Southwest Power Pool

System Impact Study Report
Offsite Nuclear Analysis
PID 204
1522 MW (1612 MW Gross) Plant, Fancy PT, LA

Prepared by:

Southwest Power Pool, Independent Coordinator of Transmission (SPP ICT)
415 North McKinley, Suite 140
Little Rock, AR 72205

Rev	Issue Date	Description of Revision	Revised By	Project Manager
0	8/31/2007	Final for Review	BMH	JDH
1	9/14/2007	Added CCT Clarification	BMH	JDH
2	9/24/2007	Modified the upgrades for PID 204	BMH	JDH

Report on the Offsite Study for Fancy PT. Unit #2 (PID-204) 1522 MW (1612 MW Gross)

DRAFT REPORT

Issued: August 30, 2007
Revised September 12, 2007

Prepared for: **Southwest Power Pool / ICT**

Submitted by:

Grid Systems Consulting
ABB Inc.
940 Main Campus Drive, Suite 300
Raleigh, NC 27606

Legal Notice

TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

Technical Report

Off Site Study for Riverbend Unit #2 (PID-204)	Grid Systems Consulting	Date 8/30/2007	Pages 45

Author:	Reviewed by:	Approved by:
Amit Kekare	William Quaintance	Willie Wong

Executive Summary

Southwest Power Pool (SPP) has commissioned ABB Inc. to conduct an offsite power analysis of the proposed nuclear unit (PID-204) at Fancy PT. 500 kV. Offsite power is the preferred power source for nuclear power stations. The true capability of offsite power cannot be verified through direct readings of plant switchyard or safety bus voltages, but through analyses of grid and plant conditions considering the occurrence of severe contingencies representing the partial loss of grid support. The objective of this analysis is to identify if the Entergy System configuration will comply with the Code of Federal Regulations (CFR) specifically with respect to the grid voltage performance and the reliability of the Offsite Power Supply for Riverbend Unit #2 (PID-204).

The steady-state analysis was conducted to determine the voltage levels at Fancy PT. 500 kV and 115 kV buses following various outage contingencies on the transmission system during projected 2012 summer peak and 2012 off-peak load conditions. The System Impact Study for PID-204 was performed on summer peak 2012 load conditions. The results of the stability analysis for the summer peak 2012 system conditions from System Impact Study are also applicable for this offsite analysis. Hence, stability analysis was performed only on 2012 off-peak load conditions. Critical Clearing Time assessment was performed to determine the critical clearing times for faults at the Fancy PT. 500 kV and adjacent substations.

Per the '*Nuclear Management Manual ENS-DC-199 Rev-2*' the acceptable steady-state post-contingency voltage range at Fancy PT 230 kV is 0.9565 p.u to 1.0522 p.u. No voltage violation was observed following simulated contingencies. The lowest voltage at Fancy PT 230 kV (0.9977 p.u) was observed following '*LINE+GEN-1*' contingency.

There is no established voltage criterion for Fancy PT 500 kV for Off-site power supply. The lowest voltage at Fancy PT. 500 kV (1.0111 p.u.) was observed following contingency '*GEN-4*' – Loss of B. Cajun #2 units (1778 MW).

The results of the offsite analysis study indicate that there are no stability criteria violations associated after interconnection of the Proposed PID-204 Unit # 2.

After addition of Riverbend Unit #2 (PID-204), the Critical Clearing Times at the Fancy PT. 500 and 230 kV substations are expected to provide at least a 1 cycle margin above the standard breaker failure clearing times.

The results of this study are based on available data and assumptions made at the time this study was conducted. The results included in this report may not apply if any of the data and/or assumptions made in developing the study models change.

Rev No.	Revision Description	Date	Authored by	Reviewed by	Approved by
0	Draft Report	8/30/2007	A. Kekare	W. Quaintance	W. Wong
1	Draft Report	9/12/2007	A. Kekare	W. Quaintance	W. Wong

DISTRIBUTION:

Jason Russell, Southwest Power Pool
Mukund Chander, Entergy Services Inc.

1 INTRODUCTION

Southwest Power Pool (SPP) has commissioned ABB Inc. to conduct the offsite analysis of the proposed new nuclear unit (PID-204) at Fancy PT. 500 kV. Offsite power is the preferred power source for nuclear power stations. The true capability of offsite power cannot be verified through direct readings of plant switchyard or safety bus voltages, but through analyses of grid and plant conditions considering the occurrence of severe contingencies representing the partial loss of grid support. The objective of this analysis is to identify if the Entergy System configuration will comply with the Code of Federal Regulations (CFR) specifically with respect to the grid voltage performance and the reliability of the Offsite Power Supply for Riverbend Unit #2 (PID-204).

Entergy proposes to install a nuclear unit facility with a maximum capacity of 1933 MVA. The gross power output of the generator is 1612 MW. An auxiliary/host load of approximately 90 MW is expected at this site. PID-204 will inject a net power of approximately 1522 MW into the Entergy transmission system. The proposed in-service date for this facility is January 2015. Figure 1-1 shows the bus configuration at Fancy PT. 500 kV after interconnection of Riverbend Unit #2 (PID-204). The following upgrades/changes identified for PID-204 were included in the study models (see Figure 1-2 for details).

- Build 56 miles 500 kV line from Webre – Richard 500 kV line included with PID 203.
- Build 140 miles 500 kV line from Fancy Point 500 kV – tap Hartburg/MT. Olive 500kV line near Toledo Bend including 2 river crossing.
- Upgrade Verdine – PPG 230kV

The steady-state analysis was conducted to determine the voltage levels at Fancy PT. 500 kV and 230 kV buses during various outage contingencies on the transmission system at 2012 summer peak and 2012 off-peak load conditions. The System Impact Study for PID-204 was performed on summer peak 2012 load conditions (Refer the report PID-204 System Impact Study). The results of the stability analysis for the summer peak 2012 system conditions from System Impact Study are also applicable for this offsite analysis. Hence, stability analysis was performed only on 2012 off-peak load conditions.

The report is organized as follows

Section 2 - Model Development
Section 3 - Steady State analysis
Section 4 - Stability Analysis
Section 5 - Critical Clearing Time Analysis
Section 6 - Conclusions

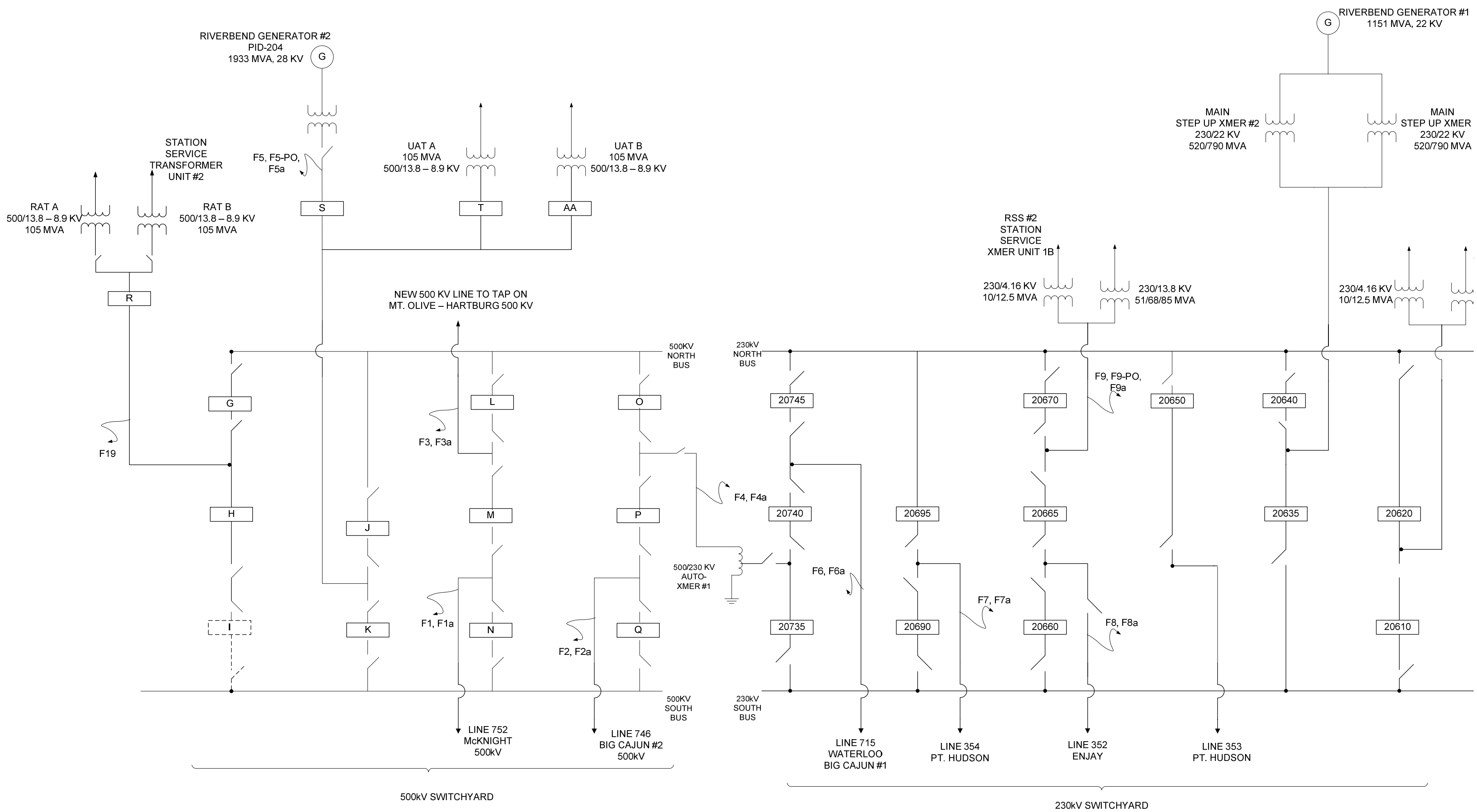


Figure 1-1: Bus Configuration of Fancy PT. 500/230 kV substation after interconnection of Riverbend Unit #2 (PID-204)

Note :- Substation Layout diagram for Fancy PT. 500/230 kV substation ***without*** *Riverbend Unit #2 (PID-204) is included in Appendix IV for reference.*

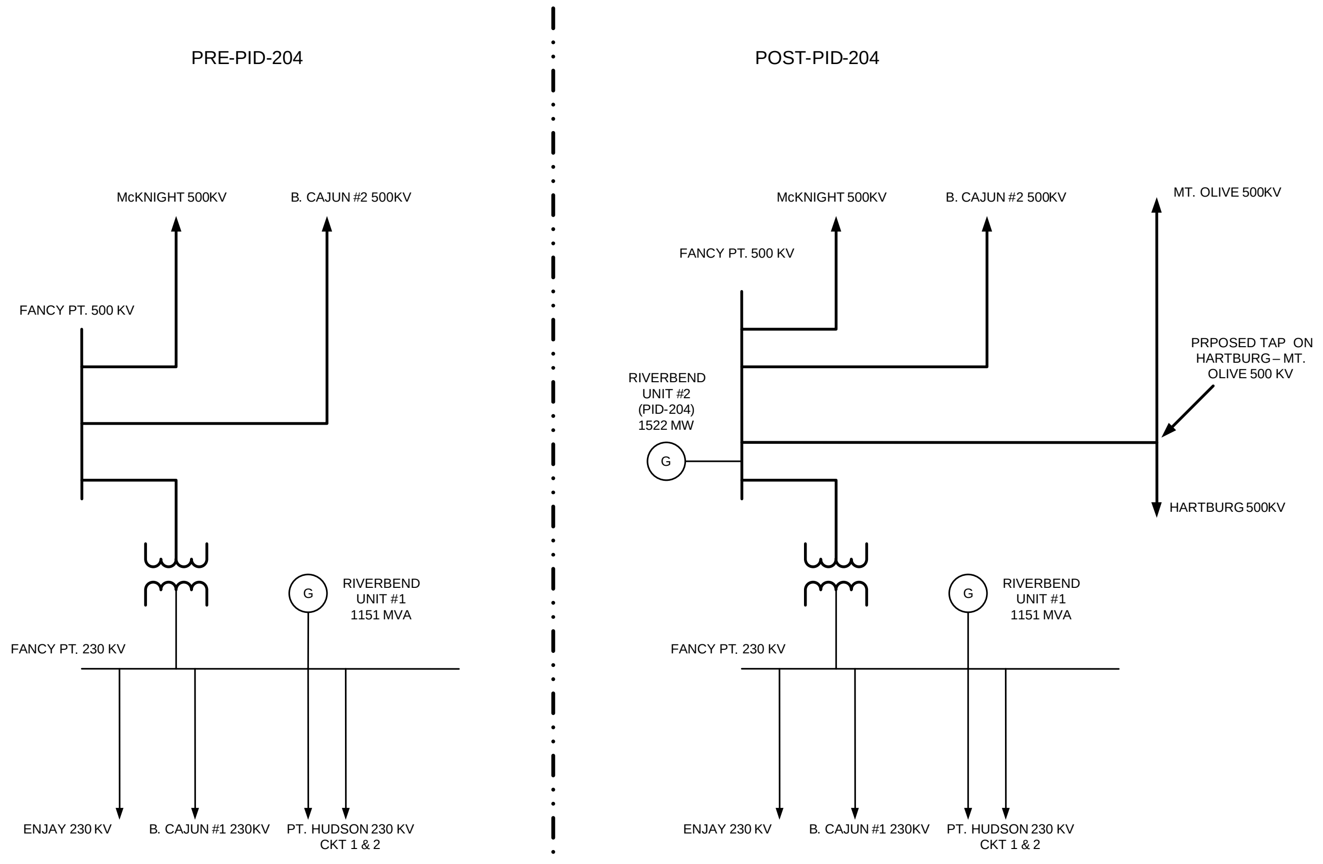


Figure 1-2: Transmission line configuration at Fancy PT. 500 kV with and without PID-204

2 STUDY METHODOLOGY & ASSUMPTIONS

2.1 STUDY DATA

Entergy provided 2012 summer peak and 2012 off-peak load base cases. The dynamic database (snapshot file) used for System Impact Study of PID-204 was used for the stability analysis.

The steady state and dynamic data for Riverbend Unit #1 and Unit #2 (PID-204) used in offsite analysis is listed in Appendix I for reference.

2.2 STEADY STATE ANALYSIS

In discussion with SPP/ICT, Entergy Transmission Planning, and Riverbend substation personnel, the following scenarios were considered for steady state analysis

- Riverbend Unit #1 and Unit #2 (PID-204) on-line
- Riverbend Unit #2 (PID-204) off-line
- Riverbend Unit #1 and Unit #2 (PID-204) off-line

SPP provided the list of IPP generators in the Entergy system for dispatching Riverbend Unit #1 and Unit #2 during steady-state analysis. The list is included in Appendix II for reference.

The off-site power supply for Riverbend Unit #2 (PID-204) is Fancy PT. 500 kV and for Riverbend Unit #1 is Fancy PT. 230 kV. The voltages at Fancy PT. 500 kV and Fancy PT. 230 kV buses were monitored for system intact and contingency conditions. Table 2-1 lists the contingencies simulated for steady state analysis. This list was provided by Entergy transmission planning group and the Riverbend substation personnel.

Per the '*Nuclear Management Manual ENS-DC-199 Rev-2*' the steady-state voltage criteria for Fancy PT. 230 kV is as shown below.

BUS	LOW VOLTAGE LIMIT		HIGH VOLTAGE LIMIT	
	kV	p.u.	kV	p.u.
Fancy PT.230 KV	220.0	0.9565	242.0	1.0522

Table 2-1: List of Contingencies for Steady State Analysis

CONTINGENCY				
NO	**NAME**	**DESCRIPTION**	**RBS UNIT #1**	**RBS UNIT #2 (PID-204)**
1	BASE CASE	BASE CASE	ON	ON
			ON	OFF
			OFF	ON
			OFF	OFF
2	LINE-1	Loss of Fancy PT. - B. Cajun 230 kV CKT 1		
3	LINE-2	Loss of Fancy PT. - PT. Hudson 230 kV CKT 1		
4	LINE-3	Loss of Fancy PT. - PT. Hudson 230 kV CKT 1 & 2		
5	LINE-4	Loss of Fancy PT. - Enjay 230 kV CKT 1		
6	LINE-5	Loss of Fancy PT. - Enjay 230 kV CKT 1 & Loss of Fancy PT. - PT. Hudson 230 kV CKT 1		
7	LINE-6	Loss of Fancy PT. - B. Cajun #2 500 kV CKT 1		
8	LINE-7	Loss of Fancy PT. - McKnight 500 kV CKT 1		
9	LINE-8	Loss of Fancy PT. - Tap MT Olive - Hartburg 500 kV CKT 1	ON	OFF
10	LINE-9	Loss of B. Cajun #2 - Weber 500 kV CKT 1		
11	GEN-1	Loss of G. Gulf Generation (1322 MW)		
12	GEN-2	Loss o Waterford Unit #3 (1197 MW)		
13	GEN-3	Loss of B. Cajun #1 230 kV Units (480 MW)		
14	GEN-4	Loss of B. Cajun #2 500 kV Units (1778 MW)		
15	GEN-5	Loss of Willow Glenn Unit #4 & #5 (1118 MW)		
16	LINE+GEN-1	Loss of Autotransformer 500/230 kV at Fancy PT & B. Cajun #1 Units (480 MW)		
17	LINE-1	Loss of Fancy PT. - B. Cajun 230 kV CKT 1		
18	LINE-2	Loss of Fancy PT. - PT. Hudson 230 kV CKT 1		
19	LINE-3	Loss of Fancy PT. - PT. Hudson 230 kV CKT 1 & 2		
20	LINE-4	Loss of Fancy PT. - Enjay 230 kV CKT 1		
21	LINE-5	Loss of Fancy PT. - Enjay 230 kV CKT 1 & Loss of Fancy PT. - PT. Hudson 230 kV CKT 1		
22	LINE-6	Loss of Fancy PT. - B. Cajun #2 500 kV CKT 1		
23	LINE-7	Loss of Fancy PT. - McKnight 500 kV CKT 1		
24	LINE-8	Loss of Fancy PT. - Tap MT Olive - Hartburg 500 kV CKT 1	OFF	OFF
25	LINE-9	Loss of B. Cajun #2 - Weber 500 kV CKT 1		
26	GEN-1	Loss of G. Gulf Generation (1322 MW)		
27	GEN-2	Loss o Waterford Unit #3 (1197 MW)		
28	GEN-3	Loss of B. Cajun #1 230 kV Units (480 MW)		
29	GEN-4	Loss of B. Cajun #2 500 kV Units (1778 MW)		
30	GEN-5	Loss of Willow Glenn Unit #4 & #5 (1118 MW)		
31	LINE+GEN-1	Loss of Autotransformer 500/230 kV at Fancy PT & B. Cajun #1 Units (480 MW)		

2.3 STABILITY ANALYSIS

The purpose of the stability analysis was to determine whether the system would be stable following selected contingencies. Several generators including both Riverbend (Unit #1 and Unit #2) were monitored to check for the first swing instability. The unstable generators, if any, were flagged and reported in the stability analysis result.

As previously mentioned the system impact study results for PID-204 for 2012 summer peak system conditions were considered applicable for this offsite analysis. Hence, stability analysis was performed only on 2012 off-peak system condition. All the contingencies simulated in the system impact study for PID-204 were repeated on the off-peak 2012 system condition.

2.4 CRITICAL CLEARING TIME

An evaluation of the critical clearing times was carried out for fault cases at the following substations:

- Fancy PT. 500 kV
- Fancy PT 230 kV

Critical Clearing Time assessment was performed on 2012 summer peak and 2012 off-peak system conditions.

Critical Clearing Time (CCT) was calculated for a three-phase stuck-breaker (IPO: 3PH-1PH) fault for each element in the above two (2) substations. The Normal Clearing Time was kept equal to the normal value (5 cycles on 500 kV and 6 cycles on 230 kV) and the backup clearing time was varied to find the CCT. All machines in the Entergy system were monitored for angle stability.

3 STEADY STATE ANALYSIS

The contingencies listed in Table 2-1 were simulated on 2012 summer peak and 2012 off-peak load conditions. The voltages at Fancy PT. 500 kV and Fancy PT. 230 kV were monitored following the contingencies. Figure 3-1 and Figure 3-2 show the power flow diagrams for 2012 summer peak and 2012 off-peak system conditions with both Riverbend units #1 and #2 (PID-204) on-line.

Table 3-1 lists the voltages at Fancy PT. 500 kV and 230 kV buses for all the simulated contingencies.

Fancy PT 230 kV

Per the '*Nuclear Management Manual ENS-DC-199 Rev-2*' the acceptable steady-state post-contingency voltage range at Riverbend 230 kV is 0.9565 p.u to 1.0522 p.u. No voltage criteria violation was observed following simulated contingencies (see Table 3-1). The voltage at Riverbend 230 kV was lowest with both Riverbend units off-line following Contingency '*LINE+GEN-1*' - simultaneous loss of Fancy PT 500/230 kV auto-transformer and B. Cajun #1 Units (480 MW). The voltage at Fancy PT. 230 kV following '*LINE+GEN-1*' was 0.9977 p.u.

Fancy PT. 500 kV

As in Pre-Project system conditions there was no nuclear plant connected to Fancy PT. 500 kV, no voltage criteria was established in the '*Nuclear Management Manual ENS-DC-199 Rev-2*' for Off-site Power supply at Fancy PT. 500 kV. Table 3-1 lists the voltage at Fancy PT. 500 kV following simulated contingencies. The lowest voltage observed at Fancy PT. 500 kV was 1.0111 p.u. following contingency '*GEN-1*' – Loss of B. Cajun #2 500 kV units (1778 MW).

Table 3-1: Results of Steady State Analysis

CONTINGENCY					2012 SUMMER PEAK		2012 OFF-PEAK	
NO	**NAME**	**DESCRIPTION**	**RBS UNIT #1**	**RBS UNIT #2 (PID-204)**	**FANCY PT 230 KV**	**FANCY PT 500 KV**	**FANCY PT 230 KV**	**FANCY PT 500 KV**
1	BASE CASE	BASE CASE	ON	ON	1.0145	1.0200	1.0192	1.0200
			ON	OFF	1.0145	1.0199	1.0194	1.0198
			OFF	ON	1.0131	1.0200	1.0159	1.0200
			OFF	OFF	1.0131	1.0198	1.0161	1.0190
2	LINE-1	Loss of Fancy PT. - B. Cajun 230 kV CKT 1	ON	OFF	1.0149	1.0199	1.0194	1.0198
3	LINE-2	Loss of Fancy PT. - PT. Hudson 230 kV CKT 1	ON	OFF	1.0144	1.0199	1.0193	1.0198
4	LINE-3	Loss of Fancy PT. - PT. Hudson 230 kV CKT 1 & 2	ON	OFF	1.0141	1.0198	1.0188	1.0198
5	LINE-4	Loss of Fancy PT. - Enjay 230 kV CKT 1	ON	OFF	1.0146	1.0198	1.0195	1.0198
6	LINE-5	Loss of Fancy PT. - Enjay 230 kV CKT 1 & Loss of Fancy PT. - PT. Hudson 230 kV CKT 1	ON	OFF	1.0145	1.0198	1.0194	1.0198
7	LINE-6	Loss of Fancy PT. - B. Cajun #2 500 kV CKT 1	ON	OFF	1.0144	1.0197	1.0193	1.0186
8	LINE-7	Loss of Fancy PT. - McKnight 500 kV CKT 1	ON	OFF	1.0145	1.0201	1.0194	1.0208
9	LINE-8	Loss of Fancy PT. - Tap MT Olive - Hartburg 500 kV CKT 1	ON	OFF	1.0144	1.0188	1.0192	1.0184
10	LINE-9	Loss of B. Cajun #2 - Weber 500 kV CKT 1	ON	OFF	1.0143	1.0190	1.0190	1.0190
11	GEN-1	Loss of G. Gulf Generation (1322 MW)	ON	OFF	1.0145	1.0199	1.0194	1.0198
12	GEN-2	Loss o Waterford Unit #3 (1197 MW)	ON	OFF	1.0144	1.0196	1.0190	1.0184
13	GEN-3	Loss of B. Cajun #1 230 kV Units (480 MW)	ON	OFF	1.0148	1.0198	1.0194	1.0198
14	GEN-4	Loss of B. Cajun #2 500 kV Units (1778 MW)	ON	OFF	1.0138	1.0136	1.0161	1.0065
15	GEN-5	Loss of Willow Glenn Unit #4 & #5 (1118 MW)	ON	OFF	1.0144	1.0196	1.0193	1.0194
16	LINE+GEN-1	Loss of Autotransformer 500/230 kV at Fancy PT & B. Cajun #1 Units (480 MW)	ON	OFF	1.0143	1.0203	1.0194	1.0198
17	LINE-1	Loss of Fancy PT. - B. Cajun 230 kV CKT 1	OFF	OFF	1.0160	1.0200	1.0168	1.0192
18	LINE-2	Loss of Fancy PT. - PT. Hudson 230 kV CKT 1	OFF	OFF	1.0127	1.0198	1.0154	1.0190
19	LINE-3	Loss of Fancy PT. - PT. Hudson 230 kV CKT 1 & 2	OFF	OFF	1.0117	1.0197	1.0127	1.0189
20	LINE-4	Loss of Fancy PT. - Enjay 230 kV CKT 1	OFF	OFF	1.0137	1.0199	1.0175	1.0192
21	LINE-5	Loss of Fancy PT. - Enjay 230 kV CKT 1 & Loss of Fancy PT. - PT. Hudson 230 kV CKT 1	OFF	OFF	1.0134	1.0198	1.0167	1.0192
22	LINE-6	Loss of Fancy PT. - B. Cajun #2 500 kV CKT 1	OFF	OFF	1.0118	1.0179	1.0109	1.0104
23	LINE-7	Loss of Fancy PT. - McKnight 500 kV CKT 1	OFF	OFF	1.0130	1.0200	1.0165	1.0202

CONTINGENCY					2012 SUMMER PEAK		2012 OFF-PEAK	
NO	**NAME**	**DESCRIPTION**	**RBS UNIT #1**	**RBS UNIT #2 (PID-204)**	**FANCY PT 230 KV**	**FANCY PT 500 KV**	**FANCY PT 230 KV**	**FANCY PT 500 KV**
24	LINE-8	Loss of Fancy PT. - Tap MT Olive - Hartburg 500 kV CKT 1	OFF	OFF	1.0123	1.0184	1.0151	1.0175
25	LINE-9	Loss of B. Cajun #2 - Weber 500 kV CKT 1	OFF	OFF	1.0126	1.0192	1.0145	1.0185
26	GEN-1	Loss of G. Gulf Generation (1322 MW)	OFF	OFF	1.0131	1.0198	1.0162	1.0191
27	GEN-2	Loss o Waterford Unit #3 (1197 MW)	OFF	OFF	1.0127	1.0193	1.0135	1.0173
28	GEN-3	Loss of B. Cajun #1 230 kV Units (480 MW)	OFF	OFF	1.0144	1.0197	1.0161	1.0190
29	GEN-4	Loss of B. Cajun #2 500 kV Units (1778 MW)	OFF	OFF	1.0082	1.0111	1.0000	0.9957
30	GEN-5	Loss of Willow Glenn Unit #4 & #5 (1118 MW)	OFF	OFF	1.0126	1.0194	1.0154	1.0186
31	LINE+GEN-1	Loss of Autotransformer 500/230 kV at Fancy PT & B. Cajun #1 Units (480 MW)	OFF	OFF	0.9977	1.0203	1.0053	1.0195

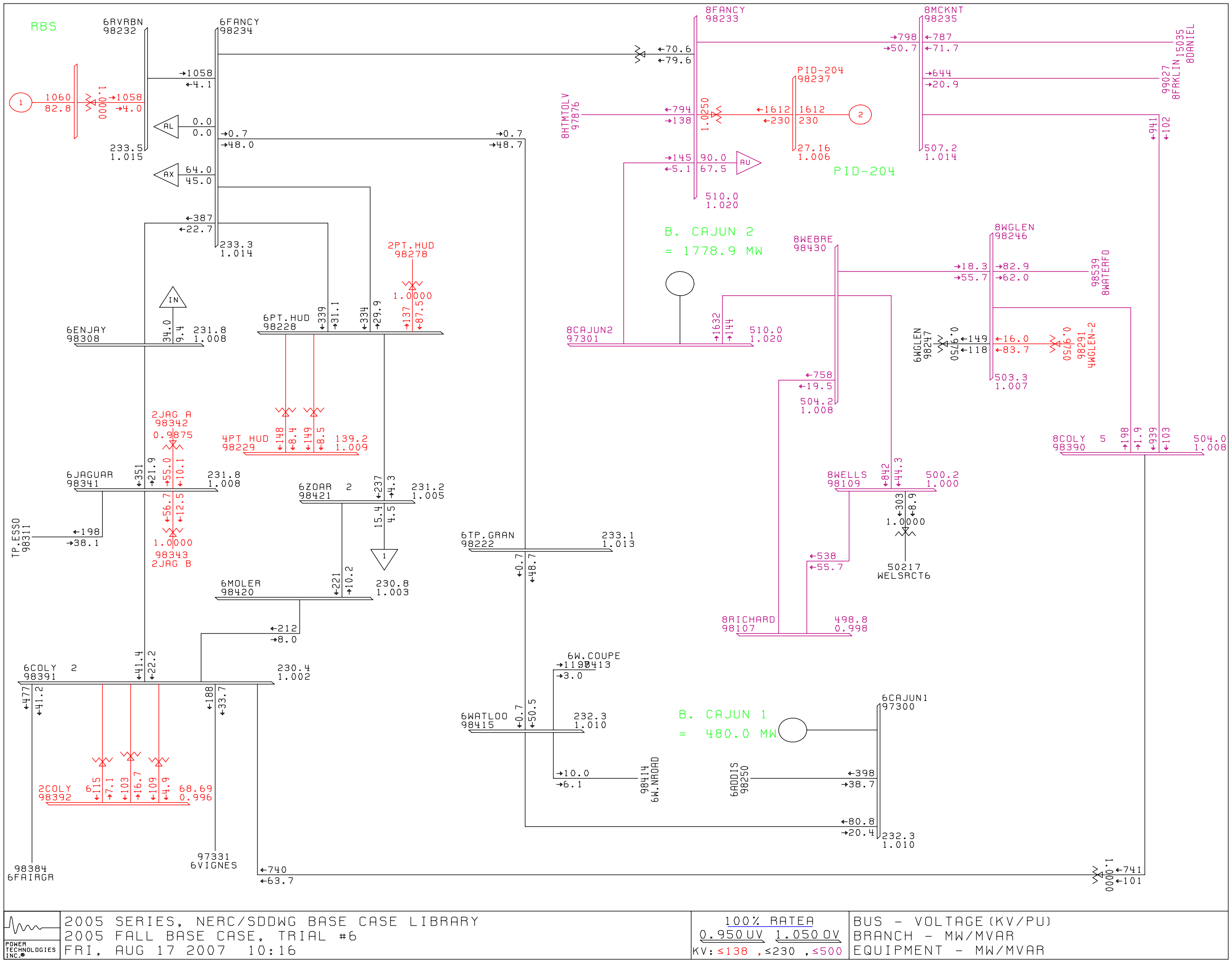


Figure 3-1: Power flow on transmission system near Fancy PT. 500 kV – 2012 Summer Peak

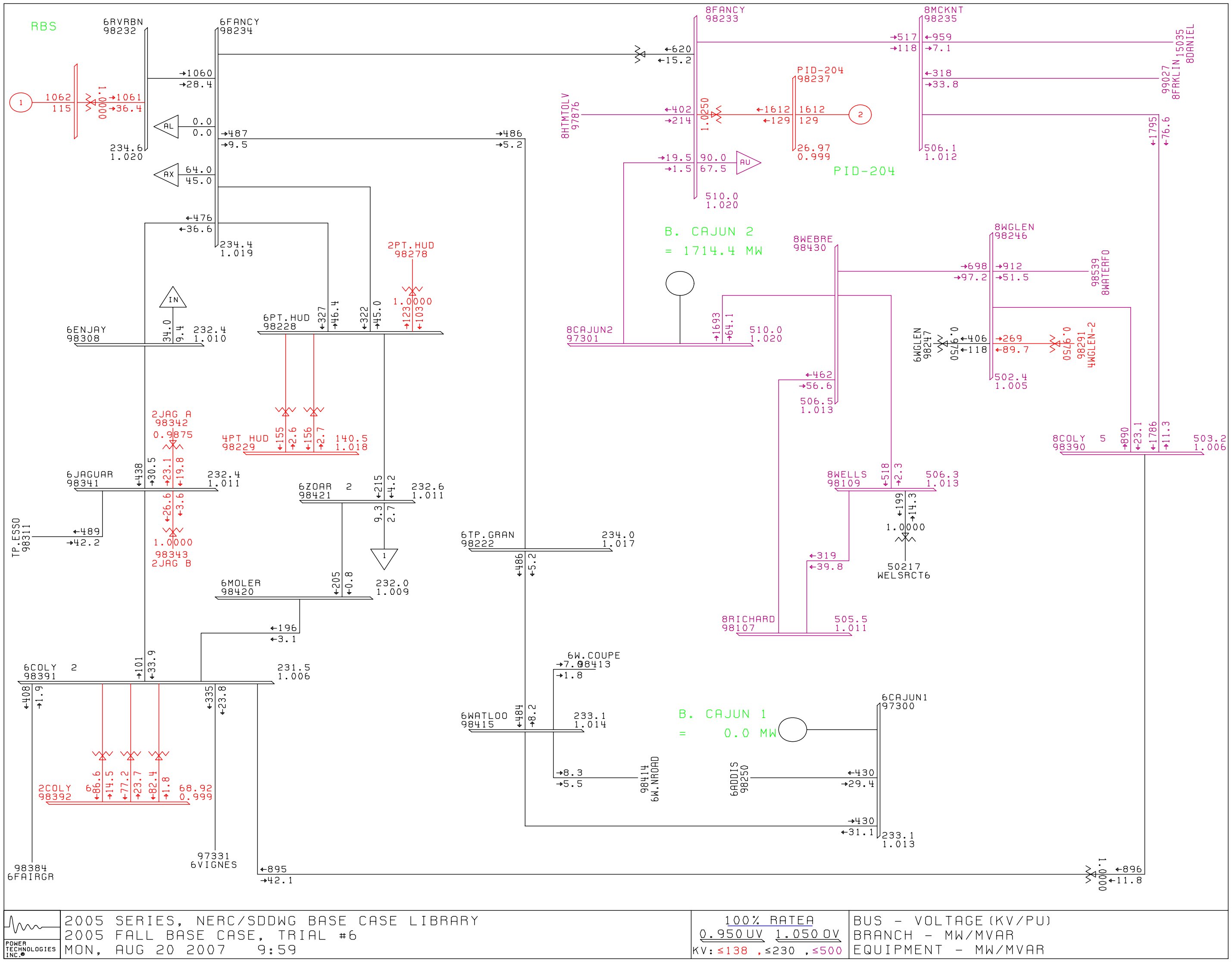


Figure 3-2: Power flow on transmission system near Fancy PT. 500 kV – 2012 Off-Peak

4 STABILITY ANALYSIS

As previously mentioned, the system impact study results for PID-204 for 2012 summer peak system conditions are applicable for this offsite analysis. Hence, stability analysis for this study was performed only on 2012 off-peak system condition. All the contingencies simulated in the system impact study for PID-204 were repeated on the off-peak 2012 system condition.

The breaker failure scenario was simulated with the following sequence of events:

1) At the normal clearing time for the primary breakers, the faulted line is tripped at the far end from the fault by normal breaker opening.

2) The fault remains in place for three-phase stuck-breakers. For single-phase faults the fault is appropriately adjusted to account for the line trip of step 1). For an IPO breaker, the 3-phase fault is replaced by a line-to-ground fault (2 phases of the faulted-end breaker clear and one phase sticks).

3) The fault is then cleared by back-up clearing. If the system is shown to be unstable for this condition, then stability of the system without the PID-204 plant needs to be verified.

All line trips are assumed to be permanent (i.e. no high speed re-closure).

The stability analysis was performed using the PSS/E dynamics program. The PSS/E dynamics program only simulates the positive sequence network. Unbalanced faults involve the positive, negative, and zero sequence networks. For unbalanced faults, the equivalent fault admittance must be inserted in the PSS/E positive sequence model between the faulted bus and ground to simulate the effect of the negative and zero sequence networks. For a single-line-to-ground (SLG) fault, the fault admittance equals the inverse of the sum of the positive, negative and zero sequence Thevenin impedances at the faulted bus. Since PSS/E inherently models the positive sequence fault impedance, the sum of the negative and zero sequence Thevenin impedances needs to be added and entered as the fault impedance at the faulted bus.

For three-phase faults, a fault admittance of –j2E9 is used (essentially infinite admittance or zero impedance).

Table 4-1 and Table 4-2 list results for all fault cases that were simulated in this study. Fault scenarios were formulated by examining the system configuration and breaker one-line diagrams.

Faults 1 through 20 represent the normal clearing 3-phase faults. Faults 1a through 18a represent the stuck breaker cases with the appropriate delayed back-up clearing times. Additional selected faults were simulated at Big Cajun 2 500 kV, Richard 500 kV and Fancy PT. 500 kV substations to evaluate any impact on the Entergy transmission system after addition of the proposed reinforcements for PID-204.

For all cases analyzed, the initial disturbance was applied at t = 0.1 seconds. The breaker clearing was applied at the appropriate time following this fault inception.

Table 4-1: 3-phase faults with normal clearing

CASE	Prior Outage Element	LOCATION	TYPE	CLEARING TIME (cycles)	PRIMARY BRK TRIP #	TRIPPED FACILITIES	Stable ?	Acceptable Voltages ?
FAULT-1	--	Fancy PT - McKnight 500 kV	3 PH	5	BRK M, N, GCB#21115, GCB#21110	Fancy PT - McKnight 500 kV	YES	YES
FAULT-2	--	Fancy PT - B. Cajun #2 500 kV	3 PH	5	BRK P, Q GCB#20535, GCB#20540	Fancy PT - B. Cajun #2 500 kV	YES	YES
FAULT-3	--	Fancy PT - Tap MT. Olive - Hartsburg 500 kV	3 PH	5	BRK M, N, Y, Z	Fancy PT - Tap MT. Olive - Hartsburg 500 kV	YES	YES
FAULT-4	--	Fancy PT 500/230 kV Transformer #1	3 PH	5	BRK P, O, 20740 20735	Fancy PT 500/230 kV Transformer #1	YES	YES
FAULT-5	--	Fancy PT 500/27 kV step-up transformer PID-204	3 PH	5	BRK S	Fancy PT 500/27 kV step-up transformer PID-204, PID-204 Unit #2	YES	YES
FAULT-5-PO	RBS UNIT#1 OFF-LINE	Fancy PT 500/27 kV step-up transformer PID-204	3 PH	5	BRK S	Fancy PT 500/27 kV step-up transformer PID-204, PID-204 Unit #2	YES	YES
FAULT-6	--	Fancy PT - Waterloo 230 kV	3 PH	6	20740, 20745, GCB#13365, GCB#13345	Fancy PT - Waterloo 230 kV	YES	YES
FAULT-7	--	Fancy PT - PT Hudson 230 kV	3 PH	6	20695, 20690, OCB#20220, GCB#21660	Fancy PT - PT Hudson 230 kV	YES	YES
FAULT-8	--	Fancy PT - Enjay 230 kV	3 PH	6	20665, 20660, OCB#14630	Fancy PT - Enjay 230 kV	YES	YES
FAULT-9	--	Fancy PT - Riverbend 230 kV & Unit #1	3 PH	6	20640, 20635	Fancy PT - Riverbend 230 kV & Unit #1	YES	YES
FAULT-9-PO	PID-204 OFF-LINE	Fancy PT - Riverbend 230 kV & Unit #1	3 PH	6	20640, 20635	Fancy PT - Riverbend 230 kV & Unit #1	YES	YES
FAULT-10	--	McKnight - Fancy PT 500 kV	3 PH	5	BRK M, N, GCB#21115, GCB#21110	McKnight - Fancy PT 500 kV	YES	YES
FAULT-11	--	McKnight - Coly 500 kV	3 PH	5	21105, 21125, GCB#21310, GCB#21300	McKnight - Coly 500 kV	YES	YES
FAULT-12	--	McKnight - Franklin 500 kV	3 PH	5	21105, 21110, GCB#J2416, GCB#J2412	McKnight - Franklin 500 kV	YES	YES
FAULT-13	--	McKnight - Daniel 500 kV	3 PH	5	21115, 21125	McKnight - Daniel 500 kV	YES	YES
FAULT-14	--	B. Cajun 2 - Fancy PT 500 kV	3 PH	5	20540, 20535, 20770, 20775	B. Cajun 2 - Fancy PT 500 kV	YES	YES

CASE	Prior Outage Element	LOCATION	TYPE	CLEARING TIME (cycles)	PRIMARY BRK TRIP #	TRIPPED FACILITIES	Stable ?	Acceptable Voltages ?
FAULT-15	--	B. Cajun 2 - Weber 500 kV	3 PH	5	20555, 20550, 20580, 20565	B. Cajun 2 - Weber 500 kV	YES	YES
FAULT-16	--	New Tap - Fancy PT 500 kV	3 PH	5	BRK Y, Z	New Tap - Fancy PT 500 kV	YES	YES
FAULT-17	--	New Tap - Mt Olive 500 kV	3 PH	5	BRK U, V	New Tap - Mt Olive 500 kV	YES	YES
FAULT-18	--	New Tap - Hartburg 500 kV	3 PH	5	BRK W, X	New Tap - Hartburg 500 kV	YES	YES
FAULT-19	--	RAT A & RAT B FOR PID-204	3 PH	5	BRK R, G, H	RAT A & RAT B **	YES	YES
FAULT-20	--	B. Cajun - Addis 230 kV	3 PH	5	13555, 13360, ocb#21165	B. Cajun - Addis 230 kV	YES	YES

** Substation Layout diagrams showing the Fault Locations are included in Appendix IV

Table 4-2: Faults with stuck-breaker

CASE	LOCATION	TYPE	CLEARING TIME (cycles)		SLG FAULT IMPEDANCE (MVA)	STUCK BRK #	PRIMARY BRK TRIP #	SECONDARY BRK TRIP	TRIPPED FACILITIES	Stable ?	Acceptable Voltages ?
			PRIMARY	Back-up							
FAULT-1a	Fancy PT - McKnight 500 kV	3 PH-1PH	5	9	1015.01-j15368.09	BRK M	BRK N, GCB#21115, GCB#21110	BRK Y, Z	Fancy PT - McKnight 500 kV, Fancy PT - Tap MT. Olive - Hartburg 500 kV	YES	NO
FAULT-1a-SLG	Fancy PT - McKnight 500 kV	SLG	5	9	1208.71-j17444.28	BRK M	BRK N, GCB#21115, GCB#21110	BRK Y, Z	Fancy PT - McKnight 500 kV, Fancy PT - Tap MT. Olive - Hartburg 500 kV	YES	YES
FAULT-2a	Fancy PT - B. Cajun #2 500 kV	3 PH-1PH	5	9	641.73-j11029.8	BRK P	BRK Q GCB#20535, GCB#20540	BRK O, 20740, 20735	Fancy PT - B. Cajun #2 500 Kv, Fancy PT 500/230 kV Tansformer #1	YES	YES
FAULT-3a	Fancy PT - Tap MT. Olive - Hartsburg 500 kV	3 PH-1PH	5	9	1131.69-j16649.66	BRK M	BRK L, BRK @ TAP	BRK N, GCB#21115, GCB#21110	Fancy PT - Tap MT. Olive - Hartsburg 500 kV, Fancy PT - McKnight 500 kV	YES	NO
FAULT-3a-SLG	Fancy PT - Tap MT. Olive - Hartsburg 500 kV	SLG	5	9	1208.71-j17444.28	BRK M	BRK L, BRK @ TAP	BRK N, GCB#21115, GCB#21110	Fancy PT - Tap MT. Olive - Hartsburg 500 kV, Fancy PT - McKnight 500 kV	YES	YES
FAULT-4a	Fancy PT 500/230 kV Transformer #1	3 PH-1PH	5	9	1074-j14579.2	BRK P	BRK O, 20740 20735	BRK P, Q, GCB#20535, GCB#20450	Fancy PT 500/230 kV Transformer #1, Fancy PT - B. Cajun #2 500 kV	YES	NO
FAULT-4a-SLG	Fancy PT 500/230 kV Transformer #1	SLG	5	9	1208.71-j17444.28	BRK P	BRK O, 20740 20735	BRK P, Q, GCB#20535, GCB#20450	Fancy PT 500/230 kV Transformer #1, Fancy PT - B. Cajun #2 500 kV	YES	YES
FAULT-5a	Fancy PT 500/27 kV step-up transformer PID-204	3 PH-1PH	5	9	1114.74-j13215.48	BRK S		BRK J, K , T	Fancy PT 500/27 kV step-up transformer PID-204, PID-204 Unit #2	YES	YES
FAULT-6a	Fancy PT - Waterloo 230 kV	3 PH-1PH	6	9	595.87-j9892.02	20740	20745, GCB#13365, GCB#13345	20735, BRK O, P	Fancy PT - Waterloo 230 kV, Fancy PT 500/230 kV transformer #1	YES	NO
FAULT-6a-SLG	Fancy PT - Waterloo 230 kV	SLG	6	9	727.86-j11036.73	20740	20745, GCB#13365, GCB#13345	20735, BRK O, P	Fancy PT - Waterloo 230 kV, Fancy PT 500/230 kV transformer #1	YES	YES
FAULT-7a	Fancy PT - PT Hudson 230 kV	3 PH-1PH	6	9	702.02-j10862.25	20695	20690, OCB#20220, GCB#21660	20745, 20670, 20650, 20640, 20620	Fancy PT - PT Hudson 230 kV	YES	YES
FAULT-8a	Fancy PT - Enjay 230 kV	3 PH-1PH	6	9	667.89-j10364.36	20665	20660, OCB#14630	20745, 20650, 20640,20620	Fancy PT - Enjay 230 kV	YES	YES
FAULT-9a	Fancy PT - Riverbend 230 kV & Unit #1	3 PH-1PH	6	9	508.54-j7949.14	20640	20635	20745, 20695, 20650, 20620	Fancy PT - Riverbend 230 kV & Unit #1	YES	YES

CASE	LOCATION	TYPE	CLEARING TIME (cycles)		SLG FAULT IMPEDANCE (MVA)	STUCK BRK #	PRIMARY BRK TRIP #	SECONDARY BRK TRIP	TRIPPED FACILITIES	Stable ?	Acceptable Voltages ?
			PRIMARY	Back-up							
FAULT-10a	McKnight - Fancy PT 500 kV	3 PH-1PH	5	9	734.56-j4686.4	21115	BRK M, N, GCB#21110	21125	McKnight - Fancy PT 500 kV, McKnight - Daniel 500 kV	YES	YES
FAULT-10b	McKnight - Fancy PT 500 kV	3 PH-1PH	5	9	734.56-j4686.4	21110	BRK M, N, GCB#21115	21105, GCB#J2416, GCB#J2412	McKnight - Fancy PT 500 kV,Mcknight - Franklin 500 kV	YES	YES
FAULT-11a	McKnight - Coly 500 kV	3 PH-1PH	5	9	855.48-j5251.4	21105	21125, GCB#21310, GCB#21300	21110, GCB#J2416, GCB#J2412	McKnight - Coly 500 Kv, McKnight - Franklin 500 kV	YES	YES
FAULT-11b	McKnight - Coly 500 kV	3 PH-1PH	5	9	855.48-j5251.4	21125	21105, GCB#21310, GCB#21300	21115	McKnight - Coly 500 Kv, McKnight - Daniel 500 kV	YES	YES
FAULT-12a	McKnight - Franklin 500 kV	3 PH-1PH	5	9	989.22-j6165.06	21105	21110, GCB#J2416, GCB#J2412	21125, GCB#21310, GCB#21300	McKnight - Franklin 500 kV, McKnight - Coly 500 kV	YES	YES
FAULT-12b	McKnight - Franklin 500 kV	3 PH-1PH	5	9	989.22-j6165.06	21110	21105, GCB#J2416, GCB#J2412	21115, GCB#20765, GCB#20775	McKnight - Franklin 500 kV, McKnight - Fancy PT 500 kV	YES	YES
FAULT-13a	McKnight - Daniel 500 kV	3 PH-1PH	5	9	1118.84-j7090.95	21115	21125	21110, GCB#20765, GCB#20775	McKnight - Daniel 500 kV, McKnight - Fancy PT 500 kV	YES	YES
FAULT-13b	McKnight - Daniel 500 kV	3 PH-1PH	5	9	1118.84-j7090.95	21125	21115	21105, GCB#21310, GCB#21300	McKnight - Daniel 500 kV, McKnight - Coly 500 kV	YES	YES
FAULT-14a	B. Cajun 2 - Fancy PT 500 kV	3 PH-1PH	5	9	598.77-j9187.57	20540	20535, 20770, 20775	20545	B. Cajun 2 - Fancy PT 500 Kv, B. Cajun #2 Gen #1	YES	NO
FAULT-14a-SLG	B. Cajun 2 - Fancy PT 500 kV	SLG	5	9	1206.84-j17023.82	20540	20535, 20770, 20775	20545	B. Cajun 2 - Fancy PT 500 Kv, B. Cajun #2 Gen #1	YES	YES
FAULT-14b	B. Cajun 2 - Fancy PT 500 kV	3 PH-1PH	5	9	598.77-j9187.57	20535	20540, 20770, 20775	20550, 20565	B. Cajun 2 - Fancy PT 500 kV	YES	NO
FAULT-14b-SLG	B. Cajun 2 - Fancy PT 500 kV	SLG	5	9	1206.84-j17023.82	20535	20540, 20770, 20775	20550, 20565	B. Cajun 2 - Fancy PT 500 kV	YES	YES
FAULT-15a	B. Cajun 2 - Weber 500 kV	3 PH-1PH	5	9	1005.9-j14770.39	20555	20550, 20580, 20565	20560	B. Cajun 2 - Weber 500 kV, B. Cajun #2 Gen#2	YES	NO
FAULT-15a-SLG	B. Cajun 2 - Weber 500 kV	SLG	5	9	1206.84-j17023.82	20555	20550, 20580, 20565	20560	B. Cajun 2 - Weber 500 kV, B. Cajun #2 Gen#2	YES	YES
FAULT-16a	New Tap - Fancy PT 500 kV	3 PH-1PH	5	9	377.42-j2095.08	BRK Y	BRK Y	BRK U, W	New Tap - Fancy PT 500 kV	YES	YES
FAULT-17a	New Tap - Mt Olive 500 kV	3 PH-1PH	5	9	391.27-j2261.24	BRK U	BRK V	BRK W, Y	New Tap - Mt Olive 500 kV	YES	YES
FAULT-18a	New Tap - Hartburg 500 kV	3 PH-1PH	5	9	311.14-j1463.24	BRK W	BRK X	BRK U, Y	New Tap - Hartburg 500 kV	YES	YES

4.1 ANALYSIS RESULTS

All of the normally-cleared, three-phase faults simulated were found to be stable. Likewise, all of the 500 kV IPO stuck-breaker faults were found to be stable. The plots are provided in Appendix III.

In addition to criteria for the stability of the machines, Entergy has evaluation criteria for the transient voltage dip as follows:

- 3-phase fault or single-line-ground fault with normal clearing resulting in the loss of a single component (generator, transmission circuit or transformer) or a loss of a single component without fault:

  Not to exceed 20% for more than 20 cycles at any bus
  Not to exceed 25% at any load bus
  Not to exceed 30% at any non-load bus

- 3-phase faults with normal clearing resulting in the loss of two or more components (generator, transmission circuit or transformer), and SLG fault delayed clearing resulted in the loss of one or more components:

  Not to exceed 20% for more than 40 cycles at any bus
  Not to exceed 30% at any load bus

The duration of the transient voltage dip excludes the duration of the fault. The transient voltage dip criteria will not be applied to three-phase faults followed by stuck breaker conditions unless the determined impact is extremely widespread.

The voltages at all buses in the Entergy system (115 kV and above) were monitored during each of the fault cases as appropriate. No voltage violations were observed for normally cleared 3 Phase faults.

There is no voltage dip criterion for three-phase stuck breaker faults. For screening purposes, the results of three-phase stuck breaker faults were compared against the most stringent voltage dip criteria. Seven (7) three-phase stuck breaker faults were found to exceed those limits. These seven faults were then repeated as single-line-to-ground (SLG) stuck breaker faults. The faults with '-SLG' extension in Table 4-2 shows the details. The results show no voltage dip criteria violations following SLG stuck breaker faults.

Hence, it can be concluded that the proposed PID-204 unit does not degrade the Entergy system stability performance.

The plots for voltages in the local area following Faults 1a, 2a 3a and 4a are shown in Figure 4-1 through Figure 4-4.

Plots of relevant parameters (machine angles and speed, the PID-204, Riverbend Unit #1, bus voltages and frequency, etc) are shown in Appendix III.

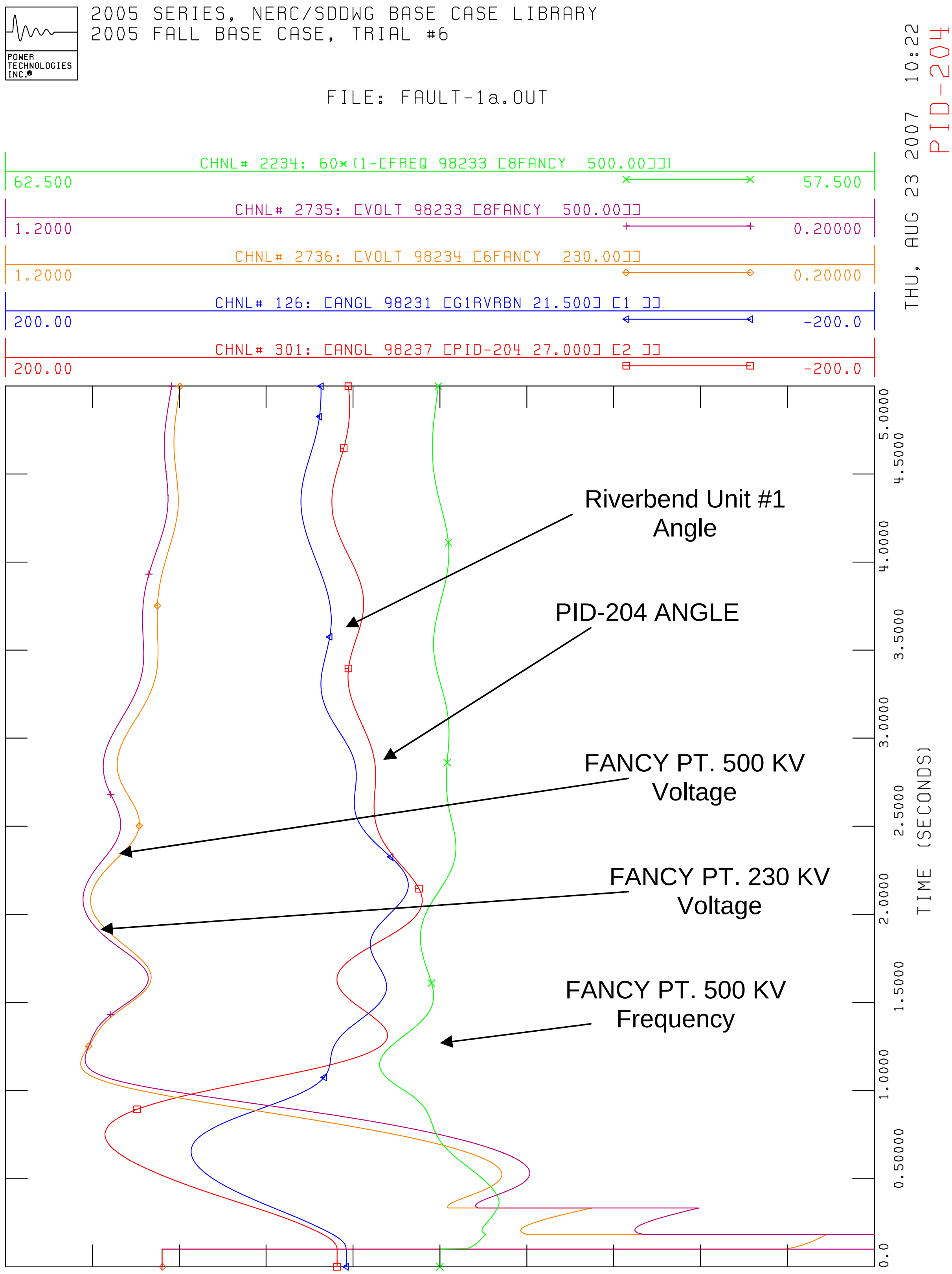


Figure 4-1: Local area voltages following Fault-1a – Off-peak conditions

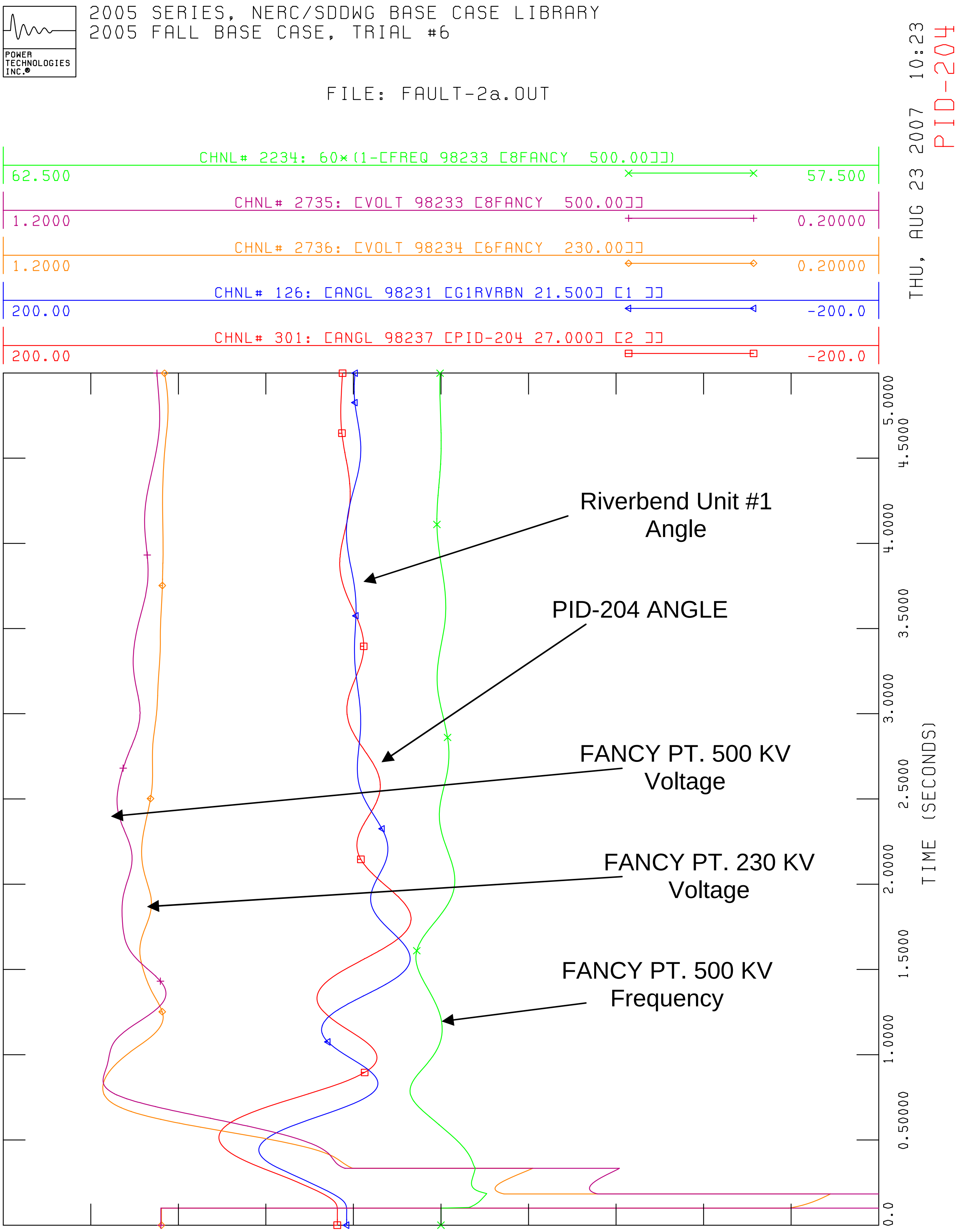


Figure 4-2: Local area voltages following Fault-2a – Off-peak conditions

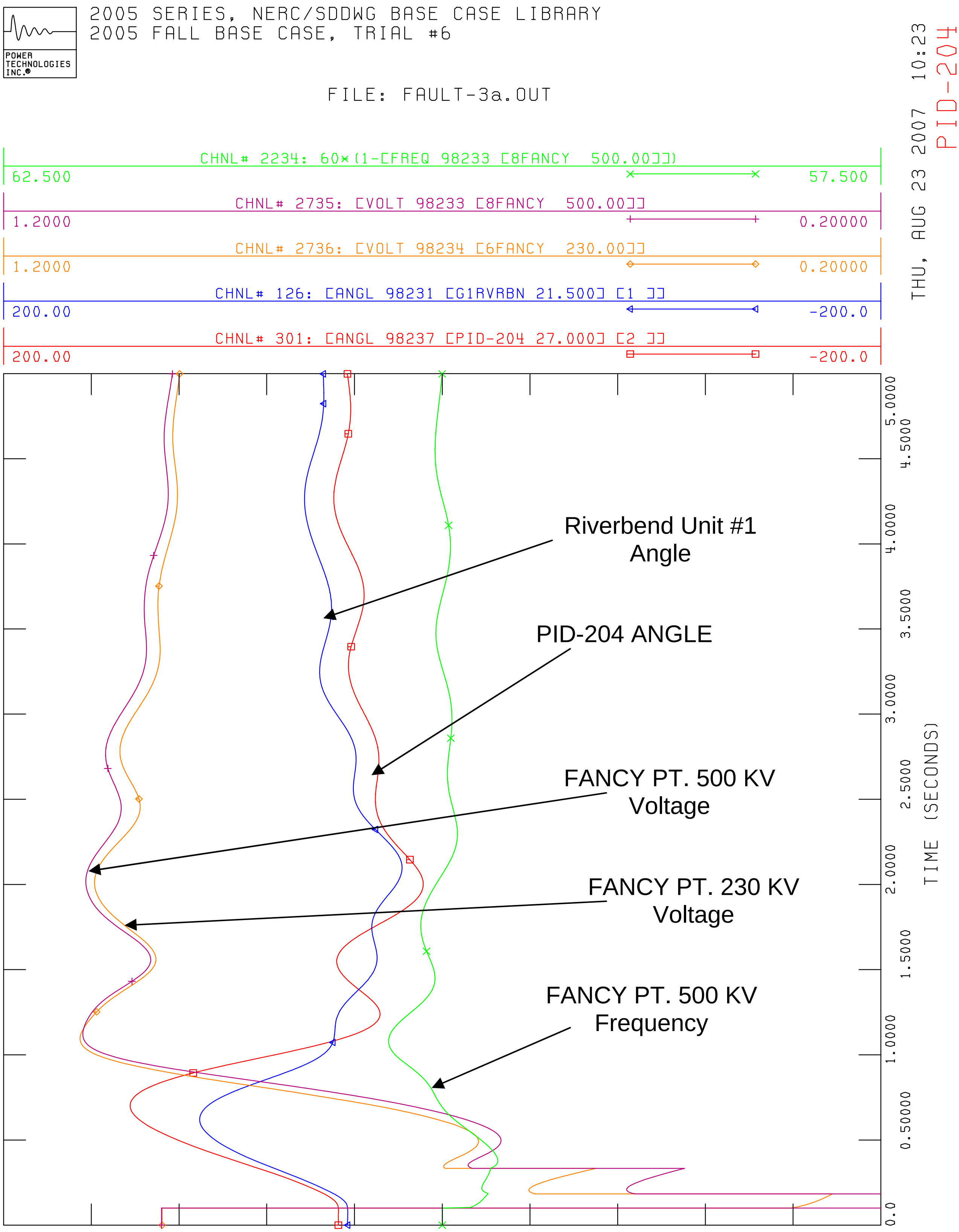


Figure 4-3: Local area voltages following Fault-3a – Off-peak conditions

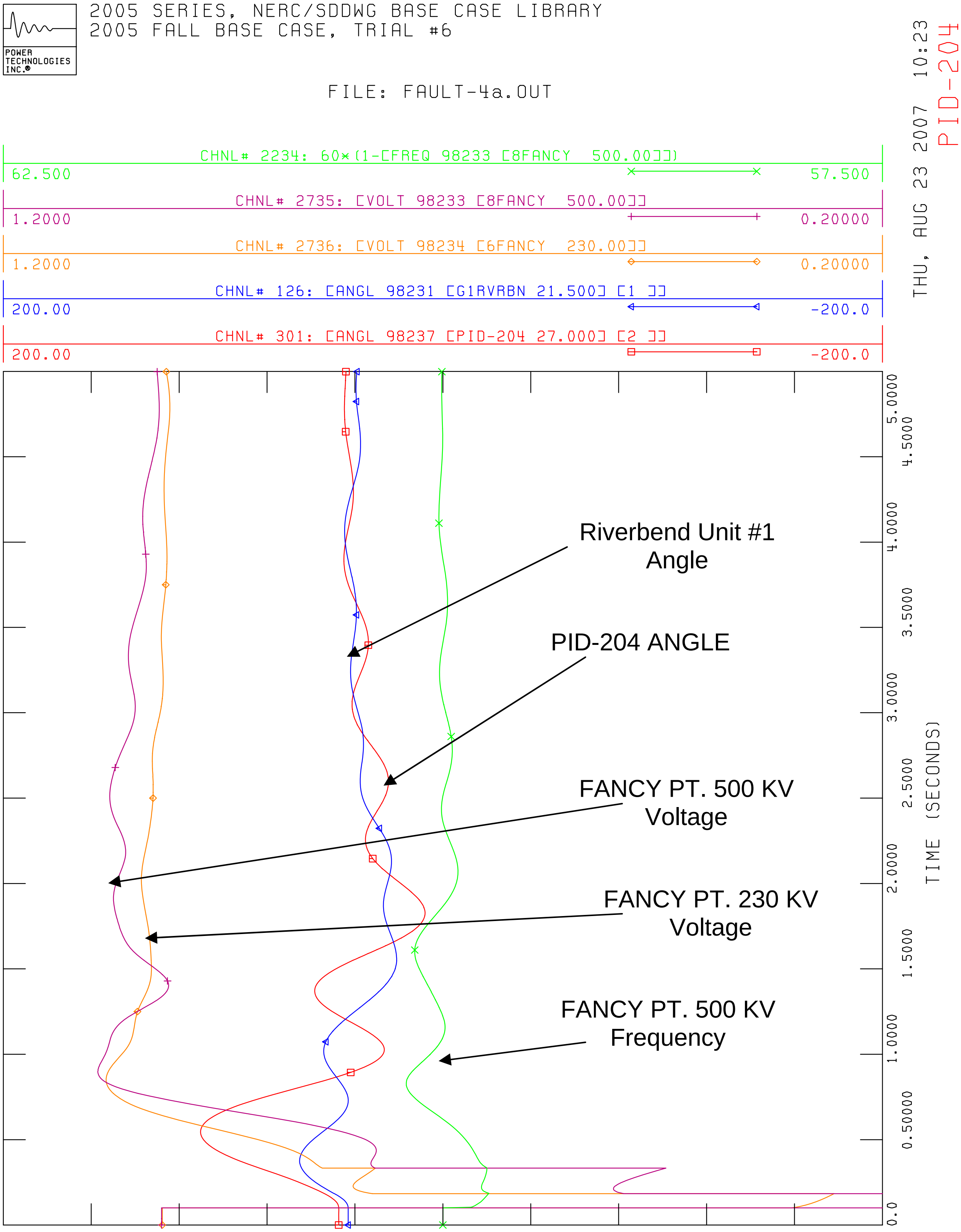


Figure 4-4: Local area voltages following Fault-4a – Off-peak conditions

5 CRITICAL CLEARING TIME ANALYSIS

Evaluation of Critical Clearing Time (CCT) was carried out for faults at the following two (2) substations:

- Fancy PT 500 kV
- Fancy PT 230 kV

Critical Clearing Time Analysis was performed on both 2012 summer peak and 2012 off-peak system conditions for Faults 1a-9a listed in Table 4-2. This covers all branches in these two switchyards.

The Normal Clearing Time was kept equal to the normal value (5 cycles on 500 kV and 6 cycles on 230 kV) and the backup clearing time was varied to find the CCT. If the system is found to be stable with 5+120 cycles delayed clearing time, then the analysis is stopped and the critical clearing time is listed 5+120 cycles (i.e. 125 cycles).

Per Entergy's comments, the existing circuit breakers in Fancy PT. 230 kV switchyard will be upgraded to IPO Breakers before PID-204 is energized. This will reduce the severity of possible breaker failure events in the Fancy PT. 230 kV switchyard.

Table 5-1 shows the Critical Clearing Times calculated for the simulated faults for Pre and Post project system conditions. It can be seen from these results that the lowest CCTs are for Faults 1a (5+10 cycles) and 6a (6+10 cycles) during off-peak conditions. The CCTs with PID-204 provide a 1 cycle margin above Entergy's standard breaker failure clearing times of 5+9 cycles and 6+9 cycles, respectively.

It should be noted that for Fancy PT. 500 kV there was no generation connected in Pre-Project case, hence the Critical Clearing times were long (~5 + 100 cycles). After interconnection of the proposed PID-204 unit, the new generator becomes the limiting element for the stability of the system. Hence, the critical clearing times were decreased compared to the Pre-Project case.

Table 5-1: CCT Results

CASE	2012 Summer Peak			2012 Off-Peak		
	Primary	Back-up		Primary	Back-up	
		PRE-PID-204	POST-PID-204		PRE-PID-204	POST-PID-204
FAULT-1a	5	38	11	5	44	10
FAULT-2a	5	105	31	5	97	24
FAULT-3a	5	--	13	5	--	11
FAULT-4a	5	120	19	5	120	15
FAULT-5a	5	--	47	5	--	36
FAULT-6a	6	--	14	6	--	10
FAULT-7a	6	--	19	6	--	16
FAULT-8a	6	--	17	6	--	15
FAULT-9a	6	--	120	6	--	120

Note: - Faults 5a through 9a are not valid for Pre-Project system conditions

6 CONCLUSIONS

Southwest Power Pool (SPP) has commissioned ABB Inc. to conduct an offsite power analysis of the proposed new nuclear unit (PID-204) at Fancy PT. 500 kV. Offsite power is the preferred power source for nuclear power stations. The true capability of offsite power cannot be verified through direct readings of plant switchyard or safety bus voltages, but through analyses of grid and plant conditions considering the occurrence of severe contingencies representing the partial loss of grid support. The objective of this analysis is to identify if the Entergy System configuration will comply with the Code of Federal Regulations (CFR) specifically with respect to the grid voltage performance and the reliability of the Offsite Power Supply for Riverbend Unit #2 (PID-204).

The steady-state analysis was conducted to determine the voltage levels at Fancy PT. 500 kV and 115 kV buses following various outage contingencies on the transmission system during projected 2012 summer peak and 2012 off-peak load conditions. The System Impact Study for PID-204 was performed on summer peak 2012 load conditions. The results of the stability analysis for the summer peak 2012 system conditions from System Impact Study are also applicable for this offsite analysis. Hence, stability analysis was performed only on 2012 off-peak load conditions. Critical Clearing Time assessment was performed to determine the critical clearing times for faults at the Fancy PT. 500 kV and adjacent substations.

Per the '*Nuclear Management Manual ENS-DC-199 Rev-2*' the acceptable steady-state post-contingency voltage range at Fancy PT 230 kV is 0.9565 p.u to 1.0522 p.u. No voltage violation was observed following simulated contingencies. The lowest voltage at Fancy PT 230 kV (0.9977 p.u) was observed following '*LINE+GEN-1*' contingency.

There is no established voltage criterion for Fancy PT 500 kV for Off-site power supply. The lowest voltage at Fancy Pt. 500 kV (1.0111 p.u.) was observed following contingency '*GEN-4*' – Loss of B. Cajun #2 units (1778 MW).

The results of the offsite analysis study indicate that there are no stability criteria violations associated after interconnection of the Proposed PID-204 Unit # 2.

After addition of Riverbend Unit #2 (PID-204), the Critical Clearing Times at the Fancy PT. 500 and 230 kV substations are expected to provide at least a 1 cycle margin above the standard breaker failure clearing times.

The results of this study are based on available data and assumptions made at the time this study was conducted. The results included in this report may not apply if any of the data and/or assumptions made in developing the study models change.

APPENDIX I - DATA FOR RIVERBEND UNIT #1 & PID-204

APPENDIX I.1 LOADFLOW DATA

```
0,   100.00          / PSS/E-29.4    MON, AUG 27 2007   8:08
2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6
98231,'G1RVRBN ',  21.5000,2,     0.000,     0.000, 151, 110,1.01955,  18.7432,   1
98232,'6RVRBN  ', 230.0000,1,     0.000,     0.000, 151, 110,1.01500,  14.4908,   1
98237,'PID-204 ',  27.0000,2,     0.000,     0.000, 151, 151,1.00595,  20.7695,   1
0 / END OF BUS DATA, BEGIN LOAD DATA
0 / END OF LOAD DATA, BEGIN GENERATOR DATA
98231,'1 ',  1060.000,    82.805,   230.000,     0.000,1.01500,98232,  1151.000,
0.00000,   0.32500,   0.00000,   0.00000,1.00000,1,  100.0,  1080.000,   234.000,
1,1.0000
98237,'2 ',  1612.000,   230.383,   842.000,  -603.000,1.02000,98233,  1933.000,
0.00000,   0.28000,   0.00000,   0.00000,1.00000,1,  100.0,  1612.000,     0.000,
1,1.0000
0 / END OF GENERATOR DATA, BEGIN BRANCH DATA
98232, 98234,'1 ',   0.00005,   0.00077,   0.00339, 1195.00, 1195.00,    0.00,  0.00000,
0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
0 / END OF BRANCH DATA, BEGIN TRANSFORMER DATA
98232,98231,    0,'1 ',1,1,1,   0.00000,   0.00000,2,'        ',1,   1,1.0000
   0.00014,   0.00725,  100.00
1.00000,   0.000,   0.000, 1151.00, 1151.00,    0.00, 0,     0, 1.50000, 0.51000,
1.50000, 0.51000, 159, 0, 0.00000, 0.00000
1.00000,   0.000
98233,98237,    0,'1 ',2,2,1,   0.00000,   0.00000,2,'        ',1,   1,1.0000
   0.00140,   0.14000, 2000.00
512.500, 525.000,   0.000, 2000.00, 2000.00, 2000.00, 0,     0,551.2500,498.7500,
1.05000, 0.95000,   5, 0, 0.00000, 0.00000
27.0000,  27.000
0 / END OF TRANSFORMER DATA, BEGIN AREA DATA
0 / END OF AREA DATA, BEGIN TWO-TERMINAL DC DATA
0 / END OF TWO-TERMINAL DC DATA, BEGIN VSC DC LINE DATA
0 / END OF VSC DC LINE DATA, BEGIN SWITCHED SHUNT DATA
0 / END OF SWITCHED SHUNT DATA, BEGIN IMPEDANCE CORRECTION DATA
0 / END OF IMPEDANCE CORRECTION DATA, BEGIN MULTI-TERMINAL DC DATA
0 / END OF MULTI-TERMINAL DC DATA, BEGIN MULTI-SECTION LINE DATA
0 / END OF MULTI-SECTION LINE DATA, BEGIN ZONE DATA
0 / END OF ZONE DATA, BEGIN INTER-AREA TRANSFER DATA
0 / END OF INTER-AREA TRANSFER DATA, BEGIN OWNER DATA
0 / END OF OWNER DATA, BEGIN FACTS DEVICE DATA
0 / END OF FACTS DEVICE DATA
```

APPENDIX I.2 DYNAMICS DATA

```
     PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS/E      MON, AUG 27 2007   8:09
2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6

PLANT MODELS

REPORT FOR ALL MODELS                         BUS 98231 [G1RVRBN 21.500] MODELS


** GENROU **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S
            98231     G1RVRBN  21.500 1   28949-28962   13459-13464

            MBASE     Z S O R C E         X T R A N       GENTAP
           1151.0  0.00000+J 0.32500  0.00000+J 0.00000  1.00000

 T'D0 T''D0  T'Q0 T''Q0     H   DAMP   XD     XQ     X'D    X'Q   X''D    XL
 7.75 0.037  0.38 0.057   3.62  0.00 1.6400 1.5700 0.4250 0.6050 0.3250 0.2350

                              S(1.0)  S(1.2)
                              0.0803  0.3213


** EXAC3 **   BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S
            98231     G1RVRBN  21.500 1   60640-60661   24281-24285

   TR     TB     TC      KA     TA   VAMAX  VAMIN    TE     KLV    KR     KF
  0.000  0.000  0.000   17.1  0.017  1.000 -0.950  1.805  0.320  6.220  0.070

   TF     KN    EFDN    KC     KD     KE     VLV    E1   S(E1)    E2   S(E2)
  1.000  0.050  0.760  0.200  0.830  1.000  0.520 4.6000 0.1800 6.1300 1.6100


** TGOV1 **   BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S     VAR
            98231     G1RVRBN  21.500 1   80204-80210   30784-30785    3731

      R         T1       VMAX      VMIN       T2        T3        DT
    0.050     0.500     1.000     0.000     2.100     7.000     0.000
```


```
     PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS/E      MON, AUG 27 2007   8:09
2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6

PLANT MODELS
```


```
REPORT FOR ALL MODELS                         BUS 98237 [PID-204 27.000] MODELS


** GENROU **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S
            98237     PID-204  27.000 2   81180-81193   31053-31058

            MBASE     Z S O R C E         X T R A N       GENTAP
           1933.0  0.00000+J 0.28000  0.00000+J 0.00000  1.00000

 T'D0 T''D0  T'Q0 T''Q0     H   DAMP   XD     XQ     X'D    X'Q   X''D    XL
11.30 0.038  0.53 0.068   4.84  0.00 2.0600 1.9400 0.3650 0.5500 0.2800 0.2250

                              S(1.0)  S(1.2)
                              0.3750  1.1000


** PSS2A **   BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S     V A R S      I C
O N S
            98237     PID-204  27.000 2   81194-81210   31059-31074    3917-3920
1210-1215
```

IC1	REMBUS1	IC2	REMBUS2	M	N
1	0	3	0	5	1

TW1	TW2	T6	TW3	TW4	T7	KS2	KS3
2.000	2.000	0.000	2.000	0.000	2.000	0.207	1.000

T8	T9	KS1	T1	T2	T3	T4	VSTMAX	VSTMIN
0.500	0.100	4.000	0.150	0.030	0.150	0.030	0.100	-0.100

** ESST4B **	BUS	X-- NAME --X	BASEKV	MC	C O N S	S T A T E S
	98237	PID-204	27.000	2	81211-81227	31075-31078

TR	KPR	KIR	VRMAX	VRMIN	TA	KPM	KIM	VMMAX	VMMIN
0.000	2.660	2.660	1.000	-0.800	0.010	1.000	0.000	1.000	-0.800

KG	KP	KI	VBMAX	KC	XL	THETAP
0.000	7.530	0.000	9.410	0.300	0.0000	0.000

** IEEEG1 **	BUS	X-- NAME --X	BASEKV	MC	C O N S	S T A T E S	V A R S
	98237	PID-204	27.000	2	81228-81247	31079-31084	3921-3922

K	T1	T2	T3	UO	UC	PMAX	PMIN	T4	K1
20.00	0.000	0.000	0.150	0.120	-0.120	0.8500	0.0000	0.500	0.340

K2	T5	K3	K4	T6	K5	K6	T7	K7	K8
0.000	0.350	0.660	0.000	0.000	0.000	0.000	0.000	0.000	0.000

APPENDIX II - LIST OF IPP GENERATION FOR DISPATCH

```
TEXT  ** File created on 8/23/2006 9:29:03 AM
TEXT  ** Excess generation of  1450  MW met by IPPs for 2012 case **
TEXT  ** Total PMAX of all IPPs that participate in matching excess load is  7251.2  MW
**
RDCH
1
0
0
97772,1,41.50,,25.00,,,,,,,,,,1,,41.50,0  /*  BAYOR U1
97773,1,41.50,,25.00,,,,,,,,,,1,,41.50,0  /*  BAYOR U2
97774,1,13.67,,8.47,,,,,,,,,,1,,32.00,0  /*  BAYOR U3
98495,1,96.67,,59.91,,,,,,,,,,1,,255.00,0  /*  S1CALBOG
98494,1,0.00,,0.00,,,,,,,,,,0,,175.00,0  /*  G2CALBOG
98493,1,0.00,,0.00,,,,,,,,,,0,,175.00,0  /*  G1CALBOG
98435,1,96.67,,59.91,,,,,,,,,,1,,187.00,0  /*  IC1CARVL
98436,1,0.00,,0.00,,,,,,,,,,0,,187.00,0  /*  IC2CARVL
98437,1,0.00,,0.00,,,,,,,,,,0,,181.00,0  /*  IS1CARVL
97785,1,96.67,,59.91,,,,,,,,,,1,,185.00,0  /*  G1CONOCO
97786,1,0.00,,0.00,,,,,,,,,,0,,185.00,0  /*  G2CONOCO
98324,1,96.67,,59.91,,,,,,,,,,1,,200.00,0  /*  DOWAEP5
98321,1,0.00,,0.00,,,,,,,,,,0,,177.00,0  /*  DOWAEP2
98322,1,0.00,,0.00,,,,,,,,,,0,,177.00,0  /*  DOWAEP3
98323,1,0.00,,0.00,,,,,,,,,,0,,177.00,0  /*  DOWAEP4
98320,1,0.00,,0.00,,,,,,,,,,0,,177.00,0  /*  DOWAEP1
98840,1,80.00,,40.00,,,,,,,,,,1,,80.00,0  /*  G3DUKEFRPT
98841,1,16.67,,10.33,,,,,,,,,,1,,80.00,0  /*  G4DUKEFRPT
98842,1,0.00,,0.00,,,,,,,,,,0,,80.00,0  /*  G5DUKEFRPT
98843,1,0.00,,0.00,,,,,,,,,,0,,80.00,0  /*  G6DUKEFRPT
98844,1,0.00,,0.00,,,,,,,,,,0,,80.00,0  /*  G7DUKEFRPT
98845,1,0.00,,0.00,,,,,,,,,,0,,80.00,0  /*  G8DUKEFRPT
98970,1,96.67,,59.91,,,,,,,,,,1,,198.00,0  /*  IS1DUKEH
98969,1,0.00,,0.00,,,,,,,,,,0,,176.60,0  /*  IG2DUKEH
98968,1,0.00,,0.00,,,,,,,,,,0,,176.60,0  /*  IG1DUKEH
98095,1,96.67,,59.91,,,,,,,,,,1,,175.00,0  /*  G1DYNEGY
98096,1,0.00,,0.00,,,,,,,,,,0,,175.00,0  /*  G2DYNEGY
98834,1,96.67,,59.91,,,,,,,,,,1,,256.00,0  /*  S1GPMCAD
98833,1,0.00,,0.00,,,,,,,,,,0,,168.50,0  /*  G2GPMCAD
98832,1,0.00,,0.00,,,,,,,,,,0,,168.50,0  /*  G1GPMCAD
97824,1,96.67,,59.91,,,,,,,,,,1,,187.50,0  /*  1G3INTHB
97826,1,0.00,,0.00,,,,,,,,,,0,,187.50,0  /*  1G4INTHB
97819,1,0.00,,0.00,,,,,,,,,,0,,125.00,0  /*  1S1INTHB
97825,1,0.00,,0.00,,,,,,,,,,0,,125.00,0  /*  1S3INTHB
97821,1,0.00,,0.00,,,,,,,,,,0,,125.00,0  /*  1S2INTHB
97827,1,0.00,,0.00,,,,,,,,,,0,,125.00,0  /*  1S4INTHB
98850,1,75.00,,46.48,,,,,,,,,,1,,75.00,0  /* IMEPCLG1
98851,1,21.67,,13.43,,,,,,,,,,1,,75.00,0  /* IMEPCLG2
98852,1,0.00,,0.00,,,,,,,,,,0,,75.00,0  /* IMEPCLG3
98853,1,0.00,,0.00,,,,,,,,,,0,,75.00,0  /* IMEPCLG4
99422,1,96.67,,59.91,,,,,,,,,,1,,180.00,0  /* 1SKY U1
99423,1,0.00,,0.00,,,,,,,,,,0,,50.00,0  /* 1SKY U2
98090,5,96.67,,59.91,,,,,,,,,,1,,185.00,0  /*  RSCO R5
98091,4,0.00,,0.00,,,,,,,,,,0,,80.00,0  /*  RSCO R4
98574,1,96.67,,59.91,,,,,,,,,,1,,170.00,0  /* 1GOXY U1
98575,1,0.00,,0.00,,,,,,,,,,0,,170.00,0  /* 1GOXY U2
98576,1,0.00,,0.00,,,,,,,,,,0,,170.00,0  /* 1GOXY U3
99649,1,96.67,,59.91,,,,,,,,,,1,,544.00,0  /* RITC U2
Q
echo
@end
```

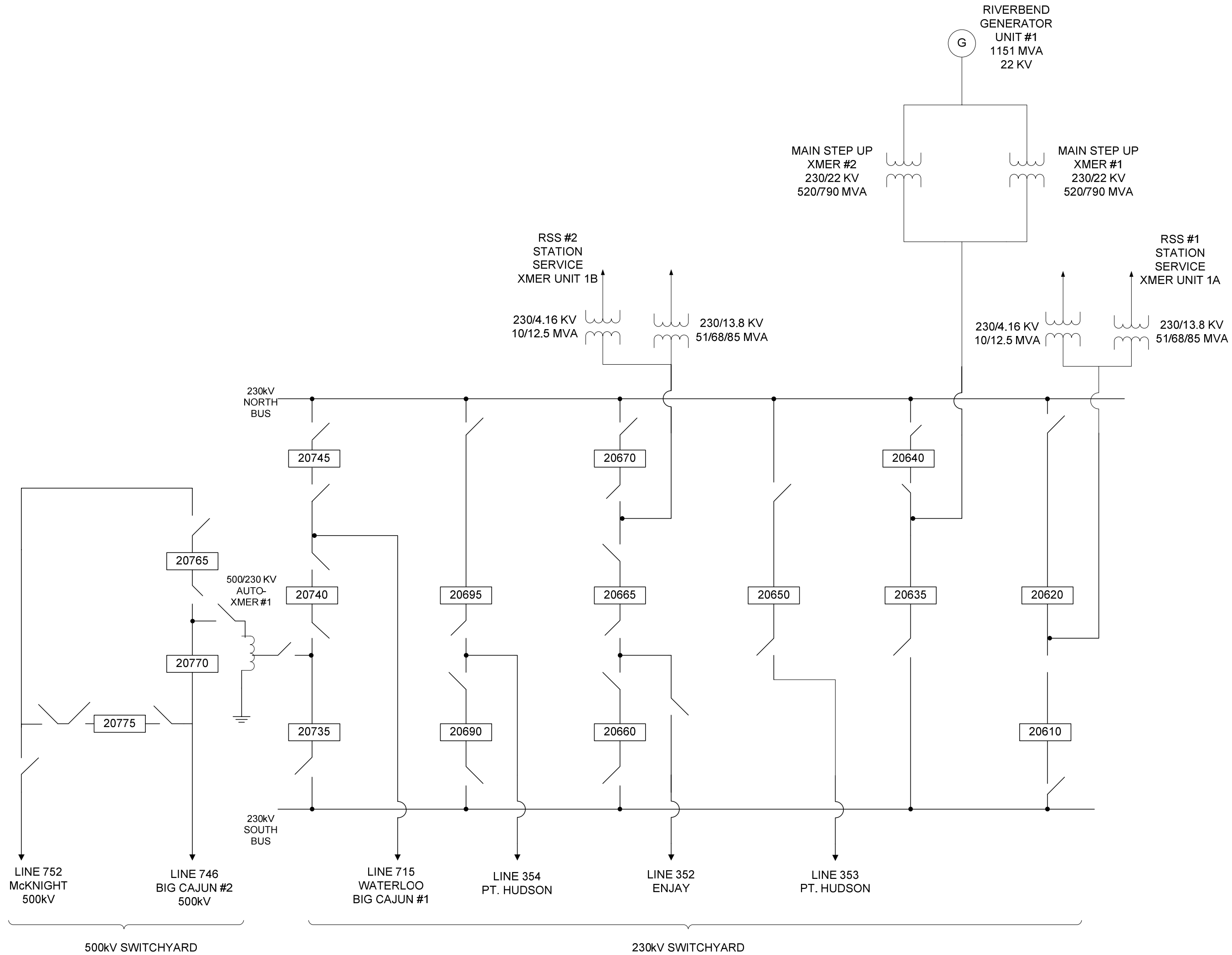
APPENDIX III - PLOTS FOR STABILITY ANALYSIS

Plots illustrating the results from the simulated cases are included in this appendix. For all cases, speed plots are given for representative generators near major 230 kV or 500 kV buses in the area near the proposed PID-204 generation.

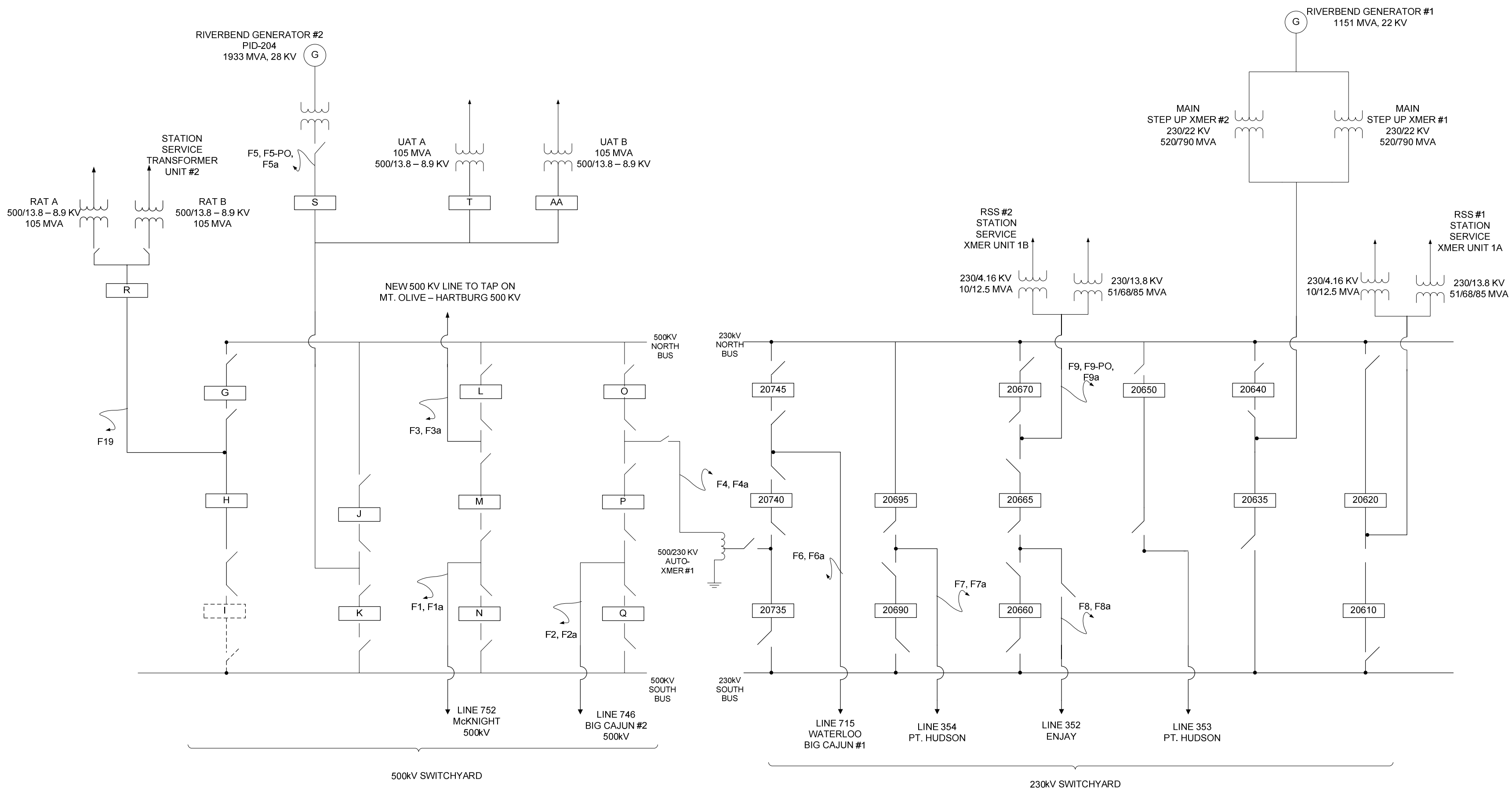
APPENDIX IV - SUBSTATION LAYOUT DIAGRAMS

Substation layout diagrams indicating the Fault Locations are included below (for reference purpose only).

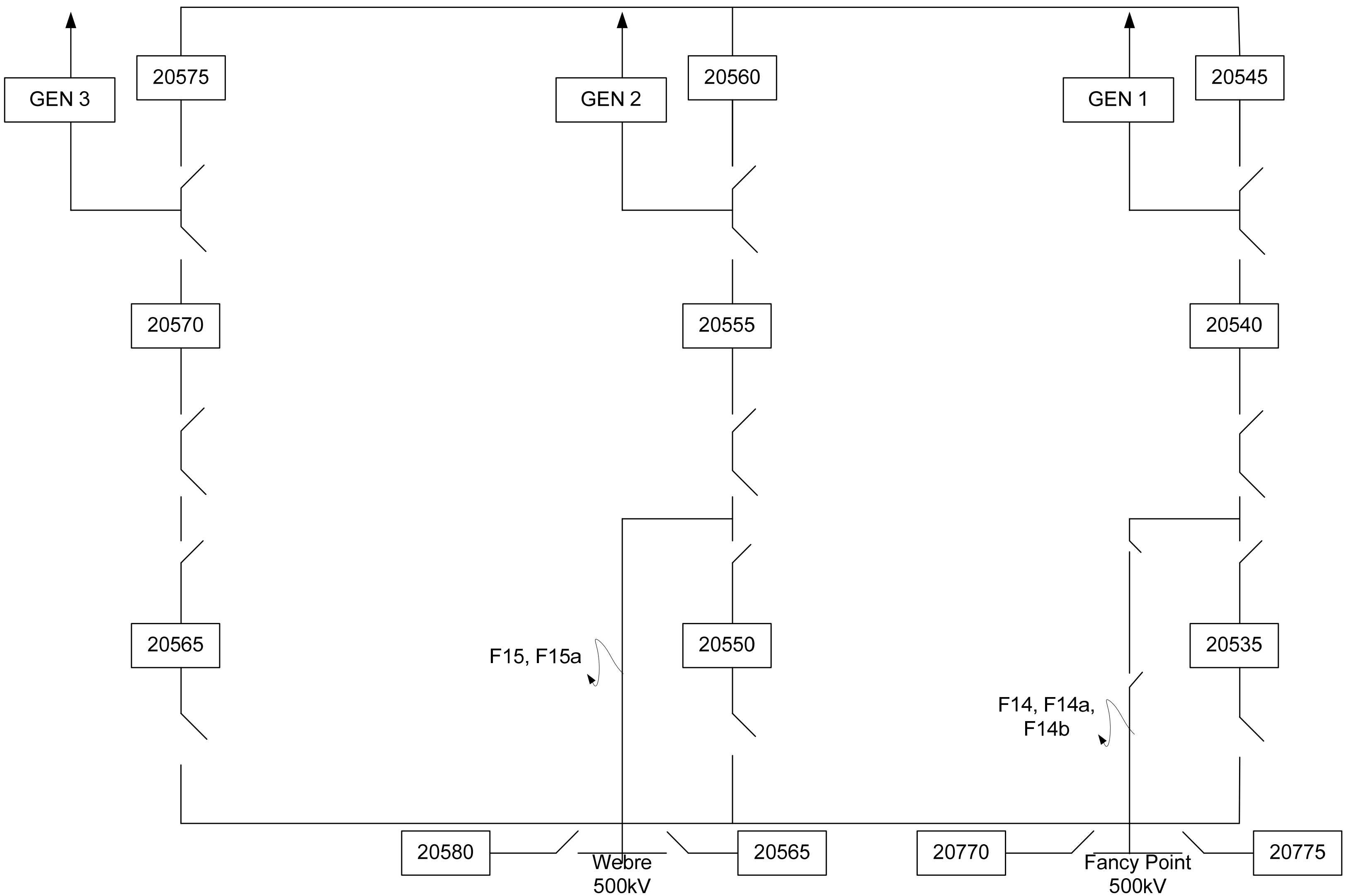
FANCY POINT 500/230 KV PRE-PID-204

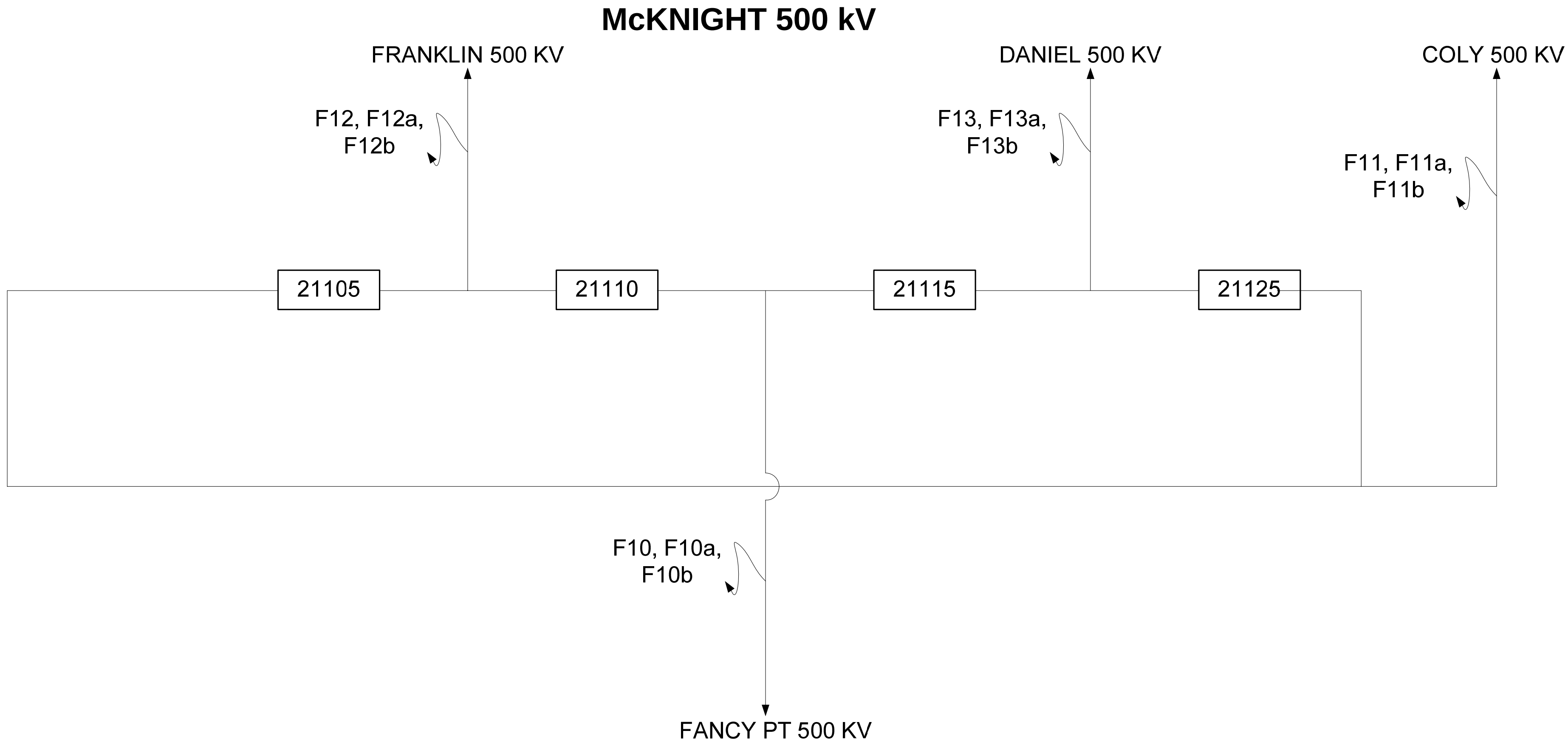


FANCY POINT 500-230 KV POST-PID-204



B. CAJUN #2 500 kV




McKNIGHT 500 kV
FRANKLIN 500 KV
DANIEL 500 KV
COLY 500 KV
F12, F12a, F12b
F13, F13a, F13b
F11, F11a, F11b
21105
21110
21115
21125
F10, F10a, F10b
FANCY PT 500 KV

Tap on Mt. Olive - Hartburg 500 kV