System Impact Study Report
PID 208
1594 MW (1684 MW Gross) Plant,
Fancy PT, LA

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Revision: 0

Rev	Issue Date	Description of Revision	Revised By	Project Manager
0	1/10/2008	Final for Review	BMH	JDH

Objective:

This System Impact Study is the second step of the interconnection process and is based on PID-208 request for interconnection on Entergy's transmission system at Fancy PT 500 kV substation. This report is organized in two sections, namely, Section – A, Energy Resource Interconnection Service (ERIS) and Section – B, Network Resource Interconnection Service (NRIS – Section B).

The Scope for the ERIS section (Section – A) includes load flow (steady state) analysis, offsite nuclear analysis and short circuit analysis as defined in FERC orders 2003, 2003A and 2003B. The NRIS section (Section – B) contains details of load flow (steady state) analysis only, however, offsite nuclear analysis and short circuit analysis of Section – A are also applicable to Section – B. Additional information on scope for NRIS study can be found in Section – B.

Requestor for PID 208 did request NRIS but did not request ERIS, therefore, under Section – A (ERIS) load flow analysis was not performed.

PID-208 intends to install a nuclear unit facility with a maximum capacity of 1933 MVA. The scheduled gross power output of the plant is 1684 MW. An auxiliary/host load of approximately 90 MW is also expected at this site. PID-208 anticipates injecting a total of approximately 1594 MW into the Entergy transmission system.

The proposed in-service date for this facility is January 1, 2015.

Section – A

Energy Resource Interconnection Service

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I. Introduction

This Energy Resource Interconnection Service (ERIS) is based on the PID-208 request for interconnection on Entergy's transmission system at Fancy PT 500 kV substation. The objective of this study is to assess the reliability impact of the new facility on the Entergy transmission system with respect to the steady state and transient stability performance of the system as well as its effects on the system's existing short circuit current capability. It is also intended to determine whether the transmission system meets standards established by NERC Reliability Standards and Entergy's planning guidelines when the plant is connected to Entergy's transmission system. If not, transmission improvements will be identified.

The System Impact Study process required a load flow analysis to determine if the existing transmission lines are adequate to handle the full output from the plant for simulated transfers to adjacent control areas. A short circuit analysis was performed to determine if the generation would cause the available fault current to surpass the fault duty of existing equipment within the Entergy transmission system. A transient stability analysis was conducted to determine if the new units would cause a stability problem on the Entergy system.

This ERIS System Impact Study was based on information provided by PID-208 and assumptions made by Entergy's Transmission Technical System Planning group. All supplied information and assumptions are documented in this report. If the actual equipment installed is different from the supplied information or the assumptions made, the results outlined in this report are subject to change.

The load flow results from the ERIS study are for information only. ERIS does not in and of itself convey any transmission service.

II. Short Circuit Analysis / Breaker Rating Analysis

A. Model Information

The short circuit analysis was performed on the Entergy system short circuit model using ASPEN software. This model includes all generators interconnected to the Entergy system or interconnected to an adjacent system and having an impact on this interconnection request, IPP's with signed IOAs, and approved future transmission projects on the Entergy transmission system including the proposed PID-208 unit.

B. Short Circuit Analysis

The method used to determine if any short circuit problems would be caused by the addition of the PID-208 generation is as follows:

1. Three phase and single phase to ground faults were simulated on the Entergy base case short circuit model and the worst case short circuit level was determined at each station. The PID-208 generator as well as the necessary NRIS upgrades shown in Section B, IV were then modeled in the base case to generate a revised short circuit model. The base case short circuit results were then compared with the results from the revised model to identify any breakers that were under-rated as a result of additional short circuit contribution from PID-208 generation. The breakers identified to be upgraded through this comparison are *mandatory* upgrades.

C. Analysis Results

The results of the short circuit analysis indicates that the additional generation due to PID-208 generators does cause an increase in short circuit current such that they exceed the fault interrupting capability of the high voltage circuit breakers within the vicinity of PID-208 plant.

Table I illustrates the station name, worst case fault level, and the number of breakers that were found to be under-rated at the respective locations as a result of the additional short circuit current due to PID-208 generator and includes no priors.

Table I: Underrated Breakers Without Priors

Substation	Breaker	Max Fault w/o PID-208 (amps)	Max Fault with PID-208 (amps)	Interrupting Rating (amps)
BC #2 500 kV	20535	34216	43559	40000
	20545	34216	43559	40000
	20550	34216	43559	40000
	20560	34216	43559	40000
	20565	34216	43559	40000
	20575	34216	43559	40000
CLECO-ACADIA 138 kV	8901	59643	63239	63000
	8909	59643	63239	63000
	8912	59643	63239	63000
	8916	59643	63239	63000
	8920	59643	63239	63000
	8923	59643	63239	63000
	8927	59643	63239	63000
	8931	59643	63239	63000
	8934	59643	63239	63000
	8938	59643	63239	63000
	8942	59643	63239	63000
	8945	59643	63239	63000
	8949	59643	63239	63000
	8953	59643	63239	63000
	8956	59643	63239	63000
	8964	59643	67191	63000
COLY -6 SPLIT 230kV	21285	36175	37335	37348
FANCY PT 1 230.kV	20610	57080	67191	63000
	20620	57080	67190	63000
	20635	57080	67190	63000
	20640	57080	66089	63000
	20650	56128	67190	63000
	20660	57080	67191	63000
	20665	57080	67191	63000
	20670	57080	67190	63000
	20690	57080	67190	63000
	20695	57080	67190	63000
	20735	57080	67190	63000
	20745	57080	67191	63000

KOLBS -2 69.kV	3505	39973	40454	40000
REPAPCO 138.kv	14655	20833	21031	20920
	20355	20833	21031	20920
RICHARD 138 kV	17235	59667	63411	63000
	17240	59667	63411	63000
	17245	59667	63411	63000
	17250	59352	63082	63000
	17255	59667	63411	63000
	17260	59667	63411	63000
	17265	59368	63099	63000
	17270	59667	63411	63000
	17275	59667	63411	63000
	18425	59368	63099	63000
	18430	59667	63411	63000
	18435	59667	63411	63000
	18440	59667	63411	63000
	27140	59389	63121	63000
	27145	59667	63411	63000
	27150	59667	63411	63000
	27155	59667	63411	63000
	27160	59667	63411	63000
	27165	59667	63411	63000
SABINE - 230.kV	13180	48969	53506	50204
	13185	48969	53506	50204
	13190	48969	53506	50204
	13195	48969	53506	50204
	13200	48969	53506	50204
	13250	48969	53506	50204
	13255	48969	53506	50204
	13260	46805	51371	50204
	13265	48969	53506	50204

Table II illustrates the station name, worst case fault level, and the number of breakers that were found to be under-rated at the respective locations as a result of the additional short circuit current due to PID-208 generator and includes prior PID's 197, 206 and 207.

Table II: Underrated Breakers With Priors Included

Substation	Breaker	Max Fault w/o PID-208 (amps)	Max Fault with PID-208 (amps)	Interrupting Rating (amps)
BC #2 500 kV	20535	35040	43994	40000
	20545	35040	43994	40000
	20550	35040	43994	40000
	20560	35040	43994	40000
	20565	35040	43994	40000
	20575	35040	43994	40000
CLECO-ACADIA 138 kV	8901	62370	65104	63000
	8909	62370	65104	63000
	8912	62370	65104	63000
	8916	61996	64708	63000
	8920	62370	65104	63000
	8923	62370	65104	63000
	8927	62370	65104	63000
	8931	62370	65104	63000
	8934	62370	65104	63000
	8938	62370	65104	63000
	8942	62370	65104	63000
	8945	62370	65104	63000
	8949	62041	64747	63000
	8953	62370	65104	63000
	8956	62370	65104	63000
	8964	62370	65104	63000
COLY -6 SPLIT 230kV	21285	36501	37535	37348
FANCY PT 1 230.kV	20610	57489	67340	63000
	20620	57489	67340	63000
	20635	57489	67340	63000
	20640	57489	67340	63000
	20650	56527	66233	63000
	20660	57489	67340	63000
	20665	57489	67340	63000
	20670	57489	67340	63000
	20690	57489	67340	63000
	20695	57489	67340	63000
	20735	57489	67340	63000
	20745	57489	67340	63000
REPAPCO 138.kv	14655	20860	21041	20920
	20355	20860	21041	20920

RICHARD 138 kV	17235	62507	65369	63000
	17240	60630	63488	63000
	17245	62507	65369	63000
	17250	62507	65369	63000
	17255	62182	65035	63000
	17260	62507	65369	63000
	17265	62507	65369	63000
	17270	62198	65053	63000
	17275	62507	65369	63000
	18425	62507	65369	63000
	18430	62198	65053	63000
	18435	62507	65369	63000
	18440	62507	65369	63000
	27140	62507	65369	63000
	27145	62220	65074	63000
	27150	62507	65369	63000
	27155	61156	64026	63000
	27160	62507	65369	63000
	27165	62507	65369	63000
SABINE - 230.kV	13180	49416	54111	50204
	13185	49416	54111	50204
	13190	49416	54111	50204
	13195	49416	54111	50204
	13200	49416	54111	50204
	13250	49416	54111	50204
	13255	49416	54111	50204
	13260	47242	51966	50204
	13265	49416	54111	50204
W GLEN 1 138.kV	9825	54666	55061	55000
	9850	54666	55061	55000
	9855	54666	55061	55000
	9860	54666	55061	55000
	9865	54666	55061	55000
	9900	54666	55061	55000
	9905	54666	55061	55000
	9910	54666	55061	55000
	9930	54666	55061	55000

D. Problem Resolution

Table III illustrates the station name, and the cost associated with upgrading the breakers at each station both for mandatory and optional breaker upgrades.

Substation	Number of Breakers	Estimated cost of Breaker Upgrades ($)
BC #2 500 kV	6	$5,400,000
CLECO-ACADIA 138 kV	16	*$7,200,000
COLY -6 SPLIT 230kV	1	$294,600
FANCY PT 1 230 kV	12	*$5,400,000
KOLBS-2 69.kV	1	**$234,000
REPAPCO 138.kv	2	$470,000
RICHARD 138 kV	19	*$8,550,000
SABINE - 230.kV	9	$3,000,000
W GLEN 1 138 kV	9	$2,500,00

*Price based on 230 kV 80 kA Breakers

**Price based on 145 kV 50 kA Breakers

The impact on breaker rating due to line upgrades will be evaluated during facilities study phase.

The results of the short circuit analysis are subject to change. They are based upon the current configuration of the Entergy transmission system and Generation Interconnection Study queue.

III. Offsite Nuclear Analysis

Technical Report

Off Site Study for PID-208 1594 MW (1687 MW Gross)	Grid Systems Consulting	Date 1/4/2008	Pages 58

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

A. Executive Summary

Southwest Power Pool (SPP) has commissioned ABB Inc. to conduct an offsite power analysis of the proposed new nuclear unit PID-208 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 modeling 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 PID-208.

The steady-state analysis was conducted to determine the voltage levels at Fancy PT. 500 kV and 230 kV buses following various outage contingencies on the transmission system during projected 2012 summer peak and 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 Fancy PT. 230 kV.

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. The results of the off-site analysis study indicate that the voltage at Fancy PT. 230 kV was lowest with both River Bend units off-line following 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 this contingency was 0.9967 p.u.

The lowest voltage observed at Fancy PT. 500 kV was 1.0165 p.u. following loss of B. Cajun #2 500 kV units (1778 MW). Voltage criteria for Fancy PT. 500 kV have not yet been established.

Critical Clearing Times (CCTs) were calculated for faults on all branches connected to the Fancy Pt. 500 and 230 kV switchyards. All CCTs are within the capabilities of the protection systems. The smallest CCT at Fancy PT. 230 kV is 6+10 cycles for a fault on the Fancy PT. – Waterloo 230 kV line. The smallest CCT at Fancy PT. 500 kV is 5+9 cycles for a fault on the Fancy Pt. – McKnight 500 kV line.

The upgrades identified for the PID-208 would result in transmission re-configuration at following substations:

- Richard 500 kV
- Weber 500 kV
- Hartburg 500 kV
- MT. Olive 500 kV
- Hartburg 230 kV
- Sabine 230 kV
- Jacinto 230 kV
- Cypress 230 kV

Further analysis should be done at the facility study stage to identify the impact at these substations.

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.

B. Introduction

Southwest Power Pool (SPP) has commissioned ABB Inc. to conduct steady state and stability analysis for PID-208, which is an interconnection request for a 1,594 MW (net) nuclear unit at Fancy PT. 500 kV substation on the Entergy transmission system. ABB recently completed a system impact study[1] and an offsite analysis[2] for PID-204. The proposed PID-208 is an interconnection request replacing the original PID-204 interconnection request with 72 MW higher net output. This report serves as a replacement for both of the aforementioned reports.

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 PID-208.

Entergy proposes to install a nuclear unit facility with a maximum capacity of 1933 MVA. The gross power output of the generator is 1687 MW. An auxiliary/host load of approximately 93 MW is expected at this site. PID-208 will inject a net power of approximately 1594 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. 500/230 kV after interconnection of PID-208. The following upgrades/changes identified for PID-208 were included in the study models (see Figure 1-2 for details).

- Build 56 miles 500 kV line from Webre – Richard 500 kV
- Build 140 miles 500 kV line from Fancy Point 500 kV – tap Hartburg/MT. Olive 500kV line near Toledo Bend including 1 river crossing.
- Build a new 21 mile 230 kV line from Hartburg – Sabine PPG 230kV
- Build new 54 mile 230 kV line from Cypress to Jacinto 230 kV

[1] A Final report ‘PID-204 Impact Study Report_September_12_2007’ issued on September 12, 2007
[2] A Final report ‘PID-204-Off-site-analysis_FINAL_REPORT_Sept_12_07’ issued on September 12, 2007

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. A Critical Clearing Time (CCT) assessment was performed for the substations adjacent to Fancy PT. 500 kV i.e. the Point of Interconnection of PID-208.

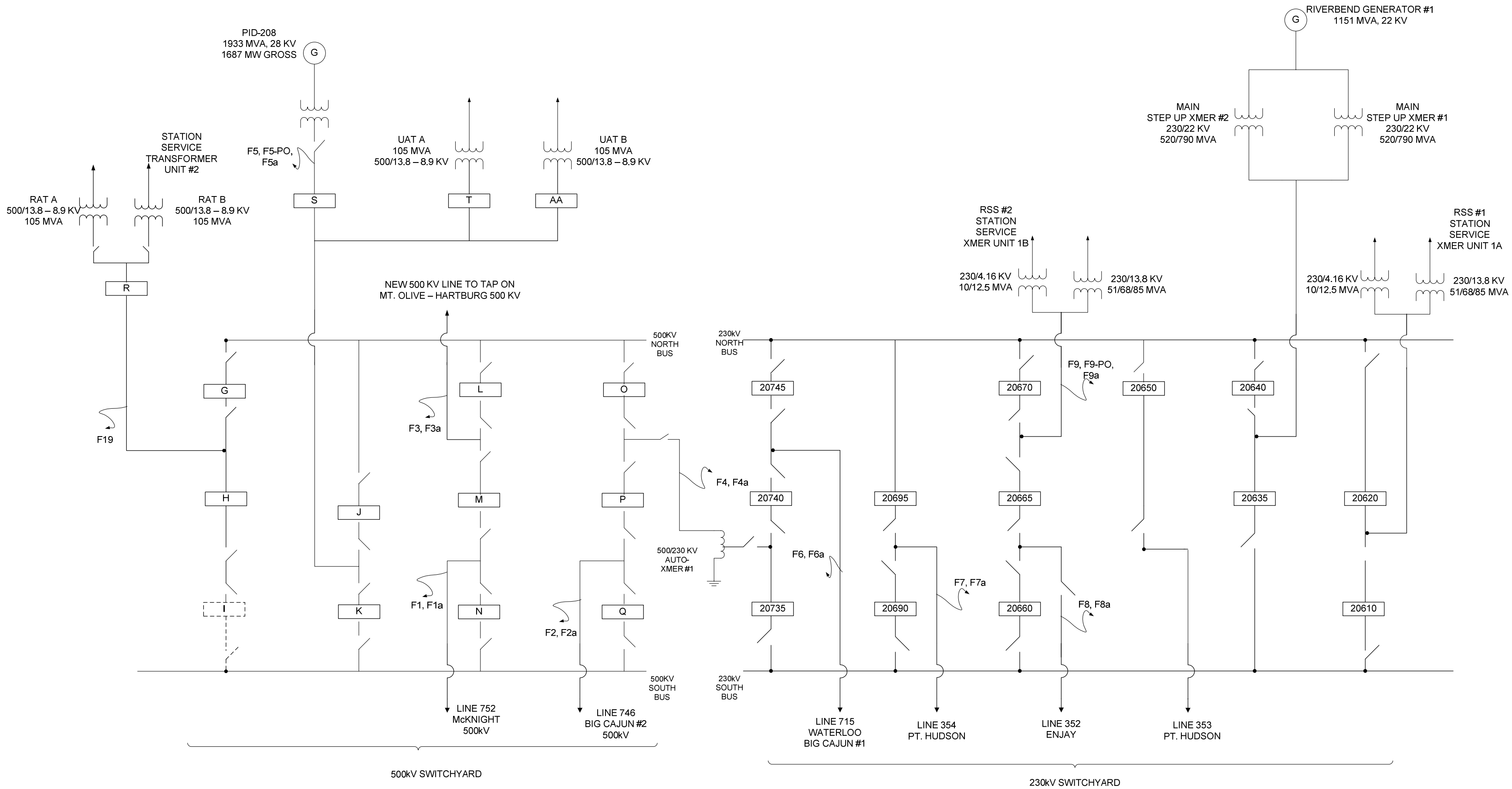


Figure 1-1: Bus Configuration of Fancy PT. 500/230 kV substation after interconnection of PID-208

*Note - Substation Layout diagram for Fancy PT. 500/230 kV substation **without** PID-208 is included in Appendix III for reference.*

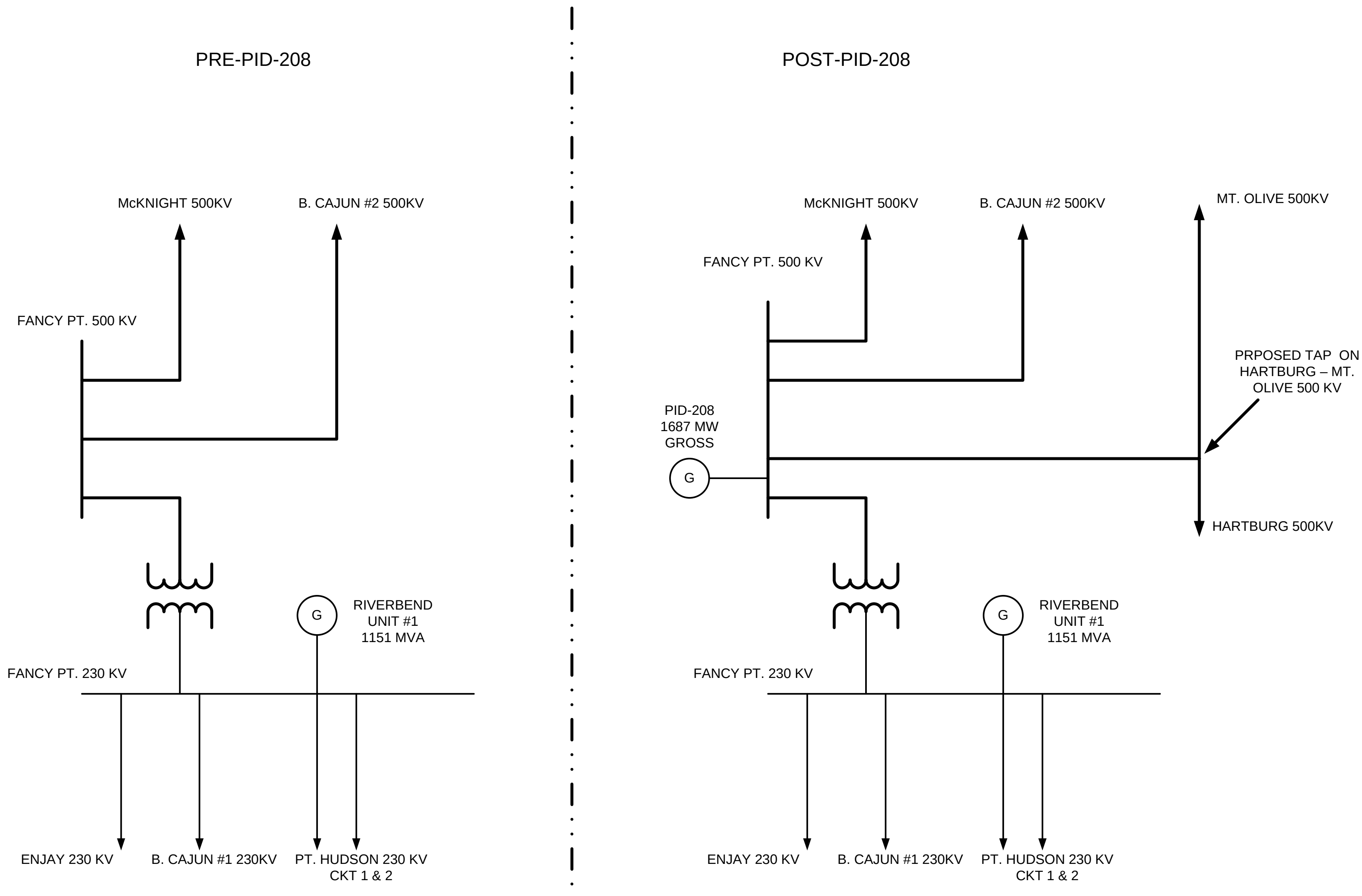


Figure 1-2: Transmission line configuration at Fancy PT. 500 kV with and without PID-208

C. Study Methodology & Assumptions

C1. STUDY DATA

Entergy provided 2012 summer peak and 2012 off-peak load cases. The dynamic database (snapshot file) used for System Impact Study of PID-204 was used for the stability analysis. Dispatch changes from the PID-204 model are discussed in Appendix IV.

The steady state and dynamic data for River Bend #1 and PID-208 used in offsite analysis is listed in Appendix I.

C2. STEADY STATE ANALYSIS

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

- River Bend Unit #1 and PID-208 on-line
- PID-208 off-line
- River Bend Unit #1 and PID-208 off-line

SPP provided the list of IPP generators in the Entergy system for dispatching River Bend Unit #1 and PID-208 during steady-state analysis. The list is included in Appendix II for reference.

There are two (2) offsite power supplies for River Bend units – Fancy PT. 500 kV and 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.

lists the contingencies simulated for steady state analysis. This list was provided by Entergy transmission planning group.

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

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

There is no established voltage criterion for Fancy PT 500 kV for Off-site power supply.

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

CONTINGENCY				
NO	NAME	DESCRIPTION	RBS UNIT #1	RBS UNIT (PID-208)
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	ON	OFF
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		
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	OFF	OFF
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		
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)		

C.3 CRITICAL CLEARING TIME

An evaluation of the critical clearing times was carried out for faults on lines and transformers in the following switchyards:

- 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 fault on each branch in the above two (2) switchyards. Exact fault locations are shown on the substation one-line diagrams in Appendix III. CCT is defined as the longest fault clearing time for which stability is maintained.

Independent pole operation (IPO) was assumed for breakers in both switchyards, with breaker failure occurring on only a single phase. This results in a three-phase fault becoming a single-phase fault at the normal clearing time. The single phase fault is then cleared by backup protection.

Currently, the Fancy Pt. 500 kV breakers are IPO, but the 230 kV breakers are not. However, as part of the PID-208 installation, all Fancy Pt. 230 kV breakers will be replaced with IPO breakers, so IPO breakers were assumed for all CCT calculations.

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 stability.

The results from PID-208 Off-site analysis were used for comparison.

D. 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 Fancy PT. units #1 and PID-208 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 Fancy PT. 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 Fancy PT. 230 kV was lowest with both River Bend 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 0.9967 p.u.

Fancy PT. 500 kV

Because there is no nuclear unit off-site power connected to Fancy PT. 500 kV before the addition of PID-208, no voltage criteria are 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 1.0165 p.u. following contingency '*GEN-4*' – 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	DESCRIPT.ION	RBS UNIT #1	PID-208	FANCY PT 230 KV	FANCY PT 500 KV	FANCY PT 230 KV	FANCY PT 500 KV
1	BASE CASE	BASE CASE	ON	ON	1.0142	1.0200	1.0123	1.0200
			ON	OFF	1.0143	1.0200	1.0122	1.0200
			OFF	ON	1.0123	1.0200	1.0145	1.0200
			OFF	OFF	1.0118	1.0199	1.0141	1.0204
2	LINE-1	Loss of Fancy PT. - B. Cajun 230 kV CKT 1	ON	OFF	1.0148	1.0200	1.0160	1.0204
3	LINE-2	Loss of Fancy PT. - PT. Hudson 230 kV CKT 1	ON	OFF	1.0142	1.0200	1.0115	1.0199
4	LINE-3	Loss of Fancy PT. - PT. Hudson 230 kV CKT 1 & 2	ON	OFF	1.0139	1.0198	1.0098	1.0197
5	LINE-4	Loss of Fancy PT. - Enjay 230 kV CKT 1	ON	OFF	1.0144	1.0200	1.0123	1.0200
6	LINE-5	Loss of Fancy PT. - Enjay 230 kV CKT 1 & Loss of Fancy PT. - PT. Hudson 230 kV CKT 1	ON	OFF	1.0143	1.0199	1.0115	1.0199
7	LINE-6	Loss of Fancy PT. - B. Cajun #2 500 kV CKT 1	ON	OFF	1.0142	1.0206	1.0121	1.0205
8	LINE-7	Loss of Fancy PT. - McKnight 500 kV CKT 1	ON	OFF	1.0143	1.0200	1.0123	1.0197
9	LINE-8	Loss of Fancy PT. - Tap MT Olive - Hartburg 500 kV CKT 1	ON	OFF	1.0142	1.0190	1.0119	1.0191
10	LINE-9	Loss of B. Cajun #2 - Weber 500 kV CKT 1	ON	OFF	1.0142	1.0191	1.0122	1.0192
11	GEN-1	Loss of G. Gulf Generation (1322 MW)	ON	OFF	1.0143	1.0200	1.0122	1.0200
12	GEN-2	Loss o Waterford Unit #3 (1197 MW)	ON	OFF	1.0143	1.0200	1.0129	1.0203
13	GEN-3	Loss of B. Cajun #1 230 kV Units (480 MW)	ON	OFF	1.0147	1.0201	1.0155	1.0205
14	GEN-4	Loss of B. Cajun #2 500 kV Units (1778 MW)	ON	OFF	1.0140	1.0181	1.0114	1.0193
15	GEN-5	Loss of Willow Glenn Unit #4 & #5 (1118 MW)	ON	OFF	1.0143	1.0200	1.0134	1.0204
16	LINE+GEN-1	Loss of Autotransformer 500/230 kV at Fancy PT & B. Cajun #1 Units (480 MW)	ON	OFF	1.0142	1.0206	1.0100	1.0209

CONTINGENCY					2012 SUMMER PEAK		2012 OFF-PEAK	
NO	NAME	DESCRIPT.ION	RBS UNIT #1	PID-208	FANCY PT 230 KV	FANCY PT 500 KV	FANCY PT 230 KV	FANCY PT 500 KV
17	LINE-1	Loss of Fancy PT. - B. Cajun 230 kV CKT 1	OFF	OFF	1.0147	1.0201	1.0186	1.0208
18	LINE-2	Loss of Fancy PT. - PT. Hudson 230 kV CKT 1	OFF	OFF	1.0115	1.0199	1.0135	1.0204
19	LINE-3	Loss of Fancy PT. - PT. Hudson 230 kV CKT 1 & 2	OFF	OFF	1.0106	1.0198	1.0111	1.0202
20	LINE-4	Loss of Fancy PT. - Enjay 230 kV CKT 1	OFF	OFF	1.0125	1.0199	1.0144	1.0205
21	LINE-5	Loss of Fancy PT. - Enjay 230 kV CKT 1 & Loss of Fancy PT. - PT. Hudson 230 kV CKT 1	OFF	OFF	1.0122	1.0199	1.0138	1.0204
22	LINE-6	Loss of Fancy PT. - B. Cajun #2 500 kV CKT 1	OFF	OFF	1.0106	1.0190	1.0150	1.0237
23	LINE-7	Loss of Fancy PT. - McKnight 500 kV CKT 1	OFF	OFF	1.0118	1.0199	1.0140	1.0201
24	LINE-8	Loss of Fancy PT. - Tap MT Olive - Hartburg 500 kV CKT 1	OFF	OFF	1.0113	1.0187	1.0136	1.0193
25	LINE-9	Loss of B. Cajun #2 - Weber 500 kV CKT 1	OFF	OFF	1.0117	1.0193	1.0142	1.0199
26	GEN-1	Loss of G. Gulf Generation (1322 MW)	OFF	OFF	1.0118	1.0199	1.0141	1.0204
27	GEN-2	Loss o Waterford Unit #3 (1197 MW)	OFF	OFF	1.0121	1.0199	1.0146	1.0207
28	GEN-3	Loss of B. Cajun #1 230 kV Units (480 MW)	OFF	OFF	1.0133	1.0200	1.0171	1.0208
29	GEN-4	Loss of B. Cajun #2 500 kV Units (1778 MW)	OFF	OFF	1.0097	1.0165	1.0147	1.0227
30	GEN-5	Loss of Willow Glenn Unit #4 & #5 (1118 MW)	OFF	OFF	1.0121	1.0198	1.0151	1.0207
31	LINE+GEN-1	Loss of Autotransformer 500/230 kV at Fancy PT & B. Cajun #1 Units (480 MW)	OFF	OFF	0.9967	1.0207	1.0086	1.0212

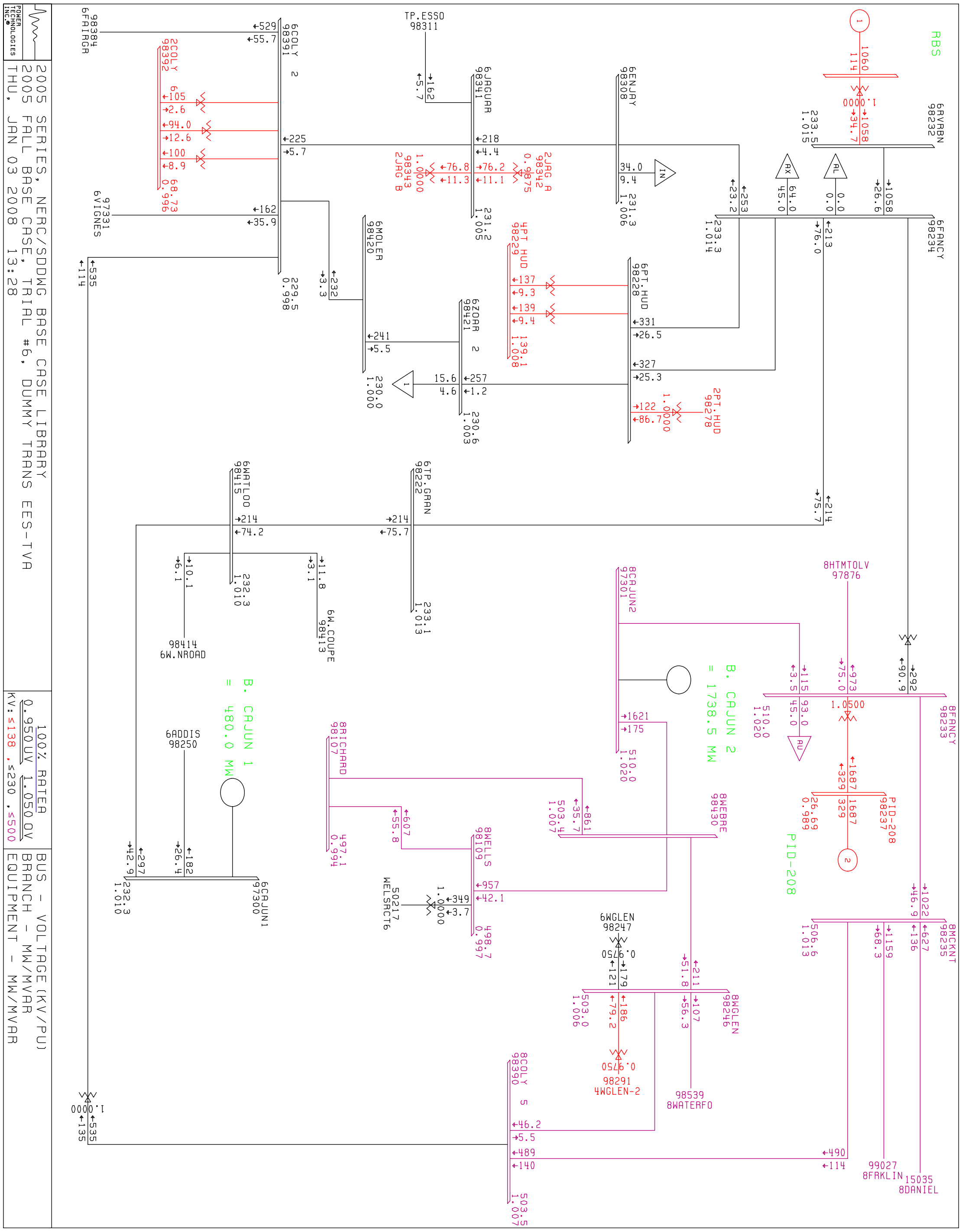


Figure 3-1: Power flow on transmission system near PID-208 – 2012 Summer Peak

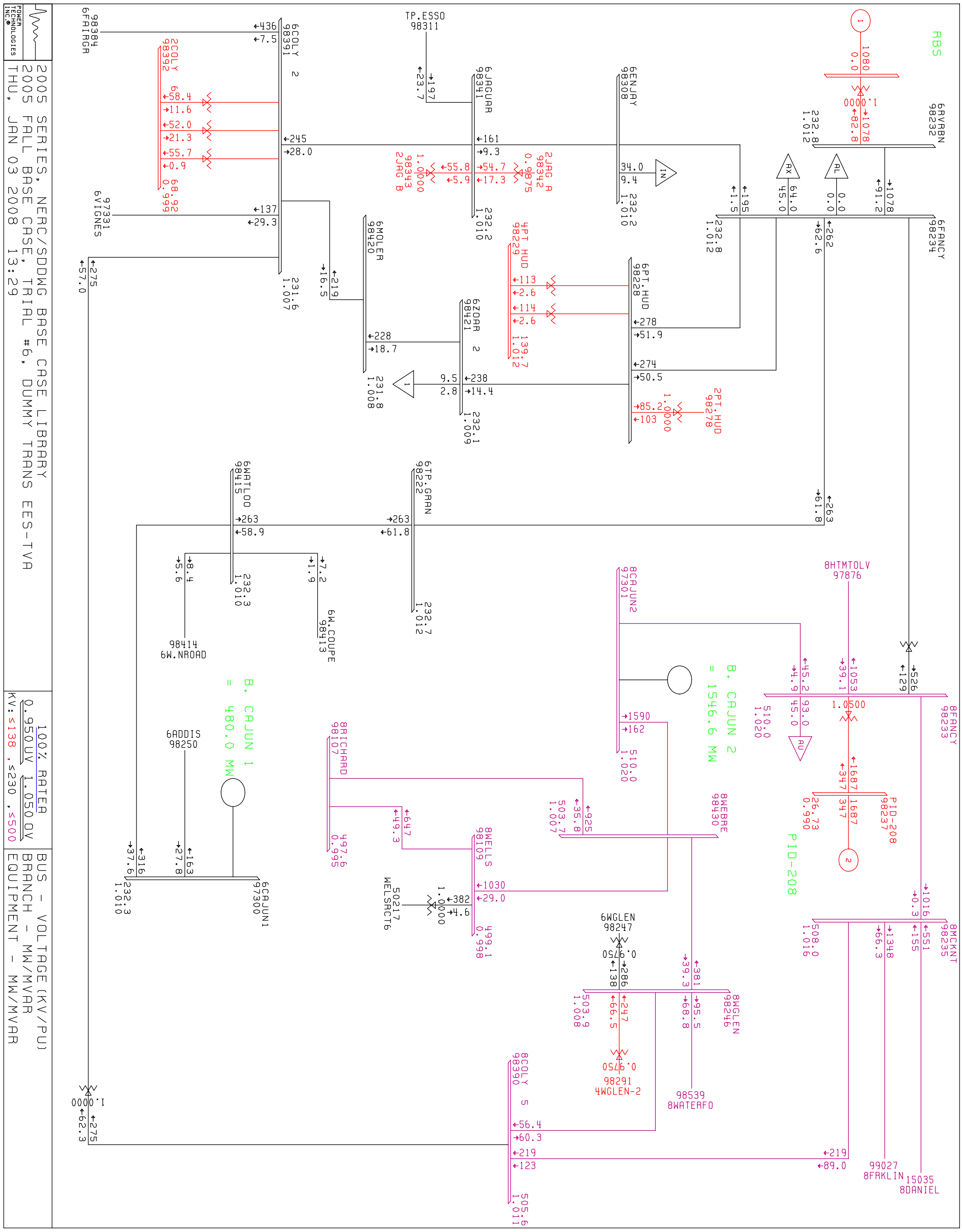


Figure 3-2: Power flow on transmission system near PID-208 – 2012 Off-Peak

E. 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 listed in Table 4-1. 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).

Table 4-1: List of faults for Critical Clearing Times assessment

CASE	LOCATION	TYPE	CLEARING TIME (cycles)		SLG FAULT IMPEDANCE (MVA)	STUCK BRK #	PRIMARY BRK TRIP #	SECONDARY BRK TRIP	TRIPPED FACILITIES
			PRIMARY	Back-up					
FAULT-1a	Fancy PT - McKnight 500 kV	3PH-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
FAULT-2a	Fancy PT - B. Cajun #2 500 kV	3PH-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 Transformer #1
FAULT-3a	Fancy PT - Tap MT. Olive - Hartsburg 500 kV	3PH-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
FAULT-4a	Fancy PT 500/230 kV Transformer #1	3PH-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
FAULT-5a	Fancy PT 500/27 kV step-up transformer PID-208	3PH-1PH	5	9	1114.74-j13215.48	BRK S		BRK J, K , T	Fancy PT 500/27 kV step-up transformer, PID-208 generator
FAULT-6a	Fancy PT - Waterloo 230 kV	3PH-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
FAULT-7a	Fancy PT - PT Hudson 230 kV	3PH-1PH	6	9	702.02-j10862.25	20695	20690, OCB#20220, GCB#21660	20745, 20670, 20650, 20640, 20620	Fancy PT - PT Hudson 230 kV
FAULT-8a	Fancy PT - Enjay 230 kV	3PH-1PH	6	9	667.89-j10364.36	20665	20660, OCB#14630	20745, 20650, 20640,20620	Fancy PT - Enjay 230 kV
FAULT-9a	Fancy PT - River Bend 230 kV & Unit #1	3PH-1PH	6	9	508.54-j7949.14	20640	20635	20745, 20695, 20650, 20620	Fancy PT - River Bend 230 kV & Unit #1

Table 4-2 shows the Critical Clearing Times calculated for the simulated faults with PID-208 compared to PID-204.

Table 4-2: CCT Results

CASE	Primary Clearing Time (Cycles)	Delayed Clearing Time (Cycles)			
		2012 Summer Peak		2012 Off-peak	
		PID-204	PID-208	PID-204	PID-208
FAULT-1a	5	11	10	10	9
FAULT-2a	5	31	22	24	19
FAULT-3a	5	13	11	11	10
FAULT-4a	5	19	16	15	16
FAULT-5a	5	47	35	36	35
FAULT-6a	6	14	17	10	10
FAULT-7a	6	19	21	16	14
FAULT-8a	6	17	19	15	13
FAULT-9a	6	120	120	120	120

It can be seen from these results that the lowest CCTs are for Faults 1a (5+9 cycles) and 3a (5+10 cycles) during off-peak conditions. The CCTs with PID-208 provide a 1 cycle margin above Entergy's standard breaker failure clearing times of 5+9 cycles and 6+9 cycles, respectively.

The CCT differences between PID-204 and PID-208 studies are primarily due to the increased local generation on line in the model, as discussed in Appendix IV.

Note that prior to the proposed PID-208 interconnection, there is no generation connected at Fancy PT. 500 kV, and after interconnection of the proposed PID-208 unit, the new generator becomes the limiting element for the stability of the system. In other words, for a fault near Fancy Pt. 500 kV, if the clearing time is longer than the CCT shown above, the PID-208 generator will go unstable. For 230 kV faults, River Bend unit 1 is the critical generator. (It is normal for the generator electrically closest to the fault to be the critical generator in CCT analysis.)

F. Conclusions

Southwest Power Pool (SPP) has commissioned ABB Inc. to conduct an offsite power analysis of the proposed new nuclear unit PID-208 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 modeling 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 PID-208.

The steady-state analysis was conducted to determine the voltage levels at Fancy PT. 500 kV and 230 kV buses following various outage contingencies on the transmission system during projected 2012 summer peak and 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 Fancy PT. 230 kV.

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. The results of the off-site analysis study indicate that the voltage at Fancy PT. 230 kV was lowest with both River Bend units off-line following 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 this contingency was 0.9967 p.u.

The lowest voltage observed at Fancy PT. 500 kV was 1.0165 p.u. following loss of B. Cajun #2 500 kV units (1778 MW). Voltage criteria for Fancy PT. 500 kV have not yet been established.

Critical Clearing Times (CCTs) were calculated for faults on all branches connected to the Fancy Pt. 500 and 230 kV switchyards. All CCTs are within the capabilities of the protection systems. The smallest CCT at Fancy PT. 230 kV is 6+10 cycles for a fault on the Fancy PT. – Waterloo 230 kV line. The smallest CCT at Fancy PT. 500 kV is 5+9 cycles for a fault on the Fancy Pt. – McKnight 500 kV line.

The upgrades identified for the PID-208 would result in transmission re-configuration at following substations:

- Richard 500 kV
- Weber 500 kV
- Hartburg 500 kV
- MT. Olive 500 kV
- Hartburg 230 kV
- Sabine 230 kV
- Jacinto 230 kV
- Cypress 230 kV

Further analysis should be done at the facility study stage to identify the impact at these substations.

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 RIVER BEND UNIT #1 AND PID-208

APPENDIX I.1 *LOADFLOW DATA*

```
98231,'G1RVRBN ',  21.5000,2,     0.000,     0.000, 151, 110,1.02173,  28.2267,   1
98237,'PID-208 ',  27.0000,2,     0.000,     0.000, 151, 151,0.98856,  29.4450,   1
0 / END OF BUS DATA, BEGIN LOAD DATA
98233,'AU',1, 151, 451,    93.000,    45.040,     0.000,     0.000,     0.000,     0.000,   1
98234,'AL',0, 151, 410,    84.700,    59.700,     0.000,     0.000,     0.000,     0.000,   1
98234,'AX',1, 151, 410,    64.000,    45.000,     0.000,     0.000,     0.000,     0.000,   1
0 / END OF LOAD DATA, BEGIN GENERATOR DATA
98231,'1 ',  1060.000,   113.600,   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 ',  1687.004,   328.770,   842.000,  -603.000,1.02000,98233,  1933.000,   0.00000,   0.28000,   0.00000,   0.00000,1.00000,1,
100.0,  1687.000,     0.000,   1,1.0000
0 / END OF GENERATOR DATA, BEGIN BRANCH DATA
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
525.000, 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      WED, DEC 26 2007  10:09
2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6, DUMMY TRANS EES-TVA

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      WED, DEC 26 2007  10:09
2005 SERIES, NERC/SDDWG BASE CASE LIBRARY
2005 FALL BASE CASE, TRIAL #6, DUMMY TRANS EES-TVA

PLANT MODELS

REPORT FOR ALL MODELS                         BUS 98237 [PID-208 27.000] MODELS


** GENROU **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S
            98237     PID-208  27.000 2   81291-81304   31103-31108

            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-208  27.000 2   81322-81338   31125-31140    5504-5507     2794-2799

                   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-208  27.000 2   81402-81418   31155-31158

   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-208      27.000 2   81439-81458   31165-31170    5510-5511

     K      T1      T2      T3     UO      UC    PMAX   PMIN     T4      K1
  20.00   0.000   0.000   0.150  0.120  -0.120 1.0000 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
```

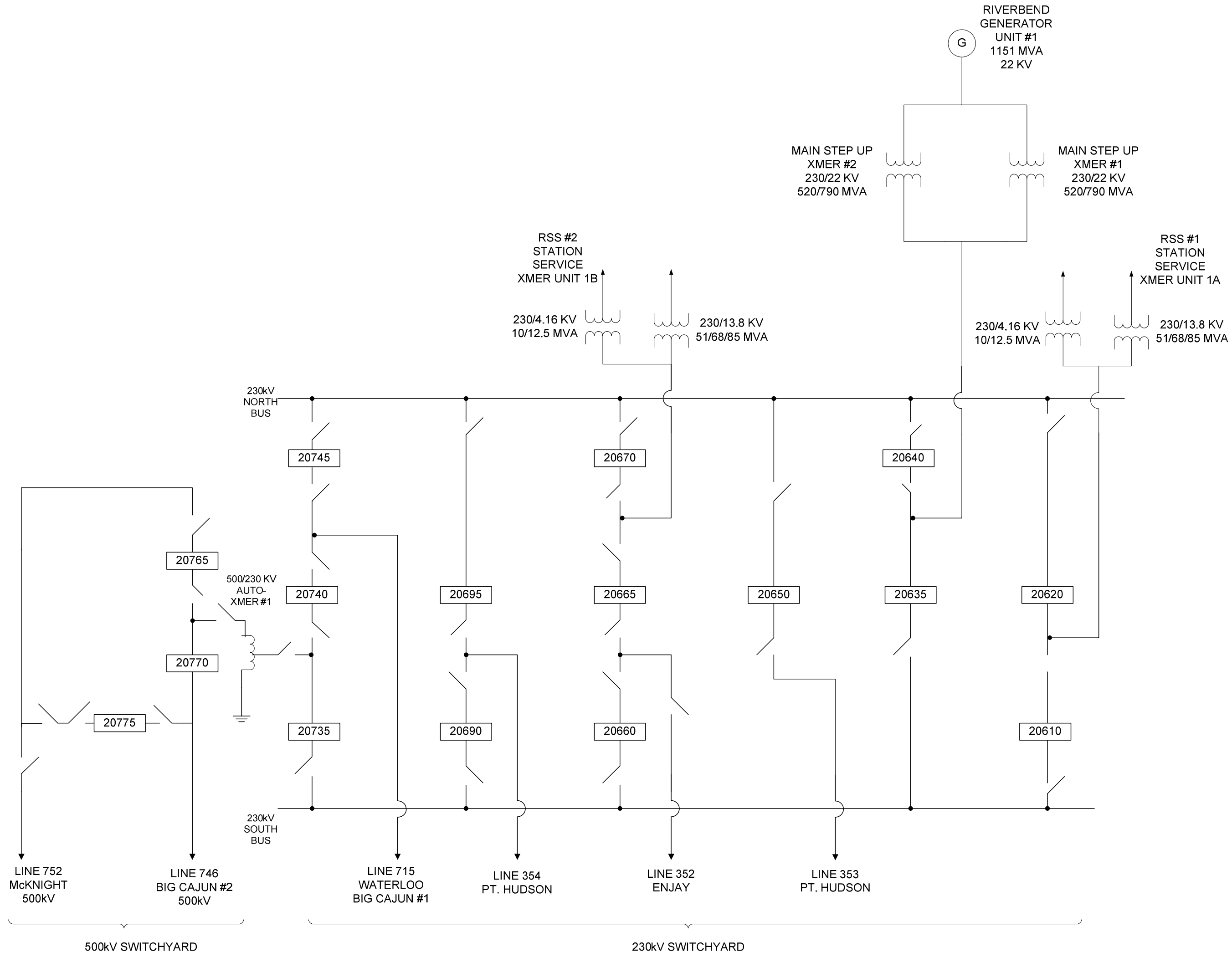
APPENDIX II - LIST OF IPP GENERATION FOR DISPATCH

```
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
```

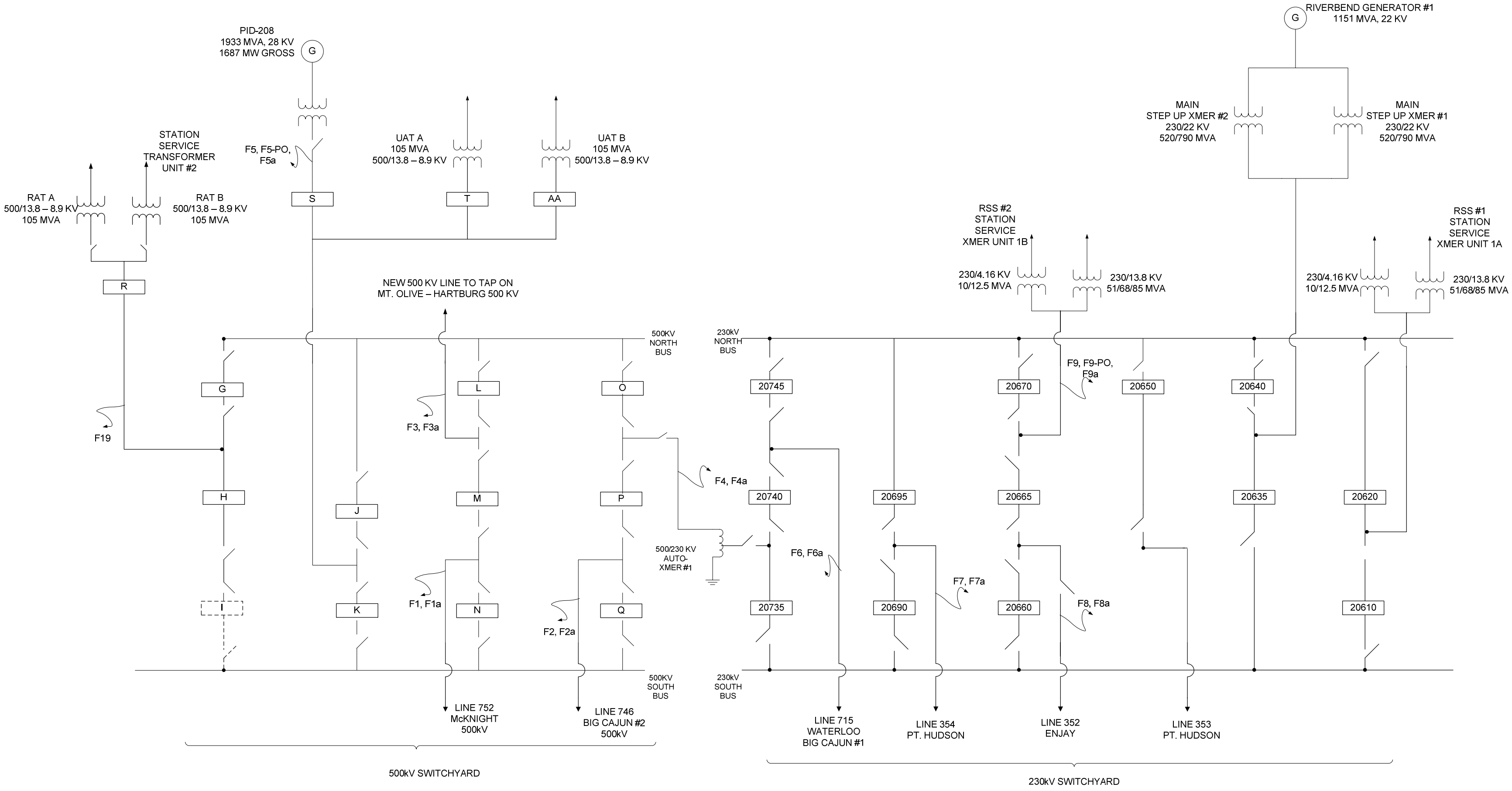
APPENDIX III - SUBSTATION LAYOUT DIAGRAMS

Substation layout diagrams indicating the Fault Locations are included below.

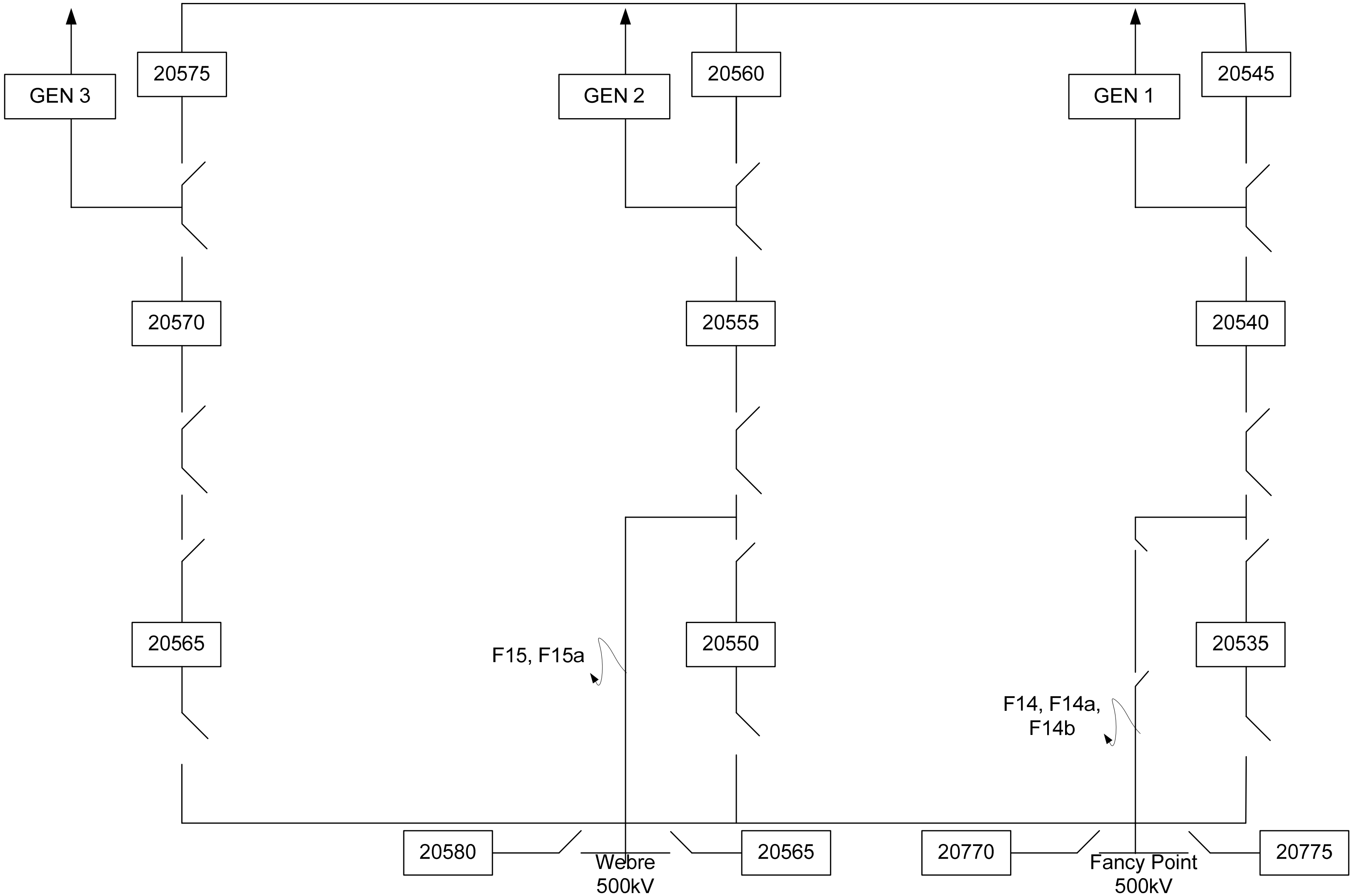
FANCY POINT 500/230 KV PRE-PID-208

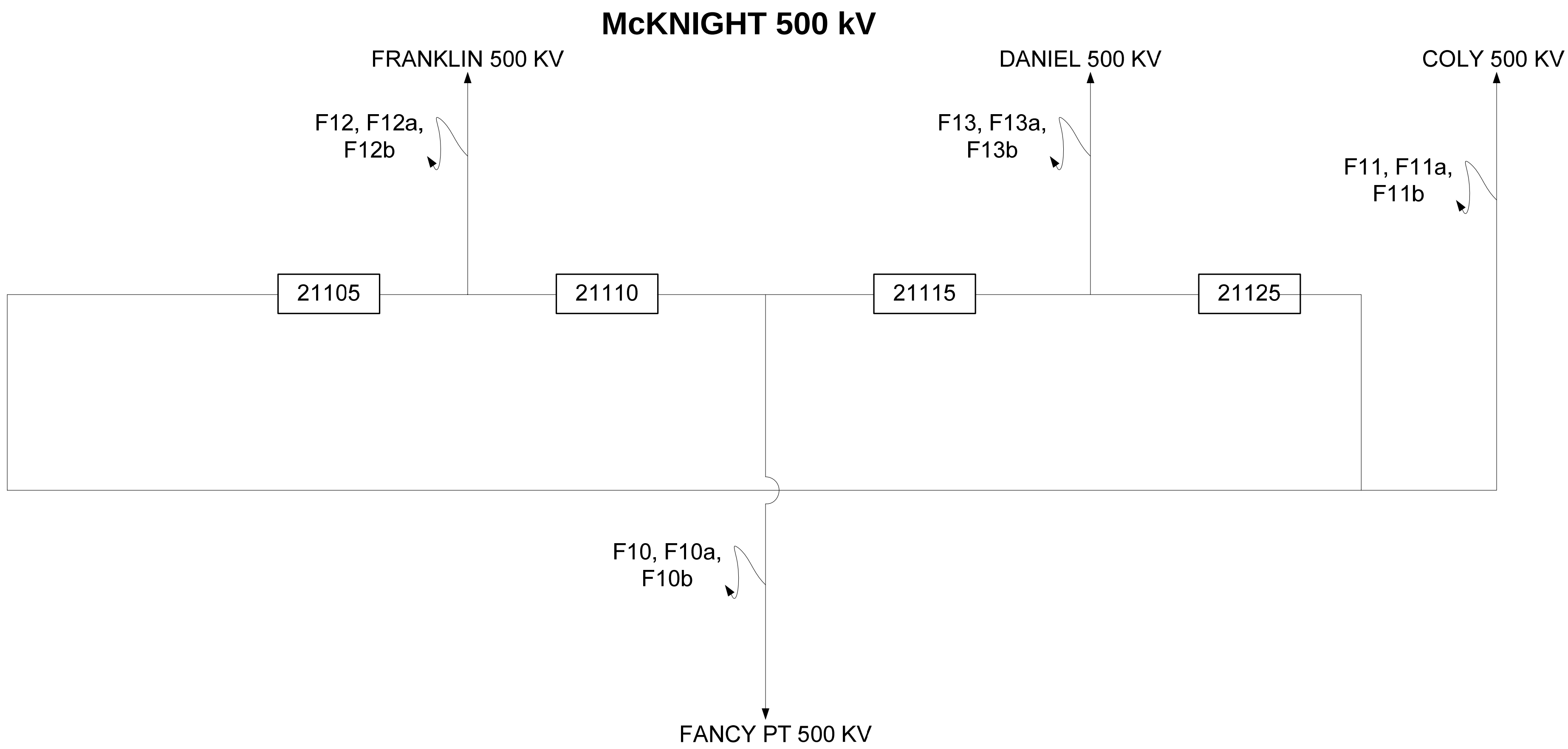


FANCY POINT 500-230 KV POST-PID-208

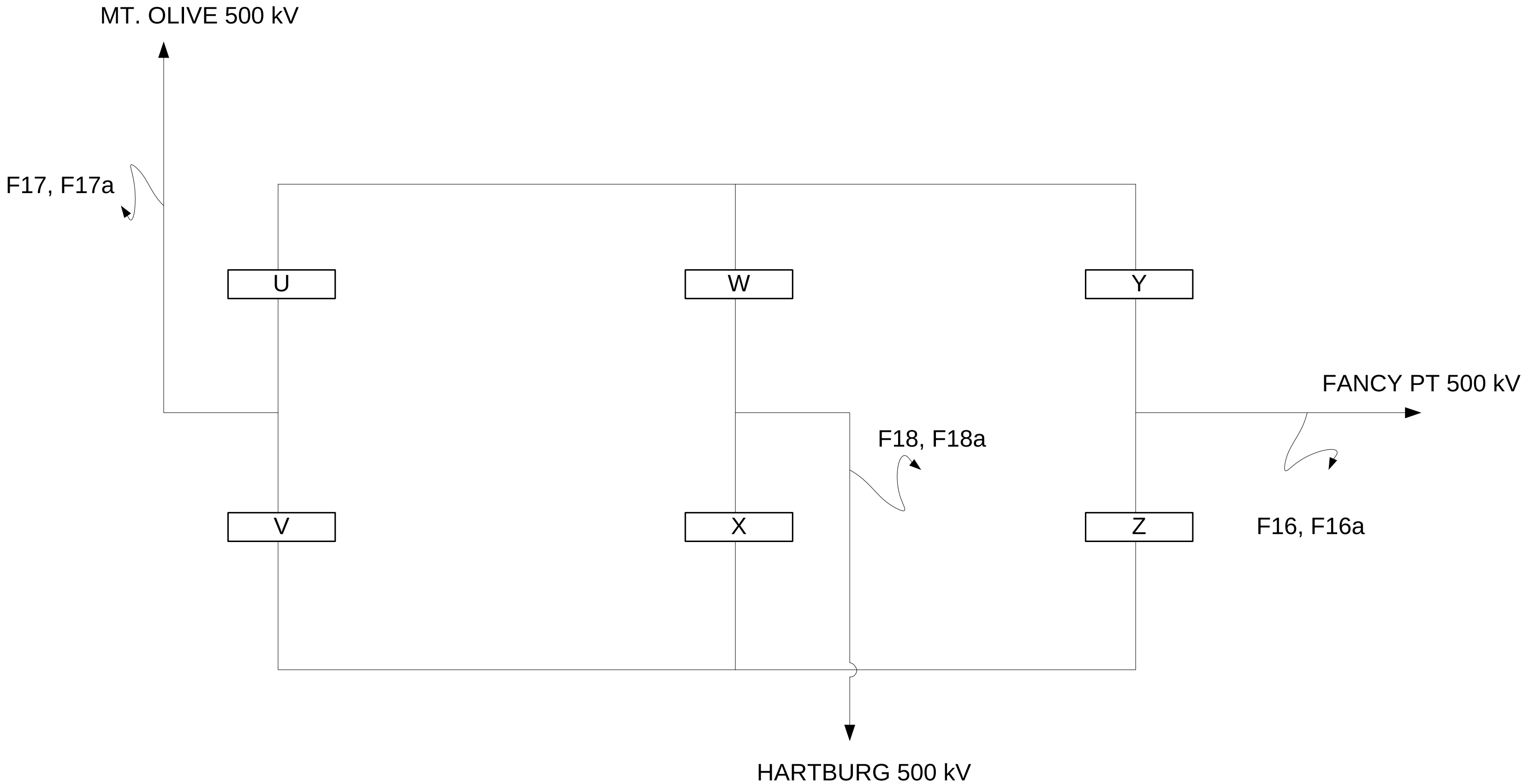


B. CAJUN #2 500 kV




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

New Switching Station on Mt. Olive - Hartburg 500 kV Line



APPENDIX IV - GENERATION DISPATCH COMPARED TO PID-204 MODELS

To develop a conservative study model with stressed system conditions, more local area generation was switched on as compared to the PID-204 study model. The large amount of on-line generation in the Entergy system had to be offset by adding an additional *dummy* area transfer of approximately 1000 MW in 2012 Summer Peak and approximately 2000 MW in 2012 Off-peak case between Entergy (Area 151) and TVA (Area 147). The difference in generation dispatch between the PID-204 and PID-208 base cases is shown below for the peak and off-peak cases.

2012 Summer Peak

BUS			PID-208 (MW)	PID-204 (MW)	DIFF
NO	NAME	KV			MW
98324	IDOWAEP5	18	199.8	0	199.8
98244	G4WGLEN	24	567.4	374	193.4
98320	IDOWAEP1	18	177	0	177
98321	IDOWAEP2	18	177	0	177
98322	IDOWAEP3	18	177	0	177
98323	IDOWAEP4	18	177	0	177
98245	G5WGLEN	20	549.5	385	164.5
98095	1DYNGYU1	18	161	0	161
98096	1DYNGYU2	18	161	0	161
98940	2B.WLSNI	69	771	655	116
98471	1G5EXXON	13.8	149.6	67.6	82
98237	PID-208	27	1687	1612	75
98982	PID-207	27	1687	1612	75
99443	IDUKHSS1	18	135	70	65
99451	IC1TRCBL	16	188	123	65
98301	1G4EXXON	13.8	87.8	32.8	55
98939	B.WLSNH1	18	550	520	30
98473	1G1ENCO	13.8	76.9	53.9	23

2012 Off-Peak

BUS			PID-208 (MW)	PID-204 (MW)	DIFF
NO	NAME	KV			MW
98244	G4WGLEN	24	567.3	160.4	406.9
98245	G5WGLEN	20	549	150.3	398.7
98243	G3WGLEN	20	536.5	160.4	376.1
98940	2B.WLSNI	69	527.3	250.6	276.7
98552	GYP U2	22	283.8	36.1	247.7
98604	NMIL U4	26	499.2	264.6	234.6
98605	NMIL U5	26	506.1	275	231.1
98535	WAT U1	26	250	41.1	208.9
98659	MICH U3	24	369.3	160.4	208.9
98536	WAT U2	26	250	42.1	207.9
98324	IDOWAEP5	18	198.7	0	198.7
98320	IDOWAEP1	18	176.1	0	176.1
98321	IDOWAEP2	18	176.1	0	176.1
98322	IDOWAEP3	18	176.1	0	176.1
98323	IDOWAEP4	18	176.1	0	176.1
99353	CATH U4	22	374.1	210.2	163.9
97575	G5SABIN	24	286	123.1	162.9
99648	RITC U1	22	231.8	70.2	161.6
98242	G2WGLEN	22	210.5	50.1	160.4
98553	GYP U3	24	372.7	218.3	154.4
98658	MICH U2	18	157.3	20	137.3
98551	GYP U1	22	171	34.1	136.9
98241	G1WGLEN	18	159.5	40.1	119.4
99145	STER U6	18	153.9	40.1	113.8
98095	1DYNGYU1	18	110.2	0	110.2
98096	1DYNGYU2	18	110.2	0	110.2
98471	1G5EXXON	13.8	149.4	42.8	106.6
98920	4REX BRJ	13.8	150.5	70.2	80.3
98237	PID-208	27	1687	1612	75
98982	PID-207	27	1687	1612	75
98301	1G4EXXON	13.8	87.1	20.7	66.4
97573	G3SABIN	22	287.4	223.4	64
99229	COUC U2	13.8	88.9	30.1	58.8
97451	G1LEWIS	22	157.4	98.9	58.5
98603	NMIL U3	18	87.5	30.1	57.4
97914	G4NELSON	24	310.7	253.8	56.9
97452	G2LEWIS	22	154.6	101.4	53.2
99352	CATH U3	13.8	68.4	20	48.4
99443	IDUKHSS1	18	92.3	44.3	48
98473	1G1ENCO	13.8	76.6	34.1	42.5
98738	DELTA U1	13.8	66.3	28.1	38.2
98921	3REX BRN	115	49.2	12	37.2
99635	MOSE U1	13.8	49.2	12	37.2
98739	DELTA U2	69	65	28.1	36.9
99636	MOSE U2	13.8	49.2	13	36.2
99149	STER 7C	13.8	58.1	22.1	36
97572	G2SABIN	20	143.7	113.2	30.5
99419	1CATH U1	22	35	10	25
99420	1CATH U2	13.8	34.9	10	24.9
98601	NMIL U1	13.8	44.5	23.1	21.4
98231	G1RVRBN	21.5	1080	1062.5	17.5
98577	1SOXY U1	18	205.2	189.7	15.5
98954	GGULF	22	1338	1325.1	12.9
98922	REX BRN1	13.8	22.6	10	12.6

Section – B

Network Resource Interconnection Service

I. Introduction

A Network Resource Interconnection Services (NRIS) study was requested by PID-208 to serve 1594 MW of Entergy network load. The expected in service date for this NRIS generator is January 1, 2015. The tests were performed with only confirmed transmission reservations and existing network generators and with transmission service requests in study mode.

Two tests were performed, a deliverability to generation test and a deliverability to load test. The deliverability to generation (DFAX) test ensures that the addition of this generator will not impair the deliverability of existing network resources and units already designated as NRIS while serving network load. The deliverability to load test determines if the tested generator will reduce the import capability level to certain load pockets (Amite South, WOTAB and Western Region) on the Entergy system. A more detailed description for these two tests is described in Appendix B-A and Appendix B-B.

Also, it is understood that the NRIS status provides the Interconnection Customer with the capability to deliver the output of the Generating Facility into the Transmission System. NRIS in and of itself does not convey any right to deliver electricity to any specific customer or Point of Delivery.

II. Load Flow Analysis

A. Models

The models used for this analysis were the 2012 summer and winter peak cases developed in September 2006.

The following modifications were made to the base cases to reflect the latest information available:

- Non-Firm IPPs within the local region of the study generator were turned off and other non-firm IPPs outside the local area were increased to make up the difference.
- Confirmed firm transmission reservations were modeled for the year 2015. These requests are shown below.

OASIS#	PSE	POR	POD	Sink	MW	Service	Begin	End
1412068	NRG	EES	AMRN	AMRN	103	Long-Term Firm PTP	01/01/07	01/01/08
1413110	NRG	EES	LAGN	LAGN	100	Yearly Network - Designated Resources	01/01/07	01/01/09
1416650	NRG	AMRN	LAGN	LAGN	100	Yearly Network - Designated Resources	01/01/07	01/01/08
1422496	Constellation Commodities Group	EES	DENL	DENL	57	Yearly Network - Designated Resources	01/01/07	01/01/08
1424384	Constellation Commodities Group	TVA	DENL	DENL	100	Yearly Network - Designated Resources	01/01/07	01/01/08
1431165	Cargill Alliant	AMRN	SOCO	SOCO	103	Long-Term Firm PTP	01/01/08	01/01/09
1435973	Entergy Services, Inc. (EMO)	EES	EES	EES	135	Yearly Network - Designated Resources	05/01/08	05/01/10
1440358	NRG	TVA	LAGN	LAGN	100	Yearly Network - Designated Resources	03/01/07	03/01/08
1442295	NRG	LEPA	LAGN	LAGN	3	Yearly Network - Designated Resources	07/01/07	07/01/09
1442453	NRG	LAGN	LAGN	LAGN	320	Yearly Network - Designated Resources	06/01/07	06/01/26
1449495	Entergy Services (EMO)	EES	EES	EES	322	Yearly Network - Designated Resources	06/01/09	06/01/59
1449881	Cargill Power Markets, LLC	AMRN	SOCO	SOCO	103	Long-Term Firm PTP	01/01/08	01/01/09
1452307	NRG	AMRN	LAGN	LAGN	100	Yearly Network - Designated Resources	01/01/08	01/01/09
1452308	NRG	AMRN	LAGN	LAGN	100	Yearly Network - Designated Resources	01/01/08	01/01/09
1452603	NRG	AMRN	LAGN	LAGN	100	Yearly Network - Designated Resources	09/01/07	09/01/08
1453402	NRG	AMRN	SOCO	SOCO	40	Long-Term Firm PTP	01/01/09	01/01/10
1456636	CLECO Power LLC	OKGE	CLECO	CLECO	10	Yearly Network - Designated Resources	10/01/07	10/01/12
1464028	East Texas Electric Coop.	EES	EES	EES	168	Yearly Network - Designated Resources	01/01/10	01/01/40
1470811	East Texas Electric Coop.	EES	EES	EES	168	Yearly Network - Designated Resources	01/01/10	01/01/40

- Base Plan transmission reliability upgrades for 2007 - 2010 were included in the base case. These upgrades can be found at Entergy's OASIS web page, http://oasis.e-terrasolutions.com/documents/EES/Disclaimer.html, under approved future projects.
- Increased the output of Big Cajun 2 units to reflect there NITS and firm point to point transfers from that unit. To do this, the output of Bayou Cove and Ouachita were reduced to 0MW.
- Reduced the load in zones 100 – 199 and 500 -998 by 1594MW. Turned off all of the non-firm IPPs and reduced the output of Baxter Wilson Unit 1 and 2 to their firm level, 1142MW.
- Reduced Waterford 1 and 2 to their firm level, 731 MW and Willow Glen 4 and 5 to their firm level, 758 MW.

Transfer analysis was performed from River Bend to loads in zone 100 – 199 and 500 – 998 using MUST.

Another model was created to include all prior transmission service requests in study mode and prior NRIS interconnection generators. The NRIS interconnection generators are:

PID	Substation	MW	In Service Date
207	Grand Gulf	1594	1/1/2015

There are no prior transmission service requests that are in study mode, all prior transmission service requests that were in study mode have either confirmed their transmission service or withdrawn/retracted the transmission service requested.

In setting up the cases, all non-firm generators serving EES load, in close proximity to the study generator were dispatched to their confirmed generation output.

The remaining generation was absorbed in Entergy's control area 151 by first reducing the non-firm IPPs and then non-firm Entergy owned units. In the confirmed case, the loads in zones 100 -199 and 500 -998 were reduced to 23831 MW. This allowed for turning off all non-firm generation in the model. A 1594MW transfer analysis was then simulated to zones 100 -199 and 500 -998 using MUST. In the case with priors, the loads were scaled to 25425MW. This allowed the prior interconnection request, PID 207 to serve network load and maintain all other generators at their designated network levels.

B. Contingencies and Monitored Elements

Single contingency analyses on Entergy's transmission facilities (including tie lines) 115kV and above were considered. All transmission facilities on Entergy transmission system above 100 kV were monitored.

C. Generation used for the transfer

The PID-208 generators were used as the source for the "from generation" test for deliverability.

III. Results

A. Deliverability to Generation (DFAX) Test:

The deliverability to generation (DFAX) test ensures that the addition of this generator will not impair the deliverability of existing network resources and units already designated as NRIS while serving network load. A more detailed description for these two tests is described in Appendix B-A and Appendix B-B.

Table III-1 Summary of Results of DFAX Test:

Study Case	Study Case with Priors
Addis - Big Cajun 1 230kV	Addis - Big Cajun 1 230kV
Big Cajun 2 - Webre 500kV	Big Cajun 2 - Webre 500kV
Champagne - Krotz Spring 138kV	Webre - Wells 500kV
Gibson - Humphrey 115kV	Willow Glen - Webre 500kV
Gibson - Ramos 138kV	
Gibson 138/115kV transformer	
Greenwood - Humphrey 115kV	
Greenwood - Terrebone 115kV	
Krotz Spring - Line 642 Tap 138kV	
Livonia - Line 642 Tap 138kV	
Livonia - Wilbert 138kV	
Louisiana Station - Thomas 138kV	
Louisiana Station - Wilbert 138kV	
Port Hudson - Thomas 138kV	
Webre - Wells 500kV	
Wells 500/230kV transformer	

Table III-2 DFAX Study Case Results without priors:

Limiting Element	Contingency Element	ATC(MW)
Livonia - Wilbert 138kV	Webre - Wells 500kV	0
Greenwood - Terrebone 115kV	Webre - Wells 500kV	0
Livonia - Line 642 Tap 138kV	Webre - Wells 500kV	0
Krotz Spring - Line 642 Tap 138kV	Webre - Wells 500kV	0
Greenwood - Humphrey 115kV	Webre - Wells 500kV	0
Gibson - Humphrey 115kV	Webre - Wells 500kV	0
Champagne - Krotz Spring 138kV	Webre - Wells 500kV	0
Livonia - Wilbert 138kV	Richard - Wells 500kV	0
Gibson - Ramos 138kV	Webre - Wells 500kV	139
Louisiana Station - Wilbert 138kV	Webre - Wells 500kV	159
Louisiana Station - Thomas 138kV	Webre - Wells 500kV	279
Webre - Wells 500kV	Franklin - McKnight 500kV	344
Webre - Wells 500kV	Eldorado EHV - Mount Olive 500kV	399
Wells 500/230 kV transformer	Richard - Wells 500kV	444
Livonia - Line 642 Tap 138kV	Richard - Wells 500kV	457

Krotz Spring - Line 642 Tap 138kV	Richard - Wells 500kV	576
Addis - Big Cajun 1 230kV	Big Cajun 2 - Webre 500kV	781
Gibson 138/115kV transformer	Webre - Wells 500kV	812
Port Hudson - Thomas 138kV	Webre - Wells 500kV	1295
Big Cajun 2 - Webre 500kV	Fancy Point - McKnight 500kV	1305
Richard - Wells 500kV	Bonin - Labbe 230kV (LAFA)	1413
Webre - Wells 500kV	Base Case	1417
Champagne - Krotz Spring 138kV	Richard - Wells 500kV	1429
Richard - Wells 500kV	Wells 500/230kV transformer	1448
Fancy Point - McKnight 500kV	Big Cajun 2 - Webre 500kV	1542
Addis - Big Cajun 1 230kV	Fancy Point - McKnight 500kV	1552

Table III-3 DFAX Study Case with Priors Results:

Limiting Element	Contingency Element	ATC(MW)
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	361
Addis - Big Cajun 1 230kV	Big Cajun 2 - Webre 500kV	408
Hartburg - Inland Orange 230kV	Cypress - Hartburg 500kV	514
Webre - Wells 500kV	Richard - Webre 500kV	531
Richard 500/138kV transformer 2	Roy S. Nelson - Richard 500kV	841
Inland - McLewis 230kV	Cypress - Hartburg 500kV	1001
Willow Glen - Webre 500kV	Big Cajun 2 - Webre 500kV	1102
Helbig - McLewis 230kV	Cypress - Hartburg 500kV	1139
Big Cajun 2 - Webre 500kV	Coly - McKnight 500kV	1181
Big Cajun 2 - Webre 500kV	Fancy Point - McKnight 500kV	1229
Bayou Cove - Richard 138kV ckt 1	Roy S. Nelson - Richard 500kV	1302
Addis - Big Cajun 1 230kV	Enjay - Fancy Point 230kV	1415
Hebert - Bayou Cove 138kV	Roy S. Nelson - Richard 500kV	1529
Addis - Big Cajun 1 230kV	Enjay - Jaguar 230kV	1554

To alleviate the constrained identified in Tables III-2 & 3 a second iteration of DFAX test was performed with the following upgrades included in the model and results are listed in Table III-4 & 5:

1. Build 82 miles 500kV transmission line from Fancy Point – Richard, including 1 river crossing.
2. Build 56 miles 500kV line from Webre – Richard 500kV

With priors, the following upgrades were needed:

1. Build 140 miles 500kV line from Fancy Point – tap Hartburg/Mount Olive 500kV line near Toledo Bend including 2 river crossings.
2. A 500kV line is included from Webre – Richard 500kV from PID 207.

Table III-4 DFAX Study Case Results without Priors:

Limiting Element	Contingency Element	ATC(MW)
NONE		1594

Table III-5 DFAX Study Case with Priors Results:

Limiting Element	Contingency Element	ATC(MW)
Hartburg - Inland Orange 230kV	Cypress - Hartburg 500kV	49
Inland - McLewis 230kV	Cypress - Hartburg 500kV	475
Helbig - McLewis 230kV	Cypress - Hartburg 500kV	599
Cypress 500/138kV transformer 1	Cypress 500/230kV transformer	1135
Bevil - Cypress 230kV	Hartburg 500/230kV transformer 1	1321
Bevil - Cypress 230kV	Hartburg - Inland Orange 230kV	1325
Addis - Big Cajun 1 230kV	Big Cajun 2 - Webre 500kV	1350
Bevil - Cypress 230kV	Inland - McLewis 230kV	1573

B. Deliverability to Load Test:

The deliverability to load test determines if the tested generator will reduce the import capability level to certain load pockets (Amite South, WOTAB and Western Region) on the Entergy system. A more detailed description for these two tests is described in Appendix B-A and Appendix B-B. With Only the confirmed transactions and committed NITS and NRIS generators:

Amite South: Passed

WOTAB: Failed

The import capability of the WOTAB region was determined to be reduced due to the proposed upgrades. Further analysis determined that two upgrades would offset the impact to import capability to this region:

1. Build a new 230 kV line from Hartburg to Sabine 230 kV
2. Build a new 230 kV line from Cypress to Jacinto 230 kV

Western Region: Failed

The import capability of the Western region was determined to be reduced due to the proposed upgrades. Further analysis determined that two upgrades would offset the impact to import capability to this region:

1. Build a new 230 kV line from Hartburg to Sabine 230 kV
2. Build a new 230 kV line from Cypress to Jacinto 230 kV

Import capability into load regions with the upgrades identified in the DFAX test.

	Import Capability (MW)		
Import Region	**BaseCase**	**RiverBend+DFAX upgrades**	**Change**
Western	1210	1147	-63
WOTAB	1654	1582	-72
Amite South	1027	1412	385

Import capability into load regions with the upgrades identified in the DFAX test and Load Deliverability test.

	Import Capability (MW)		
Import Region	**BaseCase**	**RiverBend+DFAX upgs+ Load deliverability Upgs**	**Change**
Western	1210	1223	13
WOTAB	1654	2102	448
Amite South	1027	1426	400

IV. Required Upgrades for NRIS

Preliminary Estimates of Direct Assignment of Facilities and Network Upgrades

<table>
<tr><th>Limiting Element</th><th>Planning Estimate for Upgrade</th></tr>
<tr><td>Livonia - Wilbert 138kV</td><td rowspan="26">Without priors:

Build 82 miles 500kV transmission line from Fancy Point – Richard, including 1 river crossing, $230,000,000

Build 56 miles 500kV line from Webre – Richard 500kV, $151,000,000

With priors:

Build 140 miles 500kV line from Fancy Point – tap Hartburg/Mount Olive 500kV line near Toledo Bend including 2 river crossings. (A 500kV line is included from Webre – Richard 500kV from PID 207.), $400,000,000</td></tr>
<tr><td>Greenwood - Terrebone 115kV</td></tr>
<tr><td>Livonia - Line 642 Tap 138kV</td></tr>
<tr><td>Krotz Spring - Line 642 Tap 138kV</td></tr>
<tr><td>Greenwood - Humphrey 115kV</td></tr>
<tr><td>Gibson - Humphrey 115kV</td></tr>
<tr><td>Champagne - Krotz Spring 138kV</td></tr>
<tr><td>Livonia - Wilbert 138kV</td></tr>
<tr><td>Gibson - Ramos 138kV</td></tr>
<tr><td>Louisiana Station - Wilbert 138kV</td></tr>
<tr><td>Louisiana Station - Thomas 138kV</td></tr>
<tr><td>Wells 500/230 kV transformer</td></tr>
<tr><td>Livonia - Line 642 Tap 138kV</td></tr>
<tr><td>Krotz Spring - Line 642 Tap 138kV</td></tr>
<tr><td>Addis - Big Cajun 1 230kV</td></tr>
<tr><td>Gibson 138/115kV transformer</td></tr>
<tr><td>Webre - Wells 500kV</td></tr>
<tr><td>Port Hudson - Thomas 138kV</td></tr>
<tr><td>Richard - Wells 500kV</td></tr>
<tr><td>Champagne - Krotz Spring 138kV</td></tr>
<tr><td>Fancy Point - McKnight 500kV</td></tr>
<tr><td>Addis - Big Cajun 1 230kV</td></tr>
<tr><td>Webre - Wells 500kV</td></tr>
<tr><td>Big Cajun 2 - Webre 500kV</td></tr>
<tr><td>Willow Glen - Webre 500kV</td></tr>
<tr><td>Big Cajun 2 - Webre 500kV</td></tr>
<tr><td>Import Capability into WOTAB region</td><td rowspan="2">Build a new 21 mile 230 kV line from Hartburg to Sabine 230 kV,$32,000,000

*Build a new 54 mile 230 kV line from Cypress to Jacinto 230 kV, $81,000,000</td></tr>
<tr><td>Import Capability into Western region</td></tr>
</table>

*** Included in the 2008 ICT Base Plan**

The costs of the upgrades are planning estimates only. Detailed cost estimates, accelerated costs and solutions for the limiting elements will be provided in the facility study.

In addition to the cost contained in this report, the order of magnitude cost estimate for rework inside the Fancy PT substation has been estimated at $15,000,000. Please note that these estimated costs do not contain overheads or tax gross ups. These numbers are subject to change as more detailed options will be evaluated during the facility study.

APPENDIX B.A - Deliverability Test for NRIS

1. Overview

Entergy will develop a two-part deliverability test for customers (Interconnection Customers or Network Customers) seeking to qualify a Generator as an NRIS resource: (1) a test of deliverability "from generation", that is out of the Generator to the aggregate load connected to the Entergy Transmission system; and (2) a test of deliverability "to load" associated with sub-zones. This test will identify upgrades that are required to make the resource deliverable and to maintain that deliverability for a five year period.

1.1 The "From Generation" Test for Deliverability

In order for a Generator to be considered deliverable, it must be able to run at its maximum rated output without impairing the capability of the aggregate of previously qualified generating resources (whether qualified at the NRIS or NITS level) in the local area to support load on the system, taking into account potentially constrained transmission elements common to the Generator under test and other adjacent qualified resources. For purposes of this test, the resources displaced in order to determine if the Generator under test can run at maximum rated output should be resources located outside of the local area and having insignificant impact on the results. Existing Long-term Firm PTP Service commitments will also be maintained in this study procedure.

1.2 The "To Load" Test for Deliverability

The Generator under test running at its rated output cannot introduce flows on the system that would adversely affect the ability of the transmission system to serve load reliably in import-constrained sub-zones. Existing Long-term Firm PTP Service commitments will also be maintained in this study procedure.

1.3 Required Upgrades.

Entergy will determine what upgrades, if any, will be required for an NRIS applicant to meet deliverability requirements pursuant to Appendix B-B.

Appendix B.B – NRIS Deliverability Test

<u>Description of Deliverability Test</u>

Each NRIS resource will be tested for deliverability at peak load conditions, and in such a manner that the resources it displaces in the test are ones that could continue to contribute to the resource adequacy of the control area in addition to the studied resources. The study will also determine if a unit applying for NRIS service impairs the reliability of load on the system by reducing the capability of the transmission system to deliver energy to load located in import-constrained sub-zones on the grid. Through the study, any transmission upgrades necessary for the unit to meet these tests will be identified.

<u>Deliverability Test Procedure:</u>

The deliverability test for qualifying a generating unit as a NRIS resource is intended to ensure that 1) the generating resource being studied contributes to the reliability of the system as a whole by being able to, in conjunction with all other Network Resources on the system, deliver energy to the aggregate load on the transmission system, and 2) collectively all load on the system can still be reliably served with the inclusion of the generating resource being studied.

The tests are conducted for "peak" conditions (both a summer peak and a winter peak) for each year of the 5-year planning horizon commencing in the first year the new unit is scheduled to commence operations.

1) Deliverability of Generation

The intent of this test is to determine the deliverability of a NRIS resource to the aggregate load on the system. It is assumed in this test that all units previously qualified as NRIS and NITS resources are deliverable. In evaluating the incremental deliverability of a new resource, a test case is established. In the test case, all existing NRIS and NITS resources are dispatched at an expected level of generation (as modified by the DFAX list units as discussed below). Peak load withdrawals are also modeled as well as net imports and exports. The output from generating resources is then adjusted so as to "balance" overall load and generation. This sets the baseline for the test case in terms of total system injections and withdrawals.

Incremental to this test case, injections from the proposed new generation facility are then included, with reductions in other generation located outside of the local area made to maintain system balance.

Generator deliverability is then tested for each transmission facility. There are two steps to identify the transmission facilities to be studied and the pattern of generation on the system:

1) Identify the transmission facilities for which the generator being studied has a 3% or greater distribution factor.

2) For each such transmission facility, list all existing qualified NRIS and NITS resources having a 3% or greater distribution factor on that facility. This list of units is called the Distribution Factor or DFAX list.

For each transmission facility, the units on the DFAX list with the greatest impact are modeled as operating at 100% of their rated output in the DC load flow until, working down the DFAX list, a 20% probability of all units being available at full output is reached (e.g. for 15 generators with a Forced Outage Rate of 10%, the probability of all 15 being available at 100% of their rated output is 20.6%). Other NRIS and NITS resources on the system are modeled at a level sufficient to serve load and net interchange.

From this new baseline, if the addition of the generator being considered (coupled with the matching generation reduction on the system) results in overloads on a particular transmission facility being examined, then it is not "deliverable" under the test.

2) Deliverability to Load

The Entergy transmission system is divided into a number of import constrained sub-zones for which the import capability and reliability criteria will be examined for the purposes of testing a new NRIS resource. These sub-zones can be characterized as being areas on the Entergy transmission system for which transmission limitations restrict the import of energy necessary to supply load located in the sub-zone.

The transmission limitations will be defined by contingencies and transmission constraints on the system that are known to limit operations in each area, and the sub-zones will be defined by the generation and load busses that are impacted by the contingent transmission lines. These sub-zones may change over time as the topology of the transmission system changes or load grows in particular areas.

An acceptable level of import capability for each sub-zone will have been determined by Entergy Transmission based on their experience and modeling of joint transmission and generating unit contingencies. Typically the acceptable level of transmission import capacity into the sub-zones will be that which is limited by first-contingency conditions on the transmission system when generating units within the sub-region are experiencing an abnormal level of outages and peak loads.

The "deliverability to load" test compares the available import capability to each sub-zone that is required for the maintaining of reliable service to load within the sub-zone both with and without the new NRIS resource operating at 100% of its rated output. If the new NRIS resource does not reduce the sub-zone import capability so as to reduce the reliability of load within the sub-zone to an unacceptable level, then the deliverability to load test for the unit is satisfied. This test is conducted for a 5-year planning cycle. When the new NRIS resource fails the test, then transmission upgrades will be identified that would allow the NRIS unit to operate without degrading the sub-zone reliability to below an acceptable level.

Other Modeling Assumptions:

1) Modeling of Other Resources

Generating units outside the control of Entergy (including the network resources of others, and generating units in adjacent control areas) shall be modeled assuming "worst case" operation of the units – that is, a pattern of dispatch that reduces the sub-zone import capability, or impact the common limiting flowgates on the system to the greatest extent for the "from generation" deliverability test.

2) Must-run Units

Must-run units in the control area will be modeled as committed and operating at a level consistent with the must-run operating guidelines for the unit.

3) Base-line Transmission Model

The base-line transmission system will include all transmission upgrades approved and committed to by Entergy Transmission over the 5-year planning horizon. Transmission line ratings will be net of TRM and current CBM assumptions will be maintained.