System Impact Study
PID 237
550MW Plant

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Rev	Issue Date	Description of Revision	Revised By	Project Manager
0	4/5/2010	Posting System Impact Study	MEC	JDH
1	4/16/2010	Customer requested edits	MEC	JDH

Contents

Executive Summary

This System Impact Study is the second step of the interconnection process and is based on the PID-237 request for interconnection on Entergy's transmission system at Duke Hinds in Hot Springs, AR. This report is organized in four sections, namely, Energy Resource Interconnection Service (ERIS), Network Resource Interconnection Service (NRIS), Short Circuit/Breaker Rating Analysis, and Stability Study.

The ERIS section includes load flow (steady state) analysis. The NRIS section contains details of load flow (steady state) analysis. Transient stability analysis found in the Stability Study and Short Circuit Analysis as defined in FERC orders 2003, 2003A and 2003B for ERIS are also applicable to NRIS.

Requestor for PID-237 did request NRIS and ERIS; therefore, under ERIS a load flow analysis was performed. PID-237 will be a study of moving the current 230kV POI to a 500kV POI. The study evaluates connection of 550MW to the Entergy Transmission System. The load flow study was performed on the latest available 2014 Summer Peak Case, using PSS/E and MUST software by Siemens Power Technologies International (Siemens-PTI). The short circuit study was performed on the Entergy system short circuit model using ASPEN software. The proposed in-service date for NRIS is September 1, 2010.

Results of the System Impact Study indicated that under ERIS the additional generation due to PID-237 generator **does not** 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 the PID-237 plant with priors and without priors[1]. Therefore, estimated upgrade cost to address identified short circuit issues under ERIS with and without prior is $0. See table below.

Estimated ERIS Project Planning Upgrade Cost

Estimated cost With Priors*	Estimated cost Without Priors*
$0	$0

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

Results of the System Impact Study indicated that under NRIS the upgrades listed below would be required for interconnection on Entergy's transmission system at the proposed POI.

Estimated NRIS Project Planning Upgrades for PID 237

Limiting Element	Planning Estimate for Upgrade*
Jackson Miami - Jackson Monument Street 115kV	$3,500,000
Jackson Miami - Rex Brown 115kV	$2,200,000
Klean - Jackson Northeast 115kV	$3,287,000
Lakeover - Rex Brown C 115kV ckt 1	$2,312,500
Lakeover - Rex Brown E 115kV ckt 2	$2,312,500
Lakeover 500/115kV transformer	$15,000,000
McAdams 500/230kV transformer 1	Included in 2010 ICT Base Plan
Rex Brown W - Rex Brown C 115kV ckt 1	$275,000
TOTAL	**$28,887,000**

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

[1] Reference Short Circuit Analysis / Breaker Rating Analysis section starting on page 27.

Based on the results of stability analysis, it can be concluded that interconnection of the proposed PID-237 (550MW) project at the Lakeover 500kV substation does not adversely impact the stability of the Entergy System in the local area. Results indicate that the system is stable following all simulated three-phase normally cleared and stuck-breaker faults. Also, no voltage criteria violations were observed following these faults.

Energy Resource Interconnection Service

1. Introduction

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

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

This ERIS System Impact Study was based on information provided by the Customer 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.

2. Load Flow Analysis

2.1 Model Information

The load flow analysis was performed based on the projected 2014 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 2014 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 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 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 the Customer. The one-line diagram of the Customer's facilities as modeled in the load flow analysis, and Customer supplied data are shown in Appendix A. The data used to build the load flow and dynamic models are also shown in Appendix B. Stability issues in the Western Region of the Entergy System due to Merchant Generators are shown in Appendix B. All stability study plots are shown in Appendix C.

2.2 Load Flow Analyses

2.2.1 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.

2.2.2 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.

2.2.3 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.

2.3 Analysis Results

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

Table 2-1: Summary of Results for PID237 – 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.	2014	27	0	494	0
AMRN	Ameren Transmission	2014	29	0	507	0
CLEC	CLECO	2014	0	0	338	0
AEPW	American Electric Power - West	2014	24	0	424	0
EES	Entergy	2014	0	0	406	0
EMDE	Empire District Electric Co	2014	0	0	0	0
LAFA	Lafayette Utilities System	2014	0	0	399	0
LAGN	Louisiana Generating, LLC	2014	0	0	394	0
LEPA	Louisiana Energy & Power Authority	2014	0	0	0	0
OKGE	Oklahoma Gas & Electric Company	2014	0	0	42	0
SMEPA	South Mississippi Electric Power Assoc.	2014	0	0	0	0
SOCO	Southern Company	2014	42	0	526	0
SWPA	Southwest Power Administration	2014	0	0	0	0
TVA	Tennessee Valley Authority	2014	36	0	549	0

TABLE 2-2: DETAILS OF SCENARIO 1 RESULTS (WITHOUT FUTURE PROJECTS AND WITHOUT PENDING TRANSMISSION SERVICE & STUDY REQUEST)

Limiting Element	Est. Cost	AECI	AEPW	AMRN	CLECO	EES	EMDE	LAFA	LAGN	LEPA	OKGE	SMEPA	SOCO	SWPA	TVA
Brookhaven - Mallalieu (MEPA) 115kV	Included in 2010 ICT Base Plan											X			
Bull Shoals - Bull Shoals Dam SPA 161kV	Other Ownership						X								
Calico Rock - Melbourne 161kV	13,274,000						X				X			X	
Calico Rock - Norfolk 161kV	7,656,000						X				X			X	
Colonial Academy - Richard 138kV	Included in 2010 ICT Base Plan							X							
Elton - Southwest Jackson 115kV	2,242,500								X						
Florence - South Jackson 115kV	Committed to by others											X			
Greenwood - Terrebonne 115kV	33,226,332				X										
Harrison East - Summit 161kV	17,650,000						X								
Independence SES - Moorefield 161kV	17,760,000						X							X	
Jackson Forrest Hill - Ray Braswell 115kV	TBD											X			
Jackson Forrest Hill - Southwest Jackson 115kV	TBD											X			
Jackson Miami - Jackson Monument Street 115kV	3,500,000											X			
Jackson Miami - Rex Brown 115kV	2,200,000					X						X			
Judice - Scott1 138kV	Included in 2010 ICT Base Plan				X										
Klean - Jackson Northeast 115kV	3,287,500											X			
Lakeover 500/115kV transformer	15,000,000	X	X	X	X	X			X		X	X		X	
Louisiana Station - Thomas 138kV	645,943				X			X							
Magee - New Hebron 115kV	5,612,625											X			
Melbourne - Sage 161kV	4,207,000						X				X			X	
New Hebron - Sliver Creek 115kV	3,071,250											X			
North Crowley - Scott1 138kV	Included in 2010 ICT Base Plan				X			X							
Pleasant Hill 500/161kV transformer	TBD						X							X	
Port Hudson - Thomas 138kV	TBD				X										
Port Hudson 230/138 transformer 1	TBD									X					

Limiting Element	Est. Cost	AECI	AEPW	AMRN	CLECO	EES	EMDE	LAFA	LAGN	LEPA	OKGE	SMEPA	SOCO	SWPA	TVA
Port Hudson 230/138 transformer 2	TBD									X					
Richard - Scott1 138kV	Included in 2010 ICT Base Plan				X			X							
Russellville East - Russellville North 161kV	4,910,000		X								X			X	
Ruston East - Vienna 115kV	4,470,000	X	X	X	X						X			X	
Semere - Scott2 138kV	Included in 2010 ICT Base Plan							X							
Sterlington 500/115kV transformer 1	Committed to by others				X	X			X						
Sterlington 500/115kV transformer 2	Committed to by others	X	X	X	X	X	X	X	X		X		X	X	X
Vacherie - Waterford 230kV	TBD									X					
Wells 500/230kV transformer	TBD					X	X		X					X	

TABLE 2-3: DETAILS OF SCENARIO 2 RESULTS (WITHOUT FUTURE PROJECTS AND WITH PENDING TRANSMISSION SERVICE & STUDY REQUEST)

Limiting Elements	Est. Cost	AECI	AEPW	AMRN	CLECO	EES	EMDE	LAFA	LAGN	LEPA	OKGE	SMEPA	SOCO	SWPA	TVA
Acadia GSU - Colonial Academy 138kV	Included in 2010 ICT Base Plan							X							
Addis - Big Cajun 1 230kV	Included in 2010 ICT Base Plan					X				X					
Alchem - Monochem1 138kV	Included in 2010 ICT Base Plan									X					
Bogalusa - Adams Creek 230kV ckt 2	Included in 2010 ICT Base Plan		X		X	X		X	X	X			X		
Brookhaven - Mallalieu (MEPA) 115kV	Included in 2010 ICT Base Plan											X			
Colonial Academy - Richard 138kV	Included in 2010 ICT Base Plan							X							
Elton - Byram 115kV	1,265,473							X	X	X					
Elton - Southwest Jackson 115kV	2,242,500							X	X	X					
Florence - Florence Switching Station 115kV	2,700,000											X			
Florence - South Jackson 115kV	Committed to by others											X			
Harrison East - Omaha 161kV	TBD						X								
Hopkins - Segura 13kV (CLECO)	TBD				X					X					
Jackson Forrest Hill - Ray Braswell 115kV	TBD											X			
Jackson Forrest Hill - Southwest Jackson 115kV	TBD											X			
Jackson Miami - Jackson Monument Street 115kV	3,500,000	X	X	X	X	X	X	X	X		X	X	X	X	X
Jackson Miami - Rex Brown 115kV	2,200,000	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Jaguar - Tap Point Esso 230kV	1,416,000					X									
Judice - Scott1 138kV	Included in 2010 ICT Base Plan				X					X					
Klean - Jackson Northeast 115kV	3,287,500				X	X			X			X			
Lakeover - Rex Brown C 115kV ckt 1	2,312,500	X	X	X	X	X	X	X	X		X	X	X	X	X
Lakeover - Rex Brown E 115kV ckt 2	2,312,500	X	X	X	X	X	X	X	X		X	X	X	X	X
Lakeover 500/115kV transformer	15,000,000	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Livingston Rd. - Lakeover 115kV	TBD					X			X			X			
Magee - New Hebron 115kV	5,612,625											X			

Limiting Elements	Est. Cost	AECI	AEPW	AMRN	CLECO	EES	EMDE	LAFA	LAGN	LEPA	OKGE	SMEPA	SOCO	SWPA	TVA
Mallalieu (MEPA) - Norfield 115kV	TBD											X			
McAdams 500/230kV transformer 1	Included in 2010 ICT Base	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Melbourne - Sage 161kV	4,207,000						X							X	
New Hebron - Sliver Creek 115kV	3,071,250											X			
North Crowley - Richard 138kV	Included in 2010 ICT Base Plan							X							
North Crowley - Scott1 138kV	Included in 2010 ICT Base Plan				X			X							
OZD312 - Omaha 161kV	TBD						X								
Port Hudson 230/138 transformer 1	TBD									X					
Port Hudson 230/138 transformer 2	TBD									X					
Rex Brown W - Rex Brown C 115kV ckt 1	275,000	X	X	X	X	X	X	X	X		X	X	X	X	X
Richard - Scott1 138kV	Included in 2010 ICT Base Plan				X			X							
Semere - Scott2 138kV	Included in 2010 ICT Base Plan							X							
Sterlington 500/115kV transformer 1	Committed to by others				X	X			X						
Sterlington 500/115kV transformer 2	Committed to by others	X	X	X	X	X	X	X	X		X		X	X	X
Willow Glen 500/230kV Transformer	TBD					X				X					

TABLE 2-4: DETAILS OF SCENARIO 3 RESULTS (WITH FUTURE PROJECTS AND WITHOUT PENDING TRANSMISSION SERVICE & STUDY REQUEST)

Limiting Elements	Est. Cost	AECI	AEPW	AMRN	CLECO	EES	EMDE	LAFA	LAGN	LEPA	OKGE	SMEPA	SOCO	SWPA	TVA
Bull Shoals - Bull Shoals Dam SPA 161kV	Other Ownership						X								
Bull Shoals - Lead HL 161kV	TBD						X								
Calico Rock - Melbourne 161kV	13,274,000						X				X			X	
Calico Rock - Norfolk 161kV	7,656,000						X				X			X	
Columbia - Riverton 115kV	3,870,000				X										
Elton - Southwest Jackson 115kV	2,242,500							X	X						
Harrison East - Summit 161kV	17,650,000						X								
Independence SES - Moorefield 161kV	17,760,000						X				X			X	
Jackson Forrest Hill - Ray Braswell 115kV	TBD											X			
Jackson Forrest Hill - Southwest Jackson 115kV	TBD											X			
Jackson Miami - Jackson Monument Street 115kV	3,500,000											X			
Jackson Miami - Rex Brown 115kV	2,200,000											X			
Klean - Jackson Northeast 115kV	3,287,500											X			
Lakeover 500/115kV transformer	15,000,000	X	X	X	X	X	X	X	X		X	X	X	X	X
Louisiana Station - Thomas 138kV	645,943				X			X							
Magee - New Hebron 115kV	5,612,625											X			
New Hebron - Sliver Creek 115kV	3,071,250											X			
Pleasant Hill 500/161kV transformer	TBD						X							X	
Rilla - Riverton 115kV	14,910,000				X										
Ruston East - Vienna 115kV	4,470,000	X	X		X		X				X			X	
Vacherie - Waterford 230kV	TBD									X					

TABLE 2-5: DETAILS OF SCENARIO 4 RESULTS (WITH FUTURE PROJECTS AND WITH PENDING TRANSMISSION SERVICE & STUDY REQUEST)

Limiting Elements	Est. Cost	AECI	AEPW	AMRN	CLECO	EES	EMDE	LAFA	LAGN	LEPA	OKGE	SMEPA	SOCO	SWPA	TVA
Brookhaven - Mallalieu (MEPA) 115kV	Included in 2010 ICT Base Plan											X			
Calico Rock - Melbourne 161kV	13,274,000													X	
Coly 500/230kV transformer	TBD				X	X		X	X	X					
Elton - Byram 115kV	1,265,473							X	X	X					
Elton - Southwest Jackson 115kV	2,242,500							X	X	X					
Green Forest South - PID223TAP 161kV	TBD						X								
Harrison East - Omaha 161kV	TBD						X								
Jackson Forrest Hill - Ray Braswell 115kV	TBD											X			
Jackson Forrest Hill - Southwest Jackson 115kV	TBD											X			
Jackson Miami - Jackson Monument Street 115kV	3,500,000	X	X	X	X	X	X	X	X		X	X	X	X	X
Jackson Miami - Rex Brown 115kV	2,200,000	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Klean - Jackson Northeast 115kV	3,287,500	X	X	X	X	X	X	X	X		X	X	X	X	X
Lakeover - Rex Brown C 115kV ckt 1	2,312,500	X	X	X	X	X	X	X	X		X	X	X	X	X
Lakeover - Rex Brown E 115kV ckt 2	2,312,500	X	X	X	X	X	X	X	X		X	X	X	X	X
Lakeover 500/115kV transformer	15,000,000	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Magee - New Hebron 115kV	5,612,625											X			
Mallalieu (MEPA) - Norfield 115kV	TBD											X			
McAdams 500/230kV transformer 1	Included in 2010 ICT Base Plan	X	X	X	X	X	X	X	X	X	X	X	X	X	X
New Hebron - Sliver Creek 115kV	3,071,250											X			
OZD312 - Omaha 161kV	TBD						X								
Port Hudson 230/138 transformer 1	TBD									X					
Port Hudson 230/138 transformer 2	TBD									X					
Rex Brown W - Rex Brown C 115kV ckt 1	275,000	X	X	X	X	X	X	X	X		X	X	X	X	X
Rilla - Riverton 115kV	14,910,000				X										
West New Roads - New Roads (LEPA) 230kV	TBD									X					

2.3.1 DETAILS OF SCENARIO 1 – 2014

AECI

Limiting Element	Contingency Element	ATC
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	27
Ruston East - Vienna 115kV	Eldorado EHV - Sterlington 500kV	493
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	527

AEPW

Limiting Element	Contingency Element	ATC
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	24
Ruston East - Vienna 115kV	Eldorado EHV - Sterlington 500kV	401
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	486
Russellville East - Russellville North 161kV	ANO - Fort Smith 500kV	537

AMRN

Limiting Element	Contingency Element	ATC
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	29
Ruston East - Vienna 115kV	Eldorado EHV - Sterlington 500kV	537
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	541

CLECO

Limiting Element	Contingency Element	ATC
Sterlington 500/115kV transformer 2	Sterlington 500/115kV transformer 1	0
Sterlington 500/115kV transformer 1	Sterlington 500/115kV transformer 2	0
Richard - Scott1 138kV	North Crowley - Richard 138kV	0
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	28
North Crowley - Scott1 138kV	Wells 500/230kV transformer	127
Louisiana Station - Thomas 138kV	Webre - Wells 500kV	170
Greenwood - Terrebonne 115kV	Webre - Wells 500kV	409
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	435
Judice - Scott1 138kV	Hopkins - Segura 13kV (CLECO)	492
Ruston East - Vienna 115kV	Eldorado EHV - Sterlington 500kV	499
Port Hudson - Thomas 138kV	Webre - Wells 500kV	499
North Crowley - Scott1 138kV	Greenwood - Terrebonne 115kV	510

EES

Limiting Element	Contingency Element	ATC
Sterlington 500/115kV transformer 2	Sterlington 500/115kV transformer 1	0
Sterlington 500/115kV transformer 1	Sterlington 500/115kV transformer 2	0
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	33
Wells 500/230kV transformer	Richard - Wells 500kV	221
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	433
Jackson Miami - Rex Brown 115kV	South Jackson 230/115kV transformer 1	495

EMDE

Limiting Element	Contingency Element	ATC
Pleasant Hill 500/161kV transformer	ANO 500/161/22kV transformer	0
Bull Shoals - Bull Shoals Dam SPA 161kV	St. Joe - Hilltop 161kV	0
Bull Shoals - Bull Shoals Dam SPA 161kV	Everton - St. Joe 161kV	0
Bull Shoals - Bull Shoals Dam SPA 161kV	Harrison East - Everton 161kV	0
Melbourne - Sage 161kV	Dell - Independence SES 500kV	0
Melbourne - Sage 161kV	ANO - Fort Smith 500kV	0
Melbourne - Sage 161kV	Newport - Newport Industrial 161kV	0
Melbourne - Sage 161kV	Newport AB - Newport Industrial 161kV	0
Bull Shoals - Bull Shoals Dam SPA 161kV	Bull Shoals - Lead HL 161kV	0
Melbourne - Sage 161kV	Cash - Newport AB 161kV	0
Bull Shoals - Bull Shoals Dam SPA 161kV	Clevcov - Lead HL 161kV	0
Melbourne - Sage 161kV	Sansouci - Shelby (TVA) 500kV	0
Melbourne - Sage 161kV	Cash - Jonesboro 161kV	0
Melbourne - Sage 161kV	Sage - Guion 161kV	0
Melbourne - Sage 161kV	Newport - Swifton 161kV	0
Melbourne - Sage 161kV	Mountain View - Guion 161kV	0
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	26
Calico Rock - Melbourne 161kV	ANO - Fort Smith 500kV	101
Bull Shoals - Bull Shoals Dam SPA 161kV	ANO - Fort Smith 500kV	121
Calico Rock - Melbourne 161kV	Dell - Independence SES 500kV	124
Calico Rock - Melbourne 161kV	Newport - Newport Industrial 161kV	147
Calico Rock - Melbourne 161kV	Newport AB - Newport Industrial 161kV	168
Wells 500/230kV transformer	Richard - Wells 500kV	169
Calico Rock - Norfolk 161kV	ANO - Fort Smith 500kV	187
Calico Rock - Melbourne 161kV	Cash - Newport AB 161kV	202
Calico Rock - Norfolk 161kV	Dell - Independence SES 500kV	224
Calico Rock - Melbourne 161kV	Cash - Jonesboro 161kV	231
Calico Rock - Melbourne 161kV	Newport - Swifton 161kV	240
Calico Rock - Melbourne 161kV	Sage - Guion 161kV	245
Calico Rock - Norfolk 161kV	Newport - Newport Industrial 161kV	246
Calico Rock - Melbourne 161kV	Sansouci - Shelby (TVA) 500kV	246
Calico Rock - Melbourne 161kV	Mountain View - Guion 161kV	262
Calico Rock - Norfolk 161kV	Newport AB - Newport Industrial 161kV	267
Calico Rock - Norfolk 161kV	Cash - Newport AB 161kV	300
Bull Shoals - Bull Shoals Dam SPA 161kV	Sansouci - Shelby (TVA) 500kV	323
Calico Rock - Norfolk 161kV	Cash - Jonesboro 161kV	329
Calico Rock - Norfolk 161kV	Newport - Swifton 161kV	336
Calico Rock - Norfolk 161kV	Sage - Guion 161kV	345
Calico Rock - Norfolk 161kV	Sansouci - Shelby (TVA) 500kV	350
Calico Rock - Norfolk 161kV	Mountain View - Guion 161kV	362
Harrison East - Summit 161kV	St. Joe - Hilltop 161kV	386
Independence SES - Moorefield 161kV	ANO - Fort Smith 500kV	387

LAFA

Limiting Element	Contingency Element	ATC
Semere - Scott2 138kV	North Crowley - Richard 138kV	0
Richard - Scott1 138kV	North Crowley - Richard 138kV	0
Semere - Scott2 138kV	Habetz - Richard 138kV	0
North Crowley - Scott1 138kV	Habetz - Richard 138kV	0
North Crowley - Scott1 138kV	Wells 500/230kV transformer	32
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	38
Semere - Scott2 138kV	Wells 500/230kV transformer	53
Louisiana Station - Thomas 138kV	Webre - Wells 500kV	131
Richard - Scott1 138kV	Habetz - Richard 138kV	221
Colonial Academy - Richard 138kV	North Crowley - Richard 138kV	231
Colonial Academy - Richard 138kV	Habetz - Richard 138kV	239

LAGN

Limiting Element	Contingency Element	ATC
Sterlington 500/115kV transformer 2	Sterlington 500/115kV transformer 1	0
Sterlington 500/115kV transformer 1	Sterlington 500/115kV transformer 2	0
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	35
Wells 500/230kV transformer	Richard - Wells 500kV	243
Elton - Southwest Jackson 115kV	Franklin - Ray Braswell 500kV	417
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	424

LEPA

Limiting Element	Contingency Element	ATC
Vacherie - Waterford 230kV	Raceland - Waterford 230kV	0
Port Hudson 230/138 transformer 2	Port Hudson 230/138 transformer 1	0
Port Hudson 230/138 transformer 1	Port Hudson 230/138 transformer 2	0

OKGE

Limiting Element	Contingency Element	ATC
Melbourne - Sage 161kV	ANO - Fort Smith 500kV	0
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	25
Calico Rock - Melbourne 161kV	ANO - Fort Smith 500kV	148
Calico Rock - Norfolk 161kV	ANO - Fort Smith 500kV	275
Russellville East - Russellville North 161kV	ANO - Fort Smith 500kV	383
Ruston East - Vienna 115kV	Eldorado EHV - Sterlington 500kV	432
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	503

SMEPA

Limiting Element	Contingency Element	ATC
Jackson Forrest Hill - Ray Braswell 115kV	South Jackson 230/115kV transformer 1	0
Jackson Forrest Hill - Ray Braswell 115kV	Jackson Miami - Rex Brown 115kV	0
Jackson Forrest Hill - Ray Braswell 115kV	Jackson Miami - Jackson Monument Street 115kV	0

Limiting Element	Contingency Element	ATC
Jackson Forrest Hill - Ray Braswell 115kV	Ray Braswell - West Jackson 115kV	0
Jackson Forrest Hill - Ray Braswell 115kV	Franklin - Grand Gulf 500kV	0
Jackson Forrest Hill - Ray Braswell 115kV	South Jackson - West Jackson 115kV	0
Jackson Forrest Hill - Ray Braswell 115kV	Ray Braswell - Robin 230kV	0
Jackson Forrest Hill - Ray Braswell 115kV	Lakeover 500/115kV transformer	0
Jackson Forrest Hill - Southwest Jackson 115kV	South Jackson 230/115kV transformer 1	0
Jackson Forrest Hill - Southwest Jackson 115kV	Jackson Miami - Rex Brown 115kV	0
Jackson Forrest Hill - Southwest Jackson 115kV	Jackson Miami - Jackson Monument Street 115kV	0
Jackson Forrest Hill - Southwest Jackson 115kV	Ray Braswell - West Jackson 115kV	0
Klean - Jackson Northeast 115kV	Jackson Miami - Rex Brown 115kV	25
Jackson Forrest Hill - Southwest Jackson 115kV	Franklin - Grand Gulf 500kV	98
Klean - Jackson Northeast 115kV	Jackson Miami - Jackson Monument Street 115kV	134
Jackson Forrest Hill - Southwest Jackson 115kV	South Jackson - West Jackson 115kV	158
Brookhaven - Mallalieu (MEPA) 115kV	Bogalusa - Adams Creek 500/230kV transformer	195
Brookhaven - Mallalieu (MEPA) 115kV	Bogalusa - Franklin 500kV	195
Jackson Miami - Rex Brown 115kV	South Jackson 230/115kV transformer 1	230
Jackson Forrest Hill - Southwest Jackson 115kV	Lakeover 500/115kV transformer	278
Florence - South Jackson 115kV	Bogalusa - Adams Creek 500/230kV transformer	301
Florence - South Jackson 115kV	Bogalusa - Franklin 500kV	301
Florence - South Jackson 115kV	New Hebron - Sliver Creek 115kV	305
Florence - South Jackson 115kV	Magee - New Hebron 115kV	313
Jackson Forrest Hill - Southwest Jackson 115kV	Ray Braswell - Robin 230kV	358
New Hebron - Sliver Creek 115kV	Salem - Silver Creek 115kV	395
Florence - South Jackson 115kV	Angie - Adams Creek 230kV	421
New Hebron - Sliver Creek 115kV	Florence - South Jackson 115kV	442
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	448
Florence - South Jackson 115kV	Franklin - Grand Gulf 500kV	453
Magee - New Hebron 115kV	Salem - Silver Creek 115kV	454
Florence - South Jackson 115kV	Eldorado EHV - Sterlington 500kV	459
Jackson Miami - Jackson Monument Street 115kV	South Jackson 230/115kV transformer 1	463
Jackson Miami - Rex Brown 115kV	Jackson Forrest Hill - Ray Braswell 115kV	475
Florence - South Jackson 115kV	Morton - Pelahatchie 115kV	475
Magee - New Hebron 115kV	Florence - South Jackson 115kV	476
New Hebron - Sliver Creek 115kV	Salem - Tylertown 115kV	504
New Hebron - Sliver Creek 115kV	Florence - Florence Switching Station 115kV	516
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	535

SOCO

Limiting Element	Contingency Element	ATC
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	42

SWPA

Limiting Element	Contingency Element	ATC
Pleasant Hill 500/161kV transformer	ANO 500/161/22kV transformer	0
Melbourne - Sage 161kV	Dell - Independence SES 500kV	0
Melbourne - Sage 161kV	ANO - Fort Smith 500kV	0
Melbourne - Sage 161kV	Newport - Newport Industrial 161kV	0
Melbourne - Sage 161kV	Newport AB - Newport Industrial 161kV	0
Melbourne - Sage 161kV	Cash - Newport AB 161kV	0
Melbourne - Sage 161kV	Sansouci - Shelby (TVA) 500kV	0
Melbourne - Sage 161kV	Cash - Jonesboro 161kV	0
Melbourne - Sage 161kV	Sage - Guion 161kV	0
Melbourne - Sage 161kV	Newport - Swifton 161kV	0
Melbourne - Sage 161kV	Mountain View - Guion 161kV	0
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	25
Calico Rock - Melbourne 161kV	ANO - Fort Smith 500kV	85
Calico Rock - Melbourne 161kV	Dell - Independence SES 500kV	100
Calico Rock - Melbourne 161kV	Newport - Newport Industrial 161kV	115
Calico Rock - Melbourne 161kV	Newport AB - Newport Industrial 161kV	131
Calico Rock - Norfolk 161kV	ANO - Fort Smith 500kV	157
Calico Rock - Melbourne 161kV	Cash - Newport AB 161kV	158
Wells 500/230kV transformer	Richard - Wells 500kV	171
Calico Rock - Melbourne 161kV	Cash - Jonesboro 161kV	180
Calico Rock - Norfolk 161kV	Dell - Independence SES 500kV	180
Calico Rock - Norfolk 161kV	Newport - Newport Industrial 161kV	192
Calico Rock - Melbourne 161kV	Newport - Swifton 161kV	194
Calico Rock - Melbourne 161kV	Sage - Guion 161kV	196
Calico Rock - Melbourne 161kV	Sansouci - Shelby (TVA) 500kV	197
Calico Rock - Norfolk 161kV	Newport AB - Newport Industrial 161kV	209
Calico Rock - Melbourne 161kV	Mountain View - Guion 161kV	209
Calico Rock - Norfolk 161kV	Cash - Newport AB 161kV	235
Calico Rock - Norfolk 161kV	Cash - Jonesboro 161kV	257
Calico Rock - Norfolk 161kV	Newport - Swifton 161kV	271
Calico Rock - Norfolk 161kV	Sage - Guion 161kV	275
Calico Rock - Norfolk 161kV	Sansouci - Shelby (TVA) 500kV	279
Calico Rock - Norfolk 161kV	Mountain View - Guion 161kV	289
Russellville East - Russellville North 161kV	ANO - Fort Smith 500kV	318
Independence SES - Moorefield 161kV	ANO - Fort Smith 500kV	326
Melbourne - Sage 161kV	Base Case	364
Independence SES - Moorefield 161kV	Dell - Independence SES 500kV	368
Independence SES - Moorefield 161kV	Newport - Newport Industrial 161kV	372
Independence SES - Moorefield 161kV	Newport AB - Newport Industrial 161kV	388
Independence SES - Moorefield 161kV	Cash - Newport AB 161kV	414
Independence SES - Moorefield 161kV	Cash - Jonesboro 161kV	437
Independence SES - Moorefield 161kV	Newport - Swifton 161kV	451
Ruston East - Vienna 115kV	Eldorado EHV - Sterlington 500kV	452
Independence SES - Moorefield 161kV	Sansouci - Shelby (TVA) 500kV	472
Independence SES - Moorefield 161kV	Hoxies AECC - Swifton 161 kV	480
Independence SES - Moorefield 161kV	Hoxies AECC - Walnut Ridge 161kV	490

Limiting Element	Contingency Element	ATC
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	512

TVA

Limiting Element	Contingency Element	ATC
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	36

2.3.2 DETAILS OF SCENARIO 2 - 2014

AECI

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	0
McAdams 500/230kV transformer 1	Charity Church - Lakeover 230kV	0
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	21
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	164
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	209
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	265
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	276
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	296
McAdams 500/230kV transformer 1	Charity Church - Hoy RD. 230kV	464
McAdams 500/230kV transformer 1	Choctaw - French Camp 500kV (TVA)	468

AEPW

Limiting Element	Contingency Element	ATC
Bogalusa - Adams Creek 230kV ckt 2	Bogalusa - Adams Creek 230kV ckt 1	0
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
McAdams 500/230kV transformer 1	Charity Church - Lakeover 230kV	0
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	0
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	19
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	142
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	192
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	243
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	253
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	269
McAdams 500/230kV transformer 1	Gerald Andrus SES - Indianola 230kV	287
McAdams 500/230kV transformer 1	Charity Church - Hoy RD. 230kV	450
McAdams 500/230kV transformer 1	Choctaw - FrenchCamp 500kV (TVA)	520

AMRN

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0

Limiting Element	Contingency Element	ATC
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	0
McAdams 500/230kV transformer 1	Charity Church - Lakeover 230kV	0
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	21
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	178
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	213
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	272
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	284
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	304
McAdams 500/230kV transformer 1	Choctaw - FrenchCamp 500kV (TVA)	467
McAdams 500/230kV transformer 1	Charity Church - Hoy RD. 230kV	533

CLECO

Limiting Element	Contingency Element	ATC
Sterlington 500/115kV transformer 2	Sterlington 500/115kV transformer 1	0
Sterlington 500/115kV transformer 1	Sterlington 500/115kV transformer 2	0
Bogalusa - Adams Creek 230kV ckt 2	Bogalusa - Adams Creek 230kV ckt 1	0
North Crowley - Scott1 138kV	Wells 500/230kV transformer	0
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
McAdams 500/230kV transformer 1	Charity Church - Lakeover 230kV	0
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	0
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	17
Richard - Scott1 138kV	Habetz - Richard 138kV	57
Hopkins - Segura 13kV (CLECO)	Judice - Scott1 138kV	118
Judice - Scott1 138kV	Hopkins - Segura 13kV (CLECO)	137
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	169
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	169
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	216
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	224
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	234
McAdams 500/230kV transformer 1	Gerald Andrus SES - Indianola 230kV	280
Richard - Scott1 138kV	Wells 500/230kV transformer	380
Klean - Jackson Northeast 115kV	Lakeover - Ray Braswell 500kV	500
McAdams 500/230kV transformer 1	Charity Church - Hoy RD. 230kV	508
Hopkins - Segura 13kV (CLECO)	Greenwood - Terrebonne 115kV	532
Hopkins - Segura 13kV (CLECO)	Judice - Meaux 138kV	538
Sterlington 500/115kV transformer 2	Sterlington 500/115kV transformer 1	0

EES

Limiting Element	Contingency Element	ATC
Sterlington 500/115kV transformer 2	Sterlington 500/115kV transformer 1	0
Sterlington 500/115kV transformer 1	Sterlington 500/115kV transformer 2	0
Willow Glen 500/230kV Transformer	Coly 500/230kV transformer	0
Bogalusa - Adams Creek 230kV ckt 2	Bogalusa - Adams Creek 230kV ckt 1	0
Willow Glen 500/230kV Transformer	Willow Glen - Willow Glen 2 500/138kV	0

Limiting Element	Contingency Element	ATC
	transformer 1	
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
Willow Glen 500/230kV Transformer	Jaguar - Tap Point Esso 230kV	0
McAdams 500/230kV transformer 1	Charity Church - Lakeover 230kV	0
Jackson Miami - Rex Brown 115kV	South Jackson 230/115kV transformer 1	0
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	0
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	16
Addis - Big Cajun 1 230kV	Coly - McKnight 500kV	99
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	167
McAdams 500/230kV transformer 1	Gerald Andrus SES - Indianola 230kV	190
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	199
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	217
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	226
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	237
McAdams 500/230kV transformer 1	Charity Church - Hoy RD. 230kV	335
Jackson Miami - Rex Brown 115kV	Jackson Forrest Hill - Ray Braswell 115kV	371
Livingston Rd. - Lakeover 115kV	Lakeover - Ray Braswell 500kV	399
Willow Glen 500/230kV Transformer	Addis - Big Cajun 1 230kV	425
Jaguar - Tap Point Esso 230kV	Addis - Big Cajun 1 230kV	430
McAdams 500/230kV transformer 1	Tillatoba 230/115kV transformer 1	447
Jackson Miami - Jackson Monument Street 115kV	South Jackson 230/115kV transformer 1	475
Klean - Jackson Northeast 115kV	Lakeover - Ray Braswell 500kV	503
McAdams 500/230kV transformer 1	Riverbend - Fancy Point 230kV	546

EMDE

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	0
McAdams 500/230kV transformer 1	Charity Church - Lakeover 230kV	0
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	20
Harrison East - Omaha 161kV	Green Forest South - PID223TAP 161kV	133
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	156
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	204
Harrison East - Omaha 161kV	Green Forrest - Green Forrest South 161kV	255
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	258
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	269
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	287
Harrison East - Omaha 161kV	Berryville - Green Forrest 161kV	307
OZD312 - Omaha 161kV	Green Forest South - PID223TAP 161kV	342
Melbourne - Sage 161kV	ANO - Fort Smith 500kV	414
Harrison East - Omaha 161kV	Berryville - Osage 161kV	462
OZD312 - Omaha 161kV	Green Forrest - Green Forrest South 161kV	464
McAdams 500/230kV transformer 1	Charity Church - Hoy RD. 230kV	464
Melbourne - Sage 161kV	Newport - Newport Industrial 161kV	483

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Choctaw - French Camp 500kV (TVA)	483
Melbourne - Sage 161kV	Newport AB - Newport Industrial 161kV	504
Melbourne - Sage 161kV	Dell - Independence SES 500kV	508
OZD312 - Omaha 161kV	Berryville - Green Forrest 161kV	516
Melbourne - Sage 161kV	Independence SES - Keo 500kV	535
Melbourne - Sage 161kV	Cash - Newport AB 161kV	537

LAFA

Limiting Element	Contingency Element	ATC
Bogalusa - Adams Creek 230kV ckt 2	Bogalusa - Adams Creek 230kV ckt 1	0
Elton - Southwest Jackson 115kV	Franklin - Ray Braswell 500kV	0
North Crowley - Scott1 138kV	Richard - Scott1 138kV	0
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
North Crowley - Scott1 138kV	Habetz - Richard 138kV	0
Semere - Scott2 138kV	Habetz - Richard 138kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
North Crowley - Scott1 138kV	Wells 500/230kV transformer	0
Semere - Scott2 138kV	Wells 500/230kV transformer	0
Semere - Scott2 138kV	Hopkins - Segura 13kV (CLECO)	0
McAdams 500/230kV transformer 1	Charity Church - Lakeover 230kV	0
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	0
Semere - Scott2 138kV	Richard - Scott1 138kV	0
Richard - Scott1 138kV	Habetz - Richard 138kV	13
North Crowley - Scott1 138kV	Colonial Academy - Richard 138kV	15
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	16
Richard - Scott1 138kV	North Crowley - Richard 138kV	28
Colonial Academy - Richard 138kV	Habetz - Richard 138kV	30
Semere - Scott2 138kV	North Crowley - Richard 138kV	31
Elton - Byram 115kV	Franklin - Ray Braswell 500kV	43
Richard - Scott1 138kV	North Crowley - Scott1 138kV	75
Richard - Scott1 138kV	Wells 500/230kV transformer	97
North Crowley - Richard 138kV	Richard - Scott1 138kV	126
Colonial Academy - Richard 138kV	Wells 500/230kV transformer	140
North Crowley - Richard 138kV	Habetz - Richard 138kV	142
Acadia GSU - Colonial Academy 138kV	Habetz - Richard 138kV	156
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	164
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	211
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	219
North Crowley - Richard 138kV	Wells 500/230kV transformer	223
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	228
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	232

LAGN

Limiting Element	Contingency Element	ATC
Sterlington 500/115kV transformer 2	Sterlington 500/115kV transformer 1	0
Sterlington 500/115kV transformer 1	Sterlington 500/115kV transformer 2	0

Limiting Element	Contingency Element	ATC
Bogalusa - Adams Creek 230kV ckt 2	Bogalusa - Adams Creek 230kV ckt 1	0
Elton - Southwest Jackson 115kV	Franklin - Ray Braswell 500kV	0
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
McAdams 500/230kV transformer 1	Charity Church - Lakeover 230kV	0
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	0
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	16
Elton - Byram 115kV	Franklin - Ray Braswell 500kV	43
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	163
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	209
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	210
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	218
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	226
McAdams 500/230kV transformer 1	Gerald Andrus SES - Indianola 230kV	293
Livingston Rd. - Lakeover 115kV	Lakeover - Ray Braswell 500kV	428
Klean - Jackson Northeast 115kV	Lakeover - Ray Braswell 500kV	484

LEPA

Limiting Element	Contingency Element	ATC
Willow Glen 500/230kV Transformer	Coly 500/230kV transformer	0
Bogalusa - Adams Creek 230kV ckt 2	Bogalusa - Adams Creek 230kV ckt 1	0
Willow Glen 500/230kV Transformer	Willow Glen - Willow Glen 2 500/138kV transformer 1	0
Elton - Southwest Jackson 115kV	Franklin - Ray Braswell 500kV	0
Port Hudson 230/138 transformer 2	Port Hudson 230/138 transformer 1	0
Port Hudson 230/138 transformer 1	Port Hudson 230/138 transformer 2	0
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
Alchem - Monochem1 138kV	Polsky Carville - Willow Glen 230kV	0
Alchem - Monochem1 138kV	A.A.C. - Polsky Carville 230kV	0
McAdams 500/230kV transformer 1	Charity Church - Lakeover 230kV	0
Alchem - Monochem1 138kV	A.A.C. - Licar 230kV	0
Willow Glen 500/230kV Transformer	Jaguar - Tap Point Esso 230kV	0
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	0
Addis - Big Cajun 1 230kV	Jaguar - Tap Point Esso 230kV	0
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	16
Elton - Byram 115kV	Franklin - Ray Braswell 500kV	38
Alchem - Monochem1 138kV	Belle Helene - Licar 230kV	41
Addis - Big Cajun 1 230kV	Coly - McKnight 500kV	66
Hopkins - Segura 13kV (CLECO)	Judice - Scott1 138kV	124
Judice - Scott1 138kV	Hopkins - Segura 13kV (CLECO)	150

OKGE

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	0
McAdams 500/230kV transformer 1	Charity Church - Lakeover 230kV	0
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	20
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	149
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	199
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	252
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	263
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	280
McAdams 500/230kV transformer 1	Gerald Andrus SES - Indianola 230kV	301
McAdams 500/230kV transformer 1	Charity Church - Hoy RD. 230kV	453
McAdams 500/230kV transformer 1	Choctaw - French Camp 500kV (TVA)	495

SMEPA

Limiting Element	Contingency Element	ATC
Jackson Forrest Hill - Ray Braswell 115kV	South Jackson 230/115kV transformer 1	0
Jackson Forrest Hill - Ray Braswell 115kV	Jackson Miami - Rex Brown 115kV	0
Jackson Forrest Hill - Ray Braswell 115kV	Jackson Miami - Jackson Monument Street 115kV	0
Jackson Forrest Hill - Ray Braswell 115kV	Franklin - Grand Gulf 500kV	0
Jackson Forrest Hill - Ray Braswell 115kV	Ray Braswell - West Jackson 115kV	0
Jackson Forrest Hill - Ray Braswell 115kV	South Jackson - West Jackson 115kV	0
Jackson Forrest Hill - Ray Braswell 115kV	Lakeover 500/115kV transformer	0
Jackson Forrest Hill - Ray Braswell 115kV	Ray Braswell - Robin 230kV	0
Jackson Forrest Hill - Southwest Jackson 115kV	South Jackson 230/115kV transformer 1	0
Jackson Forrest Hill - Southwest Jackson 115kV	Jackson Miami - Rex Brown 115kV	0
Jackson Forrest Hill - Southwest Jackson 115kV	Jackson Miami - Jackson Monument Street 115kV	0
Brookhaven - Mallalieu (MEPA) 115kV	Bogalusa - Adams Creek 500/230kV transformer	0
Brookhaven - Mallalieu (MEPA) 115kV	Bogalusa - Franklin 500kV	0
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Jackson Forrest Hill - Southwest Jackson 115kV	Ray Braswell - West Jackson 115kV	0
Jackson Forrest Hill - Southwest Jackson 115kV	Franklin - Grand Gulf 500kV	0
Klean - Jackson Northeast 115kV	Jackson Miami - Rex Brown 115kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
Klean - Jackson Northeast 115kV	Jackson Miami - Jackson Monument Street 115kV	0
Mallalieu (MEPA) - Norfield 115kV	Bogalusa - Adams Creek 500/230kV transformer	0
Mallalieu (MEPA) - Norfield 115kV	Bogalusa - Franklin 500kV	0
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	0
Jackson Forrest Hill - Southwest Jackson 115kV	South Jackson - West Jackson 115kV	0
Jackson Miami - Rex Brown 115kV	South Jackson 230/115kV transformer 1	0
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	14
Jackson Forrest Hill - Southwest Jackson 115kV	Lakeover 500/115kV transformer	14
Jackson Forrest Hill - Southwest Jackson 115kV	Bogalusa - Adams Creek 500/230kV transformer	73
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	141
Florence - South Jackson 115kV	Bogalusa - Adams Creek 500/230kV	182

Limiting Element	Contingency Element	ATC
	transformer	
Florence - South Jackson 115kV	Bogalusa - Franklin 500kV	182
Jackson Miami - Rex Brown 115kV	Jackson Forrest Hill - Ray Braswell 115kV	201
Jackson Miami - Jackson Monument Street 115kV	South Jackson 230/115kV transformer 1	217
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	222
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	229
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	231
Florence - South Jackson 115kV	New Hebron - Sliver Creek 115kV	253
Florence - South Jackson 115kV	Magee - New Hebron 115kV	260
Jackson Miami - Rex Brown 115kV	Jackson Forrest Hill - Southwest Jackson 115kV	303
New Hebron - Sliver Creek 115kV	Salem - Silver Creek 115kV	340
Florence - South Jackson 115kV	Franklin - Grand Gulf 500kV	355
Jackson Miami - Rex Brown 115kV	Jackson HICO - North Jackson 115kV	366
Jackson Miami - Rex Brown 115kV	Jackson HICO - Rex Brown E 115kV	366
Florence - South Jackson 115kV	Angie - Adams Creek 230kV	378
Florence - South Jackson 115kV	Franklin - Ray Braswell 500kV	387
Florence - South Jackson 115kV	Eldorado EHV - Sterlington 500kV	392
Magee - New Hebron 115kV	Salem - Silver Creek 115kV	394
Livingston Rd. - Lakeover 115kV	Lakeover - Ray Braswell 500kV	410
Klean - Jackson Northeast 115kV	Lakeover - Ray Braswell 500kV	431
New Hebron - Sliver Creek 115kV	Salem - Tylertown 115kV	458
Florence - Florence Switching Station 115kV	Bogalusa - Adams Creek 500/230kV transformer	464
Florence - Florence Switching Station 115kV	Bogalusa - Franklin 500kV	464
Jackson Miami - Jackson Monument Street 115kV	Jackson Forrest Hill - Ray Braswell 115kV	465
Jackson Miami - Rex Brown 115kV	Klean - Jackson Northeast 115kV	466
New Hebron - Sliver Creek 115kV	Florence - South Jackson 115kV	489
Florence - Florence Switching Station 115kV	New Hebron - Sliver Creek 115kV	507
Magee - New Hebron 115kV	Salem - Tylertown 115kV	512
Florence - Florence Switching Station 115kV	Magee - New Hebron 115kV	514
Jackson Miami - Rex Brown 115kV	Klean - Flowood 115kV	516
Magee - New Hebron 115kV	Florence - South Jackson 115kV	521

SOCO

Limiting Element	Contingency Element	ATC
Bogalusa - Adams Creek 230kV ckt 2	Bogalusa - Adams Creek 230kV ckt 1	0
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	21
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	214
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	256
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	282
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	294
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	312
McAdams 500/230kV transformer 1	Choctaw - French Camp 500kV (TVA)	486

SWPA

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	0
McAdams 500/230kV transformer 1	Charity Church - Lakeover 230kV	0
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	20
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	153
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	203
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	257
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	268
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	286
McAdams 500/230kV transformer 1	Gerald Andrus SES - Indianola 230kV	297
Melbourne - Sage 161kV	ANO - Fort Smith 500kV	349
Melbourne - Sage 161kV	Newport - Newport Industrial 161kV	377
Melbourne - Sage 161kV	Newport AB - Newport Industrial 161kV	394
Melbourne - Sage 161kV	Dell - Independence SES 500kV	410
Melbourne - Sage 161kV	Cash - Newport AB 161kV	420
Melbourne - Sage 161kV	Independence SES - Keo 500kV	425
McAdams 500/230kV transformer 1	Charity Church - Hoy RD. 230kV	442
Melbourne - Sage 161kV	Cash - Jonesboro 161kV	442
Melbourne - Sage 161kV	Sage - Guion 161kV	455
Melbourne - Sage 161kV	Newport - Swifton 161kV	464
Melbourne - Sage 161kV	Sansouci - Shelby (TVA) 500kV	466
McAdams 500/230kV transformer 1	Choctaw - French Camp 500kV (TVA)	480

TVA

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	23
Sterlington 500/115kV transformer 2	Eldorado EHV - Sterlington 500kV	220
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	235
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	302
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	314
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	339
McAdams 500/230kV transformer 1	Choctaw - French Camp 500kV (TVA)	509

2.3.3 DETAILS OF SCENARIO 3 - 2014

AECI

Limiting Element	Contingency Element	ATC
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	494
Ruston East - Vienna 115kV	Eldorado EHV - Sterlington 500kV	533

AEPW

Limiting Element	Contingency Element	ATC
Ruston East - Vienna 115kV	Eldorado EHV - Sterlington 500kV	424
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	456

AMRN

Limiting Element	Contingency Element	ATC
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	507

CLECO

Limiting Element	Contingency Element	ATC
Rilla - Riverton 115kV	Eldorado EHV - Sterlington 500kV	338
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	407
Columbia - Riverton 115kV	Eldorado EHV - Sterlington 500kV	504
Louisiana Station - Thomas 138kV	Webre - Wells 500kV	515
Ruston East - Vienna 115kV	Eldorado EHV - Sterlington 500kV	534

EES

Limiting Element	Contingency Element	ATC
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	406

EMDE

Limiting Element	Contingency Element	ATC
Pleasant Hill 500/161kV transformer	ANO 500/161/22kV transformer	0
Bull Shoals - Bull Shoals Dam SPA 161kV	St. Joe - Hilltop 161kV	0
Bull Shoals - Bull Shoals Dam SPA 161kV	Everton - St. Joe 161kV	0
Bull Shoals - Bull Shoals Dam SPA 161kV	Harrison East - Everton 161kV	0
Bull Shoals - Bull Shoals Dam SPA 161kV	Bull Shoals - Lead HL 161kV	0
Bull Shoals - Bull Shoals Dam SPA 161kV	Clevcov - Lead HL 161kV	0
Calico Rock - Melbourne 161kV	ANO - Fort Smith 500kV	29
Calico Rock - Melbourne 161kV	Dell - Independence SES 500kV	75
Calico Rock - Melbourne 161kV	Newport - Newport Industrial 161kV	105
Calico Rock - Norfolk 161kV	ANO - Fort Smith 500kV	113
Calico Rock - Melbourne 161kV	Newport AB - Newport Industrial 161kV	126
Bull Shoals - Bull Shoals Dam SPA 161kV	ANO - Fort Smith 500kV	159
Calico Rock - Melbourne 161kV	Cash - Newport AB 161kV	159
Calico Rock - Norfolk 161kV	Dell - Independence SES 500kV	174
Calico Rock - Melbourne 161kV	Cash - Jonesboro 161kV	188
Calico Rock - Melbourne 161kV	Sansouci - Shelby (TVA) 500kV	191
Calico Rock - Melbourne 161kV	Newport - Swifton 161kV	194
Calico Rock - Melbourne 161kV	Sage - Guion 161kV	197
Calico Rock - Norfolk 161kV	Newport - Newport Industrial 161kV	202
Calico Rock - Melbourne 161kV	Mountain View - Guion 161kV	213
Calico Rock - Norfolk 161kV	Newport AB - Newport Industrial 161kV	223
Calico Rock - Norfolk 161kV	Cash - Newport AB 161kV	257
Calico Rock - Norfolk 161kV	Cash - Jonesboro 161kV	285

Limiting Element	Contingency Element	ATC
Calico Rock - Norfolk 161kV	Newport - Swifton 161kV	289
Calico Rock - Norfolk 161kV	Sansouci - Shelby (TVA) 500kV	293
Calico Rock - Norfolk 161kV	Sage - Guion 161kV	295
Calico Rock - Norfolk 161kV	Mountain View - Guion 161kV	312
Independence SES - Moorefield 161kV	ANO - Fort Smith 500kV	321
Bull Shoals - Bull Shoals Dam SPA 161kV	Sansouci - Shelby (TVA) 500kV	379
Bull Shoals - Lead HL 161kV	Bull Shoals - Bull Shoals Dam SPA 161kV	415
Independence SES - Moorefield 161kV	Dell - Independence SES 500kV	417
Bull Shoals - Lead HL 161kV	Bull Shoals - Flippin 161kV	442
Independence SES - Moorefield 161kV	Newport - Newport Industrial 161kV	443
Harrison East - Summit 161kV	St. Joe - Hilltop 161kV	449
Bull Shoals - Bull Shoals Dam SPA 161kV	GD View - Table R 161kV	456
Independence SES - Moorefield 161kV	Newport AB - Newport Industrial 161kV	464
Harrison East - Summit 161kV	Everton - St. Joe 161kV	470
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	482
Bull Shoals - Bull Shoals Dam SPA 161kV	Independence SES - Keo 500kV	485
Ruston East - Vienna 115kV	Eldorado EHV - Sterlington 500kV	495
Independence SES - Moorefield 161kV	Cash - Newport AB 161kV	497
Bull Shoals - Bull Shoals Dam SPA 161kV	Osage - GD View 161kV	507
Bull Shoals - Lead HL 161kV	Flippin - Summit 161kV	515
Independence SES - Moorefield 161kV	Newport - Swifton 161kV	522
Independence SES - Moorefield 161kV	Cash - Jonesboro 161kV	526
Harrison East - Summit 161kV	Harrison East - Everton 161kV	530
Independence SES - Moorefield 161kV	Sansouci - Shelby (TVA) 500kV	546

LAFA

Limiting Element	Contingency Element	ATC
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	399
Louisiana Station - Thomas 138kV	Webre - Wells 500kV	405
Elton - Southwest Jackson 115kV	Franklin - Ray Braswell 500kV	447

LAGN

Limiting Element	Contingency Element	ATC
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	394
Elton - Southwest Jackson 115kV	Franklin - Ray Braswell 500kV	451

LEPA

Limiting Element	Contingency Element	ATC
Vacherie - Waterford 230kV	Raceland - Waterford 230kV	0

OKGE

Limiting Element	Contingency Element	ATC
Calico Rock - Melbourne 161kV	ANO - Fort Smith 500kV	42
Calico Rock - Norfolk 161kV	ANO - Fort Smith 500kV	165
Ruston East - Vienna 115kV	Eldorado EHV - Sterlington 500kV	464

Limiting Element	Contingency Element	ATC
Independence SES - Moorefield 161kV	ANO - Fort Smith 500kV	470
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	471

SMEPA

Limiting Element	Contingency Element	ATC
Jackson Forrest Hill - Ray Braswell 115kV	South Jackson 230/115kV transformer 1	0
Jackson Forrest Hill - Ray Braswell 115kV	Jackson Miami - Rex Brown 115kV	0
Jackson Forrest Hill - Ray Braswell 115kV	Jackson Miami - Jackson Monument Street 115kV	0
Jackson Forrest Hill - Ray Braswell 115kV	Ray Braswell - West Jackson 115kV	0
Jackson Forrest Hill - Ray Braswell 115kV	Franklin - Grand Gulf 500kV	0
Jackson Forrest Hill - Ray Braswell 115kV	Brookhaven South - Franklin 115kV	0
Jackson Forrest Hill - Ray Braswell 115kV	South Jackson - West Jackson 115kV	0
Jackson Forrest Hill - Ray Braswell 115kV	Brookhaven - Brookhaven South 115kV	0
Jackson Forrest Hill - Ray Braswell 115kV	Lakeover 500/115kV transformer	0
Jackson Forrest Hill - Ray Braswell 115kV	Ray Braswell - Robin 230kV	0
Jackson Forrest Hill - Southwest Jackson 115kV	South Jackson 230/115kV transformer 1	0
Jackson Forrest Hill - Southwest Jackson 115kV	Jackson Miami - Rex Brown 115kV	0
Klean - Jackson Northeast 115kV	Jackson Miami - Rex Brown 115kV	0
Jackson Forrest Hill - Southwest Jackson 115kV	Jackson Miami - Jackson Monument Street 115kV	0
Klean - Jackson Northeast 115kV	Jackson Miami - Jackson Monument Street 115kV	0
Jackson Forrest Hill - Southwest Jackson 115kV	Ray Braswell - West Jackson 115kV	0
Jackson Forrest Hill - Southwest Jackson 115kV	Franklin - Grand Gulf 500kV	115
Jackson Forrest Hill - Southwest Jackson 115kV	South Jackson - West Jackson 115kV	203
Jackson Miami - Rex Brown 115kV	South Jackson 230/115kV transformer 1	297
Jackson Forrest Hill - Southwest Jackson 115kV	Brookhaven South - Franklin 115kV	300
Jackson Forrest Hill - Southwest Jackson 115kV	Lakeover 500/115kV transformer	305
Jackson Forrest Hill - Southwest Jackson 115kV	Brookhaven - Brookhaven South 115kV	396
Jackson Forrest Hill - Southwest Jackson 115kV	Ray Braswell - Robin 230kV	402
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	419
New Hebron - Sliver Creek 115kV	Salem - Silver Creek 115kV	423
New Hebron - Sliver Creek 115kV	Florence - South Jackson 115kV	428
Magee - New Hebron 115kV	Florence - South Jackson 115kV	463
Magee - New Hebron 115kV	Salem - Silver Creek 115kV	485
New Hebron - Sliver Creek 115kV	Florence - Florence Switching Station 115kV	502
Jackson Miami - Jackson Monument Street 115kV	South Jackson 230/115kV transformer 1	524
New Hebron - Sliver Creek 115kV	Salem - Tylertown 115kV	535
Magee - New Hebron 115kV	Florence - Florence Switching Station 115kV	537
New Hebron - Sliver Creek 115kV	Florence Switching Station - Star 115kV	539
Jackson Miami - Rex Brown 115kV	Jackson Forrest Hill - Ray Braswell 115kV	543

SOCO

Limiting Element	Contingency Element	ATC
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	526

SWPA

Limiting Element	Contingency Element	ATC
Pleasant Hill 500/161kV transformer	ANO 500/161/22kV transformer	0
Calico Rock - Melbourne 161kV	ANO - Fort Smith 500kV	24
Calico Rock - Melbourne 161kV	Dell - Independence SES 500kV	60
Calico Rock - Melbourne 161kV	Newport - Newport Industrial 161kV	82
Calico Rock - Norfolk 161kV	ANO - Fort Smith 500kV	95
Calico Rock - Melbourne 161kV	Newport AB - Newport Industrial 161kV	98
Calico Rock - Melbourne 161kV	Cash - Newport AB 161kV	124
Calico Rock - Norfolk 161kV	Dell - Independence SES 500kV	140
Calico Rock - Melbourne 161kV	Cash - Jonesboro 161kV	146
Calico Rock - Melbourne 161kV	Sansouci - Shelby (TVA) 500kV	152
Calico Rock - Melbourne 161kV	Sage - Guion 161kV	156
Calico Rock - Melbourne 161kV	Newport - Swifton 161kV	156
Calico Rock - Norfolk 161kV	Newport - Newport Industrial 161kV	158
Calico Rock - Melbourne 161kV	Mountain View - Guion 161kV	170
Calico Rock - Norfolk 161kV	Newport AB - Newport Industrial 161kV	174
Calico Rock - Norfolk 161kV	Cash - Newport AB 161kV	200
Calico Rock - Norfolk 161kV	Cash - Jonesboro 161kV	222
Calico Rock - Norfolk 161kV	Newport - Swifton 161kV	233
Calico Rock - Norfolk 161kV	Sansouci - Shelby (TVA) 500kV	233
Calico Rock - Norfolk 161kV	Sage - Guion 161kV	235
Calico Rock - Norfolk 161kV	Mountain View - Guion 161kV	248
Independence SES - Moorefield 161kV	ANO - Fort Smith 500kV	270
Independence SES - Moorefield 161kV	Dell - Independence SES 500kV	335
Independence SES - Moorefield 161kV	Newport - Newport Industrial 161kV	345
Independence SES - Moorefield 161kV	Newport AB - Newport Industrial 161kV	361
Independence SES - Moorefield 161kV	Cash - Newport AB 161kV	387
Independence SES - Moorefield 161kV	Cash - Jonesboro 161kV	410
Independence SES - Moorefield 161kV	Newport - Swifton 161kV	421
Independence SES - Moorefield 161kV	Sansouci - Shelby (TVA) 500kV	434
Independence SES - Moorefield 161kV	Hoxies AECC - Swifton 161 kV	449
Independence SES - Moorefield 161kV	Hoxies AECC - Walnut Ridge 161kV	459
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	480

TVA

Limiting Element	Contingency Element	ATC
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	549

2.3.4 DETAILS OF SCENARIO 4 - 2014

AECI

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0

Limiting Element	Contingency Element	ATC
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	96
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	96
McAdams 500/230kV transformer 1	Charity Church - Lakeover 230kV	109
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	286
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	352
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	356
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	368
Klean - Jackson Northeast 115kV	Lakeover - Ray Braswell 500kV	388
McAdams 500/230kV transformer 1	Choctaw - FrenchCamp 500kV (TVA)	504

AEPW

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	84
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	88
McAdams 500/230kV transformer 1	Charity Church - Lakeover 230kV	107
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	263
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	320
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	327
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	338
Klean - Jackson Northeast 115kV	Lakeover - Ray Braswell 500kV	357
McAdams 500/230kV transformer 1	Gerald Andrus SES - Indianola 230kV	419

AMRN

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	98
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	115
McAdams 500/230kV transformer 1	Charity Church - Lakeover 230kV	126
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	292
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	362
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	366
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	378
Klean - Jackson Northeast 115kV	Lakeover - Ray Braswell 500kV	397
McAdams 500/230kV transformer 1	Choctaw - French Camp 500kV (TVA)	503

CLECO

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	78
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	80
McAdams 500/230kV transformer 1	Charity Church - Lakeover 230kV	122
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	231

Limiting Element	Contingency Element	ATC
Coly 500/230kV transformer	Coly - Willow Glen 500kV	241
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	278
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	289
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	299
Klean - Jackson Northeast 115kV	Lakeover - Ray Braswell 500kV	314
McAdams 500/230kV transformer 1	Gerald Andrus SES - Indianola 230kV	414
Rilla - Riverton 115kV	Eldorado EHV - Sterlington 500kV	417

EES

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	59
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	76
McAdams 500/230kV transformer 1	Charity Church - Lakeover 230kV	80
Jackson Miami - Rex Brown 115kV	South Jackson 230/115kV transformer 1	175
Coly 500/230kV transformer	Coly - Willow Glen 500kV	185
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	228
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	283
McAdams 500/230kV transformer 1	Gerald Andrus SES - Indianola 230kV	285
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	292
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	302
Klean - Jackson Northeast 115kV	Lakeover - Ray Braswell 500kV	315
McAdams 500/230kV transformer 1	Charity Church - Hoy RD. 230kV	453

EMDE

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	93
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	94
McAdams 500/230kV transformer 1	Charity Church - Lakeover 230kV	110
Harrison East - Omaha 161kV	Green Forest South - PID223TAP 161kV	113
Harrison East - Omaha 161kV	Green Forrest - Green Forrest South 161kV	238
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	278
Harrison East - Omaha 161kV	Berryville - Green Forrest 161kV	291
OZD312 - Omaha 161kV	Green Forest South - PID223TAP 161kV	322
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	342
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	347
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	359
Klean - Jackson Northeast 115kV	Lakeover - Ray Braswell 500kV	378
OZD312 - Omaha 161kV	Green Forrest - Green Forrest South 161kV	447
Harrison East - Omaha 161kV	Berryville - Osage 161kV	449
McAdams 500/230kV transformer 1	Gerald Andrus SES - Indianola 230kV	461
OZD312 - Omaha 161kV	Berryville - Green Forrest 161kV	500
McAdams 500/230kV transformer 1	Choctaw - French Camp 500kV (TVA)	521

Limiting Element	Contingency Element	ATC
Green Forest South - PID223TAP 161kV	Harrison East - Omaha 161kV	534

LAGN

Limiting Element	Contingency Element	ATC
Elton - Southwest Jackson 115kV	Franklin - Ray Braswell 500kV	0
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	75
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	82
McAdams 500/230kV transformer 1	Charity Church - Lakeover 230kV	133
Elton - Byram 115kV	Franklin - Ray Braswell 500kV	168
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	224
Coly 500/230kV transformer	Coly - Willow Glen 500kV	262
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	269
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	281
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	291
Klean - Jackson Northeast 115kV	Lakeover - Ray Braswell 500kV	304
McAdams 500/230kV transformer 1	Gerald Andrus SES - Indianola 230kV	432

LAFA

Limiting Element	Contingency Element	ATC
Elton - Southwest Jackson 115kV	Franklin - Ray Braswell 500kV	0
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	75
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	82
McAdams 500/230kV transformer 1	Charity Church - Lakeover 230kV	132
Elton - Byram 115kV	Franklin - Ray Braswell 500kV	169
Coly 500/230kV transformer	Coly - Willow Glen 500kV	199
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	224
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	271
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	283
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	292
Klean - Jackson Northeast 115kV	Lakeover - Ray Braswell 500kV	305
McAdams 500/230kV transformer 1	Gerald Andrus SES - Indianola 230kV	431

LEPA

Limiting Element	Contingency Element	ATC
Elton - Southwest Jackson 115kV	Franklin - Ray Braswell 500kV	0
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	73
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	85
Port Hudson 230/138 transformer 2	Port Hudson 230/138 transformer 1	95
Coly 500/230kV transformer	Coly - Willow Glen 500kV	105
Port Hudson 230/138 transformer 1	Port Hudson 230/138 transformer 2	112

Limiting Element	Contingency Element	ATC
West New Roads - New Roads (LEPA) 230kV	Base Case	116
McAdams 500/230kV transformer 1	Charity Church - Lakeover 230kV	145
Elton - Byram 115kV	Franklin - Ray Braswell 500kV	152

OKGE

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	89
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	92
McAdams 500/230kV transformer 1	Charity Church - Lakeover 230kV	107
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	272
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	333
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	339
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	350
Klean - Jackson Northeast 115kV	Lakeover - Ray Braswell 500kV	370
McAdams 500/230kV transformer 1	Gerald Andrus SES - Indianola 230kV	438
McAdams 500/230kV transformer 1	Choctaw - FrenchCamp 500kV (TVA)	534

SMEPA

Limiting Element	Contingency Element	ATC
Jackson Forrest Hill - Ray Braswell 115kV	South Jackson 230/115kV transformer 1	0
Jackson Forrest Hill - Ray Braswell 115kV	Jackson Miami - Rex Brown 115kV	0
Jackson Forrest Hill - Ray Braswell 115kV	Jackson Miami - Jackson Monument Street 115kV	0
Jackson Forrest Hill - Ray Braswell 115kV	Franklin - Grand Gulf 500kV	0
Jackson Forrest Hill - Ray Braswell 115kV	Ray Braswell - West Jackson 115kV	0
Jackson Forrest Hill - Ray Braswell 115kV	Brookhaven South - Franklin 115kV	0
Jackson Forrest Hill - Ray Braswell 115kV	South Jackson - West Jackson 115kV	0
Jackson Forrest Hill - Ray Braswell 115kV	Brookhaven - Brookhaven South 115kV	0
Jackson Forrest Hill - Ray Braswell 115kV	Lakeover 500/115kV transformer	0
Jackson Forrest Hill - Ray Braswell 115kV	Ray Braswell - Robin 230kV	0
Jackson Forrest Hill - Southwest Jackson 115kV	South Jackson 230/115kV transformer 1	0
Jackson Forrest Hill - Southwest Jackson 115kV	Jackson Miami - Rex Brown 115kV	0
Klean - Jackson Northeast 115kV	Jackson Miami - Rex Brown 115kV	0
Jackson Forrest Hill - Southwest Jackson 115kV	Jackson Miami - Jackson Monument Street 115kV	0
Klean - Jackson Northeast 115kV	Jackson Miami - Jackson Monument Street 115kV	0
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Jackson Forrest Hill - Southwest Jackson 115kV	Ray Braswell - West Jackson 115kV	0
Jackson Forrest Hill - Southwest Jackson 115kV	Franklin - Grand Gulf 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
Jackson Forrest Hill - Southwest Jackson 115kV	South Jackson - West Jackson 115kV	39
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	64
Jackson Miami - Rex Brown 115kV	South Jackson 230/115kV transformer 1	79
Jackson Forrest Hill - Southwest Jackson 115kV	Lakeover 500/115kV transformer	83
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	86

Limiting Element	Contingency Element	ATC
Jackson Forrest Hill - Southwest Jackson 115kV	Brookhaven South - Franklin 115kV	97
Brookhaven - Mallalieu (MEPA) 115kV	Bogalusa - Franklin 500kV	145
Brookhaven - Mallalieu (MEPA) 115kV	Bogalusa - Adams Creek 500/230kV transformer	145
Jackson Forrest Hill - Southwest Jackson 115kV	Franklin - Ray Braswell 500kV	189
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	190
Jackson Forrest Hill - Southwest Jackson 115kV	Brookhaven - Brookhaven South 115kV	192
Klean - Jackson Northeast 115kV	Lakeover - Ray Braswell 500kV	269
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	271
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	298
Jackson Miami - Rex Brown 115kV	Jackson Forrest Hill - Ray Braswell 115kV	299
Jackson Miami - Jackson Monument Street 115kV	South Jackson 230/115kV transformer 1	306
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	308
New Hebron - Sliver Creek 115kV	Salem - Silver Creek 115kV	378
Jackson Miami - Rex Brown 115kV	Jackson Forrest Hill - Southwest Jackson 115kV	398
Magee - New Hebron 115kV	Salem - Silver Creek 115kV	434
New Hebron - Sliver Creek 115kV	Florence - South Jackson 115kV	472
Jackson Miami - Rex Brown 115kV	Klean - Jackson Northeast 115kV	492
New Hebron - Sliver Creek 115kV	Salem - Tylertown 115kV	497
Magee - New Hebron 115kV	Florence - South Jackson 115kV	504
Jackson Miami - Rex Brown 115kV	Klean - Flowood 115kV	540
Mallalieu (MEPA) - Norfield 115kV	Bogalusa - Franklin 500kV	541
Mallalieu (MEPA) - Norfield 115kV	Bogalusa - Adams Creek 500/230kV transformer	541
New Hebron - Sliver Creek 115kV	Florence - Florence Switching Station 115kV	546

SOCO

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	98
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	292
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	372
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	379
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	391
Klean - Jackson Northeast 115kV	Lakeover - Ray Braswell 500kV	400
McAdams 500/230kV transformer 1	Choctaw - French Camp 500kV (TVA)	524

SWPA

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	89
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	93
McAdams 500/230kV transformer 1	Charity Church - Lakeover 230kV	105

Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	278
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	341
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	346
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	358
Klean - Jackson Northeast 115kV	Lakeover - Ray Braswell 500kV	377
McAdams 500/230kV transformer 1	Gerald Andrus SES - Indianola 230kV	432
McAdams 500/230kV transformer 1	Choctaw - French Camp 500kV (TVA)	517
Calico Rock - Melbourne 161kV	ANO - Fort Smith 500kV	544

TVA

Limiting Element	**Contingency Element**	**ATC**
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	108
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	321
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	404
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	406
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	419
Klean - Jackson Northeast 115kV	Lakeover - Ray Braswell 500kV	437
McAdams 500/230kV transformer 1	Choctaw - French Camp 500kV (TVA)	548

Network Resource Interconnection Service

3. Introduction

A Network Resource Interconnection Services (NRIS) study was requested to serve 550MW of Entergy network load. The expected in service date for this NRIS generator is 9/1/2010. 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: deliverability to generation test and 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 E.

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 Deliver.

4. Analysis

4.1 Models

The models used for this analysis is the 2014 summer peak cases developed in 2009.

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 2014.
- Approved transmission reliability upgrades for 2010 - 2014 were included in the base case. These upgrades can be found at Entergy's OASIS web page http://www.oatioasis.com/EES/EESDocs/Disclaimer.html, under approved future projects. Reference Appendix D.

4.2 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 100kV were monitored.

5. Generation used for the transfer

Source generators were used for the deliverability to generation test.

6. Results

6.1 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 E.

6.2 Constraints

Study Case	Study Case with Priors
Lakeover 500/115kV transformer	Coly 500/230kV transformer
	Jackson Miami - Jackson Monument Street 115kV
	Jackson Miami - Rex Brown 115kV
	Klean - Jackson Northeast 115kV
	Lakeover - Rex Brown C 115kV ckt 1
	Lakeover - Rex Brown E 115kV ckt 2
	Lakeover 500/115kV transformer
	McAdams 500/230kV transformer 1
	Rex Brown W - Rex Brown C 115kV ckt 1

6.3 DFAX Study Case without Priors Results

Limiting Element	Contingency Element	ATC(MW)
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	406

6.4 DFAX Study Case with Priors Results

Limiting Element	Contingency Element	ATC(MW)
McAdams 500/230kV transformer 1	Lakeover - Ray Braswell 500kV	0
Lakeover 500/115kV transformer	Lakeover - Ray Braswell 500kV	0
McAdams 500/230kV transformer 1	Lakeover 500/115kV transformer	59
Jackson Miami - Rex Brown 115kV	Lakeover - Ray Braswell 500kV	76
McAdams 500/230kV transformer 1	Charity Church - Lakeover 230kV	80
Jackson Miami - Rex Brown 115kV	South Jackson 230/115kV transformer 1	175
Coly 500/230kV transformer	Coly - Willow Glen 500kV	185
Jackson Miami - Jackson Monument Street 115kV	Lakeover - Ray Braswell 500kV	228
Rex Brown W - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	283
McAdams 500/230kV transformer 1	Gerald Andrus SES - Indianola 230kV	285
Lakeover - Rex Brown C 115kV ckt 1	Lakeover - Ray Braswell 500kV	292
Lakeover - Rex Brown E 115kV ckt 2	Lakeover - Ray Braswell 500kV	302
Klean - Jackson Northeast 115kV	Lakeover - Ray Braswell 500kV	315
McAdams 500/230kV transformer 1	Charity Church - Hoy RD. 230kV	453

6.5 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 E.

A. Amite South: Passed

B. WOTAB: Passed

C. Western Region: Passed

7. Required Upgrades for NRIS

7.1 Preliminary Estimates of Direct Assignment of Facilities and Network Upgrades

Limiting Element	Planning Estimate for Upgrade*
Jackson Miami - Jackson Monument Street 115kV	$3,500,000
Jackson Miami - Rex Brown 115kV	$2,200,000
Klean - Jackson Northeast 115kV	$3,287,500
Lakeover - Rex Brown C 115kV ckt 1	$2,312,500
Lakeover - Rex Brown E 115kV ckt 2	$2,312,500
Lakeover 500/115kV transformer	$15,000,000
McAdams 500/230kV transformer 1	Included in 2010 ICT Base Plan
Rex Brown W - Rex Brown C 115kV ckt 1	$275,000
TOTAL	**$28,887,500**

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

Short Circuit Analysis / Breaker Rating Analysis

8. Model Information

The short circuit analysis was performed on the Entergy system short circuit model using ASPEN software. This model includes all generators interconnected to the Entergy system or interconnected to an adjacent system and having an impact on this interconnection request, IPP's with signed IOAs, and approved future transmission projects on the Entergy transmission system including the proposed PID-237 unit.

9. Short Circuit Analysis

The method used to determine if any short circuit problems would be caused by the addition of the PID-237 generation is as follows:

Three-phase and single-phase to ground faults were simulated on the Entergy base case short circuit model and the worst case short circuit level was determined at each station. The PID-237 generators as well as the necessary NRIS upgrades shown in Section 7.1 were then modeled in the base case to generate a revised short circuit model. The base case short circuit results were then compared with the results from the revised model to identify any breakers that were under-rated as a result of additional short circuit contribution from PID-237 generation.

10. Analysis Results

The results of the short circuit analysis indicates that the additional generation due to PID-237 generator **does not** 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 the PID-237 plant with priors and without priors. The priors included 211, 221, 223, 224, 228, 231, and 233.

Stability Study

11. Executive Summary

A stability study was performed for the interconnection of project PID-237. The proposed project is a 550MW combined-cycle plant that is requesting interconnection at the Lakeover 500kV substation in the Entergy transmission system.

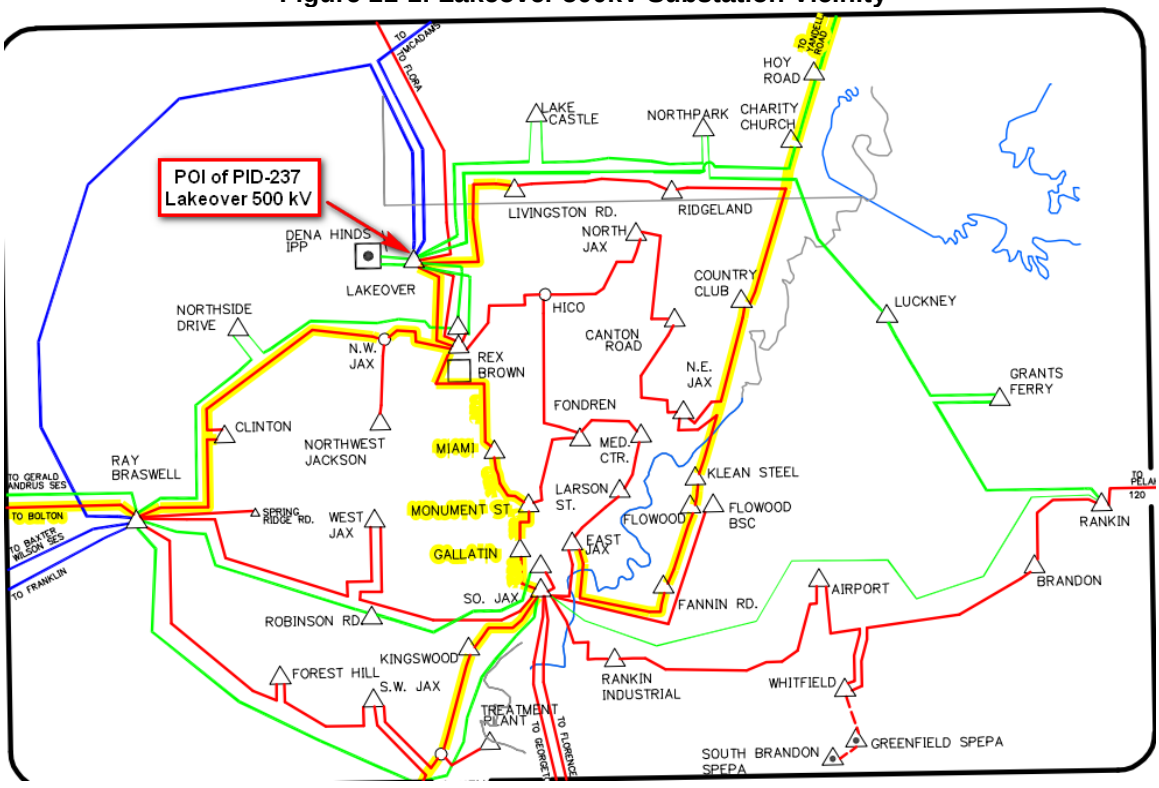
The objective of this study was to evaluate the impact of proposed PID-237 project on the stability of the transmission system and nearby generating stations. The study was performed on a 2014 Summer Peak case, provided by SPP-ICT/Entergy.

Results indicate that the system is stable following all simulated three-phase normally cleared and stuck-breaker faults. Also, no voltage criteria violations were observed following these faults.

Based on the results of stability analysis, it can be concluded that interconnection of the proposed PID-237 (550MW) generation at the Lakeover 500kV bus does not adversely impact the stability of the Entergy System.

Figure 11-1 shows the location of the proposed 550MW generation interconnecting station.

Figure 11-1: Lakeover 500kV Substation Vicinity



12. STABILITY ANALYSIS

12.1 STABILITY ANALYSIS METHODOLOGY

Using Planning Standards approved by NERC, the following stability definition was applied in the Transient Stability Analysis:

Power system stability is defined as that condition in which the differences of the angular positions of synchronous machine rotors become constant following an aperiodic system disturbance.

All the breakers at Lakeover 500kV substation are assumed to be Independent Pole Operated (IPO) breakers. Based on the Entergy study criteria, three-phase faults with normal clearing and delayed clearing were simulated. Three-phase and single-phase line faults were simulated for the specified duration and synchronous machine rotor angles were monitored to make sure they maintained synchronism following fault removal.

Stability analysis was performed using the PSS/E™ dynamics program V30.3.3. PSS/E™ is a positive sequence program. Balanced faults such as three-phase faults can be simulated by applying a fault admittance of –j2E9 (essentially infinite admittance or zero impedance).

The stability analysis was performed using the PSS/E dynamics program, which 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.

12.2 STUDY MODEL DEVELOPMENT

The study model consists of power flow case and dynamics database, that was developed as described below.

12.2.1 Power Flow Case

A power flow case “EN14S09_U0A_final_r2 - Scenario4+PID237_unconv.sav” representing the 2014 Summer Peak conditions was provided by SPP/ Entergy. The proposed PID-237 project is already included in this base case. It is connected to the Lakeover 500kV substation (#336945) with three 500/18kV transformers.

In this base case, the representation of one prior-queued project, PID-233 (150 MW), was revised.

In this manner, a post-project power flow case with PID-237 was established and named as ‘Post_PID237.sav’.

A pre-project power flow case was established by taking the PID-237 project offline from the post-project case and dispatching it against the system swing bus. The pre-project power flow case was named as “Pre_PID237.sav”.

Figure 12-1 and Figure 12-2 show the PSS/E one-line diagrams for the local area WITH and WITHOUT the PID-237 project, respectively, for 2014 Summer Peak system conditions

12.2.2 Stability Database

A base case stability database was provided by SPP/Entergy in a PSSE *.dyr file format (‘red11S_newnum.dyr’).

To create a dynamic database (a snapshot file) for Post_PID237 power flow case, stability data for prior-queued PID-233 was first appended to the base case stability database. Then, the stability data for PID-237 was appended to the stability database to create a dynamic database for the Post_PID237 power flow case.

The plant data for PID-237 is included in 0. The PSS/E power flow and stability data for PID-237, used in this study, are included in 0.

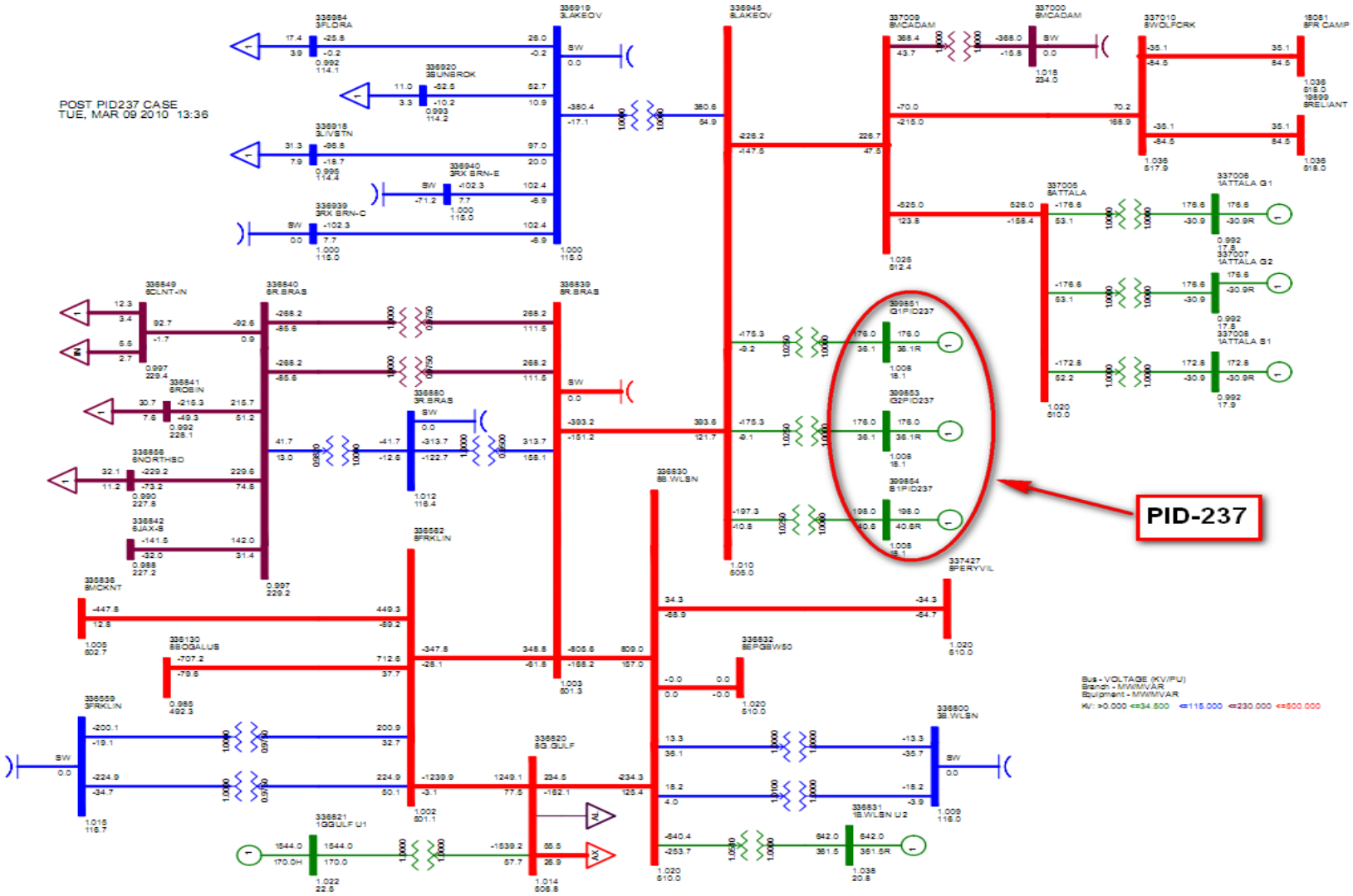


Figure 12-1: 2014 Summer Peak Flows and Voltages <u>with</u> PID-237

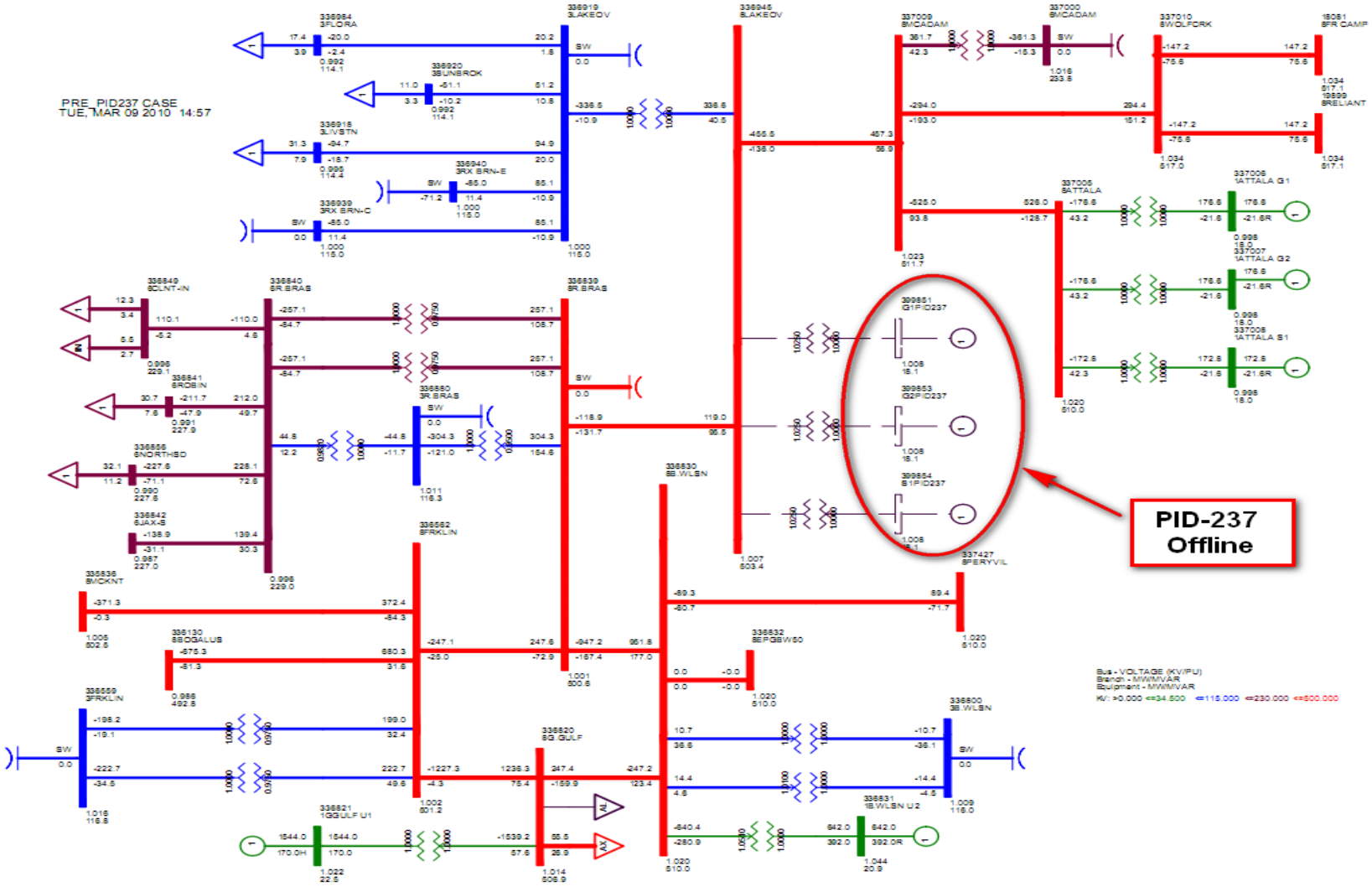


Figure 12-2: 2014 Summer Peak Flows and Voltages without PID-237

12.3 TRANSIENT STABILITY ANALYSIS

Stability simulations were run to examine the transient behavior of the PID-237 project and its impact on the Entergy system. Stability analysis was performed using the following procedure. First, three-phase faults with normal clearing were simulated. Next, three-phase stuck breaker faults were simulated. If a three-phase stuck breaker fault was found to be unstable, then a single-line-to-ground (SLG) fault followed by breaker failure was studied. The fault clearing times used for the simulations are given in Table 12-1.

Table 12-1: Fault Clearing Times

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

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.

3) The fault is then cleared by back-up clearing. If the system was found to be unstable, then the fault was repeated without the proposed PID-237 plant.

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

Table 12-2 lists all the fault cases that were simulated in this study, including normally cleared three-phase faults and three-phase stuck breaker faults. Figure 12-3 to Figure 12-8 show the layout diagrams of the nearby 500kV substations where faults were simulated, as well as fault locations.

For all cases analyzed, the initial disturbance was applied at t = 0.1 seconds.

Table12-2: List of Simulated Faults

Fault #	Fault location	Fault Type	Fault Clearing (in cy)		Stuck-breaker	Breaker Clearing		Facilities Tripped When Primary Breaker(s) Open	Facilities Tripped When Back-up Breaker(s) Open
			Primary	Back-up		Primary	Back-up		
Fault_01	Lakeover 500kV	3PH	5	--	--	J3924, J3920, J9234, JXXX1	--	Lakeover - McAdams 500kV	--
Fault_01a	Lakeover 500kV	3PH - 1PH	5	9	JXXX1	J3924, J3920, J9234	J9214, J4908, J4928	Lakeover - McAdams 500kV (2Φ)	Lakeover - McAdams 500kV; Lakeover - Ray Braswell 500kV
Fault_02	Lakeover 500kV	3PH	5	--	--	J4908, J4928, J9214, JXXX1	--	Lakeover - Ray Braswell 500kV	--
Fault_02a	Lakeover 500kV	3PH - 1PH	5	9	JXXX1	J4908, J4928, J9214	J9234, J3924, J3920	Lakeover - Ray Braswell 500kV (2Φ)	Lakeover - Ray Braswell 500kV; Lakeover - McAdams 500kV
Fault_02b	Lakeover 500kV	3PH - 1PH	5	9	J9214	J4908, J4928, JXXX1	J9218	Lakeover - Ray Braswell 500kV (2Φ)	Lakeover - Ray Braswell 500kV; Lakeover 500/115kV transformer
Fault_03	Lakeover 500kV	3PH	5	--	--	J9214, J9218	--	Lakeover 500/115kV transformer	--
Fault_03a	Lakeover 500kV	3PH - 1PH	5	9	J9214	J9218	JXXX1, J4908, J4928	Lakeover 500/115kV transformer (2Φ)	Lakeover 500/115kV transformer; Lakeover - Ray Braswell 500kV
Fault_04	Ray Braswell 500kV	3PH	5	--	--	J2230, J2233, J4928, J4920	--	Ray Braswell - B. Wilson 500kV	--
Fault_04a	Ray Braswell 500kV	3PH - 1PH	5	9	J4928	J2230, J2233, J4920	J4908, J9214, JXXX1	Ray Braswell - B. Wilson 500kV (2Φ)	Ray Braswell - B. Wilson 500kV; Ray Braswell - Lakeover 500kV
Fault_05	Ray Braswell 500kV	3PH	5	--	--	J2404, J2408, J4914, J4944	--	Ray Braswell - Franklin 500kV	--
Fault_05a	Ray Braswell 500kV	3PH - 1PH	5	9	J4914	J2404, J2408, J4944	J4952	Ray Braswell - Franklin 500kV (2Φ)	Ray Braswell - Franklin 500kV; Ray Braswell 500/115kV transformer

Fault_06	Ray Braswell 500kV	3PH	5	--	--	J4904, J4917	--	Ray Braswell 500/115kV transformer	--
Fault_07	Ray Braswell 500kV	3PH	5	--	--	J4914, J4952	--	Ray Braswell 500/230kV transformer #2	--
Fault_07a	Ray Braswell 500kV	3PH - 1PH	5	9	J4914	J4952	J2404, J2408, J4944	Ray Braswell 500/230kV transformer #2 (2Φ)	Ray Braswell 500/230kV transformer #2; Ray Braswell - Franklin 500kV
Fault_08	B. Wilson 500kV	3PH	5	--	--	J2218, J2233, R7372, R9872	--	B. Wilson - Perryville 500kV	--
Fault_08a	B. Wilson 500kV	3PH - 1PH	5	9	J2233	J2218, R7372, R9872	J2230, J4920, J4928	B. Wilson - Perryville 500kV (2Φ)	B. Wilson - Perryville 500kV; B. Wilson - Ray Braswell 500kV
Fault_09	Franklin 500kV	3PH	5	--	--	J2420, J2425, J5248, J5240	--	Franklin - G. Gulf 500kV	--
Fault_09a	Franklin 500kV	3PH - 1PH	5	9	J2420	J2425, J5248, J5240	J2416, S4402, S4405	Franklin - G. Gulf 500kV (2Φ)	Franklin - G. Gulf 500kV; Franklin - Bogal USA - Adams Creek 500kV
Fault_09b	Franklin 500kV	3PH - 1PH	5	9	J2425	J2420, J5248, J5240	J2404	Franklin - G. Gulf 500kV (2Φ)	Franklin - G. Gulf 500kV; Franklin 500/115 kV transformer #1
Fault_10	Franklin 500kV	3PH	5	--	--	S4402, S4405, J2416, J2420	--	Franklin - Bogal USA - Adams Creek 500kV	--
Fault_10a	Franklin 500kV	3PH - 1PH	5	9	J2416	S4402, S4405, J2420	J2412, J21105, J21110	Franklin - Bogal USA - Adams Creek 500kV (2Φ)	Franklin - Bogal USA - Adams Creek 500 kV; Franklin - McKnight 500kV
Fault_11	McAdams 500kV	3PH	5	--	--	J3908, J3912, J8204, J8216	--	McAdams - Wolfcreek 500kV	--
Fault_11a	McAdams 500kV	3PH - 1PH	5	9	J3908	J3912, J8204, J8216	J3924	McAdams - Wolfcreek 500kV (2Φ)	McAdams - Wolfcreek 500kV; McAdams 500/230kV transformer
Fault_12	McAdams 500kV	3PH	5	--	--	J3908, J3924	--	McAdams 500/230kV transformer	--
Fault_12a	McAdams 500kV	3PH - 1PH	5	9	J3924	J3908	J9234, JXXX1, J3920	McAdams 500/230kV transformer (2Φ)	McAdams 500/230kV transformer; McAdams - Lakeover 500kV

Fault_13	G. Gulf 500kV	3PH	5	--	--	J5224, J5216, J2240, J2244	--	G. Gulf - B. Wilson 500kV	--
Fault_13a	G. Gulf 500kV	3PH - 1PH	5	9	J5224	J5216, J2240, J2244	J5208, J5236, J5248	G. Gulf - B. Wilson 500kV (2Φ)	G. Gulf - B. Wilson 500kV
Fault_14	G. Gulf 500kV	3PH	5	--	--	J5240, J5248, J2420, J2425	--	G. Gulf - Franklin 500kV	--

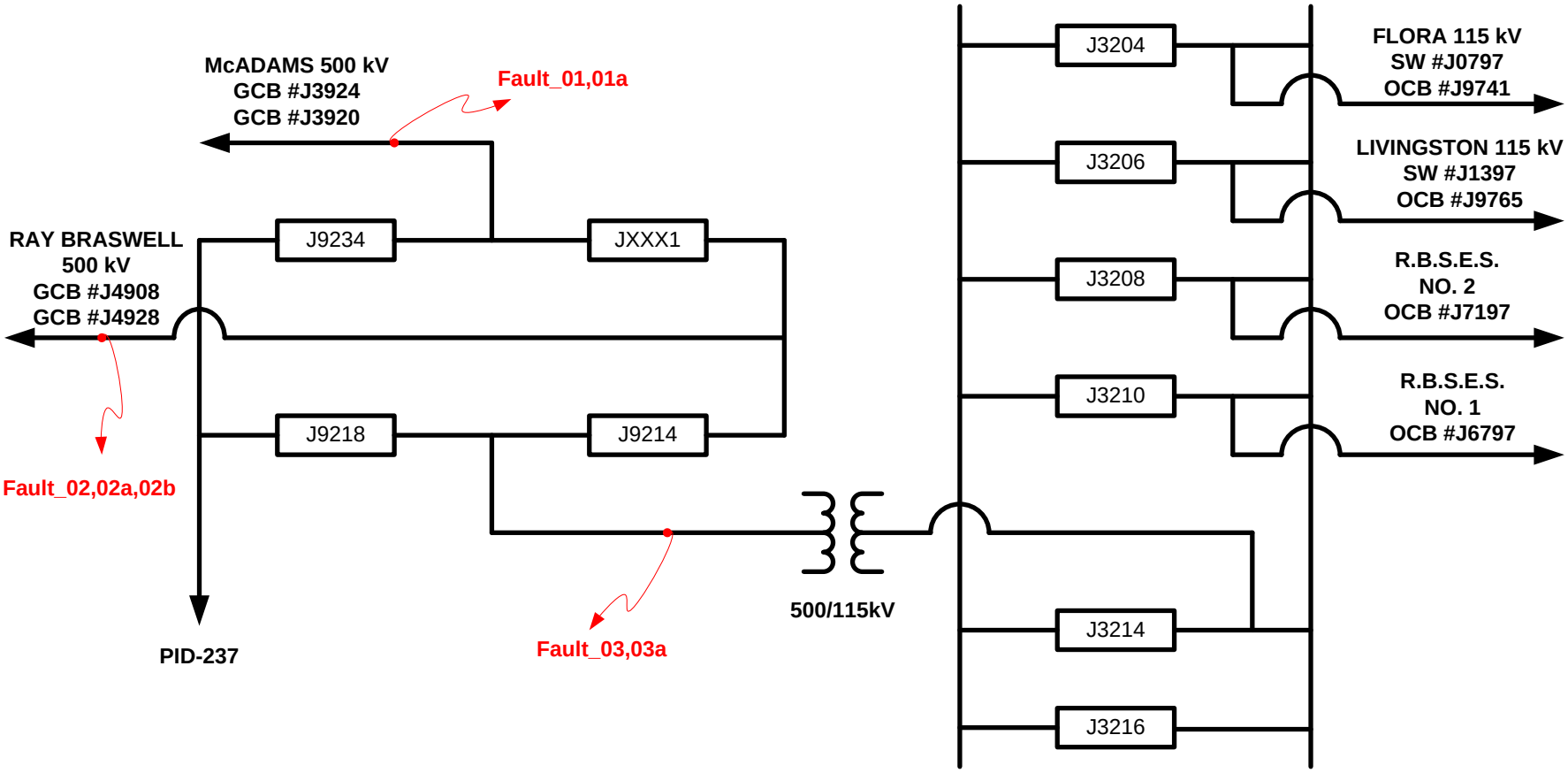


Figure 12-3: Layout Diagram for Lakeover 500kV Substation

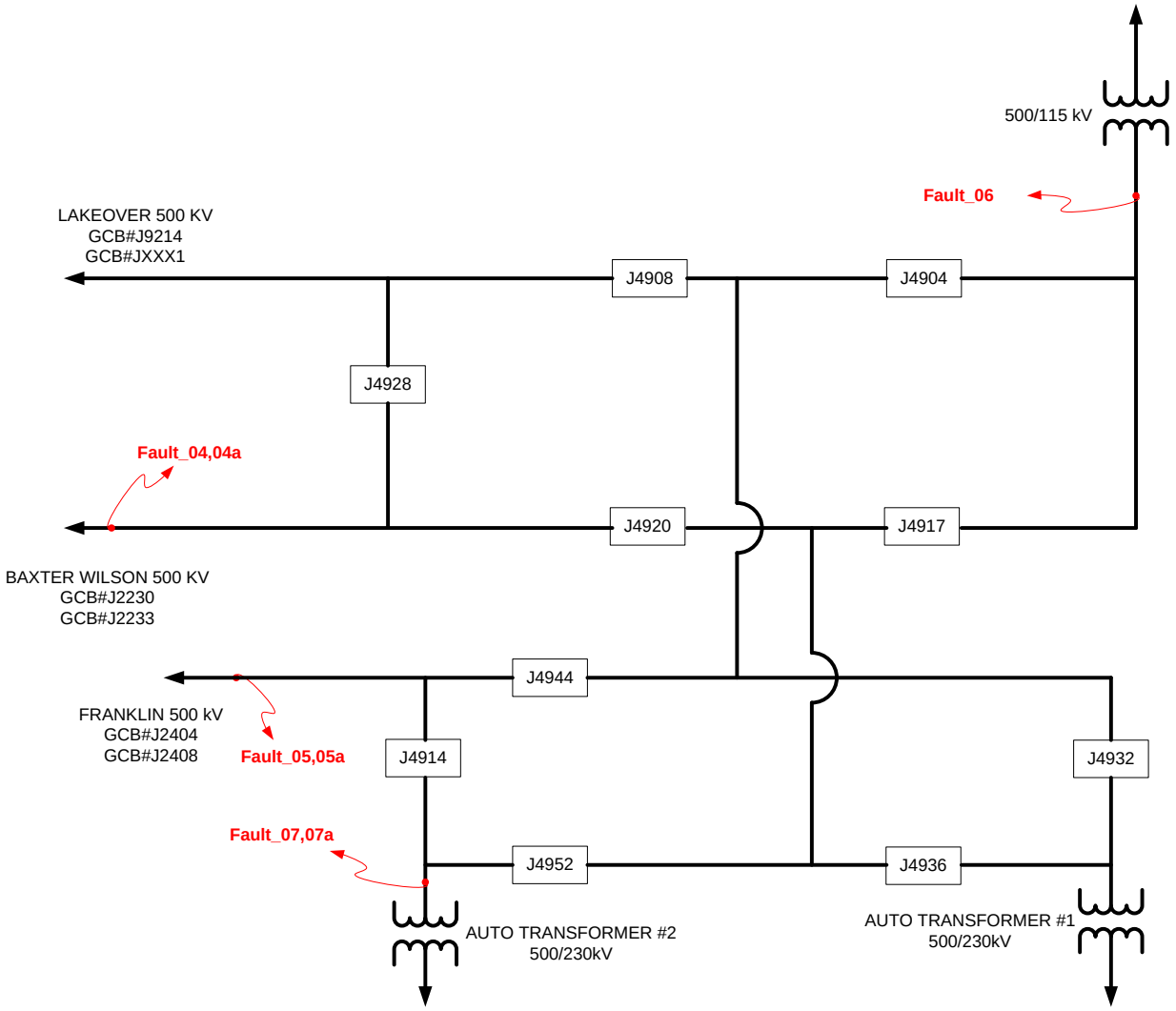


Figure 12-4: Layout Diagram for Ray Braswell 500kV Substation

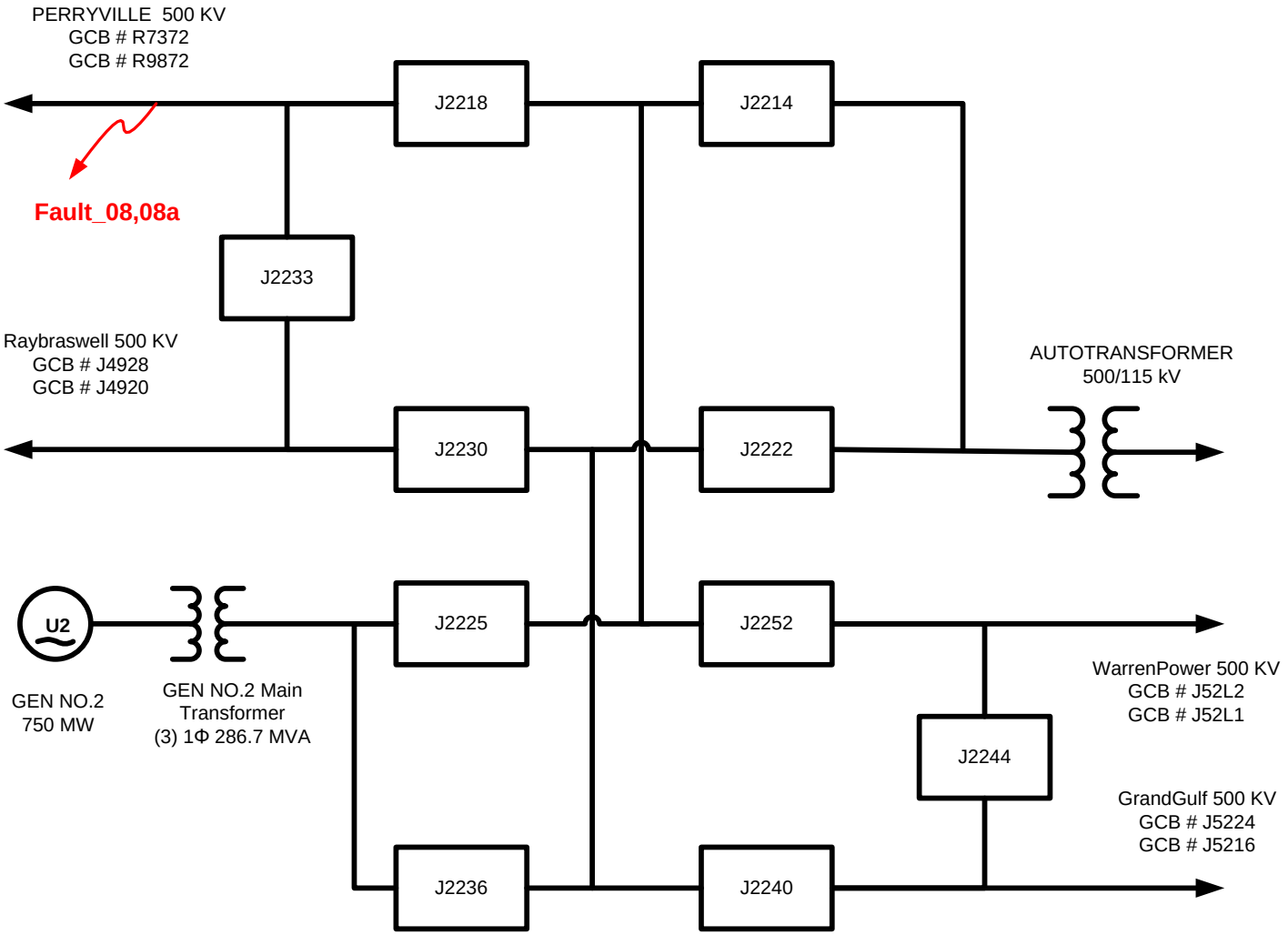


Figure 12-5: Layout Diagram for Baxter Wilson 500kV Substation

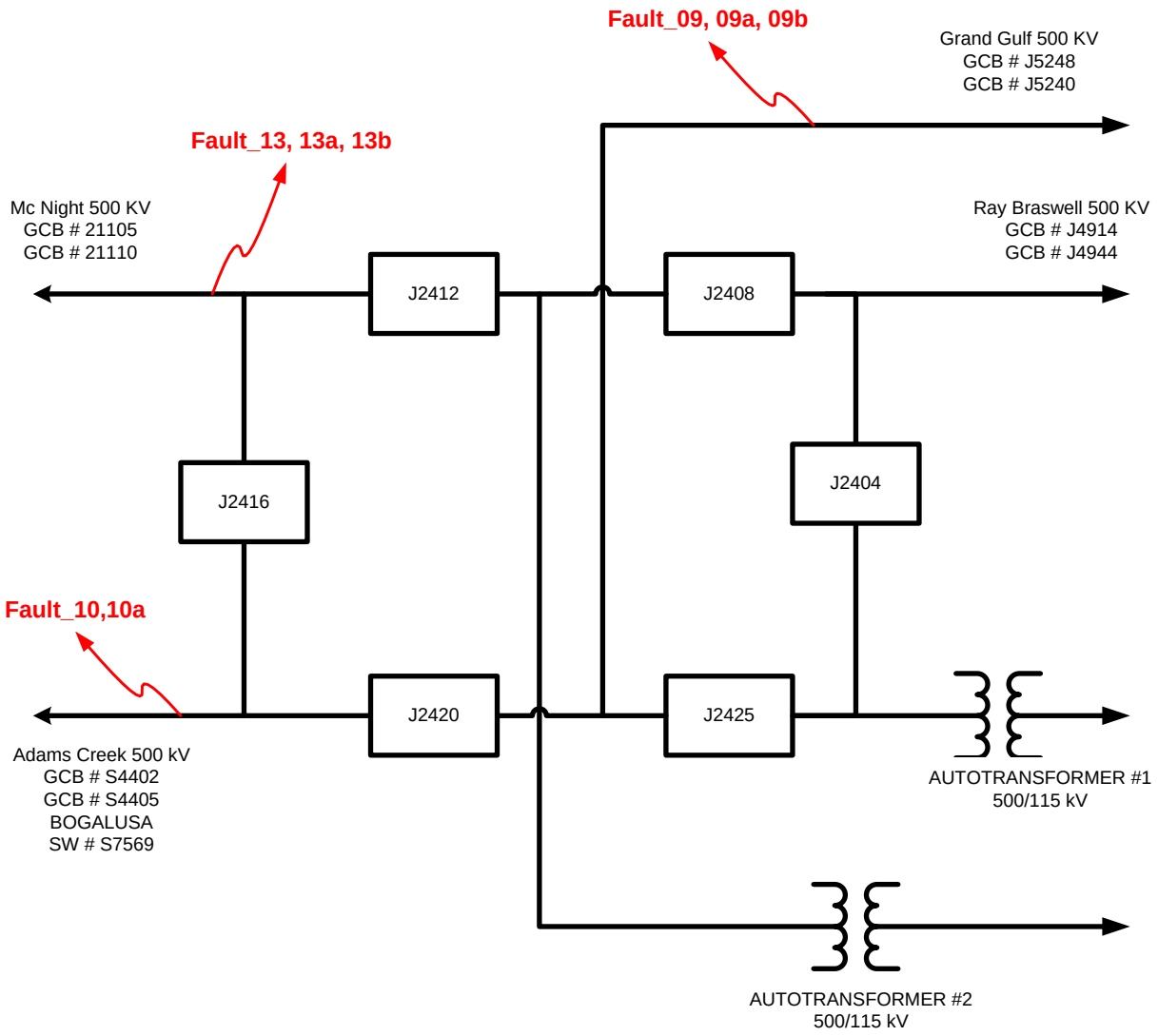


Figure 12-6: Layout Diagram for Franklin 500kV Substation

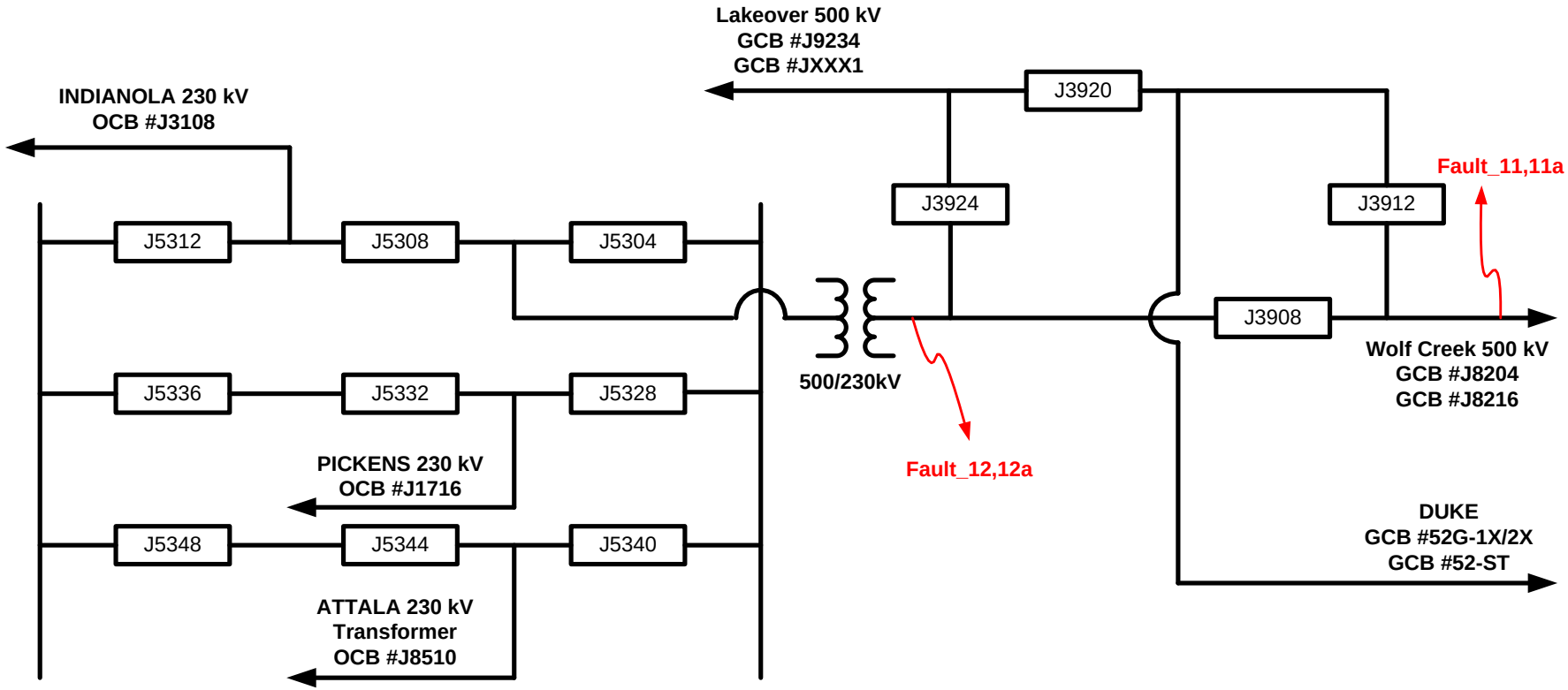


Figure 12-7: Layout Diagram for McAdams 500kV Substation

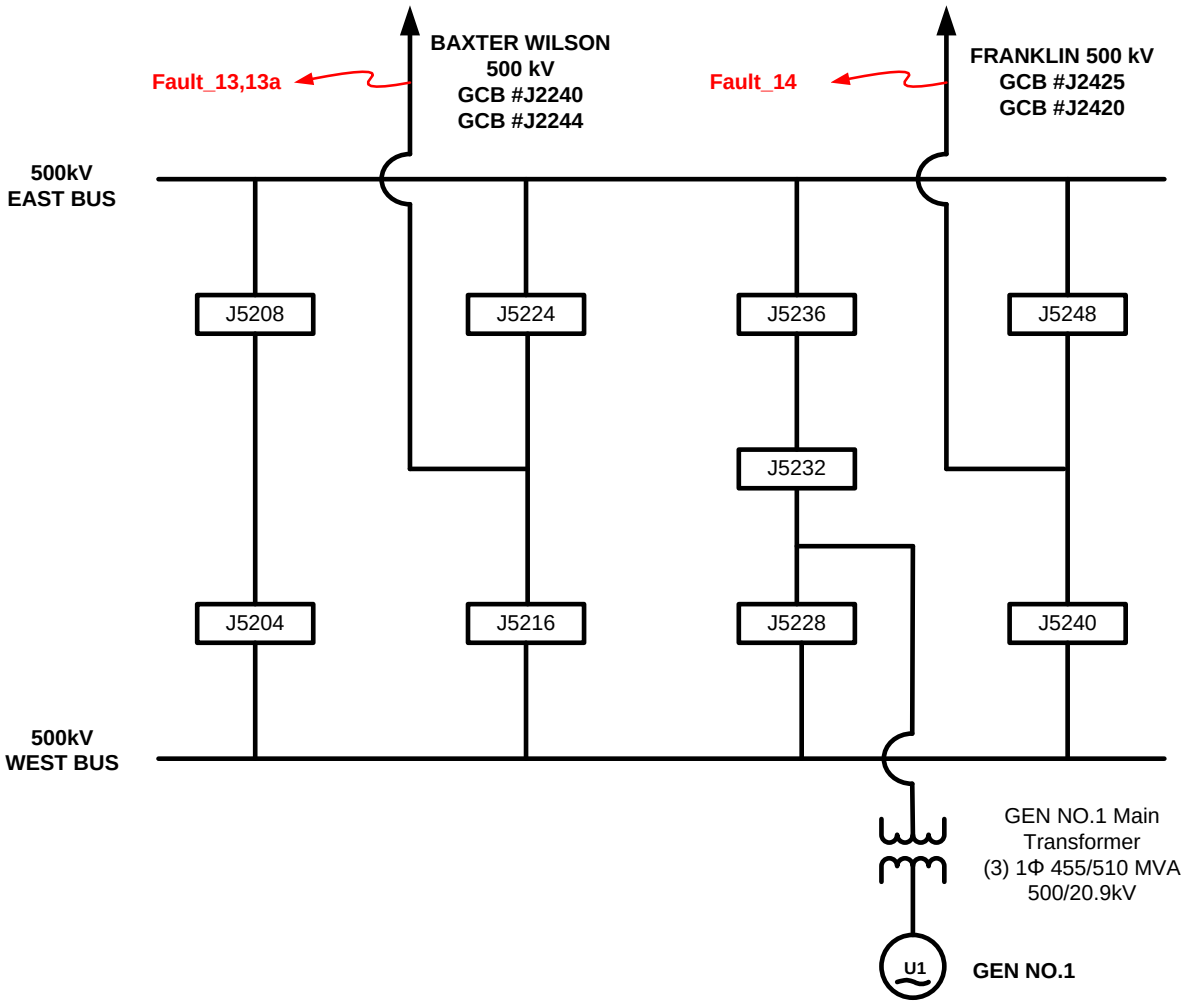


Figure 112-3: Layout Diagram for Grand Gulf 500kV Substation

Preliminary simulations on the post-project case showed the system to be stable following all the normally cleared three-phase faults and all three-phase stuck breaker faults. However, lightly damped oscillations were observed in the system following Faults 08a, 09, 09a, 09b, 10a, and 14. Similar oscillations were also observed in the pre-project case without PID-237. These oscillations were mitigated by modifying the excitation system model on Baxter Wilson unit #1 based on discussions with Entergy. Fault simulations were then repeated and the results are summarized in Table 12-.

These oscillations were discussed with SPP-ICT and Entergy and it was noted that no oscillations were observed in the recently completed PID-226 study. In an effort to identify the source of the discrepancies in the study results between the two studies, it was proposed to compare the power flow and dynamic data of nearby generating units (Baxter Wilson, Grand Gulf) between the PID-226 and PID-237 study models. This comparison revealed differences in the representation of the excitation system on Baxter Wilson unit #1 (model "IEEX2A" in the PID-226 study vs. user-written model "UAC7B" in the dynamic data provided for the PID-237 study). Simulations on the PID-237 case with Baxter Wilson unit #1 excitation system modeled as in the PID-226 study i.e., model "IEEX2A" showed well-damped system response. Per SPP/Entergy input, all simulations were repeated on the post PID-237 case by reverting back to the "IEEX2A" model on Baxter Wilson unit #1. Results are summarized in Table 12-.

Table 12- shows that the system is STABLE for all simulated faults. Simulation plots show that system response is well damped. The damping ratios in Table 12- were calculated using Modal Analysis in the PSS/E plotting program (PSSPLT). The damping ratios shown in Table 12- are all above 5%. In general, damping ratios above 5% are indicative of adequate damping in the system.

Figure 2-9 to Figure 2-11 show the responses of PID-237 project and nearby generating units (Baxter Wilson, Grand Gulf) following Fault_08a. These plots indicate a well damped system response.

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

- Three-phase fault or single-line-ground fault with normal clearing resulting in the loss of a single component (generator, transmission circuit or transformer) or a loss of a single component without fault:
  Not to exceed 20% for more than 20 cycles at any bus
  Not to exceed 25% at any load bus
  Not to exceed 30% at any non-load bus

- Three-phase faults with normal clearing resulting in the loss of two or more components (generator, transmission circuit or transformer), and SLG fault with delayed clearing resulting 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 are not applicable for three-phase stuck-breaker faults unless the determined impact is extremely widespread.

The voltages at all buses in the PID-237 project area (115kV and above) were monitored during each of the fault cases as appropriate. No voltage criteria violations were observed following normally cleared three-phase faults.

As there is no specific voltage dip criteria for three-phase stuck breaker faults, the results of these faults were compared with the most stringent voltage dip criteria i.e., not to exceed 20% for more than 20 cycles. No voltage criteria violations were observed.

Table 12-2: Result of Stability Analysis

FAULT	Result	Damping
Fault_01	STABLE	---
Fault_01a	STABLE	---
Fault_02	STABLE	---
Fault_02a	STABLE	---
Fault_02b	STABLE	---
Fault_03	STABLE	---
Fault_03a	STABLE	---
Fault_04	STABLE	---
Fault_04a	STABLE	---
Fault_05	STABLE	---
Fault_05a	STABLE	---
Fault_06	STABLE	---
Fault_07	STABLE	---
Fault_07a	STABLE	---
Fault_08	STABLE	---
Fault_08a	STABLE	9.31%
Fault_09	STABLE	6.79%
Fault_09a	STABLE	6.10%
Fault_09b	STABLE	5.22%
Fault_10	STABLE	---
Fault_10a	STABLE	8.60%
Fault_11	STABLE	---
Fault_11a	STABLE	---
Fault_12	STABLE	---
Fault_12a	STABLE	---
Fault_13	STABLE	---
Fault_13a	STABLE	---
Fault_14	STABLE	6.22%

Figure 12-9: PID-237 GT1 Responses Following Fault_08a
(Exciter Model for B,Wilson Unit #1: "IEEX2A")

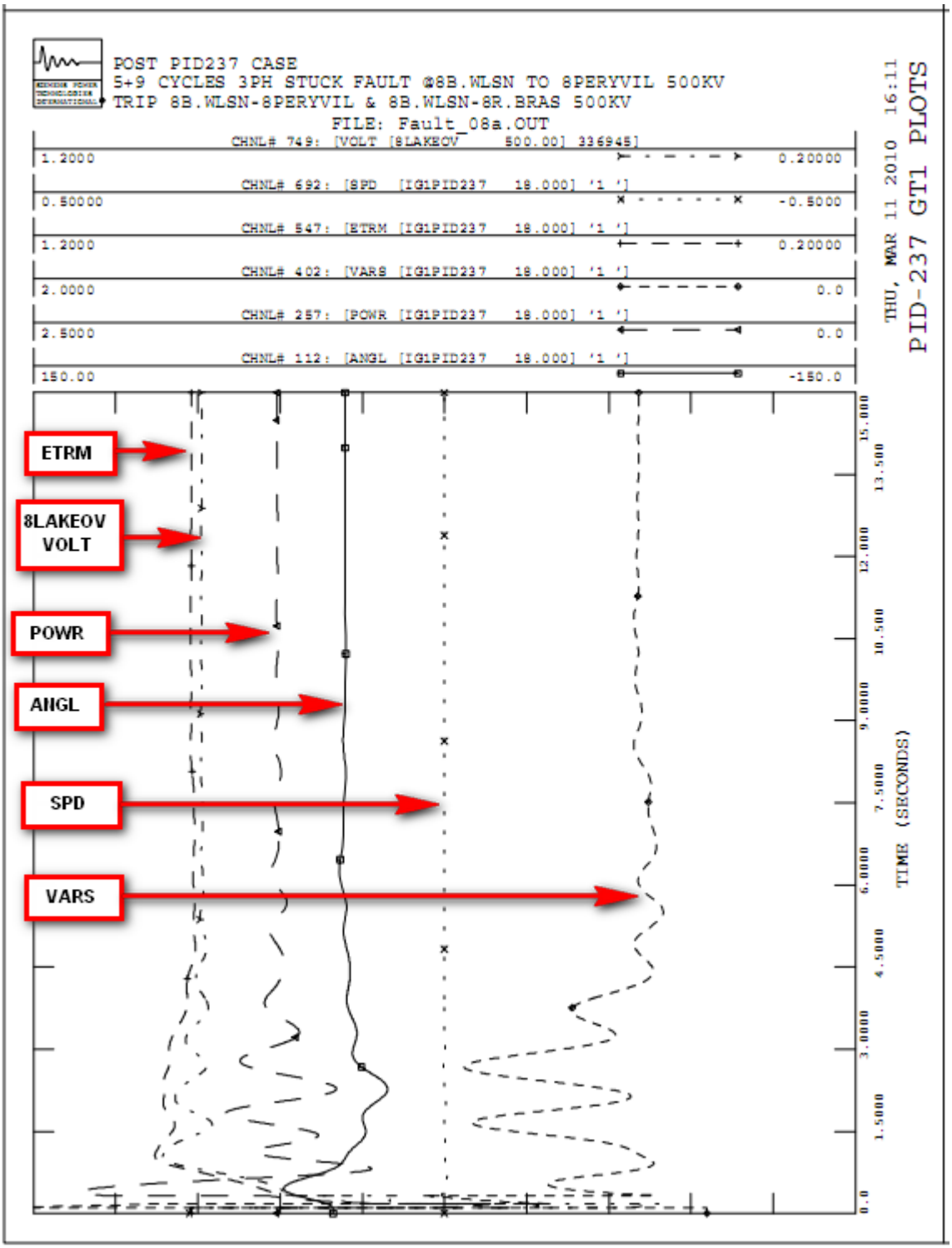


Figure 12-10: PID-237 ST Responses Following Fault_08a
(Exciter Model for B,Wilson Unit #1: "IEEX2A")

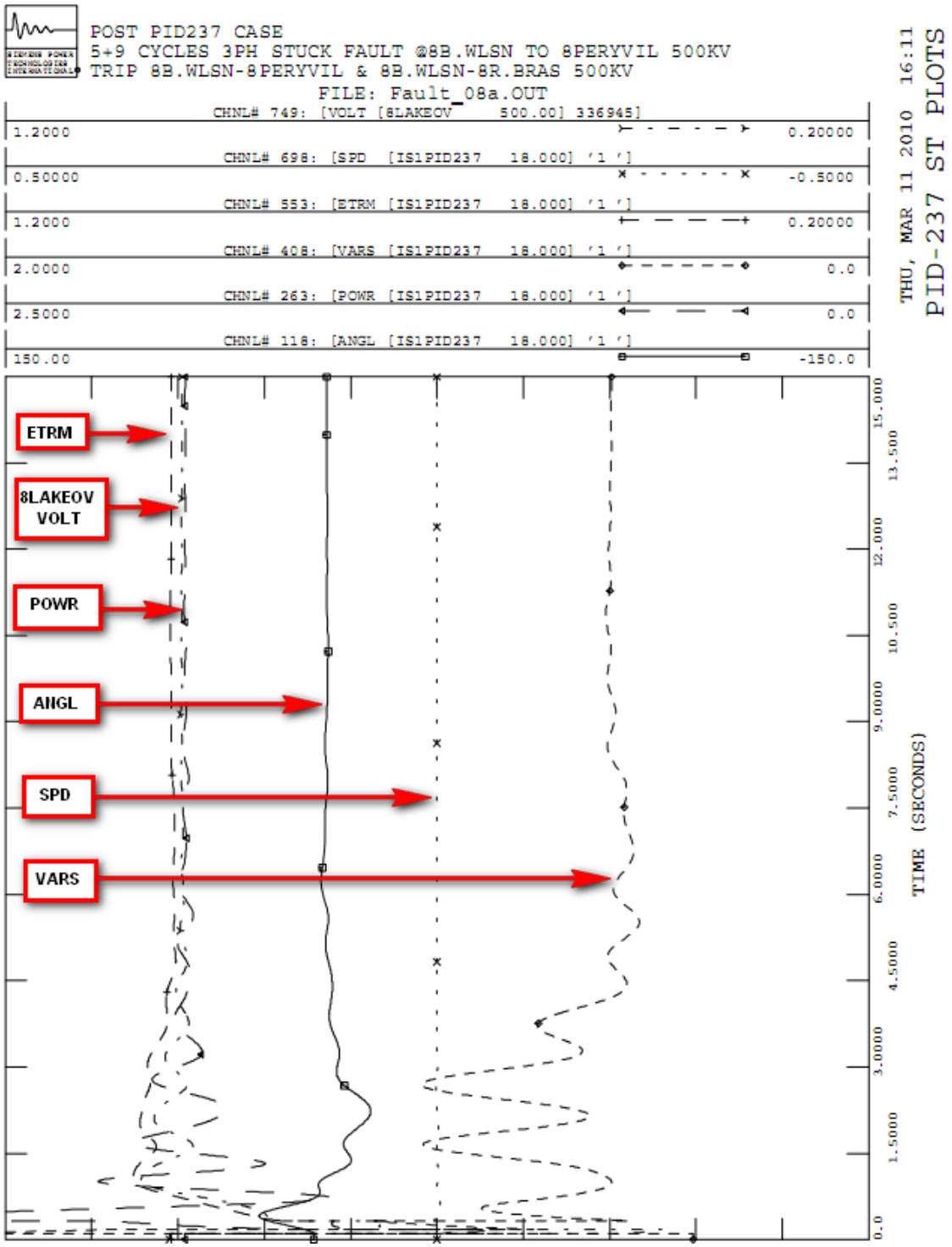
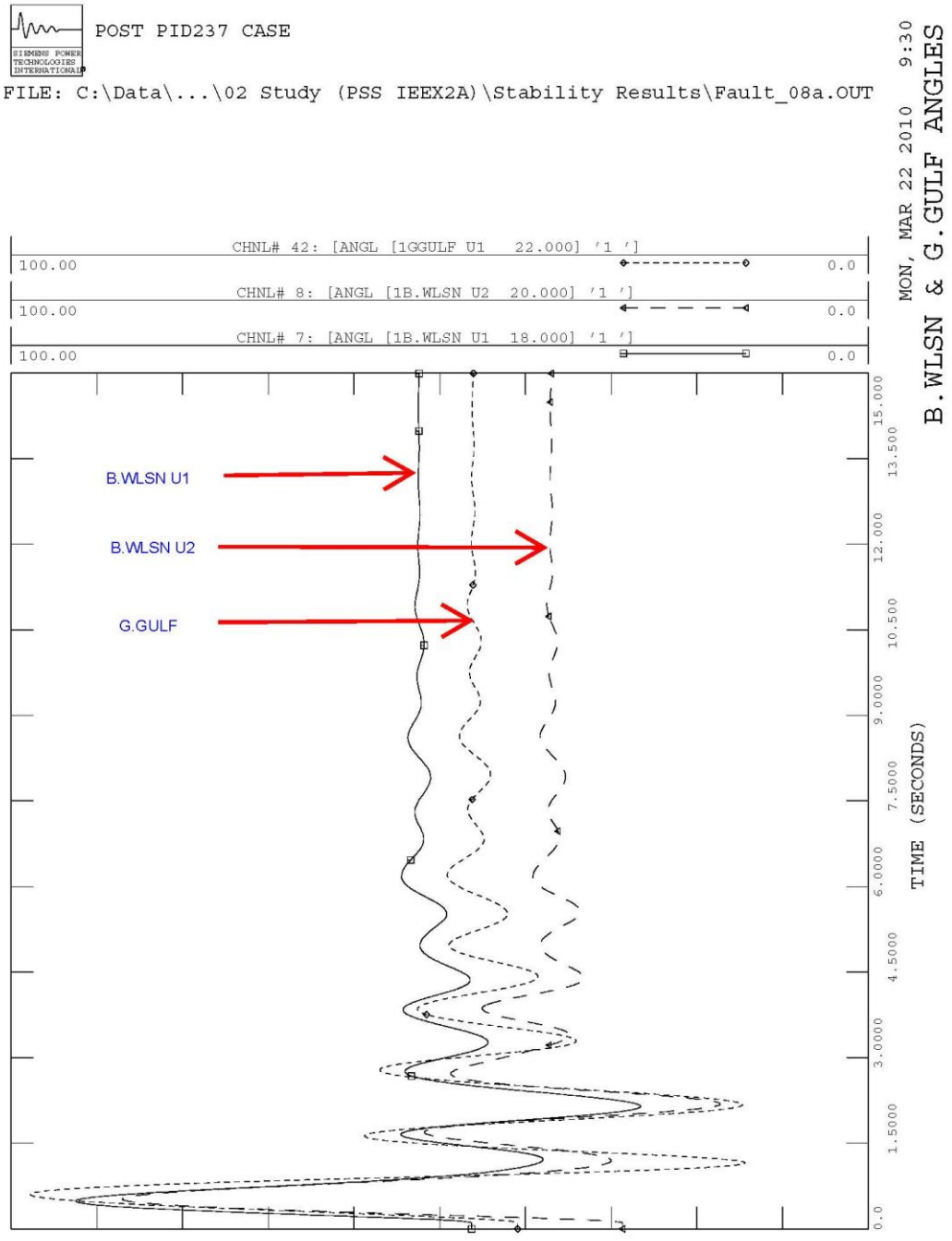


Figure 12-11: B.Wilson and G.Gulf Angle Responses Following Fault_08a (Exciter Model for B,Wilson Unit #1: "IEEX2A")



13. CONCLUSIONS

Based on the results of stability analysis, it can be concluded that interconnection of the proposed PID-237 (550MW) project at the Lakeover 500kV substation does not adversely impact the stability of the Entergy System in the local area. Results indicate that the system is stable following all simulated three-phase normally cleared and stuck-breaker faults. Also, no voltage criteria violations were observed following these faults.

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

APPENDIX A: DATA PROVIDED BY CUSTOMER

APPENDIX A.1 - GTG1 and GSU Data

Attachment A to Appendix 1
Interconnection Request

LARGE GENERATING FACILITY DATA

UNIT RATINGS

kVA 207,800 °F 104 Voltage 18,000
Power Factor 0.85
Speed (RPM) 3,600 Connection (e.g. Wye) Wye
Short Circuit Ratio 0.55 Frequency, Hertz 60
Stator Amperes at Rated kVA 6,665 Field Volts 295
Max Turbine MW 163 °F 68

COMBINED TURBINE-GENERATOR-EXCITER INERTIA DATA

Inertia Constant, H = 5.36 kW sec/kVA
Moment-of-Inertia, WR^2 = -- lb. $ft.^2$

REACTANCE DATA (PER UNIT-RATED KVA)

		DIRECT AXIS		QUADRATURE AXIS
Synchronous – saturated	X_{dv}	1.90	X_{qv}	1.813
Synchronous – unsaturated	X_{di}	1.90	X_{qi}	1.813
Transient – saturated	X'_{dv}	0.211	X'_{qv}	0.461
Transient – unsaturated	X'_{di}	0.286	X'_{qi}	0.461
Subtransient – saturated	X''_{dv}	0.147	X''_{qv}	0.143
Subtransient – unsaturated	X''_{di}	0.203	X''_{qi}	0.196
Negative Sequence – saturated	$X2_v$	0.141		
Negative Sequence – unsaturated	$X2_i$	0.193		
Zero Sequence – saturated	$X0_v$	0.095		
Zero Sequence – unsaturated	$X0_i$	0.125		
Leakage Reactance	Xl_m	0.168		

FIELD TIME CONSTANT DATA (SEC)

Open Circuit	T'_{do}	4.767	T'_{qo}	0.393
Three-Phase Short Circuit Transient	T'_{d3}	0.530	T'_{q}	0.393
Line to Line Short Circuit Transient	T'_{d2}	0.822		
Line to Neutral Short Circuit Transient	T'_{d1}	0.997		
Short Circuit Subtransient	T''_{d}	0.023	T''_{q}	0.023
Open Circuit Subtransient	T''_{do}	0.033	T''_{qo}	0.074

ARMATURE TIME CONSTANT DATA (SEC)

Three Phase Short Circuit	T_{a3}	0.349
Line to Line Short Circuit	T_{a2}	0.349
Line to Neutral Short Circuit	T_{a1}	0.311

NOTE: If requested information is not applicable, indicate by marking "N/A."

MW CAPABILITY AND PLANT CONFIGURATION
LARGE GENERATING FACILITY DATA

ARMATURE WINDING RESISTANCE DATA (PER UNIT)

Positive	R_1	0.003
Negative	R_2	0.013
Zero	R_0	0.007

Rotor Short Time Thermal Capacity I_2^2t = 10

Field Current at Rated kVA, Armature Voltage and PF = 1,482.2 amps

Field Current at Rated kVA and Armature Voltage, 0 PF = 1,728.2 amps

Three Phase Armature Winding Capacitance = 1.103 microfarad

Field Winding Resistance = 0.199 ohms 125 °C

Armature Winding Resistance (Per Phase) = 0.00167 ohms 100 °C

CURVES

Provide Saturation, Vee, Reactive Capability, Capacity Temperature Correction curves.
Designate normal and emergency Hydrogen Pressure operating range for multiple curves.

GENERATOR STEP-UP TRANSFORMER DATA RATINGS

Capacity (Self-cooled/Maximum Nameplate)

116 / 193 kVA

Voltage Ratio(Generator Side/System side/Tertiary)

18 / 236 / N/A / / kV

Winding Connections (Low V/High V/Tertiary V (Delta or Wye))

18 kV (Delta) / 236 kV (Wye) / --

Fixed Taps Available 224.2 / 230.1 / 236 / 241.9 / 247.8 kV

Present Tap Setting 236 kV

IMPEDANCE

Positive Z_1 (on self-cooled kVA rating) 0.234 +j 9.827 % -- X/R

Zero Z_0 (on self-cooled kVA rating) 0.234 +j 9.827 % -- X/R

APPENDIX A.2 - GTG2 and GSU Data

Attachment A to Appendix 1
Interconnection Request

LARGE GENERATING FACILITY DATA

UNIT RATINGS

kVA 207,800 °F 104 Voltage 18,000
Power Factor 0.85
Speed (RPM) 3,600 Connection (e.g. Wye) Wye
Short Circuit Ratio 0.55 Frequency, Hertz 60
Stator Amperes at Rated kVA 6,665 Field Volts 295
Max Turbine MW 165 °F 68

COMBINED TURBINE-GENERATOR-EXCITER INERTIA DATA

Inertia Constant, H = 5.36 kW sec/kVA
Moment-of-Inertia, WR^2 = -- lb. ft.^{2}

REACTANCE DATA (PER UNIT-RATED KVA)

		DIRECT AXIS		QUADRATURE AXIS
Synchronous – saturated	X_{dv}	1.90	X_{qv}	1.813
Synchronous – unsaturated	X_{di}	1.90	X_{qi}	1.813
Transient – saturated	X'_{dv}	0.211	X'_{qv}	0.461
Transient – unsaturated	X'_{di}	0.286	X'_{qi}	0.461
Subtransient – saturated	X''_{dv}	0.147	X''_{qv}	0.143
Subtransient – unsaturated	X''_{di}	0.203	X''_{qi}	0.196
Negative Sequence – saturated	$X2_v$	0.141		
Negative Sequence – unsaturated	$X2_i$	0.193		
Zero Sequence – saturated	$X0_v$	0.095		
Zero Sequence – unsaturated	$X0_i$	0.125		
Leakage Reactance	Xl_m	0.168		

FIELD TIME CONSTANT DATA (SEC)

Open Circuit	T'_{do}	4.767	T'_{qo}	0.393
Three-Phase Short Circuit Transient	T'_{d3}	0.530	T'_{q}	0.393
Line to Line Short Circuit Transient	T'_{d2}	0.822		
Line to Neutral Short Circuit Transient	T'_{d1}	0.997		
Short Circuit Subtransient	T''_{d}	0.023	T''_{q}	0.023
Open Circuit Subtransient	T''_{do}	0.033	T''_{qo}	0.074

ARMATURE TIME CONSTANT DATA (SEC)

Three Phase Short Circuit	T_{a3}	0.349
Line to Line Short Circuit	T_{a2}	0.349
Line to Neutral Short Circuit	T_{a1}	0.311

NOTE: If requested information is not applicable, indicate by marking "N/A."

MW CAPABILITY AND PLANT CONFIGURATION
LARGE GENERATING FACILITY DATA

ARMATURE WINDING RESISTANCE DATA (PER UNIT)

Positive	R_1	0.003
Negative	R_2	0.013
Zero	R_0	0.007

Rotor Short Time Thermal Capacity I_2^2t = 10

Field Current at Rated kVA, Armature Voltage and PF = 1,482.2 amps

Field Current at Rated kVA and Armature Voltage, 0 PF = 1,728.2 amps

Three Phase Armature Winding Capacitance = 1.103 microfarad

Field Winding Resistance = 0.199 ohms 125 °C

Armature Winding Resistance (Per Phase) = 0.00167 ohms 100 °C

CURVES

Provide Saturation, Vee, Reactive Capability, Capacity Temperature Correction curves.
Designate normal and emergency Hydrogen Pressure operating range for multiple curves.

GENERATOR STEP-UP TRANSFORMER DATA RATINGS

Capacity (Self-cooled/Maximum Nameplate)

116 / 193 kVA

Voltage Ratio(Generator Side/System side/Tertiary)

18 / 236 / N/A kV

Winding Connections (Low V/High V/Tertiary V (Delta or Wye))

18 kV (Delta) / 236 kV (Wye) / --

Fixed Taps Available 224.2 / 230.1 / 236 / 241.9 / 247.8 kV

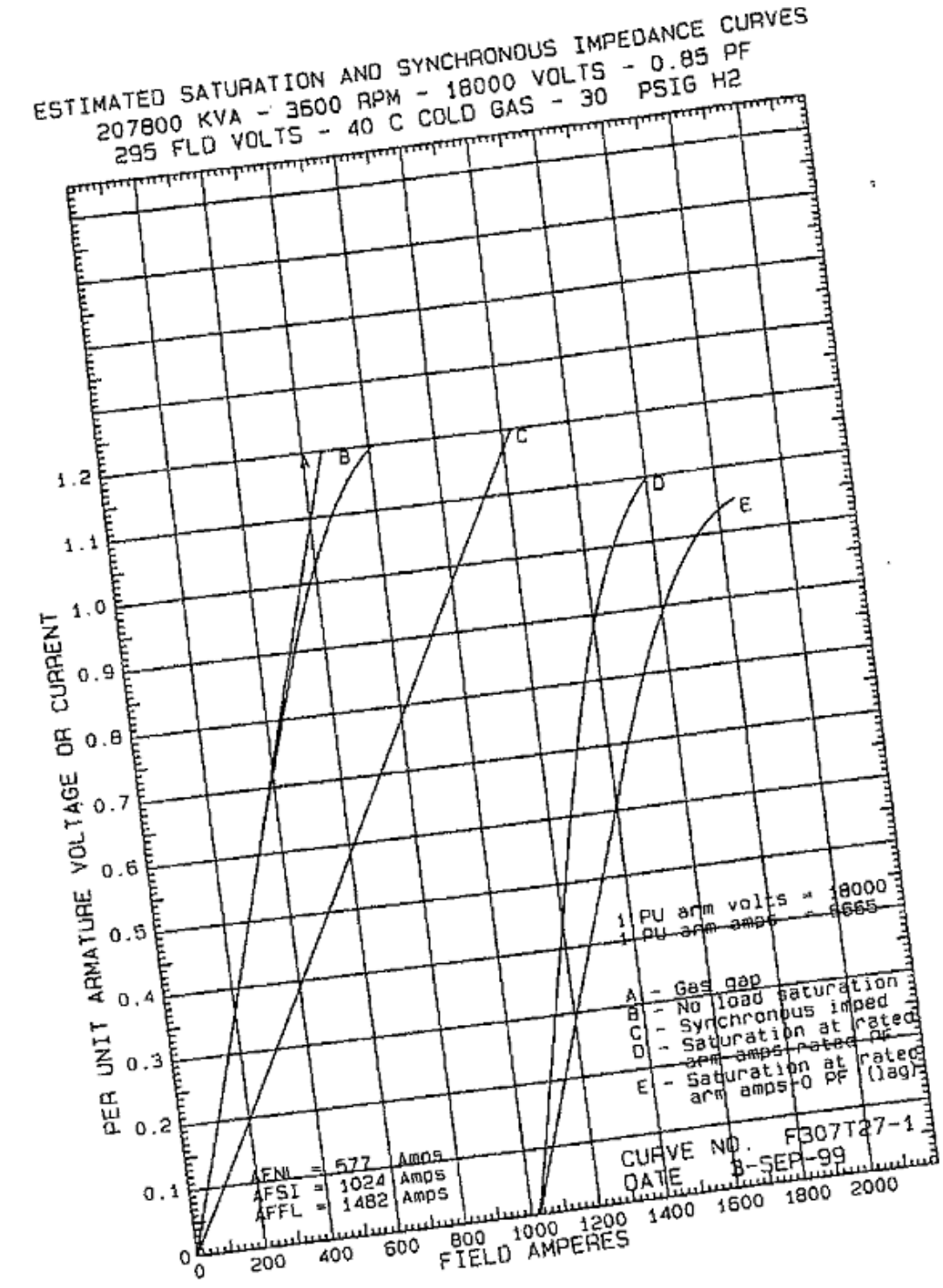
Present Tap Setting 236 kV

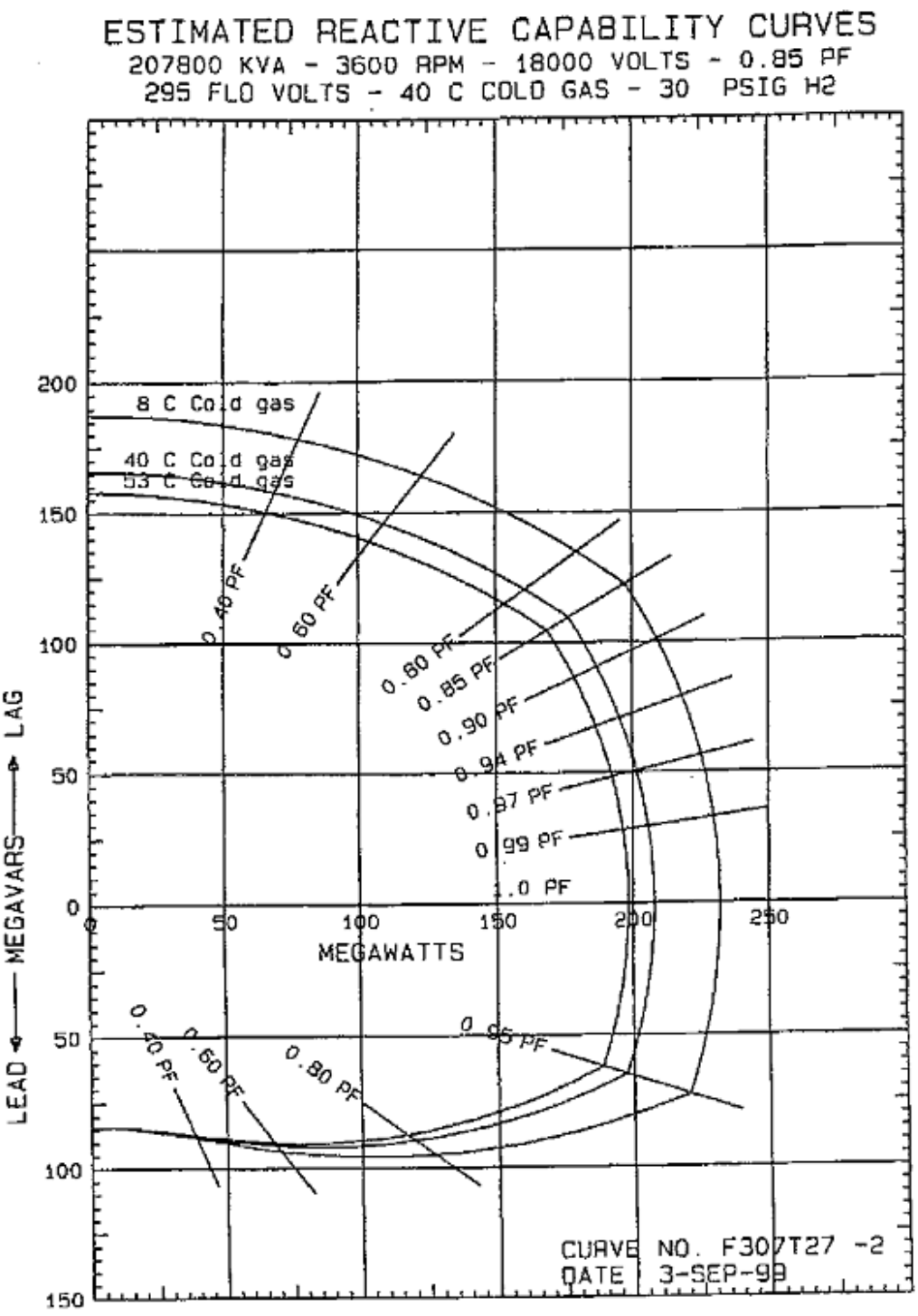
IMPEDANCE

Positive Z_1 (on self-cooled kVA rating) 0.234 +j 9.86 % -- X/R

Zero Z_0 (on self-cooled kVA rating) 0.234 +j 9.86 % -- X/R

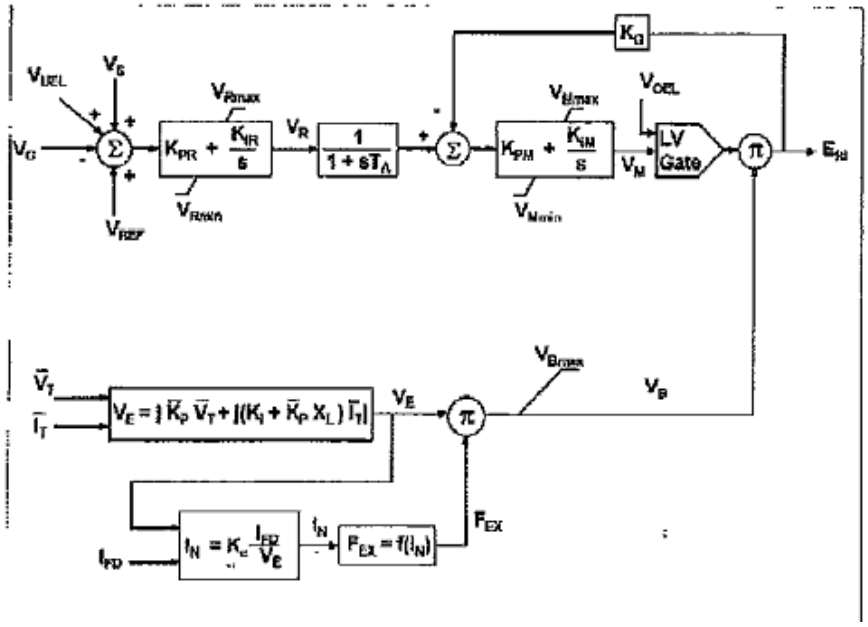
APPENDIX A.3 - GTG Curves




ESTIMATED REACTIVE CAPABILITY CURVES
207800 KVA - 3600 RPM - 18000 VOLTS - 0.85 PF
295 FLD VOLTS - 40 C COLD GAS - 30 PSIG H2
8 C Cold gas
40 C Cold gas
53 C Cold gas
0.40 PF
0.60 PF
0.80 PF
0.85 PF
0.90 PF
0.94 PF
0.97 PF
0.99 PF
1.0 PF
0.95 PF
MEGAWATTS
LEAD ← MEGAVARS → LAG
CURVE NO. F307T27 -2
DATE 3-SEP-99

APPENDIX A.4 - GTG Excitation System Data

Customer	Duke Energy - Hinds, MS			
unit				
Generator	337X116, 117			
Design	F307T27	741 (7FH2)		
MVA Rating	207.8		KV Rating	18
RPM	3600		PF	0.85
SCR	0.55		H2PSI	30
Volts DC	295		RFG at 100 C	0.1853
AFAG amps	549		AFFL amps	1482
	EX2000 Busfed Exciter Model Parameters			
IEEE ST4B Model Format		Exciter Nominal Response at rated input		2.0
TR	0		KC	0.08
KPR	3.97		KIR	3.97
VRMAX	1.00		VRMIN	-0.87
TA	0.01		KG	0
KPM	1.00		KIM	0
VMMAX	1.00		VMIMIN	-0.87
KP	5.04		KI	0
VBMAX	6.30		XL	0

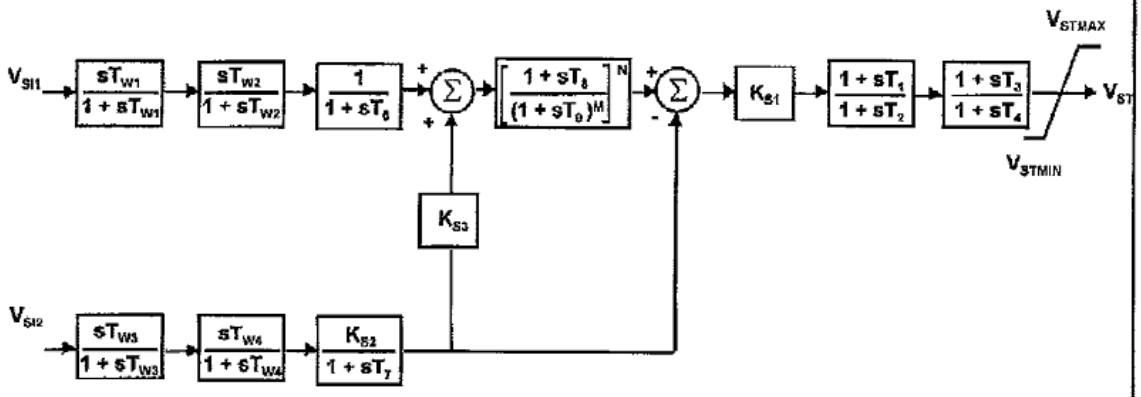


Typical Power System Stabilizer Model
Utilizing Speed Plus Power Input

Customer = Duke Energy – Hinds, MS
Generator: 337X116, 117
Generator Design: F307T27
Exciter Type: Busfed Exciter with EX2000 Digital Controls

IEEE Model Type PSS2A			
T1 = 0.15 @	T2 = 0.03 @	T3 =0.15 @	T4 = 0.03 @
KS1 = 30 @	VSTmax = 0.1	VSTmin = -0.1	
TW1 = 2	TW2 = 2	T6 = 0	
TW3 = 2	TW4 = 0	T7 = 2	KS2 = 0.15
KS3 = 1.0	T8 = 0.5	T9 = 0.1	
M = 5		N = 1	
VSI1 = Speed(pu)		VSI2 = PE(pu) (Electrical Power)	

@ = Use field settings. Optimum settings can be provided at extra cost.



IEEE Type PSS2A Dual Input Stabilizer Model

APPENDIX A.5 - GTG Governor System Data

GE PSLF **ggov1** governor/turbine model parameters for 7241 Gas Turbine Units.

Parameter	Value[1]
MWCAP	166.0
r	0.04
rselect	1
T_{pelec} (sec)	1.0
Max_{ERR} (pu)	0.05
Min_{ERR} (pu)	-0.05
K_{PGOV}	10.0
K_{IGOV}	2.0
K_{DGOV}	0.0
T_{DGOV} (sec)	1.0
V_{MAX}	1.0
V_{MIN}	0.15
T_{ACT} (sec)	0.5
K_{TURB}	1.5
W_{FNL}	0.2
T_B (sec)	0.1
T_C (sec)	0.0
flag	1.0
T_{ENG} (sec)	0.0
T_{FLOAD} (sec)	3.0
K_{PLOAD}	2.0
K_{ILOAD}	0.67

GE PSLF **ggov1** governor/turbine model parameters for 7241 Gas Turbine Units

Parameter	**Value**
L_{DREF}	1.0^2
D_M	0.0
R_{OPEN} (pu/sec)	0.10
R_{CLOSE} (pu/sec)	-0.1
K_{IMW}	0.0
P_{MWSET} (pu)	N/A
A_{SET} (pu)	0.01
K_A (pu)	10.0
T_A (sec)	0.1
db (pu)	0.0
T_{SA} (sec)	4.0
T_{SB} (sec)	5.0
R_{UP} (pu)	99.0
R_{DOWN} (pu)	-99.0
T_{LLN} (sec)	0.0
T_{LLD} (sec)	0.0

APPENDIX A.6 - STG and GSU Data

Attachment A to Appendix 1
Interconnection Request

LARGE GENERATING FACILITY DATA

UNIT RATINGS

kVA 233,000 °F 104 Voltage 18,000
Power Factor 0.85
Speed (RPM) 3,600 Connection (e.g. Wye) Wye
Short Circuit Ratio 0.49 Frequency, Hertz 60
Stator Amperes at Rated kVA 7,473 Field Volts 320
Max Turbine MW 168.5 °F 68

COMBINED TURBINE-GENERATOR-EXCITER INERTIA DATA

Inertia Constant, H = 4.17 kW sec/kVA
Moment-of-Inertia, WR^2 = -- lb. $ft.^2$

REACTANCE DATA (PER UNIT-RATED KVA)

	DIRECT AXIS		QUADRATURE AXIS	
Synchronous – saturated	X_{dv}	2.130	X_{qv}	2.033
Synchronous – unsaturated	X_{di}	2.130	X_{qi}	2.033
Transient – saturated	X'_{dv}	0.237	X'_{qv}	0.496
Transient – unsaturated	X'_{di}	0.321	X'_{qi}	0.496
Subtransient – saturated	X''_{dv}	0.165	X''_{qv}	0.161
Subtransient – unsaturated	X''_{di}	0.227	X''_{qi}	0.219
Negative Sequence – saturated	$X2_v$	0.158		
Negative Sequence – unsaturated	$X2_i$	0.216		
Zero Sequence – saturated	$X0_v$	0.106		
Zero Sequence – unsaturated	$X0_i$	0.140		
Leakage Reactance	Xl_m	0.188		

FIELD TIME CONSTANT DATA (SEC)

Open Circuit	T'_{do}	4.767	T'_{qo}	0.408
Three-Phase Short Circuit Transient	T'_{d3}	0.530	T'_{q}	0.408
Line to Line Short Circuit Transient	T'_{d2}	0.822		
Line to Neutral Short Circuit Transient	T'_{d1}	0.997		
Short Circuit Subtransient	T''_{d}	0.023	T''_{q}	0.023
Open Circuit Subtransient	T''_{do}	0.033	T''_{qo}	0.071

ARMATURE TIME CONSTANT DATA (SEC)

Three Phase Short Circuit	T_{a3}	0.349
Line to Line Short Circuit	T_{a2}	0.349
Line to Neutral Short Circuit	T_{a1}	0.311

NOTE: If requested information is not applicable, indicate by marking "N/A."

MW CAPABILITY AND PLANT CONFIGURATION
LARGE GENERATING FACILITY DATA

ARMATURE WINDING RESISTANCE DATA (PER UNIT)

Positive	R_1	0.004
Negative	R_2	0.014
Zero	R_0	0.007

Rotor Short Time Thermal Capacity I_2^2t = 10

Field Current at Rated kVA, Armature Voltage and PF = 1,611.6 amps

Field Current at Rated kVA and Armature Voltage, 0 PF = 1,885.3 amps

Three Phase Armature Winding Capacitance = 1.103 microfarad

Field Winding Resistance = 0.199 ohms 125 °C

Armature Winding Resistance (Per Phase) = 0.00167 ohms 100 °C

CURVES

Provide Saturation, Vee, Reactive Capability, Capacity Temperature Correction curves. Designate normal and emergency Hydrogen Pressure operating range for multiple curves.

GENERATOR STEP-UP TRANSFORMER DATA RATINGS

Capacity (Self-cooled/Maximum Nameplate)

134 / 223 kVA

Voltage Ratio(Generator Side/System side/Tertiary)

18 / 236 / N/A / / kV

Winding Connections (Low V/High V/Tertiary V (Delta or Wye))

18 kV (Delta) / 236 kV (Wye) / --

Fixed Taps Available 224.2 / 230.1 / 236 / 241.9 / 247.8 kV

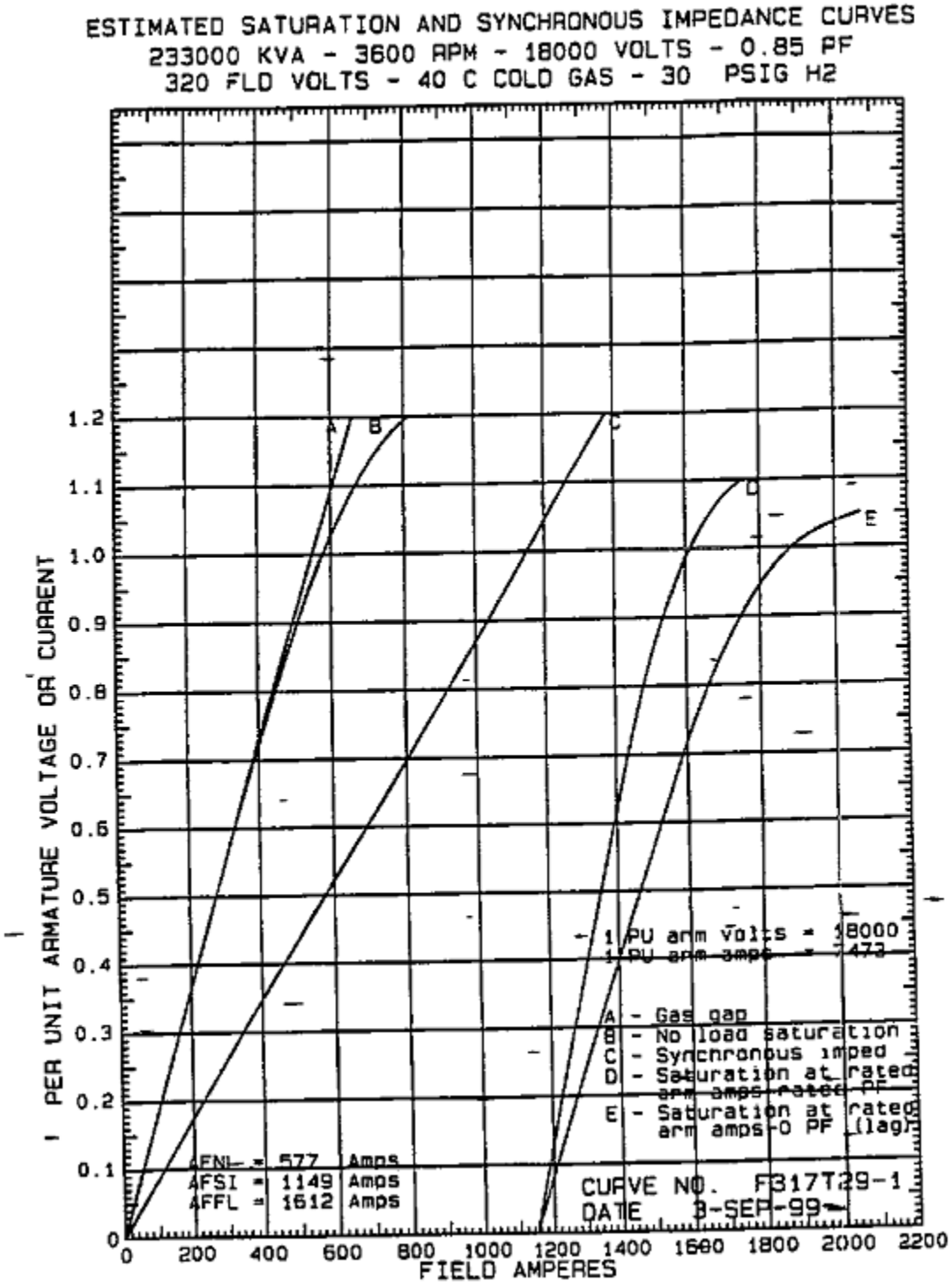
Present Tap Setting 236 kV

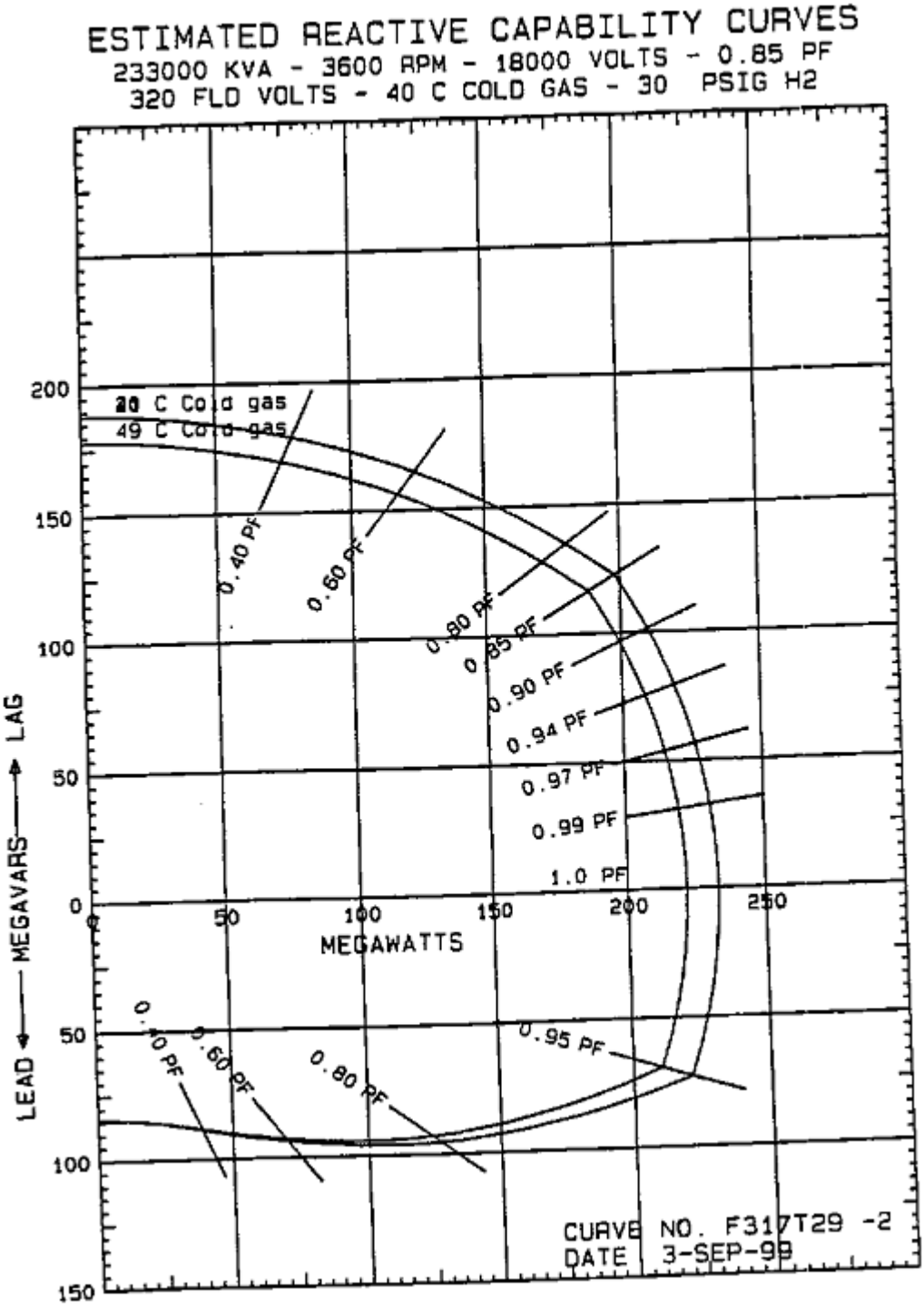
IMPEDANCE

Positive Z_1 (on self-cooled kVA rating) 0.237 +j 9.96 % -- X/R

Zero Z_0 (on self-cooled kVA rating) 0.237 +j 9.96 % -- X/R

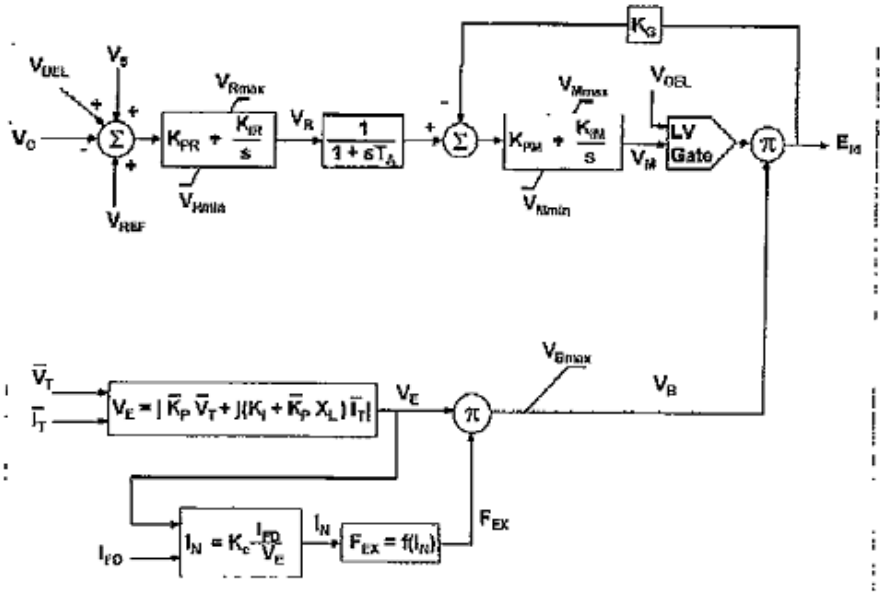
APPENDIX A.7 - STG Curves




ESTIMATED REACTIVE CAPABILITY CURVES
233000 KVA - 3600 RPM - 18000 VOLTS - 0.85 PF
320 FLD VOLTS - 40 C COLD GAS - 30 PSIG H2
40 C Cold gas
49 C Cold gas
0.40 PF
0.60 PF
0.80 PF
0.85 PF
0.90 PF
0.94 PF
0.97 PF
0.99 PF
1.0 PF
0.95 PF
0.80 PF
0.60 PF
0.40 PF
LEAD ← MEGAVARS → LAG
MEGAWATTS
200
150
100
50
0
50
100
150
200
250
CURVE NO. F317T29 -2
DATE 3-SEP-99

APPENDIX A.8 - STG Excitation System Data

Customer	Duke Energy - Hinds, MS		
unit			
Generator	290T453		
Design	F317T29 743 (7FH2)		
MVA Rating	233	KV Rating	18
RPM	3600	PF	0.85
SCR	0.49	H2PSI	30
Volts DC	320	RFG at 100 C	0.1853
AFAG amps	549	AFFL amps	1612
	EX2000 Busfed Exciter Model Parameters		
IEEE ST4B Model Format		Exciter Nominal Response at rated input	2.0
TR	0	KC	0.08
KPR	3.14	KIR	3.14
VRMAX	1.00	VRMIN	-0.87
TA	0.01	KG	0
KPM	1.00	KIM	0
VMMAX	1.00	VMIMIN	-0.87
KP	6.37	KI	0
VBMAX	7.96	XL	0

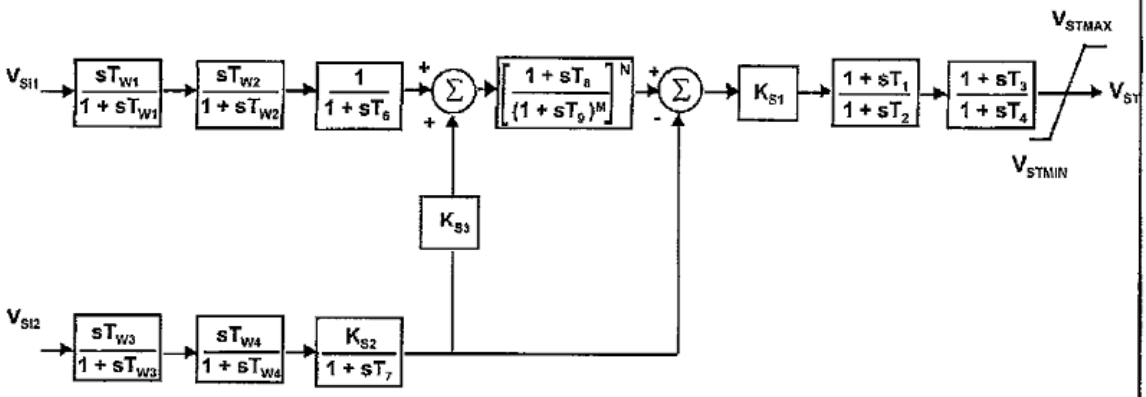


Typical Power System Stabilizer Model
Utilizing Speed Plus Power Input

Customer = Duke Energy – Hinds, MS
Generator: 290T453
Generator Design: F317T29
Exciter Type: Busfed Exciter with EX2000 Digital Controls

IEEE Model Type PSS2A			
T1 = 0.15 @	T2 = 0.03 @	T3 =0.15 @	T4 = 0.03 @
KS1 = 30 @	VSTmax = 0.1	VSTmin = -0.1	
TW1 = 2	TW2 = 2	T6 = 0	
TW3 = 2	TW4 = 0	T7 = 2	KS2 = 0.24
KS3 = 1.0	T8 = 0.5	T9 = 0.1	
M = 5		N = 1	
VSI1 = Speed(pu)		VSI2 = PE(pu) (Electrical Power)	

@ = Use field settings. Optimum settings can be provided at extra cost.



IEEE Type PSS2A Dual Input Stabilizer Model

APPENDIX B: POWER FLOW AND STABILITY DATA

Following data is presented in PSS/E VER 30.3.3 format

Powerflow Data

POST PID237 CASE

CASE C:\Data\Projects\Southwest Power Pool\E4344-PID-237 Impact study\02 Study (PSS IEEX2A)\Post_PID237.sav WAS SAVED ON WED, MAR 17 2010 10:46

0, 100.00 / PSS/E-30.3 MON, MAR 22 2010 9:27

POST PID237 CASE
399851,'IG1PID237 ', 18.0000,2, 0.000, 0.000, 351, 154,1.00819, -22.6824, 1
399853,'IG2PID237 ', 18.0000,2, 0.000, 0.000, 351, 154,1.00822, -22.6535, 1
399854,'IS1PID237 ', 18.0000,2, 0.000, 0.000, 351, 154,1.00804, -22.7931, 1
0 / END OF BUS DATA, BEGIN LOAD DATA
0 / END OF LOAD DATA, BEGIN GENERATOR DATA
399851,'1 ', 176.000, 36.112, 120.000, -75.000,1.01000,336945, 207.800, 0.00300, 0.19950, 0.00000, 0.00000,1.00000,1, 32.0, 176.600, 0.000, 1,1.0000
399853,'1 ', 176.000, 36.112, 120.000, -75.000,1.01000,336945, 207.800, 0.00300, 0.19950, 0.00000, 0.00000,1.00000,1, 32.0, 176.600, 0.000, 1,1.0000
399854,'1 ', 198.000, 40.626, 120.000, -75.000,1.01000,336945, 233.000, 0.00400, 0.22300, 0.00000, 0.00000,1.00000,1, 36.0, 198.000, 0.000, 1,1.0000
0 / END OF GENERATOR DATA, BEGIN BRANCH DATA
0 / END OF BRANCH DATA, BEGIN TRANSFORMER DATA
399851,336945, 0,'1 ',1,2,1, 0.00000, 0.00000,2,' ',1, 1,1.0000
0.00234, 0.09827, 116.00
1.00000, 0.000, 0.000, 193.00, 193.00, 0.00, 0, 0, 1.50000, 0.51000, 1.50000, 0.51000, 159, 0, 0.00000, 0.00000
1.02500, 0.000
399853,336945, 0,'1 ',1,2,1, 0.00000, 0.00000,2,' ',1, 1,1.0000
0.00234, 0.09860, 116.00
1.00000, 0.000, 0.000, 193.00, 193.00, 0.00, 0, 0, 1.50000, 0.51000, 1.50000, 0.51000, 159, 0, 0.00000, 0.00000
1.02500, 0.000
399854,336945, 0,'1 ',1,2,1, 0.00000, 0.00000,2,' ',1, 1,1.0000
0.00237, 0.09960, 134.00
1.00000, 0.000, 0.000, 223.00, 223.00, 0.00, 0, 0, 1.50000, 0.51000, 1.50000, 0.51000, 159, 0, 0.00000, 0.00000
1.02500, 0.000
0 / END OF TRANSFORMER DATA, BEGIN AREA DATA
0 / END OF AREA DATA, BEGIN TWO-TERMINAL DC DATA
0 / END OF TWO-TERMINAL DC DATA, BEGIN VSC DC LINE DATA
0 / END OF VSC DC LINE DATA, BEGIN SWITCHED SHUNT DATA
0 / END OF SWITCHED SHUNT DATA, BEGIN IMPEDANCE CORRECTION DATA
0 / END OF IMPEDANCE CORRECTION DATA, BEGIN MULTI-TERMINAL DC DATA
0 / END OF MULTI-TERMINAL DC DATA, BEGIN MULTI-SECTION LINE DATA
0 / END OF MULTI-SECTION LINE DATA, BEGIN ZONE DATA
0 / END OF ZONE DATA, BEGIN INTER-AREA TRANSFER DATA
0 / END OF INTER-AREA TRANSFER DATA, BEGIN OWNER DATA

0 / END OF OWNER DATA, BEGIN FACTS DEVICE DATA
0 / END OF FACTS DEVICE DATA

Dynamics Data

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS/E THU, MAR 04 2010 9:01

POST PID237 CASE

PLANT MODELS

REPORT FOR ALL MODELS BUS 399851 [IG1PID237 18.000] MODELS

** GENROU ** BUS X-- NAME --X BASEKV MC C O N S S T A T E S
399851 IG1PID237 18.000 1 130764-130777 51178-51183

MBASE Z S O R C E X T R A N GENTAP
207.8 0.00300+J 0.19950 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
4.77 0.033 0.39 0.074 5.36 0.00 1.9000 1.8130 0.2860 0.4610 0.1995 0.1680

S(1.0) S(1.2)
0.0556 0.2121

** PSS2A ** BUS X-- NAME --X BASEKV MC C O N S S T A T E S V A R S I C O N S
399851 IG1PID237 18.000 1 130806-130822 51196-51211 8253-8256 4255-4260

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

TW1 TW2 T6 TW3 TW4 T7 KS2 KS3
2.000 2.000 0.000 2.000 0.000 2.000 0.150 1.000

T8 T9 KS1 T1 T2 T3 T4 VSTMAX VSTMIN
0.500 0.100 30.000 0.150 0.030 0.150 0.030 0.100 -0.100

** ESST4B ** BUS X-- NAME --X BASEKV MC C O N S S T A T E S
399851 IG1PID237 18.000 1 130857-130873 51244-51247

TR KPR KIR VRMAX VRMIN TA KPM KIM VMMAX VMMIN
0.000 3.970 3.970 1.000 -0.870 0.010 1.000 0.000 1.000 -0.870

KG KP KI VBMAX KC XL THETAP
0.000 5.040 0.000 6.300 0.080 0.0000 0.000

** GGOV1 ** BUS X-- NAME --X BASEKV MC C O N S S T A T E S V A R S ICONS
399851 IG1PID237 18.000 1 130908-130940 51256-51265 8265-8284 4273-4274

R TPELEC MAXERR MINERR KPGOV KIGOV KDGOV TDGOV VMAX VMIN
0.040 1.000 0.050 -0.050 10.000 2.000 0.000 1.000 1.000 0.150

TACT KTURB WFNL TB TC TENG TFLOAD KPLOAD KILOAD LDREF
0.500 1.500 0.200 0.100 0.000 0.000 3.000 2.000 0.670 1.000

```
  DM    ROPEN  RCLOSE    KIMW    ASET      KA     TA    TRATE    DB
0.000   0.100  -0.100   0.000   0.010  10.000   0.100 176.600   0.000

 TSA     TSB     RUP    RDOWN
4.000   5.000  99.000 -99.000


          ICON(M)= 1 (Feedback signal for governor droop)
          ICON(M+1)= 0 (Switch for fuel source characteristic)

   PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS/E      THU, MAR 04 2010   9:01

POST PID237 CASE

PLANT MODELS

REPORT FOR ALL MODELS                 BUS 399853 [IG2PID237   18.000] MODELS


** GENROU **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S
        399853 IG2PID237    18.000 1  130778-130791  51184-51189

         MBASE     Z S O R C E         X T R A N       GENTAP
         207.8  0.00300+J 0.19950  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
 4.77 0.033  0.39 0.074    5.36  0.00 1.9000 1.8130 0.2860 0.4610 0.1995 0.1680

                     S(1.0)  S(1.2)
                     0.0556  0.2121


 ** PSS2A **   BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S     V A R S      I C O N
S
        399853 IG2PID237    18.000 1  130823-130839  51212-51227    8257-8260     4261-4266

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

    TW1     TW2     T6      TW3     TW4     T7      KS2     KS3
   2.000    2.000   0.000   2.000   0.000   2.000   0.150   1.000

    T8      T9      KS1     T1      T2      T3      T4      VSTMAX   VSTMIN
   0.500    0.100   30.000   0.150   0.030   0.150   0.030   0.100   -0.100


** ESST4B **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S
        399853 IG2PID237    18.000 1  130874-130890  51248-51251

  TR    KPR     KIR     VRMAX    VRMIN    TA     KPM     KIM     VMMAX   VMMIN
 0.000   3.970   3.970   1.000  -0.870   0.010   1.000   0.000   1.000  -0.870

        KG      KP      KI   VBMAX     KC      XL     THETAP
       0.000   5.040   0.000   6.300   0.080  0.0000   0.000
```

```
 **  GGOV1 ** BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S     V A R S        ICONS
         399853 IG2PID237    18.000 1  130941-130973  51266-51275    8286-8305     4275-4276

   R    TPELEC   MAXERR  MINERR  KPGOV   KIGOV   KDGOV   TDGOV    VMAX    VMIN
 0.040   1.000   0.050  -0.050  10.000   2.000   0.000   1.000   1.000   0.150

  TACT   KTURB    WFNL     TB     TC    TENG   TFLOAD  KPLOAD   KILOAD  LDREF
 0.500   1.500   0.200   0.100   0.000   0.000   3.000   2.000   0.670   1.000

   DM    ROPEN  RCLOSE    KIMW    ASET     KA     TA    TRATE    DB
 0.000   0.100  -0.100   0.000   0.010  10.000   0.100 176.600   0.000

  TSA     TSB     RUP    RDOWN
 4.000   5.000  99.000 -99.000


           ICON(M)= 1 (Feedback signal for governor droop)
           ICON(M+1)= 0 (Switch for fuel source characteristic)

         PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS/E      WED, MAR 17 2010
10:46

 POST PID237 CASE

 PLANT MODELS

 REPORT FOR ALL MODELS                  BUS 399854 [IS1PID237   18.000] MODELS


 ** GENROU **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S
         399854 IS1PID237    18.000 1  130898-130911  51251-51256

          MBASE     Z S O R C E         X T R A N       GENTAP
          233.0  0.00400+J 0.22300  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
 4.77 0.033  0.41 0.071    4.17  0.00 2.1300 2.0330 0.3210 0.4960 0.2230 0.1880

                       S(1.0)  S(1.2)
                       0.0556  0.2462


  ** PSS2A **   BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S     V A R S      I C O N
S
         399854 IS1PID237    18.000 1  130946-130962  51289-51304    8268-8271     4283-4288

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

     TW1     TW2     T6      TW3     TW4     T7      KS2     KS3
    2.000   2.000   0.000   2.000   0.000   2.000   0.240   1.000

     T8      T9      KS1     T1      T2      T3      T4     VSTMAX   VSTMIN
    0.500   0.100  30.000   0.150   0.030   0.150   0.030   0.100   -0.100
```

** ESST4B ** BUS X-- NAME --X BASEKV MC C O N S S T A T E S
399854 IS1PID237 18.000 1 130997-131013 51313-51316

TR	KPR	KIR	VRMAX	VRMIN	TA	KPM	KIM	VMMAX	VMMIN
0.000	3.140	3.140	1.000	-0.870	0.010	1.000	0.000	1.000	-0.870

KG	KP	KI	VBMAX	KC	XL	THETAP
0.000	6.370	0.000	7.960	0.080	0.0000	0.000

APPENDIX C: PLOTS FOR STABILITY SIMULATIONS

Plots will be posted in a separate posting titled *System Impact Study Report Stability Plots*.

The plots can be viewed at the following link:

http://www.oatioasis.com/EES/EESDocs/interconnection_studies_ICT.htm

APPENDIX D: Approved Projects and Transactions in Study Mode

Year	Approved Future Projects
2010 - 2012 EAI	10CP 2009S EAI Blytheville POD - AECC Rev 1.idv 10CP 2009S EAI Conway West - Donaghey 161kV Line Reconductor.idv 10CP 2009S EAI Gillette 115kV Substation.idv 10CP 2009S EAI Hamlet 161kV Substation Rev 1.idv 10CP 2009S EAI Sarepta Project Rev 0.idv 10CP 2009W EAI Harrison East to Everton Road 161kV Line Rev 1.idv 10CP 2010S EAI AECC Avilla POD Rev 2.idv 10CP 2010S EAI Coffeeville POD - AECC Rev 0.idv 10CP 2010S EAI Melbourne - Sage 161kV Line Upgrade Line Rev 0.idv 10CP 2010S EAI Parkin to Twist 161kVLine Trap Rev 0.idv 10CP 2010S EAI Transmission Service (OG&E) Rev 0.idv 10CP 2010S EAI Warren East 115kV Substation Install Capacitor Bank Rev 1.idv 10CP 2010Z EAI Beebe 115kV Substation - Install Capacitor Bank Rev 0.idv 10CP 2010Z EAI Donaghey - Conway South 161kV Rev 1.idv 10CP 2010Z EAI SMEPA (Plum Point) Rev 1.idv 10CP 2011S EAI Osage Creek-Grandview New Line Rev 2.idv 10CP 2012S EAI Albright (HS Hamilton) Substation 2014 Load.idv 10CP 2012S EAI Cofer Road (Crawford) Substation 2014 Load Rev 0.idv 10CP 2011W EAI Transmission Service (Aquilla) Rev 0.idv 10CP 2012S EAI Westar Transmission Service Rev 0.idv rovements_PhaseII.idv
2010 - 2014 EGSL	10CP 2009S EGSL Acadia 138kV Substation capbank.idv 10CP 2010Z EGSL Addis to Cajun 230kV line upgrade.idv 10CP 2011S EGSL Acadiana Area Improvement Project Phase 1 Rev 1.idv 10CP 2011S EGSL Alchem - Monochem 138kV line upgrade.idv 10CP 2011S EGSL Construct New Youngsville 138kV Sub (run AAIP 1 first).idv 10CP 2012S EGSL Acadiana Area Improvement Project Phase 2 (run AAIP 1 first).idv 10CP 2012S EGSL Construct new Nelson to Moss Bluff 230kV line.idv 10CP 2012S EGSL Tejac to Marydale Upgrade 69kV line.idv 10CP 2012S EGSLELL Loblolly-Hammond Build 230kV Line.idv 10CP 2014S Gulf Oxygen Load Correction.idv
2010 - 2013 ELL	10CP 2009W ELLN Delhi 115kV Substation - Add Cap Bank.idv 10CP 2010W ELLN Delhi 115kV Substation - Add series reactor.idv 10CP 2010Z ELLS Bogalusa to Adams Creek 230kV No 2.idv 10CP 2010Z ELLS Snakefarm to Kenner 115kV line upgrade.idv 10CP 2011S ELLN Sarepta Project.idv 10CP 2012S ELLS Bayou LaBoutte Construct new 500-230kV Substation.idv 10CP 2012 ELLN Ouachita Project Set 2 Run Second.idv 10CP 2013S ELLN Ouachita Projects Set 1 Run First.idv
2010 - 2012 EMI	10CP 2009W EMI Grenada-Winona-Greenwood Area Improvement Phase I.idv 10CP 2010S EMI Grand Gulf Uprate Project.idv 10CP 2010S EMI Indianola-Greenwood 115kV Line Upgrade.idv 10CP 2010S EMI Magee 115kV substation - Replace switches.idv 10CP 2010Z EMI TVA Affected System Upgrades.idv 10CP 2011S EMI Church Road Substation (2014 load).idv 10CP 2011S EMI Sunnybrook-only-2011.idv 10CP 2011S EMI Waterways - Vicksburg East 115kV Line Upgrade.idv 10CP 2011Z EMI Florence - Florence SS - Star 115kV Line Upgrade.idv 10CP 2011Z EMI Grand Gulf Uprate add vars.idv 10CP 2012S EMI Grenada-Winona-Greenwood Area Improvement Phase II.idv 10CP 2012S EMI Ridgeland-Madison Reliability Improvement (Sunnybrook-2014).idv

Year	Approved Future Projects
2010 - 2012 ETI	10CP 2009F ETI Gulfway 230kV Substation.idv 10CP 2009S ETI Beaumont 69kV Improvement Plan Option 2.idv 10CP 2009S ETI Newton Bulk Replace Re-tap CT to Increase Rating on Holly Springs Line.idv 10CP 2009S ETI Porter-Tamina Replace Breaker & Switches.idv 10CP 2009W ETI Fawil Upgrade 138-69kV Auto.idv 10CP 2010S ETI Temco and Shepherd 138kV Substations.idv 10CP 2010S ETI Western Region Reliability Improvement Plan Phase 3 Interim (Part 1).idv 10CP 2010W ETI Western Region Reliability Improvement Plan Phase 3 Interim (Part 3).idv 10CP 2011S ETI Grand Gulf Uprate Project.idv 10CP 2011S ETI Western Region Reliability Improvement Plan Phase 3 Interim (Part 2).idv 10CP 2011W ETI Tamina to Cedar Hill 138kV line.idv

Prior Generation Interconnection NRIS requests that were included in this study:

PID	Substation	MW	In Service Date
PID 221	Wolfcreek	875	In Service
PID 223	PID-223 Tap	125	10/1/2010
PID 224	PID-224 Tap	100	12/1/2009
PID 228	PID-228	115	4/30/2011
PID 233	PID-233	150	12/31/2013

Prior transmission service requests that were included in this study:

OASIS #	PSE	MW	Begin	End
1668165	Entergy Services (SPO)	600	1/1/2013	1/1/2043

APPENDIX E: Deliverability Tests for Network Resource Interconnection Service Resources

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.

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.

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.

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.

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.

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.

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

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.

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.

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.