New York ISO
Independent System Operator

OSWEGO EXPORT STABILITY LIMITS ANALYSIS, ALL LINES I/S AND OUTAGE CONDITIONS (OE-24)

A report by the
New York Independent System Operator

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Executive Summary

The purpose of this study is to validate the existing operating guidelines and potentially establish additional guidelines for Oswego Complex generation export limitations for all lines in service and line outage conditions. This involves a comprehensive evaluation of system transient stability in the Central East/Volney East transmission system.

The last comprehensive transient stability limit analysis of the Oswego Export was performed in 2012. With numerous changes to the New York Control Area (NYCA) since then, there is a need to re-confirm the existing Oswego Export stability limits for all lines in service and line outage conditions. The limits recommended in this report are based on a stable system response at the highest export level tested. There were no instances of any system or unit instability observed.

It is recommended that the Oswego Complex generation export limitations be implemented as reported in Table 1.

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Summary of Proposed Limits

The proposed new limits are presented in Table 1, below:

Table 1: Summary of Evaluated Stability Limits (MW)

Scenario	Previous Stability Limit (MW)	New Stability Limit (MW)	Delta (MW)
All-Lines-in-Service (Seasonal Limit)	5250	5300	50
9mile - Clay (Ln# 8) 345 kV	5150	5300	150
Marcy - Edic (Ln# UE 1-7) 345 kV	5250	5300	50
Oswego - Lafayette (Ln# 17) 345 kV	5250	5300	50
Oswego - Volney (Ln# 11) 345 kV	5250	5300	50
Oswego - Volney (Ln# 12) 345 kV	5250	5300	50
Scriba - Independence (Ln# 25) 345 kV	5250	5300	50
Scriba - Volney (Ln# 21) 345 kV	5250	5300	50
Scriba - Volney (Ln# 20) 345 kV	5250	5300	50
Volney - Clay (Ln# 6) 345 kV	5250	5300	50
Marcy STATCOM - OS (Unavailable)	5250	5300	50
Clay - Independence (Ln# 26) 345 kV	5000	5300	300
Clay - Edic (Ln# 1-16) 345 KV	4850	5300	450
Clay - Edic (Ln# 2-15) 345 KV	4850	5300	450
Fitz - Edic (Ln# FE1) 345 kV	4800	5300	500
Marcy - Volney (Ln# 19) 345 kV	4900	5250	350

Introduction

This report documents the result of the analysis for the system conditions listed in Table 1, and the recommendations are based on the results of the simulation of Central East and Volney East contingencies shown in Table 3. All assumptions are documented in the base case development section of the report.

This report includes the result of the stability analysis, the list of contingencies, copies of the most severe stability plots, and base case assumptions made in developing the various Oswego Export cases for all lines in-service and line outage conditions.

This study provides recommendations to update the Oswego Export stability limits for outage conditions as per Table 1.

System Operating Limit (SOL) Methodology

As identified in "FAC-011-4_Methodology for Establishing SOL for Operations Horizon_20230401", the NYSRC Reliability Rules provide the documented methodology for use in 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, Tables C-1 and C-2 addresses the contingencies to be evaluated and the performance requirements to be applied. Rule C.1 also incorporates by reference Attachment H, NYISO Transmission Planning Guideline #3-1, "Guideline for Stability Analysis and Determination of Stability-Based Transfer Limits" of the NYISO Transmission Expansion and Interconnection Manual.

Oswego Complex Generation Export Summary

The Oswego Export Stability Limit is set at the actual test level, since this is a generation pocket (Oswego Complex generation pocket), and flows cannot exceed the maximum output of the generation in the pocket. Table 2 presents the units forming the Oswego Complex generation pocket, and Figure 1 gives a graphical representation of their location within the NYCA.

Table 2: Oswego Complex Generation Dispatch

Unit	MW
Nine Mile Point #1	620
Nine Mile Point #2	1272
Oswego #5	798
Oswego #6	823
Fitzpatrick	831
Sithe-Independence	958
Total	5302

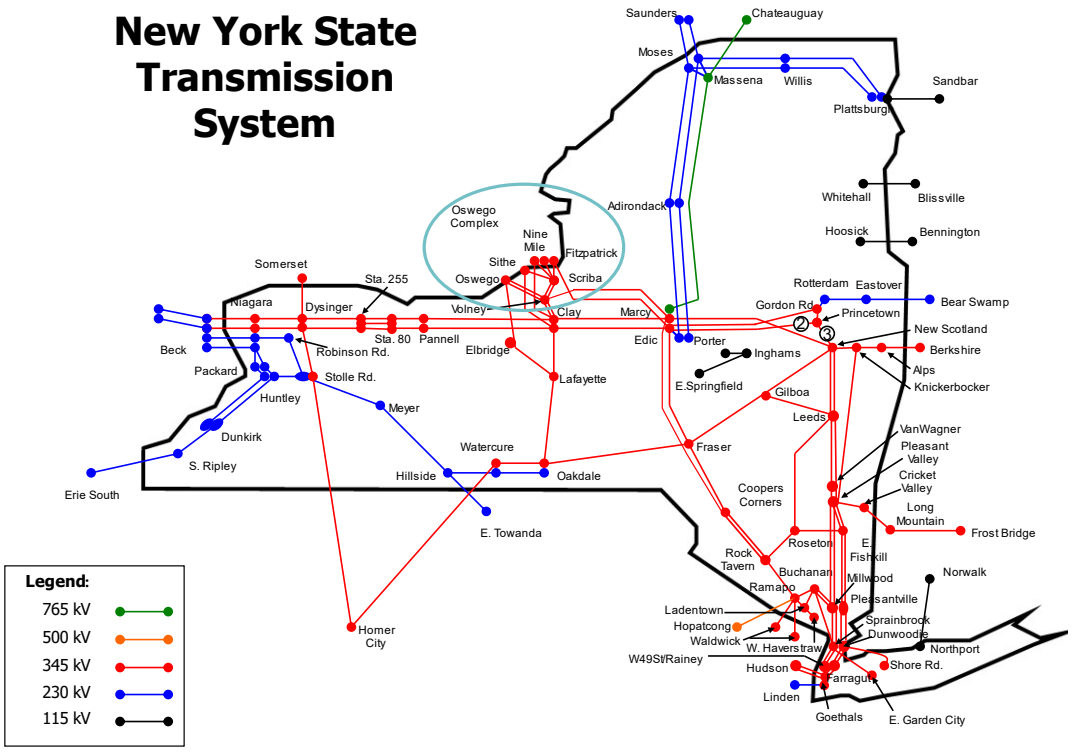

Figure 1. Oswego Complex Highlighted by the Teal Ellipsoid

System Representation and Stability Case Development

The analysis was based on the 2024 NYISO Operations dynamics base case, which was developed from the 2023 series MMWG dynamics base case with the NYISO representation updated to match with the representation of the NYISO 2024 Summer Operating Study.

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.

The Central East transfer was at its margined stability limit of 4250 MW. All the Oswego Nuclear Units were dispatched at full load, and generation dispatch within the complex was adjusted using Oswego 5. Fraser SVC, Leeds SVC and Marcy FACTs were modeled out of service in pre-contingency conditions and put back in service, if applicable in the scenario, with their pre-contingency terminal voltage as their set point.

Import from Hydro-Quebec (1310 MW all AC) is entirely derived from Beauharnois generation with the Chateauguay HVDC out-of-service. This is a conservative approach to decouple the damping effect of the HVDC control circuits.

Sensitivities were also performed with the Marcy South Series Compensation (MSSC) in service and bypassed, long-term outage of the Marcy STATCOM, and the outage of the Edic – Princetown lines #351/352. None of these sensitivity runs impacted the Oswego Export stability limit results.

Tested Contingencies

Fifty eight (58) contingencies were tested for each developed Oswego Export stability case scenario. Table 3 provides the identification and description of these contingencies.

Table 3:
Contingencies Applied for Evaluating Oswego Export Stability Limits

#	ID	Description
1	CE01_AC-SegA	3PH-NCEDIC345LOEDIC-PRINCETOWN351
2	CE01AR_AC-SegA	3PH-NCEDIC345LOEDIC-PRINCETOWN351WAUTORCL
3	CE02	3PH-NC@MARCY345 – L/O MARCY-N.SCOTLAND (UNS-18) W/RCL
4	CE03_AC-SegA	SLG-STK@EDIC345 (BKR R935) – L/O EDIC-GORDON ROAD #14 / 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	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	3PH-NC@GORDON ROAD345 – L/O EDIC-GORDON ROAD #14 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
24	CE20	SLG-STK@EDIC345 (BKR R70) – L/O EDIC-MARCY UE1-7/ BKUP CLR EDIC T4 (WithT2 Moved)
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
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	CE41_AC-SegA	SLG-STK@EDIC345 (BKR R935) – L/O EDIC-PRINCETOWN #351 / BKUP CLR FE1
51	CE42_AC-SegA	3PH-NC@PRINCETOWN345 – L/O EDIC-PRINCETOWN #351 W/H.S RCL
52	CE99	SLG-STK@SCRIBA345 (BKR R935) – L/O SCRIBA-VOLNEY 21 / BKUP CLR FITZ-SCRIBA #10
53	NYPA150	LLG- @MOSES230 L/O MOSES-ST.LAWRENCE (L33P & L34P)PDCT W/NOREJ
54	VE01	SLG-STK@CLAY345 (BKR3 R935) – L/O EDIC-CLAY (2-15) / BKUP CLR#PC2
55	VE02	SLG-STK@CLAY345 (BKR#R935) – L/O PANNELL-CLAY (PC#2) / BKUP CLR#2-15
56	VE03	SLG-STK@LAFAYETTE (BKR R220) – L/O DEWITT-LAFAYETTE (22) / BKUP CLR#17
57	VE04	SLG-STK@CLAY 345 (BKR R925) - L/O DEWITT-CLAY (13) / BKUP CLR#8
58	VE06SLG	SLG-STK@CLAY345 (BKR 60) L/O VOLNEY-CLAY (6) / BKUP CLR#CLAYT2

Monitored Elements

In order to assess system stability response for the Oswego Export stability case scenarios considering contingencies, the following parameters were monitored and analyzed:

- Rotor angles for generating units in Oswego complex and some select units in the rest of NY
- Bus voltages in the Oswego Complex and select bus voltages in the rest of NY and OH
- Power transfers across Central East and some select NYISO interfaces
- NY SVC's and STATCOM output in response to changes in bus voltages in central NY

The recommended limits in this report are all based on stable system response at the highest tested transfer level, prior to observed instability.

Discussion

The all-lines-in-service case and line outage conditions were subjected to the contingencies listed in Table 3. Most of the cases exhibited stable performance with no limitations to the Oswego Export. Only one outage case (Marcy – Volney 345 kV (VU-19)) required a limitation on Oswego Export and it is detailed below.

The Oswego Export limits were evaluated in accordance with the NYISO Transmission Planning Guideline #3 "Guideline for Stability Analysis and Determination of Stability-Based Transfer Limits".

Marcy – Volney 345 kV (VU-19) Outage

With VU-19 out of service, the worst dynamic response was noted for the 3-Phase@Fitzpatrick on Fitz–Edic 345kV (CE33). For that fault (CE33), angle separation occurred with an Oswego Export of 5300 MW (Fig 2), but the system remained stable when the Oswego Export limit is set to 5250 MW (Fig3). This is a critical Central East contingency since it separates the Marcy 345 kV substation from the Oswego Complex with Volney – Marcy out of service.

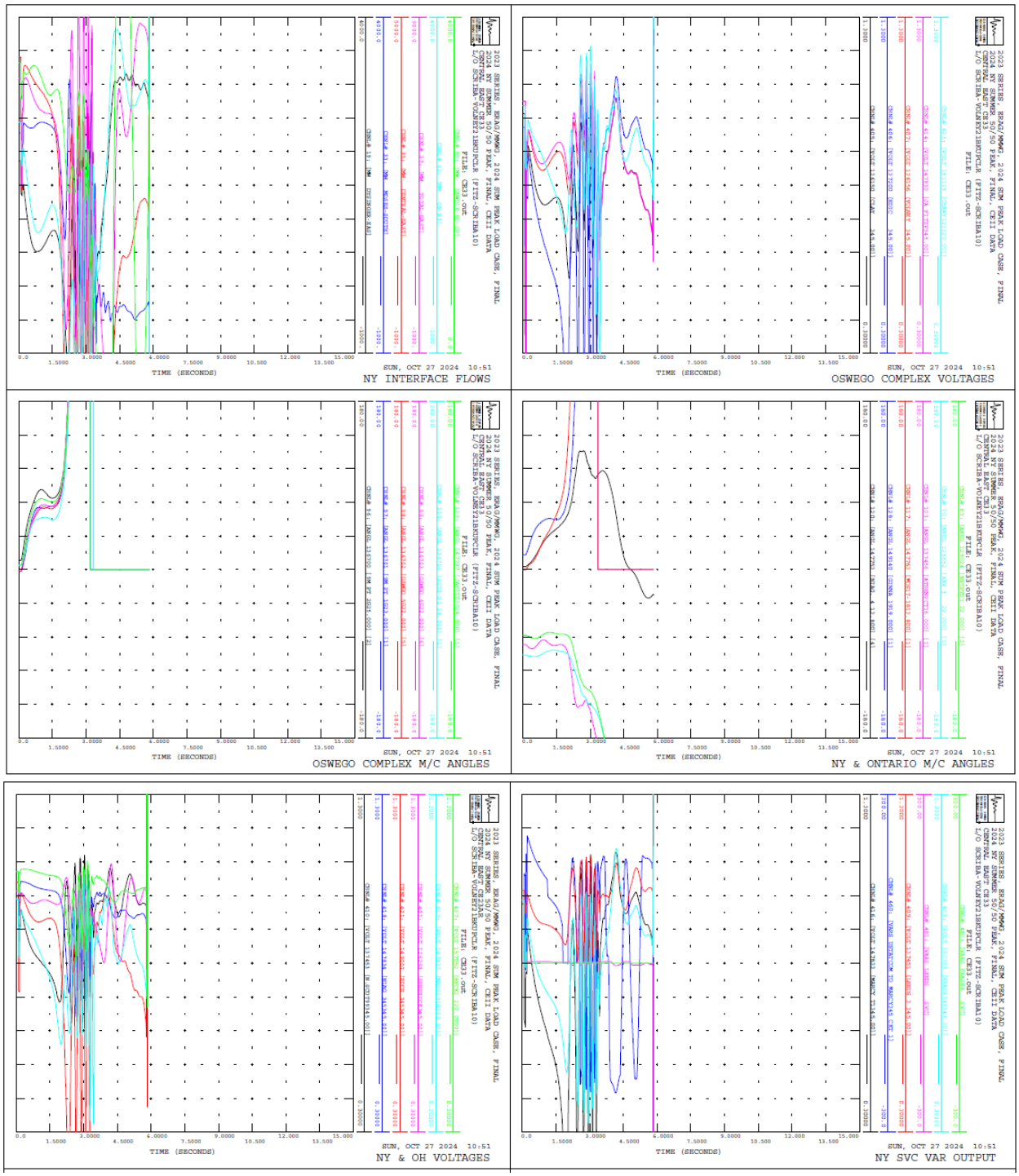

Fig 2 Marcy–Volney (VU-19) OS; 3-Phase@Fitzpatrick on Fitz–Edic 345kV (CE33) with Oswego Export at 5300 MW

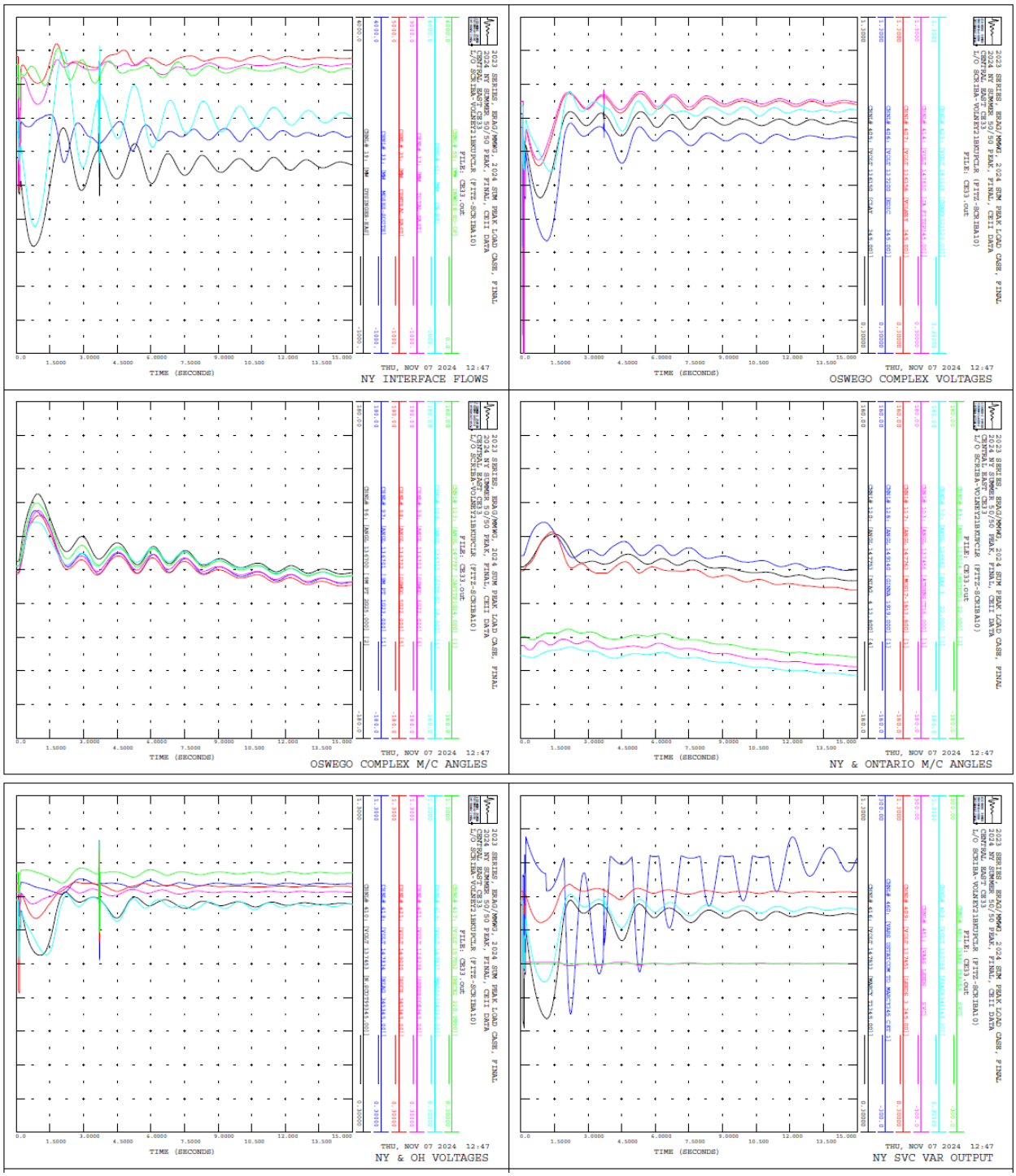

Fig 3 Marcy–Volney (VU-19) OS; 3-Phase@Fitzpatrick on Fitz–Edic 345kV (CE33) with Oswego Export at 5250 MW

Recommendations

Table 1 shows the line outage conditions evaluated in this analysis, and the Oswego complex export operating limit.

The system demonstrated stable performance for the tested contingencies (see Tables 3 and 4) with Oswego Complex generation at 5300 MW for all cases except for the single line outage case (Marcy - Volney (Ln# 19) 345 kV) with a generation limitation of 5250 MW. The results of the analysis showed that there were no adverse impacts on the NYISO bulk power system for this level of Oswego Export.

The guidelines developed from this study for Oswego Complex generation export are based on the assessment of system dynamic performance for the tested cases and conditions.