Report on the System Impact Study for

[redacted]

340 MW (620MW Gross) Plant,

Lake Charles, LA

PID 191

Prepared by:

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Objective:

This System Impact Study is the second step of the interconnection process and is based on [redacted] request for interconnection on Entergy's transmission system between P.P.G and substations located at [redacted] .

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).

Scope for ERIS section (Section – A) includes load flow (steady state) analysis, transient stability analysis and short circuit analysis as defined in FERC orders 2003, 2003A and 2003B. NRIS section (Section – B) contains details of load flow (steady state) analysis only, however, transient stability 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.

[redacted] intends to install a combined cycle facility consisting of turbines and with a maximum capacity of . The scheduled gross power output of the plant is . An auxiliary/host load of approximately 280 MW is also expected at this site. [redacted] anticipates injecting a total of approximately 340 MW into the Entergy transmission system.

The proposed in-service date for this facility is September 1, 2007.

Section – A

Energy Resource Interconnection Service

TABLE OF CONTENTS FOR ERIS

I. Introduction

This Energy Resource Interconnection Service (ERIS) is based on [redacted] request for interconnection on Entergy's transmission system between P.P.G and substations located at [redacted] 230kV 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 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 is 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 [redacted] 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. Load Flow Analysis

A. Model Information

The load flow analysis was performed based on the projected summer peak load flow model. The loads were scaled based on the forecasted loads for the year. All firm power transactions between Entergy and its neighboring control areas were modeled for the year 2008-excluding short-term firm transactions on the same transmission interface. An economic dispatch was carried out on Entergy generating units after the scaling of load and modeling of transactions. The proposed [redacted] generation and the associated facilities were then modeled in the case to build a revised case for the load flow analysis. Transfers were simulated between thirteen (13) control areas and Entergy using requesting generator as the source and adjacent control area as sink. (Note: Refer to NRIS [Section – B] for details of dispatch within Entergy system)

This study considered the following four scenarios:

Scenario No.	Approved Future Transmission Projects	Pending Transmission Service & Study Requests
1	Not Included	Not Included
2	Not Included	Included
3	Included	Not Included
4	Included	Included

The generator step-up transformers, generators, and interconnecting lines were modeled according to the information provided by [redacted]. The one-line diagram of [redacted] facilities as modeled in the load flow analysis, and. Customer supplied data are shown in **Appendix A-A**. The data used to build the load flow and dynamic models are also shown in **Appendix A-A**. Stability issues in the Western Region of the Entergy System due to Merchant Generators are shown in **Appendix A-G**. All stability study plots are shown in **Appendix A-H**. Policy statement / guidelines for Power System Stabilizer is included as **Appendix A-I**.

B. Load Flow Analyses

i) Load Flow Analysis:

With the above assumptions implemented, the First Contingency Incremental Transfer Capability (FCITC) values are calculated. The FCITC depends on various factors – the system load, generation dispatch, scheduled maintenance of equipment, and the configuration of the interconnected system and the power flows in effect among the interconnected systems. The FCITC is also dependent on previously confirmed firm reservations on the interface.

ii) Performance Criteria

The criteria for overload violations are as follows:

A) With All Lines in Service

- The MVA flow in any branch should not exceed Rate A (normal rating).

B) Under Contingencies

- The MVA flow through any facility should not exceed Rate A.

iii) Power Factor Consideration / Criteria

Entergy, consistent with the FERC Large Generator Interconnection Procedures (LGIP) requires the customer to be capable of supplying at least 0.33 MVAR (*i.e.*, 0.95 lagging power factor) and absorbing at least 0.33 MVAR (*i.e.*, 0.95 leading power factor) for every MW of power injected into the grid. In the event that, under normal operating conditions, the customer facility does not meet the prescribed power factor requirements at the point of interconnection, the customer shall take necessary steps, such as the installation of reactive power compensating devices, to achieve the desired power factor.

C. Analysis Results

Summary of the analysis results are documented in following table for each scenario.

Table II-C Summary of Results for [redacted] – ERIS Load Flow Study

Interface		Summer Peak Case Used	FCITC Available for Scenario 1	FCITC Available for Scenario 2	FCITC Available for Scenario 3	FCITC Available for Scenario 4
AECI	Associated Electric Cooperative, Inc.	2008	0 MW	0 MW	0 MW	0 MW
AMRN	Ameren Transmission	2008	0 MW	0 MW	0 MW	0 MW
CLEC	CLECO	2008	0 MW	0 MW	0 MW	0 MW
AEP-W	American Electric Power - West	2008	0 MW	0 MW	0 MW	0 MW
EDE	Empire District Electric Co	2008	0 MW	0 MW	0 MW	0 MW
LAF	Lafayette Utilities Sustem	2008	0 MW	0 MW	0 MW	0 MW
LAGN	Louisiana Generating, LLC	2008	0 MW	61 MW	0 MW	0 MW
LEPA	Louisiana Energy & Power Authority	2008	0 MW	0 MW	0 MW	0 MW
OGE	Oklahoma Gas & Electric Company	2008	0 MW	0 MW	0 MW	0 MW
SME	South Mississippi Electric Power Assoc.	2008	0 MW	0 MW	0 MW	0 MW
SOCO	Southern Company	2008	0 MW	0 MW	0 MW	0 MW
SPA	Southwest Power Administration	2008	0 MW	0 MW	0 MW	0 MW
TVA	Tennessee Valley Authority	2008	0 MW	0 MW	0 MW	0 MW

Scenario No.	Approved Future Transmission Projects	Pending Transmission Service & Study Requests
1	Not Included	Not Included
2	Not Included	Included
3	Included	Not Included
4	Included	Included

TABLE II-C-1 DETAILS OF SCENARIO 1 RESULTS: (WITHOUT FUTURE PROJECTS AND WITHOUT PENDING TRANSMISSION SERVICE & STUDY REQUEST)

Limiting Element	Cost	AECI	AMRN	CLEC	CSW	DENL	EDE	LAF	LAGN	LEPA	OGE	SME	SOCO	SPA	TVA
Acadia GSU - Scanlan 138kV	$ 1,991,250.00			X				X		X					
Addis - Willow Glen 138kV	$ 5,018,625.00							X							
Amelia Bulk - China 230kV	$ 6,970,050.00				X						X				
Apollo - Splendora 138kV	$ 901,125.00				X										
Bayou Cove - Hebert 138kV	$ 168,750.00														
Bull Shoals - Flippin 161kV	$ 2,300,400.00						X								
Calico Rock - Melborne 161kV	$ 6,735,150.00													X	
Caney Creek - Peach Creek 138kV	$ 4,050,000.00				X						X				
Cheeks - South Beaumont 138kV	$ 2,392,875.00	X	X		X	X	X				X			X	X
Colonial Academy - Acadia GSU 138kV	$ 2,824,875.00			X				X		X					
Colonial Academy - Richard 138kV	$ 3,580,875.00			X				X		X					
Colonial Welsh Tap - Hebert 138kV	$ 4,664,250.00														
Conway South - Donaghe 161kV	$ 1,012,500.00					X								X	
Conway West - Donaghe 161kV	$ 1,032,750.00					X								X	
Coteau - Houma 115kV	$ 1,343,250.00									X					
Dayton Bulk - Cheeks 138kV	$14,512,500.00	X	X		X	X	X		X		X	X	X	X	X
Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	X	X		X	X	X				X			X	
Daytona Bulk - National 138kV	$ 1,856,250.00				X										
East Gate - Hickory Ridge 138kV	$ 2,173,500.00	X	X		X	X	X				X			X	
East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	X	X		X	X	X				X			X	
Fairview - Gypsy 230kV	$40,000,000.00	X	X		X	X	X				X	X	X	X	X
Franklin - Mcknight 500kV	$24,000,000.00	X	X		X	X	X				X			X	X
Georgetown - Helbig 230kV	$ 5,447,250.00	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Gibson - Humphrey 115kV	$ 4,120,875.00							X		X					
Gibson 138/115kV transformer	$ 3,375,000.00							X							
Gleason - Morrilton East 161kV	$ 4,407,750.00					X									
Hickory Ridge - New Caney 138kV	$ 2,446,875.00	X	X		X	X	X				X			X	
Jacinto - Peach Creek 138kV	$ 4,050,000.00				X		X				X				
Jacinto - Splendora 138kV	$ 4,343,625.00				X										
Little Rock FOURCHE - Little Rock East 115kV	$ 475,875.00					X									
Livonia - Line 642 Tap 138kV	$ 4,367,250.00							X							
Livonia - Wilbert 138kV	$ 6,510,375.00							X							
Maumelle - Morgan 115kV	$ 168,750.00					X									

Limiting Element	Cost	AECI	AMRN	CLEC	CSW	DENL	EDE	LAF	LAGN	LEPA	OGE	SME	SOCO	SPA	TVA
Mayflower - Morgan 115kV	$ 1,650,375.00					X									
Melborne - Sage 161kV	$ 1,931,850.00						X							X	
National - Ray Wood 138kV	$ 2,760,750.00				X										
PPG - Rose Bluff 230kV	$ 2,138,400.00	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Raceland - Coteau 115kV	$ 4,137,750.00									X					
Ray Braswell 500/115kV Auto 1	$ 9,100,000.00	X	X		X	X	X				X	X	X	X	X
Ray Braswell 500/230kV Auto 1	$ 9,100,000.00	X	X		X	X	X				X	X	X	X	X
Richard - Scott 138kV	$ 9,531,000.00							X							
Richard - Webre 500kV	$ 1,161,000.00														
Sabine - OILLA 138kV	$ 3,044,250.00	X	X		X	X	X				X		X	X	X
Scanlan - Scott 138kV	$ 3,341,250.00			X				X		X					
Scott - Lafayet 69kV	$ 1,506,600.00							X							
Terrebone 230/115kV Auto	$ 4,050,000.00							X		X					

TABLE II-C-2 DETAILS OF SCENARIO 2 RESULTS: (WITHOUT FUTURE PROJECTS AND WITH PENDING TRANSMISSION SERVICE & STUDY REQUEST)

Limiting Element	Cost	AECI	AMRN	CLEC	CSW	DENL	EDE	LAF	LAGN	LEPA	OGE	SME	SOCO	SPA	TVA
Acadia GSU - Scanlan 138kV	$ 1,991,250.00			X				X		X					
Amelia Bulk - China 230kV	$ 6,970,050.00				X						X				
Apollo - Splendora 138kV	$ 901,125.00				X										
Bull Shoals - Flippin 161kV	$ 2,300,400.00						X								
Caney Creek - Peach Creek 138kV	$ 4,050,000.00				X						X				
Cheeks - South Beaumont 138kV	$ 2,392,875.00	X	X		X	X	X				X			X	X
Colonial Academy - Acadia GSU 138kV	$ 2,824,875.00			X				X		X					
Colonial Academy - Richard 138kV	$ 3,580,875.00			X				X		X					
Colonial Welsh Tap - Hebert 138kV	$ 4,664,250.00														
Conway South - Donaghe 161kV	$ 1,012,500.00					X								X	
Conway West - Donaghe 161kV	$ 1,032,750.00					X								X	
Dayton Bulk - Cheeks 138kV	$14,512,500.00	X	X		X	X	X		X		X	X	X	X	X
Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	X	X		X	X	X				X			X	
Daytona Bulk - National 138kV	$ 1,856,250.00				X										
East Gate - Hickory Ridge 138kV	$ 2,173,500.00	X	X		X	X	X				X			X	
East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	X	X		X	X	X				X			X	
Fairview - Gypsy 230kV	$40,000,000.00	X	X		X	X	X				X	X	X	X	X
Franklin - Meadville 115kV	$ 6,837,750.00									X					
Georgetown - Helbig 230kV	$ 5,447,250.00	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Gibson - Humphrey 115kV	$ 4,120,875.00							X							
Gloster - Liberty 115kV	$ 7,128,000.00									X					
Hickory Ridge - New Caney 138kV	$ 2,446,875.00	X	X		X	X	X				X			X	
Jacinto - Peach Creek 138kV	$ 4,050,000.00				X						X				
Jacinto - Splendora 138kV	$ 4,343,625.00				X										
Jennings - Bayou cove 138kV	$ 1,748,250.00														
Jennings 138/69kV auto 1	$ 2,025,000.00									X					
Jennings 138/69kV auto 2	$ 2,025,000.00									X					
Keo - White Bluff 500kV	$11,650,500.00	X	X		X	X	X				X		X	X	X
Lake Charles Bulk - Colonial Welsh Tap 138kV	$ 6,027,750.00														
Lawtag - Jennimgs 69kV	$ 1,290,600.00									X					
Lawtag - Welsh 69kV	$ 1,539,000.00									X					
Livonia - Line 642 Tap 138kV	$ 4,367,250.00							X							
Livonia - Wilbert 138kV	$ 6,510,375.00							X							
LR-East - LR-Fourche 115kV	$ 475,875.00					X									

Limiting Element	Cost	AECI	AMRN	CLEC	CSW	DENL	EDE	LAF	LAGN	LEPA	OGE	SME	SOCO	SPA	TVA
Maumelle - Morgan 115kV	$ 168,750.00					X									
Mayflower - Morgan 115kV	$ 1,650,375.00					X									
Meadville - Roxie 115kV	$ 4,316,625.00									X					
Morrilton East - Gleason 161kV	$ 5,289,300.00					X									
National - Ray Wood 138kV	$ 2,760,750.00				X										
PPG - Rose Bluff 230kV	$ 2,138,400.00	X	X	X	X	X	X			X	X	X	X	X	X
Ray Braswell 500/115kV Auto 1	$ 9,100,000.00	X	X		X	X	X				X	X	X	X	X
Ray Braswell 500/230kV Auto 1	$ 9,100,000.00	X	X		X	X	X				X	X	X	X	X
Richard - Scott 138kV	$ 9,531,000.00							X							
Sabine - OILLA 138kV	$ 3,044,250.00	X	X		X	X	X				X		X	X	X
Scanlan - Scott 138kV	$ 3,341,250.00			X				X		X					
Scott 138/69kV Auto 1	$ 2,025,000.00									X					
Scott 138/69kV Auto 2	$ 2,025,000.00									X					
South Vicksburg - Port Gibson 115kV	$ 7,637,625.00									X					
Terrebone 230/115kV Auto	$ 4,050,000.00							X		X					

TABLE II-C-3 DETAILS OF SCENARIO 3 RESULTS: (WITH FUTURE PROJECTS AND WITHOUT PENDING TRANSMISSION SERVICE & STUDY REQUEST)

Limiting Element	Cost	AECI	AMRN	CLEC	CSW	DENL	EDE	LAF	LAGN	LEPA	OGE	SME	SOCO	SPA	TVA
Bayou Cove - Hebert 138kV	$ 168,750.00														
Bull Shoals - Flippin 161kV	$ 2,300,400.00						X								
Cedar Hill - Tamina 138kV Note-1	$ 1,309,500.00	X	X	X	X	X	X				X	X	X	X	X
China Bulk - Sabine 230kV	$14,733,900.00	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Colonial Welsh Tap - Hebert 138kV	$ 4,664,250.00														
Conroe Bulk - Plantation 138kV Note-1	$ 988,875.00	X	X	X	X	X	X				X	X	X	X	X
Conway South - Donaghe 161kV	$ 1,012,500.00					X								X	
Conway West - Donaghe 161kV	$ 1,032,750.00					X								X	
Coteau - Houma 115kV	$ 1,343,250.00									X					
Dayton Bulk - Cheeks 138kV Note-3	$14,512,500.00				X		X				X			X	
Fairview - Gypsy 230kV	$40,000,000.00	X	X		X	X	X				X	X	X	X	X
Georgetown - Helbig 230kV	$ 5,447,250.00	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Georgetown - Sabine 230kV	$10,493,550.00	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Lake Charles Bulk - Colonial Welsh Tap 138kV	$ 6,027,750.00														
Little Rock FOURCHE - Little Rock East 115kV	$ 475,875.00					X									
Mayflower - Morgan 115kV	$ 1,650,375.00					X									
Melborne - Sage 161kV	$ 1,931,850.00						X							X	
Morgan - Maumelle East Tap 115kV	$ 168,750.00					X									

Limiting Element	Cost	AECI	AMRN	CLEC	CSW	DENL	EDE	LAF	LAGN	LEPA	OGE	SME	SOCO	SPA	TVA
Morrilton East - Gleason 161kV	$ 5,289,300.00					X									
Oak Ridge - Porter 138kV	$ 2,845,125.00				X										
Plantation - Cedar Hill 138kV Note-1	$ 1,056,375.00	X	X	X	X	X	X				X	X	X	X	X
Porter - Tamina 138kV	$ 33,750.00	X	X	X	X	X	X				X	X	X	X	X
PPG - Rose Bluff 230kV	$ 2,138,400.00	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ray Braswell 500/115kV Auto Note-2	$ 9,100,000.00	X	X		X	X	X				X	X	X	X	X
Ray Braswell 500/230kV Auto Note-2	$ 9,100,000.00	X	X		X	X	X				X	X	X	X	X
Roy S. Nelson SES 500/230kV auto	$ 7,560,000.00	X	X		X	X	X		X		X	X	X	X	X
Terrebone 230/115kV transformer	$ 4,050,000.00									X					

Note 1: Identified as long term reliability project
Note 2: Addition of second 500/230 auto will solve this problem. This is tentatively approve as part of Perryville project
Note 3: Significant portion of this line (approx. 40 of 43.02 miles) will be rebuilt as part of Western Region project to 424 MVA. Rating of remaining section will be 177 MVA

TABLE II-C-4 DETAILS OF SCENARIO 4 RESULTS: (WITH FUTURE PROJECTS AND WITH PENDING TRANSMISSION SERVICE & STUDY REQUEST)

Limiting Element	Cost	AECI	ARMN	CLEC	CSW	DENL	EDE	LAF	LAGN	LEPA	OGE	SME	SOCO	SPA	TVA
Bull Shoals - Flippin 161kV	$ 2,300,400.00						X								
Cedar Hill - Tamina 138kV Note-1	$ 1,309,500.00	X	X	X	X	X	X				X	X	X	X	X
China Bulk - Sabine 230kV	$14,733,900.00	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Colonial Welsh Tap - Hebert 138kV	$ 4,664,250.00														
Conroe Bulk - Plantation 138kV Note-1	$ 988,875.00	X	X	X	X	X	X				X	X	X	X	X
Conway South - Donaghe 161kV	$ 1,012,500.00					X								X	
Conway West - Donaghe 161kV	$ 1,032,750.00					X								X	
Dayton Bulk - Cheeks 138kV Note-3	$14,512,500.00				X		X				X			X	
Fairview - Gypsy 230kV	$40,000,000.00	X	X		X	X	X				X	X	X	X	X
Franklin - Meadville 115kV	$ 6,837,750.00									X					
Georgetown - Helbig 230kV	$ 5,447,250.00	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Georgetown - Sabine 230kV	$10,493,550.00	X	X		X	X	X				X		X	X	X
Jennings - Bayou cove 138kV	$ 1,748,250.00														
Jennings 138/69kV auto 1 Note-4	$ 2,025,000.00									X					
Jennings 138/69kV auto 2 Note-4	$ 2,025,000.00									X					
Keo - White Bluff 500kV	$11,650,500.00	X	X			X	X				X		X	X	X
Lake Charles Bulk - Colonial Welsh Tap 138kV	$ 6,027,750.00														
Lawtag - Jennimgs 69kV	$ 1,290,600.00									X					
Lawtag - Welsh 69kV	$ 1,539,000.00									X					

Limiting Element	Cost	AECI	ARMN	CLEC	CSW	DENL	EDE	LAF	LAGN	LEPA	OGE	SME	SOCO	SPA	TVA
LR-East - LR-Fourche 115kV	$ 475,875.00					X									
Maumelle - Morgan 115kV	$ 168,750.00					X									
Mayflower - Morgan 115kV	$ 1,650,375.00					X									
Morrilton East - Gleason 161kV	$ 5,289,300.00					X									
Plantation - Cedar Hill 138kV Note-1	$ 1,056,375.00	X	X	X	X	X	X				X	X	X	X	X
Porter - Tamina 138kV	$ 33,750.00	X	X	X	X	X	X				X	X	X	X	X
PPG - Rose Bluff 230kV	$ 2,138,400.00	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ray Braswell 500/115kV Auto 1 Note-2	$ 9,100,000.00	X	X		X	X	X				X	X	X	X	X
Ray Braswell 500/230kV Auto 1 Note-2	$ 9,100,000.00	X	X		X	X	X				X	X	X	X	X
Roy S. Nelson SES 500/230kV auto	$ 7,560,000.00	X	X		X	X	X				X			X	X
Scott 138/69kV Auto 1 Note-4	$ 2,025,000.00									X					
Scott 138/69kV Auto 2 Note-4	$ 2,025,000.00									X					
Terrebone 230/115kV transformer	$ 4,050,000.00									X					

Note 1: Identified as long term reliability project
Note 2: Addition of second 500/230 auto will solve this problem. This is tentatively approve as part of Perryville project
Note 3: Significant portion of this line (approx. 40 of 43.02 miles) will be rebuilt as part of Western Region project to 424 MVA. Rating of remaining section will be 177 MVA
Note 4: Predominantly a function of load in the local area

III. Short Circuit Analysis / Breaker Rating Analysis

A. Model Information

The short circuit analysis was performed using the Entergy system Aspen short circuit model. This model includes all generators in the Entergy system including [redacted] generators. The data used in the model for this analysis are shown in **Appendix A-A**.

B. Short Circuit Analysis

The method used to determine if any short circuit problems would be caused by the addition of the [redacted] generators 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 [redacted] plant was 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 [redacted] generators. The breakers identified to be upgraded through this comparison are *mandatory* upgrades.

2) Impact due to Facility upgrades identified through the results of the feasibility study and AC load flow analysis will be studied during re-study phase.

C. Analysis Results

The results of the short circuit analysis indicates that the additional generation due to [redacted] 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 [redacted] plant.

The following table 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 [redacted] generators.

Station	**Breaker Duty**	**MANDATORY CIRCUIT**
MOSSVILLE 138 kV	21,421 AMPS.	17965

D. Problem Resolution

The following table illustrates the station name, and the cost associated with upgrading the breakers at the station both for mandatory and optional breaker upgrades.

Station	**Estimated cost of *Mandatory* Breaker Upgrades ($)**
MOSSVILLE 138	135,000

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 Interconnection Study queue.

IV. Transient Stability Analysis

A. Model Information

The dynamic database representing the fall peak was used in this analysis. The new generation and load were also added to the model at a proposed Prien 230kV bus tapped approximately 0.25miles from the Rose Bluff 230kV bus on the PPG – Rose Bluff line. The resulting one-line diagram of the area of the Entergy system considered for stability studies is shown in Figure IV-1. Note that overloaded branches are drawn with thick orange lines and can have a detrimental effect on stability. Also, note that additional branches become overloaded under contingency conditions.

The stability studies were conducted to assess the impact of the power injection of 340MW into Entergy's system. The loads in the Entergy system were represented as follows: for the active part, 90% was modeled with a constant current model, and 10% with a constant power model; all of the reactive part, on the other hand, was modeled with a constant impedance model. The Plant had two 13.8kV buses with large synchronous motors. For the purposes of this study the motors were represented as constant MVA loads. The simulations were conducted with the units approximately generating 620 MW total and injecting 340 MW net into the Entergy System.

provided dynamic models of their generation equipment for use in this study. The generators were modeled using the standard PSS/E GENROU model. No stabilizer system was modeled.

also provided data for the excitation and Automatic Voltage Regulator (AVR) systems. The data for the combustion turbines represents a GE EX2000 static excitation system according to the IEEE ST4B standard, and was modeled using the PSS/E ESST4B model. The data for the steam turbine represents the excitation system according to the IEEE AC2 standard and was modeled using the PSS/E EXAC2 model.

[redacted] did not provide data for the gas and steam turbine-governor controls. But in this case, the use of governor controls is not required because governor controls do not usually respond fast enough to affect first-swing transient stability. Regarding the steam turbine, typically, in a combined-cycle power plant, the steam turbine is operated either in sliding pressure mode (valves wide open) or inlet steam pressure control mode. As a result, the steam turbine power changes very slowly and only after changes in gas turbine power output has been reflected through the heat-recovery-steam-generator. Thus, for the purposes of studying first-swing transient stability, it is adequate to assume constant mechanical power on the steam turbine.

The data used to for the proposed [redacted] generator, exciter, and governor models are shown in **Appendix A-A.**

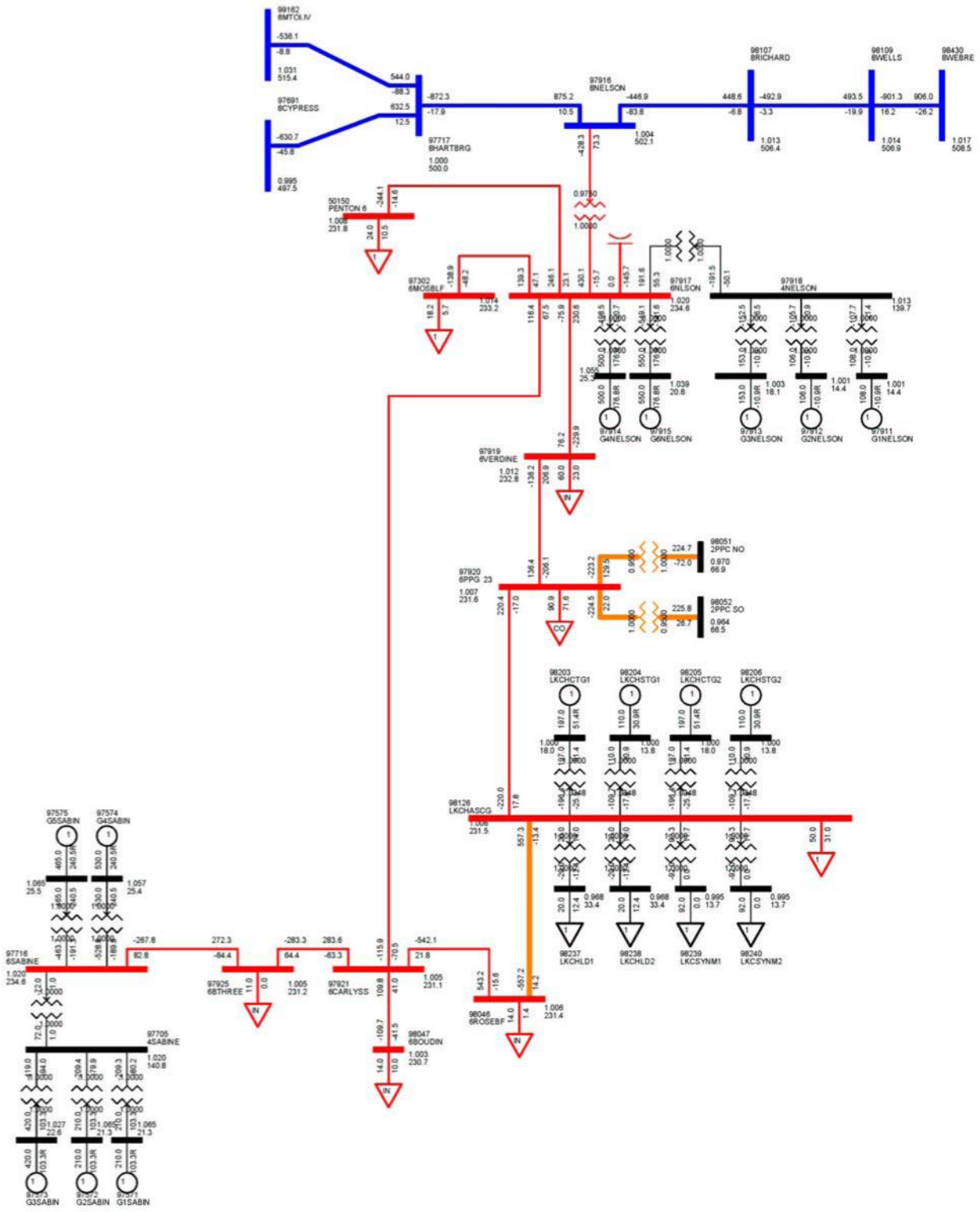


Figure IV-1. Single Line Diagram of the Stability Study Area of Focus

B. Transient Stability Analysis

Stability simulations were run to examine the transient behavior of the [redacted] generators and their effect on the Entergy system. Based on Entergy's criteria, stability analysis was performed using the procedure described below. According to these procedures, the faults to be considered for transient and dynamic stability problems are three-phase faults and three-phase faults with a stuck breaker. The fault clearing times given in Table IV-1 are used for the contingency tests shown in Table IV-2.

Table IV-1 Fault Clearing Times

Contingency at kV level	Normal Clearing	Delayed Clearing
230	6cycles	6+9cycles
500	5cycles	5+9cycles

The system should be stable for three-phase faults that are normally cleared. For 230kV faults, stuck breakers were simulated as three-phase stuck breakers. For 500kV faults, it was assumed that all breakers have independent pole operation and a stuck breaker occurs on one-phase only thereby converting the three-phase fault into a single-phase fault upon breaker failure. If there is a problem with three-phase faults with stuck breakers, then additional cases are performed to evaluate single-phase faults with stuck breakers.

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 Lake Charles 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. Entergy supplied the sequence impedances for the following substations and conditions:

Bus	**Condition 1**	**Condition 2**	**Condition 3**
Lake Charles PID191 230kV	All lines in service	Lake Charles – PPG 230kV line open	Lake Charles – Rose Bluff 230kV line open
Nelson 230kV	All lines in service	Nelson 230/500kV transformer out	Nelson – Penton 230kV line open
Nelson 500kV	All lines in service	Nelson – Richard 500kV line open	Nelson – Hartburg 500kV line open
Richard 500kV	All lines in service	Richard – Wells 500kV line open	--
Hartburg 500kV	All lines in service	Hartburg – Cypress 500kV line open	Hartburg – Mt. Olive 500kV line open

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

The analysis was carried out on the power flow case with the [redacted] generation dispatched to the northern area of the Entergy system because initial results of faults at the Nelson 500kV bus indicated this dispatch to North is more conservative from a stability point of view compared to dispatching the generation to the east.

Table IV-2A and Table IV-2B list all the fault cases that were simulated in this study. Fault scenarios were formulated by examining the system configuration shown in **Figure IV-2**.

Cases 1-10 represent the normal clearing 3-phase faults. Cases 1a - 10a represent the stuck pole cases with the appropriate delayed back-up clearing times.

Cases 1b - 10b were all performed to confirm the behavior of the system without the Lake Charles generation. These were performed with the Lake Charles bus in place and with the same operational sequence followed as in the corresponding "a" cases in order to verify whether or not the impact on the system was due to the new [redacted] generators. Case 1c was conducted to confirm the response of the PPG generators.

Cases 1d and 2c - 5c represent the single-phase fault with stuck breaker cases for the scenarios that were unstable for 3-phase faults with stuck breakers.

Cases 2d, 2e, and 2f were performed to evaluate remedial actions for case 2a. Likewise, case 2g explored the effect of using IPO breakers for the 230kV ring bus at Lake Charles as a remedy to the results observed for case 2a.

For all cases analyzed, the initial disturbance was applied at t = 0.05 seconds. The breaker clearing was applied at the appropriate time following this fault inception.

Table IV-2A Fault Cases Simulated in this Study: 3phase faults with normal clearing

Fault Case #	Fault Location	Fault Type	Fault Clearing Time (ms)	Tripping Breaker #	Tripped facilities	Stable ?	Acceptable Voltage Dip ?
1	*Lake Charles [redacted] 230kV*	*3LG*	*100*	*LC1, LC2, 18025*	*Lake Charles – PPG 230kV line*	**YES**	**YES**
2	*Lake Charles [redacted] 230kV*	*3LG*	*100*	*LC1, LC2, 27035, 27040*	*Lake Charles – Rose Bluff 230kV line*	**YES**	**YES**
3	*PPG 230kV*	*3LG*	*100*	*18020, 18345, 18870*	*PPG – Verdine 230kV line*	**YES**	**YES**
4	*Nelson 230kV*	*3LG*	*100*	*13025, 13030, 13060, 13110*	*Nelson 230/500kV transformer*	**YES**	**YES**
5	*Nelson 230kV*	*3LG*	*100*	*18145, Penton*	*Nelson – Penton 230kV line*	**YES**	**YES**
6	*Nelson 500kV*	*3LG*	*83*	*13060, 13150, Richard*	*Nelson – Richard 500kV line*	**YES**	**YES**
7	*Nelson 500kV*	*3LG*	*83*	*13110, 13105, Hartburg*	*Nelson – Hartburg 230kV line*	**YES**	**YES**
8	*Richard 500kV*	*3LG*	*83*	*Richard, Wells*	*Richard – Wells 500kV line*	**YES**	**YES**
9	*Hartburg 500kV*	*3LG*	*83*	*Hartburg, Cypress*	*Hartburg – Cypress 500kV line*	**YES**	**YES**
10	*Hartburg 500kV*	*3LG*	*83*	*Hartburg, Mt. Olive*	*Hartburg – Mt. Olive 500kV line*	**YES**	**YES**

Table IV-2B Fault Cases Simulated in this Study: faults with stuck breaker

Fault Case #	Fault Location	Fault Type	Primary Fault Clearing Time (ms)	Backup Fault Clearing Time (ms)	SLG Fault Admittance(MVA)	Stuck Breaker	Primary Trip Breaker #	Secondary Trip Breaker #	Stable?	Acceptable Voltage Dip?
1a	*Lake Charles – PPG 230kV Line at Lake Charles* [redacted]	*3LG*	*100*	*250*	*NA*	*LC2*	*LC1, 18025*	*LC-4, 52-2B, 52-2C*	**NO**	**NO**
1b	*Lake Charles – PPG 230kV line at Lake Charles Tap(No Lake Charles* [redacted]	*3LG*	*100*	*250*	*NA*	*LC2*	*LC1, 18025*	*LC-4, 52-2B, 52-2C*	**YES**	**YES**
1c	*Lake Charles – PPG 230kV line at PPG (No Lake Charles* [redacted]	*3LG*	*100*	*250*	*NA*	*18025*	*LC1-18025*	*18025*	**YES**	**YES**
1d	*Lake Charles – PPG 230kV line at Lake Charles*	*1LG*	*100*	*250*	*10724.6-j23191 to 11182.6-j14291*	*LC2*	*LC1, 18025*	*LC-4, 52-2B, 52-2C*	**YES**	**YES**
2a	*Lake Charles – Rose Bluff 230kV at Lake Charles*	*3LG*	*100*	*250*	*NA*	*LC4*	*LC3, 27035, 27040*	*LC-2, 52-3A, 52-3B*	**NO**	**NO**
2b	*Lake Charles – Rose Bluff 230kV at Lake Charles Tap (No Lake Charles* [redacted]	*3LG*	*100*	*250*	*NA*	*LC4*	*LC3, 27035, 27040*	*LC-2, 52-3A, 52-3B*	**YES**	**YES**
2c	*Lake Charles – Rose Bluff 230kV at Lake Charles*	*1LG*	*100*	*250*	*10724.6-j23191 to 10761.2-j15817*	*LC4*	*LC3, 27035, 27040*	*LC-2, 52-3A, 52-3B*	**YES**	**YES**
2d	*Lake Charles – Rose Bluff 230kV at Lake Charles (Trip* [redacted] *Steam Turbines at backup clearing)*	*3LG*	*100*	*250*	*NA*	*LC4*	*LC3, 27035, 27040*	*LC-2, LC-4B, LC-4C, LC-5B, LC-5C, 52-3A, 52-3B*	**YES**	**NO**
2e	*Lake Charles – Rose Bluff 230kV at Lake Charles(Trip* [redacted] *STGs at ¼ cycle after backup clearing of the line)*	*3LG*	*100*	*250 (254.2)*	*NA*	*LC4*	*LC3, 27035, 27040*	*LC-2, LC-4B, LC-4C, LC-5B, LC-5C, 52-3A, 52-3B*	**NO**	**NO**
2f	*Lake Charles – Rose Bluff 230kV at Lake Charles(Trip all* [redacted] *generators 12 cycles after backup clearing of the line)*	*3LG*	*100*	*250 (450)*	*NA*	*LC4*	*LC3, 27035, 27040*	*LC-2, LC-4A, LC-4B, LC-4C, LC-5A, LC-5B, LC-5C, 52-3A, 52-3B*	**YES**	**NO**
2g	*Lake Charles – Rose Bluff 230kV at Lake Charles with IPO Breakers at* [redacted]	*3LG*	*100*	*250*	*10761.2-j15817*	*LC4*	*LC3, 27035, 27040*	*LC-2, 52-3A, 52-3B*	**YES**	**YES**
3a	*PPG – Verdine 230kV Line at PPG*	*3LG*	*100*	*250*	*NA*	*18020*	*18345, 18870*	*18030*	**YES**	**YES**
4a	*Nelson 230/500kV Transformer at 230kV terminals*	*3LG*	*100*	*250*	*NA*	*13025*	*13030, 13060, 13110*	*13140*	**NO**	**NO**

Fault Case #	Fault Location	Fault Type	Primary Fault Clearing Time (ms)	Backup Fault Clearing Time (ms)	SLG Fault Admittance(MVA)	Stuck Breaker	Primary Trip Breaker #	Secondary Trip Breaker #	Stable?	Acceptable Voltage Dip?
4b	*Nelson 230/500kV Transformer at 230kV terminals (No Lake Charles* [redacted]	*3LG*	*100*	*250*	*NA*	*13025*	*13030, 13060, 13110*	*13140*	**NO**	**NO**
4c	*Nelson 230/500kV Transformer at 230kV terminals*	*1LG*	*100*	*250*	*4005.1-j47373 to 3653.1-j38680*	*13025*	*13030, 13060, 13110*	*13140*	**YES**	**YES**
5a	*Nelson – Penton 230kV Line at Nelson*	*3LG*	*100*	*250*	*NA*	*18145*	*Penton*	*18160, 18165, 13140, 18210, 13035, 18155*	**NO**	**NO**
5b	*Nelson – Penton 230kV Line at Nelson (no Lake Charles* [redacted]	*3LG*	*100*	*250*	*NA*	*18145*	*Penton*	*18160, 18165, 13140, 18210, 13035, 18155*	**NO**	**NO**
5c	*Nelson – Penton 230kV Line at Nelson*	*1LG*	*100*	*250*	*4005.1-j47373 to 3841.7-j46339*	*18145*	*Penton*	*18160, 18165, 13140, 18210, 13035, 18155*	**YES**	**YES**
6a	*Nelson – Richard 500kV Line at Nelson*	*3LG*	*83*	*233*	*324.8-j4415*	*13060*	*13105*	*13110, 13030, 13025*	**YES**	**YES**
7a	*Nelson – Hartburg 500kV Line at Nelson*	*3LG*	*83*	*233*	*251.8-j3419*	*13110*	*13105*	*13060, 13030, 13025*	**YES**	**YES**
8a	*Richard – Wells 500kV Line at Richard*	*3LG*	*83*	*233*	*394.2-j4195*	*Richard*	*Wells*	*13060, 13105*	**YES**	**YES**
9a	*Hartburg – Cypress 500kV Line at Hartburg*	*3LG*	*83*	*233*	*336.1-j6369*	*Hartburg*	*Cypress*	*13110, 13105*	**YES**	**YES**
10a	*Hartburg – Mt. Olive 500kV Line at Hartburg*	*3LG*	*83*	*233*	*372.9-j6663*	*Hartburg*	*Mt. Olive*	*13110, 13105*	**YES**	**YES**

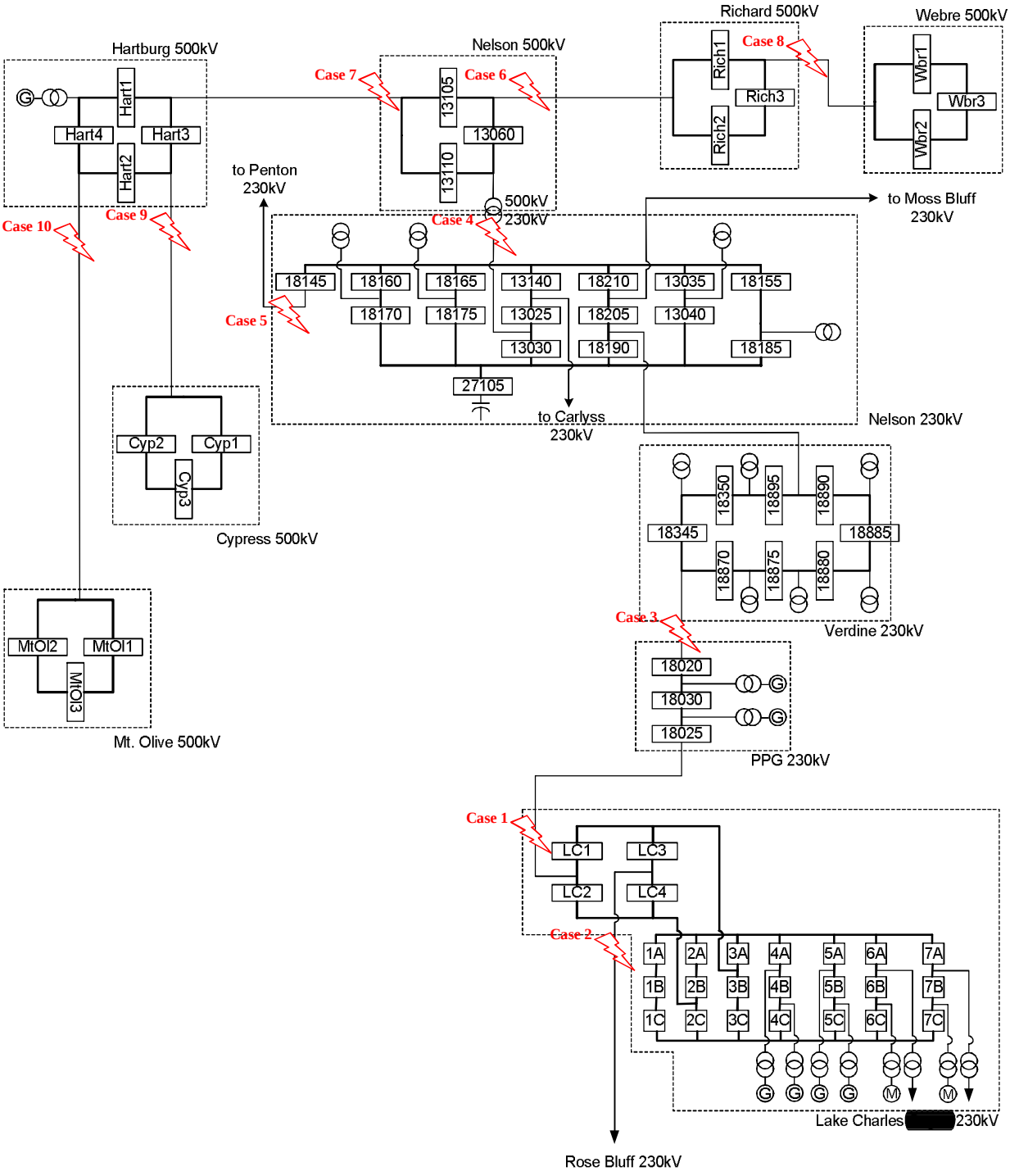


Figure IV-2. Bus/Breaker Configuration of the Lake Charles 230 kV Station and Adjacent Stations

C. Analysis Results

All of the normally-cleared, three-phase faults simulated were found to be stable. Likewise, all of the 500kV IPO stuck-breaker faults were found to be stable. However, of the 230kV three-phase stuck breaker fault cases only the fault on the PPG-Verdine line at PPG was found to be stable. All other 230kV three-phase stuck breaker faults cases were unstable. These unstable fault cases are summarized in Table IV-3 below. The plots are provided in Appendix A-G

Table IV-3 Unstable Fault Cases

Case #	Fault Location	Fault Type	Fault Duration (ms)	Facilities Tripped	Units Losing Synchronism
1a	*Lake Charles 230kV on Lake Charles – PPG line*	*3PH*	*250*	*Lake Charles – PPG 230kV line*	*Lake Charles Gens*
2a	*Lake Charles230kV on Lake Charles – Rose Bluff line*	*3PH*	*250*	*Lake Charles – Rose Bluff 230kV line*	*Lake Charles Gens PPG Gens*
4a	*Nelson 230kV on Nelson 230/500kV transformer*	*3PH*	*250*	*Nelson 230/500kV transformer Nelson – Carlyss 230kV line*	*Nelson, PPG, Lake Charles*
4b	*Nelson 230kV on Nelson 230/500kV transformer – No Lake Charles* [redacted]	*3PH*	*250*	*Nelson 230/500kV transformer Nelson – Carlyss 230kV line*	*Nelson, PPG*
5a	*Nelson 230kV on Nelson – Penton 230kV line*	*3PH*	*250*	*Nelson – Penton 230kV line*	*Nelson, PPG, Lake Charles*
5b	*Nelson 230kV on Nelson – Penton 230kV line*	*3PH*	*250*	*Nelson – Penton 230kV line*	*Nelson, PPG*

These unstable cases involved, respectively, a) faults at the proposed Lake Charles bus on each of the lines to PPG and Rose Bluff; b) the PPG bus; and c) the Nelson 230kV bus on the 230/500kV transformer and the line to Penton. In case 1a, only [redacted] generators becomes unstable. Tripping the Lake Charles – PPG 230kV line isolates the Lake Charles bus from the PPG generators which are the most sensitive to the new [redacted] plant.

The fault simulated in case 2a indicates that the PPG machines lose synchronism along with the [redacted] generators when a stuck breaker occurs at Lake Charles on the Lake Charles – Rose Bluff 230kV line. In order to verify that this was due to the new machines at [redacted] case 2b was run for the same scenario with the [redacted] machines excluded (only the Lake Charles 230kV bus was

modeled). For this case, the PPG machines did not lose synchronism, so an additional case (1c) was performed with an extended (250ms) three-phase fault at the PPG bus. Once again this case did not lose synchronism. These results indicate that the new [redacted] machines interact with the PPG machines so that all machines at both buses lose synchronism for a three-phase stuck breaker during a three-phase fault on the Lake Charles – Rose Bluff 230kV line at the Lake Charles 230kV bus. Possible remedial actions were evaluated in cases 2d, 2e, and 2f. In case 2d the [redacted] steam turbine generators were tripped at the same time that the line was tripped by backup clearing. The system remained stable so case 2e was performed to determine how much delay was possible between the tripping of the line and the tripping of the STGs. It was observed that if even a ¼-cycle delay was experienced, then the [redacted] combustion turbine generators would become unstable. Finally, case 2f was performed where all of the [redacted] generation was tripped following backup clearing of the fault. Here it was observed that even after a delay as long as 12 cycles, the PPG generators would remain stable provided that all of the [redacted] generation is tripped. However, upon backup clearing the bus voltages tend to decrease until the [redacted] generators are tripped. It is therefore recommended that the generators be tripped as soon as possible after backup clearing of this fault.

Another option for dealing with the instabilities observed for case 2a is to utilize breakers with independent pole operation (IPO) at the Lake Charles 230kV ring-bus. At the time of breaker failure at [redacted] the three-phase fault was converted to a single-phase fault that was ultimately cleared via backup protection. This case is stable indicating that the use of IPO breakers would be a good option from a stability standpoint.

For cases 4a, and 5a the machines at Nelson, PPG, and Lake Charles all lose synchronism. However, the Nelson and PPG machines still lose synchronism for the same fault scenarios with the [redacted] machines removed. This indicates that the machines are already unstable under the indicated fault scenarios.

Finally, 230kV bus faults were performed with single-phase faults with stuck breakers at the locations discussed above. After the primary tripping of the appropriate line, the fault impedance was properly adjusted to account for the removed line and the fault was cleared by back-up breaker tripping. All of these faults were stable.

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

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

The voltages at all of the buses shown in Figure IV-2 were monitored during each of the fault cases as appropriate. Since single-line-to-ground faults were not performed on the 500kV buses, the IPO stuck breaker fault was considered in lieu of the SLG faults for evaluation purposes only. No violations of the transient voltage dip criteria were observed among cases that are otherwise stable.

In summary, when considering the new [redacted] generation at the proposed Lake Charles bus, all three-phase faults with normal clearing are stable. All 500kV three-phase faults with single-phase stuck breakers are stable. All 230kV three-phase faults with three-phase stuck breakers are unstable. However, all 230kV single-phase faults with stuck breakers are stable. No violations of the voltage dip criteria were observed. This meets Entergy's performance criteria when the [redacted] plant is in-service.

Nevertheless, the case of a three-phase stuck breaker fault near [redacted] resulted in instability of all of the [redacted] generators and the PPG generators. This is a concern and two options are available to maintain stability:

1) Remedial tripping of all of the [redacted] generators upon backup line clearing.
2) Utilization of IPO breakers at the [redacted] 230kV ring bus

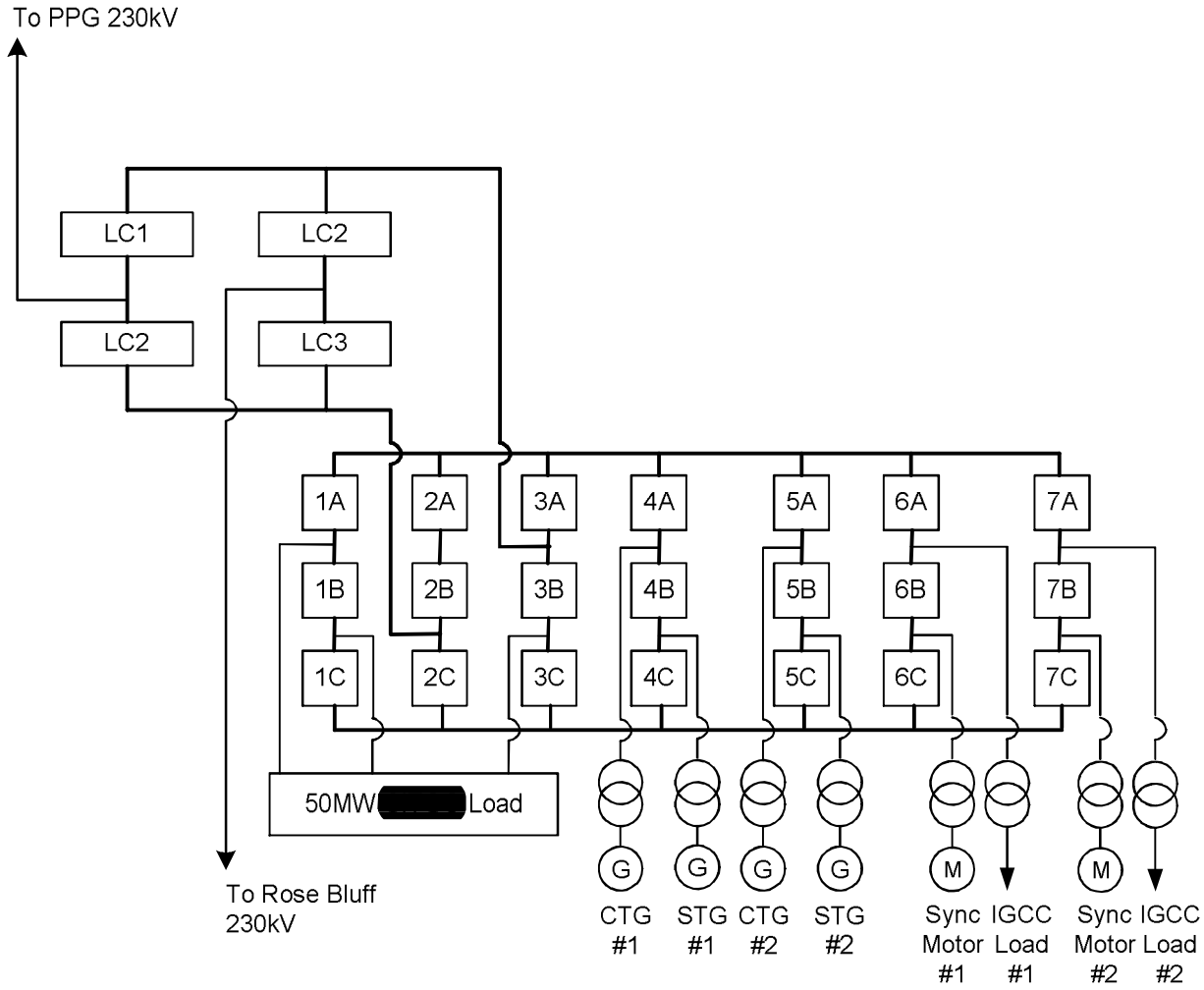
Due to restructuring of the utility industry, there has been a large increase of merchant generation activity on the Entergy system. These generators are equipped with modern exciters that have a high gain and a fast response to enhance transient stability. However, these fast response exciters, if used without stabilizers, can lead to oscillatory instability affecting local or regional reliability. This problem is exacerbated particularly in areas where there is a large amount of generation with limited transmission available for exporting power.

Stability studies carried out at Entergy have validated this concern. Furthermore, based on the understanding of operational problems experienced in the WSCC area over the last several years and the opinion of leading experts in the stability area, Power System Stabilizers (PSS) are an effective and a low cost means of mitigating dynamic stability problems. In particular, PSS cost can be low if it is included in power plant procurement specifications.

Therefore, as a pre-emptive measure, Entergy requires all merchant generation intending to interconnect to its transmission system to install PSS on their respective units.

Please refer to Appendix A-I for Entergy's Policy Statement on PSS Requirements.

APPENDIX A-A: DATA SUPPLIED BY THE CUSTOMER



Lake Charles Plant Generators

- **Steam Turbine (2): GE**

1. Generator Data.

Unit Rating			
Generator Base MVA	144 MVA	Neut. Gnd Resistor (if applicable)	NGT/NGR to <10A.
Rated Voltage	13.8 kV	Short Circuit Ratio	0.48
Rated Power Factor	0.85	Stator Amperes at Rated KVA	
Speed (RPM)	3600	Hydrogen Pressure (if applicable)	
Frequency (Hz)	60	H_2 Temp ºF	40 ºC
Connection	Wye	Max Turbine MW	120MW

Combined Turbine – Generator-Exciter Inertia			
Inertia Constant, H (kW sec/kVA)	3.0 sec		

Reactance Data (per unit – rated kVA)		
Generator Base MVA for Impedance base		237.4 MVA
	Direct Axis	**Quadrature Axis**
Synchronous – Saturated	X dv = 1.306	X qv = 1.306
Synchronous – Unsaturated	X di = 1.6	X qi = 1.54
Transient – Saturated	X' dv = 0.175	X' qv = --
Transient – Unsaturated	X' di = 0.195	X' qi = 0.379
Subtransient – Saturated	X'' dv = 0.115	X'' qv = 0.116
Subtransient - Unsaturated	X''di = 0.15	X''qi = 0.149
Negative Sequence – Saturated	X_2v = 0.116	--- na ---
Negative Sequence – Unsaturated	X_2i = 0.15	--- na ---
Zero Sequence - Saturated	X_0v = 0.085	--- na ---
Zero Sequence – Unsaturated	X_0i = 0.085	--- na ---
Leakage reactance – Saturated	Xlv = 0.110	--- na ---
Leakage reactance - Unsaturated	Xli = --	--- na ---
Field Time Constants		
Open Circuit	T'do = 6.036	T'qo = 0.524
Three Phase Short Circuit Transient	T'd3 = 0.592	T'q = 0.129
Line-Line Short Circuit Transient	T'd2 = 1.021	
Line-Neutral Short Circuit Transient	T'd1 = 1.252	
Short Circuit Subtransient	T''d = 0.026	T''q = 0.026
Open Circuit Subtransient	T''do = 0.039	T''qo = 0.084
Armature DC Component Time Constants		
Three Phase Short Circuit	Ta3 = 0.359	
Line-Line Short Circuit	Ta2 = 0.359	
Line-Neutral Short Circuit	Ta1 = 0.278	
Armature Winding Sequence Resistance (per unit)		
Positive Sequence	R_1 = 0.0027	
Negative Sequence	R_2 = 0.0167	
Zero Sequence	R_0 = 0.0088	
Machine Saturation		
S / 1.0 (determined from curve)	0.1110	
S / 1.2 (determined from curve)	0.3040	

Other Data		
ANSI Rotor Short-Time Thermal Capacity (Unbalanced Faults)	I_2^2t = 10	
Three phase Armature Winding Capacitance	0.8256 µ F	

Armature Winding DC Resistance per phase	0.001327 Ω @ 100ºC	
Field Winding DC Resistance	0.3616 Ω @ 125ºC	
Field Current at Rated kVA, Armature Voltage and PF	1171 A	
Field Current at Rated kVA, Armature Voltage and 0 PF	1120 A	

Exciter Data for AC2 (EXAC2) Model			
TA	0.010	KH	0.000
TB	1.000	KL	4.000
TC	1.000	VLR	8.850
TE	0.780	VAMAX	7.0
TF	1	VAMIN	-7.0
TR	0.010	VRMAX	14.6
KA	1000	VRMIN	-14.6
KB	1.000	EFDMAX	3.520
KC	0.100	SEMAX	0.010
KD	1.000	EFD.75MAX	2.640
KE	1.000	SE.75MAX	0.010
KF	0.05		

2. Transformer Data.

Transformer Base for Impedance	90 MVA
Positive Sequence Impedance (resistance and reactance) (R+jX)	9% Z, X/R=40
Zero Sequence Impedance (resistance and reactance) (R+jX)	9% Z, X/R=40
Full Load Rating (i.e. OA/FA/FOA)	90 / 120 / 150 MVA
Available Tap Positions (kV)	226.1, 232, 238, 243.9, 250
Position of Tap in the field (kV)	238
High Side Rated Voltage (kV)	238
High Side Connection (Y/Delta)	Wye
High Side Grounding type and resistance value (if applicable)	Solidly Grd
Low Side Rated Voltage (kV)	13.8
Low Side Connection (Y/Delta)	Delta
Low Side Grounding type and resistance value (if applicable)	Hi R grd NGT/NGR to <10A
BIL Rating (kV)	750

Combustion Turbines (2): GE

1. Generator Data.

Unit Rating			
Generator Base MVA	237.4 MVA	Neut. Gnd Resistor (if applicable)	NGT/NGR to <10A.
Rated Voltage	18 kV	Short Circuit Ratio	0.48
Rated Power Factor	0.85	Stator Amperes at Rated KVA	7615 A
Speed (RPM)	3600	Hydrogen Pressure (if applicable)	45 psig
Frequency (Hz)	60	H_2 Temp ºF	109 ºF cold gas
Connection	Wye	Max Turbine MW	197MW @ -11ºC

Combined Turbine – Generator-Exciter Inertia			
Inertia Constant, H (kW sec/kVA)	5.53 sec		

Reactance Data (per unit – rated kVA)				
Generator Base MVA for Impedance base			237.4 MVA	
	Direct Axis		**Quadrature Axis**	
Synchronous – Saturated	X dv =	2.15	X qv =	2.05
Synchronous – Unsaturated	X di =	2.15	X qi =	2.05
Transient – Saturated	X' dv =	0.235	X' qv =	--
Transient – Unsaturated	X' di =	0.264	X' qi =	0.489
Subtransient – Saturated	X'' dv =	0.155	X'' qv =	0.154
Subtransient – Unsaturated	X''di =	0.2	X''qi =	0.199
Negative Sequence – Saturated	X_2v =	0.154	--- na ---	
Negative Sequence – Unsaturated	X_2i =	0.199	--- na ---	
Zero Sequence – Saturated	X_0v =	0.127	--- na ---	
Zero Sequence – Unsaturated	X_0i =	0.127	--- na ---	
Leakage reactance – Saturated	Xlv =	0.151	--- na ---	
Leakage reactance – Unsaturated	Xli =	--	--- na ---	
Field Time Constants				
Open Circuit	T'do =	6.69	T'qo =	0.589
Three Phase Short Circuit Transient	T'd3 =	0.656	T'q =	0.135
Line-Line Short Circuit Transient	T'd2 =	1.13		
Line-Neutral Short Circuit Transient	T'd1 =	1.42		
Short Circuit Subtransient	T''d =	0.026	T''q =	0.026
Open Circuit Subtransient	T''do =	0.039	T''qo =	0.078
Armature DC Component Time Constants				
Three Phase Short Circuit	Ta3 =	0.386		
Line-Line Short Circuit	Ta2 =	0.386		
Line-Neutral Short Circuit	Ta1 =	0.31		
Armature Winding Sequence Resistance (per unit)				
Positive Sequence	R_1 =	0.0031		
Negative Sequence	R_2 =	0.0205		
Zero Sequence	R_0 =	0.0110		
Machine Saturation				
S / 1.0 (determined from curve)	0.0910			
S / 1.2 (determined from curve)	0.4620			

Other Data		
ANSI Rotor Short-Time Thermal Capacity (Unbalanced Faults)	$I_2^2t = 10$	
Three phase Armature Winding Capacitance	0.8 µ F	
Armature Winding DC Resistance per phase	0.0013 Ω @ 100ºC	
Field Winding DC Resistance	0.141 Ω @ 125ºC	
Field Current at Rated kVA, Armature Voltage and PF	1703 A	
Field Current at Rated kVA, Armature Voltage and 0 PF	2026 A	

Exciter Data for IEEE ST4B (ESST4B) Model			
TR	0	KC	0.08
KPR	3.86	KIR	3.86
VRMAX	1.00	VRMIN	-0.87
TA	0.01	KG	0
KPM	1.00	KIM	0
VMMAX	1.00	VMMIN	-0.87
KP	5.18	KI	0
VBMAX	6.48	XL	0
Exciter Nominal Response at rated input			2.0

2. Transformer Data

Transformer Base for Impedance	144 MVA
Positive Sequence Impedance (resistance and reactance) (R+jX)	9% Z, X/R=40
Zero Sequence Impedance (resistance and reactance) (R+jX)	9% Z, X/R=40
Full Load Rating (i.e. OA/FA/FOA)	144 / 192 / 240 MVA
Available Tap Positions (kV)	226.1, 232, 238, 243.9, 250
Position of Tap in the field (kV)	238
High Side Rated Voltage (kV)	238
High Side Connection (Y/Delta)	Wye
High Side Grounding type and resistance value (if applicable)	Solidly Grd
Low Side Rated Voltage (kV)	18
Low Side Connection (Y/Delta)	Delta
Low Side Grounding type and resistance value (if applicable)	Hi R grd NGT/NGR to <10A
BIL Rating (kV)	750

Lake Charles Plant Loads

- **13.8kV Synchronous Motors (2):**

1. Motor Data

Item	Unit	Main Air Compressor	Booster Air Compressor	Nitrogen Compressor
Motor voltage	kV	13.8	13.8	13.8
Motor nameplate rating	MW	44	20	28
Motor nameplate power factor		1.0	1.0	1.0
Direct axis subtransient reactance – X''d (unsat/sat)	pu	0.19/0.17	0.21/0.19	0.20/0.18
Direct axis transient reactance – X'd (unsat/sat)	pu	0.28/0.25	0.31/0.28	0.29/0.26
Direct axis synchronous reactance – Xd	pu	1.1	1.1	1.1
Quadrature axis synchronous reactance – Xq	pu	1.08	1.08	1.08
Armature leakage reactance – Xl	pu	0.11	0.11	0.11
Direct axis transient open circuit time constant – T'do	sec	5.6	5.6	5.6
Saturation factor – S (100% V)		1.07	1.07	1.07
Saturation factor – S (120% V)		1.18	1.18	1.18
Inertia Constant – H (Combined Motor & Load)	sec	4	3.90	4
Motor X/R ratio		50	50	50

2. Transformer Data

Transformer Base for Impedance	66 MVA
Positive Sequence Impedance (resistance and reactance) (R+jX)	9% Z, X/R=40
Zero Sequence Impedance (resistance and reactance) (R+jX)	NA
Full Load Rating (i.e. OA/FA/FOA)	66 / 88 / 110 MVA
Available Tap Positions (kV)	218.5, 224.2, 230, 235.7, 241.5
Position of Tap in the field (kV)	230
High Side Rated Voltage (kV)	230
High Side Connection (Y/Delta)	Delta
High Side Grounding type and resistance value (if applicable)	NA
Low Side Rated Voltage (kV)	18
Low Side Connection (Y/Delta)	Wye
Low Side Grounding type and resistance value (if applicable)	400A NGR
BIL Rating (kV)	750

- **Static Loads (2):**

1. Load Data

[redacted]34.5kV Load: 40MW at 0.85 pf (47MVA)
divided equally on two transformers (data below)

[redacted]Load (at 230kV): 50MW (0.85 pf assumed by ABB)

2. Transformer Data

Transformer Base for Impedance	66 MVA
Positive Sequence Impedance (resistance and reactance) (R+jX)	9% Z, X/R=40
Zero Sequence Impedance (resistance and reactance) (R+jX)	NA
Full Load Rating (i.e. OA/FA/FOA)	66 / 88 / 110 MVA
Available Tap Positions (kV)	218.5, 224.2, 230, 235.7, 241.5
Position of Tap in the field (kV)	230
High Side Rated Voltage (kV)	230
High Side Connection (Y/Delta)	Delta
High Side Grounding type and resistance value (if applicable)	NA
Low Side Rated Voltage (kV)	18
Low Side Connection (Y/Delta)	Wye
Low Side Grounding type and resistance value (if applicable)	400A NGR
BIL Rating (kV)	750

Load Flow Models

The [redacted] plant equipment data are listed in Appendix A-C. The [redacted] plant was connected to the existing network by tapping the PPG – Rose Bluff 230 kV line at 0.25 miles from Rose Bluff. The transformers, loads, and generators of the [redacted] plant were modeled using the data provided in Appendix A-C. No other elements were added to the Entergy system.

Stability Models

The [redacted] plant equipment stability model data are listed in Appendix A-C. The resulting PSS/E model data is a follows:

PSS/E Data – STG1

```
REPORT FOR ALL MODELS                          BUS 98204 [LKCHSTG113.800] MODELS

 ** GENROU **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S
             98204     LKCHSTG1 13.800 1   80674-80687   30898-30903

             MBASE     Z S O R C E         X T R A N       GENTAP
             144.0  0.00000+J 0.15000  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
  6.04 0.039  0.52 0.084   3.00  0.00 1.6000 1.5400 0.1950 0.3790 0.1500 0.1100

                              S(1.0)  S(1.2)
                              0.1110  0.3040

 ** EXAC2 **   BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S
             98204     LKCHSTG1 13.800 1   80736-80758   30918-30922

     TR      TB      TC      KA      TA    VAMAX   VAMIN     KB    VRMAX   VRMIN
   0.010   1.000   1.000  1000.0   0.010   7.000  -7.000     1.0    14.6   -14.6

         TE      KL      KH      KF      TF      KC      KD      KE      VLR
       0.780   4.000   0.000   0.050   1.000   0.100   1.000   1.000   8.850

                         E1      S(E1)     E2      S(E2)
                       3.5200   0.0100   2.6400   0.0100
```

PSS/E Data – STG2

```
REPORT FOR ALL MODELS                          BUS 98206 [LKCHSTG213.800] MODELS

 ** GENROU **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S
             98206     LKCHSTG2 13.800 1   80688-80701   30904-30909

             MBASE     Z S O R C E         X T R A N       GENTAP
             144.0  0.00000+J 0.15000  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
  6.04 0.039  0.52 0.084   3.00  0.00 1.6000 1.5400 0.1950 0.3790 0.1500 0.1100

                              S(1.0)  S(1.2)
                              0.1110  0.3040

 ** EXAC2 **   BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S
             98206     LKCHSTG2 13.800 1   80759-80781   30923-30927

     TR      TB      TC      KA      TA    VAMAX   VAMIN     KB    VRMAX   VRMIN
   0.010   1.000   1.000  1000.0   0.010   7.000  -7.000     1.0    14.6   -14.6

         TE      KL      KH      KF      TF      KC      KD      KE      VLR
       0.780   4.000   0.000   0.050   1.000   0.100   1.000   1.000   8.850

                         E1      S(E1)     E2      S(E2)
                       3.5200   0.0100   2.6400   0.0100
```

PSS/E Data – CTG1

```
REPORT FOR ALL MODELS                          BUS 98203 [LKCHCTG118.000] MODELS


 ** GENROU **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S
             98203     LKCHCTG1 18.000 1   80646-80659   30886-30891

             MBASE     Z S O R C E         X T R A N       GENTAP
             237.4  0.00000+J 0.20000  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
  6.69 0.039  0.59 0.078   5.53  0.00 2.1500 2.0500 0.2640 0.4890 0.2000 0.1510

                              S(1.0)  S(1.2)
                              0.0910  0.4620


 ** ESST4B **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S
             98203     LKCHCTG1 18.000 1   80702-80718   30910-30913

     TR    KPR     KIR     VRMAX    VRMIN    TA     KPM     KIM    VMMAX   VMMIN
   0.000   3.860   3.860   1.000  -0.870   0.010   1.000   0.000   1.000  -0.870

             KG      KP      KI   VBMAX     KC      XL    THETAP
           0.000   5.180   0.000   6.480   0.080  0.0000   0.000
```

PSS/E Data – CTG2

237.4 MVA, 18.0kV, 0.85pf, 60Hz, Wye connection, 3600rpm

```
REPORT FOR ALL MODELS                          BUS 98205 [LKCHCTG218.000] MODELS


 ** GENROU **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S
             98205     LKCHCTG2 18.000 1   80660-80673   30892-30897

             MBASE     Z S O R C E         X T R A N       GENTAP
             237.4  0.00000+J 0.20000  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
  6.69 0.039  0.59 0.078   5.53  0.00 2.1500 2.0500 0.2640 0.4890 0.2000 0.1510

                              S(1.0)  S(1.2)
                              0.0910  0.4620


 ** ESST4B **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S
             98205     LKCHCTG2 18.000 1   80719-80735   30914-30917

     TR    KPR     KIR     VRMAX    VRMIN    TA     KPM     KIM    VMMAX   VMMIN
   0.000   3.860   3.860   1.000  -0.870   0.010   1.000   0.000   1.000  -0.870

             KG      KP      KI   VBMAX     KC      XL    THETAP
           0.000   5.180   0.000   6.480   0.080  0.0000   0.000
```

APPENDIX A-B: APPROVED PROJECTS AND TRANSACTIONS IN STUDY MODE

Future Projects:

Year	Projects
2004	Upgrade Couch - Magnolia Dow 115kV line
	Upgrade Lynch - Mcalmont - Jacksonville south 115kV line
	Upgrade Mcalmont - Jacksonville North 115kV
	Upgrade Harrisburg Tap - Marked Tree 161kV line
	Upgrade Paragould - Paragould South 161kV line
	Upgrade Jonesboro - Jones boro SPA 161 kV line
	Build ISES - Newport 3rd line
2005	Install Dell 2nd 500/161kV auto transformer
	Upgrade Trumann - Harrisburg Tap 161kV line
	Install Wells 500/230kV auto transformer
	Reconfigure Scott substation
	Build Conroe - Goslin 138kV line
	Upgrade China - Amelia 230kV line
	Build China - Porter 230kV line
	Install Series cap at China - Porter 230kV line
	Install 300MVA SVC at Porter 230kV substation
	Install 750MVA Porter 230/138kV auto transformer
	Build Tamina – Porter 138kV line
	Install a 300MVAR Static Var Compensator (SVC) at the Ninemile 230kV bus
	Upgrade the Waterford-Ninemile 230kV line
	Upgrade the Little Gypsy-S.Norco-Prospect 230kV line
	Install Cap banks at Behrman, Napoleon, Destrehan 230kV substation
	Build Conwy - Panama 230kV line
	Upgrade Amite - Chatawa 115kV line
	Install Cap bank at Gloster 115kV substation
	Install Cap bank at Hazlehurst 115kV substation
	Build Rankin - South Jackson 230kV line
	Upgrade Franklin - Brookhaven 115kV line
2006	Install Sterlington 3rd auto transformer (600MVA)
	Upgrade Monre - WalnutGrove 115kV line
	Install Cap Bank at Lakecastle 115kV susbstation
2007	Build Panama - Dutch Bayou 230kV line
	Upgrade Conway - Bagtelle 230kV line
	Upgrade Coly - Vignes 230kV line

Transactions in Study Mode:

Source	Sink	MW
MIDSTREAM	EES	725
ATTALA	EES	526
BAYOUCOVE	LAGN	320
PLUMPOINT	MEAM	40
SPA	LEPA	13
LAFA	LEPA	61
CLEC	LEPA	52
OXYTAFT	LEPA	26
BCAJUN2	SOCO	103
LEWIS	AECI	37
MICHOUD	AECI	37
SPA	SOCO	52
SPA	SOCO	52
SPA	SOCO	52
SPA	SOCO	52
SPA	SOCO	52
SPA	SOCO	52
SPA	SOCO	52
SPA	SOCO	52
SPA	SOCO	52
SPA	SOCO	52

APPENDIX A-C: DETAILS OF SCENARIO 1

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	China Bulk - Sabine 230kV
0.0	Franklin - Mcknight 500kV	$ 24,000,000.00	Richard - Webre 500kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.00	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
11.70	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Roy S. Nelson SES 500/230kV auto
145.00	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Sabine 138kV
230.10	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Neches 138kV
262.20	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	China Bulk - Sabine 230kV
0.0	Franklin - Mcknight 500kV	$ 24,000,000.00	Richard - Webre 500kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
12.2	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Roy S. Nelson SES 500/230kV auto
146.4	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Sabine 138kV
232.1	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Neches 138kV
263.2	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Colonial Academy - Richard 138kV	$ 3,580,875.00	Richard - Scott 138kV
0.0	Colonial Academy - Richard 138kV	$ 3,580,875.00	North Crowley - Richard 138kv
0.0	Colonial Academy - Richard 138kV	$ 3,580,875.00	North Crowley - Scott 138kV
0.0	Colonial Academy - Acadia GSU 138kV	$ 2,824,875.00	Richard - Scott 138kV
0.0	Colonial Academy - Acadia GSU 138kV	$ 2,824,875.00	North Crowley - Richard 138kv
0.0	Acadia GSU - Scanlan 138kV	$ 1,991,250.00	Richard - Scott 138kV
0.0	Colonial Academy - Acadia GSU 138kV	$ 2,824,875.00	North Crowley - Scott 138kV
0.0	Acadia GSU - Scanlan 138kV	$ 1,991,250.00	North Crowley - Richard 138kv
0.0	Acadia GSU - Scanlan 138kV	$ 1,991,250.00	North Crowley - Scott 138kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
187.5	Scanlan - Scott 138kV	$ 1,991,250.00	Richard - Scott 138kV
273.3	Scanlan - Scott 138kV	$ 1,991,250.00	North Crowley - Richard 138kv
279.1	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Jacinto - Splendora 138kV	$ 4,343,625.00	Daytona Bulk - Line 533 Tap8 138kV
0.0	Jacinto - Splendora 138kV	$ 4,343,625.00	East Gate - Line 533 Tap8 138kV
0.0	Jacinto - Splendora 138kV	$ 4,343,625.00	East Gate - Hickory Ridge 138kV
0.0	Apollo - Splendora 138kV	$ 901,125.00	Daytona Bulk - Line 533 Tap8 138kV
0.0	Apollo - Splendora 138kV	$ 901,125.00	East Gate - Line 533 Tap8 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Apollo - Splendora 138kV	$ 901,125.00	East Gate - Hickory Ridge 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	National - Ray Wood 138kV	$ 2,760,750.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	National - Ray Wood 138kV	$ 2,760,750.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Amelia Bulk - China 230kV	$ 6,970,050.00	China Bulk - Sabine 230kV
0.0	Daytona Bulk - National 138kV	$ 1,856,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Daytona Bulk - National 138kV	$ 1,856,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - Splendora 138kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - Splendora 138kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Jacinto - Peach Creek 138kV	$ 4,050,000.00	Jacinto - Splendora 138kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - Splendora 138kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - Splendora 138kV
0.0	Jacinto - Peach Creek 138kV	$ 4,050,000.00	Apollo - Splendora 138kV
0.0	Caney Creek - Peach Creek 138kV	$ 4,050,000.00	Jacinto - Splendora 138kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	China Bulk - Sabine 230kV
0.0	Franklin - Mcknight 500kV	$ 24,000,000.00	Richard - Webre 500kV
0.0	Caney Creek - Peach Creek 138kV	$ 4,050,000.00	Apollo - Splendora 138kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
15.7	Jacinto - Peach Creek 138kV	$ 4,050,000.00	Cleveland - Jacinto 138kV
133.5	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Sabine 138kV
212.9	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Neches 138kV
225.2	Caney Creek - Peach Creek 138kV	$ 4,050,000.00	Cleveland - Jacinto 138kV
257.2	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	China Bulk - Sabine 230kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Conway West - Donaghe 161kV	$ 1,032,750.00	Greenbrier - Pleasant Hill 161kV
0.0	Conway South - Donaghe 161kV	$ 1,012,500.00	Greenbrier - Pleasant Hill 161kV
0.0	Franklin - Mcknight 500kV	$ 24,000,000.00	Richard - Webre 500kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
12.2	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Roy S. Nelson SES 500/230kV auto
63.5	Gleason - Morrilton East 161kV	$ 4,407,750.00	Lake Conway - Mayflower 115kV
144.8	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Sabine 138kV
181.5	Mayflower - Morgan 115kV	$ 1,650,375.00	Mayflower - Sylvan Hills 115kV
217.8	Mayflower - Morgan 115kV	$ 1,650,375.00	Lakewood - NLR Dixie 115kV
219.4	Mayflower - Morgan 115kV	$ 1,650,375.00	Mayflower - Roland Road 115kV
229.8	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Neches 138kV
259.9	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
328.3	Maumelle - Morgan 115kV	$ 168,750.00	Mayflower - Sylvan Hills 115kV
336.7	Little Rock FOURCHE - Little Rock East 115kV	$ 475,875.00	LR Rock Creek - LR South 115kV
338.7	Maumelle - Morgan 115kV	$ 168,750.00	Lakewood - NLR Dixie 115kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	China Bulk - Sabine 230kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Franklin - Mcknight 500kV	$ 24,000,000.00	Richard - Webre 500kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Bull Shoals - Flippin 161kV	$ 2,300,400.00	Bee Branch AECC - Quitman 161kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
10.8	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Roy S. Nelson SES 500/230kV auto
39.5	Bull Shoals - Flippin 161kV	$ 2,300,400.00	Bee Branch AECC - Clinton 161kV
108.5	Bull Shoals - Flippin 161kV	$ 2,300,400.00	Clinton West - Clinton 161kV
125.1	Melborne - Sage 161kV	$ 1,931,850.00	Dell - ISES 500kV
128	Melborne - Sage 161kV	$ 1,931,850.00	Dell - ISES 500kV
142.9	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Sabine 138kV
226.9	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Neches 138kV
260.9	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
301.0	Jacinto - Peach Creek 138kV	$ 4,050,000.00	Cleveland - Jayhawker 138kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Livonia - Wilbert 138kV	$ 6,510,375.00	Richard - Webre 500kV
0.0	Livonia - Line 642 Tap 138kV	$ 4,367,250.00	Richard - Webre 500kV
0.0	Gibson - Humphrey 115kV	$ 4,120,875.00	Richard - Webre 500kV
0.0	Terrebone 230/115kV transformer	$ 4,050,000.00	Richard - Webre 500kV
0.0	Colonial Academy - Richard 138kV	$ 3,580,875.00	Richard - Scott 138kV
0.0	Colonial Academy - Richard 138kV	$ 3,580,875.00	North Crowley - Richard 138kv
0.0	Colonial Academy - Richard 138kV	$ 3,580,875.00	North Crowley - Scott 138kV
0.0	Colonial Academy - Acadia GSU 138kV	$ 2,824,875.00	Richard - Scott 138kV
0.0	Colonial Academy - Acadia GSU 138kV	$ 2,824,875.00	North Crowley - Richard 138kv
0.0	Acadia GSU - Scanlan 138kV	$ 1,991,250.00	Richard - Scott 138kV
0.0	Colonial Academy - Acadia GSU 138kV	$ 2,824,875.00	North Crowley - Scott 138kV
0.0	Acadia GSU - Scanlan 138kV	$ 1,991,250.00	North Crowley - Richard 138kv
0.0	Acadia GSU - Scanlan 138kV	$ 1,991,250.00	North Crowley - Scott 138kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
28.5	Scanlan - Scott 138kV	$ 1,991,250.00	Richard - Scott 138kV
51.6	Scanlan - Scott 138kV	$ 1,991,250.00	North Crowley - Richard 138kv
73.2	Scanlan - Scott 138kV	$ 1,991,250.00	North Crowley - Scott 138kV
192.3	Richard - Scott 138kV	$ 9,531,000.00	Colonial Academy - Richard 138kV
208.9	Richard - Scott 138kV	$ 9,531,000.00	Colonial Academy - Acadia GSU 138kV
212.3	Richard - Scott 138kV	$ 9,531,000.00	North Crowley - Richard 138kv
257.9	Gibson 138/115kV transformer	$ 3,375,000.00	Richard - Webre 500kV
290.4	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
294.5	Scott - Lafayet 69kV	$ 1,506,600.00	Bonin - Scott 138kV
323.4	Addis - Willow Glen 138kV	$ 5,018,625.00	Louisiana Station - Wilbert 138kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
18.1	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Roy S. Nelson SES 500/230kV auto
286.1	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Gibson - Humphrey 115kV	$ 4,120,875.00	Richard - Webre 500kV
0.0	Colonial Academy - Richard 138kV	$ 3,580,875.00	Richard - Scott 138kV
0.0	Colonial Academy - Richard 138kV	$ 3,580,875.00	North Crowley - Richard 138kv
0.0	Colonial Academy - Richard 138kV	$ 3,580,875.00	North Crowley - Scott 138kV
0.0	Colonial Academy - Acadia GSU 138kV	$ 2,824,875.00	Richard - Scott 138kV
0.0	Colonial Academy - Acadia GSU 138kV	$ 2,824,875.00	North Crowley - Richard 138kv
0.0	Acadia GSU - Scanlan 138kV	$ 1,991,250.00	Richard - Scott 138kV
0.0	Colonial Academy - Acadia GSU 138kV	$ 2,824,875.00	North Crowley - Scott 138kV
0.0	Acadia GSU - Scanlan 138kV	$ 1,991,250.00	North Crowley - Richard 138kv
0.0	Acadia GSU - Scanlan 138kV	$ 1,991,250.00	North Crowley - Scott 138kV
0.0	Terrebone 230/115kV transformer	$ 4,050,000.00	Richard - Webre 500kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
72.2	Terrebone 230/115kV transformer	$ 4,050,000.00	Raceland - Coteau 115kV
193.8	Terrebone 230/115kV transformer	$ 4,050,000.00	Raceland 230/115kV transformer
202.6	Scanlan - Scott 138kV	$ 1,991,250.00	Richard - Scott 138kV
271.5	Coteau - Houma 115kV	$ 1,343,250.00	Chauvin - Valentine 115kV
286	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
294.3	Scanlan - Scott 138kV	$ 1,991,250.00	North Crowley - Richard 138kv
323.3	Raceland - Coteau 115kV	$ 4,137,750.00	Terrebone 230/115kV transformer
329	Coteau - Houma 115kV	$ 1,343,250.00	Chauvin - Ashland 115kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Amelia Bulk - China 230kV	$ 6,970,050.00	China Bulk - Sabine 230kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - Splendora 138kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - Splendora 138kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Jacinto - Peach Creek 138kV	$ 4,050,000.00	Jacinto - Splendora 138kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - Splendora 138kV
0.0	Jacinto - Peach Creek 138kV	$ 4,050,000.00	Apollo - Splendora 138kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - Splendora 138kV
0.0	Caney Creek - Peach Creek 138kV	$ 4,050,000.00	Jacinto - Splendora 138kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	China Bulk - Sabine 230kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Franklin - Mcknight 500kV	$ 24,000,000.00	Richard - Webre 500kV
0.0	Caney Creek - Peach Creek 138kV	$ 4,050,000.00	Apollo - Splendora 138kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
140.1	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Sabine 138kV
219.8	Jacinto - Peach Creek 138kV	$ 4,050,000.00	Daytona Bulk - Line 533 Tap8 138kV
222.8	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Neches 138kV
259.6	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
15.6	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Roy S. Nelson SES 500/230kV auto
156.7	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Ray Braswell 500/115kV transformer 1
274.5	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
292.5	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Ray Braswell 500/230kV transformer 1

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
13.8	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Roy S. Nelson SES 500/230kV auto
151.6	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Sabine 138kV
239.9	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Neches 138kV
268.1	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	China Bulk - Sabine 230kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Franklin - Mcknight 500kV	$ 24,000,000.00	Richard - Webre 500kV
0.0	Conway West - Donaghe 161kV	$ 1,032,750.00	Greenbrier - Pleasant Hill 161kV
0.0	Conway South - Donaghe 161kV	$ 1,012,500.00	Greenbrier - Pleasant Hill 161kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
11	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Roy S. Nelson SES 500/230kV auto
105.9	Melborne - Sage 161kV	$ 1,931,850.00	Dell - ISES 500kV
108.9	Melborne - Sage 161kV	$ 1,931,850.00	Dell - ISES 500kV
143.2	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Sabine 138kV
227.4	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Neches 138kV
260.8	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
319.6	Calico Rock - Melborne 161kV	$ 6,735,150.00	Dell - ISES 500kV
323.2	Calico Rock - Melborne 161kV	$ 6,735,150.00	Dell - ISES 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	China Bulk - Sabine 230kV
0.0	Franklin - Mcknight 500kV	$ 24,000,000.00	Richard - Webre 500kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
13.1	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Roy S. Nelson SES 500/230kV auto
149	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Sabine 138kV
236	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Neches 138kV
265.2	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV

APPENDIX A-D: DETAILS OF SCENARIO 2

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	China Bulk - Sabine 230kV
56.2	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
166.5	Keo - White Bluff 500kV	$ 11,650,500.00	Mabelvale - Sheridan 500kV
168.2	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
187.9	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Roy S. Nelson SES 500/230kV auto
261.3	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Sabine 138kV
312.2	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	China Bulk - Sabine 230kV
56.4	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
170.7	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
173.3	Keo - White Bluff 500kV	$ 11,650,500.00	Mabelvale - Sheridan 500kV
190.5	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Roy S. Nelson SES 500/230kV auto
263.5	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Sabine 138kV
313.4	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Colonial Academy - Richard 138kV	$ 3,580,875.00	Richard - Scott 138kV
0.0	Colonial Academy - Richard 138kV	$ 3,580,875.00	North Crowley - Richard 138kv
0.0	Colonial Academy - Richard 138kV	$ 3,580,875.00	North Crowley - Scott 138kV
0.0	Colonial Academy - Acadia GSU 138kV	$ 2,824,875.00	Richard - Scott 138kV
0.0	Colonial Academy - Acadia GSU 138kV	$ 2,824,875.00	North Crowley - Richard 138kv
0.0	Acadia GSU - Scanlan 138kV	$ 1,991,250.00	Richard - Scott 138kV
0.0	Colonial Academy - Acadia GSU 138kV	$ 2,824,875.00	North Crowley - Scott 138kV
0.0	Acadia GSU - Scanlan 138kV	$ 1,991,250.00	North Crowley - Richard 138kv
0.0	Acadia GSU - Scanlan 138kV	$ 1,991,250.00	North Crowley - Scott 138kV
73.2	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
203.8	Scanlan - Scott 138kV	$ 1,991,250.00	Richard - Scott 138kV
260	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
290.6	Scanlan - Scott 138kV	$ 1,991,250.00	North Crowley - Richard 138kv
332	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Jacinto - Splendora 138kV	$ 4,343,625.00	Daytona Bulk - Line 533 Tap8 138kV
0.0	Jacinto - Splendora 138kV	$ 4,343,625.00	East Gate - Line 533 Tap8 138kV
0.0	Jacinto - Splendora 138kV	$ 4,343,625.00	East Gate - Hickory Ridge 138kV
0.0	Apollo - Splendora 138kV	$ 901,125.00	Daytona Bulk - Line 533 Tap8 138kV
0.0	Apollo - Splendora 138kV	$ 901,125.00	East Gate - Line 533 Tap8 138kV
0.0	Apollo - Splendora 138kV	$ 901,125.00	East Gate - Hickory Ridge 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	National - Ray Wood 138kV	$ 2,760,750.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	National - Ray Wood 138kV	$ 2,760,750.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Daytona Bulk - National 138kV	$ 1,856,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Daytona Bulk - National 138kV	$ 1,856,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Amelia Bulk - China 230kV	$ 6,970,050.00	China Bulk - Sabine 230kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - Splendora 138kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - Splendora 138kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - Splendora 138kV
0.0	Jacinto - Peach Creek 138kV	$ 4,050,000.00	Jacinto - Splendora 138kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - Splendora 138kV
0.0	Jacinto - Peach Creek 138kV	$ 4,050,000.00	Apollo - Splendora 138kV
0.0	Caney Creek - Peach Creek 138kV	$ 4,050,000.00	Jacinto - Splendora 138kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	China Bulk - Sabine 230kV
55.8	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
79.3	Caney Creek - Peach Creek 138kV	$ 4,050,000.00	Apollo - Splendora 138kV
164.7	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
242	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Sabine 138kV
306.3	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
316.8	Jacinto - Peach Creek 138kV	$ 4,050,000.00	Cleveland - Jacinto 138kV
320.4	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Neches 138kV
322.6	Keo - White Bluff 500kV	$ 11,650,500.00	Mabelvale - Sheridan 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	China Bulk - Sabine 230kV
0.0	Conway West - Donaghe 161kV	$ -	Greenbrier - Pleasant Hill 161kV
0	Conway South - Donaghe 161kV	$ -	Greenbrier - Pleasant Hill 161kV
55.4	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
122.5	Morrilton East - Gleason 161kV	$ 5,289,300.00	Lake Conway - Mayflower 115kV
143.5	Keo - White Bluff 500kV	$ 11,650,500.00	Mabelvale - Sheridan 500kV
159.3	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
162.4	Mayflower - Morgan 115kV	$ 1,650,375.00	Mayflower - Sylvan Hills 115kV
190.5	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Roy S. Nelson SES 500/230kV auto
201.7	Mayflower - Morgan 115kV	$ 1,650,375.00	Mayflower - Roland Road 115kV
207.6	Mayflower - Morgan 115kV	$ 1,650,375.00	Roland Road - LR Pinnacle 115kV
260.9	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Sabine 138kV
309.4	Maumelle - Morgan 115kV	$ 168,750.00	Mayflower - Sylvan Hills 115kV
309.5	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
312.2	LR-East - LR-Fourche 115kV	$ 475,875.00	LR Rock Creek - LR South 115kV
330.5	Maumelle - Morgan 115kV	$ 168,750.00	Lakewood - NLR Dixie 115kV
337	Maumelle - Morgan 115kV	$ 168,750.00	NLR Levy - Lakewood 115kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Bull Shoals - Flippin 161kV	$ 2,300,400.00	Bee Branch AECC - Quitman 161kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	China Bulk - Sabine 230kV
0.0	Bull Shoals - Flippin 161kV	$ 2,300,400.00	Bee Branch AECC - Clinton 161kV
31.9	Bull Shoals - Flippin 161kV	$ 2,300,400.00	Clinton West - Clinton 161kV
56	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
166	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
175.9	Keo - White Bluff 500kV	$ 11,650,500.00	Mabelvale - Sheridan 500kV
183.4	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Roy S. Nelson SES 500/230kV auto
257.7	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Sabine 138kV
310.7	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Livonia - Wilbert 138kV	$ 6,510,375.00	Richard - Webre 500kV
0.0	Livonia - Line 642 Tap 138kV	$ 4,367,250.00	Richard - Webre 500kV
0.0	Colonial Academy - Richard 138kV	$ 3,580,875.00	Richard - Scott 138kV
0.0	Gibson - Humphrey 115kV	$ 4,120,875.00	Richard - Webre 500kV
0.0	Colonial Academy - Richard 138kV	$ 3,580,875.00	North Crowley - Richard 138kv
0.0	Colonial Academy - Richard 138kV	$ 3,580,875.00	North Crowley - Scott 138kV
0.0	Colonial Academy - Acadia GSU 138kV	$ 2,824,875.00	Richard - Scott 138kV
0.0	Colonial Academy - Acadia GSU 138kV	$ 2,824,875.00	North Crowley - Richard 138kv
0.0	Acadia GSU - Scanlan 138kV	$ 1,991,250.00	Richard - Scott 138kV
0.0	Colonial Academy - Acadia GSU 138kV	$ 2,824,875.00	North Crowley - Scott 138kV
0.0	Acadia GSU - Scanlan 138kV	$ 1,991,250.00	North Crowley - Richard 138kv
0.0	Terrebone 230/115kV transformer	$ 4,050,000.00	Richard - Webre 500kV
0.0	Acadia GSU - Scanlan 138kV	$ 1,991,250.00	North Crowley - Scott 138kV
16.4	Terrebone 230/115kV transformer	$ 4,050,000.00	Raceland - Coteau 115kV
32.7	Scanlan - Scott 138kV	$ 1,991,250.00	Richard - Scott 138kV
56	Scanlan - Scott 138kV	$ 1,991,250.00	North Crowley - Richard 138kv
73.9	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
77.5	Scanlan - Scott 138kV	$ 1,991,250.00	North Crowley - Scott 138kV
196.4	Richard - Scott 138kV	$ 9,531,000.00	Colonial Academy - Richard 138kV
213	Richard - Scott 138kV	$ 9,531,000.00	Colonial Academy - Acadia GSU 138kV
216.6	Richard - Scott 138kV	$ 9,531,000.00	North Crowley - Richard 138kv
333.2	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
61.4	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
221.7	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Roy S. Nelson SES 500/230kV auto
261	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Lawtag - Jennimgs 69kV	$ 1,290,600.00	Roy S. Nelson SES - Richard 500kV
0.0	Colonial Academy - Richard 138kV	$ 3,580,875.00	Richard - Scott 138kV
0.0	Colonial Academy - Richard 138kV	$ 3,580,875.00	North Crowley - Richard 138kv
0.0	Colonial Academy - Richard 138kV	$ 3,580,875.00	North Crowley - Scott 138kV
0.0	Lawtag - Welsh 69kV	$ 1,539,000.00	Roy S. Nelson SES - Richard 500kV
0.0	Colonial Academy - Acadia GSU 138kV	$ 2,824,875.00	Richard - Scott 138kV
0.0	Colonial Academy - Acadia GSU 138kV	$ 2,824,875.00	North Crowley - Richard 138kv
0.0	Acadia GSU - Scanlan 138kV	$ 1,991,250.00	Richard - Scott 138kV
0.0	Colonial Academy - Acadia GSU 138kV	$ 2,824,875.00	North Crowley - Scott 138kV
0.0	Acadia GSU - Scanlan 138kV	$ 1,991,250.00	North Crowley - Richard 138kv
0.0	Acadia GSU - Scanlan 138kV	$ 1,991,250.00	North Crowley - Scott 138kV
0.0	Lawtag - Jennimgs 69kV	$ 1,290,600.00	Roy S. Nelson SES 500/230kV auto
0.0	Scott 138/69kV Auto transformer 2	$ 2,025,000.00	Scott 138/69kV Auto transformer 1
0.0	Scott 138/69kV Auto transformer 1	$ 2,025,000.00	Scott 138/69kV Auto transformer 2
0.0	Terrebone 230/115kV transformer	$ 4,050,000.00	Richard - Webre 500kV
0.0	Terrebone 230/115kV transformer	$ 4,050,000.00	Raceland - Coteau 115kV
18.1	Lawtag - Jennimgs 69kV	$ 1,290,600.00	Jennings 138/69kV auto transformer 1
71.2	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
93.5	Jennings 138/69kV auto transformer 2	$ 2,025,000.00	Jennings 138/69kV auto transformer 1
93.5	Jennings 138/69kV auto transformer 1	$ 2,025,000.00	Jennings 138/69kV auto transformer 2
144.9	Franklin - Meadville 115kV	$ 6,837,750.00	South Vicksburg - Baxter Wilson 115kV
162.7	Scanlan - Scott 138kV	$ 1,991,250.00	Richard - Scott 138kV
234.3	Scanlan - Scott 138kV	$ 1,991,250.00	North Crowley - Richard 138kv
253.3	Scott 138/69kV Auto transformer 1	$ 2,025,000.00	Judice - Scott 138kV
253.3	Scott 138/69kV Auto transformer 2	$ 2,025,000.00	Judice - Scott 138kV
269.8	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
276.2	Gloster - Liberty 115kV	$ 7,128,000.00	South Vicksburg - Baxter Wilson 115kV
290.5	South Vicksburg - Port Gibson 115kV	$ 7,637,625.00	Franklin - Meadville 115kV
300.4	Scanlan - Scott 138kV	$ 1,991,250.00	North Crowley - Scott 138kV
330.6	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
333.2	Meadville - Roxie 115kV	$ 4,316,625.00	South Vicksburg - Baxter Wilson 115kV
334.5	Franklin - Meadville 115kV	$ 6,837,750.00	South Vicksburg - Port Gibson 115kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Amelia Bulk - China 230kV	$ 6,970,050.00	China Bulk - Sabine 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - Splendora 138kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - Splendora 138kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - Splendora 138kV
0.0	Jacinto - Peach Creek 138kV	$ 4,050,000.00	Jacinto - Splendora 138kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - Splendora 138kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Jacinto - Peach Creek 138kV	$ 4,050,000.00	Apollo - Splendora 138kV
0.0	Caney Creek - Peach Creek 138kV	$ 4,050,000.00	Jacinto - Splendora 138kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	China Bulk - Sabine 230kV
55.9	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
111.6	Caney Creek - Peach Creek 138kV	$ 4,050,000.00	Apollo - Splendora 138kV
164.6	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
198.7	Keo - White Bluff 500kV	$ 11,650,500.00	Mabelvale - Sheridan 500kV
253.1	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Sabine 138kV
309.2	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
334.7	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Neches 138kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
27.9	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Ray Braswell 500/115kV transformer 1
58.9	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
156.8	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Ray Braswell 500/230kV transformer 1
207.7	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
208.2	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Roy S. Nelson SES 500/230kV auto
326.7	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
57.4	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
184.8	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
198.9	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Roy S. Nelson SES 500/230kV auto
243.7	Keo - White Bluff 500kV	$ 11,650,500.00	Mabelvale - Sheridan 500kV
272.2	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Sabine 138kV
319.1	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Daytona Bulk - Line 533 Tap8 138kV	$ 371,250.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Line 533 Tap8 138kV	$ 2,271,375.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	East Gate - Hickory Ridge 138kV	$ 2,173,500.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Hickory Ridge - New Caney 138kV	$ 2,446,875.00	Jacinto - China/Jacitno Series Capacitor 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	China Bulk - Sabine 230kV
0.0	Conway West - Donaghe 161kV	$ -	Greenbrier - Pleasant Hill 161kV
0.0	Conway South - Donaghe 161kV	$ -	Greenbrier - Pleasant Hill 161kV
55.9	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
165.1	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
165.9	Keo - White Bluff 500kV	$ 11,650,500.00	Mabelvale - Sheridan 500kV
184.6	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Roy S. Nelson SES 500/230kV auto
258.3	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Sabine 138kV
310.5	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Cheeks - South Beaumont 138kV	$ 2,392,875.00	China Bulk - Sabine 230kV
56.8	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
175.7	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
192.4	Keo - White Bluff 500kV	$ 11,650,500.00	Mabelvale - Sheridan 500kV
195.3	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	Roy S. Nelson SES 500/230kV auto
267.9	Sabine - OILLA 138kV	$ 3,044,250.00	Hampton - Sabine 138kV
315.7	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV

APPENDIX A-E: DETAILS OF SCENARIO 3

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Porter - Tamina 138kV	$ 33,750.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Oak Ridge - Porter 138kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Conroe Bulk - Plantation 138kV	$ 988,875.00	Oak Ridge - Porter 138kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Metro - Oak Ridge 138kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Metro - Oak Ridge 138kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Metro - Oak Ridge 138kV
156.1	China Bulk - Sabine 230kV	$ 14,733,900.00	Hartburg - Nelson 500kV
179.8	China Bulk - Sabine 230kV	$ 14,733,900.00	Georgetown - Sabine 230kV
195.4	Georgetown - Sabine 230kV	$ 10,493,550.00	China Bulk - Sabine 230kV
245	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
278	Roy S. Nelson SES 500/230kV auto	$ 7,560,000.00	Roy S. Nelson SES - Richard 500kV
300.2	Conroe Bulk - Plantation 138kV	$ 988,875.00	Metro - Oak Ridge 138kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Porter - Tamina 138kV	$ 33,750.00	Oak Ridge - Porter 138kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Oak Ridge - Porter 138kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Conroe Bulk - Plantation 138kV	$ 988,875.00	Oak Ridge - Porter 138kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Metro - Oak Ridge 138kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Metro - Oak Ridge 138kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Metro - Oak Ridge 138kV
159.6	China Bulk - Sabine 230kV	$ 14,733,900.00	Hartburg - Nelson 500kV
181.4	China Bulk - Sabine 230kV	$ 14,733,900.00	Georgetown - Sabine 230kV
196.2	Georgetown - Sabine 230kV	$ 10,493,550.00	China Bulk - Sabine 230kV
246	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
279.9	Roy S. Nelson SES 500/230kV auto	$ 7,560,000.00	Roy S. Nelson SES - Richard 500kV
314.6	Conroe Bulk - Plantation 138kV	$ 988,875.00	Metro - Oak Ridge 138kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Porter - Tamina 138kV	$ 33,750.00	Oak Ridge - Porter 138kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Oak Ridge - Porter 138kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Oak Ridge - Porter 138kV
0.0	Conroe Bulk - Plantation 138kV	$ 988,875.00	Oak Ridge - Porter 138kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Metro - Oak Ridge 138kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Metro - Oak Ridge 138kV
0.0	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Metro - Oak Ridge 138kV
216.2	China Bulk - Sabine 230kV	$ 14,733,900.00	Georgetown - Sabine 230kV
225.3	China Bulk - Sabine 230kV	$ 14,733,900.00	Hartburg - Nelson 500kV
233.7	Georgetown - Sabine 230kV	$ 10,493,550.00	China Bulk - Sabine 230kV
260.6	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV

FCITC(MW)	Limiting Element	Cost	Contingency Element
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Oak Ridge - Porter 138kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Oak Ridge - Porter 138kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Oak Ridge - Porter 138kV
0.0	Conroe Bulk - Plantation 138kV	$ 988,875.00	Oak Ridge - Porter 138kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Metro - Oak Ridge 138kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Metro - Oak Ridge 138kV
0.0	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Metro - Oak Ridge 138kV
135.6	China Bulk - Sabine 230kV	$ 14,733,900.00	Hartburg - Nelson 500kV
166.6	China Bulk - Sabine 230kV	$ 14,733,900.00	Georgetown - Sabine 230kV
186.5	Conroe Bulk - Plantation 138kV	$ 988,875.00	Metro - Oak Ridge 138kV
191.0	Georgetown - Sabine 230kV	$ 10,493,550.00	China Bulk - Sabine 230kV
240.0	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
278.2	Roy S. Nelson SES 500/230kV auto	$ 7,560,000.00	Roy S. Nelson SES - Richard 500kV
294.5	Oak Ridge - Porter 138kV	$ 2,845,125.00	Conroe Bulk - Plantation 138kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Porter - Tamina 138kV	$ 33,750.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Oak Ridge - Porter 138kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Conroe Bulk - Plantation 138kV	$ 988,875.00	Oak Ridge - Porter 138kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Metro - Oak Ridge 138kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
0.0	Conway West - Donaghe 161kV	$ -	Greenbrier - Pleasant Hill 161kV
0.0	Conway South - Donaghe 161kV	$ -	Greenbrier - Pleasant Hill 161kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Metro - Oak Ridge 138kV
0.0	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Metro - Oak Ridge 138kV
83.4	Morrilton East - Gleason 161kV	$ 5,289,300.00	Lake Conway - Mayflower 115kV
151.3	China Bulk - Sabine 230kV	$ 14,733,900.00	Hartburg - Nelson 500kV
179.5	China Bulk - Sabine 230kV	$ 14,733,900.00	Georgetown - Sabine 230kV
180.4	Mayflower - Morgan 115kV	$ 1,650,375.00	Mayflower - Sylvan Hills 115kV
193.7	Georgetown - Sabine 230kV	$ 10,493,550.00	China Bulk - Sabine 230kV
217.2	Mayflower - Morgan 115kV	$ 1,650,375.00	Lakewood - NLR Dixie 115kV
218.3	Mayflower - Morgan 115kV	$ 1,650,375.00	Mayflower - Roland Road 115kV
242.8	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
269.7	Roy S. Nelson SES 500/230kV auto	$ 7,560,000.00	Roy S. Nelson SES - Richard 500kV
320	Conroe Bulk - Plantation 138kV	$ 988,875.00	Metro - Oak Ridge 138kV
327.3	Morgan - Maumelle East Tap 115kV	$ 168,750.00	Mayflower - Sylvan Hills 115kV
338.2	Morgan - Maumelle East Tap 115kV	$ 168,750.00	Lakewood - NLR Dixie 115kV
339.6	Little Rock FOURCHE - Little Rock East 115kV	$ 475,875.00	LR Rock Creek - LR South 115kV

FCITC(MW)	Limiting Element	Cost	Contingency Element
0.0	Porter - Tamina 138kV	$ 33,750.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Oak Ridge - Porter 138kV
0.0	Conroe Bulk - Plantation 138kV	$ 988,875.00	Oak Ridge - Porter 138kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Metro - Oak Ridge 138kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Metro - Oak Ridge 138kV
0.0	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Metro - Oak Ridge 138kV
0	Bull Shoals - Flippin 161kV	$ 2,300,400.00	Bee Branch AECC - Quitman 161kV
49.6	Bull Shoals - Flippin 161kV	$ 2,300,400.00	Bee Branch AECC - Clinton 161kV
118.4	Bull Shoals - Flippin 161kV	$ 2,300,400.00	Clinton West - Clinton 161kV
151.3	China Bulk - Sabine 230kV	$ 14,733,900.00	Hartburg - Nelson 500kV
177.4	China Bulk - Sabine 230kV	$ 14,733,900.00	Georgetown - Sabine 230kV
194.3	Georgetown - Sabine 230kV	$ 10,493,550.00	China Bulk - Sabine 230kV
243.7	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
271.8	Melborne - Sage 161kV	$ -	Dell - ISES 500kV
275.2	Conroe Bulk - Plantation 138kV	$ 988,875.00	Metro - Oak Ridge 138kV
275.9	Melborne - Sage 161kV	$ -	Dell - ISES 500kV
276.6	Roy S. Nelson SES 500/230kV auto	$ 7,560,000.00	Roy S. Nelson SES - Richard 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
0.0	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
224.3	China Bulk - Sabine 230kV	$ 14,733,900.00	Georgetown - Sabine 230kV
231.7	Georgetown - Sabine 230kV	$ 10,493,550.00	China Bulk - Sabine 230kV
272.1	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
303.2	China Bulk - Sabine 230kV	$ 14,733,900.00	Hartburg - Nelson 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
0.0	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
206.0	China Bulk - Sabine 230kV	$ 14,733,900.00	Georgetown - Sabine 230kV
213.4	Georgetown - Sabine 230kV	$ 10,493,550.00	China Bulk - Sabine 230kV
258.5	China Bulk - Sabine 230kV	$ 14,733,900.00	Hartburg - Nelson 500kV
268.5	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
339.8	Roy S. Nelson SES 500/230kV auto	$ 7,560,000.00	Roy S. Nelson SES - Richard 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
0.0	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
186.3	Terrebone 230/115kV transformer	$ 4,050,000.00	Raceland - Coteau 115kV
209.2	China Bulk - Sabine 230kV	$ 14,733,900.00	Georgetown - Sabine 230kV
216.9	Georgetown - Sabine 230kV	$ 10,493,550.00	China Bulk - Sabine 230kV
261.4	China Bulk - Sabine 230kV	$ 14,733,900.00	Hartburg - Nelson 500kV
268.2	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
271.5	Coteau - Houma 115kV	$ 1,343,250.00	Chauvin - Valentine 115kV
320.6	Terrebone 230/115kV transformer	$ 4,050,000.00	Raceland 230/115kV transformer
329.0	Coteau - Houma 115kV	$ 1,343,250.00	Chauvin - Ashland 115kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Oak Ridge - Porter 138kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Oak Ridge - Porter 138kV
0.0	Conroe Bulk - Plantation 138kV	$ 988,875.00	Oak Ridge - Porter 138kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Metro - Oak Ridge 138kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Metro - Oak Ridge 138kV
0.0	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Metro - Oak Ridge 138kV
146.2	China Bulk - Sabine 230kV	$ 14,733,900.00	Hartburg - Nelson 500kV
174.3	China Bulk - Sabine 230kV	$ 14,733,900.00	Georgetown - Sabine 230kV
193.3	Georgetown - Sabine 230kV	$ 10,493,550.00	China Bulk - Sabine 230kV
242.4	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
245.8	Conroe Bulk - Plantation 138kV	$ 988,875.00	Metro - Oak Ridge 138kV
276.1	Roy S. Nelson SES 500/230kV auto	$ 7,560,000.00	Roy S. Nelson SES - Richard 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Porter - Tamina 138kV	$ 33,750.00	Oak Ridge - Porter 138kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Oak Ridge - Porter 138kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Oak Ridge - Porter 138kV
0.0	Conroe Bulk - Plantation 138kV	$ 988,875.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Metro - Oak Ridge 138kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Metro - Oak Ridge 138kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Metro - Oak Ridge 138kV
136.5	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Ray Braswell 500/115kV transformer 1
194.5	China Bulk - Sabine 230kV	$ 14,733,900.00	Georgetown - Sabine 230kV
201.4	China Bulk - Sabine 230kV	$ 14,733,900.00	Hartburg - Nelson 500kV
205.1	Georgetown - Sabine 230kV	$ 10,493,550.00	China Bulk - Sabine 230kV
257.2	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
307.1	Roy S. Nelson SES 500/230kV auto	$ 7,560,000.00	Roy S. Nelson SES - Richard 500kV
308.9	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Ray Braswell 500/230kV transformer 1

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Porter - Tamina 138kV	$ 33,750.00	Oak Ridge - Porter 138kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Oak Ridge - Porter 138kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Oak Ridge - Porter 138kV
0.0	Conroe Bulk - Plantation 138kV	$ 988,875.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Metro - Oak Ridge 138kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Metro - Oak Ridge 138kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Metro - Oak Ridge 138kV
176.2	China Bulk - Sabine 230kV	$ 14,733,900.00	Hartburg - Nelson 500kV
187.3	China Bulk - Sabine 230kV	$ 14,733,900.00	Georgetown - Sabine 230kV
200	Georgetown - Sabine 230kV	$ 10,493,550.00	China Bulk - Sabine 230kV
250.8	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
290.6	Roy S. Nelson SES 500/230kV auto	$ 7,560,000.00	Roy S. Nelson SES - Richard 500kV
306.5	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Ray Braswell 500/115kV transformer 1

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Porter - Tamina 138kV	$ 33,750.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Oak Ridge - Porter 138kV
0.0	Conroe Bulk - Plantation 138kV	$ 988,875.00	Oak Ridge - Porter 138kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Metro - Oak Ridge 138kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Conway West - Donaghe 161kV	$ -	Greenbrier - Pleasant Hill 161kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
0.0	Conway South - Donaghe 161kV	$ -	Greenbrier - Pleasant Hill 161kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Metro - Oak Ridge 138kV
0.0	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Metro - Oak Ridge 138kV
151.5	China Bulk - Sabine 230kV	$ 14,733,900.00	Hartburg - Nelson 500kV
177.8	China Bulk - Sabine 230kV	$ 14,733,900.00	Georgetown - Sabine 230kV
194.3	Georgetown - Sabine 230kV	$ 10,493,550.00	China Bulk - Sabine 230kV
234.6	Melborne - Sage 161kV	$ -	Dell - ISES 500kV
239.1	Melborne - Sage 161kV	$ -	Dell - ISES 500kV
243.6	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
275.6	Roy S. Nelson SES 500/230kV auto	$ 7,560,000.00	Roy S. Nelson SES - Richard 500kV
282.1	Conroe Bulk - Plantation 138kV	$ 988,875.00	Metro - Oak Ridge 138kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Porter - Tamina 138kV	$ 33,750.00	Oak Ridge - Porter 138kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Oak Ridge - Porter 138kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Conroe Bulk - Plantation 138kV	$ 988,875.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Metro - Oak Ridge 138kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Metro - Oak Ridge 138kV
0.0	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Metro - Oak Ridge 138kV
166.7	China Bulk - Sabine 230kV	$ 14,733,900.00	Hartburg - Nelson 500kV
184.3	China Bulk - Sabine 230kV	$ 14,733,900.00	Georgetown - Sabine 230kV
197.8	Georgetown - Sabine 230kV	$ 10,493,550.00	China Bulk - Sabine 230kV
248	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
283.5	Roy S. Nelson SES 500/230kV auto	$ 7,560,000.00	Roy S. Nelson SES - Richard 500kV
300.9	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Ray Braswell 500/115kV transformer 1

APPENDIX A-F: DETAILS OF SCENARIO 4

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Porter - Tamina 138kV	$ 33,750.00	Oak Ridge - Porter 138kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Oak Ridge - Porter 138kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Conroe Bulk - Plantation 138kV	$ 988,875.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Metro - Oak Ridge 138kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
15.5	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
185.4	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
200.8	Keo - White Bluff 500kV	$ 11,650,500.00	Mabelvale - Sheridan 500kV
228.9	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Metro - Oak Ridge 138kV
300.9	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
326.5	Georgetown - Sabine 230kV	$ 10,493,550.00	China Bulk - Sabine 230kV
332.8	Roy S. Nelson SES 500/230kV auto	$ 7,560,000.00	Roy S. Nelson SES - Richard 500kV
339.3	China Bulk - Sabine 230kV	$ 14,733,900.00	Georgetown - Sabine 230kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Porter - Tamina 138kV	$ 33,750.00	Oak Ridge - Porter 138kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Oak Ridge - Porter 138kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Conroe Bulk - Plantation 138kV	$ 988,875.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Metro - Oak Ridge 138kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
16.1	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
190.6	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
209.1	Keo - White Bluff 500kV	$ 11,650,500.00	Mabelvale - Sheridan 500kV
240.3	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Metro - Oak Ridge 138kV
302.1	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
327.8	Georgetown - Sabine 230kV	$ 10,493,550.00	China Bulk - Sabine 230kV
335	Roy S. Nelson SES 500/230kV auto	$ 7,560,000.00	Roy S. Nelson SES - Richard 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Porter - Tamina 138kV	$ 33,750.00	Oak Ridge - Porter 138kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Oak Ridge - Porter 138kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Oak Ridge - Porter 138kV
0.0	Conroe Bulk - Plantation 138kV	$ 988,875.00	Oak Ridge - Porter 138kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Metro - Oak Ridge 138kV
35.3	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
227.3	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
294.5	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Metro - Oak Ridge 138kV
319.6	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Oak Ridge - Porter 138kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Oak Ridge - Porter 138kV
0.0	Conroe Bulk - Plantation 138kV	$ 988,875.00	Oak Ridge - Porter 138kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Metro - Oak Ridge 138kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
14.1	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
137.8	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
139.8	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Metro - Oak Ridge 138kV
221.4	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Metro - Oak Ridge 138kV
294.8	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
316.1	China Bulk - Sabine 230kV	$ 14,733,900.00	Georgetown - Sabine 230kV
319.7	Georgetown - Sabine 230kV	$ 10,493,550.00	China Bulk - Sabine 230kV
333.1	Roy S. Nelson SES 500/230kV auto	$ 7,560,000.00	Roy S. Nelson SES - Richard 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Porter - Tamina 138kV	$ 33,750.00	Oak Ridge - Porter 138kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Oak Ridge - Porter 138kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Conroe Bulk - Plantation 138kV	$ 988,875.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Metro - Oak Ridge 138kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
13.4	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
26.9	Conway West - Donaghe 161kV	$ -	Greenbrier - Pleasant Hill 161kV
41.6	Conway South - Donaghe 161kV	$ -	Greenbrier - Pleasant Hill 161kV
145	Morrilton East - Gleason 161kV	$ 5,289,300.00	Lake Conway - Mayflower 115kV
161.7	Mayflower - Morgan 115kV	$ 1,650,375.00	Mayflower - Sylvan Hills 115kV
173.4	Keo - White Bluff 500kV	$ 11,650,500.00	Mabelvale - Sheridan 500kV
191.2	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
201	Mayflower - Morgan 115kV	$ 1,650,375.00	Mayflower - Roland Road 115kV
206.9	Mayflower - Morgan 115kV	$ 1,650,375.00	Roland Road - LR Pinnacle 115kV
244.5	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Metro - Oak Ridge 138kV
298.3	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
308.8	Maumelle - Morgan 115kV	$ 168,750.00	Mayflower - Sylvan Hills 115kV
315.6	LR-East - LR-Fourche 115kV	$ 475,875.00	LR Rock Creek - LR South 115kV
323.1	Roy S. Nelson SES 500/230kV auto	$ 7,560,000.00	Roy S. Nelson SES - Richard 500kV
323.8	Georgetown - Sabine 230kV	$ 10,493,550.00	China Bulk - Sabine 230kV
330.1	Maumelle - Morgan 115kV	$ 168,750.00	Lakewood - NLR Dixie 115kV
336.7	Maumelle - Morgan 115kV	$ 168,750.00	NLR Levy - Lakewood 115kV
338.7	China Bulk - Sabine 230kV	$ 14,733,900.00	Georgetown - Sabine 230kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Porter - Tamina 138kV	$ 33,750.00	Oak Ridge - Porter 138kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Conroe Bulk - Plantation 138kV	$ 988,875.00	Oak Ridge - Porter 138kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Metro - Oak Ridge 138kV
0.0	Bull Shoals - Flippin 161kV	$ 2,300,400.00	Bee Branch AECC - Quitman 161kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0	Bull Shoals - Flippin 161kV	$ 2,300,400.00	Bee Branch AECC - Clinton 161kV
14.9	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
39.3	Bull Shoals - Flippin 161kV	$ 2,300,400.00	Clinton West - Clinton 161kV
176.1	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
209.3	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Metro - Oak Ridge 138kV
211.9	Keo - White Bluff 500kV	$ 11,650,500.00	Mabelvale - Sheridan 500kV
299.3	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
324.3	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Metro - Oak Ridge 138kV
324.9	Georgetown - Sabine 230kV	$ 10,493,550.00	China Bulk - Sabine 230kV
331.2	Roy S. Nelson SES 500/230kV auto	$ 7,560,000.00	Roy S. Nelson SES - Richard 500kV
335	China Bulk - Sabine 230kV	$ 14,733,900.00	Georgetown - Sabine 230kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
51.3	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
296.8	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
333.4	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
39.4	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
268.6	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
329.1	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Lawtag - Jennimgs 69kV	$ 1,290,600.00	Roy S. Nelson SES - Richard 500kV
0.0	Lawtag - Welsh 69kV	$ 1,539,000.00	Roy S. Nelson SES - Richard 500kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Lawtag - Jennimgs 69kV	$ 1,290,600.00	Roy S. Nelson SES 500/230kV auto
0.0	Scott 138/69kV Auto transformer 1	$ 2,025,000.00	Scott 138/69kV Auto transformer 2
0.0	Scott 138/69kV Auto transformer 2	$ 2,025,000.00	Scott 138/69kV Auto transformer 1
0	Lawtag - Jennimgs 69kV	$ 1,290,600.00	Jennings 138/69kV auto transformer 2
39.2	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
72.2	Jennings 138/69kV auto transformer 1	$ 2,025,000.00	Jennings 138/69kV auto transformer 2
72.2	Jennings 138/69kV auto transformer 2	$ 2,025,000.00	Jennings 138/69kV auto transformer 1
246.9	Franklin - Meadville 115kV	$ 6,837,750.00	South Vicksburg - Baxter Wilson 115kV
253.5	Scott 138/69kV Auto transformer 2	$ 2,025,000.00	Judice - Scott 138kV
253.5	Scott 138/69kV Auto transformer 1	$ 2,025,000.00	Judice - Scott 138kV
276.8	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
285.6	Terrebone 230/115kV transformer	$ 4,050,000.00	Raceland - Coteau 115kV
318.8	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
339.1	Lawtag - Welsh 69kV	$ 1,539,000.00	Roy S. Nelson SES 500/230kV auto

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Porter - Tamina 138kV	$ 33,750.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Oak Ridge - Porter 138kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Conroe Bulk - Plantation 138kV	$ 988,875.00	Oak Ridge - Porter 138kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Metro - Oak Ridge 138kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
14.4	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
164.5	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
186.3	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Metro - Oak Ridge 138kV
239	Keo - White Bluff 500kV	$ 11,650,500.00	Mabelvale - Sheridan 500kV
290.2	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Metro - Oak Ridge 138kV
297.8	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
323.2	Georgetown - Sabine 230kV	$ 10,493,550.00	China Bulk - Sabine 230kV
329.6	China Bulk - Sabine 230kV	$ 14,733,900.00	Georgetown - Sabine 230kV
330.6	Roy S. Nelson SES 500/230kV auto	$ 7,560,000.00	Roy S. Nelson SES - Richard 500kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Porter - Tamina 138kV	$ 33,750.00	Oak Ridge - Porter 138kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Oak Ridge - Porter 138kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Oak Ridge - Porter 138kV
0.0	Conroe Bulk - Plantation 138kV	$ 988,875.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Metro - Oak Ridge 138kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
1.1	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Ray Braswell 500/115kV transformer 1
25.5	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
167.4	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Ray Braswell 500/230kV transformer 1
231.1	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
315.5	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
338.7	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Metro - Oak Ridge 138kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Porter - Tamina 138kV	$ 33,750.00	Oak Ridge - Porter 138kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Oak Ridge - Porter 138kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Oak Ridge - Porter 138kV
0.0	Conroe Bulk - Plantation 138kV	$ 988,875.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Metro - Oak Ridge 138kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
19.7	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
32.8	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Ray Braswell 500/115kV transformer 1
209.2	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
282.7	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Metro - Oak Ridge 138kV
295	Keo - White Bluff 500kV	$ 11,650,500.00	Mabelvale - Sheridan 500kV
307.8	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
333.8	Georgetown - Sabine 230kV	$ 10,493,550.00	China Bulk - Sabine 230kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Porter - Tamina 138kV	$ 33,750.00	Oak Ridge - Porter 138kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Conroe Bulk - Plantation 138kV	$ 988,875.00	Oak Ridge - Porter 138kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Dayton Bulk - Cheeks 138kV	$ 14,512,500.00	China Bulk - Sabine 230kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Metro - Oak Ridge 138kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
14.7	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
29.4	Conway West - Donaghe 161kV	$ -	Greenbrier - Pleasant Hill 161kV
44.7	Conway South - Donaghe 161kV	$ -	Greenbrier - Pleasant Hill 161kV
178.6	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
199.9	Keo - White Bluff 500kV	$ 11,650,500.00	Mabelvale - Sheridan 500kV
214.8	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Metro - Oak Ridge 138kV
299.2	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
324.8	Georgetown - Sabine 230kV	$ 10,493,550.00	China Bulk - Sabine 230kV
330	Roy S. Nelson SES 500/230kV auto	$ 7,560,000.00	Roy S. Nelson SES - Richard 500kV
332.4	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Metro - Oak Ridge 138kV
335.7	China Bulk - Sabine 230kV	$ 14,733,900.00	Georgetown - Sabine 230kV

FCITC (MW)	Limiting Element	Cost	Contingency Element
0.0	Porter - Tamina 138kV	$ 33,750.00	Oak Ridge - Porter 138kV
0.0	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Oak Ridge - Porter 138kV
0.0	Plantation - Cedar Hill 138kV	$ 1,056,375.00	Oak Ridge - Porter 138kV
0.0	Conroe Bulk - Plantation 138kV	$ 988,875.00	Oak Ridge - Porter 138kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	French Settlement - Sorrento 230kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Franklin - Mcknight 500kV
0.0	Fairview - Gypsy 230kV	$ 40,000,000.00	Front Street - Michoud 230kV
0.0	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
0.0	Georgetown - Helbig 230kV	$ 5,447,250.00	China Bulk - Sabine 230kV
0.0	Porter - Tamina 138kV	$ 33,750.00	Metro - Oak Ridge 138kV
0.0	Ray Braswell 500/115kV transformer 1	$ 9,100,000.00	Lakeover - Ray Braswell 500kV
17.4	Georgetown - Helbig 230kV	$ 5,447,250.00	Hartburg - Nelson 500kV
31.7	Ray Braswell 500/230kV transformer 1	$ 9,100,000.00	Ray Braswell 500/115kV transformer 1
201.1	China Bulk - Sabine 230kV	$ 14,733,900.00	Amelia Bulk - China 230kV
232.4	Keo - White Bluff 500kV	$ 11,650,500.00	Mabelvale - Sheridan 500kV
264.2	Cedar Hill - Tamina 138kV	$ 1,309,500.00	Metro - Oak Ridge 138kV
304.5	PPG - Rose Bluff 230kV	$ 2,138,400.00	Hartburg - Nelson 500kV
330.4	Georgetown - Sabine 230kV	$ 10,493,550.00	China Bulk - Sabine 230kV
339.4	Roy S. Nelson SES 500/230kV auto	$ 7,560,000.00	Roy S. Nelson SES - Richard 500kV

APPENDIX A-G: Stability Issues in the Western Region of the Entergy System Due to Independent Power Generation

Introduction

The WOTAB (West of the Atchafalaya Basin) Area in defined as Entergy's systems in Southwestern Louisiana, and Southeastern Texas. The WOTAB area is a major load center for the Entergy System. The load to generation ratio requires a significant amount of power to be imported into the WOTAB area. However, because of the influx of new generating projects proposed for the area, it is likely that by the year 2003 this area may turn into a significant exporter of power. There have been a significant number of requests for interconnection studies to evaluate the potential interconnection of new generating facilities in the WOTAB area. It is anticipated that by 2003 there may be approximately 4000 – 6000 MW of new merchant generation within the WOTAB area.

Entergy's transmission system was planned, designed and built to serve approximately 5000 – 6000 MW of native and network loads in the WOTAB area. The addition of a significant amount of merchant generation will result in the export of power out of the WOTAB area. A high level of export power has the potential to create major problems, such as voltage and dynamic stability. The main objective of this study is to establish an estimated power export limit for the WOTAB area based on stability criteria.

Signing an interconnection agreement provides the generator the right to interconnection to the transmission system, but does not provide it any right to move its power onto or over the transmission system. The right to use the transmission system to transmit power can only be obtained by submitting a transmission request for service pursuant to Entergy's FERC-approved transmission tariff. Solutions to stability problems to increase export limits, such as construction of 500 kV line, have very long lead-times and tend to be very expensive.

Entergy believes that it is important to post this study publicly on its OASIS site so that entities that have already executed interconnection agreements, as well as entities that are proposing to site new generation within the WOTAB area, can incorporate this information into their decision-making process.

Analysis

In order to establish stability limits from the WOTAB area, all merchant generating that have signed an interconnection agreement were dispatched at their maximum capability along with the native generation in the area. In order to accommodate this export and simulate a worst case scenario, generation was reduced in the northern part of the Entergy System.

In this analysis the export limits were determined without the addition of any Power System Stabilizers (PSSs). However, sensitivity studies were conducted to determine the impact of stabilizers. If voltage stability limits were found to be lower than the dynamic stability limits, they were captured in this analysis.

One important assumption made in this study was to ignore thermal limitations. Thermal issues will be addressed as part of Transmission Service Request as they are based on source to sink information and generation dispatch within the WOTAB area.

The two cases analyzed in this study are as follows:

1. Base case with no merchant generation
2. Base case with merchant generation

Voltage stability analysis was performed for the pre-contingency condition and contingencies on four critical lines: Hartburg-Mt. Olive 500 kV, Richard–Webre 500 kV, Nelson–Richard 500 kV, and Grimes–Crockett 345 kV lines. As part of the voltage stability analysis, PV curves were developed in order to determine the maximum power that can be exported from the WOTAB area without experiencing voltage decline or voltage collapse. Entergy's guideline on voltage decline states that voltage at any station should not fall below 0.92 pu of nominal system voltage on single contingency.

Transient stability analysis was performed by applying a 3 phase to ground fault on the lines mentioned earlier. The fault clearing time was assumed to be 5 cycles for 500 kV and 345 kV lines and 6 cycles for the 230 kV lines. The transient stability plots show the machine angle as a function of time and indicate whether machine is stable and well damped, transiently unstable or dynamically unstable. A three percent damping criteria was used to screen the damping problem.

Results

Case 1 – Base Case with no Merchant Generation

No voltage stability problems were identified in this case. The transient stability plots in Figures 1 and 2 for a three-phase fault on the Hartburg – Mt.Olive 500 kV and Richard – Webre 500 kV lines show that the machines are stable and well damped.

Case 2 – Base case with Merchant Generation

A. Voltage Stability Analysis

The voltage stability plot or PV Curve for this case is shown in Figure 3. The X-axis of this plot is the power export level from the WOTAB area corresponding to the pre-contingency condition and the contingency of the four critical lines described earlier. The Y-axis represents the voltage at the Cane River 115 kV bus in the North Louisiana area. This station is representative of the voltage collapse occurring in that area. From the PV plot it can be observed that the most limiting contingency from the point of view of export from the area is the Hartburg – Mt. Olive 500 kV line. Based on the voltage decline guideline, the export limit from the area on the contingency of Hartburg-Mt. Olive line is 2100 MW. Figure 3 also shows that voltage collapse will eventually occur at about 3300 MW.

B. Transient/Dynamic Stability Analysis

The transient stability simulations were performed with the assumption that there are no Power System Stabilizers (PSS) installed on the proposed merchant generating units. The maximum export under this condition where the units are marginally damped was determined to be approximately 2700 MW. The stability plot for this simulation is shown in Figure 4. It was determined that export limits can be improved by adding PSS to the merchant generation. Henceforth, it will be a requirement that all new units in the area be equipped with stabilizers.

Conclusions:

The West of the Atchafalaya Basin (WOTAB) area can experience a voltage and dynamic stability problem if a significant amount of new merchant generation is operating in the area by year 2003. The export limit from this area is determined to be 2700 MW based on dynamic stability and 2100 MW based on voltage decline. As this area can experience dynamic problems beyond a certain export limit it will be mandatory for all IPPs in the area to install PSS on their units. Any *further* increase in the export level may require major upgrades, such as construction of 500 kV transmission lines.
The thermal limits were not evaluated in this study because they are source and sink specific and based on the generation dispatch. These limits will be evaluated when transmission service is requested and a System Impact Study is conducted.

APPENDIX A-H: Transient Stability DATA & Plots

Plots illustrating the results from the simulated cases have been provided. For all cases, speed plots are given for representative generators near major 230kV or 500kV buses in the area near the proposed Lake Charles bus. The following representative generators were selected.

Generator Description	Bus #	Bus Name	Nearby 230kV or 500kV bus	Comments
Lake Charles CTG 1	98203	LKCHCTG118.000	Lake Charles 230	Not modeled for "b" cases or Case 1c.
PPG C4	98057	1PPG C4 13.800	PPG 230	
Nelson G1	97911	G1NELSON14.400	Nelson 230	
Sabine G1	97571	G1SABIN 20.000	Sabine 230	
Cottonwood G1	97818	1G1INTHB18.000	Hartburg 500	
Acadia G1	50291	G1-2ACAD18.000	Richard 500	

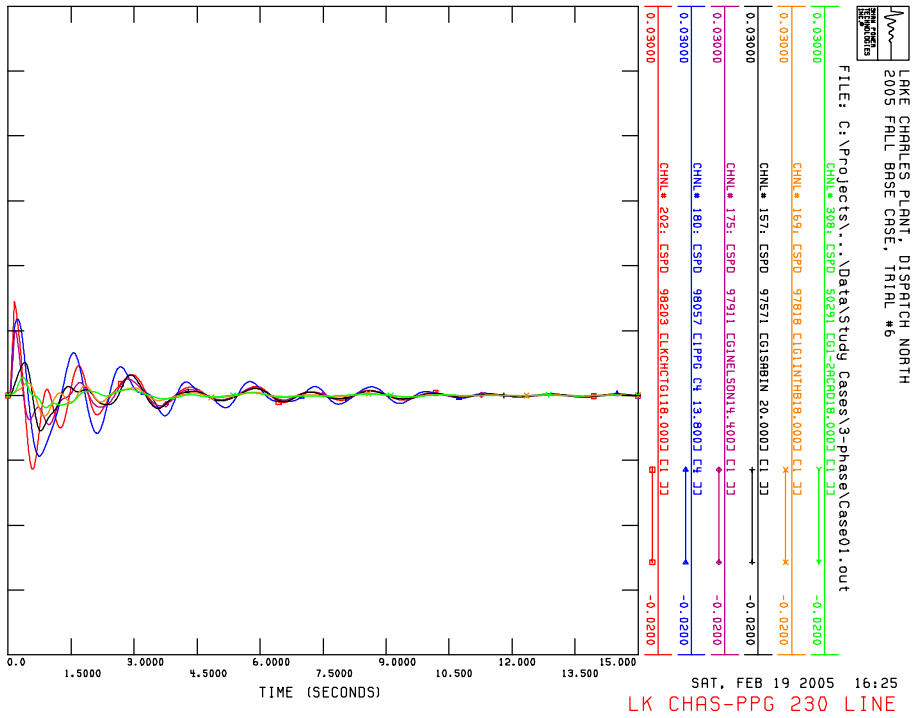


Figure 1: Case 1 – 3-phase Fault on Lake Charles-PPG 230kV Line with Normal Clearing

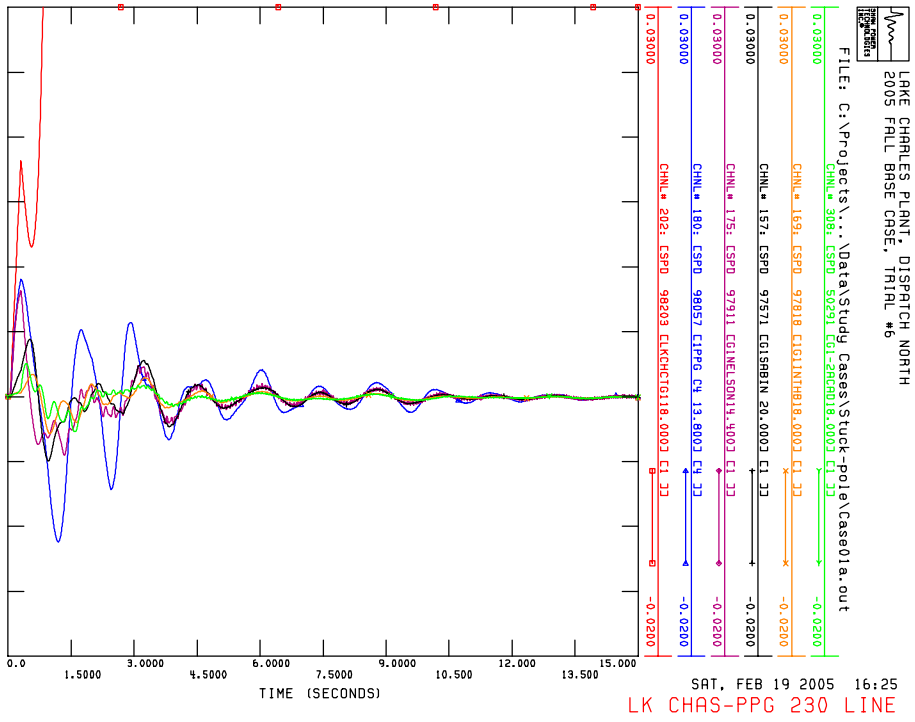


Figure 2: Case 1A – 3-phase Fault on Lake Charles-PPG 230kV Line with Stuck Breaker at Lake Charles

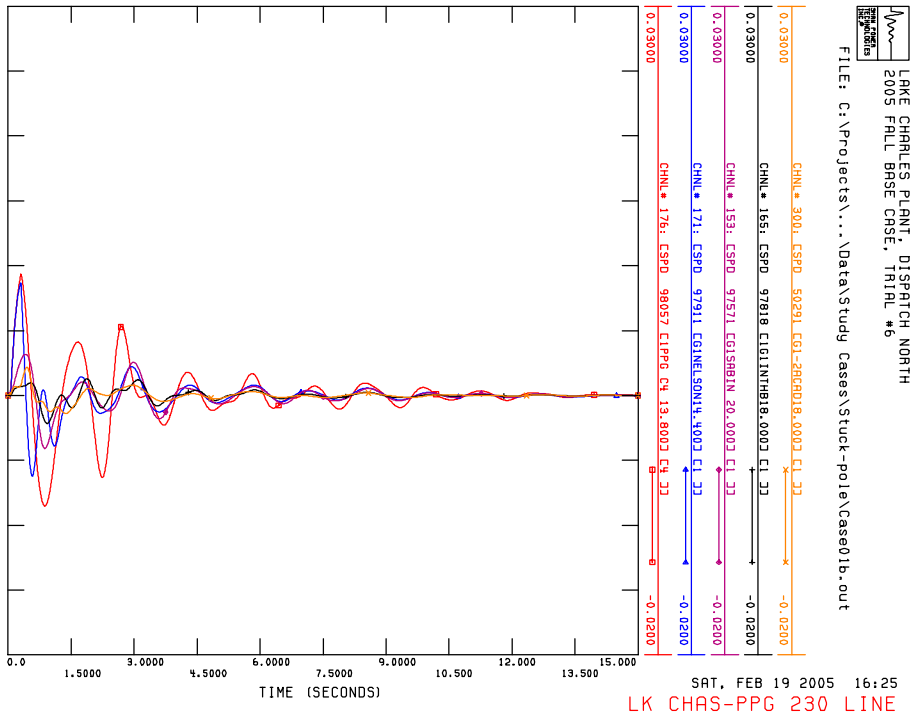


Figure 3: Case 1B – 3-phase Fault on Lake Charles-PPG 230kV Line with Stuck Breaker at Lake Charles – No Lake Charles Generation

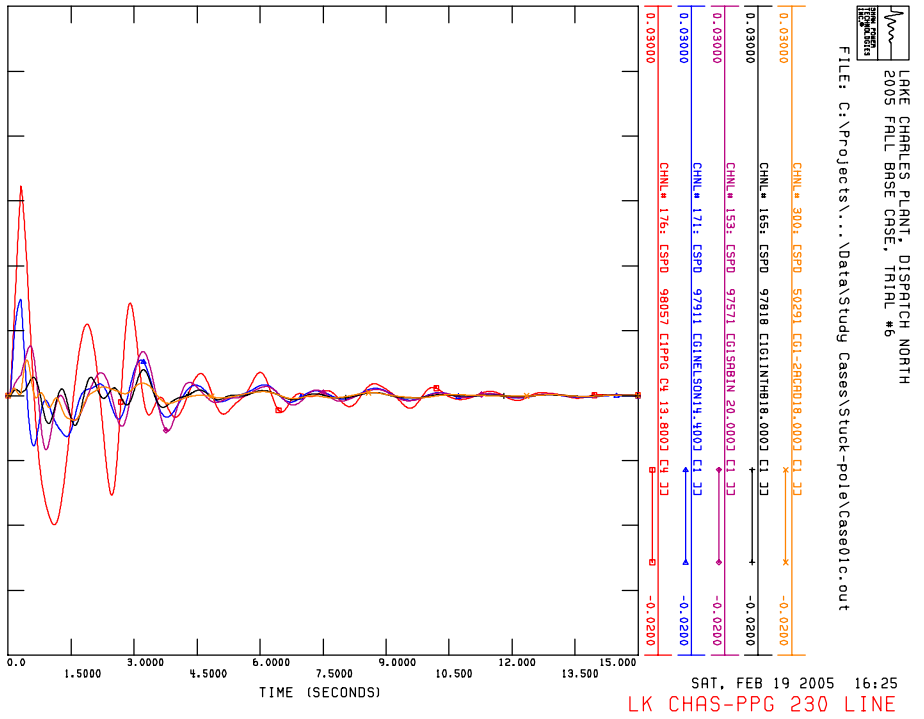


Figure 4: Case 1C – 3-phase Fault on Lake Charles-PPG at PPG 230kV Line with Stuck Breaker at Lake Charles – No Lake Charles Generation

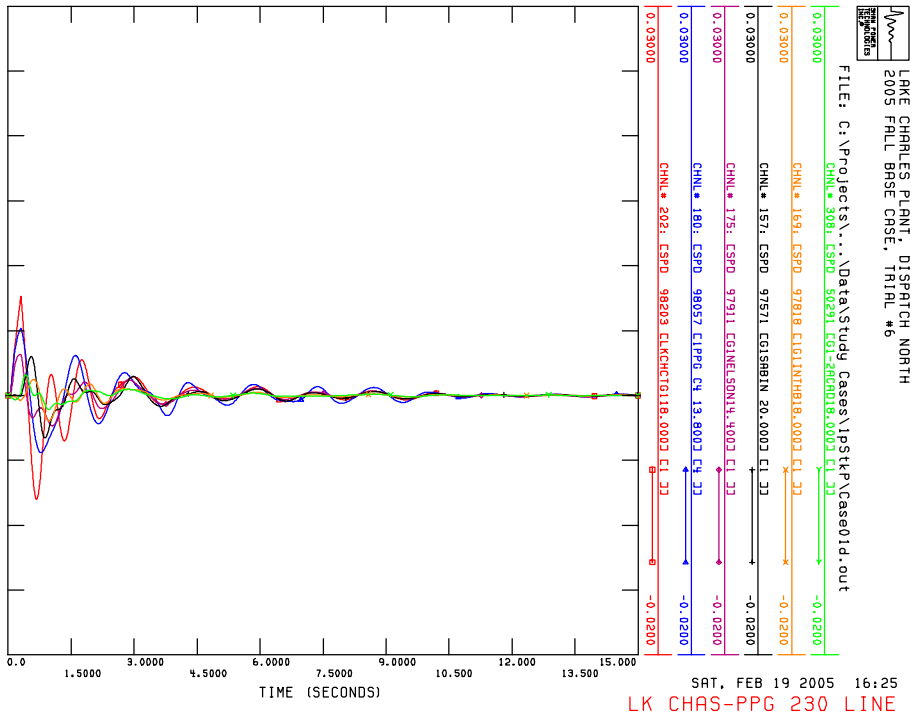


Figure 5: Case 1D – 1-phase Fault on Lake Charles-PPG 230kV Line with Stuck Breaker at Lake Charles

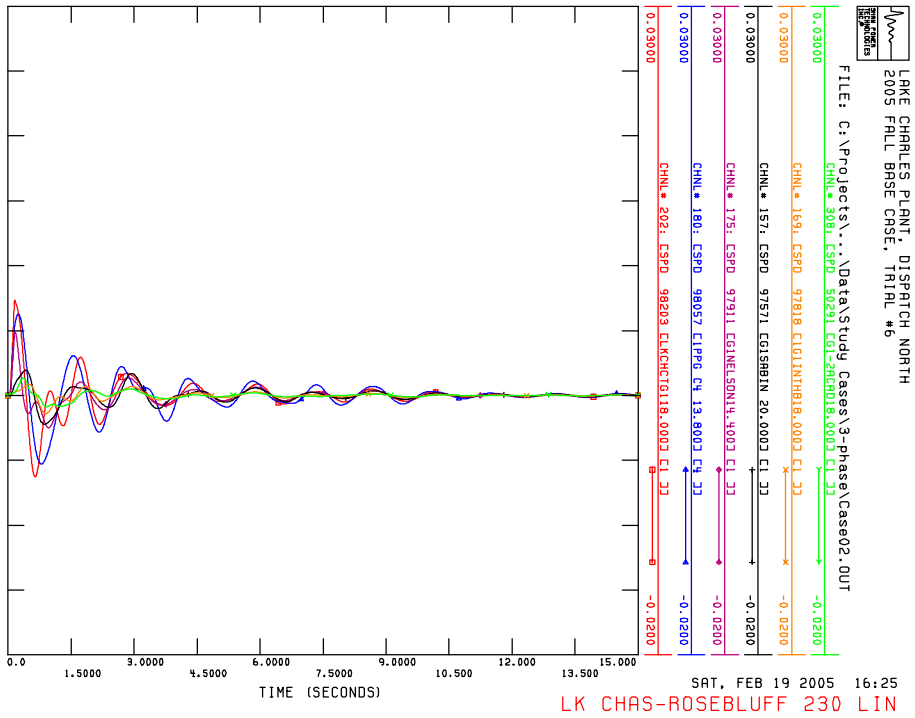


Figure 6: Case 2 – 3-phase Fault on Lake Charles-Rose Bluff 230kV Line with Normal Clearing

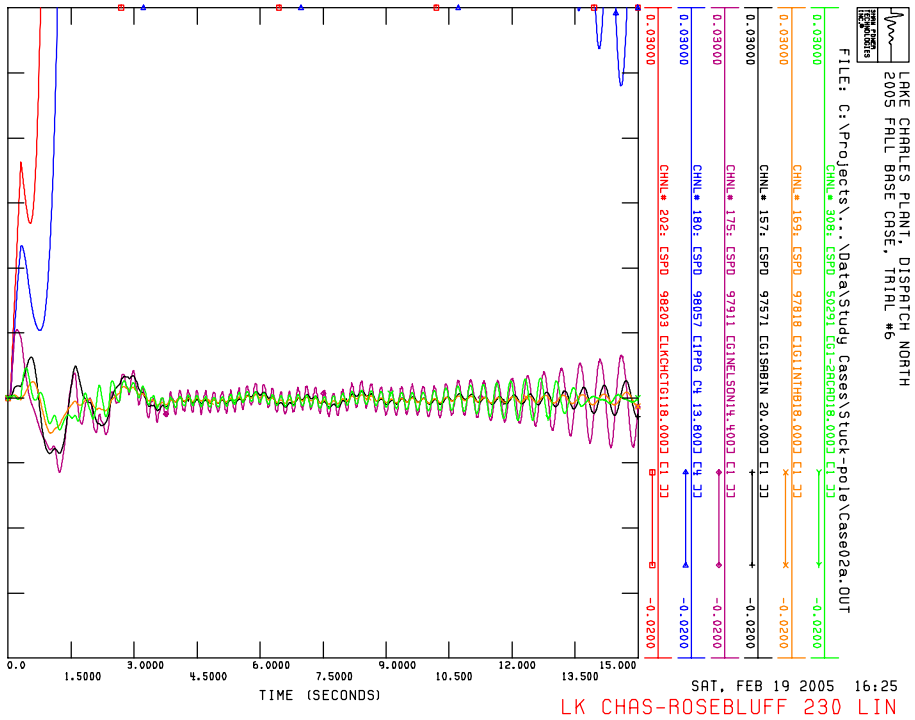


Figure 7: Case 2A – 3-phase Fault on Lake Charles-Rose Bluff 230kV Line with Stuck Breaker at Lake Charles

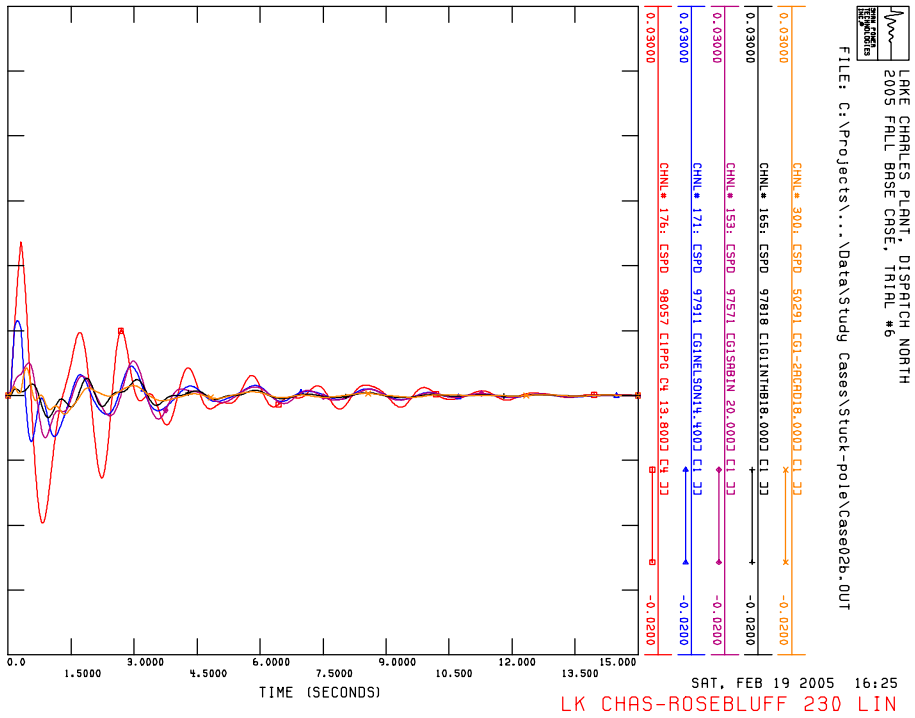


Figure 8: Case 2B – 3-phase Fault on Lake Charles-Rose Bluff 230kV Line with Stuck Breaker at Lake Charles – No Lake Charles Generation

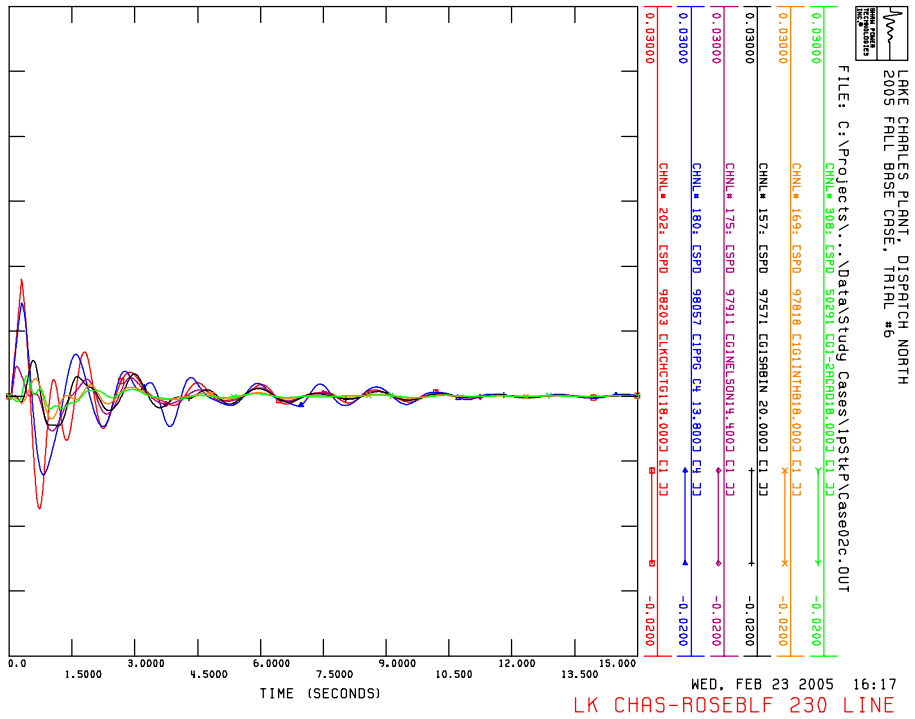


Figure 9: Case 2C – 1-phase Fault on Lake Charles-Rose Bluff 230kV Line with Stuck Breaker at Lake Charles

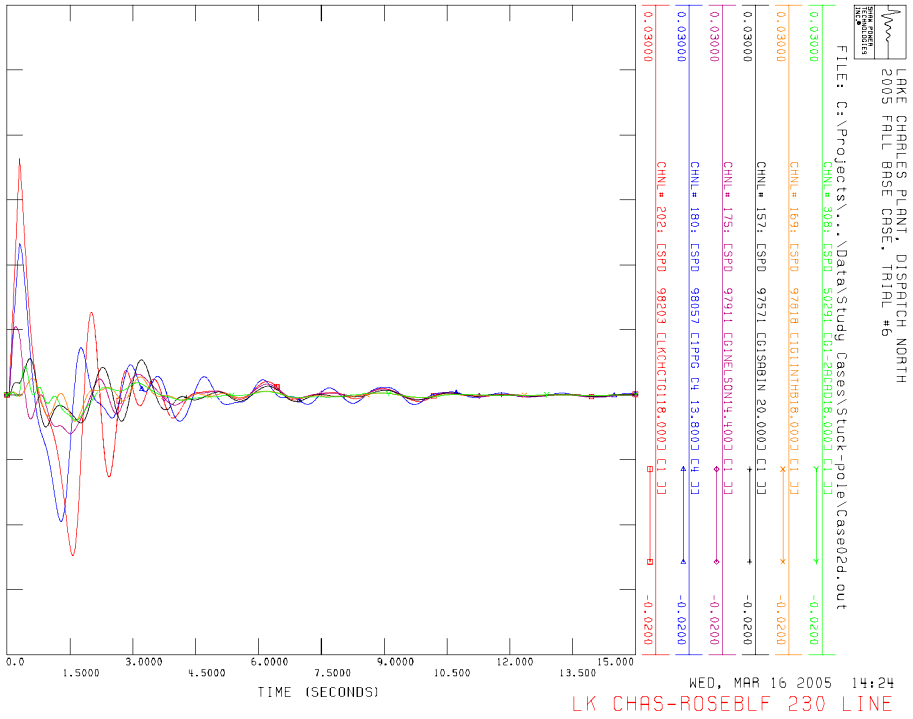


Figure 10: Case 2D – 3-phase Fault on Lake Charles-Rose Bluff 230kV Line with Stuck Breaker at Lake Charles. [redacted] STGs Tripped with Backup Line Clearing

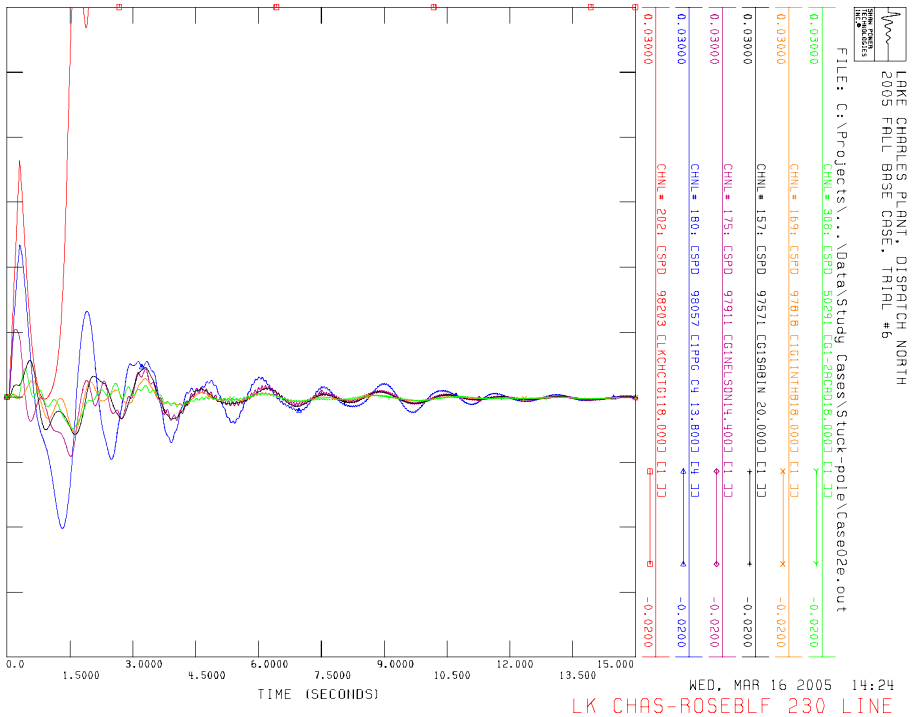


Figure 11: Case 2E – 3-phase Fault on Lake Charles-Rose Bluff 230kV Line with Stuck Breaker at Lake Charles. [redacted] STGs Tripped ¼ Cycle After Backup Line Clearing

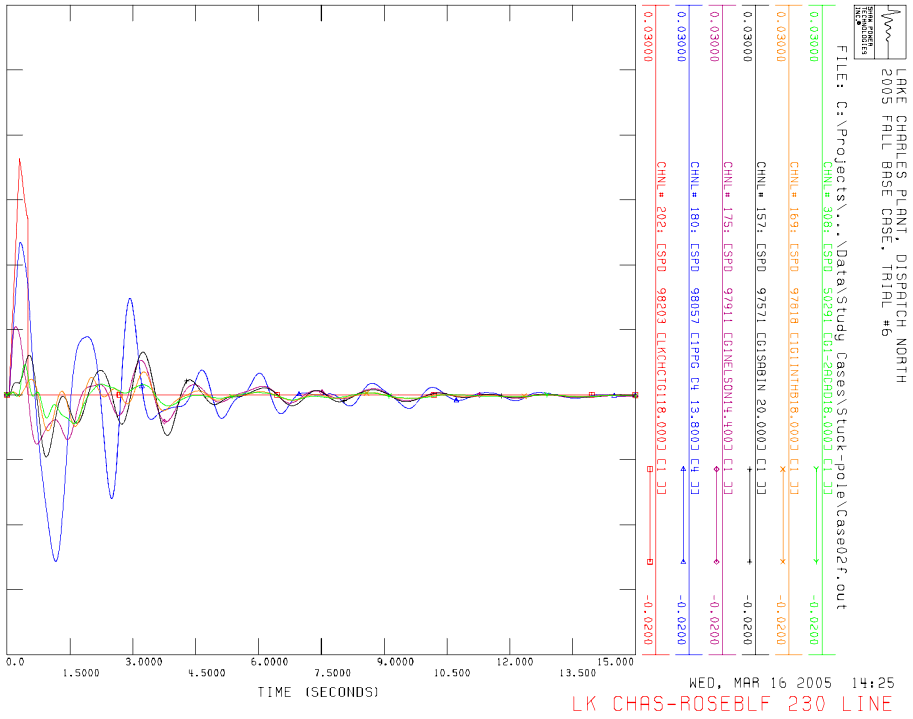


Figure 12: Case 2F – 3-phase Fault on Lake Charles-Rose Bluff 230kV Line with Stuck Breaker at Lake Charles. [redacted] STGs Tripped 15 Cycles After Backup Line Clearing

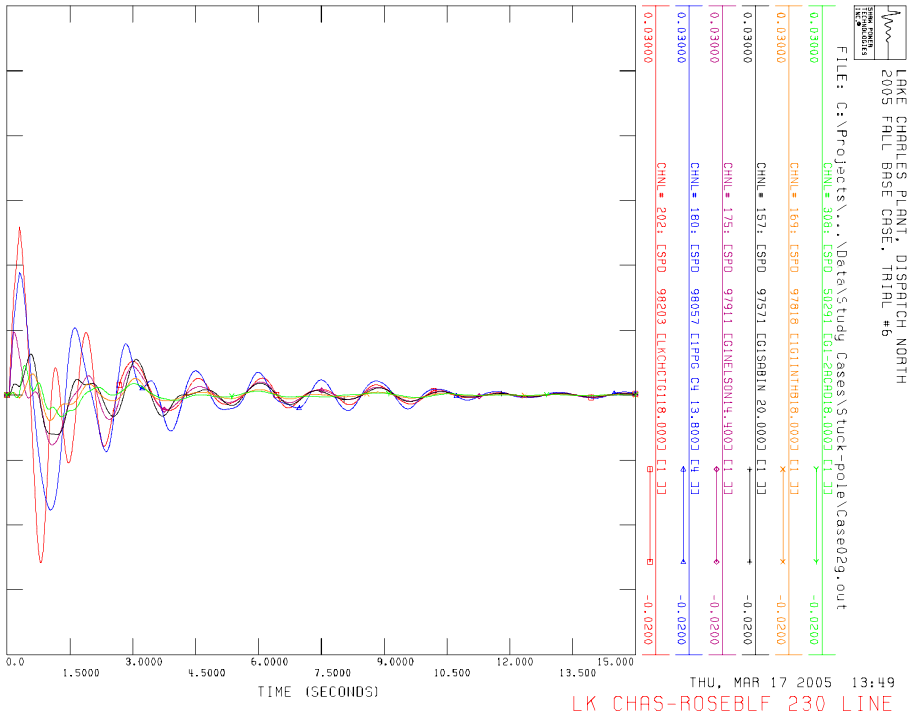


Figure 13: Case 2G – 3-phase Fault on Lake Charles-Rose Bluff 230kV Line with Stuck Breaker at Lake Charles. [redacted] 230kV Breakers are IPO.

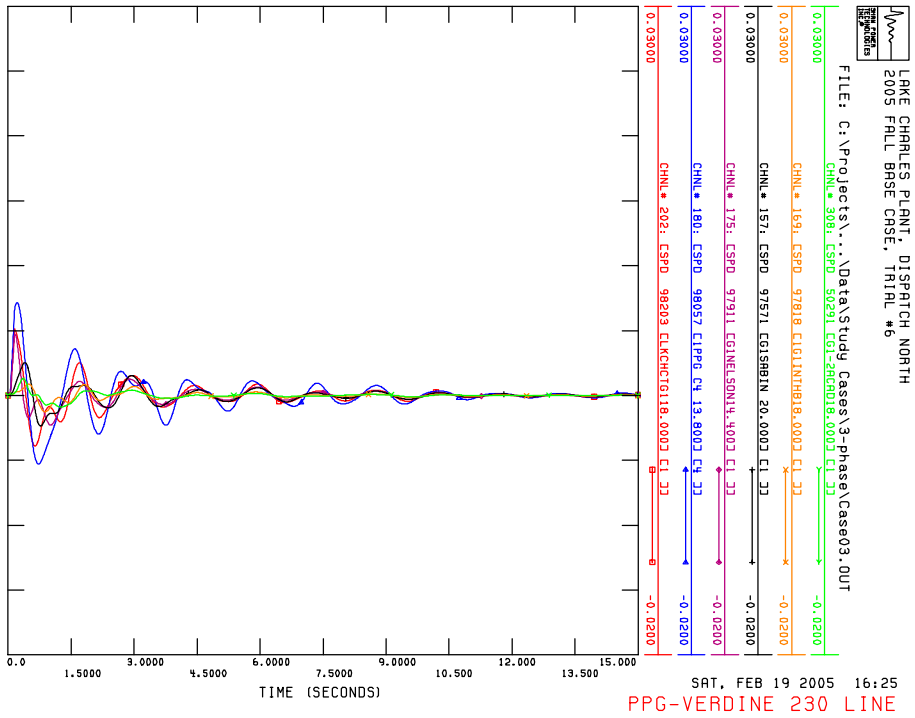


Figure 14: Case 3 – 3-phase Fault on PPG-Verdine 230kV Line with Normal Clearing

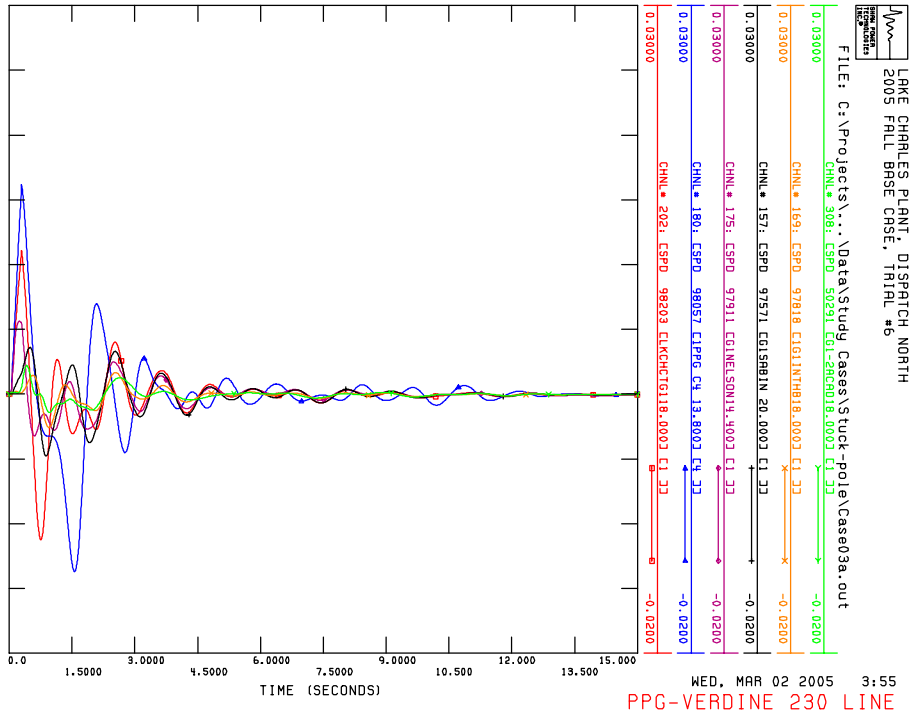


Figure 15: Case 3A – 3-phase Fault on PPG-Verdine 230kV Line with Stuck Breaker at PPG

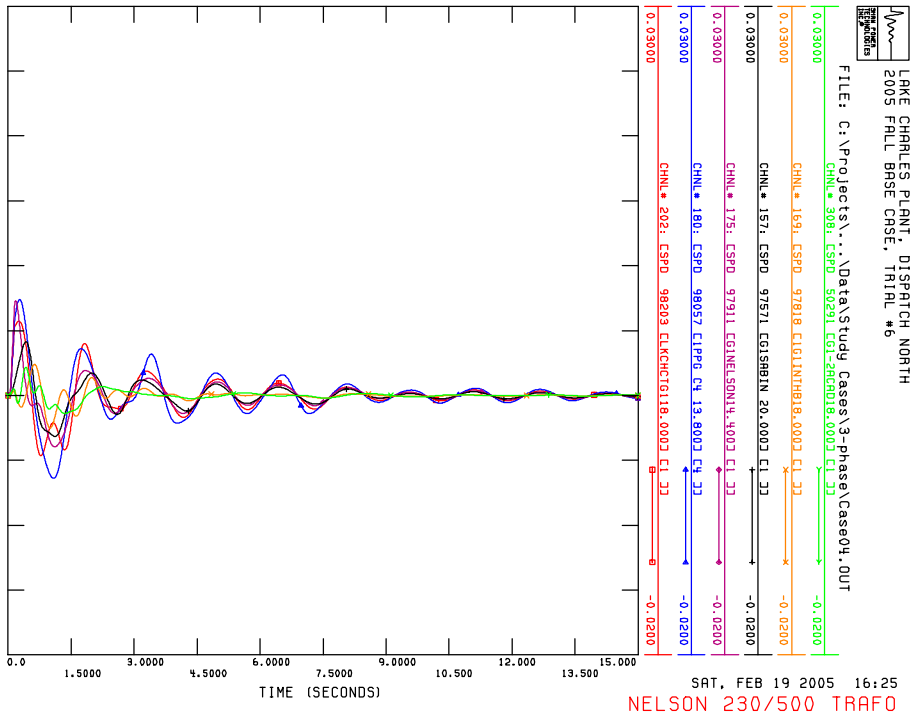


Figure 16: Case 4 – 3-phase Fault on Nelson 230/500kV Transformer with Normal Clearing

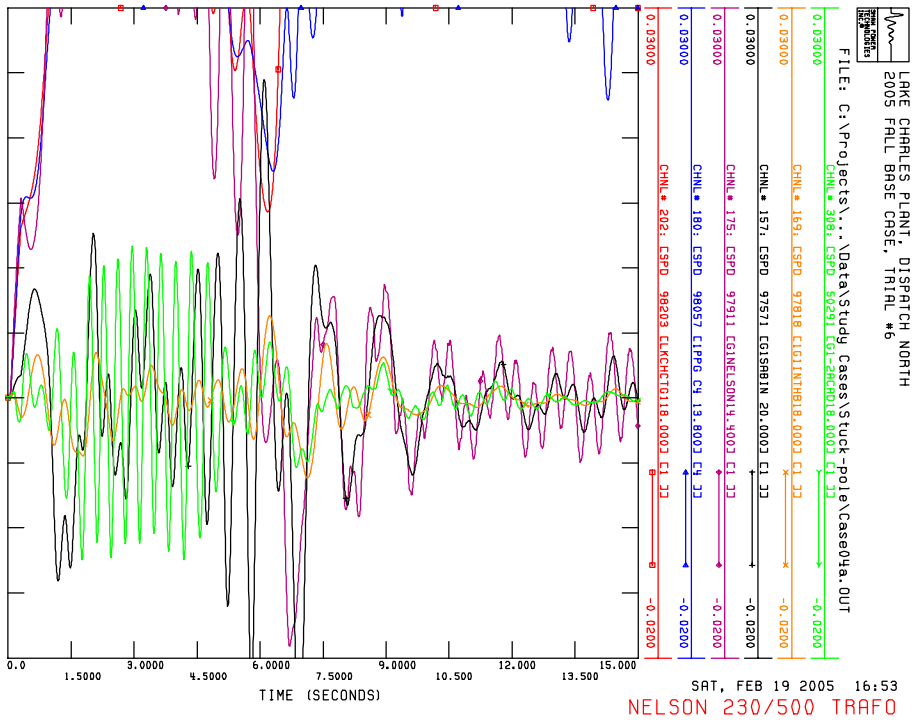


Figure 17: Case 4A – 3-phase Fault on Nelson 230/500kV Transformer with Stuck Breaker at 230kV Side

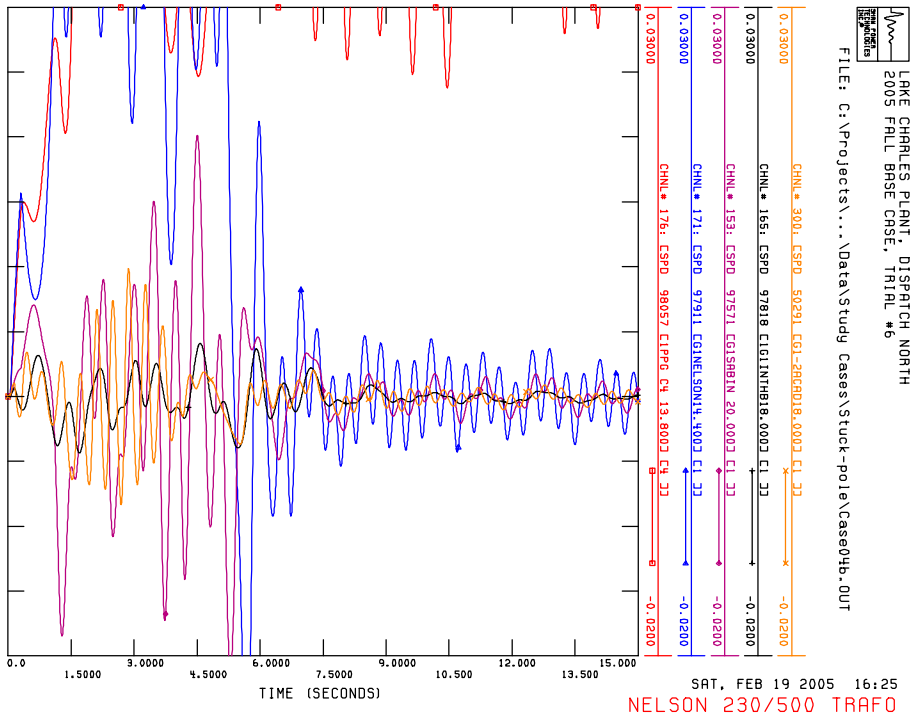


Figure 18: Case 4B – 3-phase Fault on Nelson 230/500kV Transformer with Stuck Breaker on 230kV Side – No Lake Charles Generation

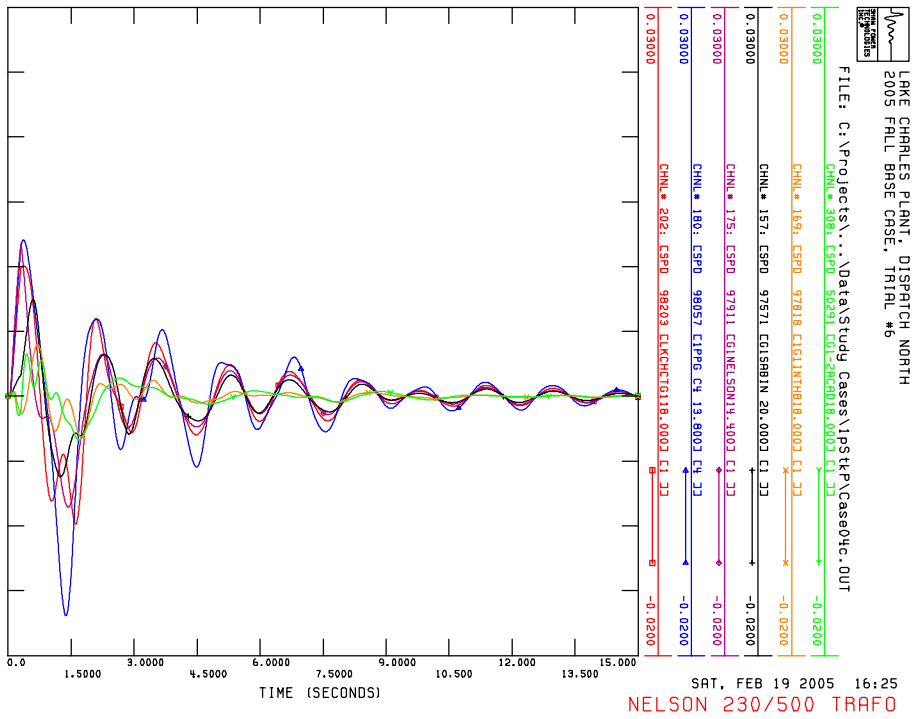


Figure 19: Case 4C – 1-phase Fault on Nelson 230/500kV Transformer with Stuck Breaker at 230kV Side

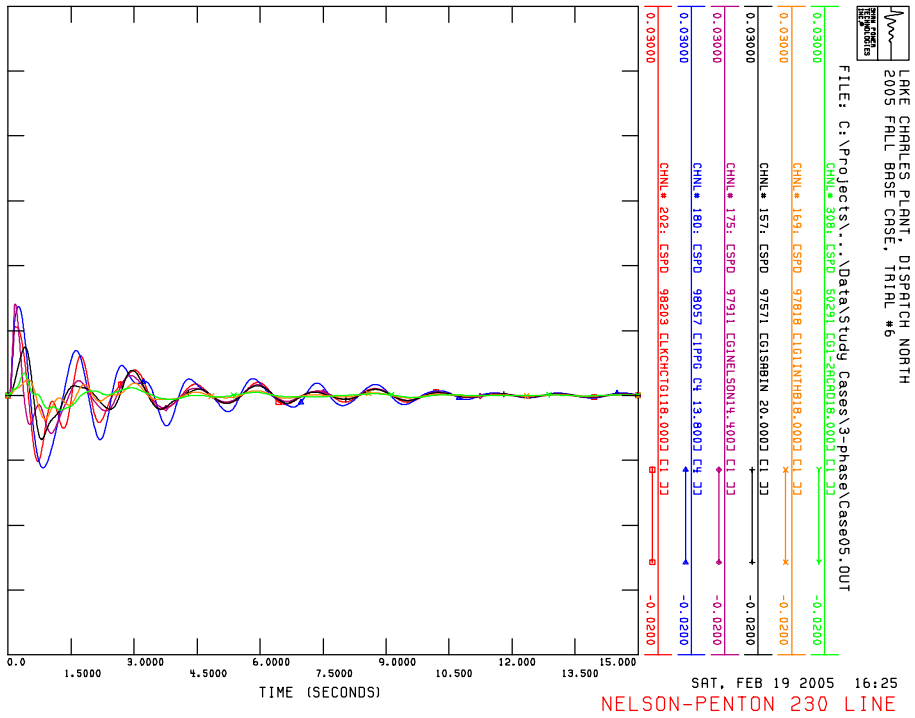


Figure 20: Case 5 – Fault on Nelson-Penton 230kV Line with Normal Clearing

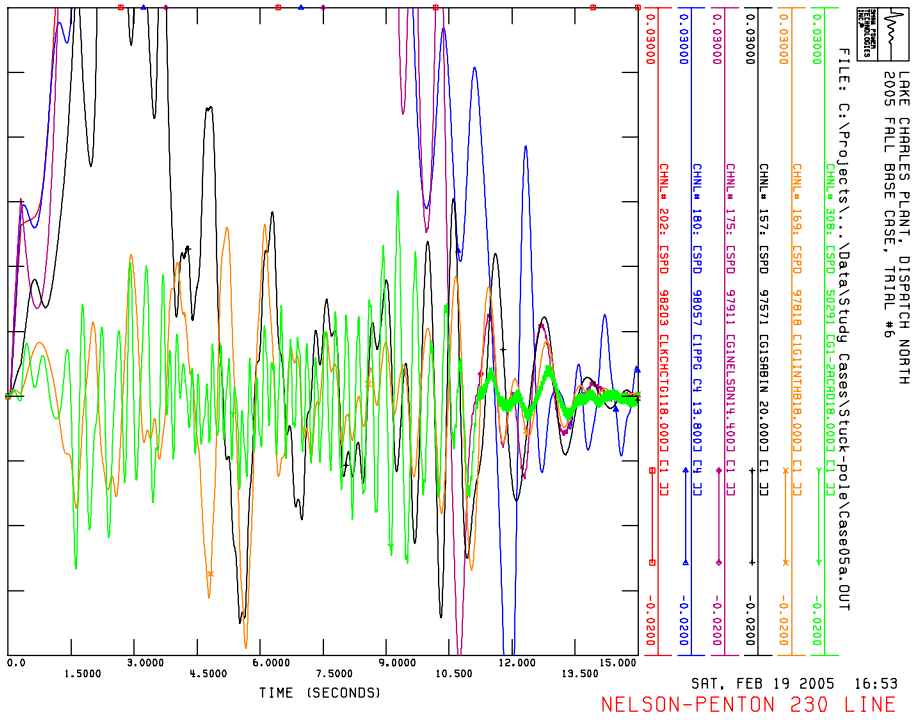


Figure 21: Case 5A – 3-phase Fault on Nelson-Penton 230kV Line with Stuck Breaker at Nelson

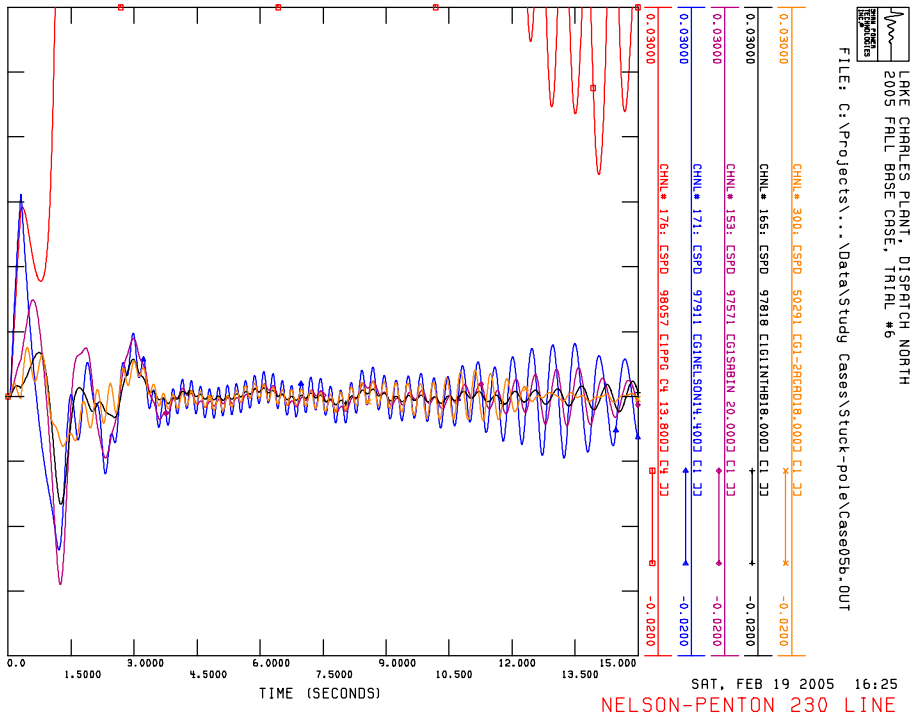


Figure 22: Case 5B – 3-phase Fault on Nelson-Penton 230kV Line with Stuck Breaker at Nelson – No Lake Charles Generation

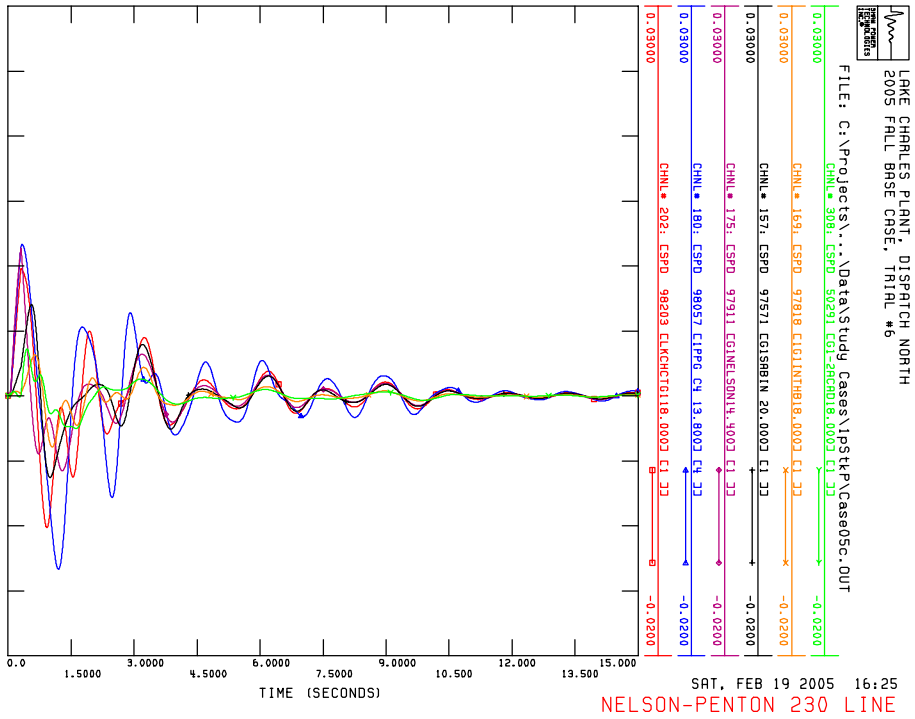


Figure 23: Case 5C – 1-phase Fault on Nelson-Penton 230kV Line with Stuck Breaker at Nelson

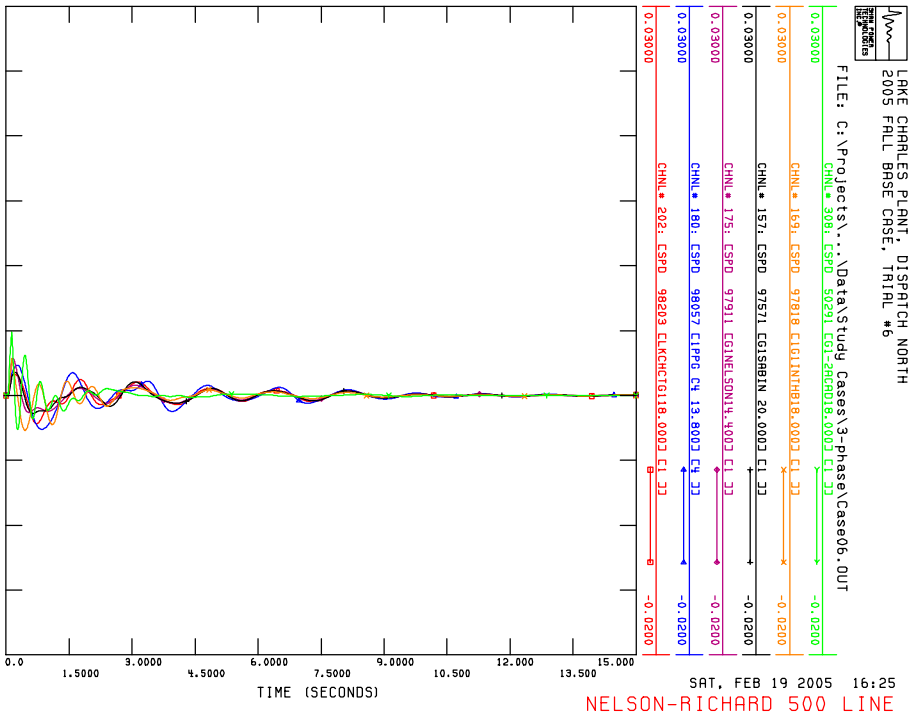


Figure 24: Case 6– 3-phase Fault on Nelson-Richard 500kV Line with Normal Clearing

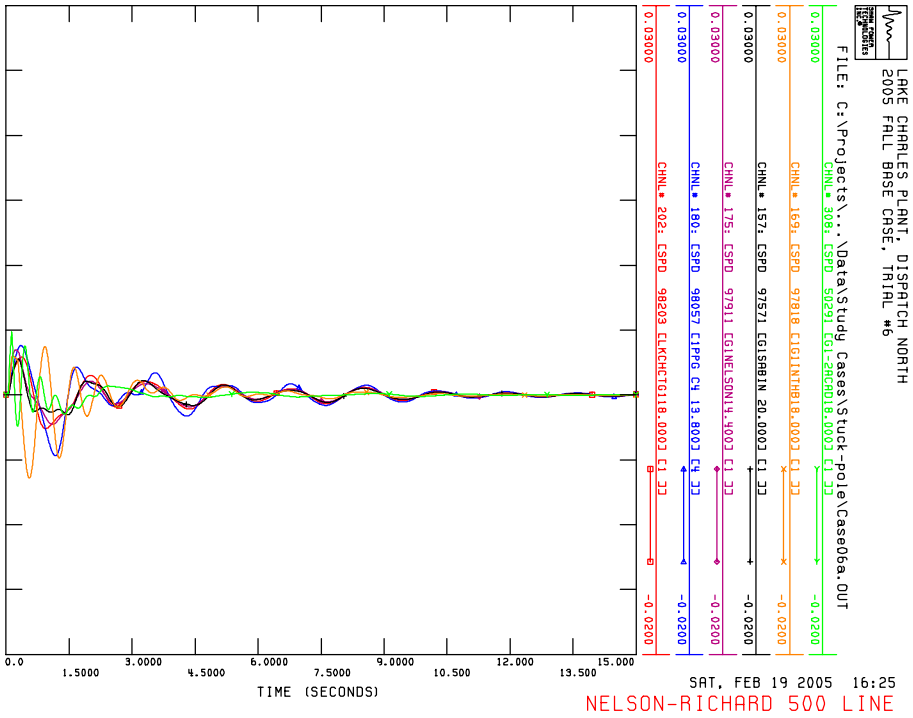


Figure 25: Case 6A– 3-phase Fault on Nelson-Richard 500kV Line with Stuck Breaker at Nelson

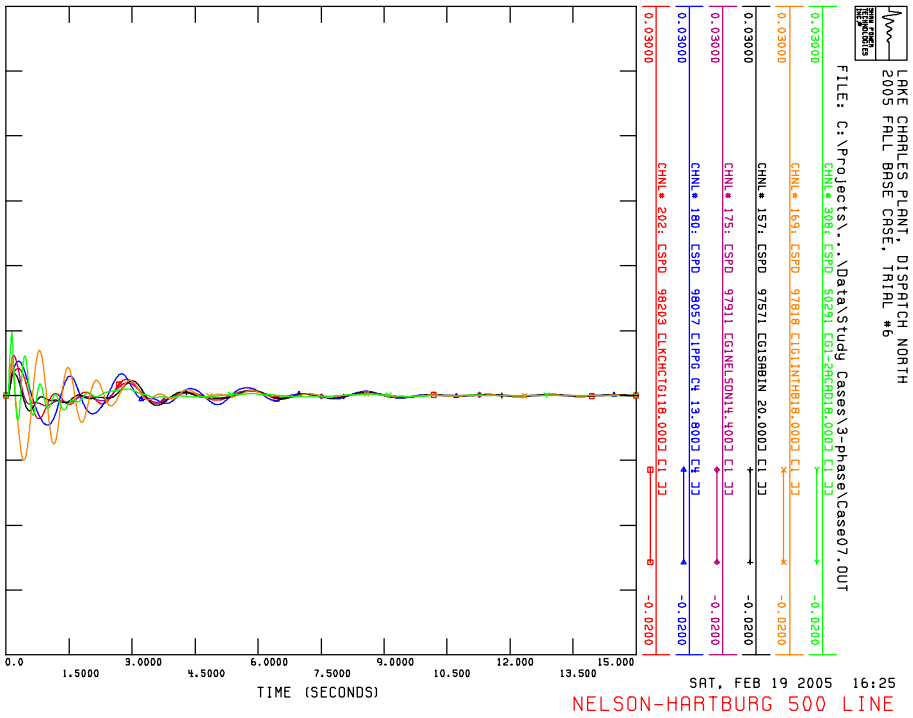


Figure 26: Case 7– 3-phase Fault on Nelson-Hartburg 500kV Line with Normal Clearing

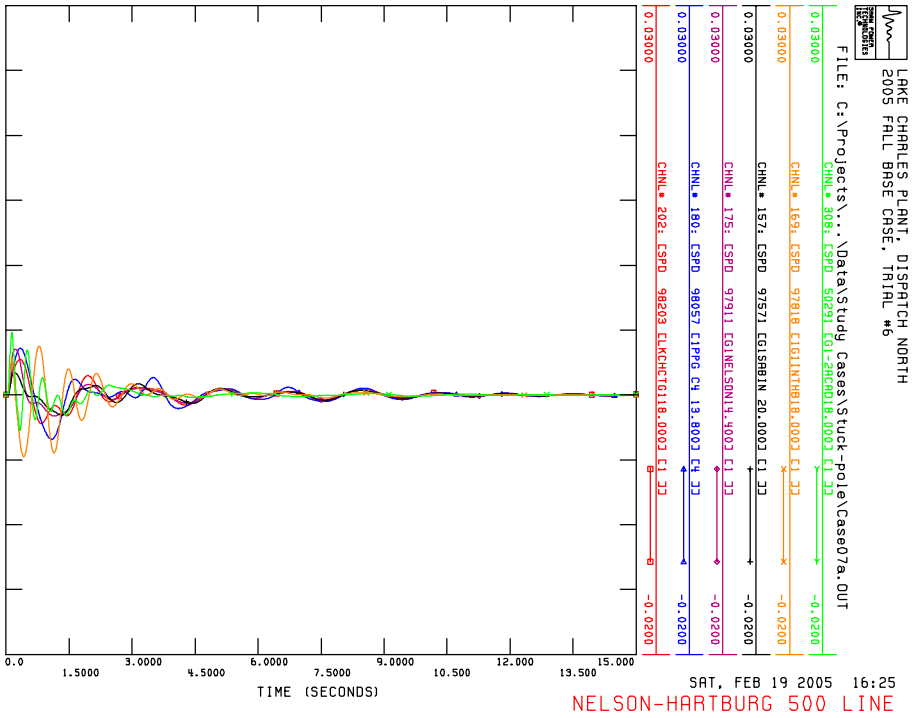


Figure 27: Case 7A– 3-phase Fault on Nelson-Hartburg 500kV Line with Stuck Breaker at Nelson

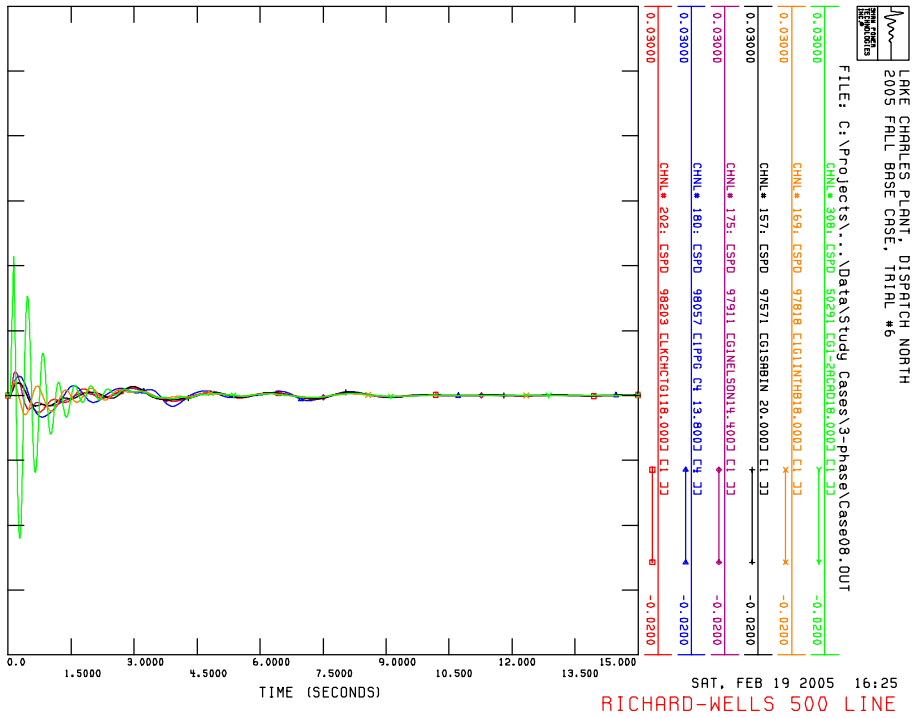


Figure 28: Case 8– 3-phase Fault on Richard-Wells 500kV Line with Normal Clearing

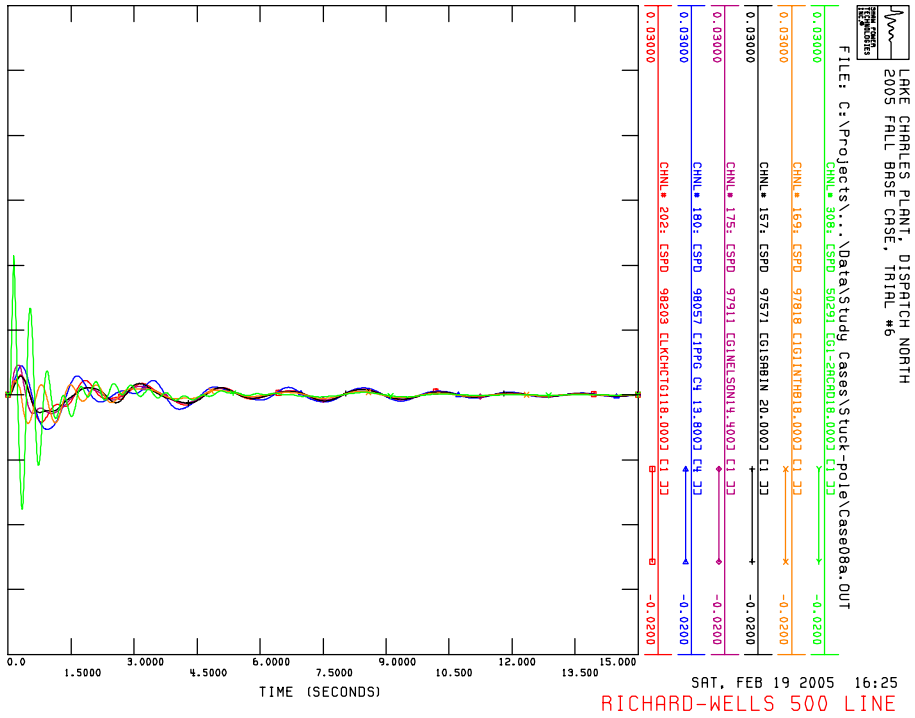


Figure 29: Case 8A– 3-phase Fault on Richard-Wells 500kV Line with Stuck Breaker at Richard

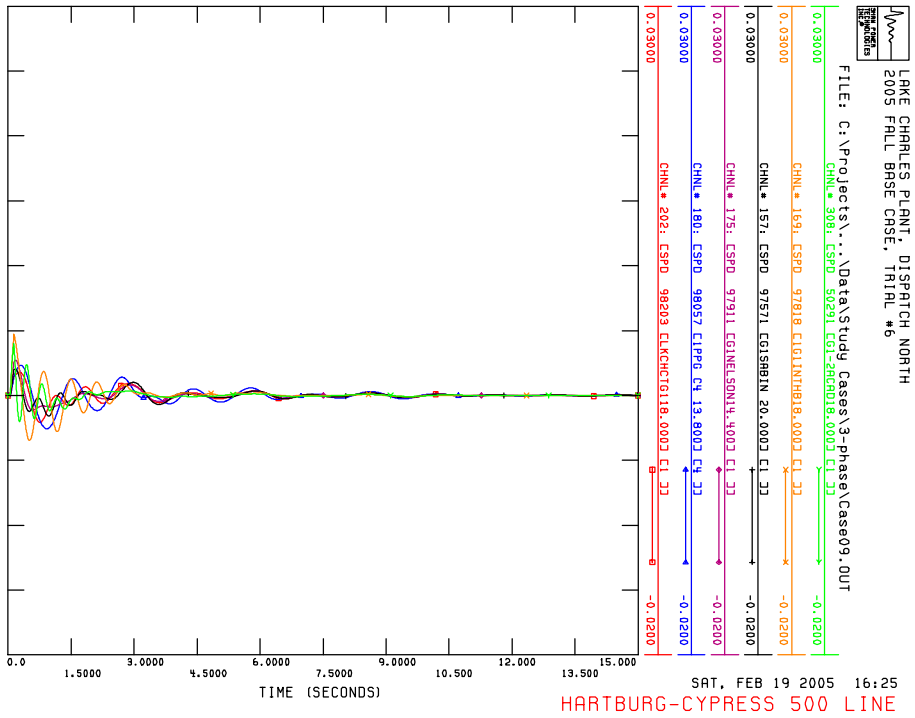


Figure 30: Case 9– 3-phase Fault on Hartburg-Cypress 500kV Line with Normal Clearing

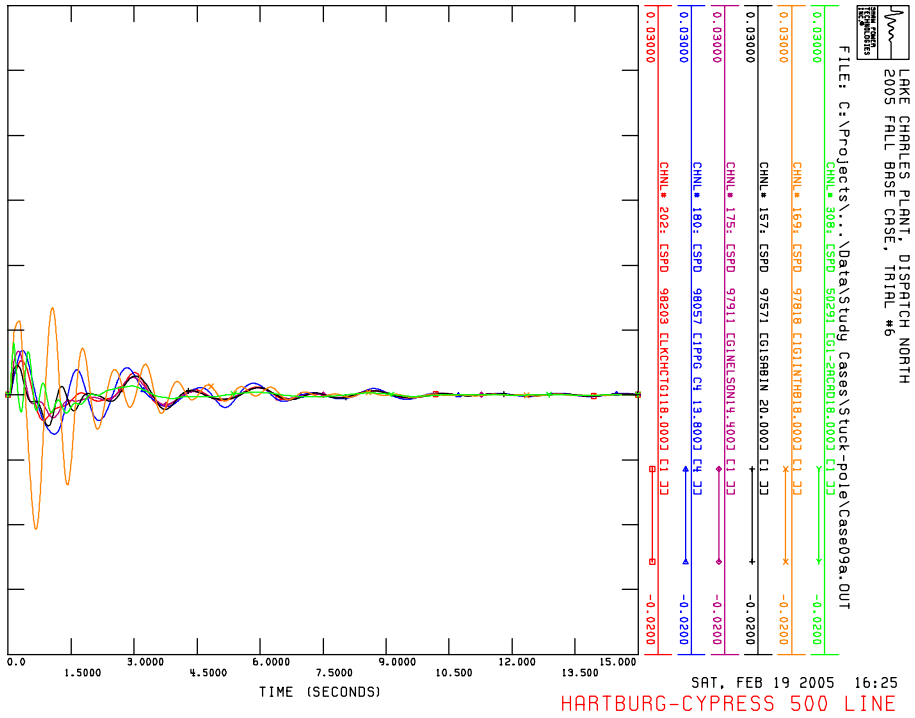


Figure 31: Case 9A– 3-phase Fault on Hartburg-Cypress 500kV Line with Stuck Breaker at Hartburg

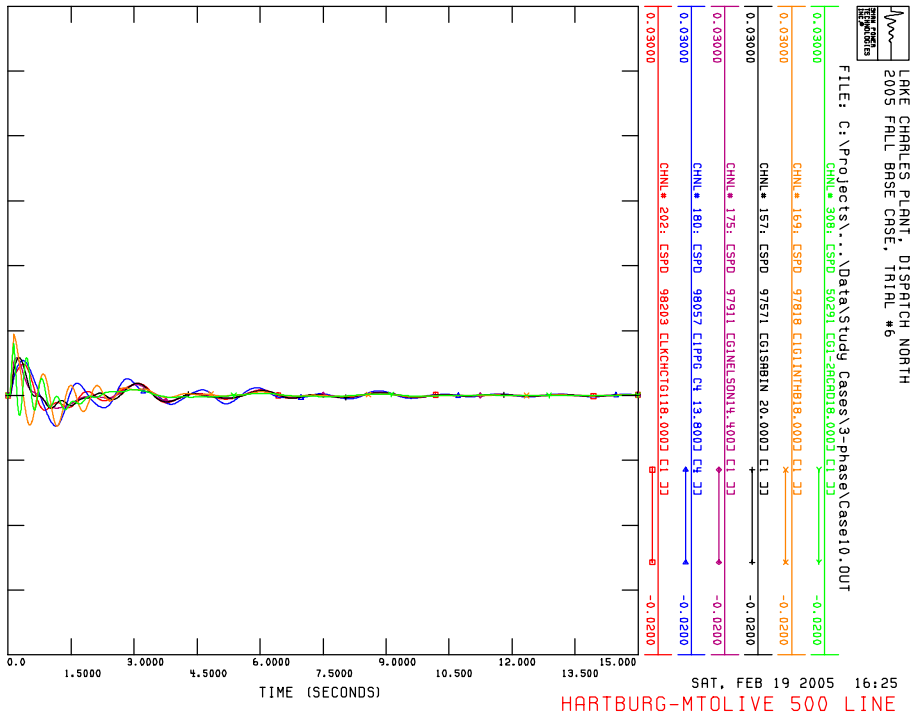


Figure 32: Case 10– 3-phase Fault on Hartburg-Mt. Olive 500kV Line with Normal Clearing

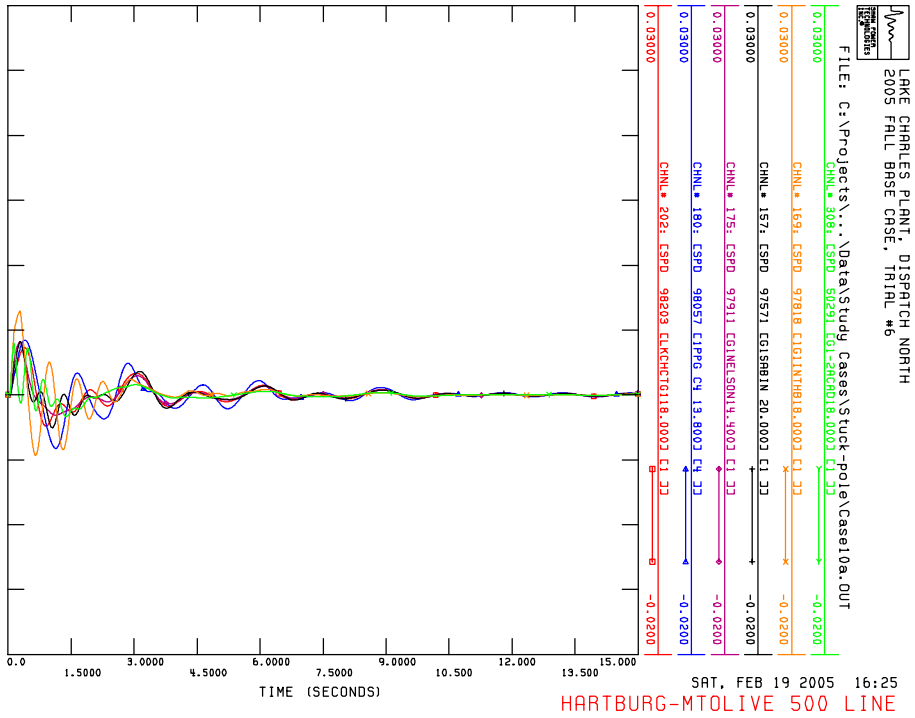


Figure 33: Case 10A– 3-phase Fault on Hartburg-Mt. Olive 500kV Line with Stuck Breaker at Hartburg

APPENDIX A-I: POLICY STATEMENT/GUIDELINES FOR POWER SYSTEM STABILIZER ON THE ENTERGY SYSTEM

Background:

A Power System Stabilizer (PSS) is an electronic feedback control that is a part of the excitation system control for generating units. The PSS acts to modulate the generator field voltage to damp the Power System oscillation.

Due to restructuring of the utility industry, there has been a significant amount of merchant generation activity on the Entergy system. These generators are typically equipped with modern exciters that have a high gain and a fast response to enhance transient stability. However, these fast response exciters, if used without stabilizers, can lead to oscillatory instability affecting local or regional reliability. This problem is exacerbated particularly in areas where there is a large amount of generation with limited transmission available for exporting power.

Stability studies carried out at Entergy have validated this concern. Furthermore, based on the understanding of operational problems experienced in the WSCC area over the last several years and the opinion of leading experts in the stability area, PSS are an effective and a low cost means of mitigating dynamic stability problems. In particular, PSS cost can be low if it is included in power plant procurement specifications.

Therefore, as a pre-emptive measure, Entergy requires all new generation (including affiliates and qualifying facilities) intending to interconnect to its transmission system to install PSS on their respective units.

The following guidelines shall be followed for PSS installation:

- PSS shall be installed on all new synchronous generators (50 MVA and larger) connecting to the transmission system that were put into service after January 1, 2000.

- PSS shall be installed on synchronous generators (50 MVA and larger) installed before January 1, 2000 subject to confirmation by Entergy that these units are good candidates for PSS and installing PSS on these units will enhance stability in the region. The decision to install PSS on a specific unit will be based on the effectiveness of the PSS in controlling oscillations, the suitability of the excitation system, and cost of retrofitting.

- In areas where a dynamic stability problem has not been explicitly identified, all synchronous generators (50 MVA and larger) will still be required to install stabilizers. However, in such cases the tuning will not be required and the stabilizer may remain disconnected until further advised by Entergy.

- Need for testing and tuning of PSS on units requesting transmission service from areas where stability problem has not been explicitly identified will be determined on an as-needed basis as part of transmission service study.

- The plants are responsible for testing and tuning of exciter and stabilizer controls for optimum performance and providing PSS model and data for use with PSS/E stability program.

- PSS equipment shall be tested and calibrated in conjunction with automatic voltage regulation (AVR) testing and calibration at-least every five years in accordance with the NERC Compliance Criteria on Generator Testing. PSS re-calibration must be performed if AVR parameters are modified.

- The PSS equipment to be installed is required to be of the Delta-P-omega type.

References:

WOTAB Area Stability Study for the Entergy System
WSCC Draft Policy Statement on Power System Stabilizers
PSEC Application Notes: Power System Stabilizer helps need plant stability margins for Simple Cycle and Combined Cycle Power Plants

Section – B

Network Resource Interconnection Service

TABLE OF CONTENTS FOR NRIS

Introduction:

A Network Resource Interconnection Services (NRIS) study was requested by [redacted] to serve 340 MW of Entergy network load. The expected in service date for this NRIS generator is September 1, 2007. 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

Analysis:

D. Models

The models used for this analysis is the 2008 summer and winter peak cases developed in 2004.

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 2008.
- Approved transmission reliability upgrades for 2005, 2006 and 2007 were included in the base case. These upgrades can be found at Entergy's OASIS web page, http://www.entergy.com/etroasis/, under approved future projects.

Prior transmission service requests that were included in this study:

OASIS #	Customer	POR	POD	MW	Begin	End
1192287	Entergy Services	EES	EES	725	1/1/2005	9/1/2033

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.

Generation used for the transfer

The [redacted] generators were used as the source for the deliverability to generation test.

Results

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.

Constraints:

Study Case	Study Case with Priors
Conroe Bulk - Plantation 138kV	Conroe Bulk - Plantation 138kV
Dayton Bulk - Cheek 138kV	Dayton Bulk - Cheek 138kV
Georgetown - Helbig 230kV	Georgetown - Helbig 230kV
Nelson 500/230kV transformer 1	Plantation - Cedar Hill 138kV
Oak Ridge - Porter 138kV	Prien - Rose Bluff 230kV
Plantation - Cedar Hill 138kV	Tamina - Cedar Hill 138kV
Prien - Rose Bluff 230kV	
Tamina - Cedar Hill 138kV	

DFAX Study Case Results:

Limiting Element	Contingency Element	ATC(MW)
Tamina - Cedar Hill 138kV	Oak Ridge - Porter 138kV	0
Plantation - Cedar Hill 138kV	Oak Ridge - Porter 138kV	0
Conroe Bulk - Plantation 138kV	Oak Ridge - Porter 138kV	0
Georgetown - Helbig 230kV	China Bulk - Sabine 230kV	0
Georgetown - Helbig 230kV	Hartburg - Nelson 500kV	3
Prien - Rose Bluff 230kV	Hartburg - Nelson 500kV	172
Dayton Bulk - Cheek 138kV	China Bulk - Sabine 230kV	176
Prien - Rose Bluff 230kV	Carlyss - Nelson 230kV	265
Tamina - Cedar Hill 138kV	Metro - Oak Ridge 138kV	279
Oak Ridge - Porter 138kV	Tamina - Porter 138kV	309
Nelson 500/230kV transformer 1	Roy S. Nelson SES - Richard 500kV	326
Prien - Rose Bluff 230kV	Cypress - Hartburg 500kV	332

DFAX Study Case with Priors Results:

Limiting Element	Contingency Element	ATC(MW)
Tamina - Cedar Hill 138kV	Oak Ridge - Porter 138kV	0
Plantation - Cedar Hill 138kV	Oak Ridge - Porter 138kV	0
Conroe Bulk - Plantation 138kV	Oak Ridge - Porter 138kV	0
Georgetown - Helbig 230kV	China Bulk - Sabine 230kV	0
Georgetown - Helbig 230kV	Hartburg - Nelson 500kV	162
Prien - Rose Bluff 230kV	Hartburg - Nelson 500kV	196
Dayton Bulk - Cheek 138kV	China Bulk - Sabine 230kV	227
Prien - Rose Bluff 230kV	Carlyss - Nelson 230kV	271
Prien - Rose Bluff 230kV	Cypress - Hartburg 500kV	336

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.

Amite South: Passed

WOTAB: Passed

Western Region: Passed

Required Upgrades for NRIS

Preliminary Estimates of Direct Assignment of Facilities and Network Upgrades

Limiting Element		Planning Estimate for Upgrade
Conroe Bulk – Plantation 138 kV	Note 1	988,875
Dayton Bulk – Cheek 138kV		14,733,900
Georgetown – Helbig 230kV		5,447,250
Nelson 500/230kV transformer 1		7,560,000
Oak Ridge – Porter 138kV		2,845,125
Plantation – Cedar Hill 138 kV	Note 1	1,056,375
Prien – Rose Bluff 230kV		2,138,400
Tamina – Cedar Hill 138 kV	Note 1	1,309,500

Note 1: identified as long term reliability project

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 facilities study.

APPENDIX B-A: Deliverability Test for Network Resource Interconnection Service Resources

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

Description of Deliverability Test

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.

Deliverability Test Procedure:

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.