DYSINGER EAST STABILITY LIMIT ANALYSIS FOR OUTAGE CONDITIONS (DYSE-21)

A Report by the
New York Independent System Operator

OCTOBER 2021

Executive Summary

This study was conducted to examine stability limits for the Dysinger East interface for the anticipated installation of the Empire State Line Alternative Project, which includes the Dysinger 345kV substation and a new PAR-controlled connection from Dysinger to the new East Stolle Rd 345kV substation. The new substations will be installed in four subsequent installation phases taking place over Q4 2021 through Q2 2022, impacting existing 345kV transmission lines in the Rochester area.

Phase 1 evaluated the network configuration as the new Dysinger 345kV substation cuts into the existing Niagara-Somerset (NS1-38) 345kV line, which is anticipated in December 2021. Phase 2 includes the network configuration changes from Phase 1 and includes the network configuration as the Dysinger 345kV substation cuts into the Niagara-Station 255 (NH2) 345kV line, which is anticipated in January 2022. Phase 3 includes network configurations from Phase 2 while cutting into the Somerset-Station 255 (SR1-39) 345kV line, anticipated in February 2022. Lastly, a full evaluation was conducted for Phase 4, which includes the changes examined in Phases 1-3, as well as the addition of a PAR-controlled 345kV tie line connecting the Dysinger substation and the new East Stolle Rd 345kV substation. The final, completed network configuration analyzed in Phase 4 is expected to be in place by summer 2022.

The Dysinger East interface is illustrated in Figure 1 and defined in Table 3 (pre-project), Table 4 (Phase 1), Table 8 (Phase 2), Table 12 (Phase 3), and Table 16 (Phase 4). The study confirms or increases existing equipment outage limits associated with the Dysinger East interface. 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 Dysinger East stability transfer limits be updated as reported in Tables 1 and 2.

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Summary of Proposed Limits

The proposed limit revisions and the magnitude of the changes are presented in Tables 1 and 2, below:

Phase	Outages Applied	Previous Outage Studied	Proposed Marginal Stability Limit (MW)	Existing Stability Limit (MW)	Change In Stability Limit (MW)
Phase 1	None	None	3150	3150	0
	ND1	N/A	2500	N/A	New Limit
	38	N/A	2500	N/A	New Limit
Phase 2	None	None	3150	3150	0
	ND1	N/A	2600	N/A	New Limit
	ND2	N/A	2550	N/A	New Limit
	DH2	N/A	2400	N/A	New Limit
	DH2 & ND2	NH2	2350	2350	0
	DH2 & SH1-39	NH2 & SH1-39	1250	1250	0
	ND1 & ND2	NH2 & SH1-39	1250	1250	0
Phase 3	None	None	3200	3150	50
	39	N/A	3200*	N/A	New Limit
	ND1	N/A	2650	N/A	New Limit
	DH1	N/A	2550	N/A	New Limit
	DH2	N/A	2550	N/A	New Limit
	DH1 & DH2	NH2 & SH1-39	1250	1250	0
	ND1 & ND1	NH2 & SH1-39	1250	1250	0

Table 1: Summary of Proposed Dysinger East Stability Limits, Phases 1-3

Phase	Outages Applied	Previous Outage Studied	Proposed Marginal Stability Limit (MW)	Existing Stability Limit (MW)	Change In Stability Limit (MW)
Phase 4	None	None	3200	3150	50
	ND1 **OR** ND2	N/A	2700	N/A	New Limit
	38 **OR** 39	N/A	3200*	N/A	New Limit
	DH1 **OR** DH2	N/A	2850	N/A	New Limit
	RP1 **OR** RP2	RP1	3200*	3100	100
	60 **OR** 68 **OR** 72	60 OR 68 OR 72	3150	3050	100
	PC1 **OR** PC2	PC1	3050	3000	50
	67 **OR** 81 **OR** 83 **OR** 85 **OR** 87	67 OR 81 OR 83 OR 85 OR 87	2850	2850	0
	PC1 & PC2	PC1 & PC2	2600	2550	50
	RP1 & RP2	RP1 & RP2	2500	2450	50
	HR1 & HR2	HR1 & HR2	3200*	3100	100
	HR1 & 40	HR1 & 40	3200*	3050	150
	(ND1 **OR** ND2) & (DH1 **OR** DH2)	NH2	2550	2350	200
	DH1 & DH2	NH2 & SH1-39	1300	1250	50
	ND1 & ND2	NH2 & SH1-39	1300	1250	50
	((ND1 **OR** ND2) & (DH1 **OR** DH2)) & (67 **OR** 81 **OR** 83 **OR** 85 or 87)	NH2 & 67 OR 81 OR 83 OR 85 OR 87	2350	2150	200
	DES1	N/A	3200*	N/A	New Limit
	28	N/A	3200*	N/A	New Limit
	29	N/A	3200*	N/A	New Limit

Table 2: Summary of Proposed Dysinger East Stability Transfer Limits, Phase 4

*Matches All-lines-in service. Outage is not critical to derivation of Dysinger East IROL limit

Introduction

This study serves as a review of Dysinger East stability limits for the construction of the Empire State Line Alternative Project, which includes the installation of a new 345kV substation at Dysinger and a PAR-controlled 345kV tie line between Dysinger and a new East Stolle Rd 345kV substation. Forty-six (46) different dispatch scenarios were tested, including the impact of system configuration changes to Dysinger East limits across the different stages of installation of the Empire State Line Alternative project, and a full evaluation post-completion.

This study provides recommendations to update the Dysinger East stability transfer limits for the outage scenarios as per Tables 1 and 2.

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.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.”

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 results of the NYISO 2020 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

Generation shifts between Ontario, West and the Central, Capital, and Hudson zones were primarily used to adjust Dysinger East 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.

Monitored Elements

In order to assess system stability response for the Dysinger 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); and
- bus voltages and frequencies around Dysinger East, ties to IESO, and the Central East 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.

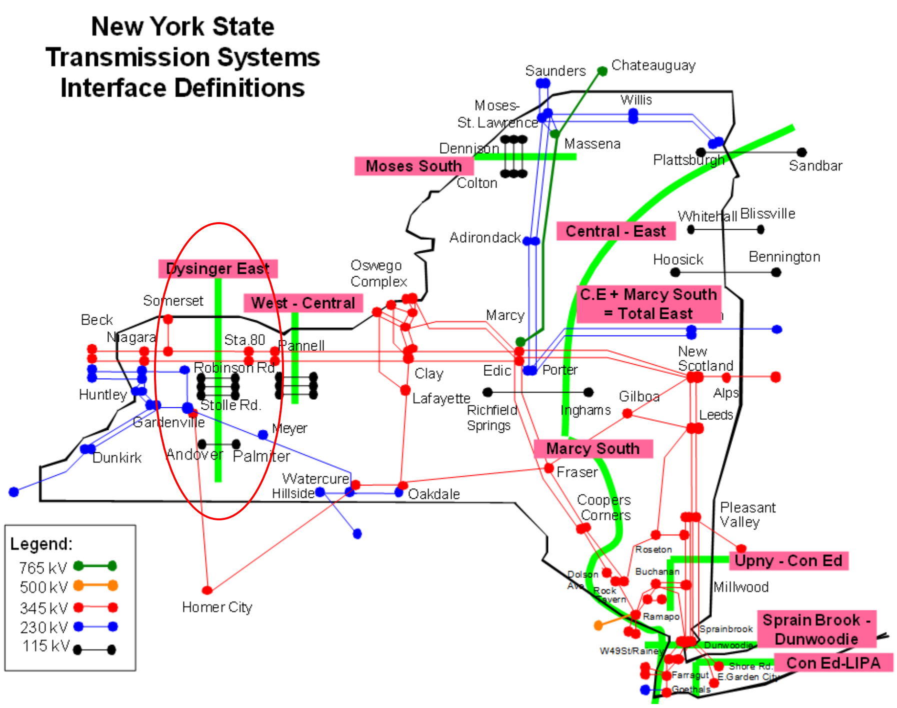
Pre-Empire State Line Alternative Project Interface Summary

The existing Dysinger East interface definition, prior to the completion of any portion of the Empire State Line Alternative Project, is given below in Table 3 and illustrated in Figure 1.

DYSINGER EAST (PRE-EMPIRE STATE LINE ALTERNATIVE PROJECT)		
West (Zone A) – Genesee (Zone B)		
Name	**Line ID**	**Voltage (kV)**
*SOMERSET – STA. 255	SH1-39	345
*NIAGARA – STA. 255	NH2	345
*LOCKPORT – SHELBY	113	115
*LOCKPORT – N. AKRON	108	115
*LOCKPORT – OAKFIELD	112	115
*LOCKPORT – SOUR	111	115
*LOCKPORT – TELEGRAPH	107	115
*LOCKPORT – TELEGRAPH	114	115
West (Zone A) – Central (Zone C)		
*STOLLE RD. - HIGH SHELDON	67	230
*ANDOVER – PALMITER	932	115

Table 3: Dysinger East Interface Definition (Pre-Empire State Line Alternative Project)

* indicates the metered end of the circuit.



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.

Base Case Development

The creation of the base cases for this study required power to be imported across the Niagara-Beck ties from Ontario to create the necessary transfers across the Dysinger East interface.

Phase 1 Discussion

Phase 1 Dysinger East Network Topology

Phase 1 of the Empire State Line Alternative project establishes the Dysinger 345kV substation in the NYCA system, cutting into the existing Niagara-Somerset (NS1-38) 345kV line in the West. The Niagara-Dysinger 345kV portion of the line is designated as ND1 and the Dysinger-Somerset 345kV half of the line is designated as 38.

Phase 1 Dysinger East Interface Definition

The Dysinger East interface definition is not changed by the installation of new equipment, or the redesignation of lines involved in Phase 1.

The Dysinger East interface definition, as of Phase 1, is given below in Table 4 and illustrated in Figure 1.

DYSINGER EAST (DYSINGER PROJECT, PHASE 1)		
West (Zone A) – Genesee (Zone B)		
Name	**Line ID**	**Voltage (kV)**
*SOMERSET – STA. 255	SH1-39	345
*NIAGARA – STA. 255	NH2	345
*LOCKPORT – SHELBY	113	115
*LOCKPORT – N. AKRON	108	115
*LOCKPORT – OAKFIELD	112	115
*LOCKPORT – SOUR	111	115
*LOCKPORT – TELEGRAPH	107	115
*LOCKPORT – TELEGRAPH	114	115
West (Zone A) – Central (Zone C)		
*STOLLE RD. - HIGH SHELDON	67	230
*ANDOVER – PALMITER	932	115

Table 4: Dysinger East Interface Definition (Phase 1, Empire State Line Alternative Project)

* indicates the metered end of the circuit.

Phase 1 Tested Contingencies

Thirty-six (36) contingencies were tested for each developed Phase 1 Dysinger East transfer case scenario, including contingencies provided by NextEra (prefaced with NEX) and NYISO West-Central contingencies (prefaced with WC). Table 5 provides the identification and description of these contingencies.

Table 5. Phase 1 Contingencies Applied for Evaluating Dysinger East Stability Transfer Limits		
#	ID	Description
1	NEX-NC01-Q545A	3 PHASE FAULT ON DYSINGER-SOMERSET 345 kV CKT 1 (38)
2	NEX-NC03-Q545A	3 PHASE FAULT ON DYSINGER-NIAGARA 345 kV CKT 1 (ND1)
3	NEX-SBF1A-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - SOMERSET 345 kV CKT 1 (38)
4	NEX-SBF1B-Q545A	SLG STUCK BREAKER FAULT@DYSINGER 345 KV - SOMERSET 345 kV CKT 1 (38)
5	NEX-SBF3A-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - NIAGARA 345 kV CKT 1 (ND1)
6	NEX-SBF3B-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - NIAGARA 345 kV CKT 1 (ND1)
7	WC01ARQ339	3PH-NC NIAGARA – L/O NIAGARA-STATION 255 (NR-2) W/RCL
8	WC01Q339	3PH-NC@NIAGARA – L/O NIAGARA-STATION 255 (NR-2)
9	WC02ARQ339	3PH-NC@STATION 255 - L/O NIAGARA-STATION 255 (NR-2) W/RCL
10	WC02Q339	3PH-NC@STATION 255 - L/O NIAGARA-STATION 255 (NR-2)
11	WC03AR-Q530-545A	3PH-NC@NIAGARA – L/O NIAGARA-DYSINGER W/RCL
12	WC03-Q530-545A	3PH-NC@NIAGARA – L/O NIAGARA-DYSINGER
13	WC04ARQ339	3PH-NC@STATION 255 - L/O SOMERSET-STATION 255 (SR-1/39) W/RCL
14	WC04Q339	3PH-NC@STATION 255 - L/O SOMERSET-STATION 255 (SR-1/39)
15	WC05Q339	SLG-STK@NIA345 (BKR#3108) – L/O NIAG-STATION 255 (NR-2) / BKUP CLR NIAG AT#4
16	WC06-Q530-545A	SLG-STK@DYSINGER – L/O NIAGARA - DYSINGER
17	WC07	3PH-NC@ROCHESTER – L/O ROCHESTER-PANNELL (RP-1)
18	WC07AR	3PH-NC@ROCHESTER – L/O ROCHESTER-PANNELL (RP-1) W/RCL
19	WC08	3PH-NC@PANNELL – L/O PANNELL-CLAY (PC-1)
20	WC08AR	3PH-NC@PANNELL – L/O PANNELL-CLAY (PC-1)
21	WC09	3PH-NC@PANNELL – L/O ROCHESTER-PANNELL (RP-1)
22	WC09AR	3PH-NC@PANNELL – L/O ROCHESTER-PANNELL (RP-1) W/RCL
23	WC10Q339	SLG-STK@ROCHESTER (BKR#3508) – L/O ROCHESTER-PANNELL (RP-1) / BKUP CLR STATION 255
24	WC11	SLG-STK@PANNELL (BKR#3808) – L/O ROCHESTER-PANNELL (RP-1) / BKUP CLR PC-1
25	WC12Q339	SLG-STK@ROCH (BKR#3508) – L/O ROCHESTER -STATION 255 (SR-1/39) / BKUP CLR RP-1
26	WC13	3PH-NC@NIAGARA 345KV – L/O BECK-NIAGARA 345KV
27	WC14Q339	SLG-STK@ROCH (BKR#3502) – L/O ROCH-STATION 255 (SR-1/39) / BKUP CLR ROCH T1 & NR-2
28	WC15	LLG@BECK – L/O NIAGARA-PACKARD (PA27 & BP76) DCT
29	WC16	3PH-NC@HUNTLEY68 – L/O LINES 78/79 AND HUNTLEY 68 GEN
30	WC17	SLG-STK@HUNTLEY (BKR#1402) – L/O LINES 78/79 AND HUNTLEY 68 GEN
31	WC18	SLG-STK@HUNTLEY (BKR#1502) – L/O LINES 78/79 AND HUNTLEY 68 GEN
32	WC19	LLG@NIAGARA230 - L/O NIAGARA-PACKARD (61) & NIAGARA-ROBINSON (64) DCT
33	WC20	LLG@NIAGARA230 - L/O NIAGARA-PACKARD (62) & NIAGARA-BECK (PA27) DCT
34	WC21	LLG@PACKARD230 - L/O NIAGARA-PACKARD (62) & PACKARD-BECK (BP76) DCT
35	WC22-Q530-545A	3PH-NC@SOMERSET/SOMERSET - DYSINGER CKT 2 (NC)
36	WC23Q339	3PH-NC@SOMERSET - L/O SOMERSET-STATION 255 (SR-1/39)

Table 5: Phase 1 Contingencies Applied for Evaluating Dysinger East Stability Transfer Limits

Phase 1 Dysinger East Stability Limit Results

Stability limit results for all Phase 1 cases are found in Table 6 below:

Outages Applied	Tested Transfer Level (MW)	Proposed Marginal Stability Limit (MW)	Existing Stability Limit (MW)	Most Severe Contingency
None	3550	3150*	3150	WC16
ND1	2825	2500	New Limit	WC12Q339
38	2810	2500	New Limit	WC12Q339

Table 6: Phase 1 Dysinger East Stability Limit Results

* Matches All-lines-in service. Outage is not critical to derivation of Dysinger East IROL limit

Most Severe Contingency – WC12Q339, SLG at Rochester 345 kV, Stuck Breaker, Loss of HR1, RP1 345 kV

The most severe system response among tested contingencies for the ND1 O/S case resulted from contingency WC12Q339, a single line to ground fault at Rochester 345 kV station with a stuck breaker preventing single-line clearing. As a result, loss of a Station 255 to Rochester 345 kV line (HR1), and a

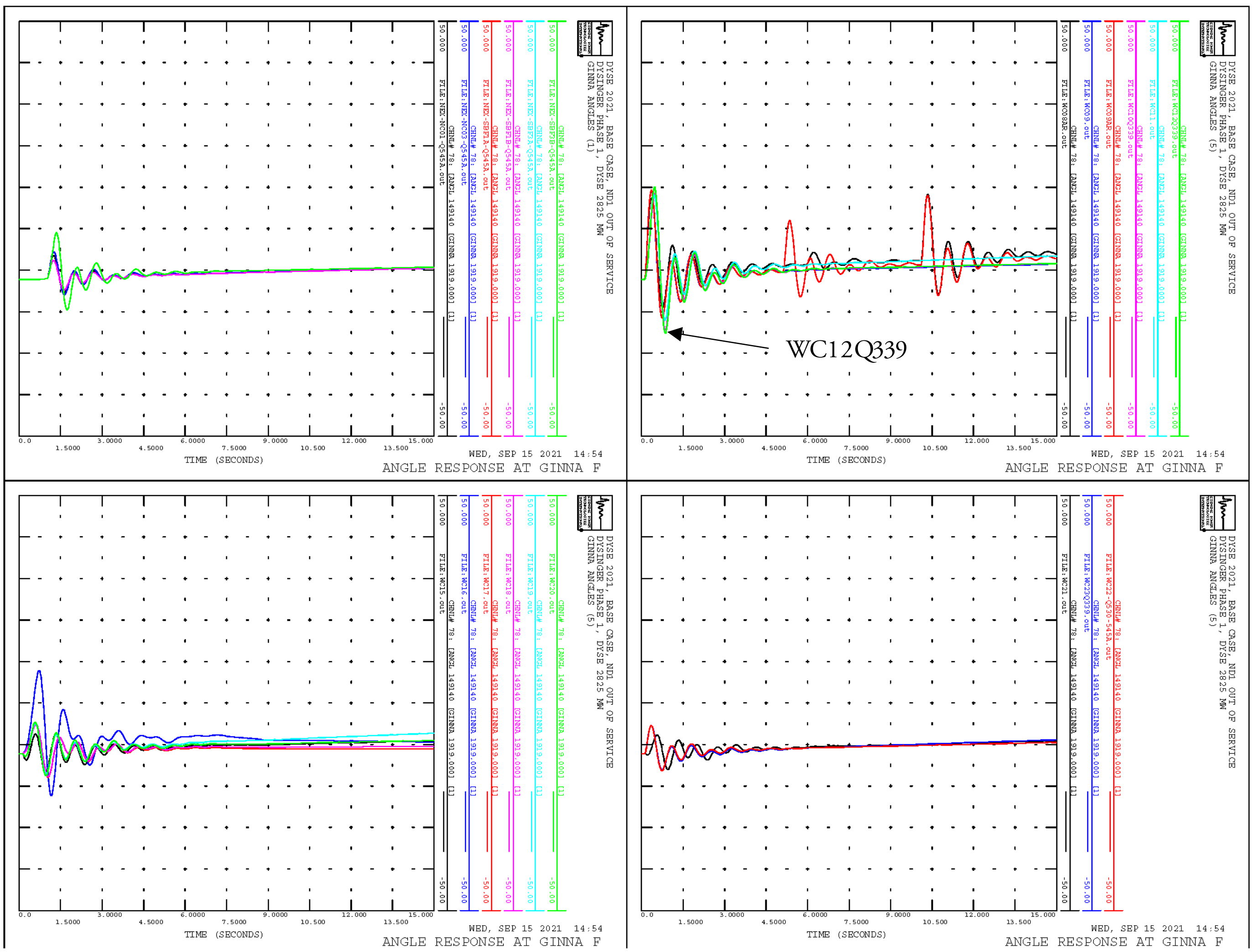


Figure 2: Ginna Angles in Phase 1 ND1 O/S Contingency Responses

Rochester to Pannell Rd. 345 kV line (RP1) follow. As shown in Figures 2 and 3, the WC12Q339 contingency stands out from the rest in the magnitude of its angle response compared to other tested contingencies. System responses for the other Phase 1 cases, which include outage conditions, show similar responses to those seen in Figures 2 and 3 and can be found in the Appendices.

The left graph in Figure 3 shows the voltage response at major buses near Dysinger East: Beck 220,

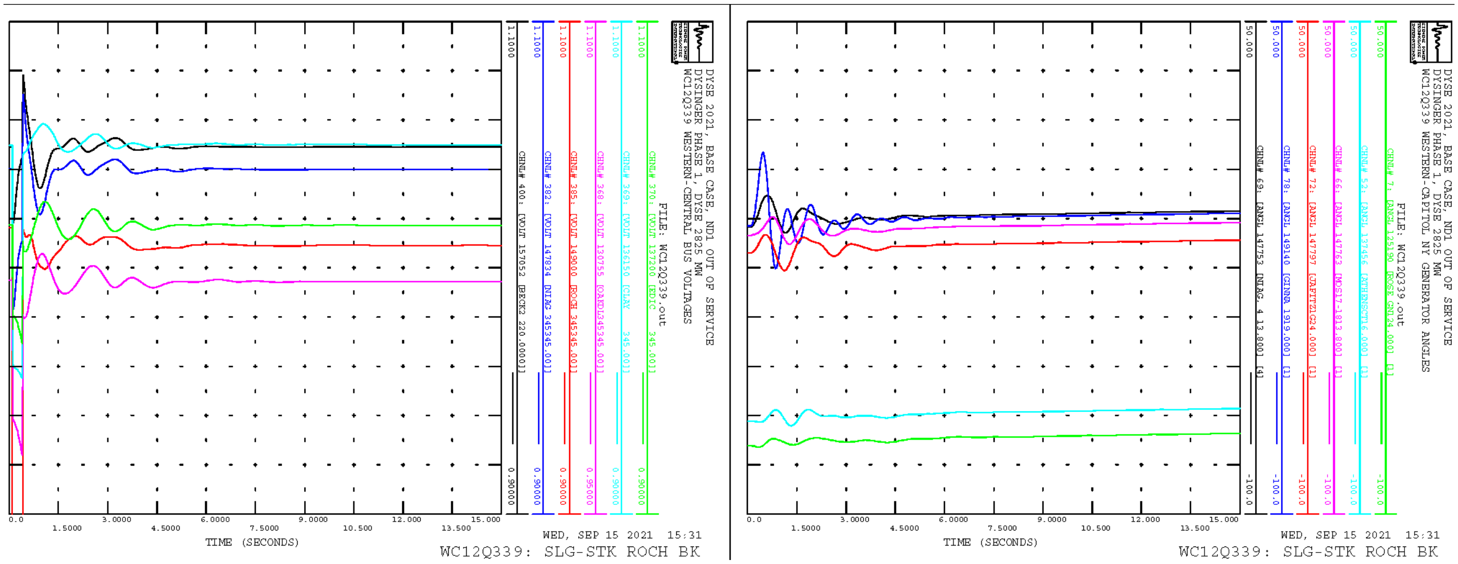


Figure 3: Phase 1, ND1 O/S Case, NYCA Voltage Response

Niagara 345, Rochester STA 80 345, Oakdale 345, Clay 345, and Edic 345. The right graph in Figure 3 shows angle responses: Ginna and Niagara 4 to show the impact on major generators near Dysinger East, and Fitzpatrick, Moses, Athens, and Roseton to show the broader impact of the system response to WC12Q339 on the NYCA.

Phase 2 Discussion

Phase 2 Dysinger East Network Topology

Phase 2 of the Empire State Line Alternative project cuts the Niagara-Station 255 345kV line (designated NH2) and ties it into the Dysinger 345kV substation activated as part of Phase 1. The cut in the NH2 line will cause each section to be renamed, with the Niagara-Dysinger 345kV portion to be designated as ND2 and the Dysinger-Station 255 345kV portion to be designated as DH2.

Phase 2 Dysinger East Interface Definition

The Dysinger East interface definition will be changed due to the alteration of the Niagara-Station 255 (NH2) 345kV line, which was formerly part of the interface. As of the completion of Phase 2, the Dysinger East interface will replace the NH2 line with the Dysinger – Station 255 (DH2) 345kV line.

The Dysinger East interface definition is given below in Table 7 and illustrated in Figure 1.

DYSINGER EAST (DYSINGER PROJECT, PHASE 2)		
West (Zone A) – Genesee (Zone B)		
Name	**Line ID**	**Voltage (kV)**
*SOMERSET – STA. 255	SH1-39	345
*DYSINGER – STA. 255	DH2	345
*LOCKPORT – SHELBY	113	115
*LOCKPORT – N. AKRON	108	115
*LOCKPORT – OAKFIELD	112	115
*LOCKPORT – SOUR	111	115
*LOCKPORT – TELEGRAPH	107	115
*LOCKPORT – TELEGRAPH	114	115
West (Zone A) – Central (Zone C)		
*STOLLE RD. - HIGH SHELDON	67	230
*ANDOVER – PALMITER	932	115

Table 7. Dysinger East Interface Definition (Phase 2 Empire State Line Alternative Project)

* indicates the metered end of the circuit.

Phase 2 Tested Contingencies

Forty-two (42) contingencies were tested for each developed Phase 2 Dysinger East transfer case scenario, including contingencies provided by NextEra (prefaced with NEX) and NYISO West-Central contingencies (prefaced with WC). Table 8 provides the identification and description of these contingencies.

Table 8. Contingencies Applied for Evaluating Dysinger East Stability Transfer Limits		
#	ID	Description
1	NEX-NC01-Q545A	3 PHASE FAULT ON DYSINGER-SOMERSET 345 kV CKT 1 (38)
2	NEX-NC03-Q545A	3 PHASE FAULT ON DYSINGER-NIAGARA 345 kV CKT 1 (ND1)
3	NEX-NC05-Q545A	3 PHASE FAULT ON DYSINGER-STATION 255 345 kV CKT 2 (DH2)
4	NEX-NC06-Q545A	3 PHASE FAULT ON DYSINGER-NIAGARA 345 kV CKT 2 (ND2)
5	NEX-SBF1A-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - SOMERSET 345 kV CKT 1 (38)
6	NEX-SBF1B-Q545A	SLG STUCK BREAKER FAULT@DYSINGER 345 KV - SOMERSET 345 kV CKT 1 (38)
7	NEX-SBF3A-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - NIAGARA 345 kV CKT 1 (ND1)
8	NEX-SBF3B-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - NIAGARA 345 kV CKT 1 (ND1)
9	NEX-SBF5A-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - STATION 255 345 kV CKT 2 (DH2)
10	NEX-SBF5B-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - STATION 255 345 kV CKT 2 (DH2)
11	NEX-SBF6A-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - NIAGARA 345 kV CKT 2 (ND2)
12	NEX-SBF6B-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - NIAGARA 345 kV CKT 2 (ND2)
13	WC01ARQ339-530-545A	3PH-NC NIAGARA – L/O NIAGARA-Q530DYSINGER W/RCL
14	WC01Q339-530-545A	3PH-NC@NIAGARA – L/O NIAGARA-DYSINGER
15	WC02ARQ339-530-545A	3PH-NC@DYSINGER - L/O NIAGARA-DYSINGER W/RCL
16	WC02Q339-530-545A	3PH-NC@DYSINGER - L/O NIAGARA-DYSINGER
17	WC03AR-Q530-545A	3PH-NC@NIAGARA – L/O NIAGARA-DYSINGER W/RCL
18	WC03-Q530-545A	3PH-NC@NIAGARA – L/O NIAGARA-DYSINGER
19	WC04ARQ339	3PH-NC@STATION 255 - L/O SOMERSET-STATION 255 (SR-1/39) W/RCL
20	WC04Q339	3PH-NC@STATION 255 - L/O SOMERSET-STATION 255 (SR-1/39)
21	WC05Q339-530-545A	SLG-STK@NIA345 (BKR#3108) – L/O NIAG-DYSINGER / BKUP CLR NIAG AT#4
22	WC06-Q530-545A	SLG-STK@DYSINGER – L/O NIAGARA - DYSINGER
23	WC07	3PH-NC@ROCHESTER – L/O ROCHESTER-PANNELL (RP-1)
24	WC07AR	3PH-NC@ROCHESTER – L/O ROCHESTER-PANNELL (RP-1) W/RCL
25	WC08	3PH-NC@PANNELL – L/O PANNELL-CLAY (PC-1)
26	WC08AR	3PH-NC@PANNELL – L/O PANNELL-CLAY (PC-1)
27	WC09	3PH-NC@PANNELL – L/O ROCHESTER-PANNELL (RP-1)
28	WC09AR	3PH-NC@PANNELL – L/O ROCHESTER-PANNELL (RP-1) W/RCL
29	WC10Q339	SLG-STK@ROCHESTER (BKR#3508) – L/O ROCHESTER-PANNELL (RP-1) / BKUP CLR STATION 255
30	WC11	SLG-STK@PANNELL (BKR#3808) – L/O ROCHESTER-PANNELL (RP-1) / BKUP CLR PC-1
31	WC12Q339	SLG-STK@ROCH (BKR#3508) – L/O ROCHESTER -STATION 255 (SR-1/39) / BKUP CLR RP-1
32	WC13	3PH-NC@NIAGARA 345KV – L/O BECK-NIAGARA 345KV
33	WC14Q339	SLG-STK@ROCH (BKR#3502) – L/O ROCH-STATION 255 (SR-1/39) / BKUP CLR ROCH T1 & NR-2
34	WC15	LLG@BECK – L/O NIAGARA-PACKARD (PA27 & BP76) DCT
35	WC16	3PH-NC@HUNTLEY68 – L/O LINES 78/79 AND HUNTLEY 68 GEN
36	WC17	SLG-STK@HUNTLEY (BKR#1402) – L/O LINES 78/79 AND HUNTLEY 68 GEN
37	WC18	SLG-STK@HUNTLEY (BKR#1502) – L/O LINES 78/79 AND HUNTLEY 68 GEN
38	WC19	LLG@NIAGARA230 - L/O NIAGARA-PACKARD (61) & NIAGARA-ROBINSON (64) DCT
39	WC20	LLG@NIAGARA230 - L/O NIAGARA-PACKARD (62) & NIAGARA-BECK (PA27) DCT
40	WC21	LLG@PACKARD230 - L/O NIAGARA-PACKARD (62) & PACKARD-BECK (BP76) DCT
41	WC22-Q530-545A	3PH-NC@SOMERSET/SOMERSET - DYSINGER CKT 2 (NC)

42	WC23Q339	3PH-NC@SOMERSET - L/O SOMERSET-STATION 255 (SR-1/39)

Table 8. Contingencies Applied for Evaluating Dysinger East Stability Transfer Limits

Phase 2 Dysinger East Stability Limit Results

Stability limit results for all Phase 2 cases are found in Table 9 below:

Outages Applied	Tested Transfer Level (MW)	Proposed Marginal Stability Limit (MW)	Existing Stability Limit (MW)	Most Severe Contingency
None	3550	3150	3150	WC12Q339
ND1	2880	2600	New Limit	WC12Q339
ND2	2910	2550	New Limit	WC12Q339
DH2	2670	2400	New Limit	WC12Q339
DH2 & ND2	2630	2350	2350	WC12Q339
DH2 & SH1-39	1480	1250	1250	WC12Q339
ND1 & ND2	1480	1250	1250	WC12Q339

Table 9: Phase 2 Dysinger East Stability Limit Results

Example –Phase 2, Dysinger to Station 255 345 kV 2 (DH2) Out of Service

Most Severe Contingency – WC12Q339, SLG at Rochester 345 kV, Stuck Breaker, Loss of HR1, RP1 345 kV

The most severe system response among tested contingencies for the DH1 O/S case resulted from contingency WC12Q339, a single line to ground fault at Rochester 345 kV station with a stuck breaker

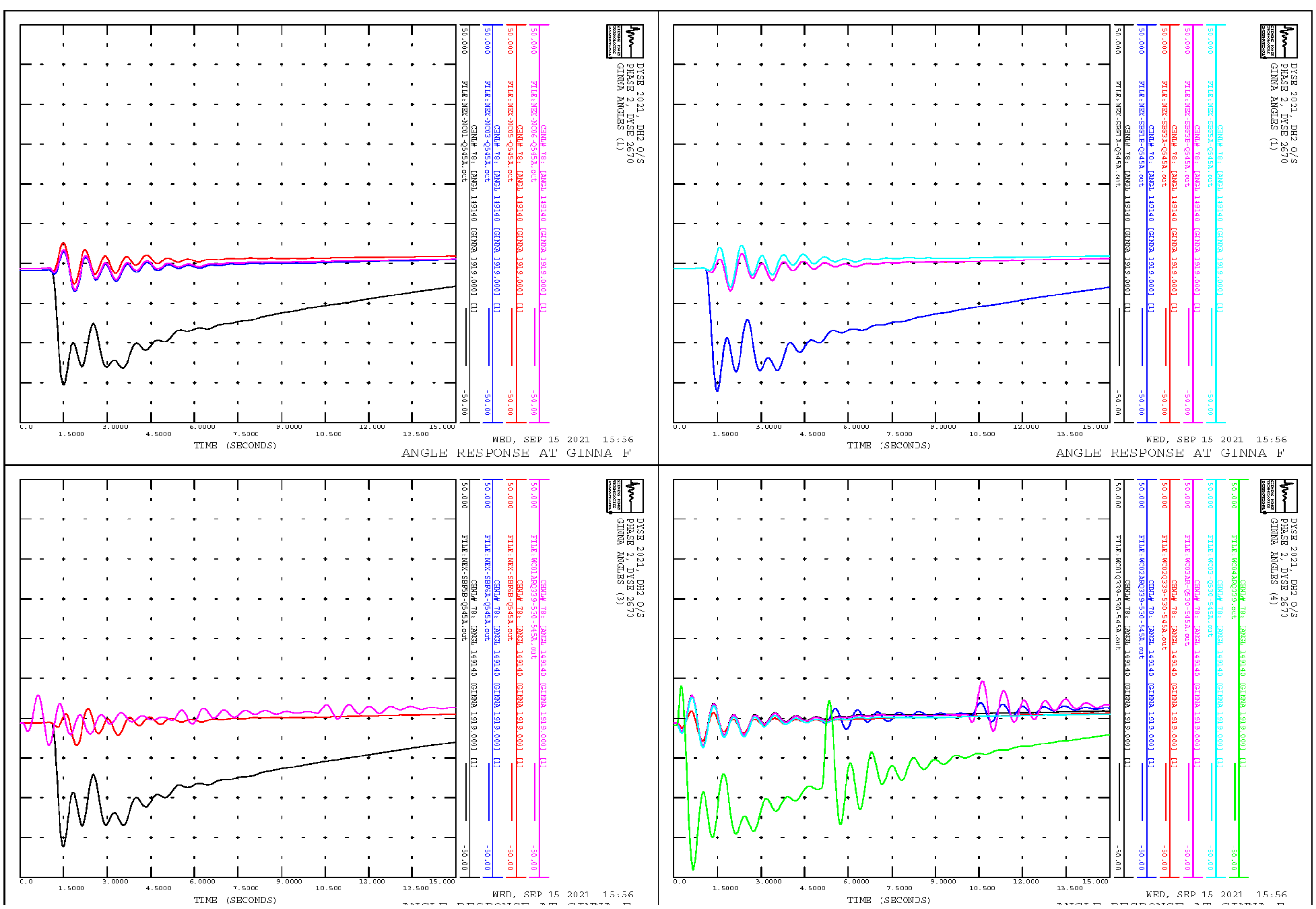


Figure 4: Ginna Angles in Phase 2 DH2 O/S Contingency Responses

preventing single-line clearing. As a result, loss of a Station 255 to Rochester 345 kV line (HR1), and a Rochester to Pannell Rd. 345 kV line (RP1) follow. As shown in Figures 4.1 and 4.2, the WC12Q339

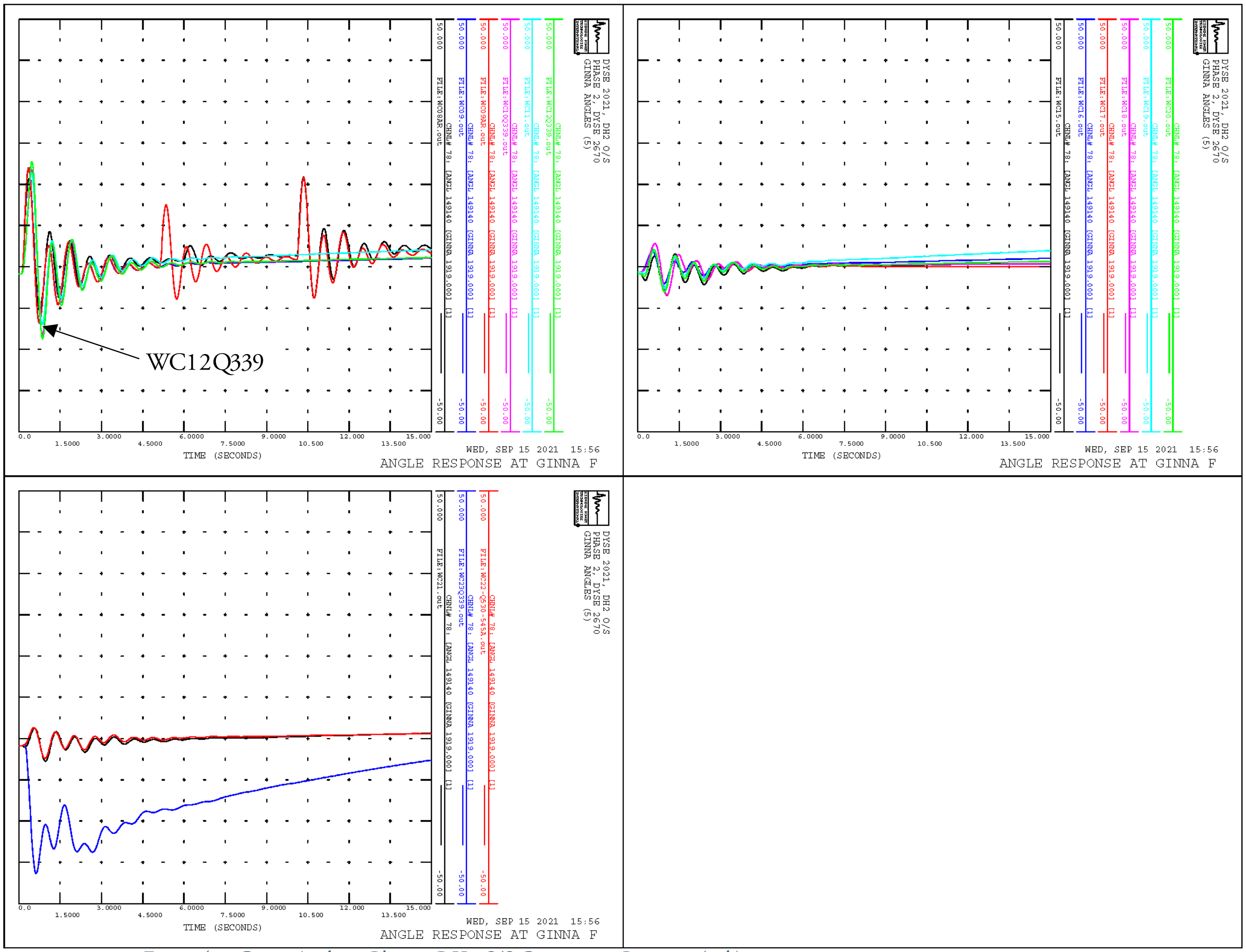


Figure 4.2: Ginna Angles in Phase 2 DH2 O/S Contingency Responses (ctd.)

The left graph in Figure 5 below shows the voltage response at major buses near Dysinger East: Beck 220, Niagara 345, Rochester STA 80 345, Oakdale 345, Clay 345, and Edic 345. The right graph in Figure 5 shows angle responses: Ginna and Niagara 4 to show the impact on major generators near Dysinger East, and Fitzpatrick, Moses, Athens, and Roseton to show the broader impact of the system response to WC12Q339 on the NYCA.

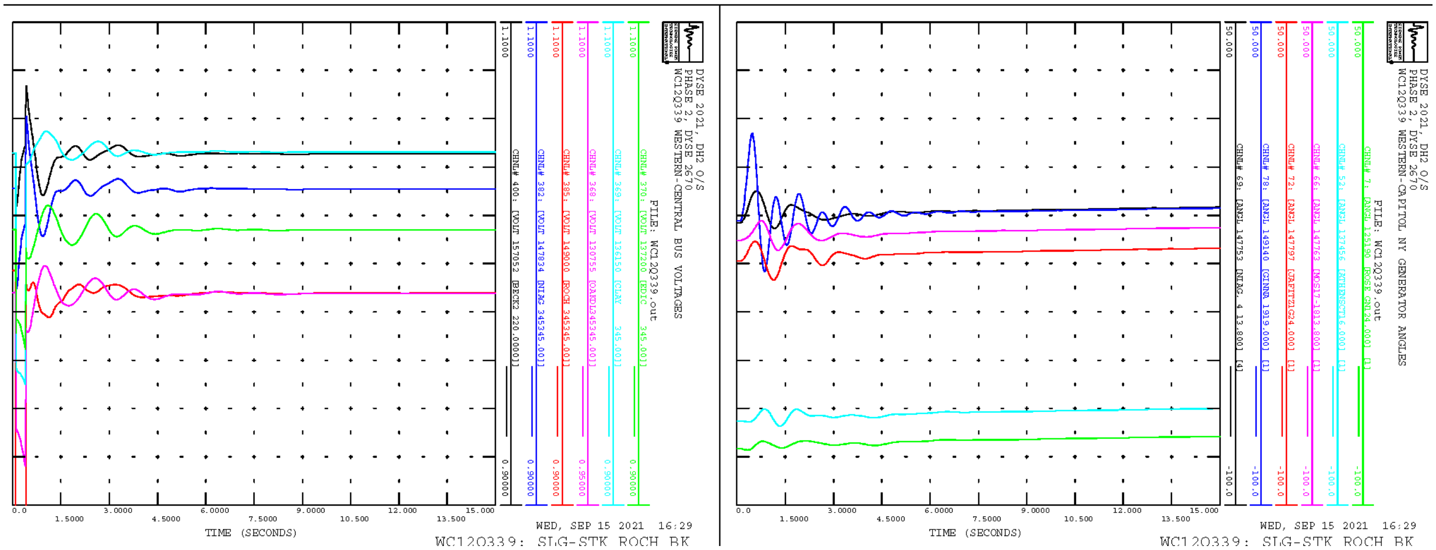


Figure 5: Phase 2, DH2 O/S Case, NYCA Voltage Response

Phase 3 Discussion

Phase 3 Dysinger East Network Topology Changes

Phase 3 of the Empire State Line Alternative project cuts the Somerset-Station 255 345kV line (designated SH1-39) and ties it into the Dysinger 345kV substation activated as part of Phase 1 and Phase 2. The cut in the SH1-39 line will cause each section to be renamed, with the Dysinger-Station 255 345kV portion to be designated as DH1 and the Somerset-Dysinger 345kV portion to be designated as 39.

Phase 3 Dysinger East Interface Definition

The Dysinger East interface definition will be changed due to the alteration of the Somerset-Station 255 (SH1-39) 345kV line, which was formerly part of the interface. As of the completion of Phase 3, the Dysinger East interface will replace the SH1-39 line with the Dysinger – Station 255 (DH1) 345kV line. See the Dysinger East interface definition below in Table 10 and illustrated in Figure 1.

DYSINGER EAST (DYSINGER PROJECT, PHASE 3)		
West (Zone A) – Genesee (Zone B)		
Name	**Line ID**	**Voltage (kV)**
*DYSINGER – STA. 255	DH1	345
*DYSINGER – STA. 255	DH2	345
*LOCKPORT – SHELBY	113	115
*LOCKPORT – N. AKRON	108	115
*LOCKPORT – OAKFIELD	112	115
*LOCKPORT – SOUR	111	115
*LOCKPORT – TELEGRAPH	107	115
*LOCKPORT – TELEGRAPH	114	115
West (Zone A) – Central (Zone C)		
*STOLLE RD. - HIGH SHELDON	67	230
*ANDOVER – PALMITER	932	115

Table 10. Dysinger East Interface Definition (Phase 3 Empire State Line Alternative Project)

* indicates the metered end of the circuit.

Phase 3 Tested Contingencies

Forty-six (46) contingencies were tested for each developed Phase 3 Dysinger East transfer case scenario, including contingencies provided by NextEra (prefaced with NEX) and NYISO West-Central contingencies (prefaced with WC). Table 11 provides the identification and description of these contingencies.

Table 11. Phase 3 Contingencies Applied for Evaluating Dysinger East Stability Transfer Limits		
#	ID	Description
1	NEX-NC01-Q545A	3 PHASE FAULT ON DYSINGER-SOMERSET 345 kV CKT 1 (38)
2	NEX-NC02-Q545A	3 PHASE FAULT ON DYSINGER-STATION 255 345 kV CKT 1 (DH1)
3	NEX-NC03-Q545A	3 PHASE FAULT ON DYSINGER-NIAGARA 345 kV CKT 1 (ND1)
4	NEX-NC04-Q545A	3 PHASE FAULT ON DYSINGER-SOMERSET 345 kV CKT 2 (39)
5	NEX-NC05-Q545A	3 PHASE FAULT ON DYSINGER-STATION 255 345 kV CKT 2 (DH2)
6	NEX-NC06-Q545A	3 PHASE FAULT ON DYSINGER-NIAGARA 345 kV CKT 2 (ND2)
7	NEX-SBF1A-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - SOMERSET 345 kV CKT 1 (38)
8	NEX-SBF1B-Q545A	SLG STUCK BREAKER FAULT@DYSINGER 345 KV - SOMERSET 345 kV CKT 1 (38)
9	NEX-SBF2A-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - STATION 255 345 kV CKT 1 (DH1)
10	NEX-SBF2B-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - STATION 255 345 kV CKT 1 (DH1)
11	NEX-SBF3A-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - NIAGARA 345 kV CKT 1 (ND1)
12	NEX-SBF3B-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - NIAGARA 345 kV CKT 1 (ND1)
13	NEX-SBF4A-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - SOMERSET 345 kV CKT 2 (39)
14	NEX-SBF4B-Q545A	STUCK BREAKER FAULT DYSINGER 345 KV - SOMERSET 345 kV CKT 2 (39)
15	NEX-SBF5A-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - STATION 255 345 kV CKT 2 (DH2)
16	NEX-SBF5B-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - STATION 255 345 kV CKT 2 (DH2)
17	NEX-SBF6A-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - NIAGARA 345 kV CKT 2 (ND2)
18	NEX-SBF6B-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - NIAGARA 345 kV CKT 2 (ND2)
19	WC01ARQ339-530-545A	3PH-NC NIAGARA – L/O NIAGARA-Q530DYSINGER W/RCL
20	WC01Q339-530-545A	3PH-NC@NIAGARA – L/O NIAGARA-DYSINGER
21	WC02ARQ339-530-545A	3PH-NC@DYSINGER - L/O NIAGARA-DYSINGER W/RCL
22	WC02Q339-530-545A	3PH-NC@DYSINGER - L/O NIAGARA-DYSINGER
23	WC03AR-Q530-545A	3PH-NC@NIAGARA – L/O NIAGARA-DYSINGER W/RCL
24	WC03-Q530-545A	3PH-NC@NIAGARA – L/O NIAGARA-DYSINGER
25	WC04ARQ339-530-545A	3PH-NC@STATION 255 - L/O DYSINGER - STATION 255 (CKT 2) W/RCL
26	WC04Q339-530-545A	3PH-NC@STATION 255 - L/O DYSINGER - STATION 255 (DH-1)
27	WC05Q339-530-545A	SLG-STK@NIA345 (BKR#3108) – L/O NIAG-DYSINGER / BKUP CLR NIAG AT#4
28	WC06-Q530-545A	SLG-STK@DYSINGER – L/O NIAGARA - DYSINGER
29	WC07	3PH-NC@ROCHESTER – L/O ROCHESTER-PANNELL (RP-1)
30	WC07AR	3PH-NC@ROCHESTER – L/O ROCHESTER-PANNELL (RP-1) W/RCL
31	WC08	3PH-NC@PANNELL – L/O PANNELL-CLAY (PC-1)
32	WC08AR	3PH-NC@PANNELL – L/O PANNELL-CLAY (PC-1)
33	WC09	3PH-NC@PANNELL – L/O ROCHESTER-PANNELL (RP-1)
34	WC09AR	3PH-NC@PANNELL – L/O ROCHESTER-PANNELL (RP-1) W/RCL
35	WC10Q339	SLG-STK@ROCHESTER (BKR#3508) – L/O ROCHESTER-PANNELL (RP-1) / BKUP CLR STATION 255
36	WC11	SLG-STK@PANNELL (BKR#3808) – L/O ROCHESTER-PANNELL (RP-1) / BKUP CLR PC-1
37	WC13	3PH-NC@NIAGARA 345KV – L/O BECK-NIAGARA 345KV
38	WC15	LLG@BECK – L/O NIAGARA-PACKARD (PA27 & BP76) DCT
39	WC16	3PH-NC@HUNTLEY68 – L/O LINES 78/79 AND HUNTLEY 68 GEN
40	WC17	SLG-STK@HUNTLEY (BKR#1402) – L/O LINES 78/79 AND HUNTLEY 68 GEN
41	WC18	SLG-STK@HUNTLEY (BKR#1502) – L/O LINES 78/79 AND HUNTLEY 68 GEN
42	WC19	LLG@NIAGARA230 - L/O NIAGARA-PACKARD (61) & NIAGARA-ROBINSON (64) DCT
43	WC20	LLG@NIAGARA230 - L/O NIAGARA-PACKARD (62) & NIAGARA-BECK (PA27) DCT
44	WC21	LLG@PACKARD230 - L/O NIAGARA-PACKARD (62) & PACKARD-BECK (BP76) DCT
45	WC22-Q530-545A	3PH-NC@SOMERSET/SOMERSET - DYSINGER CKT 2 (NC)
46	WC23Q339-530-545A	3PH-NC@SOMERSET - L/O SOMERSET-DYSINGER CKT 2

Table 11. Phase 3 Contingencies Applied for Evaluating Dysinger East Stability Transfer Limits

Phase 3 Dysinger East Stability Limit Results

Stability limit results for all Phase 3 cases are found in Table 12 below:

Outages Applied	Tested Transfer Level (MW)	Proposed Marginal Stability Limit (MW)	Existing Stability Limit (MW)	Most Severe Contingency
None	3610	3200	3150	WC09AR
39	3610	3200	New Limit	WC09AR
DH1	2880	2550	New Limit	WC09AR
DH2	2880	2550	New Limit	WC09AR
ND1	2955	2650	New Limit	WC09AR
DH1 & DH2	1480	1250	1250	WC10Q339
ND1 & ND2	1480	1250	1250	WC10Q339

Table 12: Phase 3 Dysinger East Stability Limit Results

Example –Phase 3, Dysinger to Station 255 345 kV 1 & 2 (DH1 & DH2) Out of Service

Most Severe Contingency – WC10Q339, Single Line to Ground w/ Stuck Breaker @ Rochester 345 – Loss of Rochester-Pannell Rd (RP1)

The most severe system response among tested contingencies for the DH1 & DH2 O/S case resulted from contingency WC10Q339, a single line to ground fault at Rochester 345 kV station with a stuck breaker preventing single-line clearing. As a result, loss of a Station 255 to Rochester 345 kV line (HR2), and a Rochester to Pannell Rd. 345 kV line (RP1) follow. As shown in Figures 6 and 6.2, the WC10Q339 contingency stands out from the rest in the magnitude of its angle response compared to other tested contingencies. System responses for the other Phase 3 cases, which include outage conditions, show similar responses to those seen in Figures 6 and 6.2 and can be found in the Appendices.

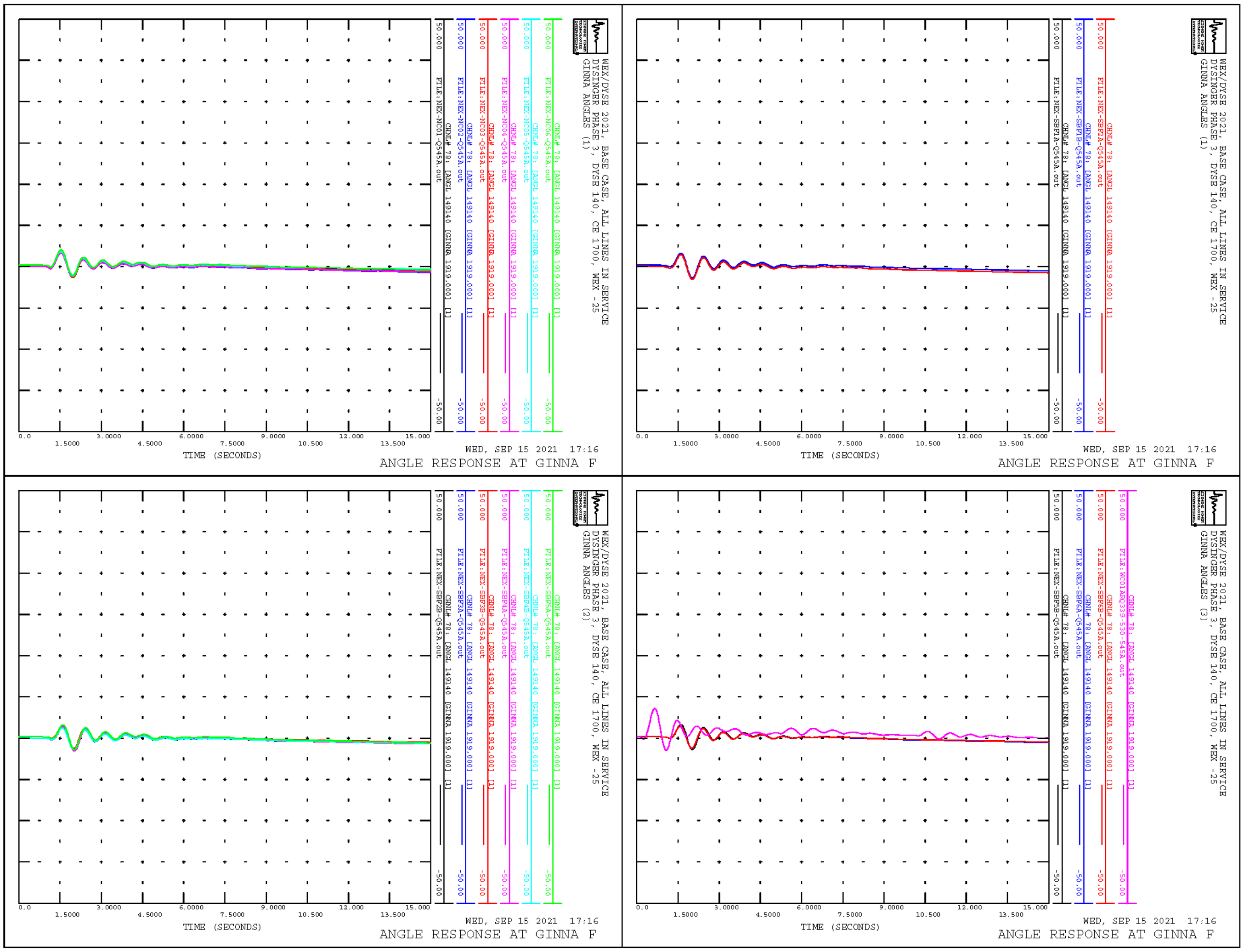


Figure 6: Ginna Angles in Phase 3 DH1 & DH2 O/S Contingency Responses

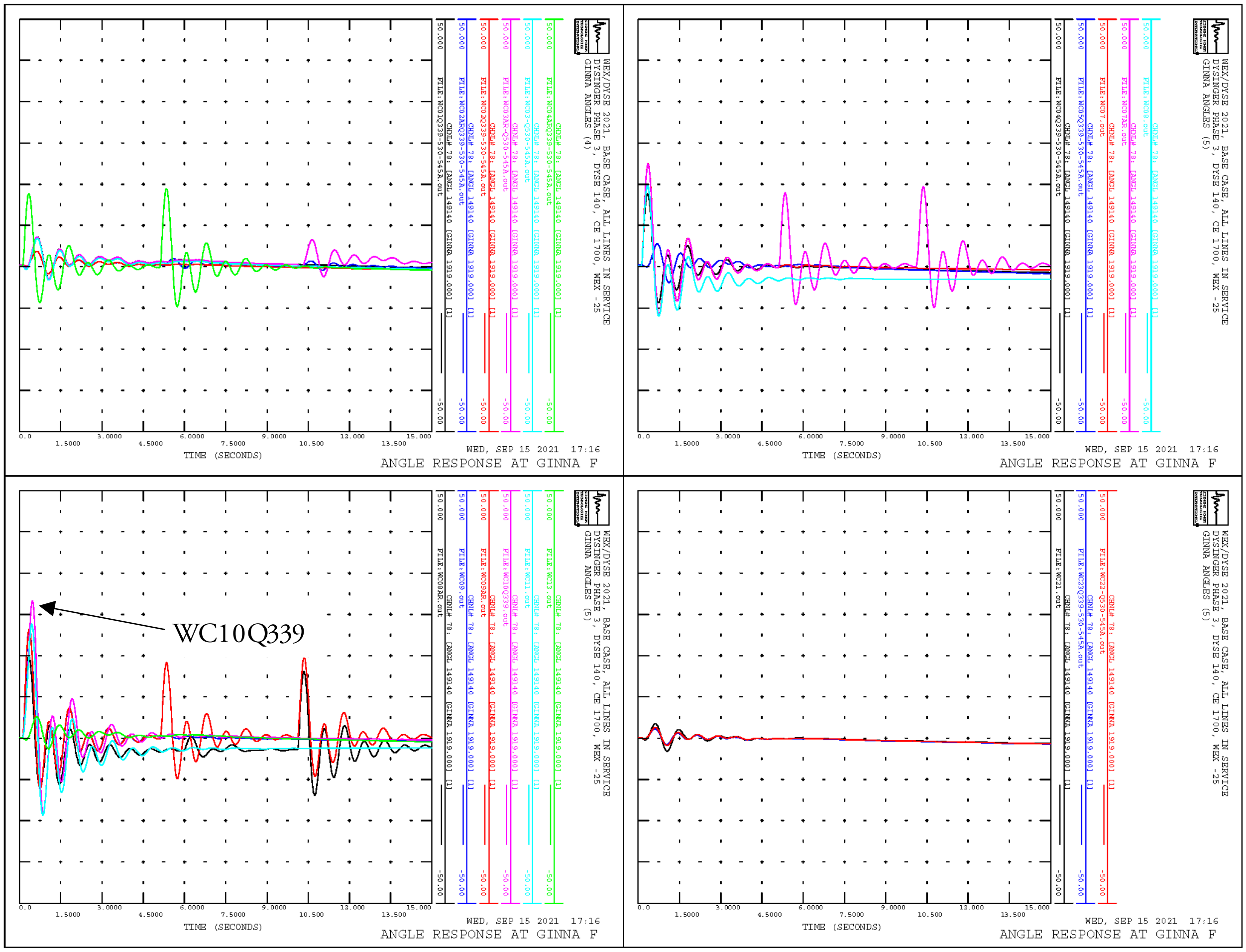


Figure 6.2: Ginna Angles in Phase 3 DH1 & DH2 O/S Contingency Responses

The left graph in Figure 7 below shows the voltage response at major buses near Dysinger East: Beck 220, Niagara 345, Rochester STA 80 345, Oakdale 345, Clay 345, and Edic 345. The right graph in Figure 7 shows angle responses: Ginna and Niagara 4 to show the impact on major generators near Dysinger East, and Fitzpatrick, Moses, Athens, and Roseton to show the broader impact of the system response to WC10Q339 on the NYCA.

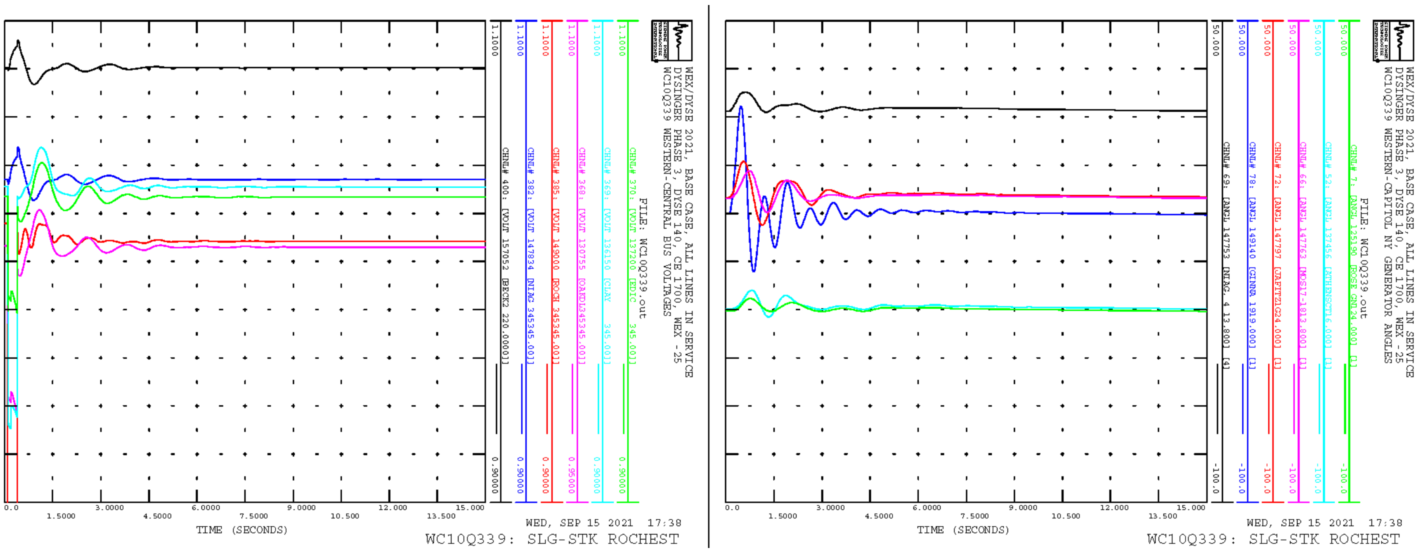


Figure 7: Phase 3, DH1 & DH2 O/S Case, NYCA Voltage Response

Phase 4 Discussion

Phase 4 Dysinger East Network Topology Changes

Phase 4 of the Empire State Line Alternative project is the final phase, adding in a PAR-controlled 345kV tie line from the Dysinger substation to the new East Stolle Road 345kV substation. The new East Stolle Rd substation will bisect the Stolle Road-Five Mile 345kV line into two parts. The Stolle Road-East Stolle Road segment will be designated as 28, while the East Stolle Road-Five Mile 345kV segment will be designated as 29. The PAR-controlled tie line from Dysinger to East Stolle Road will be designated as DES-1.

Phase 4 Dysinger East Interface Definition

The Dysinger East interface definition will not be affected by the addition of these new transmission lines and the East Stolle Road substation, retaining the new definition established as of Phase 3.

The Dysinger East interface definition is given below in Table 13 and illustrated in Figure 1.

DYSINGER EAST (DYSINGER PROJECT, PHASE 4)		
West (Zone A) – Genesee (Zone B)		
Name	**Line ID**	**Voltage (kV)**
*DYSINGER – STA. 255	DH1	345
*DYSINGER – STA. 255	DH2	345
*LOCKPORT – SHELBY	113	115
*LOCKPORT – N. AKRON	108	115
*LOCKPORT – OAKFIELD	112	115
*LOCKPORT – SOUR	111	115
*LOCKPORT – TELEGRAPH	107	115
*LOCKPORT – TELEGRAPH	114	115
West (Zone A) – Central (Zone C)		
*STOLLE RD. - HIGH SHELDON	67	230
*ANDOVER – PALMITER	932	115

Table 13. Dysinger East Interface Definition (Phase 4 Empire State Line Alternative Project)

* indicates the metered end of the circuit.

Phase 4 Tested Contingencies

Fifty-one (51) contingencies were tested for each developed Phase 4 Dysinger East transfer case scenario, including contingencies provided by NextEra (prefaced with NEX) and NYISO West-Central contingencies (prefaced with WC). Table 14 provides the identification and description of these contingencies.

Table 14. Phase 4 Contingencies Applied for Evaluating Dysinger East Stability Transfer Limits		
#	ID	Description
1	NEX-NC01-Q545A	3 PHASE FAULT ON DYSINGER-SOMERSET 345 kV CKT 1 (38)
2	NEX-NC02-Q545A	3 PHASE FAULT ON DYSINGER-STATION 255 345 kV CKT 1 (DH1)
3	NEX-NC03-Q545A	3 PHASE FAULT ON DYSINGER-NIAGARA 345 kV CKT 1 (ND1)
4	NEX-NC04-Q545A	3 PHASE FAULT ON DYSINGER-SOMERSET 345 kV CKT 2 (39)
5	NEX-NC05-Q545A	3 PHASE FAULT ON DYSINGER-STATION 255 345 kV CKT 2 (DH2)
6	NEX-NC06-Q545A	3 PHASE FAULT ON DYSINGER-NIAGARA 345 kV CKT 2 (ND2)
7	NEX-NC07-Q545A	3 PHASE FAULT ON Q545ADYSINGER-Q545AESTOLLE 345 kV CKT 1
8	NEX-NC09-Q545A	3 PHASE FAULT ON Q545AESTOLLE-STOLLE 345 kV CKT 1
9	NEX-NC10-Q545A	3 PHASE FAULT ON Q545AESTOLLE-DYSINGER 345 kV CKT 1
10	NEX-SBF1A-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - SOMERSET 345 kV CKT 1 (38)
11	NEX-SBF1B-Q545A	SLG STUCK BREAKER FAULT@DYSINGER 345 KV - SOMERSET 345 kV CKT 1 (38)
12	NEX-SBF2A-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - STATION 255 345 kV CKT 1 (DH1)
13	NEX-SBF2B-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - STATION 255 345 kV CKT 1 (DH1)
14	NEX-SBF3A-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - NIAGARA 345 kV CKT 1 (ND1)
15	NEX-SBF3B-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - NIAGARA 345 kV CKT 1 (ND1)
16	NEX-SBF4A-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - SOMERSET 345 kV CKT 2 (39)
17	NEX-SBF4B-Q545A	STUCK BREAKER FAULT DYSINGER 345 KV - SOMERSET 345 kV CKT 2 (39)
18	NEX-SBF5A-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - STATION 255 345 kV CKT 2 (DH2)
19	NEX-SBF5B-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - STATION 255 345 kV CKT 2 (DH2)
20	NEX-SBF6A-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - NIAGARA 345 kV CKT 2 (ND2)
21	NEX-SBF6B-Q545A	SLG STUCK BREAKER FAULT DYSINGER 345 KV - NIAGARA 345 kV CKT 2 (ND2)
22	NEX-SBF7-Q545A	STK BRK FAULT DYGR 345 KV-Q545_PAR – E.STOLLE ROAD 345 kV CKT 1
23	NEX-SBF8-Q545A	SLG STUCK BREAKER FAULT EAST STOLLE ROAD 345 KV
24	WC01ARQ339-530-545A	3PH-NC NIAGARA – L/O NIAGARA-Q530DYSINGER W/RCL
25	WC01Q339-530-545A	3PH-NC@NIAGARA – L/O NIAGARA-DYSINGER
26	WC02ARQ339-530-545A	3PH-NC@DYSINGER - L/O NIAGARA-DYSINGER W/RCL
27	WC02Q339-530-545A	3PH-NC@DYSINGER - L/O NIAGARA-DYSINGER
28	WC03AR-Q530-545A	3PH-NC@NIAGARA – L/O NIAGARA-DYSINGER W/RCL
29	WC03-Q530-545A	3PH-NC@NIAGARA – L/O NIAGARA-DYSINGER
30	WC04ARQ339-530-545A	3PH-NC@STATION 255 - L/O DYSINGER - STATION 255 (CKT 2) W/RCL
31	WC04Q339-530-545A	3PH-NC@STATION 255 - L/O DYSINGER - STATION 255 (DH-1)
32	WC05Q339-530-545A	SLG-STK@NIA345 (BKR#3108) – L/O NIAG-DYSINGER / BKUP CLR NIAG AT#4
33	WC06-Q530-545A	SLG-STK@DYSINGER – L/O NIAGARA - DYSINGER
34	WC07	3PH-NC@ROCHESTER – L/O ROCHESTER-PANNELL (RP-1)
35	WC07AR	3PH-NC@ROCHESTER – L/O ROCHESTER-PANNELL (RP-1) W/RCL
36	WC08	3PH-NC@PANNELL – L/O PANNELL-CLAY (PC-1)
37	WC08AR	3PH-NC@PANNELL – L/O PANNELL-CLAY (PC-1)
38	WC09	3PH-NC@PANNELL – L/O ROCHESTER-PANNELL (RP-1)
39	WC09AR	3PH-NC@PANNELL – L/O ROCHESTER-PANNELL (RP-1) W/RCL
40	WC10Q339	SLG-STK@ROCHESTER (BKR#3508) – L/O ROCHESTER-PANNELL (RP-1) / BKUP CLR STATION 255
41	WC11	SLG-STK@PANNELL (BKR#3808) – L/O ROCHESTER-PANNELL (RP-1) / BKUP CLR PC-1
42	WC13	3PH-NC@NIAGARA 345KV – L/O BECK-NIAGARA 345KV
43	WC15	LLG@BECK – L/O NIAGARA-PACKARD (PA27 & BP76) DCT
44	WC16	3PH-NC@HUNTLEY68 – L/O LINES 78/79 AND HUNTLEY 68 GEN
45	WC17	SLG-STK@HUNTLEY (BKR#1402) – L/O LINES 78/79 AND HUNTLEY 68 GEN
46	WC18	SLG-STK@HUNTLEY (BKR#1502) – L/O LINES 78/79 AND HUNTLEY 68 GEN
47	WC19	LLG@NIAGARA230 - L/O NIAGARA-PACKARD (61) & NIAGARA-ROBINSON (64) DCT

48	WC20	LLG@NIAGARA230 - L/O NIAGARA-PACKARD (62) & NIAGARA-BECK (PA27) DCT
49	WC21	LLG@PACKARD230 - L/O NIAGARA-PACKARD (62) & PACKARD-BECK (BP76) DCT
50	WC22-Q530-545A	3PH-NC@SOMERSET/SOMERSET - DYSINGER CKT 2 (NC)
51	WC23Q339-530-545A	3PH-NC@SOMERSET - L/O SOMERSET-DYSINGER CKT 2

Table 14. Phase 4 Contingencies Applied for Evaluating Dysinger East Stability Transfer Limits

Phase 4 Dysinger East Stability Limit Results

Phase 4 Outage Stability Limit Results

Stability limit results for all Phase 4 outage cases are found in Table 15 below:

Outages Applied	Tested Transfer Level (MW)	Proposed Marginal Stability Limit (MW)	Existing Stability Limit (MW)	Most Severe Contingency
None	3610	3200	3150	WC09AR
ND1 **OR** ND2	3050	2700	N/A	WC09AR
38 **OR** 39	3610	3200*	N/A	WC09AR
DH1 **OR** DH2	3200	2850	N/A	WC09AR
RP1 **OR** RP2	3600	3200*	3100	WC09AR
60 **OR** 68 **OR** 72	3500	3150	3050	WC09AR
PC1 **OR** PC2	3390	3050	3000	WC09AR
67 **OR** 81 **OR** 83 **OR** 85 **OR** 87	3210	2850	2850	WC09AR
PC1 & PC2	2895	2600	2550	WC10Q339
RP1 & RP2	2800	2500	2450	WC09AR
HR1 & HR2	3610	3200*	3100	WC09AR
HR1 & 40	3610	3200*	3050	WC10Q339
(ND1 **OR** ND2) & (DH1 **OR** DH2)	2850	2550	2350	WC09AR
DH1 & DH2	1500	1300	1250	WC09AR
ND1 & ND2	1500	1300	1250	WC09AR
((ND1 **OR** ND2) & (DH1 **OR** DH2)) & (67 **OR** 81 **OR** 83 **OR** 85)	2615	2350	2150	WC09AR
DES1	3610	3200*	N/A	WC10Q339
28	3610	3200*	N/A	WC09AR
29	3610	3200*	N/A	WC10Q339

Table 15: Phase 4 Dysinger East Stability Limit Results

*Matches All-lines-in service. Outage is not critical to derivation of Dysinger East IROL limit

Example – Phase 4, All in Service

Most Severe Contingency – <u>WC09AR</u> – 3 Phase, Normally Closing Fault @ PANNELL RD – Loss of ROCHESTER-PANNELL (RP1) W/ Automatic Reclosing

The most severe system response among tested contingencies for the all lines in-service case resulted from contingency WC09AR, a three-phase, normally closing fault at Pannell Rd 345 kV station which leads to the loss of a Rochester to Pannell 345 kV line (RP1). As shown in Figures 8 and 8.2, the WC09AR contingency stands out from the rest in the magnitude of its angle response compared to other tested contingencies. System responses for the other Phase 4 cases, which include outage conditions, show similar responses to those seen in Figures 8 and 8.2 and can be found in the Appendices.

Figure 8.2: Ginna Angles in Phase 4 All In Service Contingency Responses (ctd.)

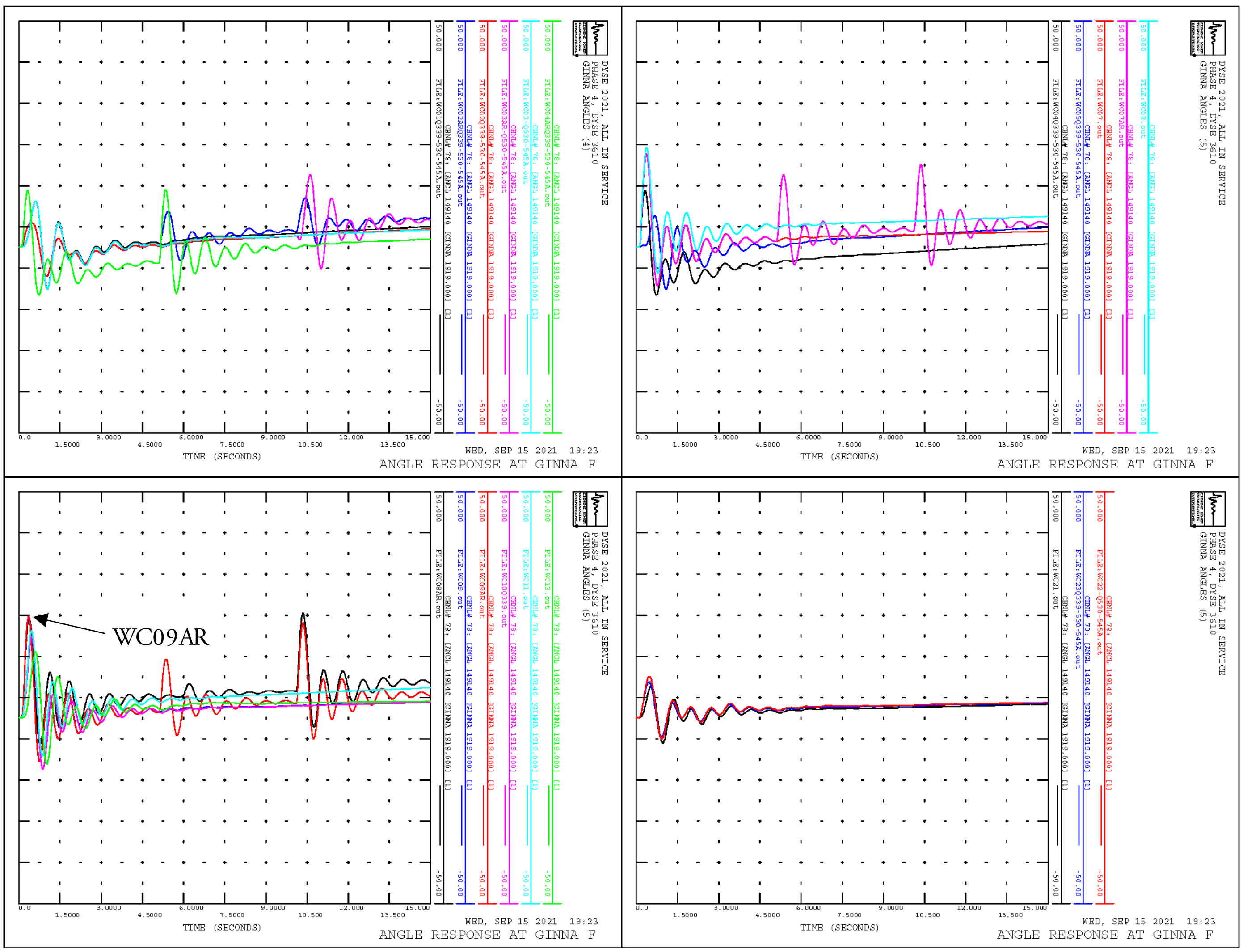


Figure 8: Ginna Angles in Phase 4 All In Service Contingency Responses

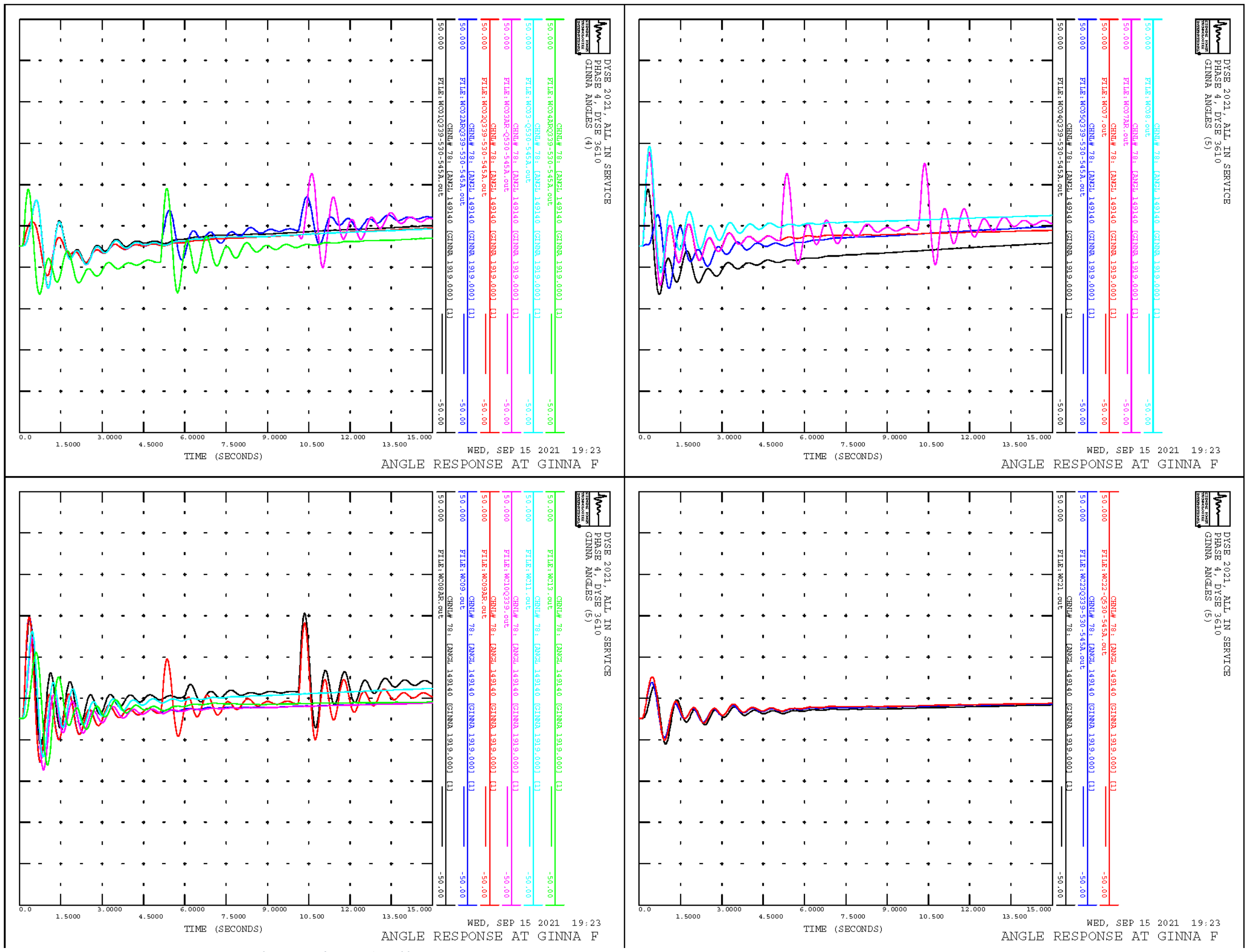


Figure 8.2: Ginna Angles in Phase 4 All In Service Contingency Responses (2/2)

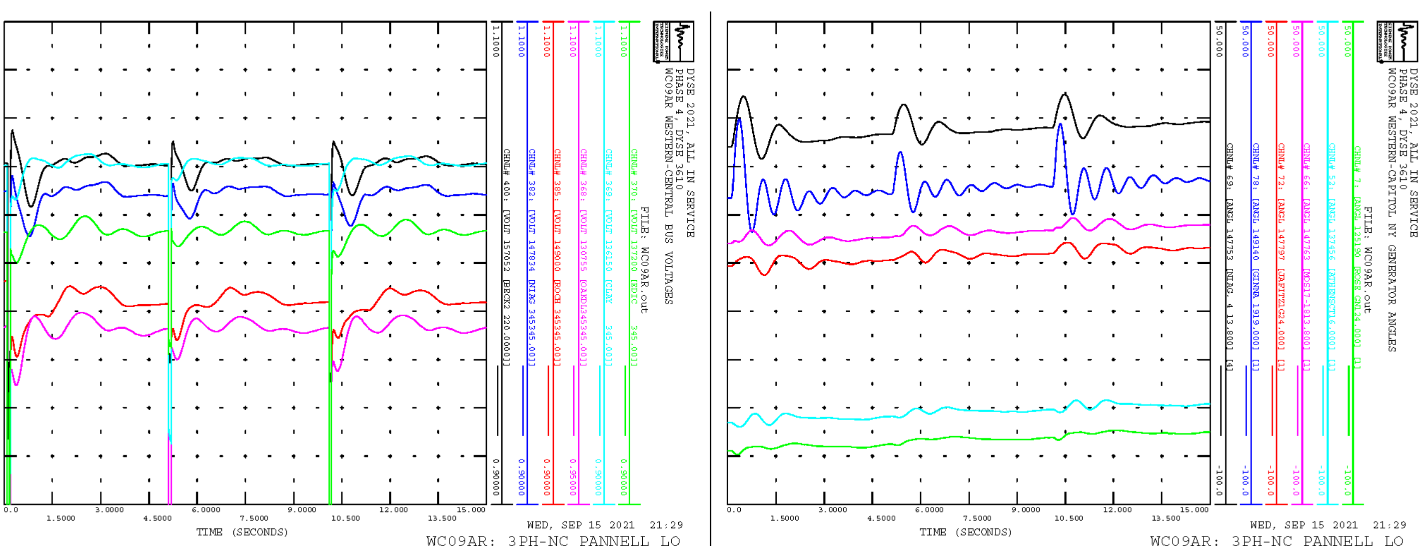


Figure 9: Phase 4, All In Service Case, NYCA Voltage Response