NEW YORK INDEPENDENT SYSTEM OPERATOR

Final OC Approved

UPNY-CON ED STABILITY LIMITS ANALYSIS FOR ALL LINES IN-SERVICE AND OUTAGE CONDITIONS (UPCE-16)

A report from the New York Independent System Operator

August 10th 2017

Executive Summary

This study was conducted as a periodic review of stability limits for the UPNY-Con Ed Interface. The UPNY-Con Ed interface definition is given in Table 2 and illustrated in Figure 1. The study provides updates to the all-lines-in-service limit as well as the six equipment outage limits associated with UPNY-Con Ed. The transfer limits developed in this analysis increase by 600 MW to 850 MW as shown on Table 1.

The limits recommended 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 this analysis.

The results of this analysis eliminates the need for a distinct UPNY-Con Ed stability limit based on the status of the series reactors on M51, M52, 71 and 72 lines. The results show that the all-lines-in-service stability limit is valid with or without the reactors in-service.

This study confirms the lack of sensitivity of the UPNY-Con Ed stability limits to the status of the recently installed Marcy South Series Capacitors. The results show that the stability limits are all valid with or without the Marcy South Series Capacitors in-service.

On an informational basis, this study examined a configuration with CPV Valley in-service and Indian Points 2 & 3 out of service. The new all-lines-in-service stability limits for UPNY-Con Ed is valid for that dispatch scenario.

On an informational basis this study also examined the sensitivity for the varying levels of Operational Base Flow (OBF) through PSE&-G after the termination of the Con Ed PSE&G wheeling contracts. The recommended all-lines-in-service stability limit for UPNY-Con Ed is valid for all the dispatch scenarios studied.

It is recommended that the UPNY-Con Ed stability transfer limits be updated as reported on Table 1. Implementing these increased limits are anticipated to have no impact on NYISO operations, since the current stability limits for UPNY-Con Ed have not been historically constrained in day-ahead or real-time operations.

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1. Summary of Proposed Limits

The proposed limit revisions and the magnitude of the changes are presented on Table 1

Table 1.
Summary of proposed UPNY-Con Ed stability transfer limits

Case #	Scenario	Proposed UPNY-Con Ed Stability Limit (MW)	Existing UPNY-Con Ed Stability Limit (MW)	Change in UPNY-Con Ed Stability Limit (MW)
1.0	All Lines In	5700	4850	850
1.1	All Lines In, Con Ed Series Reactors bypassed	5700	5100	600
2.0	Y88 Ladentown - Buchanan 345 KV O/S	4800	4150	650
3.0	Y94 Ramapo - Buchanan 345KV O/S	4800	4150	650
4.0	RFK305 Roseton - E.Fishkill 345KV O/S	4800	4100	700
5.0	5018 Hopatcong - Ramapo 500KV O/S	5000	4350	650
6.0	5060 Hopatcong – Branchburg 500KV O/S	5000	4350	650

2. Introduction

This study was conducted as a periodic review of UPNY-Con Ed stability limits.

The study evaluated the all-lines-in-service condition as well as significant UPNY-Con Ed line outage scenarios. All limits were evaluated with and without the Marcy-South Series Compensation in-service. On an informational basis, the study evaluated Indian Point and CPV Valley generation dispatch scenarios and impact of varying levels of Operational Base Flow through PSE&G after the termination of the Con Ed/PSE&G wheeling contracts.

This study provides recommendations to update the UPNY-Con Ed stability transfer limits for all lines in-service and outage scenarios as per Table 1.

3. System Operating Limit (SOL) Methodology

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

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 by 10% of the pre-contingency transfer on that interface.

4. Interface Summary

The UPNY-Con Ed interface definition is given in Table 2 and illustrated in Figure 1.

Table 2.

UPNY-Con Ed interface definition. Hudson Valley (Zone G)-Millwood (Zone H)

Name	Line ID	Voltage (kV)
ROSETON – E FISHKILL	RFK305	345
E FISH 1 – E FISHKILL	F33	115/345
E FISH 1 – E FISHKILL	F33	115/345
LADENTWN – BUCHANAN S	Y88	345
PLTVLLEY – E FISHKILL	F36	345
PLTVLLEY – E FISHKILL	F37	345
PLTVLLEY – MILWOOD	F31	345
PLTVLLEY – WOOD B	F30	345
RAMAPO – BUCHANAN N	Y94	345
FISHKILL – SYLVN115	A/990	115

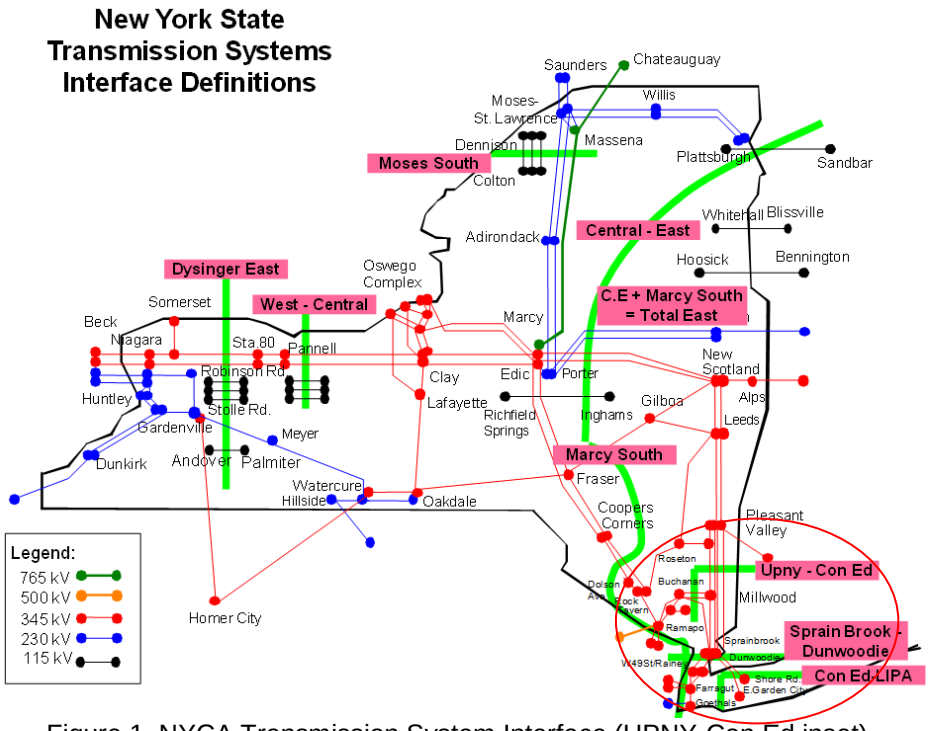


Figure 1. NYCA Transmission System Interface (UPNY-Con Ed inset).

5. System Representation and Transfer Case Development

The analysis was based on the 2016 NYISO Dynamics Base Case that was developed from the 2016 MMWG Dynamics Base Case with the NYISO representation updated to reflect the results of the NYISO 2016 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 Capital and New York City zones were primarily used to adjust UPNY-Con Ed transfer power flows. This study was performed with Chateauguay HVDC terminals in-service.

All the cases were studied with and without the Marcy South Series Compensation in-service.

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 looked into future generation patterns in the lower Hudson Valley region such as Indian Point nuclear units retiring and commissioning of CPV Valley generation.

The Study also looked into the expiration of the Con Edison – PSE&G wheel of 1000 MW and the anticipated typical 400 MW Operational Base Flow and 0 MW Operational Base Flow on an informational basis.

6. Tested Contingencies

Twenty (20) contingencies were tested for each developed UPNY-Con Ed transfer case scenario. Table 3 provides the identification and description of these contingencies.

Table 3.
Contingencies Applied for Evaluating UPNY-Con Ed Stability Transfer Limits

#	ID	Description
1	UC01	SLG-STK@PLTVLLEY (BKR RNS4) – L/O PLTVLLEY-MILLWOOD (F31) / BKUP CLR#91
2	UC04	SLG-STK@BUCHANAN N (BKR#9) – L/O IP#2 / BKUP CLR#W93/W79
3	UC06	SLG-STK@DUNWODIE (BKR#8) – L/O DUNWODIE-PL VILLW (W90) / BKUP CLR#72
4	UC07	SLG-STK@FISHKILL (BKR#11) – L/O FISHKILL-PV (F36) / BKR CLR# FISHKILL T1
5	UC08	SLG-STK@LADENTOWN (BKR#1-56-2) - L/O RAMAPO-LADENTWN (W72) / BKUP CLR BOWL#1
6	UC09	SLG-STK@MILLWOOD (BKR#16) – L/O MILLWOOD-SPRAIN (W99/W64) / BKUP CLR#W98
7	UC11	SLG-STK@SPRAIN (BKR#RNS6) – L/O SPRAIN-TREMONT (X28) / BKUP CLR#W93/W79
8	UC13	SLG-STK@LEEDS (BKR#R94301) – L/O LEEDS-N.SCOTLAND (94)/ BKUP CLR#301@HURLEY
9	UC19	3PH@MILLWOOD - L/O MILLWOOD-SPRAINBROOK (W82/W65 & W85/W78) DCT W/RCL
10	UC22	SLG-STK@LADENTWN (BKR#3-56-2) – L/O BUCHANAN-LADENTWN (Y88) / BKUP CLR BOWL#1
11	UC23	SLG-STK@RAMAPO (BKR#T77-94-2) – L/O RAMAPO-BUCHANAN (Y94) / BKUP CLR#77
12	UC24	SLG-STK@ROCK (BKR#31153) – L/O ROCK TAVERN-ROSESTON (311) / BKUP CLR# CCRT-34
13	UC25A	3PH-NC@RAVENSWOOD#3 – L/O RAVENSWOOD#3
14	UC25B	3PH-NC@RAINEY – L/O RAVENSWOOD#3 60L CABLE
15	UC26	LLG@LADENTWN - L/O 67/68 DCT / REJECT BOWLINE
16	UC28	SLG-STK@COOPERS – L/O CCDA-42 / BKUP CLR UCC2-41@MARCY
17	UC28Q251	SLG-STK@COOPERS – L/O CCDA-42 (CPV) / BKUP CLR UCC2-41@MARCY
18	UC29	SLG-STK@LADENTWN (BKR#6-56-2) – L/O LADENTWN-BUCHANAN (Y88) / BKUP CLR BOWL#2
19	CE18ARQ251-CE30ARQ251	LLG@ROCK – L/O COOPERS CORNERS-ROCK TAVERN DCT W/ RCL
20	CE19ARQ251	LLG@COOPERS – L/O COOPERS CORNERS-ROCK TAVERN DCT W/ RCL

7. Monitored Elements

In order to assess system stability response for the UPNY-Con Ed power transfer scenarios considering contingencies, the following parameters were monitored and analyzed:

- generators' angles, power outputs, terminal voltages, and speeds in the following areas/zones (North, Mohawk, Capital, representative generators from West, Central, Hudson and NYC); and
- bus voltages and frequencies around UPNY-Con Ed and Central East,

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.

8. Discussion

8.1 UPNY-Con Ed Stability Limit versus Thermal Limit

UPNY-Con Ed has historically been limited by thermal constraints prior to approaching the interface stability limit. Implementing these increased limits will have no impact on NYISO operations, since the current UPNY-Con Ed stability limits have not historically been a constraint in day-ahead or real-time operations.

8.2 UPNY-Con Ed Historical Flows versus Stability Limit

UPNY-Con Ed has not historically been constrained in day-ahead or real-time operations. In 2016 maximum historical flow for UPNY-Con Ed was 4184 MW and 2015 maximum historical flow was 4104 MW, well below the existing stability limit of 4850 MW. In 2017 UPNY-Con Ed Interface flows were observed to be 4631 MW on June 12th, which is 200 MW less than the existing stability limit.

8.3 Angle, Voltage, and Frequency Monitoring

Machine angles, bus voltages and bus frequency 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 the 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 observed in this analysis of any system or unit instability.

8.4 Most Severe Contingency (1.0)

The most severe system responses were in response to UC-19, a three-phase fault at Millwood resulting in the loss of the circuits, W82/W65 & W85/W78 with automatic reclosing.

It can be seen from Figure 2 and 3 that the angle response of Astoria 5 unit and bus voltage response at Edic 345 kV is most severe for UC19 contingency compared to all other UPNY – Con Ed contingencies.

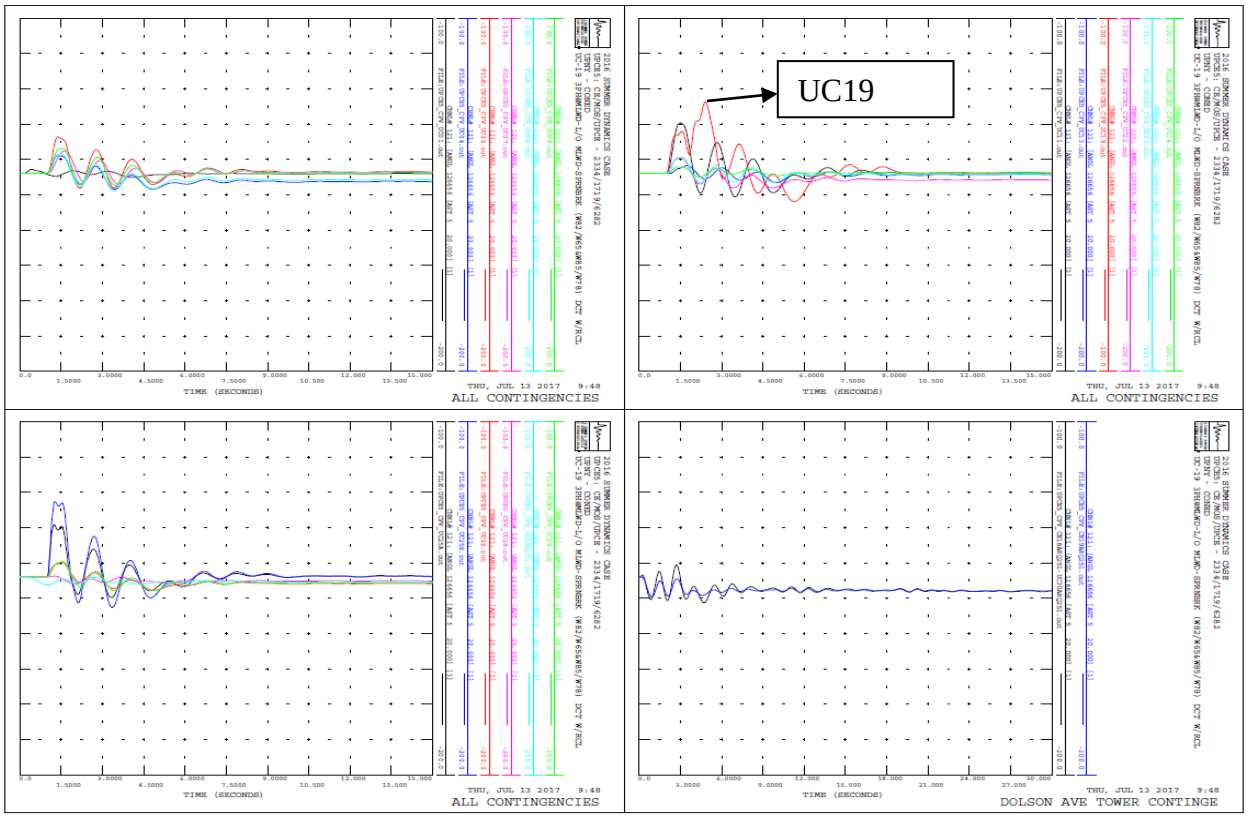


Figure 2. Astoria 5 angle response for all contingencies.

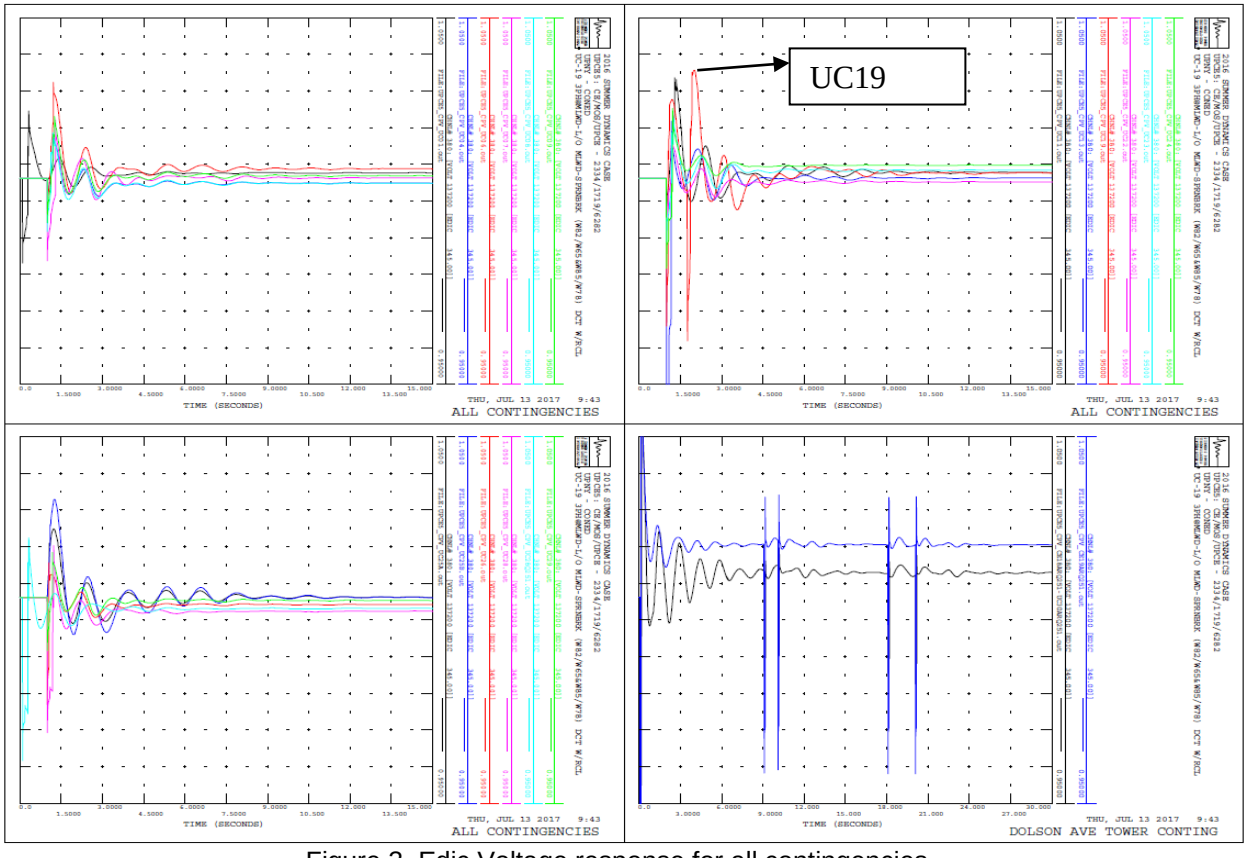


Figure 3. Edic Voltage response for all contingencies.

8.5 All In-Service and Marcy South Series Capacitor Sensitivity (1.0)

Marcy South Series Capacitor (MSSC) equipment is one component of upstate system enhancements associated with the Transmission Owner Transmission Solution (TOTS) project. The series capacitors went into service in June 2016. One of the major impacts of the MSSC project is the re-distribution of power among the paths from Central NY to NYC area.

The impact of having the series compensation in-service shifts some of the power supply to the UPNY-Con Ed interface from the transmission corridor through Leeds to the transmission corridor through Rock Tavern. This study looked at all lines in-service and outage conditions, with and without MSSC in-service.

Figure 4 has the plots of Athens and Astoria 5 units' angular response, Pleasant Valley and Sprain Brook 345 kV voltage response and New Scotland frequency response for all lines in-service case with MSSC in-service for the most severe contingency UC19. Figure 5 has the same plots for all lines in-service for UC19 contingency with MSSC out of service. It can be seen that there is little difference in the response of the units for the contingency.

It is evident from the Figures 4 and 5 that the status of the MSSC does not have an impact in the stability of the UPNY-Con Ed interface.

Representative plots for all the UPNY-Con Ed contingencies for each of these scenarios can be found in Appendices 1 – 2.

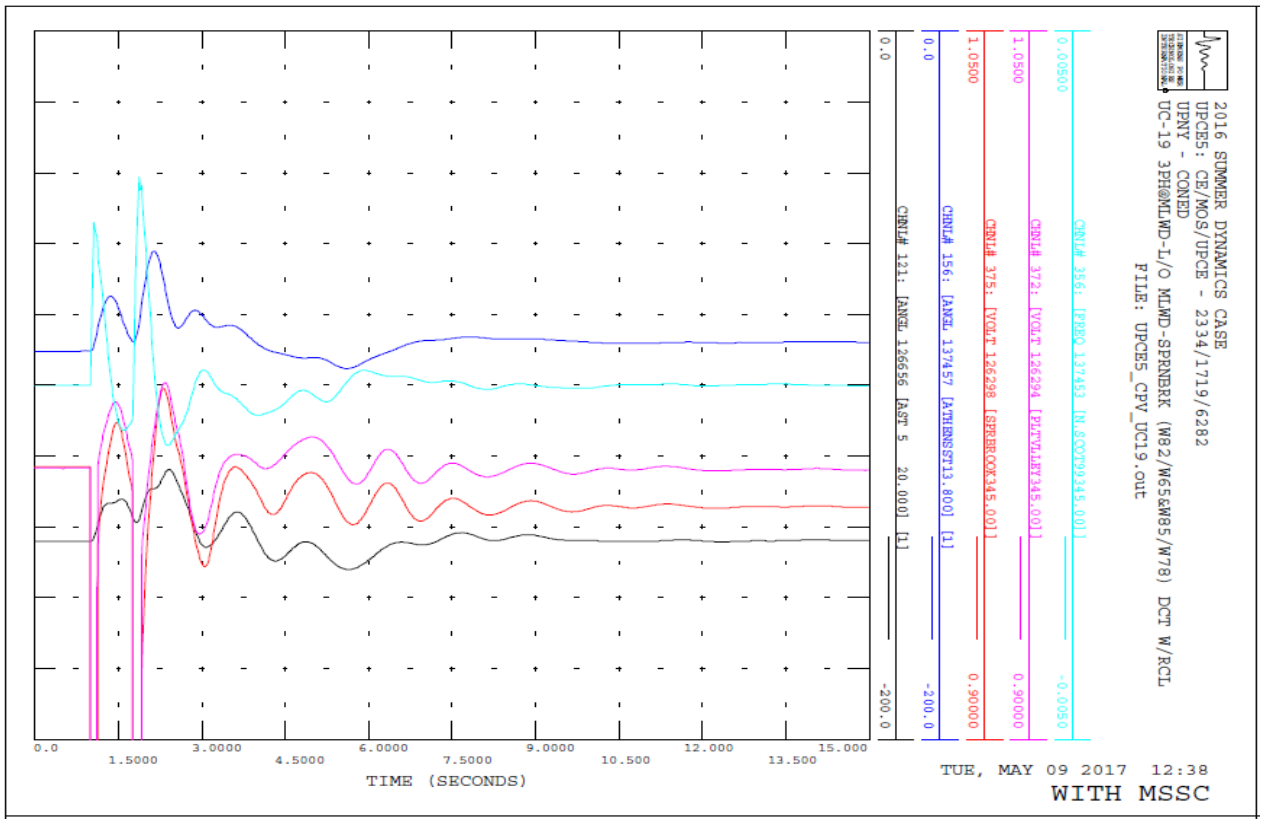


Figure 4. All-line-in-service with Marcy Series Capacitors in-service: UC19 contingency.

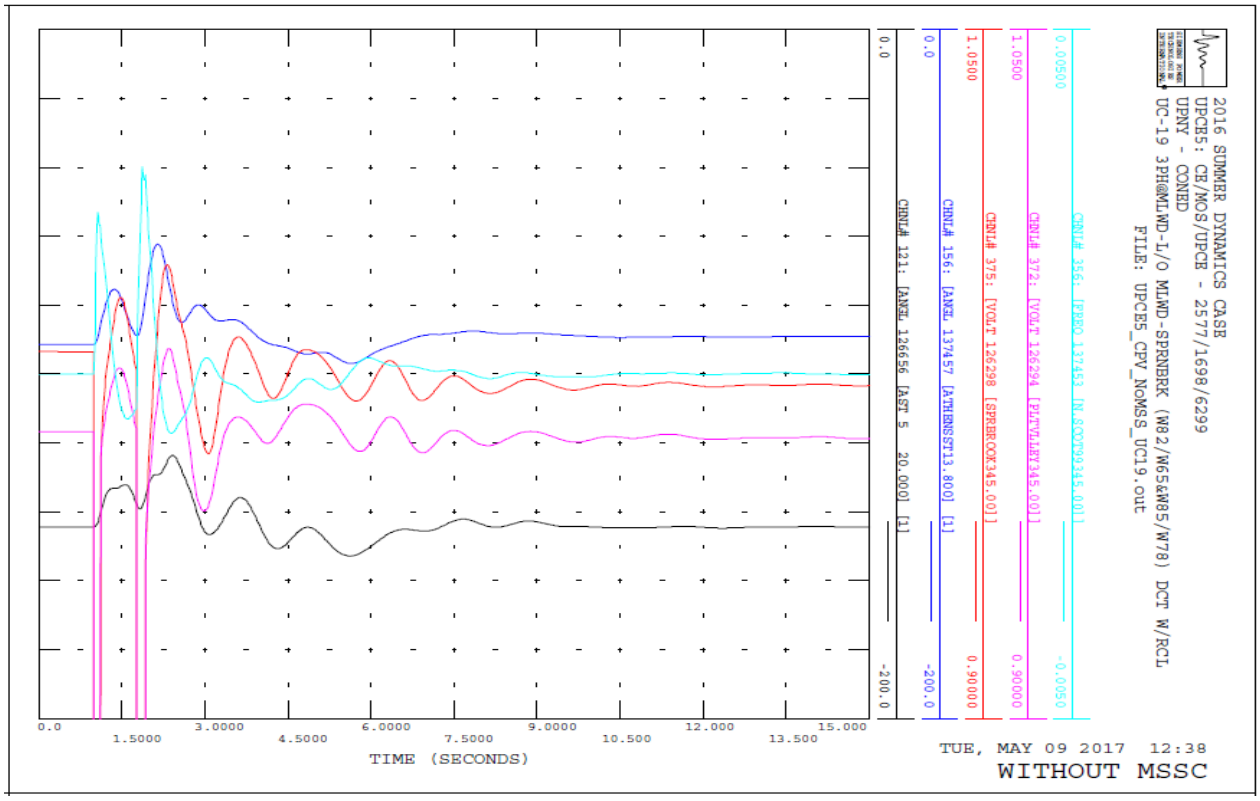


Figure 5. All-line-in-service with Marcy Series Capacitors out of service: UC19 contingency.

8.6 Con Ed Series Reactors and Marcy South Series Capacitors (1.1)

This study also looked at the impact of bypassing Con Ed series reactors (CESR), with and without the MSSC. As part of the Con Edison Fault Current Mitigation project, 3.26% series reactors are installed on each of the M51, M52, 71 and 72 lines.

One of the effects of having the Con Ed series reactors in-service is a reduction in the amount of reactive support that can be supplied from NYC to the lower Hudson Valley. The study examined the base case with all lines in-service with the various combinations of the Con Edison Series Reactors and the Marcy South Series Capacitors.

Figure 6 has the plots of Athens and Astoria 5 units angular response, Pleasant Valley and Sprain Brook 345 kV voltage response and New Scotland bus frequency response for the most severe contingency UC19 varying the in-service status of the MSSC and the Con Ed series reactors. In the upper left is the plot with both MSSC and the Con Ed series reactors in-service. In the lower left is the plot with the MSSC in-service and the Con Ed series reactors out of service. In the upper right is the plot with the Con Ed series reactors in-service and the MSSC out of service. In the lower right is the plot with both Con Ed series reactors and the MSSC out-of-service.

Representative plots for all the UPNY-Con Ed contingencies for each of these scenarios can be found in Appendices 3 – 4. The dynamic responses in all cases were very well damped.

On the basis of these results there is no longer a need for a reduced stability limit when the Con Ed Series Reactors are in-service. The all lines-in-service value will apply in either configuration. As with the all-lines in-service evaluations, the status of the MSSC had no impact on system damping.

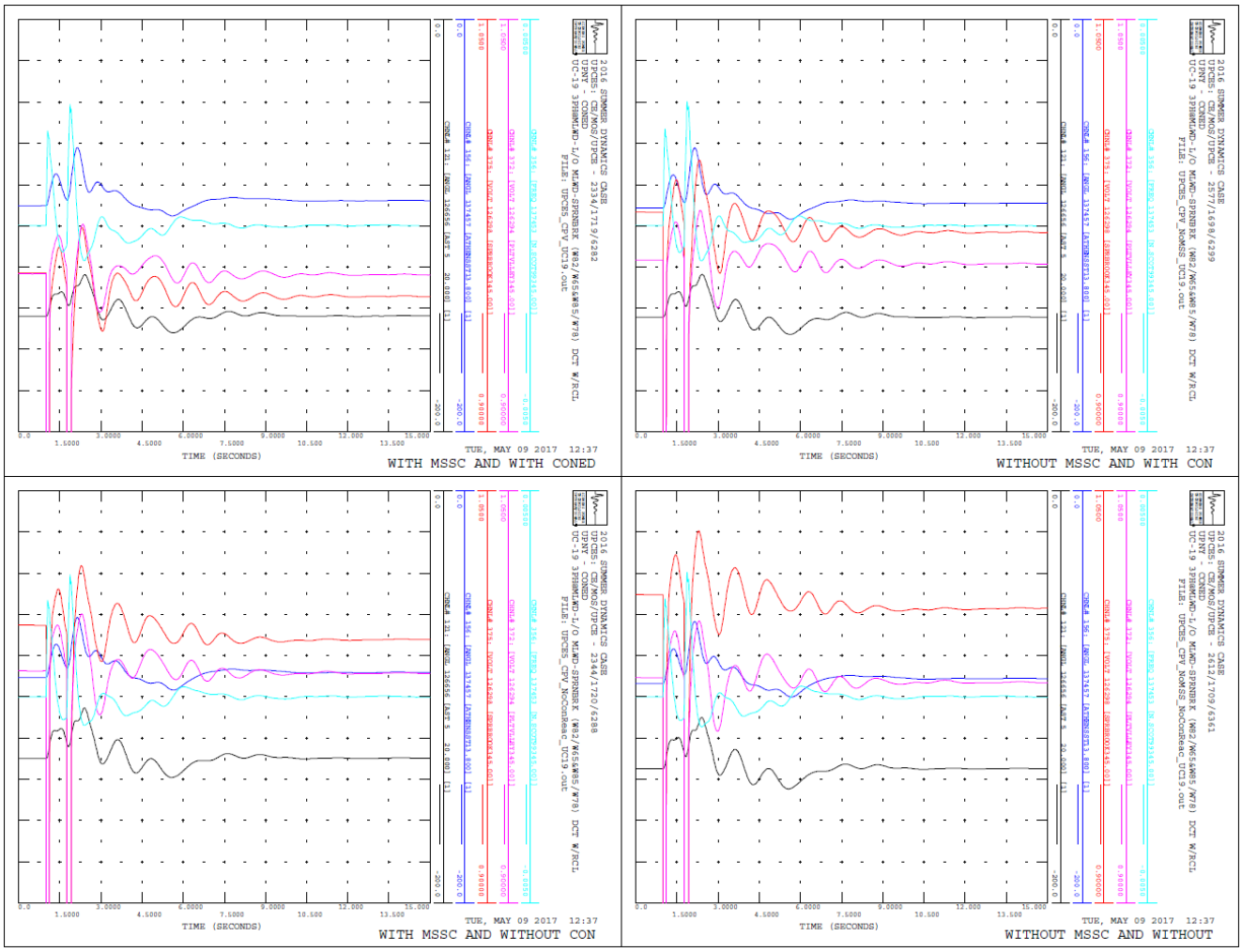


Figure 6. All-line-in-service with and without Con Ed Series Rectors in-service: UC19 contingency.

8.7 Line Outage Limits and Marcy South Series Capacitor Sensitivity (2.0, 3.0, 4.0, 5.0)

Line outage conditions were modeled and evaluated for the stability. Table 4 lists the line outage conditions that were evaluated with the recommended stability limits. The lines selected for the outage conditions were 345 kV lines which are part of the UPNY-Con Ed Interface and 500 kV lines adjacent to Ramapo station.

The impact of having the line outages is to redistribute the flow on the remaining elements on the UPNY-Con Ed interface, with the resulting increase in reactive line losses and reduction in voltage. The scenarios were repeated with the Marcy South Series Capacitors out of service.

Table 4

UPNY-Con Ed stability transfer limits.

#	Scenario	2017			Most limiting Contingency
		UPNY-Con Ed Test Level (MW)	UPNY-Con Ed Stability Limit With MSSC I/S	UPNY-Con Ed Stability Limit with MSSC O/S	
1.0	All Lines In	6282	5700	5700	UC19
1.1	All Lines In, Con Ed Series Reactors bypassed	6288	5700	5700	UC19
2.0	Y88 Ladentown - Buchanan 345 kV O/S	5323	4800	4800	UC19
3.0	Y94 Ramapo - Buchanan 345 kV O/S	5326	4800	4800	UC19
4.0	RFK305 Roseton - E.Fishkill 345 kV O/S	5326	4800	4800	UC19
5.0	5018 Hopatcong - Ramapo 500 kV O/S	5598	5000	5000	UC19
6.0	5060 Hopatcong – Branchburg 500 kV O/S	5598	5000	5000	UC19

Figure 7 has the plots of Athens and Astoria 5 unit's angular response, Pleasant Valley and Sprain Brook 345KV voltage response and New Scotland frequency response for the outage conditions studies with and without MSSC in-service for the most severe contingency UC19. It can be seen that the response of frequency, voltage and angle is similar for all the conditions albeit change in voltage profile. Representative plots for all the UPNY-Con Ed contingencies for each of these scenarios can be found in Appendices 5– 8.

Figure 8 has the plots of Athens and Astoria 5 unit's angular response, Pleasant Valley and Sprain Brook 345KV voltage response and New Scotland frequency response for the outage conditions studies with and without MSSC in-service for the most severe contingency UC19. It can be seen that the response of frequency, voltage and angle is similar for all the conditions

albeit change in voltage profile. Representative plots for all the UPNY-Con Ed contingencies for each of these scenarios can be found in Appendices 9-12.

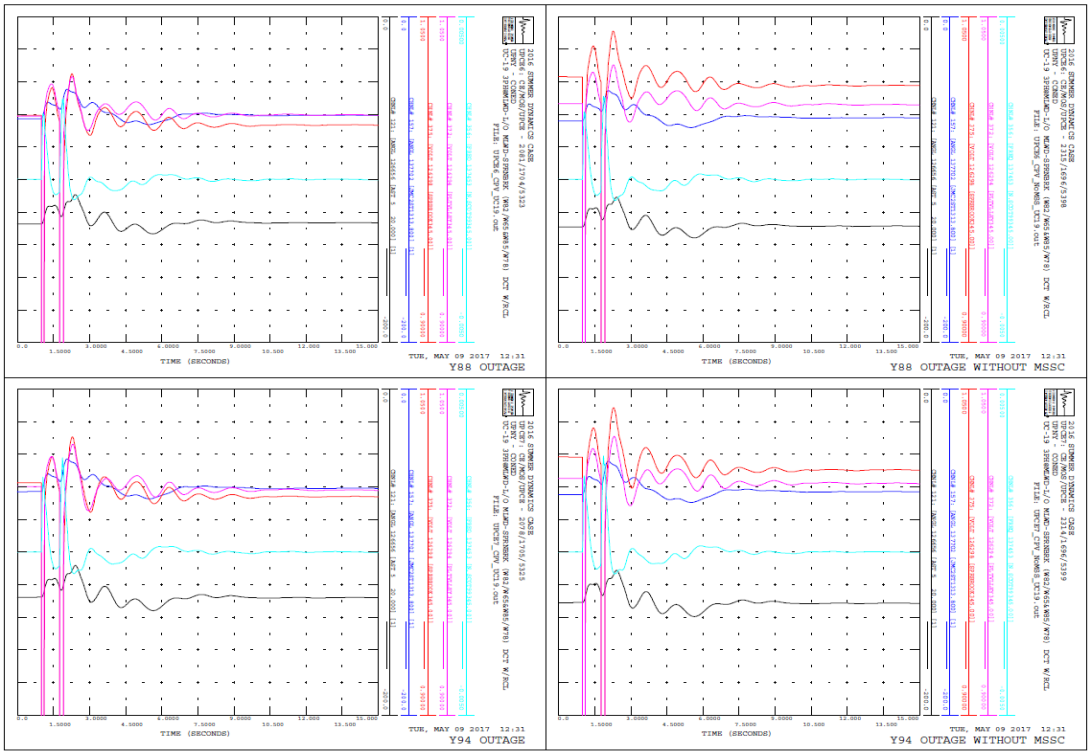


Figure 7. Scenarios 2 and 3 with and without the MSSC: UC19 contingency.

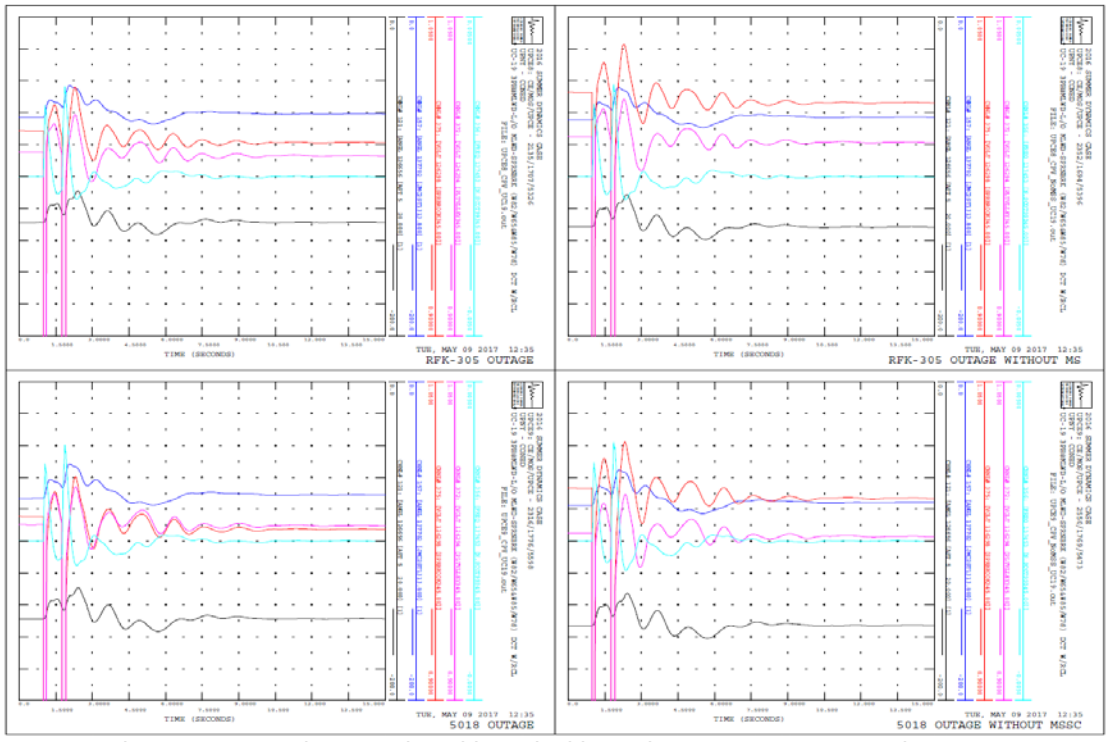


Figure 8. Scenarios 4 and 5 with and without the MSSC: UC19 contingency.

8.8 CPV Valley and Indian Point Sensitivity

A new generator, CPV Valley, is modeled at the new Dolson Ave transmission station. Dolson Ave station is being added on the 345KV Coopers Corners – Rock Tavern (CCRT-42) line. This station is on the east side of the Total East interface. For informational purposes only, this study examined future generation dispatch pattern in the lower Hudson valley such as retirement of Indian Point nuclear units.

The impact of this dispatch configuration alters the balance of flows supplying UPNY-Con Ed though Leeds and Rock Tavern corridors as well as altering the reactive support available in the lower Hudson Valley. Only the all-lines-in-service scenario was evaluated for the configuration, as an informational exercise.

Figure 9 has the plots of Athens and Astoria 5 units' angular response, Pleasant Valley and Sprain Brook 345 kV voltage response and New Scotland frequency response for all lines in-service case with Indian Point units in-service and CPV Valley not modeled in for the most severe contingency UC19.

Figure 10 has the plots of Athens and Astoria 5 unit's angular response, Pleasant Valley and Sprain Brook 345 kV voltage response and New Scotland bus frequency response for all lines in-service case with Indian Point units out of service and CPV Valley is modeled in-service for the most severe contingency UC19.

It can be seen that the response of frequency, voltage and angle is similar for the studied conditions albeit change in voltage profile.

The study found that these generation pattern changes do not have an effect on the stability limit and recommends using the same limit as all lines in-service for this scenario.

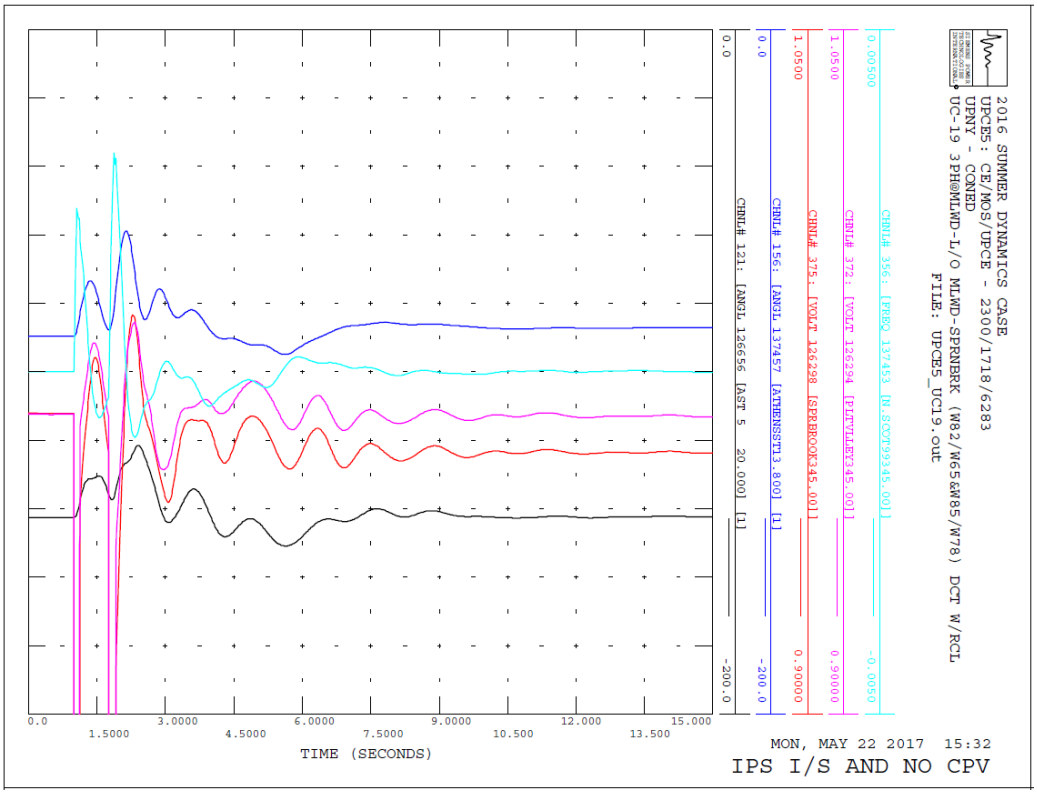


Figure 9. Indian Points in-service and No CPV: UC19 contingency.

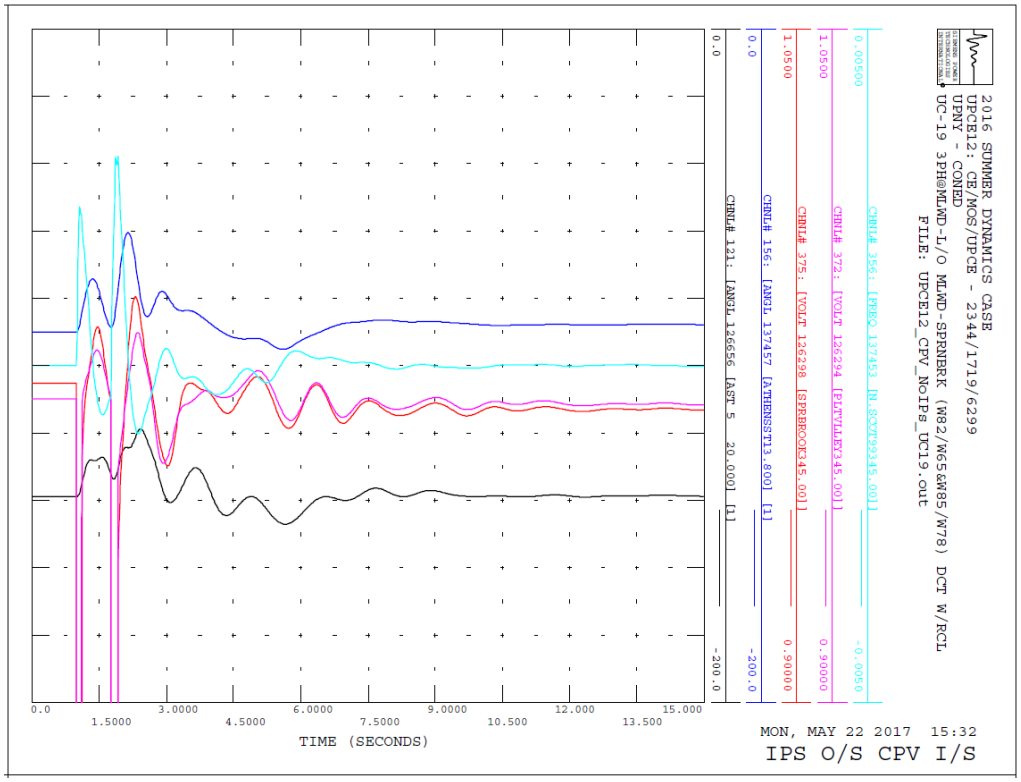


Figure 10. Indian Points O/S and CPV in-service: UC19 contingency.

8.9 PJM Wheel sensitivity for All-Lines-In-Service Limits

This study examined the effect on the stability of the UPNY-Con Ed interface due to the change in line flows from Hudson Valley to NYC due to termination of 1000 MW Con Edison – PSEG Wheel and the implementation of 400 MW operational base flow.

The impact of this dispatch configuration alters the balance of flows supplying UPNY-Con Ed though the Leeds and Rock Tavern corridors. Only the all-lines-in-service scenario was evaluated for the configuration, as an informational exercise.

Figure 11 has the plots of Athens and Astoria 5 units' angular response, Pleasant Valley and Sprain Brook 345 kV bus voltage response and New Scotland bus frequency response for all lines in-service case with the ABC and JK PAR set to 1000 MW to represent the historical ConEd/PSE&G wheel for the most severe contingency UC19.

Figure 12 has the plots of Athens and Astoria 5 unit's angular response, Pleasant Valley and Sprain Brook 345 kV bus voltage response and New Scotland bus frequency response for all lines in-service case with the ABC and JK PAR set to 400MW Operational Base Flow for the most severe contingency UC19.

On an informational basis the study looked at the scenario of 0MW Operational Base Flow. Figure 13 has the plots of Athens and Astoria 5 units' angular response, Pleasant Valley and Sprain Brook 345KV bus voltage response and New Scotland bus frequency response for all lines in-service

It can be seen that the change in the power flows has minimal effect on the stability of the system.

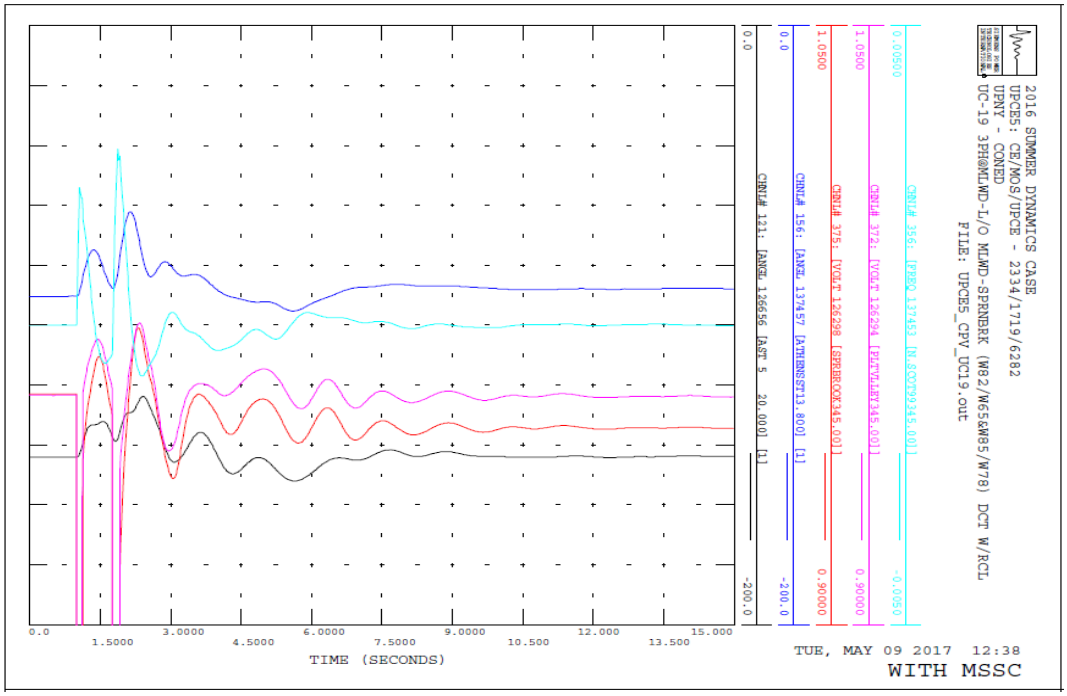


Figure 11. All Lines in-service with the historic PJM Wheel: UC19 contingency.

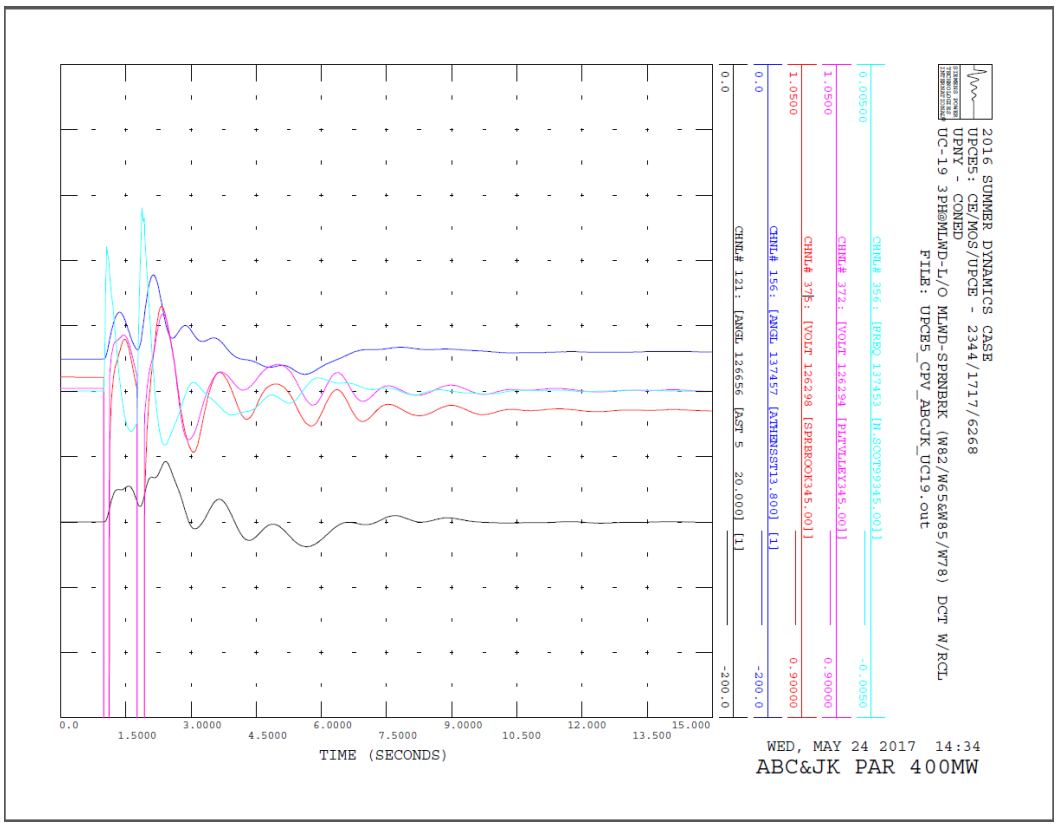


Figure 12. All Lines in-service with 400 MW OBF: UC19 contingency.

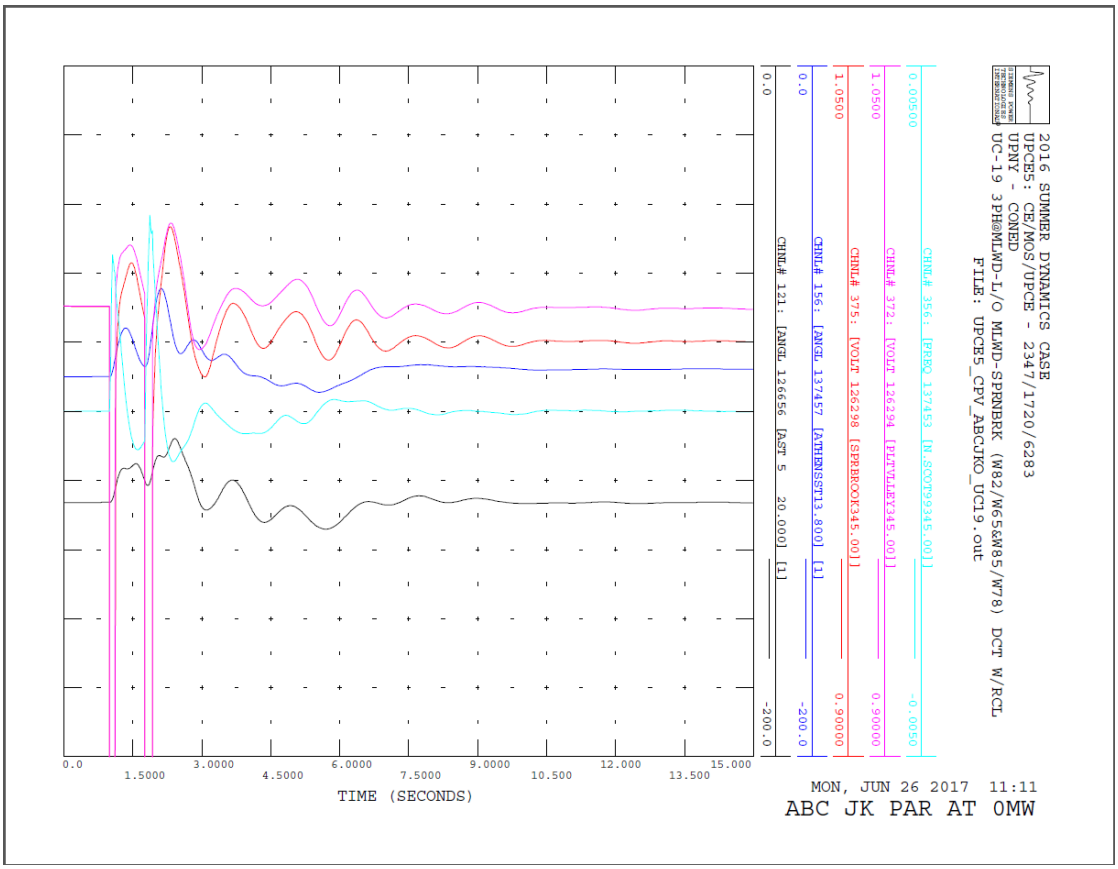


Figure 13. All Lines in-service with 400 MW OBF: UC19 contingency.

8.10 PJM 500kV Line Outage Sensitivity (6.0)

On informational basis this study looked at the impact of PJM 500kV lines being out of service. The outages examined were, Hopatcong to Lackawanna 5063 line, Hopatcong to Roseland 5061 line and Hopatcong to Branchburg 5060 line.

It is found that the outages of 5063 and 5061 lines have minimal effect on the stability. 5060 line outage is found to have the same stability limit as of the Hopatcong to Ramapo 5018 line outage.

Figure 14 has the plots of Athens and Astoria 5 unit's angular response, Pleasant Valley and Sprain Brook 345 kV bus voltage response and New Scotland bus frequency response for the cases with the outages studied for the most severe contingency UC19. The figure includes the 5018 line outage as well to compare the impact of these outages.

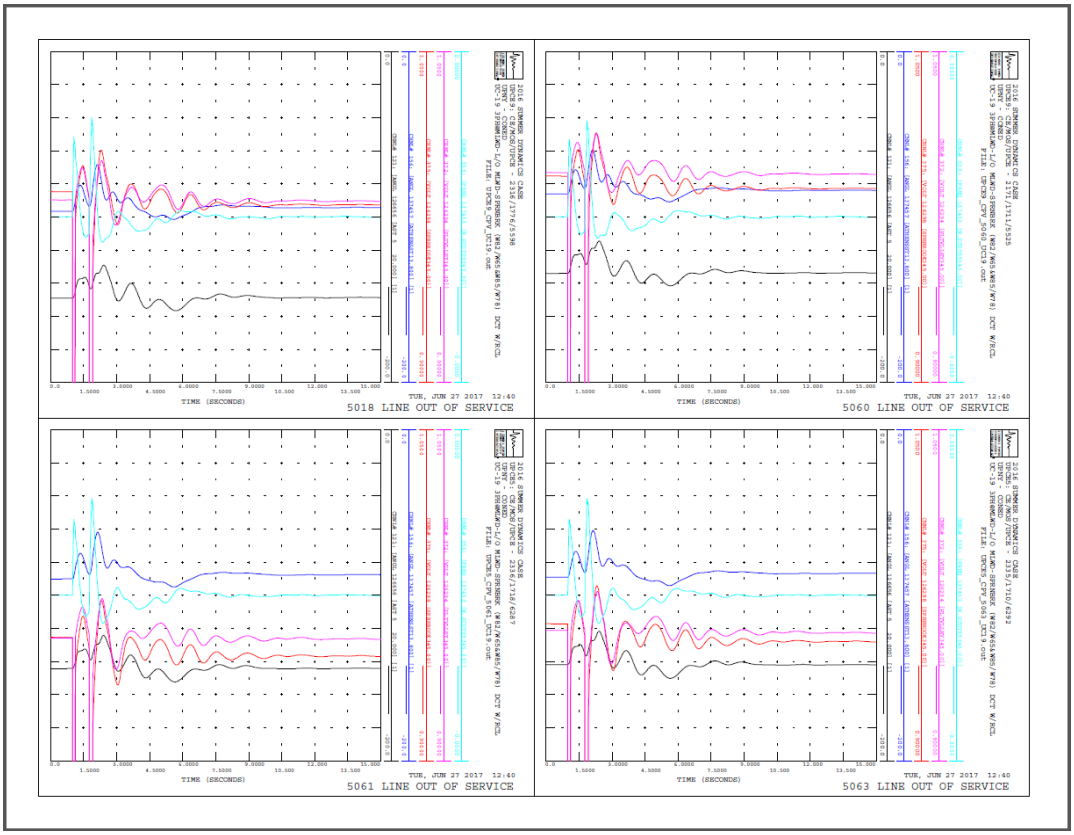


Figure 14. PJM 500kV Line Outages: UC19 contingency.

8.11 Consistency in All-Lines-In-Service Limits

The higher all-lines-in-service limits recommended in this report are valid for the alterations in flow patterns expected with the expiration of the Con Ed/PSE&G wheel contract and changes in dispatch expected in the Hudson Valley.

9. Recommendations

This report has been reviewed and recommended for NYISO Operating Committee approval by the NYISO Operating Studies Task Force (OSTF), the System Operations Advisory Subcommittee (SOAS) and the Transmission Planning Advisory Subcommittee.

Based on the results of this study, it is recommended that the UPNY-Con Ed stability transfer limits be updated in accordance with Table 1.

Appendices

Appendix 1	All Lines In-Service, CESR In-Service, MSSC In-Service
Appendix 2	All Lines In-Service, CESR In-Service, MSSC Out of Service
Appendix 3	All Lines In-Service, CESR Out of Service, MSSC In-Service
Appendix 4	All Lines In-Service, CESR Out of Service, MSSC Out of Service
Appendix 5	Y88 Out of Service, CESR In-Service, MSSC In-Service
Appendix 6	Y88 Out of Service, CESR In-Service, MSSC Out of Service
Appendix 7	Y94 Out of Service, CESR In-Service, MSSC In-Service
Appendix 8	Y94 Out of Service, CESR In-Service, MSSC Out of Service
Appendix 9	RFK305 Out of Service, CESR In-Service, MSSC In-Service
Appendix 10	RFK305 Out of Service, CESR In-Service, MSSC Out of Service
Appendix 11	5018 Out of Service, CESR In-Service, MSSC In-Service
Appendix 12	5018 Out of Service, CESR In-Service, MSSC Out of Service
Appendix 13	IP 2&3 Out of Service, CPV Valley In-Service, CESR In-Service, MSSC In-Service
Appendix 14	All Lines In-Service, MSSC In-Service, 400MW OBF
Appendix 15	All Lines In-Service, MSSC In-Service, 0MW OBF

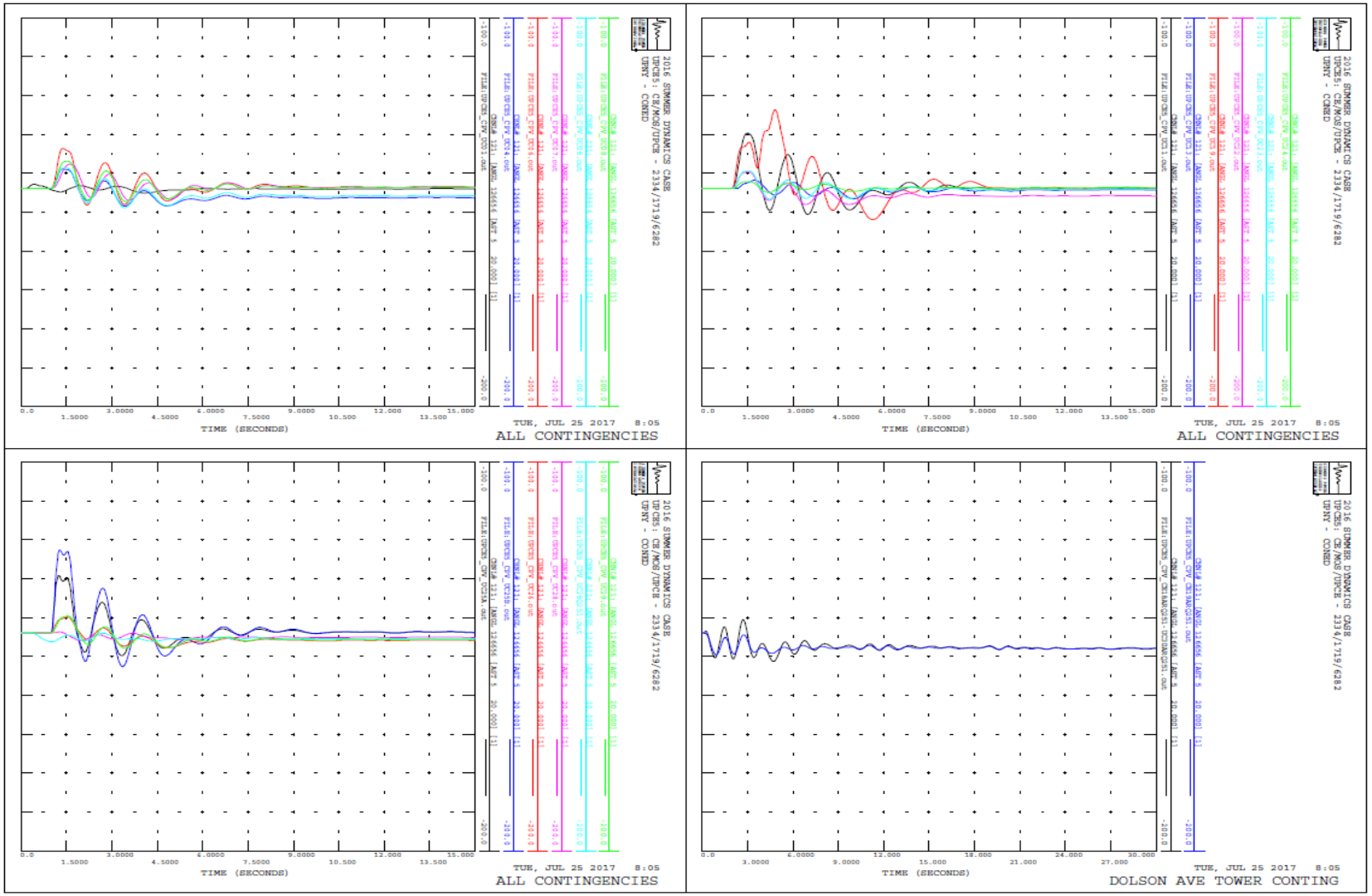
Appendix 1 - All Lines In-Service, CESR In-Service, MSSC In-Service (1 of 2)

Test Level Interface Power Flow Summary and Key Voltages

Interface	DYSINGER-EAST	WEST-CENTRAL	VOLNEY-EAST	MOSES-SOUTH	CENTRAL-EAST	UPNY-SENY	UPNY-CONED	MILLWOOD-SO	DNWDIE-SO-PL	DNWDIE-SO-OP	SENY-115kV	PJM-NY	ON-NY	NE-NY-WCSC
MW	2185	867	3827	1719	2334	7553	6282	9032	4757	3827	398	1559	1806	1044
MVAr	-83	-33	151	-238	-346	791	341	427	-737	-82	-93	846	1806	139

Bus Number	Bus Name	Base kV	Voltage(pu)	Bus Number	Bus Name	Base kV	Voltage(pu)
137200	EDIC	345	1.0062	147828	MASS 765	765	0.9996
137453	N.SCOT99	345	1.004	147827	MARCY765	765	0.988
130750	COOPC345	345	0.9665	126250	RAMAPO 5	500	0.9517
126260	BOWLINE1	345	0.9956	125001	ROCK TAV	345	0.9769
126263	BUCHANAN S	345	0.9752	130757	WATRC345	345	0.9989
130753	FRASR345	345	1.0044	126291	MILLWOOD	345	0.9625
147831	GILB 345	345	1.0202	126281	E FISHKILL	345	0.9651
126290	LADENTWN	345	0.9885	130757	WATRC345	345	0.9989
137451	LEEDS 3	345	0.9968	126294	PLTVLLEY	345	0.9575
147833	MARCY T1	345	1.0081	125002	ROSETON	345	0.9816
147834	NIAG 345	345	1.0397	137488	BETHLEHE	115	1.0234
130755	OAKDL345	345	1.0062	136154	OSWEGO	345	1.0511
126266	DUNWOODIE	345	0.9571	136155	SCRIBA	345	1.0562
126298	SPRAINBROOK	345	0.9579	136156	VOLNEY	345	1.0484

Appendix 1 - All Lines In-Service, CESR In-Service, MSSC In-Service (2 of 2)



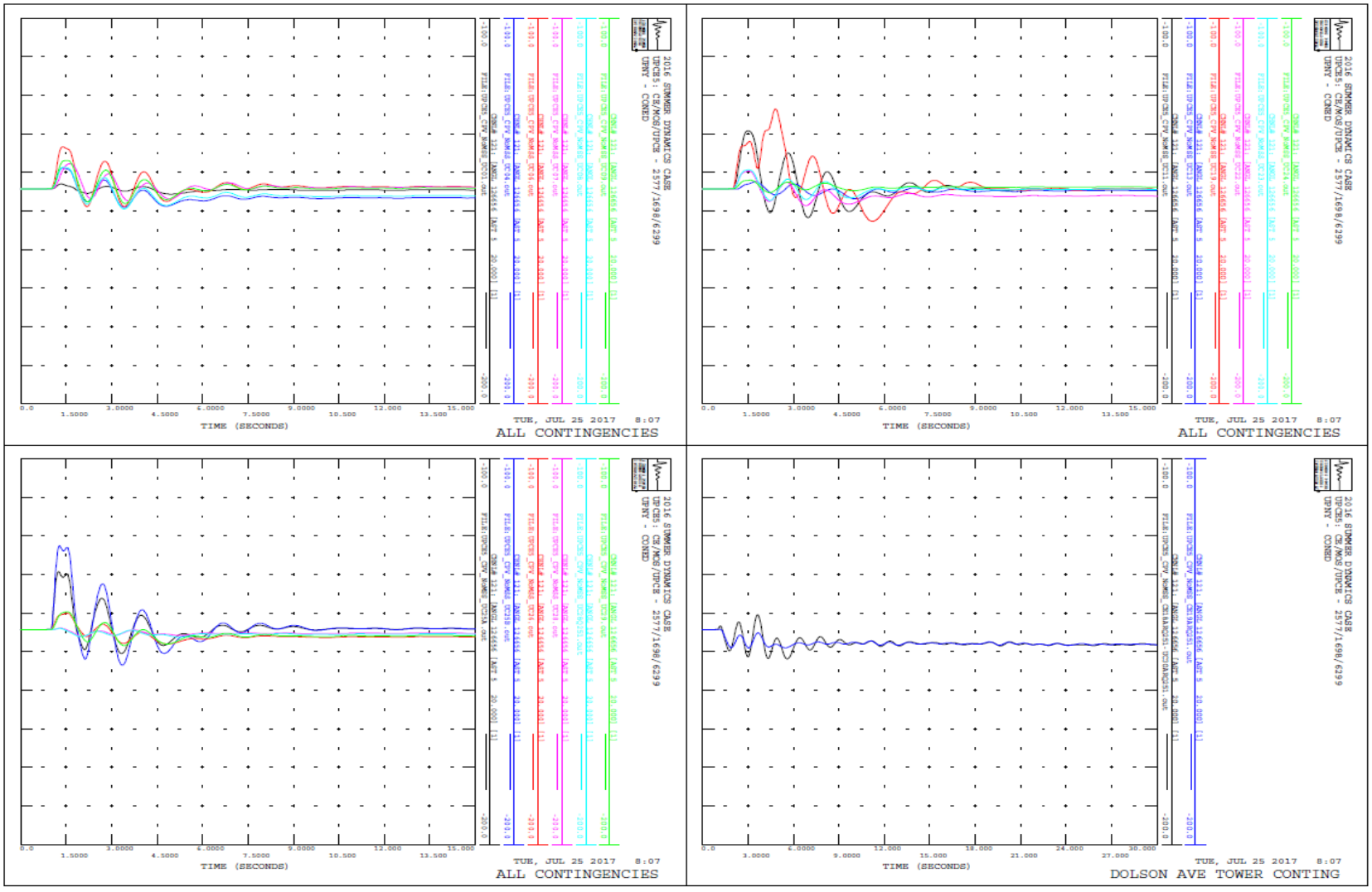
Appendix 2 - All Lines In-Service, CESR In-Service, MSSC Out of Service (1 of 2)

Test Level Interface Power Flow Summary and Key Voltages

Interface	DYSINGER-EAST	WEST-CENTRAL	VOLNEY-EAST	MOSES-SOUTH	CENTRAL-EAST	UPNY-SENY	UPNY-CONED	MILLWOOD-SO	DNWDIE-SO-PL	DNWDIE-SO-OP	SENY-115kV	PJM-NY	ON-NY	NE-NY-WCSC
MW	2162	845	3791	1698	2578	7500	6297	9099	4773	3774	415	1583	1779	1044
MVAr	-82	-25	83	-38	-400	722	-47	-24	-870	40	-109	732	71	148

Bus Number	Bus Name	Base kV	Voltage(pu)	Bus Number	Bus Name	Base kV	Voltage(pu)
137200	EDIC	345	1.0086	147828	MASS 765	765	1.0122
137453	N.SCOT99	345	0.9938	147827	MARCY765	765	0.9727
130750	COOPC345	345	0.9689	126250	RAMAPO 5	500	0.9505
126260	BOWLINE1	345	1.0067	125001	ROCK TAV	345	0.9841
126263	BUCHANAN S	345	0.9913	130757	WATRC345	345	0.9891
130753	FRASR345	345	0.9975	126291	MILLWOOD	345	0.9804
147831	GILB 345	345	1.0115	126281	E FISHKILL	345	0.9722
126290	LADENTWN	345	1.0007	130757	WATRC345	345	0.9891
137451	LEEDS 3	345	0.9896	126294	PLTVLLEY	345	0.9625
147833	MARCY T1	345	1.0114	125002	ROSETON	345	0.9866
147834	NIAG 345	345	1.0393	137488	BETHLEHE	115	1.0271
130755	OAKDL345	345	0.9987	136154	OSWEGO	345	1.0498
126266	DUNWOODIE	345	0.9788	136155	SCRIBA	345	1.0544
126298	SPRAINBROOK	345	0.98	136156	VOLNEY	345	1.047

Appendix 2 - All Lines In-Service, CESR In-Service, MSSC Out of Service (2 of 2)



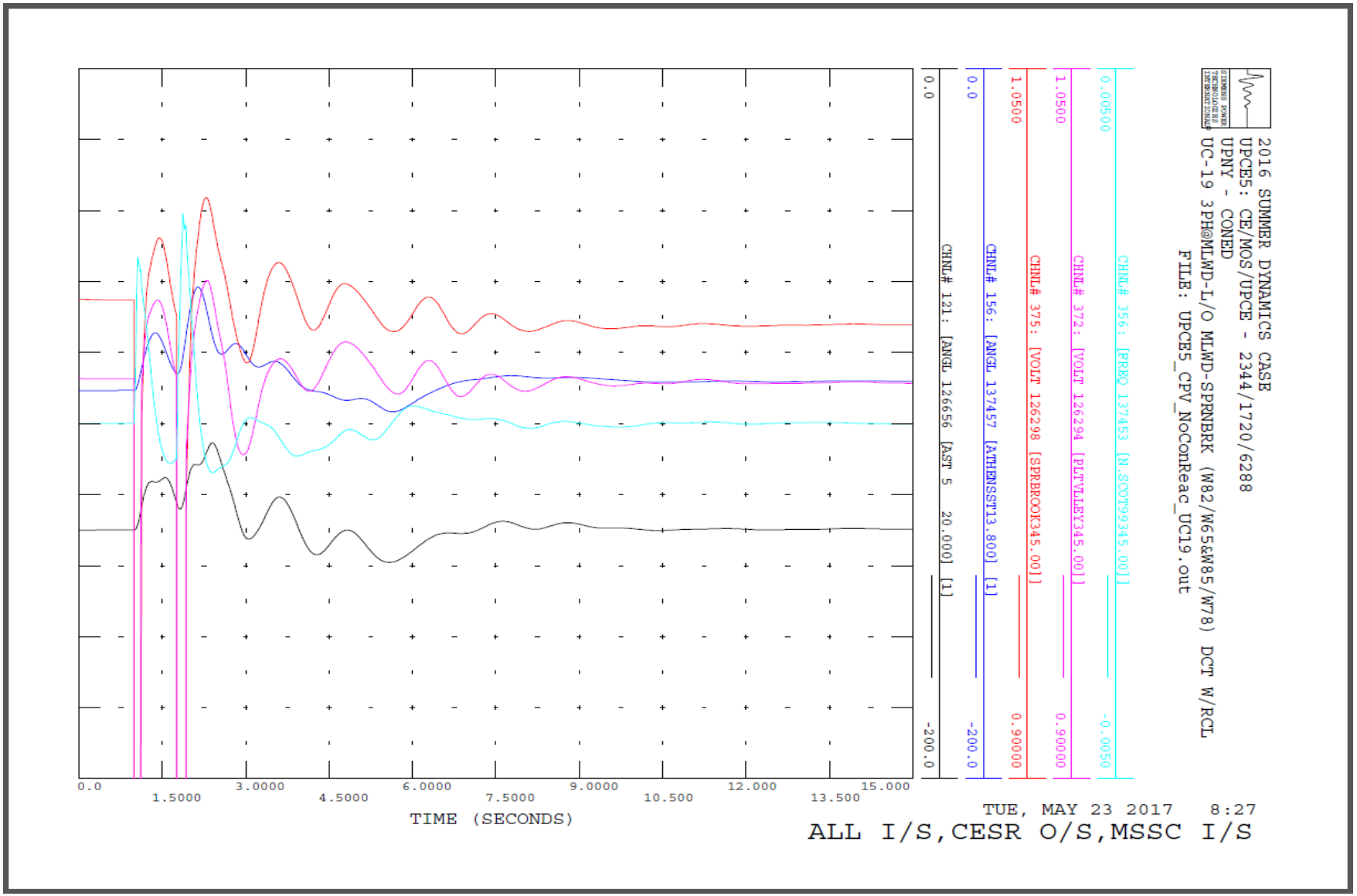
Appendix 3 - All Lines In-Service, CESR Out of Service, MSSC In-Service (1 of 2)

Test Level Interface Power Flow Summary and Key Voltages

Interface	DYSINGER-EAST	WEST-CENTRAL	VOLNEY-EAST	MOSES-SOUTH	CENTRAL-EAST	UPNY-SENY	UPNY-CONED	MILLWOOD-SO	DNWDIE-SO-PL	DNWDIE-SO-OP	SENY-115kV	PJM-NY	ON-NY	NE-NY-WCSC
MW	2188	870	3830	1720	2344	7556	6288	9028	4769	3840	393	1551	1809	1045
MVAr	-83.5	-38	89	-248	-400	560	-257	-90	-629	-478	-108	639	64	20

Bus Number	Bus Name	Base kV	Voltage(pu)	Bus Number	Bus Name	Base kV	Voltage(pu)
137200	EDIC	345	1.0094	147828	MASS 765	765	1.0009
137453	N.SCOT99	345	1.0169	147827	MARCY765	765	0.9908
130750	COOPC345	345	0.9746	126250	RAMAPO 5	500	0.962
126260	BOWLINE1	345	1.0149	125001	ROCK TAV	345	0.9912
126263	BUCHANAN S	345	1.0067	130757	WATRC345	345	0.9996
130753	FRASR345	345	1.0126	126291	MILLWOOD	345	0.999
147831	GILB 345	345	1.0336	126281	E FISHKILL	345	0.9935
126290	LADENTWN	345	1.01	130757	WATRC345	345	0.9996
137451	LEEDS 3	345	1.0156	126294	PLTVLLEY	345	0.9845
147833	MARCY T1	345	1.0114	125002	ROSETON	345	1.0052
147834	NIAG 345	345	1.0398	137488	BETHLEHE	115	1.0264
130755	OAKDL345	345	1.0095	136154	OSWEGO	345	1.0509
126266	DUNWOODIE	345	1.0002	136155	SCRIBA	345	1.0553
126298	SPRAINBROOK	345	1.0013	136156	VOLNEY	345	1.048

Appendix 3 - All Lines In-Service, CESR Out of Service, MSSC In-Service (2 of 2)



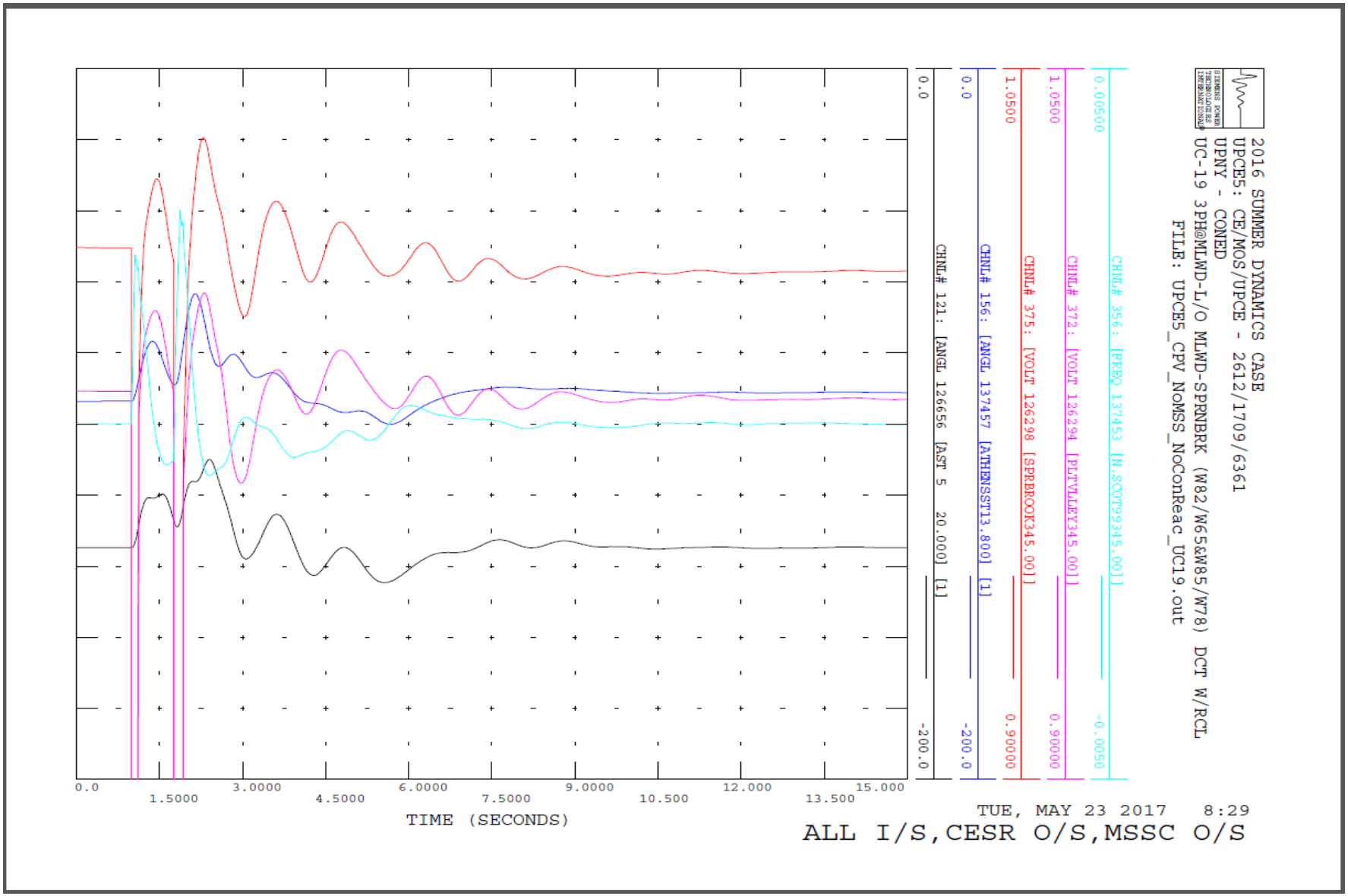
Appendix 4 - All Lines In-Service, CESR Out of Service, MSSC Out of Service (1 of 2)

Test Level Interface Power Flow Summary and Key Voltages

Interface	DYSINGER-EAST	WEST-CENTRAL	VOLNEY-EAST	MOSES-SOUTH	CENTRAL-EAST	UPNY-SENY	UPNY-CONED	MILLWOOD-SO	DNWDIE-SO-PL	DNWDIE-SO-OP	SENY-115kV	PJM-NY	ON-NY	NE-NY-WCSC
MW	2185	867	3843	1709	2612	7564	6361	9102	4836	3836	413	1565	1800	1044
MVAr	-82	-33	50	-48	-442	543	-477	-476	-747	-287	-111	624	65	65

Bus Number	Bus Name	Base kV	Voltage(pu)	Bus Number	Bus Name	Base kV	Voltage(pu)
137200	EDIC	345	1.0109	147828	MASS 765	765	1.0129
137453	N.SCOT99	345	1.0035	147827	MARCY765	765	0.9746
130750	COOPC345	345	0.9736	126250	RAMAPO 5	500	0.9592
126260	BOWLINE1	345	1.0211	125001	ROCK TAV	345	0.9943
126263	BUCHANAN S	345	1.0147	130757	WATRC345	345	0.993
130753	FRASR345	345	1.0031	126291	MILLWOOD	345	1.0076
147831	GILB 345	345	1.0209	126281	E FISHKILL	345	0.9928
126290	LADENTWN	345	1.017	130757	WATRC345	345	0.993
137451	LEEDS 3	345	1.0029	126294	PLTVLLEY	345	0.982
147833	MARCY T1	345	1.0138	125002	ROSETON	345	1.0037
147834	NIAG 345	345	1.0394	137488	BETHLEHE	115	1.0265
130755	OAKDL345	345	1.003	136154	OSWEGO	345	1.0505
126266	DUNWOODIE	345	1.0108	136155	SCRIBA	345	1.0552
126298	SPRAINBROOK	345	1.0123	136156	VOLNEY	345	1.0478

Appendix 4 - All Lines In-Service, CESR Out of Service, MSSC Out of Service (2 of 2)



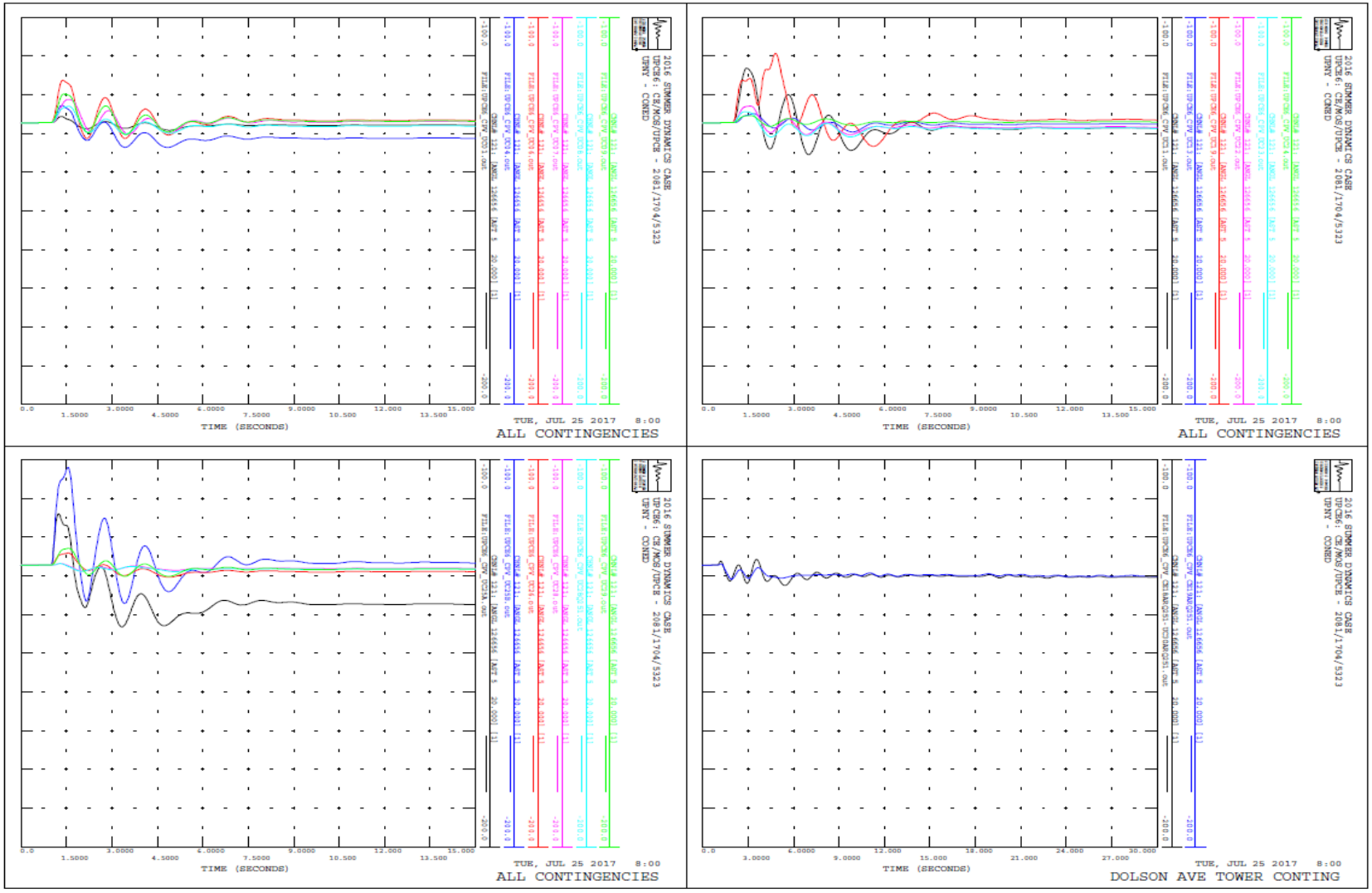
Appendix 5 - Y88 Out of Service, CESR In-Service, MSSC In-Service (1 of 2)

Test Level Interface Power Flow Summary and Key Voltages

Interface	DYSINGER-EAST	WEST-CENTRAL	VOLNEY-EAST	MOSES-SOUTH	CENTRAL-EAST	UPNY-SENY	UPNY-CONED	MILLWOOD-SO	DNWDIE-SO-PL	DNWDIE-SO-OP	SENY-115kV	PJM-NY	ON-NY	NE-NY-WCSC
MW	2205	887	3221	1704	2081	6589	5323	8068	3810	2880	339	1539	1808	1045
MVAr	-82	-44	-35	-266	-342	329	84	78	-414	-97	-99	379	69	-78

Bus Number	Bus Name	Base kV	Voltage(pu)	Bus Number	Bus Name	Base kV	Voltage(pu)
137200	EDIC	345	1.0139	147828	MASS 765	765	1.0028
137453	N.SCOT99	345	1.0311	147827	MARCY765	765	0.9949
130750	COOPC345	345	1.0182	126250	RAMAPO 5	500	0.9925
126260	BOWLINE1	345	1.0299	125001	ROCK TAV	345	1.0245
126263	BUCHANAN S	345	1.0069	130757	WATRC345	345	1.0043
130753	FRASR345	345	1.0341	126291	MILLWOOD	345	1.0044
147831	GILB 345	345	1.0433	126281	E FISHKILL	345	1.0139
126290	LADENTWN	345	1.0268	130757	WATRC345	345	1.0043
137451	LEEDS 3	345	1.0347	126294	PLTVLLEY	345	1.0042
147833	MARCY T1	345	1.0161	125002	ROSETON	345	1.0285
147834	NIAG 345	345	1.0394	137488	BETHLEHE	115	1.0216
130755	OAKDL345	345	1.0103	136154	OSWEGO	345	1.0446
126266	DUNWOODIE	345	1.0035	136155	SCRIBA	345	1.0512
126298	SPRAINBROOK	345	1.0046	136156	VOLNEY	345	1.0443

Appendix 5 - Y88 Out of Service, CESR In-Service, MSSC In-Service (2 of 2)



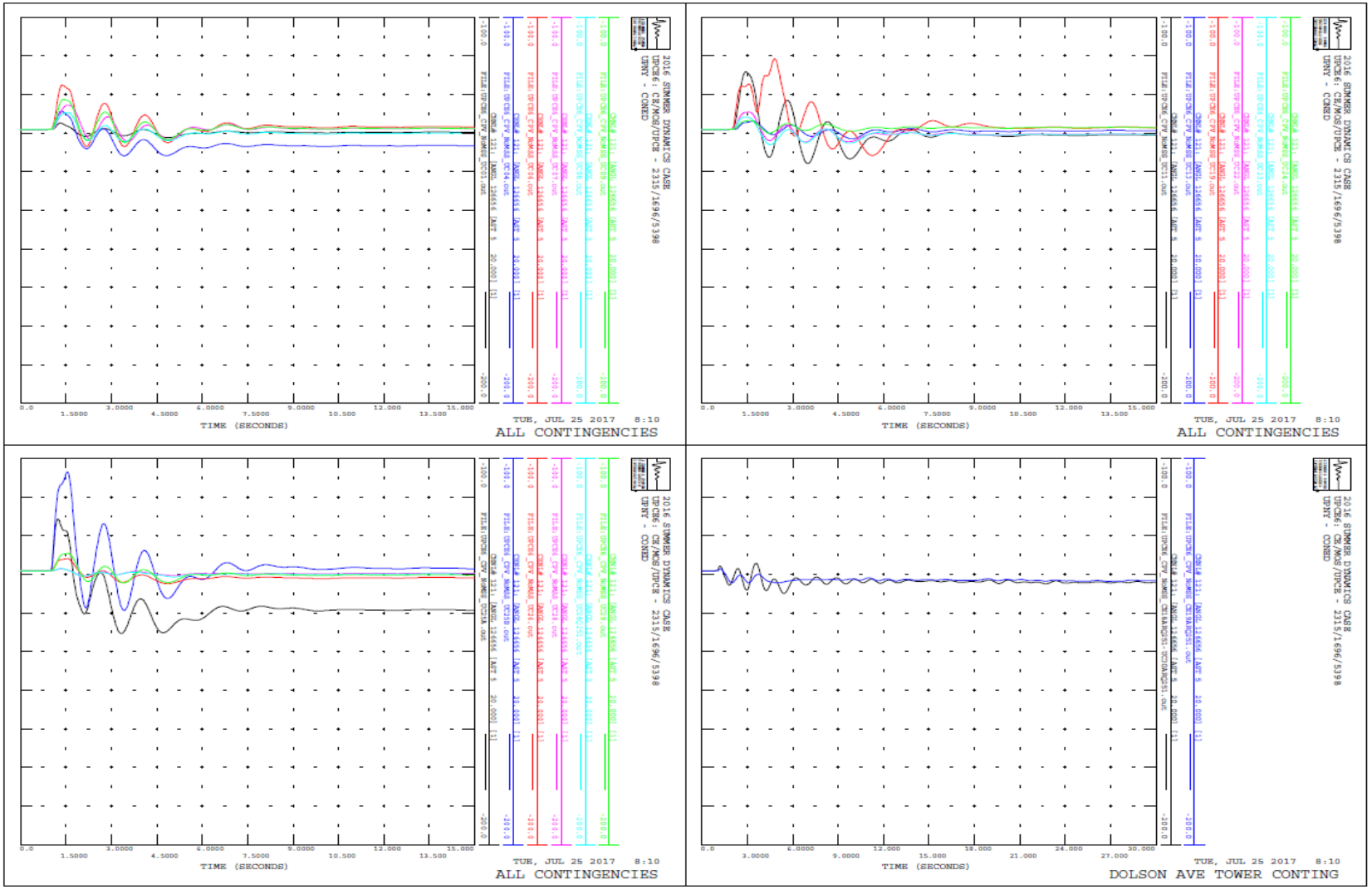
Appendix 6 - Y88 Out of Service, CESR In-Service, MSSC Out of Service (1 of 2)

Test Level Interface Power Flow Summary and Key Voltages

Interface	DYSINGER-EAST	WEST-CENTRAL	VOLNEY-EAST	MOSES-SOUTH	CENTRAL-EAST	UPNY-SENY	UPNY-CONED	MILLWOOD-SO	DNWDIE-SO-PL	DNWDIE-SO-OP	SENY-115kV	PJM-NY	ON-NY	NE-NY-WCSC
MW	2203	885	3233	1696	2315	6596	5398	8142	3879	2880	349	1551	1801	1044
MVAr	-81	-42	-120	-70	-425	527	-100	-341	-567	52	-96	431	76	-108

Bus Number	Bus Name	Base kV	Voltage(pu)	Bus Number	Bus Name	Base kV	Voltage(pu)
137200	EDIC	345	1.0185	147828	MASS 765	765	1.016
137453	N.SCOT99	345	1.0342	147827	MARCY765	765	0.9811
130750	COOPC345	345	1.0251	126250	RAMAPO 5	500	0.9697
126260	BOWLINE1	345	1.0381	125001	ROCK TAV	345	1.0311
126263	BUCHANAN S	345	1.0197	130757	WATRC345	345	1.0053
130753	FRASR345	345	1.0359	126291	MILLWOOD	345	1.0191
147831	GILB 345	345	1.0446	126281	E FISHKILL	345	1.0206
126290	LADENTWN	345	1.0362	130757	WATRC345	345	1.0053
137451	LEEDS 3	345	1.036	126294	PLTVLLEY	345	1.01
147833	MARCY T1	345	1.0215	125002	ROSETON	345	1.0333
147834	NIAG 345	345	1.0391	137488	BETHLEHE	115	1.024
130755	OAKDL345	345	1.0129	136154	OSWEGO	345	1.0446
126266	DUNWOODIE	345	1.0209	136155	SCRIBA	345	1.0505
126298	SPRAINBROOK	345	1.0223	136156	VOLNEY	345	1.0441

Appendix 6 - Y88 Out of Service, CESR In-Service, MSSC Out of Service (2 of 2)



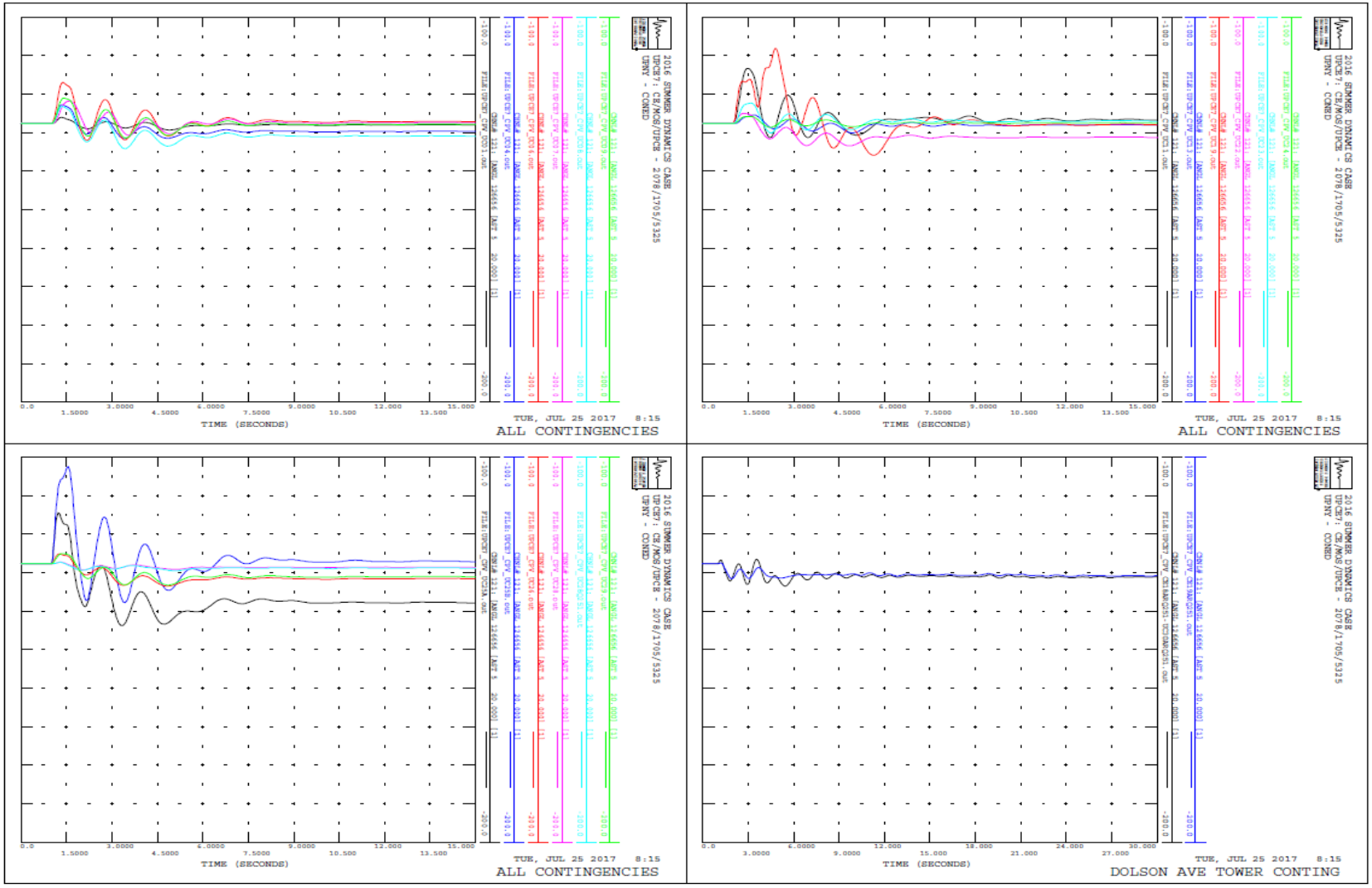
Appendix 7 - Y94 Out of Service, CESR In-Service, MSSC In-Service (1 of 2)

Test Level Interface Power Flow Summary and Key Voltages

Interface	DYSINGER-EAST	WEST-CENTRAL	VOLNEY-EAST	MOSES-SOUTH	CENTRAL-EAST	UPNY-SENY	UPNY-CONED	MILLWOOD-SO	DNWDIE-SO-PL	DNWDIE-SO-OP	SENY-115kV	PJM-NY	ON-NY	NE-NY-WCSC
MW	2206	888	3225	1705	2078	6593	5326	8069	3809	2880	339	1542	1808	1045
MVAr	-79	-42	-19	-258	-347	446	121	111	-392	-79	-92	460	70	-83

Bus Number	Bus Name	Base kV	Voltage(pu)	Bus Number	Bus Name	Base kV	Voltage(pu)
137200	EDIC	345	1.0123	147828	MASS 765	765	1.0021
137453	N.SCOT99	345	1.03	147827	MARCY765	765	0.9935
130750	COOPC345	345	1.0112	126250	RAMAPO 5	500	0.9733
126260	BOWLINE1	345	1.0212	125001	ROCK TAV	345	1.0171
126263	BUCHANAN S	345	1.0112	130757	WATRC345	345	1.0029
130753	FRASR345	345	1.0308	126291	MILLWOOD	345	1.0067
147831	GILB 345	345	1.0421	126281	E FISHKILL	345	1.0138
126290	LADENTWN	345	1.0169	130757	WATRC345	345	1.0029
137451	LEEDS 3	345	1.0345	126294	PLTVLLEY	345	1.0052
147833	MARCY T1	345	1.0145	125002	ROSETON	345	1.0268
147834	NIAG 345	345	1.0393	137488	BETHLEHE	115	1.0226
130755	OAKDL345	345	1.0081	136154	OSWEGO	345	1.0441
126266	DUNWOODIE	345	1.0056	136155	SCRIBA	345	1.0508
126298	SPRAINBROOK	345	1.0069	136156	VOLNEY	345	1.0438

Appendix 7 - Y94 Out of Service, CESR In-Service, MSSC In-Service (2 of 2)



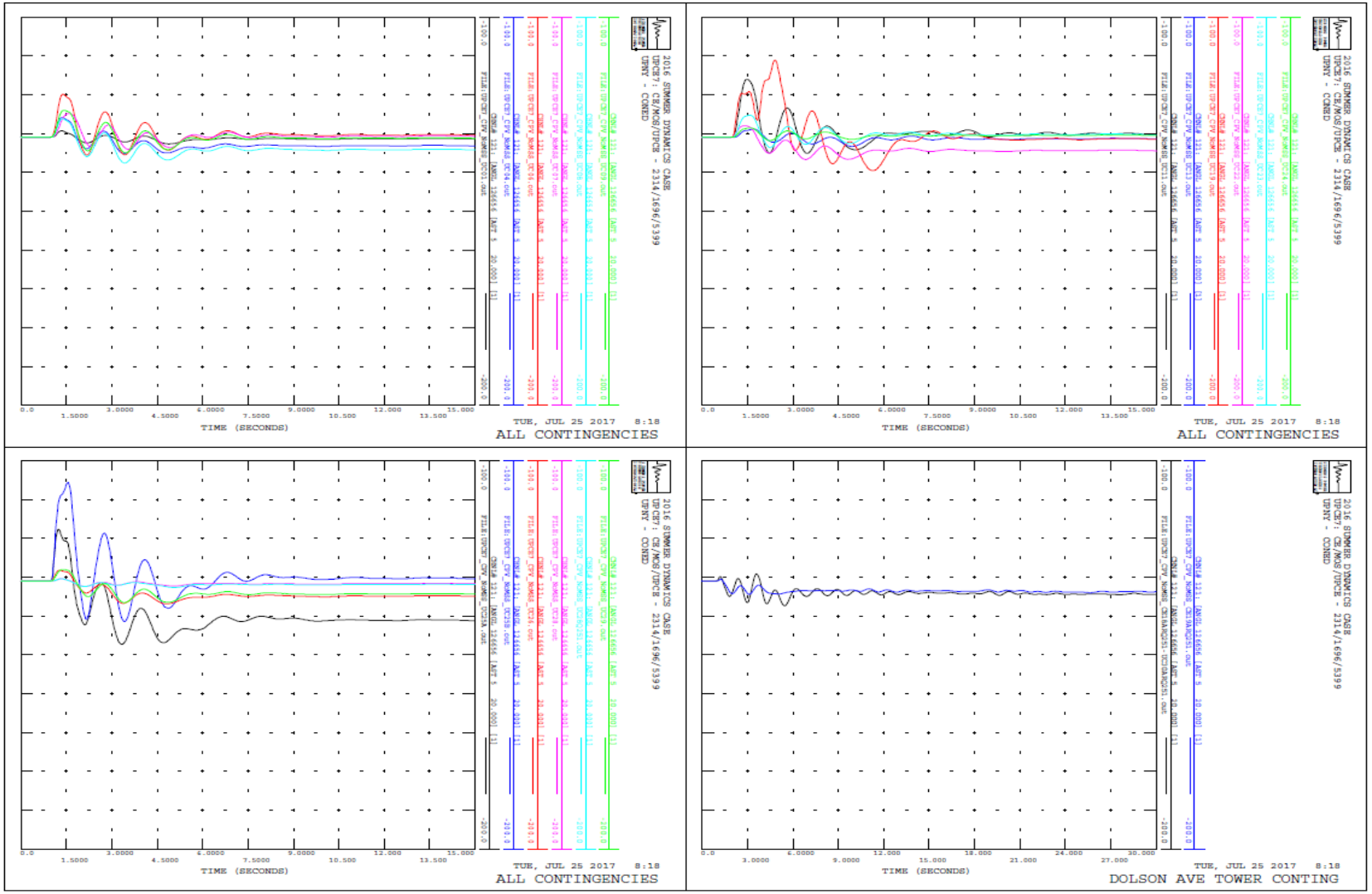
Appendix 8 - Y94 Out of Service, CESR In-Service, MSSC Out of Service (1 of 2)

Test Level Interface Power Flow Summary and Key Voltages

Interface	DYSINGER-EAST	WEST-CENTRAL	VOLNEY-EAST	MOSES-SOUTH	CENTRAL-EAST	UPNY-SENY	UPNY-CONED	MILLWOOD-SO	DNWDIE-SO-PL	DNWDIE-SO-OP	SENY-115kV	PJM-NY	ON-NY	NE-NY-WCSC
MW	2204	886	3235	1696	2314	6597	5399	8141	3880	2881	349	1552	1801	1045
MVAr	-82	-42	-89	-64	-429	631	11	-198	-626	11	-92	505	76	-85

Bus Number	Bus Name	Base kV	Voltage(pu)	Bus Number	Bus Name	Base kV	Voltage(pu)
137200	EDIC	345	1.017	147828	MASS 765	765	1.0155
137453	N.SCOT99	345	1.0341	147827	MARCY765	765	0.9798
130750	COOPC345	345	1.0175	126250	RAMAPO 5	500	0.9605
126260	BOWLINE1	345	1.0289	125001	ROCK TAV	345	1.0227
126263	BUCHANAN S	345	1.0201	130757	WATRC345	345	1.0055
130753	FRASR345	345	1.0333	126291	MILLWOOD	345	1.0169
147831	GILB 345	345	1.0438	126281	E FISHKILL	345	1.0182
126290	LADENTWN	345	1.0256	130757	WATRC345	345	1.0055
137451	LEEDS 3	345	1.0353	126294	PLTVLLEY	345	1.009
147833	MARCY T1	345	1.02	125002	ROSETON	345	1.03
147834	NIAG 345	345	1.0391	137488	BETHLEHE	115	1.022
130755	OAKDL345	345	1.0134	136154	OSWEGO	345	1.0446
126266	DUNWOODIE	345	1.0169	136155	SCRIBA	345	1.0504
126298	SPRAINBROOK	345	1.0188	136156	VOLNEY	345	1.044

Appendix 8 - Y94 Out of Service, CESR In-Service, MSSC Out of Service (2 of 2)



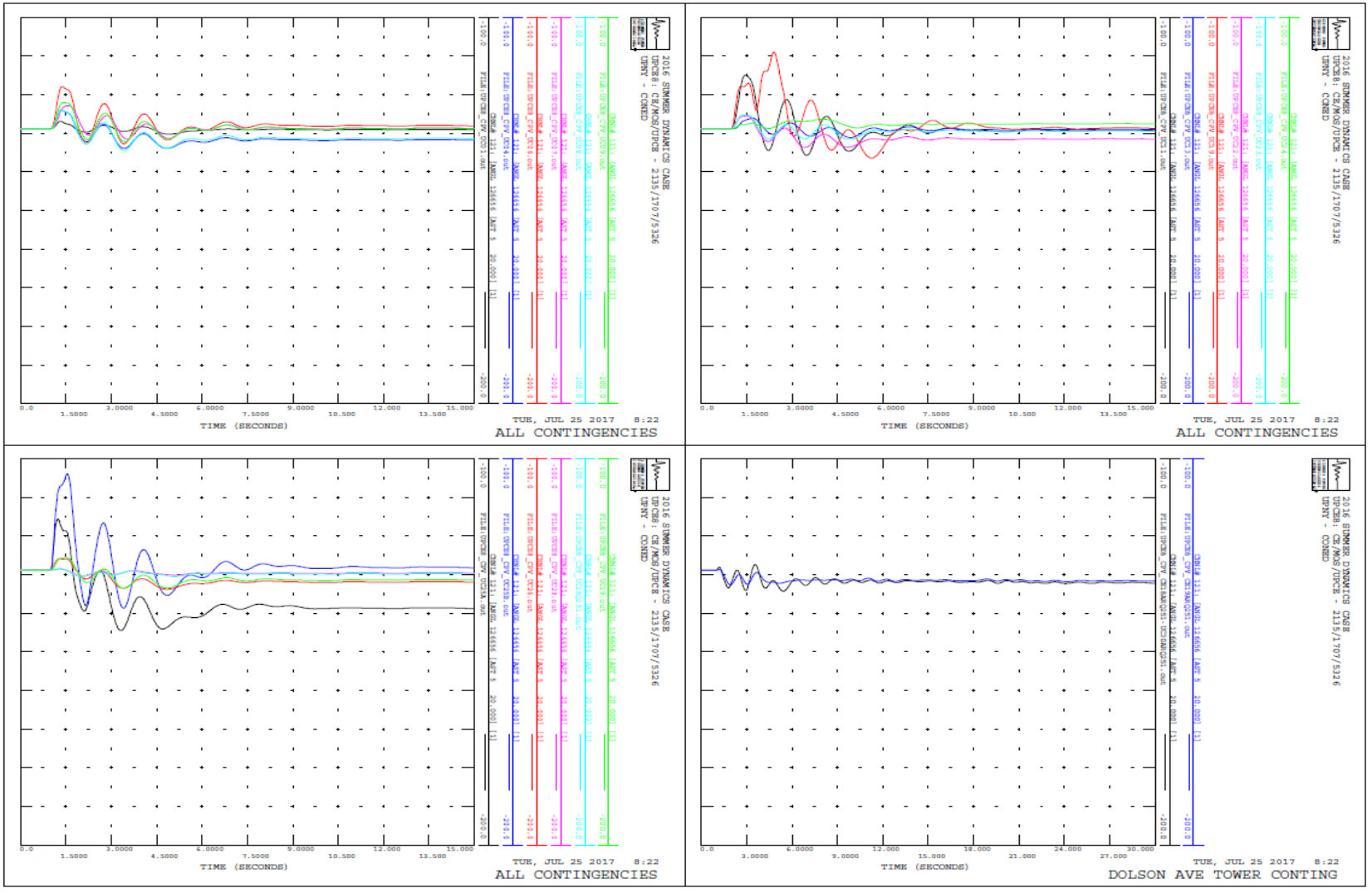
Appendix 9 - RFK305 Out of Service, CESR In-Service, MSSC In-Service (1 of 2)

Test Level Interface Power Flow Summary and Key Voltages

Interface	DYSINGER-EAST	WEST-CENTRAL	VOLNEY-EAST	MOSES-SOUTH	CENTRAL-EAST	UPNY-SENY	UPNY-CONED	MILLWOOD-SO	DNWDIE-SO-PL	DNWDIE-SO-OP	SENY-115kV	PJM-NY	ON-NY	NE-NY-WCSC
MW	2201	883	3215	1707	2135	6588	5326	8065	3811	2880	351	1538	1806	1044
MVAr	-73	-35	-141	-283	-347	745	-199	27	-462	-140	-98	545	80	-13

Bus Number	Bus Name	Base kV	Voltage(pu)	Bus Number	Bus Name	Base kV	Voltage(pu)
137200	EDIC	345	1.0179	147828	MASS 765	765	1.0048
137453	N.SCOT99	345	1.0326	147827	MARCY765	765	0.9991
130750	COOPC345	345	1.0127	126250	RAMAPO 5	500	0.9628
126260	BOWLINE1	345	1.0165	125001	ROCK TAV	345	1.0157
126263	BUCHANAN S	345	1.0038	130757	WATRC345	345	0.9973
130753	FRASR345	345	1.0233	126291	MILLWOOD	345	0.9971
147831	GILB 345	345	1.0396	126281	E FISHKILL	345	0.991
126290	LADENTWN	345	1.0118	130757	WATRC345	345	0.9973
137451	LEEDS 3	345	1.0304	126294	PLTVLLEY	345	0.9864
147833	MARCY T1	345	1.021	125002	ROSETON	345	1.0409
147834	NIAG 345	345	1.0391	137488	BETHLEHE	115	1.024
130755	OAKDL345	345	1.0029	136154	OSWEGO	345	1.0385
126266	DUNWOODIE	345	0.9956	136155	SCRIBA	345	1.0459
126298	SPRAINBROOK	345	0.9966	136156	VOLNEY	345	1.0393

Appendix 9 - RFK305 Out of Service, CESR In-Service, MSSC In-Service (2 of 2)



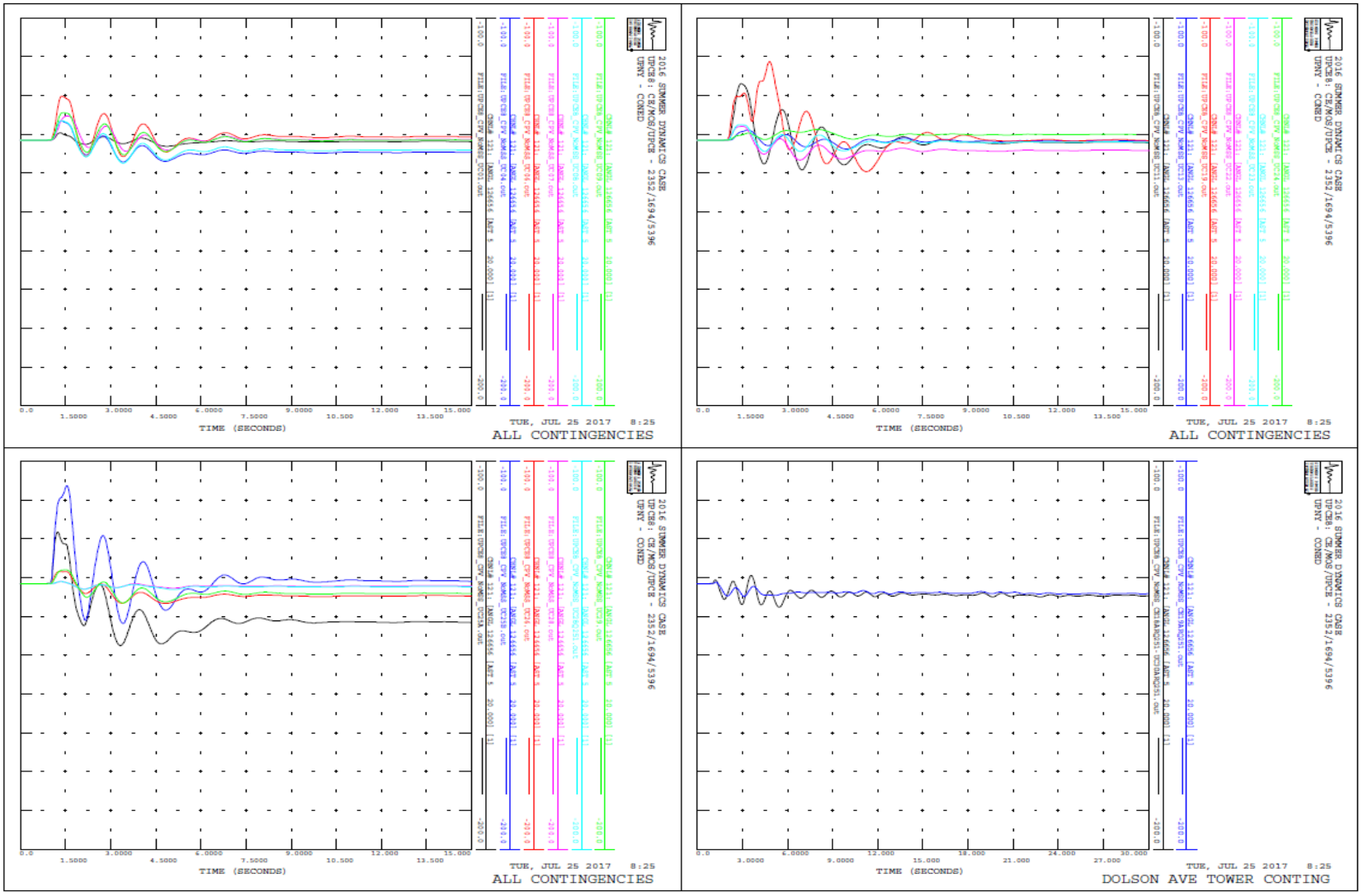
Appendix 10 - RFK305 Out of Service, CESR In-Service, MSSC Out of Service (1 of 2)

Test Level Interface Power Flow Summary and Key Voltages

Interface	DYSINGER-EAST	WEST-CENTRAL	VOLNEY-EAST	MOSES-SOUTH	CENTRAL-EAST	UPNY-SENY	UPNY-CONED	MILLWOOD-SO	DNWDIE-SO-PL	DNWDIE-SO-OP	SENY-115kV	PJM-NY	ON-NY	NE-NY-WCSC
MW	2201	883	3229	1694	2352	6589	5396	8136	3878	2879	361	1547	1798	1045
MVAr	-79	-38	-95	-62	-432	792	-388	-393	-632	-13	-102	530	73	-30

Bus Number	Bus Name	Base kV	Voltage(pu)	Bus Number	Bus Name	Base kV	Voltage(pu)
137200	EDIC	345	1.0161	147828	MASS 765	765	1.015
137453	N.SCOT99	345	1.03	147827	MARCY765	765	0.9791
130750	COOPC345	345	1.0197	126250	RAMAPO 5	500	0.9581
126260	BOWLINE1	345	1.0251	125001	ROCK TAV	345	1.0208
126263	BUCHANAN S	345	1.0156	130757	WATRC345	345	1.0041
130753	FRASR345	345	1.0333	126291	MILLWOOD	345	1.0118
147831	GILB 345	345	1.0412	126281	E FISHKILL	345	1
126290	LADENTWN	345	1.0215	130757	WATRC345	345	1.0041
137451	LEEDS 3	345	1.03	126294	PLTVLLEY	345	0.9937
147833	MARCY T1	345	1.0191	125002	ROSETON	345	1.0424
147834	NIAG 345	345	1.0391	137488	BETHLEHE	115	1.0226
130755	OAKDL345	345	1.0112	136154	OSWEGO	345	1.0442
126266	DUNWOODIE	345	1.0131	136155	SCRIBA	345	1.05
126298	SPRAINBROOK	345	1.0146	136156	VOLNEY	345	1.0436

Appendix 10 - RFK305 Out of Service, CESR In-Service, MSSC Out of Service (2 of 2)



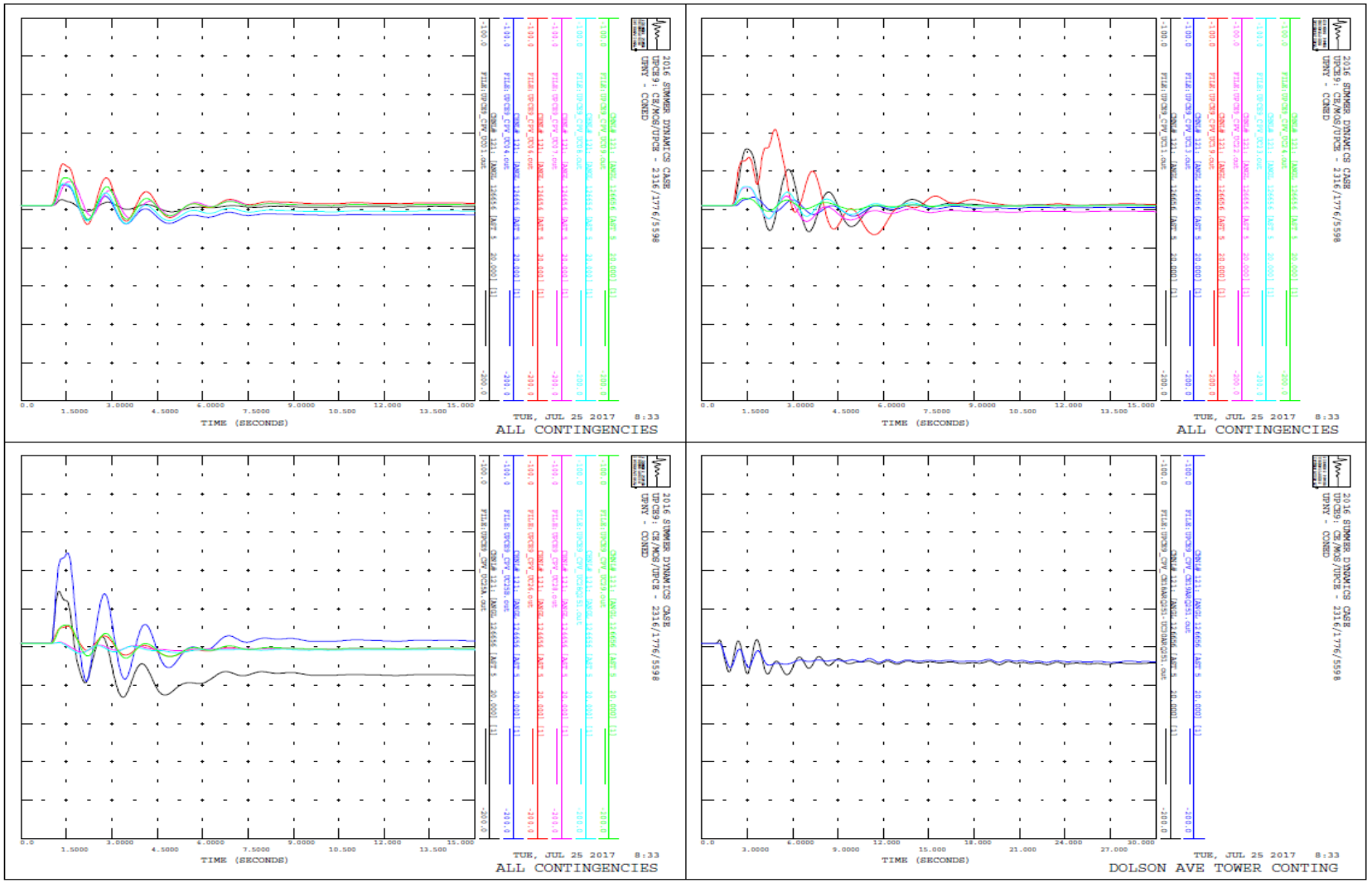
Appendix 11 - 5018 Out of Service, CESR In-Service, MSSC In-Service (1 of 2)

Test Level Interface Power Flow Summary and Key Voltages

Interface	DYSINGER-EAST	WEST-CENTRAL	VOLNEY-EAST	MOSES-SOUTH	CENTRAL-EAST	UPNY-SENY	UPNY-CONED	MILLWOOD-SO	DNWDIE-SO-PL	DNWDIE-SO-OP	SENY-115kV	PJM-NY	ON-NY	NE-NY-WCSC
MW	2333	1000	3781	1778	2316	6244	5598	8269	4081	3084	377	1418	1930	1045
MVAr	-46	-74	27	-227	-419	85	-53	139	-569	-143	-103	146	44	33

Bus Number	Bus Name	Base kV	Voltage(pu)	Bus Number	Bus Name	Base kV	Voltage(pu)
137200	EDIC	345	1.0056	147828	MASS 765	765	0.9979
137453	N.SCOT99	345	1.0165	147827	MARCY765	765	0.987
130750	COOPC345	345	0.976	126250	RAMAPO 5	500	0.9908
126260	BOWLINE1	345	1.0051	125001	ROCK TAV	345	0.9884
126263	BUCHANAN S	345	0.9942	130757	WATRC345	345	0.9935
130753	FRASR345	345	1.0085	126291	MILLWOOD	345	0.9873
147831	GILB 345	345	1.0265	126281	E FISHKILL	345	0.9908
126290	LADENTWN	345	0.999	130757	WATRC345	345	0.9935
137451	LEEDS 3	345	1.0164	126294	PLTVLLEY	345	0.9827
147833	MARCY T1	345	1.0077	125002	ROSETON	345	1.0033
147834	NIAG 345	345	1.0381	137488	BETHLEHE	115	1.0237
130755	OAKDL345	345	1.0044	136154	OSWEGO	345	1.0407
126266	DUNWOODIE	345	0.9856	136155	SCRIBA	345	1.0469
126298	SPRAINBROOK	345	0.9865	136156	VOLNEY	345	1.0394

Appendix 11 - 5018 Out of Service, CESR In-Service, MSSC In-Service (2 of 2)



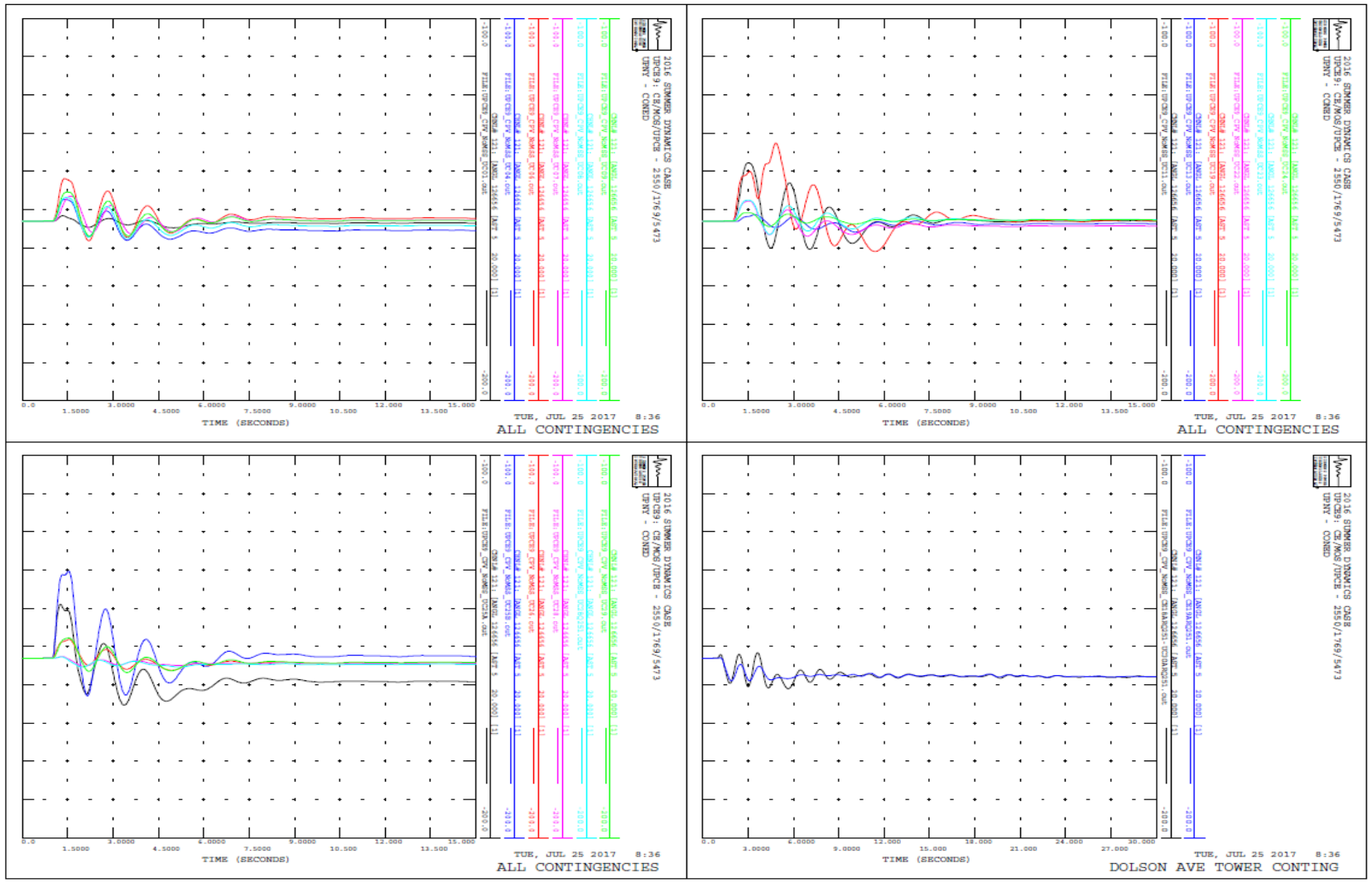
Appendix 12 - 5018 Out of Service, CESR In-Service, MSSC Out of Service (1 of 2)

Test Level Interface Power Flow Summary and Key Voltages

Interface	DYSINGER-EAST	WEST-CENTRAL	VOLNEY-EAST	MOSES-SOUTH	CENTRAL-EAST	UPNY-SENY	UPNY-CONED	MILLWOOD-SO	DNWDIE-SO-PL	DNWDIE-SO-OP	SENY-115kV	PJM-NY	ON-NY	NE-NY-WCSC
MW	2352	1024	3717	1769	2550	6432	5473	8531	3953	2952	401	1412	1937	1044
MVAr	-32	-72	-17	-15	-460	-15	-322	-312	-727	-88	-94	135	52	77

Bus Number	Bus Name	Base kV	Voltage(pu)	Bus Number	Bus Name	Base kV	Voltage(pu)
137200	EDIC	345	1.005	147828	MASS 765	765	1.0091
137453	N.SCOT99	345	1.0032	147827	MARCY765	765	0.9691
130750	COOPC345	345	0.9776	126250	RAMAPO 5	500	0.9757
126260	BOWLINE1	345	1.0104	125001	ROCK TAV	345	0.9935
126263	BUCHANAN S	345	1.0024	130757	WATRC345	345	0.9866
130753	FRASR345	345	0.9999	126291	MILLWOOD	345	0.9977
147831	GILB 345	345	1.0165	126281	E FISHKILL	345	0.991
126290	LADENTWN	345	1.0051	130757	WATRC345	345	0.9866
137451	LEEDS 3	345	1.0029	126294	PLTVLLEY	345	0.9803
147833	MARCY T1	345	1.008	125002	ROSETON	345	1.0026
147834	NIAG 345	345	1.0374	137488	BETHLEHE	115	1.0223
130755	OAKDL345	345	0.999	136154	OSWEGO	345	1.0389
126266	DUNWOODIE	345	0.9997	136155	SCRIBA	345	1.0446
126298	SPRAINBROOK	345	1.0011	136156	VOLNEY	345	1.0373

Appendix 12 - 5018 Out of Service, CESR In-Service, MSSC Out of Service (2 of 2)



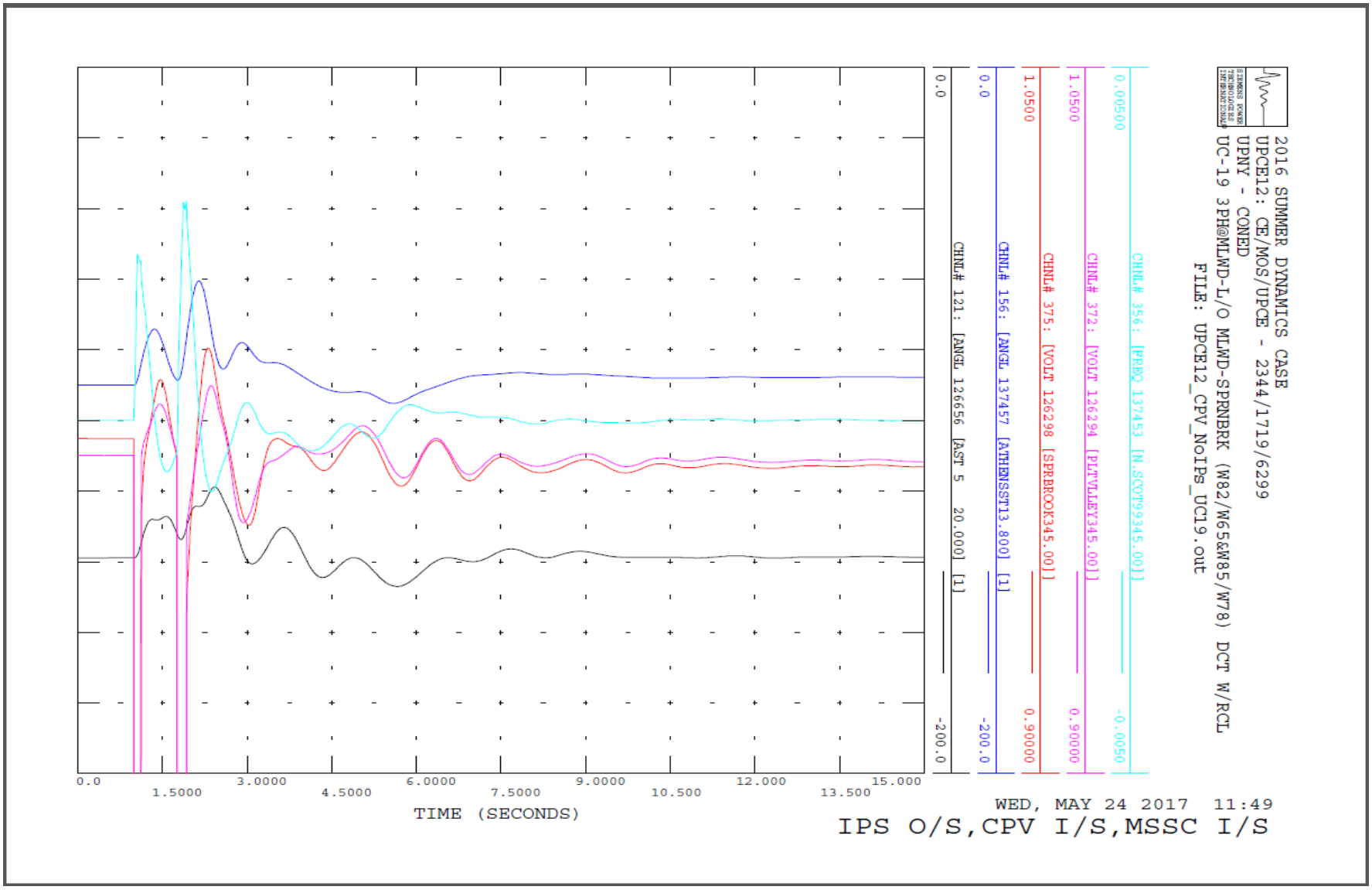
Appendix 13 - IP 2&3 Out of Service, CPV Valley In-Service, CESR In-Service, MSSC In-Service (1 of 2)

Test Level Interface Power Flow Summary and Key Voltages

Interface	DYSINGER-EAST	WEST-CENTRAL	VOLNEY-EAST	MOSES-SOUTH	CENTRAL-EAST	UPNY-SENY	UPNY-CONED	MILLWOOD-SO	DNWDIE-SO-PL	DNWDIE-SO-OP	SENY-115kV	PJM-NY	ON-NY	NE-NY-WCSC
MW	2183	865	3823	1719	2344	7569	6299	8393	4128	3200	387	1550	1805	1044
MVAr	-69	-32	97	-228	-403	726	454	-130	-832	-413	-84	708	71	82

Bus Number	Bus Name	Base kV	Voltage(pu)	Bus Number	Bus Name	Base kV	Voltage(pu)
137200	EDIC	345	1.0046	147828	MASS 765	765	0.999
137453	N.SCOT99	345	1.0121	147827	MARCY765	765	0.9868
130750	COOPC345	345	0.9734	126250	RAMAPO 5	500	0.9513
126260	BOWLINE1	345	0.9952	125001	ROCK TAV	345	0.9832
126263	BUCHANAN S	345	0.9758	130757	WATRC345	345	0.9972
130753	FRASR345	345	1.0082	126291	MILLWOOD	345	0.9697
147831	GILB 345	345	1.0262	126281	E FISHKILL	345	0.9759
126290	LADENTWN	345	0.9878	130757	WATRC345	345	0.9972
137451	LEEDS 3	345	1.0054	126294	PLTVLLEY	345	0.9676
147833	MARCY T1	345	1.0067	125002	ROSETON	345	0.9908
147834	NIAG 345	345	1.0392	137488	BETHLEHE	115	1.0249
130755	OAKDL345	345	1.006	136154	OSWEGO	345	1.0456
126266	DUNWOODIE	345	0.9707	136155	SCRIBA	345	1.0495
126298	SPRAINBROOK	345	0.9711	136156	VOLNEY	345	1.0425

Appendix 13 - IP 2&3 Out of Service, CPV Valley In-Service, CESR In-Service, MSSC In-Service (2 of 2)



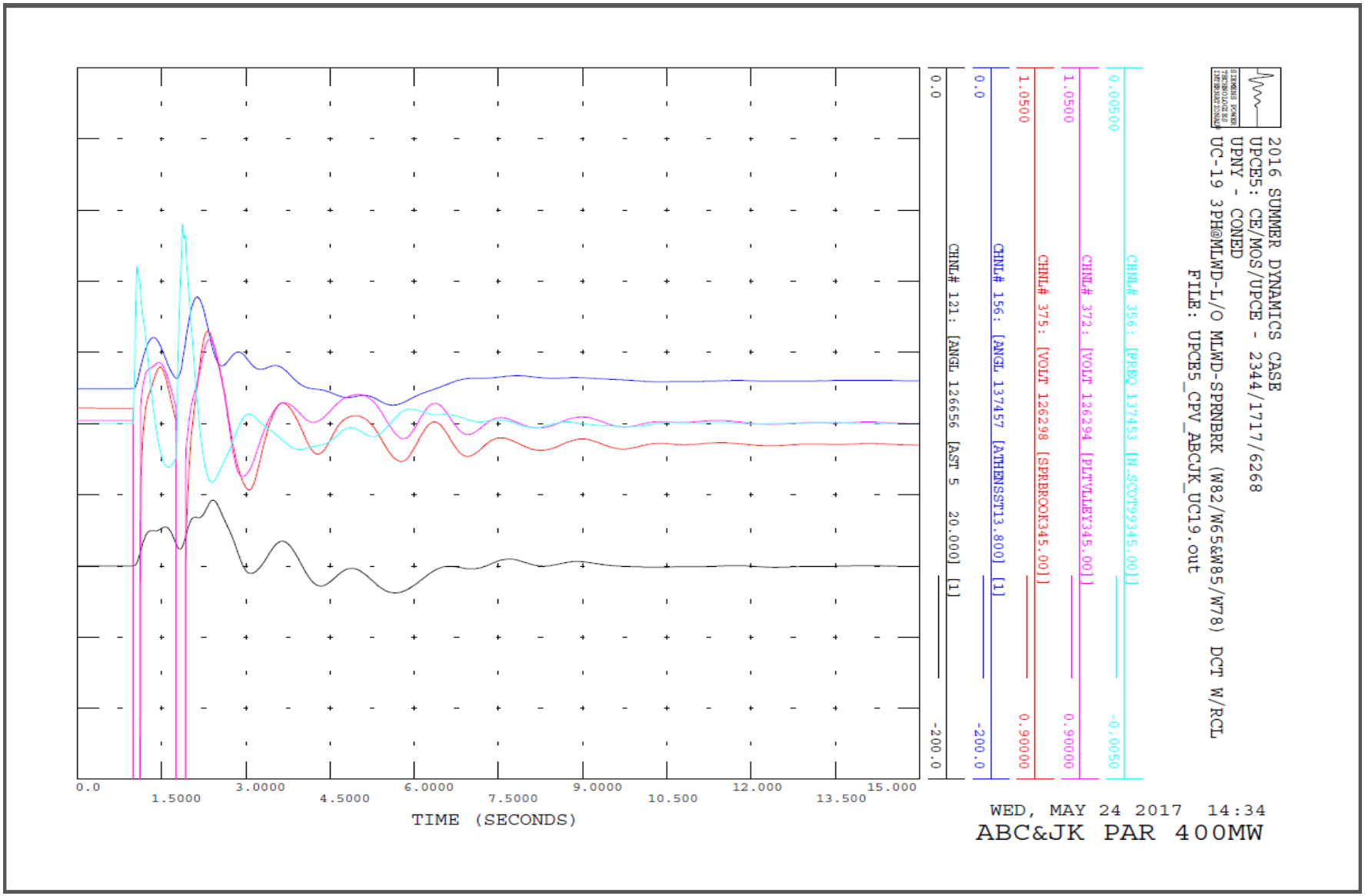
Appendix 14 - All Lines In-Service, MSSC In-Service, 400MW OBF(1 of 2)

Test Level Interface Power Flow Summary and Key Voltages

Interface	DYSINGER-EAST	WEST-CENTRAL	VOLNEY-EAST	MOSES-SOUTH	CENTRAL-EAST	UPNY-SENY	UPNY-CONED	MILLWOOD-SO	DNWDIE-SO-PL	DNWDIE-SO-OP	SENY-115kV	PJM-NY	ON-NY	NE-NY-WCSC
MW	2178	860	3814	1717	2344	7536	6267	8425	4747	3819	396	1557	1801	1044
MVAr	-71	-20	40	-239	-388	635	144	276	-706	-79	-104	663	68	60

Bus Number	Bus Name	Base kV	Voltage(pu)	Bus Number	Bus Name	Base kV	Voltage(pu)
137200	EDIC	345	1.0067	147828	MASS 765	765	0.9998
137453	N.SCOT99	345	1.0115	147827	MARCY765	765	0.9885
130750	COOPC345	345	0.9737	126250	RAMAPO 5	500	0.9586
126260	BOWLINE1	345	1.0088	125001	ROCK TAV	345	0.9892
126263	BUCHANAN S	345	0.9928	130757	WATRC345	345	0.9998
130753	FRASR345	345	1.01	126291	MILLWOOD	345	0.9818
147831	GILB 345	345	1.0285	126281	E FISHKILL	345	0.9848
126290	LADENTWN	345	1.0029	130757	WATRC345	345	0.9998
137451	LEEDS 3	345	1.0089	126294	PLTVLLEY	345	0.9756
147833	MARCY T1	345	1.0087	125002	ROSETON	345	0.9999
147834	NIAG 345	345	1.0393	137488	BETHLEHE	115	1.0264
130755	OAKDL345	345	1.0075	136154	OSWEGO	345	1.0404
126266	DUNWOODIE	345	0.9774	136155	SCRIBA	345	1.0473
126298	SPRAINBROOK	345	0.9783	136156	VOLNEY	345	1.0395

Appendix 14 - All Lines In-Service, MSSC In-Service, 400MW OBF (2 of 2)



Appendix 15 - All Lines In-Service, MSSC In-Service, 0MW OBF(1 of 2)

Test Level Interface Power Flow Summary and Key Voltages

Interface	DYSINGER-EAST	WEST-CENTRAL	VOLNEY-EAST	MOSES-SOUTH	CENTRAL-EAST	UPNY-SENY	UPNY-CONED	MILLWOOD-SO	DNWDIE-SO-PL	DNWDIE-SO-OP	SENY-115kV	PJM-NY	ON-NY	NE-NY-WCSC
MW	2185	867	3826	1720	2347	7152	6283	8026	4764	3835	376	1550	1808	1044
MVAr	-80	-32	-43	-268	-418	429	68	256	-615	-7	-105	492	65	-41

Bus Number	Bus Name	Base kV	Voltage(pu)	Bus Number	Bus Name	Base kV	Voltage(pu)
137200	EDIC	345	1.0133	147828	MASS 765	765	1.0025
137453	N.SCOT99	345	1.0265	147827	MARCY765	765	0.9944
130750	COOPC345	345	0.998	126250	RAMAPO 5	500	0.9738
126260	BOWLINE1	345	1.0224	125001	ROCK TAV	345	1.0118
126263	BUCHANAN S	345	1.0108	130757	WATRC345	345	1.0045
130753	FRASR345	345	1.0239	126291	MILLWOOD	345	1.0013
147831	GILB 345	345	1.0394	126281	E FISHKILL	345	1.0069
126290	LADENTWN	345	1.0182	130757	WATRC345	345	1.0045
137451	LEEDS 3	345	1.0279	126294	PLTVLLEY	345	0.9977
147833	MARCY T1	345	1.0157	125002	ROSETON	345	1.0212
147834	NIAG 345	345	1.0396	137488	BETHLEHE	115	1.0261
130755	OAKDL345	345	1.0146	136154	OSWEGO	345	1.0421
126266	DUNWOODIE	345	0.9961	136155	SCRIBA	345	1.049
126298	SPRAINBROOK	345	0.9972	136156	VOLNEY	345	1.0416

Appendix 15 - All Lines In-Service, MSSC In-Service, 0MW OBF (2 of 2)