NYISO Interface Stability Limit Analysis For All Lines I/S and Outage Conditions

Review of Transient Stability Limits for Transmission Line Outages

Central East, Total East, UPNY - ConEd Dysinger East and West Central Interfaces

Approved by NYISO Operating Committee
April 29, 2004

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March 5, 2004

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Attachments

1 INTRODUCTION

The purpose of this study is to examine NYISO Interface stability limits for various line outage conditions. This study reviewed selected transmission line outages for the Dysinger – East, West – Central, UPNY – Con Edison, Central East and Total East interfaces.

The review of these interface limits was necessitated by the recent additions to the NYISO bulk power system: +/- 200 MVAr of Static Compensator (STATCOM), 200MVAr capacitor at Edic, 135MVAr capacitor at Oakdale, and 1080 MW generation at Athens. Additionally, some of these limits had not been reviewed during the last 10 years.

2 RECOMMENDATIONS

Table 1, below, summarizes the line outage conditions studied, the Oswego complex configuration, test transfer level and the recommended limit for each condition. Appendices to this report include selected results of the stability analysis, copies of stability plots, and base case assumptions made in developing the various transfer cases. While certain of the outages evaluated indicate stable performance at higher transfer levels than previously, this report does not recommend increasing any existing limits.

The West – Central all lines in and outages and two of the Dysinger – East outages indicate lower limits than currently in effect. These limits are indicated by "**".

All limits assume the Leeds and Fraser SVCs, and Marcy STATCOM are in service and operated as regulating post-contingency.

NYISO Stability Limit Analysis For Outage Conditions

Table 1 **STATCOM, SVCs and Athens Generation In Service**

Outage Condition	***Oswego Complex***	***Sithe Unit***	***Tested Transfer Level*** (Highest Stable Test Level)	***Confirmed Limit*** (Includes NYISO 10% Margin)
Central East Outages				
New Scotland 77 Bus O/S	**2**	**0**	**2371**	**2050**
New Scotland 99 Bus O/S	**2**	**0**	**2321**	**2050**
Edic - New Scotland (14) O/S	**2**	**0**	**2449**	**2050**
Marcy - New Scotland (18) O/S	**2**	**0**	**2317**	**2050**
Lafayette - Oakdale (4) O/S	**4**	**5**	**3397**	**2900**
Oakdale - Fraser (32) 0/S	**4**	**5**	**3390**	**3050**
Total East Outages				
Seasonal Limit	**2**	**5**	**7458**	**6500**
Branchburg-Ramapo (5018) O/S	**2**	**5**	**7112**	**6400**
Branchburg-Ramapo (5018) with any SVC O/S	**2**	**5**	**7112**	**6300**
UPNY-Coned Outages				
Seasonal Limit	**2**	**5**	**5792**	**5100**
Branchburg-Ramapo (5018) O/S	**2**	**5**	**4877**	**4350**
Ladentown - Buchanan S. (Y88) O/S	**2**	**5**	**5167**	**4150**
Ramapo - Buchanan N. (Y94) O/S	**2**	**5**	**5174**	**4150**
Roseton – E. Fishkill (RFK-305) O/S)	**2**	**5**	**5171**	**4100**
Dysinger East Outages				
Seasonal Limit	**2**	**5**	**3350**	**2850**
Niagara - Rochester (NR-2) O/S	**2**	**5**	**2660**	**2350 ****
Somerset - Rochester (SR-1) O/S	**2**	**5**	**2612**	**2350 ****
Stole Road - Meyer (67) 230 kV O/S	**2**	**5**	**3057**	**2650**
Meyer - Hillside (68) 230 kV O/S	**2**	**5**	**3195**	**2650**
West Central Outages				
Seasonal Limit	**2**	**5**	**2503**	**2250 ****
Rochester – Pannell (RP-1) O/S	**2**	**5**	**2114**	**1900**
Pannell – Clay (PC-1) O/S	**2**	**5**	**2116**	**1900**
Niagara - Rochester (NR-2) O/S	**2**	**5**	**1945**	**1750 ****
Somerset - Rochester (SR-1) O/S	**2**	**5**	**1890**	**1700 ****

** Note: Testing indicates lower stability limit based on highest solved base case.

3. STUDY ASSUMPTIONS AND METHODOLOGY

3.1 Discussion

Most testing demonstrates that the existing limits are valid. There are a limited number of outage conditions where the testing indicates that the stability limit could be increased. This study does not propose to increase any limits as additional detailed testing would be required to confirm a higher limit, and, as with most outage conditions, there is limited exposure to the outage and the constraint that it imposes. Further, for most line outage conditions, the thermal or voltage constraints are usually more limiting than transient stability.

The original base case for this study was developed from the NERC SDDWG/NPCC/NYISO dynamics representation, and was updated for the Marcy FACTS Phase I (2001) Analysis and for Central East Stability Analysis (2003) with Athens Generation in service.

Central East outage conditions involving the Edic – New Scotland #14, Marcy – New Scotland #18 lines, and the New Scotland 345kV bus outages were studied for a specific Oswego Complex configuration of 2 units only and no Sithe/Independence units. The existing stability limits for these outage conditions are not adjusted (in real-time) for Oswego Complex configuration.

The evaluation of the Lafayette – Oakdale #4/36 and Oakdale – Fraser #32 outages was performed for the 4 Oswego/5 Sithe configuration only. These limits are adjusted (in real-time) for Oswego Complex configuration. The test configuration is consistent with the previous analyses.

The West – Central all lines in and outages and two of the Dysinger – East outages indicate limits lower than currently in effect. These limits are indicated by "**" and represent the highest solved transfer level. This primarily due to the inability to solve the powerflow base case at higher transfer levels. It is recommended that these lower limits be used pending more detailed analysis of these specific conditions.

3.2 NYISO Interface Definition

Table 2

'TOTAL EAST DEFINITION'	
ADD CENTRAL EAST	
FRASR345 345 GILB 345 345	345KV
COOPC345 345 ROCK TAV 345	345KV
COOPC345 345 SHOEMTAP 345	345KV
BRANCHBG 500 RAMAPO 5 500	500KV
HUDSON-1 345 FARRGUT1 345	345KV
HUDSON-2 345 FARRGUT2 345	345KV
LINDEN 9 230 GOETHALS 230	230KV
WALDWICK 345 SMAHWAH1 345	345KV
WALDWICK 345 SMAHWAH2 345	345KV
CLOSTER SPARKILL 69	69KV
HARINGS CORNERS W. NYACK 69	69KV
HARINGS CORNERS BURNS 138	138KV
MONTVALE PEARL RIVER 69	69KV
HARINGS CORNERS PEARL RIVER 34	34KV
S.MAHWAH RAMAPO 138	138KV
S.MAHWAH HILLBURN 69	69KV
S.MAHWAH 138/345	138/345KV

'WEST-CENTRAL DEFINITION'	
CLAY 345 PANNELL3 345	345KV
CLAY 345 PANNELL3 345	345KV
STOLE230 230 MEYER230 230	115KV
MORTIMER 115 LAWLER-1 115	115KV
MORTIMER 115 LAWLER-2 115	115KV
S121 B#2 115 SLEIG115 115	115KV
PANNELLI 115 FRMGTN-4 115	115KV
STA 162 115 S.PER115 115	115KV
QUAKER 115 MACDN115 115	115KV
ANDOVER1 115 PALMT115 115 NORM. OPEN	115KV
CLYDE199 115 SLEIG115 115	115KV
CLYDE199 115 CLTNCORN 115	115KV
FARMNGTN 34.5 FARMGTN1 115	115KV
FARMNGTN 34.5 FRMGTN-4 115	115KV
S168 12 FRMGTN-4 115	115KV
STA127 34.5 HOOKRD 115	115KV

'CENTRAL EAST DEFINITION'	
EDIC 345 N.SCOT77 345	345KV
MARCY T1 345 N.SCOT99 345	345KV
PORTER 2 230 ROTRDM.2 230	230KV
PORTER 2 230 ROTRDM.2 230	230KV
E.SPR115 115 INGHAM-E 115	115KV
INGMS-CD 115 INGHAM-E 115	115KV
PLAT T#3 115 GRAND IS 115	115KV

'UPNY-CONED DEFINITION'	
ROSETON 345 FISHKILL 345	345KV
PLTVLLEY 345 MILLWOOD 345	345KV
PLTVLLEY 345 FISHKILL 345	345KV
PLTVLLEY 345 FISHKILL 345	345KV
PLTVLLEY 345 WOOD B 345	345KV
RAMAPO 345 BUCH N 345	345KV
LADENTWN 345 BUCH S 345	345KV
FISHKILL 115 SYLVN115 115	115KV
E. FISH I 115 FISHKILL 345	345KV

'DYSINGER-EAST DEFINITION'	
SOMERSET TO ROCHESTER 345KV	345KV
NIAGRA TO ROCHESTER 345KV	345KV
STOLLE 230 TO MEYER 230KV	230KV
LOCKPORT TO SOUR111 115KV	115KV
LOCKPORT TO SHEL-113 115KV	115KV
LOCKPORT TO TELR114 115KV	115KV
LOCKPORT TO OAKFLD 115KV 112	115KV
LOCKPORT TO NAKR108 115KV 108	115KV
LOCKPORT TO TELR107 115KV 107	115KV
PALMITER TO BENNETT 115KV	115KV
ANDOVER TO PALMT115 115KV NORM. OPEN	115KV

3.3 Base Case Development

The study used the NERC SDDWG/NPCC/NYISO dynamics representation that was used for the Marcy FACTS – Phase1 STATCOM stability analysis, and includes the Oakdale 135MVAr, Edic 200MVAr capacitor banks and 1080MW Athens Generation. The analysis was performed with the Chateaugauy HVdc terminals out of service and NYISO importing 1180MW (all AC) from Hydro Quebec on the Massena – Chateauguay (7040) line.

3.4 Transfer Case Development

The analysis for Dysinger East, West Central, Total East, and UPNY- ConEd testing was performed on a common case assuming 2 (Oswego Complex) and 5 (Sithe Independence) units in service. Analysis of the outage conditions for Central East used specific Oswego Complex configurations that were consistent with previous testing of those outages. NYISO generation dispatch was held constant, and generation shifts between Ontario/Michigan and New England/South East New York were used to adjust flow on the respective interfaces under study.

3.5 SVC/STATCOM Normal Operating Mode

The Leed/Fraser SVC and Marcy STATCOM are modeled in service, the base case load flow were solved with the SVCs/STATCOM set to minimum (0MVAr) output by adjusting their respective voltage schedules in the pre-contingency case.

3.6 Contingency Analysis

The table 3, below, outlines the most critical/limiting contingencies tested for this analysis. Selected simulation results are attached in the Appendices.

The analysis was performed in accordance with the “Standards for Planning and Operating the New York ISO Bulk Power System” and the NYISO Transmission Planning Guideline #2. The NYISO stability transfer limit, obtained from a stable simulation of the most severe contingencies, is obtained by reducing the test level of the interface in question by the larger of either 10% of the pre-contingency transfer on the interface, or 200 MW.

Table 3	SIMULATED FAULTS
	CENTRAL EAST CONTINGENCIES
CE01	3PH@EDIC 345KV EDIC-N.SCOT#14, NORM.CLR. W/RCL@NS
CE02	3PH@MARCY345KV MARCY-N.SCOT18, NORM.CLR. W/RCL@NS
CE03	SLG/STK@EDIC345/EDIC-N.SCOT#14;BKUP CLR@FITZ345
CE04	SLG/NC@EDIC/EDIC-NEW SCOTLAND #14 W/HS&AUTO RCL
CE05	3PH@EDIC 345KV/EDIC-MARCY UE1-7 NORM.CLR
CE06	3PH@MARCY345KV/EDIC-MARCY UE1-7 NORM.CLR
CE07AR	LLG@MARCY/EDIC:MARCY-COOPERS/EDIC-FRASER W/O RCL@EDIC
CE08	LLG @COOPERS ON MARCY-COOPER/FRASER-COOPERS
CE09	SLG/STK@EDIC345KV FITZ-EDIC #FE-1/BKUP CLR@N.SCOT345
CE10	SLG/STK@MARCY345/MARCY-N.SCOT UNS18/STK@MARCY 345
CE11	SLG/STK@FRASER / FRASER-GILBOA & CLEAR SVS
CE12	3PH-NC@NSCOT345/EDIC-N.SCOT #14 W/HS RCL@ N.SCOT
CE14	3PH@ MARCY 345KV VOLNEY-MARCY VU-19 NORM.CLR.
CE15	SLG/STK@MARCY345/VOLNEY-MARCY VU-19/STK@MARCY 345
CE17	SLG/STK @MARCY ON MARCY-COOPERS CORNERS/ CLEAR AT#1
CE18	LLG@ROCK TAVN/ COOPERS CORNERS-ROCK TAVERN D/C
CE19	LLG L/O TOWER@COOPERS CORNERS - ROCK TAVERN
CE20	SLG/STK@EDIC345/EDIC-MARCY UE1-7/CLR PORTER 230&115#4
CE21	SLG/STK @FRASER/FRASER-COOPERS 33/CLR#32@OAKDALE
CE24	3PH-NC@FRASER ON FRASER - COOPERS CONRNERS FCC-33
CE26	3PH-NC@COOPERS / MARCY-COOPERS CONRNERS UCC-2/41
CE32	3PH-NC@FRASER ON EDIC - FRASER EF-24/40
CE33	3PH-NC@FITZ ON EDIC - FITZPATRICK FE-1
	TOTAL EAST CONTINGENCIES
TE02	3PH@FISHKILL-L/O TOWER(2-1938)FISHKILL*PLEASANTVILLE
TE03	3PH@SPRAIN BK-L/O TOWER(2-1956)MILLWOOD*SPRAIN BROOK
TE05	3PH/STK @ BUCHANAN SOUTH / W97*MILLWOOD STK BKR 6
TE14	SLG/STK@LEEDS*GILBOA / STK R391 / CLR#91 PL.VALLEY
TE15	SLG/STK@LEEDS*PLEASANT VALLEY/STK R9293/CLR#93 NS
TE16	SLG/STK @ ROSETON/ROSETON*ROCK TAVERN#311/STK 31151
TE18	3PH@LADENTOWN-L/O TOWER Y88/Y94 DOUBLE CIRCUIT
TE20	3PH@DUNWOODIE-L/O TOWER(2-1938)PLEASANTVILLE*DUNWO.
TE21	3PH@PLEAS.VAL-L/O TOWER(2-1961)PV*MILLWOOD DBL CKT
TE27	SLG/STK@ROCK TAVERN*COOPERS/CLR ROCK TAVN*RAMAPO
TE29	3PH@N.SCOT / N.SCOT-LEEDS#93 W/HS RCL
TE30	3PH@LEEDS / GILBOA * LEEDS GL-3
TE32	3PH@NEW SCOTLAND - 77 BUS
TE33	3PH@NEW SCOTLAND - 99 BUS
TE34	SLG-STK@GILBOA/GILBOA*NSCOT / STUCK 3208
TE36	3PH @ LEEDS / LEEDS - HURLEY AVENUE
TE37	3PH@80%FROM ROSETON/ROSETON*HURLEY AV#303/CLR ZONE2@ROS
TE38	3PH/NC @ ROCK TAVERN / ROSETON * ROCK TAVERN #311

UPNY - CONED CONTINGENCIES	
UC01ATH	SLG/STK#RNS4 @ PL.VLLY./PL.VLLY.-MILLWOOD
UC02	3PH@FISHKILL-L/O TOWER(2-1938)FISHKILL-PLEASANTVILLE
UC03	3PH@SPRAIN BK-L/O TOWER(2-1956)MILLWOOD-SPRAIN BROOK
UC04	SLG/STK @ BUCHANAN NORTH / IP#2 STK BKR 9
UC05	3PH/STK @ BUCHANAN SOUTH / W97*MILLWOOD STK BKR 6
UC06	SLG/STK @ DUNWOODIE - PVLE W90 / STK#8 CLR RAINEY#72
UC09	SLG/STK@MILLWOOD-EASTVIEW/SPRAIN BROOK/STK#16 CLR W98
UC10	SLG/STK@RAMAPO-ROCK TAVERN/STK T-77-94-2/CLR Y94 *T
UC13	SLG/STK@LEEDS-N.SCOTLAND/STK R94301/CLR#303*HURLEY
UC14ATH	SLG/STK@LEEDS-GILBOA / STK R391 / CLR#91 PL.VALLEY
UC16	SLG/STK @ ROSETON/ROSETON-ROCK TAVERN#311/STK 31151
UC19	3PH@MILLWOOD-L/O TOWER (2-1961) MILLWOOD-SPRAINBROOK
UC20	3PH@DUNWOODIE-L/O TOWER(2-1938)PLEASANTVILLE*DUNWD
UC21	3PH@PL.VALLEY-L/O TOWER(2-1961)PV-MILLWOOD DBL CKT
UC22	SLG/STK@LADENTOWN-BUCHANAN Y88/STK#3-56-2/CLR W67&BP#1
UC23	SLG/STK@RAMAPO-BUCHANAN/STK T-77-94-2/CLR#377 ROCK TAV
UC24	SLG/STK@ROCK TAVERN-ROSETON/CLR COOPERS-ROCK TAV
UC26	LLG L/O TOWER LADENTOWN-W.HAVERSTRAW /REJ BOWLINE
UC27	SLG/STK@ROCK TAVERN-COOPERS/CLR ROCK TAVN-RAMAPO
UC29	SLG/STK@LADENTOWN-BUCHANAN Y88/STK#6-56-2/CLR W68&BP#2
UC30AR	LLG@ROCK TAVN/COOPERS CORNERS-ROCK TAVERN D/C
UC32	SLG/STK@COOPERS/ CCRT-42 / BACKUP CLR UCC-2/41@MARCY
WEST CENTRAL CONTINGENCIES	
WC01	3PH @ NIAGARA/NIAGARA ROCHESTER NR-2 /N.C.
WC01AR	3PH @ NIAGARA/NIAGARA ROCHESTER NR-2 W/RECLOSING
WC02	3PH @ ROCHESTER/NIAGARA-ROCHESTER NR-2 /N.C
WC02AR	3PH @ ROCHESTER/NIAGARA-ROCHESTER NR-2 W/RECLOSING
WC03	3PH@NIAGARA/NIAGARA-SOMERSET NS-1/38 /N.C
WC03AR	3PH@NIAGARA/NIAGARA-SOMERSET NS-1/38 W/RECLOSING
WC04	3PH @ ROCHESTER/SOMERSET-ROCHESTER SR-1/39 /N.C.
WC04AR	3PH@ROCHESTER/SOMERSET-ROCHESTER SR-1/39 W/RECLOSING
WC05	SLG/STK @ NIAGARA 345KV/NIAG-ROCH NR-2
WC06	SLG/STK @ SOMERSET/NIAGARA-SOMERSET NS-1/38
WC07	3PH @ ROCHESTER/ROCHESTER-PANNELL RP-1 /N.C.
WC07AR	3PH @ ROCHESTER/ROCHESTER-PANNELL RP-1 /RECLOSING
WC08AR	3PH @ PANNELL/PANNELL-CLAY PC-1 /RECLOSING
WC09	3PH @ PANNELL/ROCHESTER-PANNELL RP-1 NORM.CLR.
WC09AR	3PH @ PANNELL/ROCHESTER-PANNELL RP-1 /RECLOSING
WC10	SLG @ ROCHESTER 345KV ON ROCHESTER-PANNELL RP-1
WC11	SLG/STK @ PANNELL/ROCHESTER-PANNELL RP-1
WC12	SLG/STK @ ROCHESTER/SOMERSET-ROCHESTER SR-1/39
WC13	3PH @ NIAGARA 345KV / BECK-NIAGARA 345KV /N.C.
WC14	SLG/STK3502 @ ROCHESTER/KINTIGH-ROCHESTER SR-1/39
WC15	LLG @ BECK/NIAGARA-PACKARD