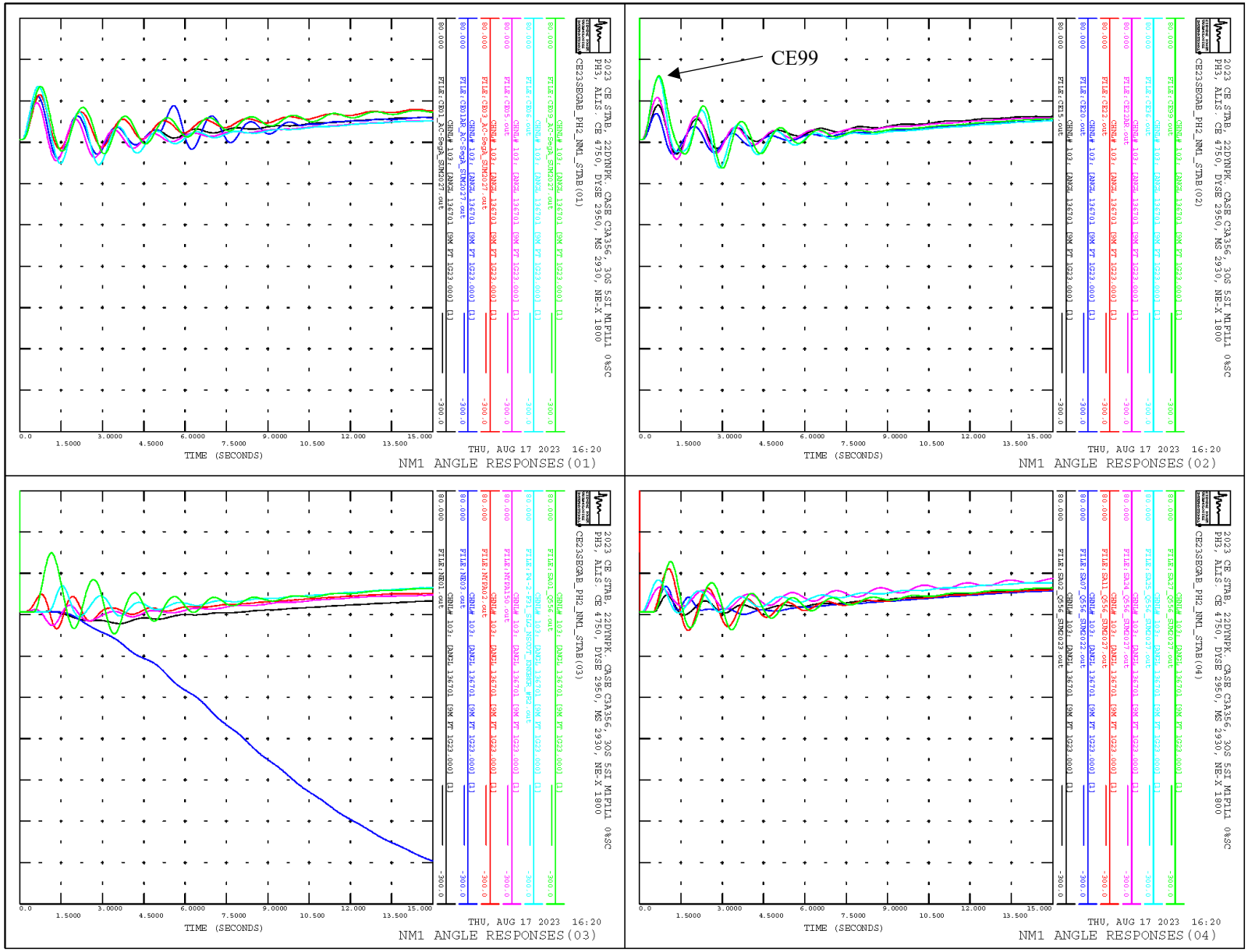

Figure 3: Nine Mile 2 Angle Response for 24 Severe Contingencies for ALIS, 4 Oswego, 5 Sithe, Marcy StatCom In-Service Case

All Central East contingencies listed on Table 8: Contingencies Applied for Evaluating Central East Stability Transfer Limits were tested for the 4 Oswego scenario with 5 Sithe and Marcy StatCom in-service with all lines in-service. The contingencies that resulted in the largest oscillation of machine angles or caused instability were employed to determine all the proposed limits presented on the table above.

The most severe contingency related to Central East stability is CE99, a single line to ground fault at Scriba 345 kV which results in the loss of Scriba – Volney (21) 345kV and the back-up clearing of the Fitzpatrick – Scriba (FS-10) 345 kV line.

The left graph in the plot below shows six angle responses: Fitzpatrick, Nine Mile 2, Moses and Gilboa to show the impact on major generators near the Central East, along with Niagara and Roseton to show the broader impact of CE99 on the NYCA. The right graph in the plot also shows the voltage response at major buses near the Central East, Marcy 345 kV, Edic 345 kV, Fitzpatrick 345 kV and Leeds 345 kV, as well as Niagara 345 kV and Rock Tavern 345 kV to show the broader impact of CE99.

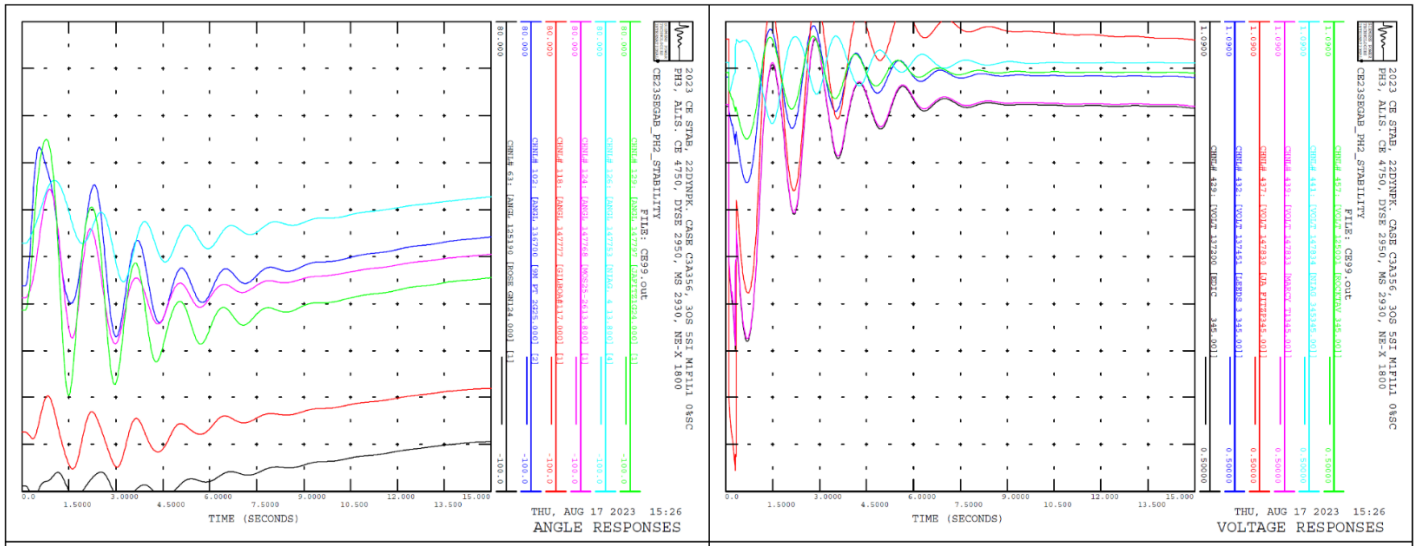

Figure 4: All In-Service Angle and Voltage Response to CE99

Central East Stability Limit with Line Outages

Massena – Marcy (MSU1) 765 kV Line Out-of-Service Stability Limit Results

Massena – Marcy (MSU1) 765 kV Line Out-of-Service													
Oswego	Sithe	Marcy South Series Capacitors Bypassed						Marcy South Series Capacitors I/S					
		Marcy StatCom O/S			Marcy StatCom I/S			Marcy StatCom O/S			Marcy StatCom I/S		
		Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta
5	5	N/A	3150		N/A	3250		N/A	2950		N/A	3050	
5	3	N/A	3000		N/A	3100		N/A	2800		N/A	2900	
5	0	N/A	2750		N/A	2850		N/A	2550		N/A	2650	
4	5	N/A	3150		N/A	3250		N/A	2950		N/A	3050	
4	3	N/A	3000		N/A	3100		N/A	2800		N/A	2900	
4	0	N/A	2750		N/A	2850		N/A	2550		N/A	2650	
3	5	2050	2900	850	2150	3000	850	1800	2700	900	1900	2800	900
3	3	2000	2750	750	2000	2850	850	1750	2550	800	1750	2650	900
3	0	1850	2450	600	1850	2550	700	1600	2250	650	1600	2350	750
2	5	1950	2700	750	1950	2800	850	1700	2500	800	1700	2600	900
2	3	1850	2550	700	1850	2650	800	1600	2350	750	1600	2450	850
2	0	1650	2200	550	1650	2300	650	1400	2000	600	1400	2100	700
1	5	N/A	2150		N/A	2250		N/A	1950		N/A	2050	
1	3	N/A	2000		N/A	2100		N/A	1800		N/A	1900	
1	0	N/A	1650		N/A	1750		N/A	1450		N/A	1550	
0	5	N/A	1650		N/A	1750		N/A	1450		N/A	1550	
0	3	N/A	1450		N/A	1550		N/A	1250		N/A	1350	
0	0	N/A	1100		N/A	1200		N/A	900		N/A	1000	

Table 10: Proposed Massena – Marcy (MSU1) 765 kV Line Out-of-Service Limits

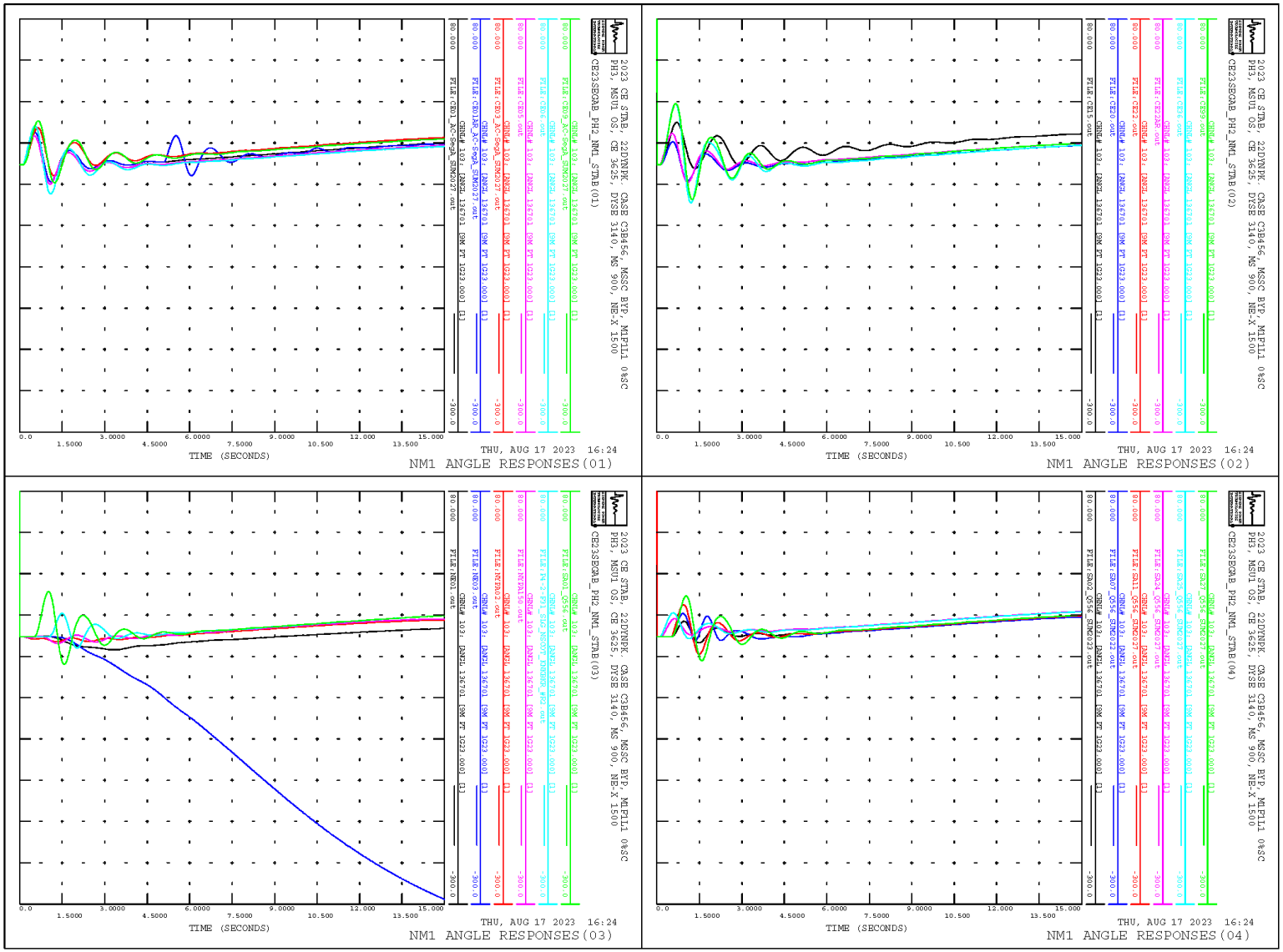

Figure 5: Nine Mile 2 Angle Response for 24 Severe Contingencies for MSU1 Line out-of-service, 4 Oswego, 5 Sithe, Marcy StatCom In-Service Case

All Central East contingencies listed on Table 8: Contingencies Applied for Evaluating Central East Stability Transfer Limits were tested for the 4 Oswego scenario with 5 Sithe and Marcy StatCom in-service with Marcy – Massena (765 kV) out-of-service. The contingencies that resulted in the largest oscillation of machine angles or caused instability were employed to determine all the proposed limits presented on the table above.

The most severe contingency related to Central East stability is CE99, a single line to ground fault at Scriba 345 kV which results in the loss of Scriba – Volney (21) 345kV and the back-up clearing of the Fitzpatrick – Scriba (FS-10) 345 kV line.

The left graph in the plot below shows six angle responses: Fitzpatrick, Nine Mile 2, Moses and Gilboa to show the impact on major generators near the Central East, along with Niagara and Roseton to show the broader impact of CE99. The right graph in the plot also shows the voltage response at major buses near the Central East, Marcy 345 kV, Edic 345 kV, Fitzpatrick 345 kV and Leeds 345 kV, as well as Niagara 345 kV and Rock Tavern 345 kV to show the broader impact of CE99.

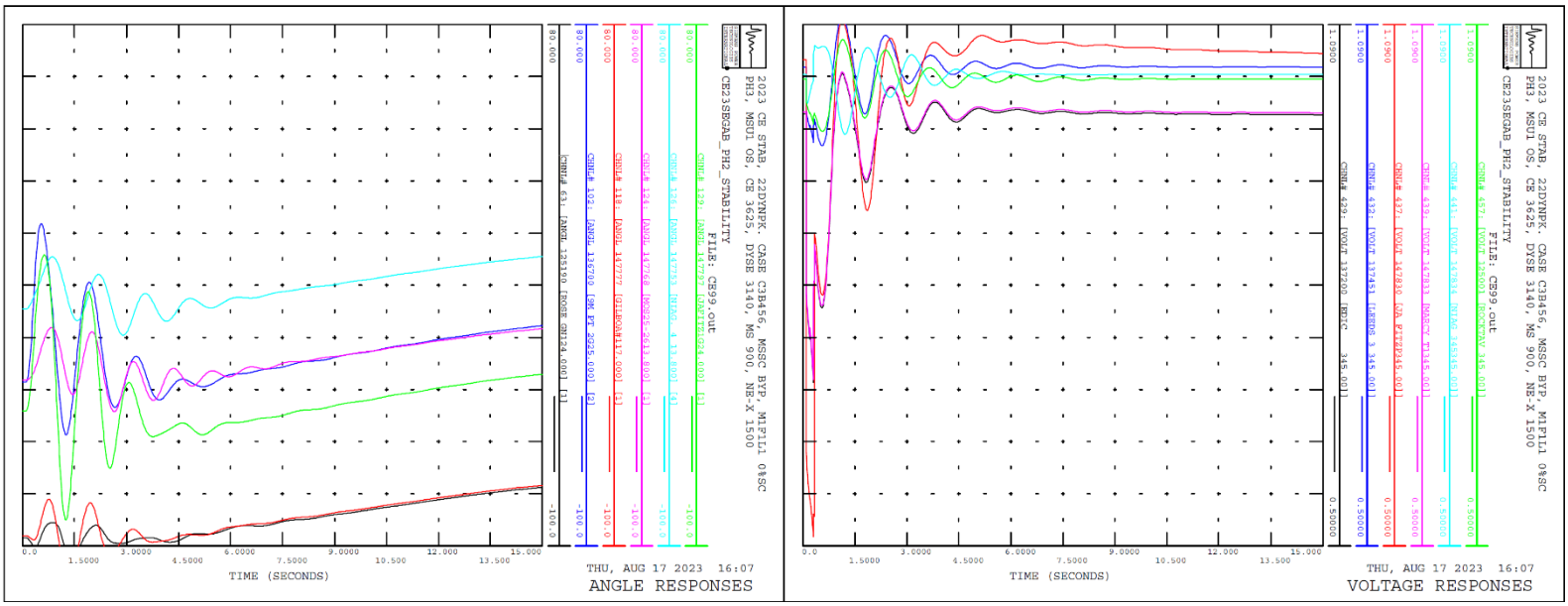

Figure 6: MSU1 Line Out-of-Service Angle and Voltage Response to CE99

Marcy – New Scotland (18) 345 kV Line Out-of-Service Stability Limit Results

Marcy – New Scotland (18) 345 kV Line Out-of-Service													
Oswego	Sithe	Marcy South Series Capacitors Bypassed						Marcy South Series Capacitors I/S					
		Marcy StatCom O/S			Marcy StatCom I/S			Marcy StatCom O/S			Marcy StatCom I/S		
		Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta
4	5	N/A	3650		N/A	3750		N/A	3450		N/A	3550	
4	3	N/A	3600		N/A	3700		N/A	3400		N/A	3500	
4	0	N/A	3450		N/A	3550		N/A	3250		N/A	3350	
3	5	1650	3575	1925	1700	3675	1975	1400	3375	1975	1450	3475	2025
3	3	1650	3475	1825	1650	3575	1925	1400	3275	1875	1400	3375	1975
3	0	1550	3250	1700	1600	3350	1750	1300	3050	1750	1350	3150	1800
2	5	1650	3500	1850	1650	3600	1950	1400	3300	1900	1400	3400	2000
2	3	1600	3350	1750	1650	3450	1800	1350	3150	1800	1400	3250	1850
2	0	1600	3050	1450	1600	3150	1550	1350	2850	1500	1350	2950	1600
1	5	N/A	3050		N/A	3150		N/A	2850		N/A	2950	
1	3	N/A	2900		N/A	3000		N/A	2700		N/A	2800	
1	0	N/A	2600		N/A	2700		N/A	2400		N/A	2500	
0	5	N/A	2600		N/A	2700		N/A	2400		N/A	2500	
0	3	N/A	2450		N/A	2550		N/A	2250		N/A	2350	
0	0	N/A	2150		N/A	2250		N/A	1950		N/A	2050	

Table 11: Proposed Marcy – New Scotland (18) 345 kV Line Out-of-Service Limits

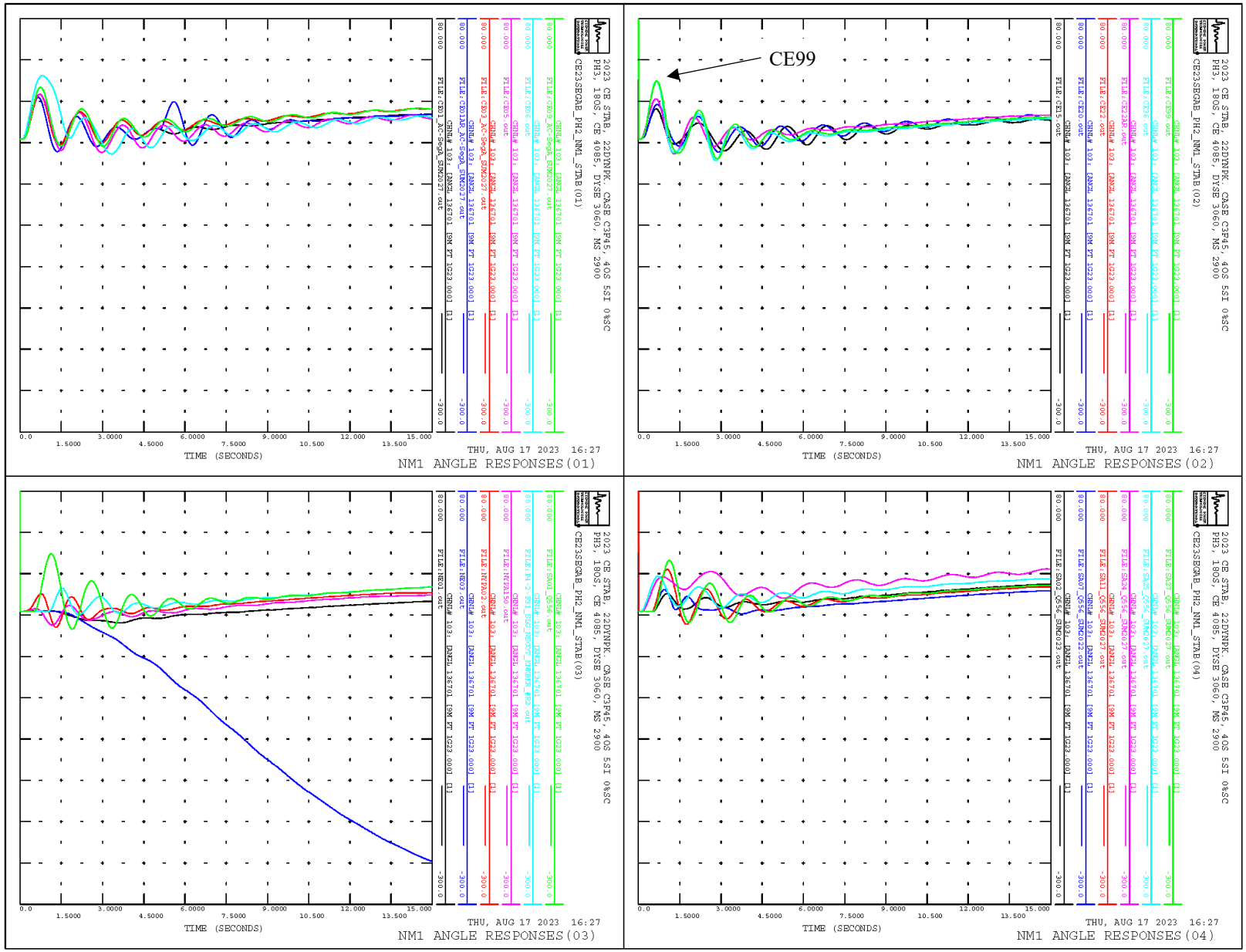

Figure 7: Nine Mile 2 Angle Response for 24 Severe Contingencies for 18 Line out-of-service, 4 Oswego, 5 Sithe, Marcy StatCom In-Service Case

All Central East contingencies listed on Table 8: Contingencies Applied for Evaluating Central East Stability Transfer Limits were tested for the 4 Oswego scenario with 5 Sithe and Marcy StatCom in-service with Marcy – New Scotland (18) 345 kV out-of-service. The contingencies that resulted in the largest oscillation of machine angles or caused instability were employed to determine all the proposed limits presented on the table above.

The most severe contingency related to Central East stability is CE99, a single line to ground fault at Scriba 345 kV which results in the loss of Scriba – Volney (21) 345kV and the back-up clearing of the Fitzpatrick – Scriba (FS-10) 345 kV line.

The left graph in the plot below shows six angle responses: Fitzpatrick, Nine Mile 2, Moses and Gilboa to show the impact on major generators near the Central East, along with Niagara and Roseton to show the broader impact of CE99 on the NYCA. The right graph in the plot also shows the voltage response at major buses near the Central East, Marcy 345 kV, Edic 345 kV, Fitzpatrick 345 kV and Leeds 345 kV, as well as Niagara 345 kV and Rock Tavern 345 kV to show the broader impact of CE99.

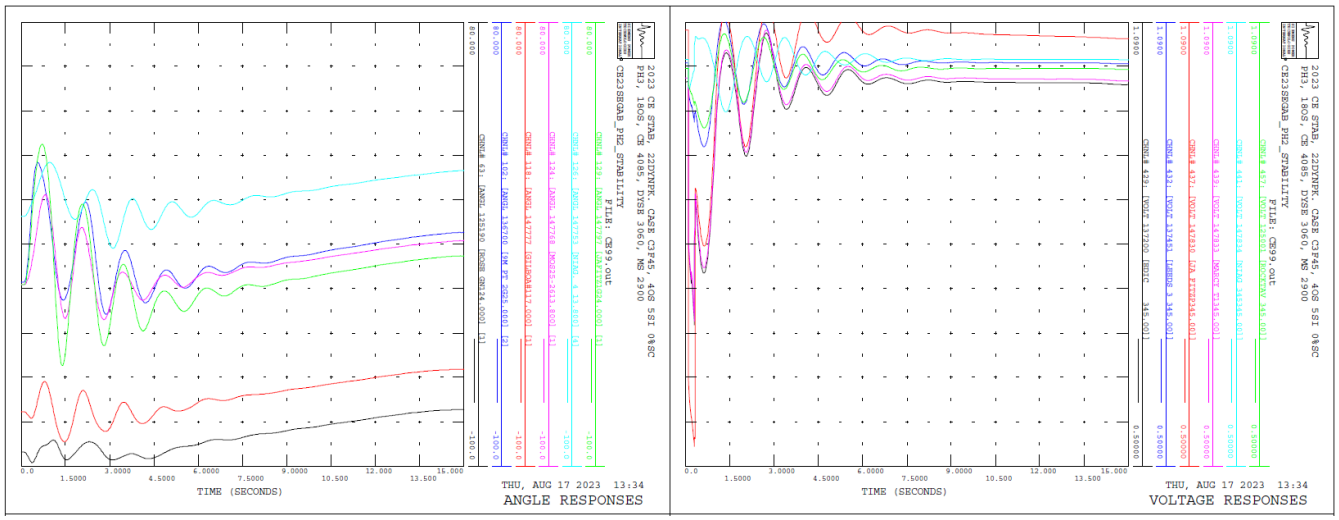

Figure 8: 18 Line Out-of-Service Angle and Voltage Response to CE99

Edic – Gordon Rd (14) 345 kV Line Out-of-Service Stability Limit Results

Edic – Gordon Rd (14) 345 kV Line Out-of-Service												
Oswego	Sithe	Marcy South Series Capacitors Bypassed						Marcy South Series Capacitors I/S				
		Marcy StatCom O/S			Marcy StatCom I/S			Marcy StatCom O/S			Marcy StatCom I/S	
		Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta
4	5	N/A	3650		N/A	3750		N/A	3450		N/A	3550	
4	3	N/A	3650		N/A	3750		N/A	3450		N/A	3550	
4	0	N/A	3500		N/A	3600		N/A	3300		N/A	3400	
3	5	1800	3500	1700	1850	3600	1750	1550	3300	1750	1600	3400	1800
3	3	1750	3475	1725	1800	3575	1775	1500	3275	1775	1550	3375	1825
3	0	1400	3275	1875	1650	3375	1725	1150	3075	1925	1400	3175	1775
2	5	1750	3350	1600	1900	3450	1550	1500	3150	1650	1650	3250	1600
2	3	1650	3300	1650	1750	3400	1650	1400	3100	1700	1500	3200	1700
2	0	1400	3050	1650	1650	3150	1500	1150	2850	1700	1400	2950	1550
1	5	N/A	3000		N/A	3100		N/A	2800		N/A	2900	
1	3	N/A	2900		N/A	3000		N/A	2700		N/A	2800	
1	0	N/A	2600		N/A	2700		N/A	2400		N/A	2500	
0	5	N/A	2650		N/A	2750		N/A	2450		N/A	2550	
0	3	N/A	2500		N/A	2600		N/A	2300		N/A	2400	
0	0	N/A	2200		N/A	2300		N/A	2000		N/A	2100	

Table 12: Proposed Edic – Gordon Road (14) 345 kV Line Out-of-Service Limits

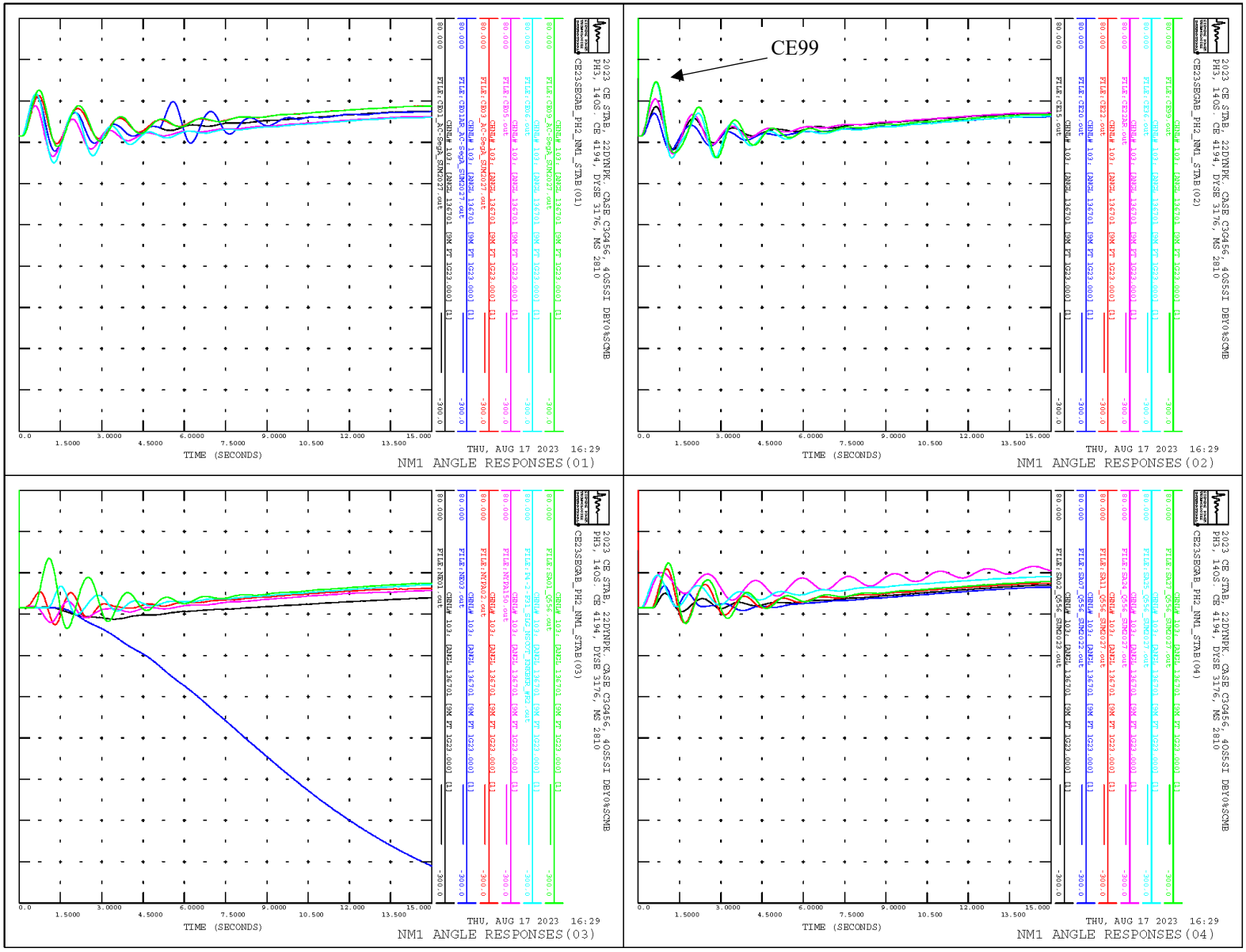

Figure 9: Nine Mile 2 Angle Response for 24 Severe Contingencies for 14 Line out-of-service, 4 Oswego, 5 Sithe, Marcy StatCom In-Service Case

All Central East contingencies listed on Table 8: Contingencies Applied for Evaluating Central East Stability Transfer Limits were tested for the 4 Oswego scenario with 5 Sithe and Marcy StatCom in-service with Edic – Gordon Road (14) 345 kV out-of-service. The contingencies that resulted in the largest oscillation of machine angles or caused instability were employed to determine all the proposed limits presented on the table above.

The most severe contingency related to Central East stability is CE99, a single line to ground fault at Scriba 345 kV which results in the loss of Scriba – Volney (21) 345kV and the back-up clearing of the Fitzpatrick – Scriba (FS-10) 345 kV line.

The left graph in the plot below shows six angle responses: Fitzpatrick, Nine Mile 2, Moses and Gilboa to show the impact on major generators near the Central East, along with Niagara and Roseton to show the broader impact of CE99. The right graph in the plot also shows the voltage response at major buses near the Central East, Marcy 345 kV, Edic 345 kV, Fitzpatrick 345 kV and Leeds 345 kV, as well as Niagara 345 kV and Rock Tavern 345 kV to show the broader impact of CE99.

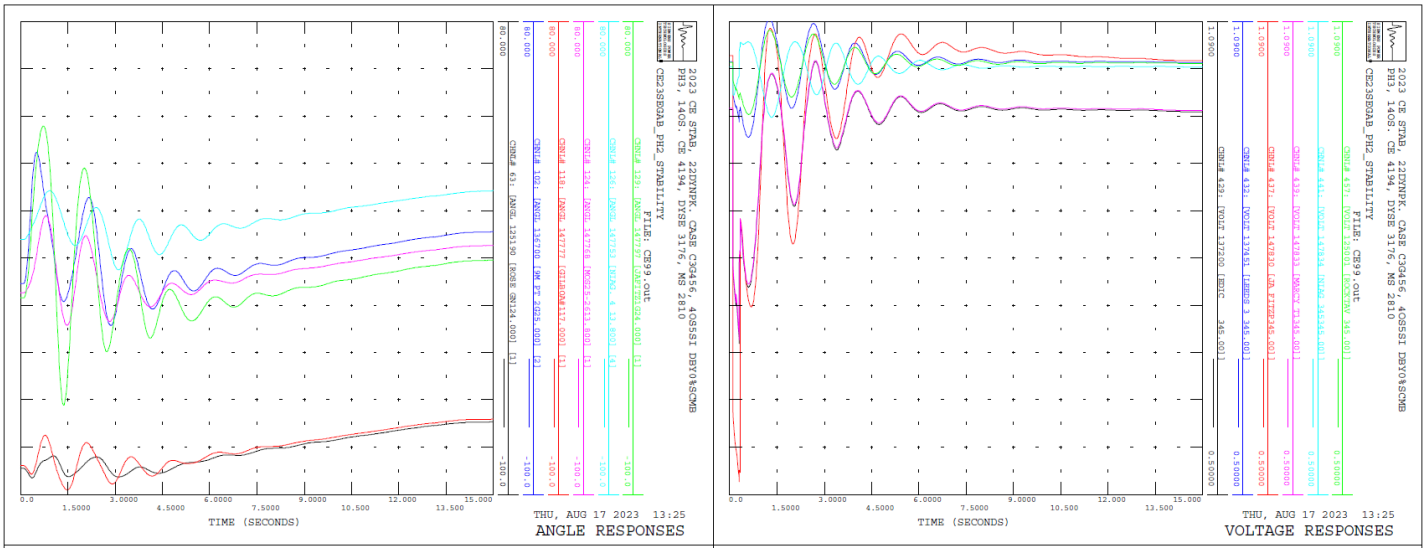

Figure 10: 14 Line Out-of-Service Angle and Voltage Response to CE99

Princetown – New Scotland (55 or 361 or 362) 345 kV Line Out-of-Service Stability Limit Results

Princetown – New Scotland (55 or 361 or 362) 345 kV Line Out-of-Service													
Oswego	Sithe	Marcy South Series Capacitors Bypassed						Marcy South Series Capacitors I/S					
		Marcy StatCom O/S			Marcy StatCom I/S			Marcy StatCom O/S			Marcy StatCom I/S		
		Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta
4	5	N/A	4000		N/A	4100		N/A	4000		N/A	4100	
4	3	N/A	4000		N/A	4100		N/A	4000		N/A	4100	
4	0	N/A	3800		N/A	3900		N/A	3800		N/A	3900	
3	5	2750	3925	1175	2850	4025	1175	2500	3725	1225	2600	3825	1225
3	3	2550	3850	1300	2650	3950	1300	2300	3650	1350	2400	3750	1350
3	0	2450	3650	1200	2500	3750	1250	2200	3450	1250	2250	3550	1300
2	5	2650	3850	1200	2700	3950	1250	2650	3850	1200	2700	3950	1250
2	3	2550	3700	1150	2600	3800	1200	2550	3700	1150	2600	3800	1200
2	0	2450	3500	1050	2500	3600	1100	2450	3500	1050	2500	3600	1100
1	5	N/A	3300		N/A	3400		N/A	3300		N/A	3400	
1	3	N/A	3150		N/A	3250		N/A	3150		N/A	3250	
1	0	N/A	2900		N/A	3000		N/A	2900		N/A	3000	
0	5	N/A	2800		N/A	2900		N/A	2800		N/A	2900	
0	3	N/A	2650		N/A	2750		N/A	2650		N/A	2750	
0	0	N/A	2350		N/A	2450		N/A	2350		N/A	2450	

Table 13: Proposed Princetown – New Scotland (55 or 361 or 362) 345 kV Line Out-of-Service Limits

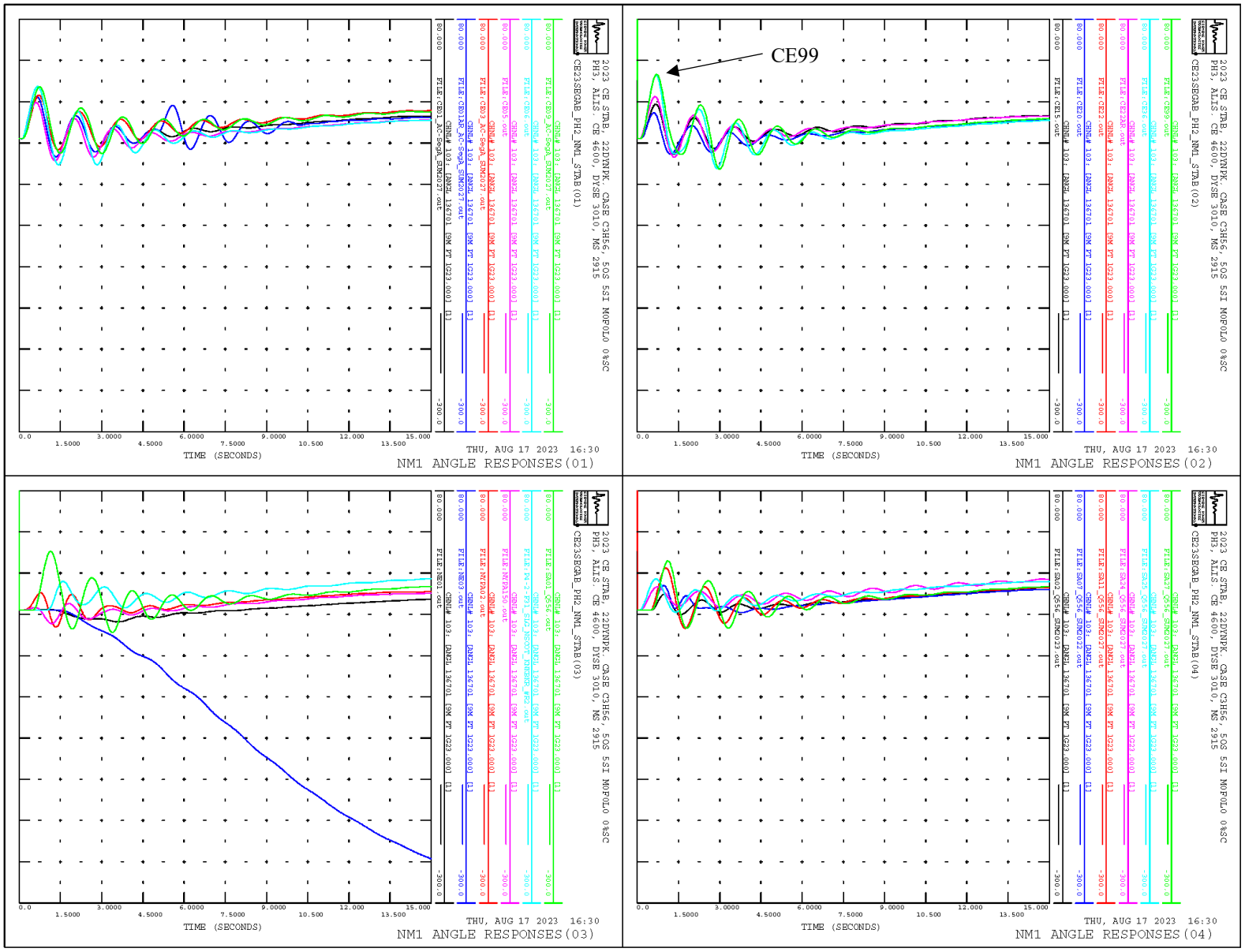

Figure 11: Nine Mile 2 Angle Response for 24 Severe Contingencies for 55 Line out-of-service, 4 Oswego, 5 Sithe, Marcy StatCom In-Service Case

All Central East contingencies listed on Table 8: Contingencies Applied for Evaluating Central East Stability Transfer Limits were tested for the 4 Oswego scenario with 5 Sithe and Marcy StatCom in-service with Princetown – New Scotland (55 or 361 or 362) 345 kV out-of-service. The contingencies that resulted in the largest oscillation of machine angles or caused instability were employed to determine all the proposed limits presented on the table above.

The most severe contingency related to Central East stability is CE99, a single line to ground fault at Scriba 345 kV which results in the loss of Scriba – Volney (21) 345kV and the back-up clearing of the Fitzpatrick – Scriba (FS-10) 345 kV line.

The left graph in the plot below shows six angle responses: Fitzpatrick, Nine Mile 2, Moses and Gilboa to show the impact on major generators near the Central East, along with Niagara and Roseton to show the broader impact of CE99 on the NYCA. The right graph in the plot also shows the voltage response at major buses near the Central East, Marcy 345 kV, Edic 345 kV, Fitzpatrick 345 kV and Leeds 345 kV, as well as Niagara 345 kV and Rock Tavern 345 kV to show the broader impact of CE99.

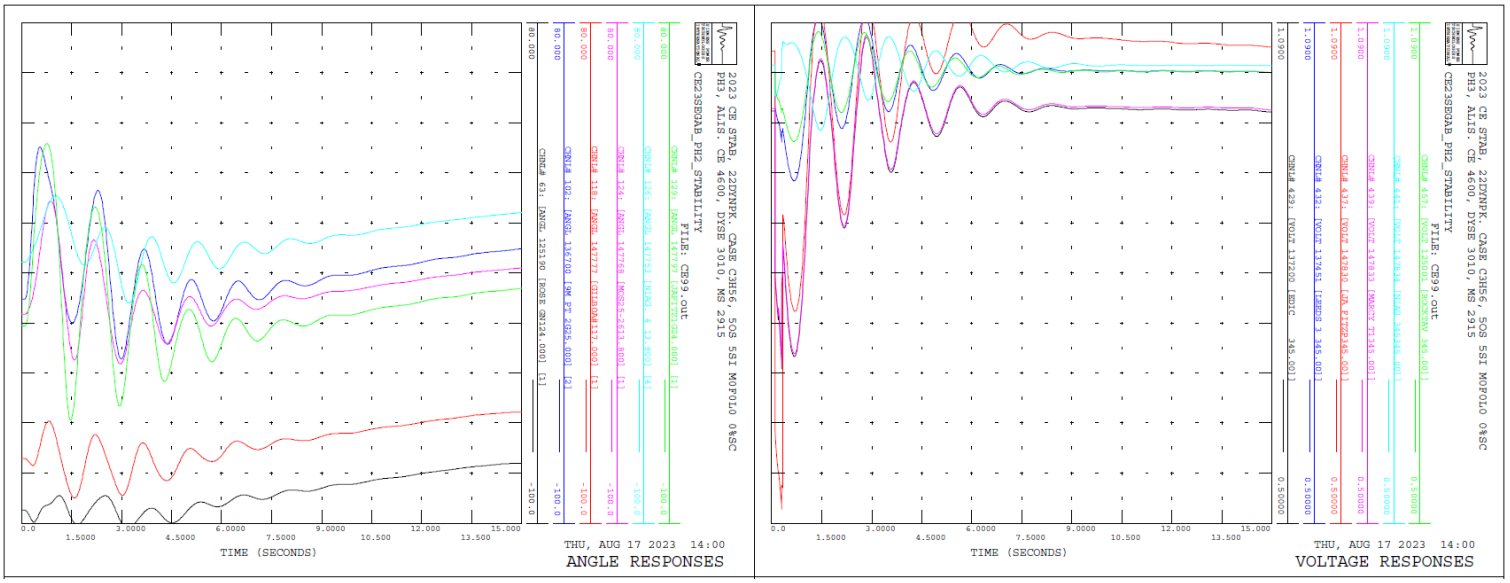

Figure 12: 55 Line Out-of-Service Angle and Voltage Response to CE99

Princetown – Gordon Road (371) 345 kV Line Out-of-Service Stability Limit Results

Princetown – Gordon Road (371) 345 kV Line Out-of-Service													
Oswego	Sithe	Marcy South Series Capacitors Bypassed						Marcy South Series Capacitors I/S					
		Marcy StatCom O/S			Marcy StatCom I/S			Marcy StatCom O/S			Marcy StatCom I/S		
		Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta
4	5	N/A	4050		N/A	4150		N/A	3850		N/A	3950	
4	3	N/A	3950		N/A	4050		N/A	3750		N/A	3850	
4	0	N/A	3800		N/A	3900		N/A	3600		N/A	3700	
3	5	2450	3900	1450	2600	4000	1400	2200	3700	1500	2350	3800	1450
3	3	2400	3800	1400	2500	3900	1400	2150	3600	1450	2250	3700	1450
3	0	2000	3575	1575	2400	3675	1275	1750	3375	1625	2150	3475	1325
2	5	2400	3750	1350	2450	3850	1400	2150	3550	1400	2200	3650	1450
2	3	2350	3650	1300	2400	3750	1350	2100	3450	1350	2150	3550	1400
2	0	2000	3350	1350	2250	3450	1200	1750	3150	1400	2000	3250	1250
1	5	N/A	3250		N/A	3350		N/A	3050		N/A	3150	
1	3	N/A	3150		N/A	3250		N/A	2950		N/A	3050	
1	0	N/A	2850		N/A	2950		N/A	2650		N/A	2750	
0	5	N/A	2800		N/A	2900		N/A	2600		N/A	2700	
0	3	N/A	2650		N/A	2750		N/A	2450		N/A	2550	
0	0	N/A	2350		N/A	2450		N/A	2150		N/A	2250	

Table 14: Proposed Princetown – Gordon Road (371) 345 kV Line Out-of-Service Limits

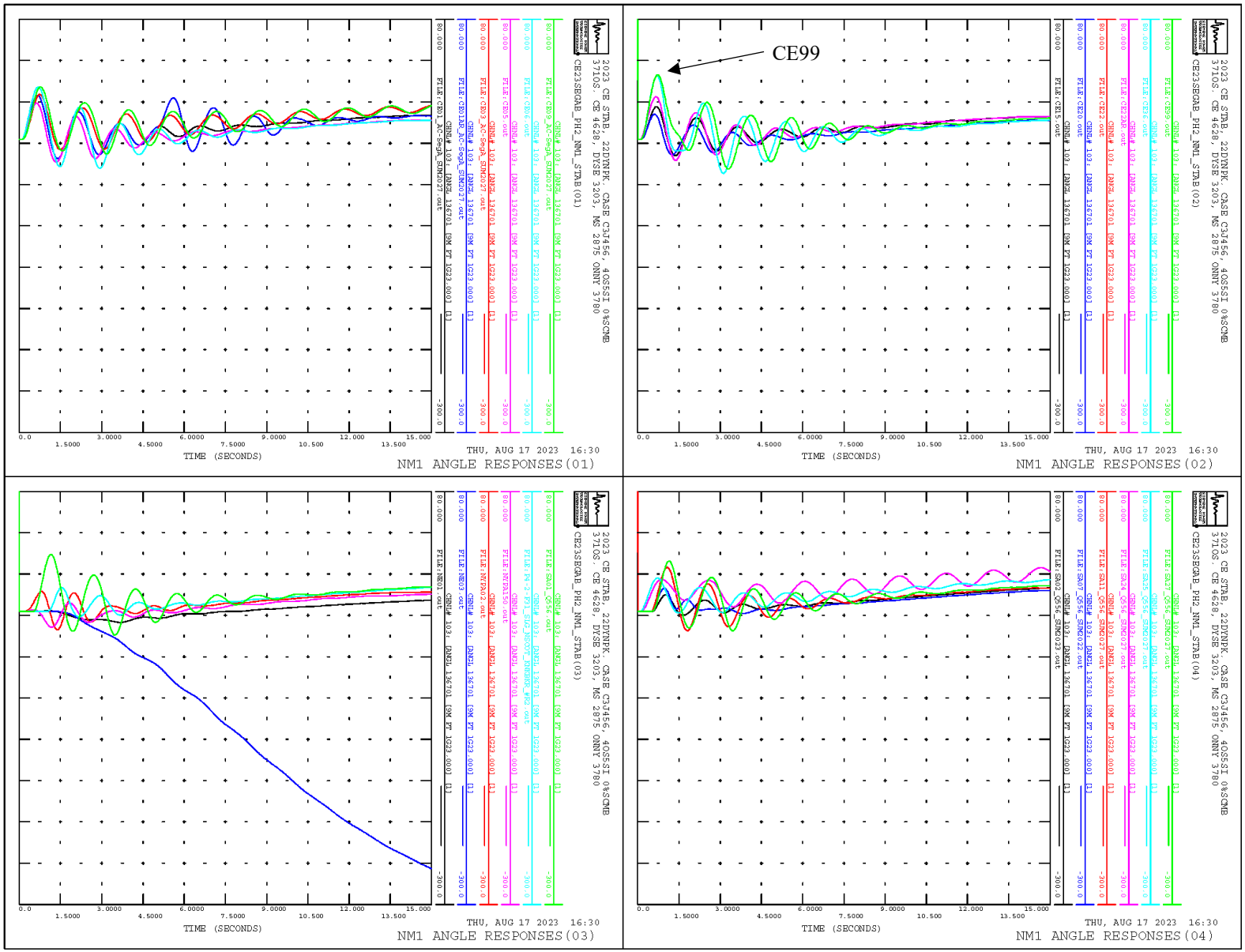

Figure 13: Nine Mile 2 Angle Response for 24 Severe Contingencies for 371 Line out-of-service, 4 Oswego, 5 Sithe, Marcy StatCom In-Service Case

All Central East contingencies listed on Table 8: Contingencies Applied for Evaluating Central East Stability Transfer Limits were tested for the 4 Oswego scenario with 5 Sithe and Marcy StatCom in-service with Princetown – Gordon Road (371) 345 kV out-of-service. The contingencies that resulted in the largest oscillation of machine angles or caused instability were employed to determine all the proposed limits presented on the table above.

The most severe contingency related to Central East stability is CE99, a single line to ground fault at Scriba 345 kV which results in the loss of Scriba – Volney (21) 345kV and the back-up clearing of the Fitzpatrick – Scriba (FS-10) 345 kV line.

The left graph in the plot below shows six angle responses: Fitzpatrick, Nine Mile 2, Moses and Gilboa to show the impact on major generators near the Central East, along with Niagara and Roseton to show the broader impact of CE99 on the NYCA. The right graph in the plot also shows the voltage response at major buses near the Central East, Marcy 345 kV, Edic 345 kV, Fitzpatrick 345 kV and Leeds 345 kV, as well as Niagara 345 kV and Rock Tavern 345 kV to show the broader impact of CE99.

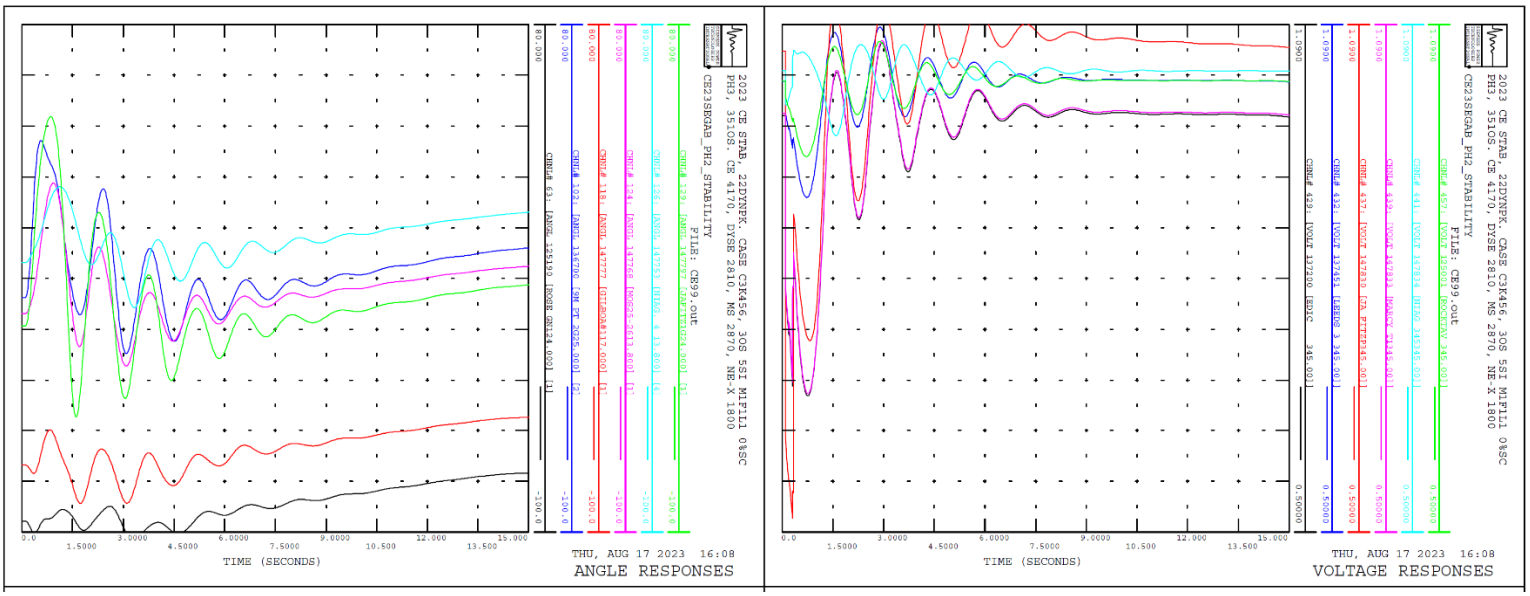

Figure 14: 371 Line Out-of-Service Angle and Voltage Response to CE99

Edic - Princetown (351 or 352) 345 kV Line Out-of-Service Stability Limit Results

Edic - Princetown (351 or 352) 345 kV Line Out-of-Service													
Oswego	Sithe	Marcy South Series Capacitors Bypassed						Marcy South Series Capacitors I/S					
		Marcy StatCom O/S			Marcy StatCom I/S			Marcy StatCom O/S			Marcy StatCom I/S		
		Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta	Current	Tested	Delta
4	5	N/A	3650		N/A	3750		N/A	3450		N/A	3550	
4	3	N/A	3600		N/A	3700		N/A	3400		N/A	3500	
4	0	N/A	3450		N/A	3550		N/A	3250		N/A	3350	
3	5	N/A	3450		N/A	3550		N/A	3250		N/A	3350	
3	3	N/A	3350		N/A	3450		N/A	3150		N/A	3250	
3	0	N/A	3100		N/A	3200		N/A	2900		N/A	3000	
2	5	N/A	3050		N/A	3150		N/A	2850		N/A	2950	
2	3	N/A	2900		N/A	3000		N/A	2700		N/A	2800	
2	0	N/A	2650		N/A	2750		N/A	2450		N/A	2550	
1	5	N/A	2650		N/A	2750		N/A	2450		N/A	2550	
1	3	N/A	2450		N/A	2550		N/A	2250		N/A	2350	
1	0	N/A	2200		N/A	2300		N/A	2000		N/A	2100	
0	5	N/A	3650		N/A	3750		N/A	3450		N/A	3550	
0	3	N/A	3600		N/A	3700		N/A	3400		N/A	3500	
0	0	N/A	3450		N/A	3550		N/A	3250		N/A	3350	

Table 15: Proposed Edic – Princetown (351 or 352) 345 kV Line Out-of-Service Limits

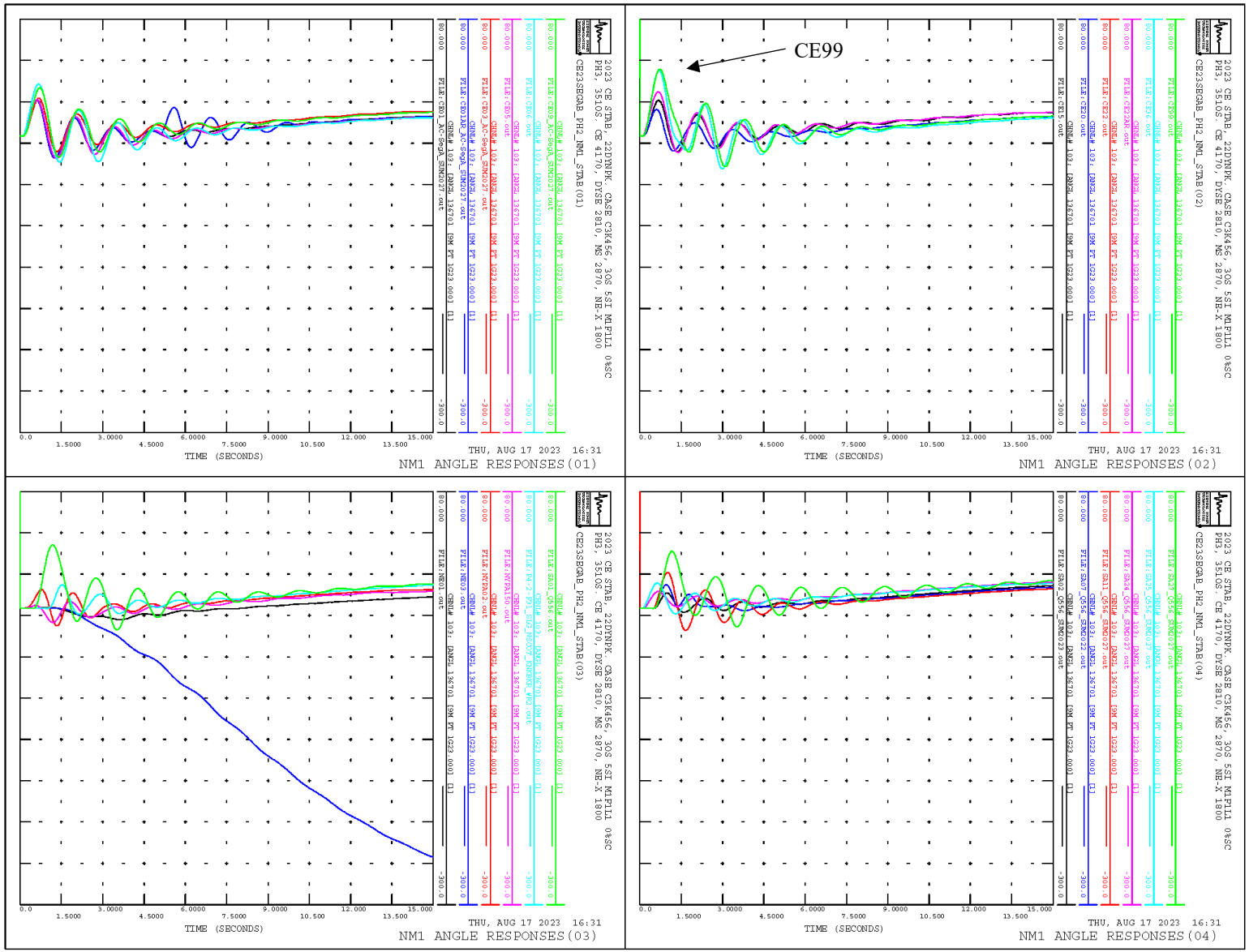

Figure 15: Nine Mile 2 Angle Response for 24 Severe Contingencies for 351 Line out-of-service, 4 Oswego, 5 Sithe, Marcy StatCom In-Service Case

All Central East contingencies listed on Table 8: Contingencies Applied for Evaluating Central East Stability Transfer Limits were tested for the 4 Oswego scenario with 5 Sithe and Marcy StatCom in-service with Edic - Princetown (351 or 352) 345 kV out-of-service. The contingencies that resulted in the largest oscillation of machine angles or caused instability were employed to determine all the proposed limits presented on the table above.

The most severe contingency related to Central East stability is CE99, a single line to ground fault at Scriba 345 kV which results in the loss of Scriba – Volney (21) 345kV and the back-up clearing of the Fitzpatrick – Scriba (FS-10) 345 kV line.

The left graph in the plot below shows six angle responses: Fitzpatrick, Nine Mile 2, Moses and Gilboa to show the impact on major generators near the Central East, along with Niagara and Roseton to show the broader impact of CE99 on the NYCA. The right graph in the plot also shows the voltage response at major buses near the Central East, Marcy 345 kV, Edic 345 kV, Fitzpatrick 345 kV and Leeds 345 kV, as well as Niagara 345 kV and Rock Tavern 345 kV to show the broader impact of CE99.

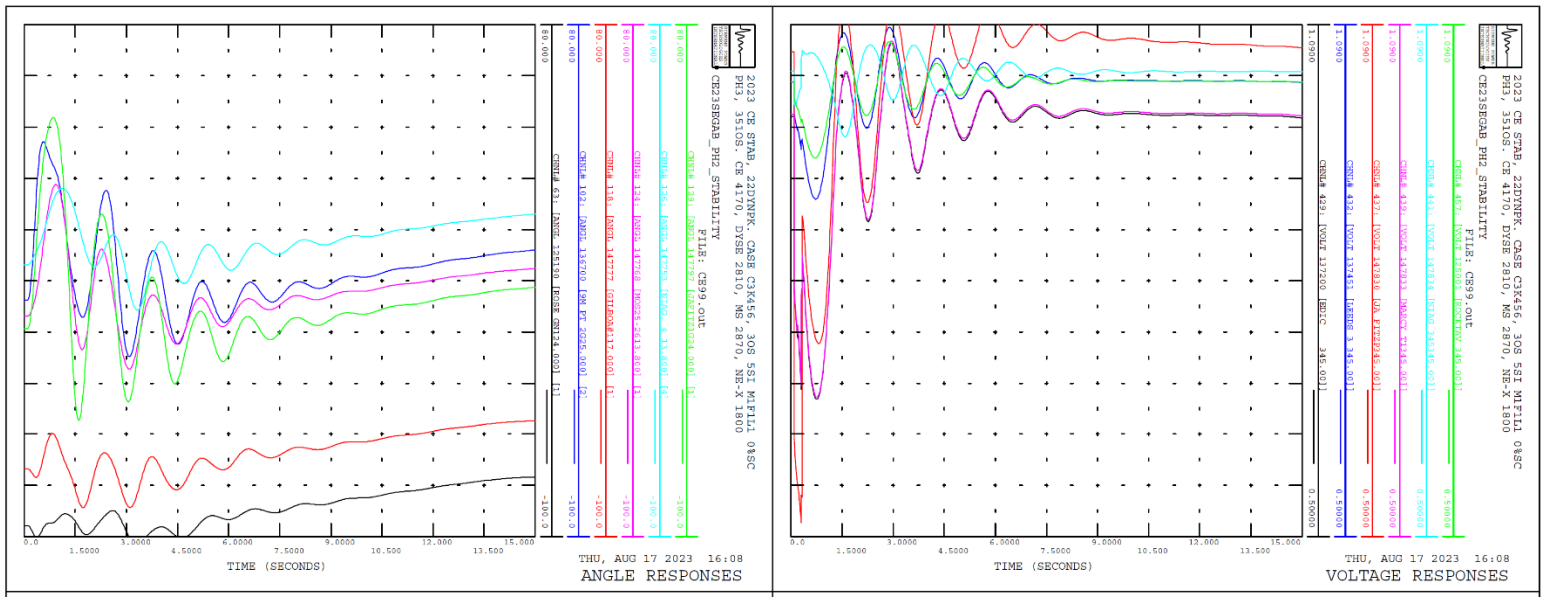

Figure 16: 351 Line Out-of-Service Angle and Voltage Response to CE99