System Impact Study
PID 256
90MW Plant

Prepared by:

Southwest Power Pool
Independent Coordinator of Transmission
415 N. McKinley, Suite140
Little Rock, AR 72205

Rev	Issue Date	Description of Revision	Revised By	Project Manager
0	8/16/11	Posting System Impact Study	EC	BR
1	8/19/11	Corrected Customer Data	BC	BR

Contents

1. Introduction

This Energy Resource Interconnection Service (ERIS) is based on the the customer's request for a 90MW interconnection on Entergy's transmission system between Vincent and Graywood substations located at the PID 256 230kV substation. The proposed commercial operation date of the project is June 1, 2013. The objective of this study is to assess the reliability impact of the new facility on the Entergy transmission system with respect to the steady state and transient stability performance of the system as well as its effects on the system's existing short circuit current capability. It is also intended to determine whether the transmission system meets standards established by NERC Reliability Standards and Entergy's planning guidelines when the plant is connected to Entergy's transmission system. If not, transmission improvements will be identified.

The System Impact Study process required a load flow analysis to determine if the existing transmission lines were 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 unit would cause a stability problem on the Entergy system. The load flow results from the ERIS study are for information only. ERIS does not in and of itself convey any transmission service.

This ERIS System Impact Study was based on information provided by the Customer and assumptions made by Entergy's Independent Coordinator of Transmission (ICT) planning group and Entergy's 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.

It was determined that there are no Entergy Transmission System upgrades required for this ERIS request. The estimated cost of interconnection facilities is $9,000,000; which covers the cost of the construction of a new 230kV 3-element ring bus substation cut-in at the Customer's point of interconnection on Entergy's Vincent – Graywood 230kV transmission line.

2. Short circuit Analysis/Breaker Rating Analysis

2.1 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.

2.2 Short Circuit Analysis

The method used to determine if any short circuit problems would be caused by the addition of the PID 256 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 256 generator was then modeled in the base case to generate a revised short circuit model. The base case short circuit results were then compared with the results from the revised model to identify any breakers that were under-rated as a result of additional short circuit contribution from PID 256 generation. Any breakers identified to be upgraded through this comparison are mandatory upgrades.

2.3 Analysis Results

The results of the short circuit analysis indicated that the additional generation due to PID 256 generation caused no increase in short circuit current such that they exceeded the fault interrupting capability of the high voltage circuit breakers within the vicinity of the PID 256 plant **with and without priors**. Priors included are: 221, 231, 238, 240, 244, 247, 250, 251, 252, and 255.

2.4 Problem Resolution

As a result of the short circuit analysis findings, no resolution was required.

3. Load Flow Analysis

3.1 Model Information

The load flow analysis was performed based on the projected 2013 summer peak load flow model. Approved future transmission projects in the 2011-2013 ICT Base Plan were used in the models for scenarios three and four. These upgrades can be found on Entergy's OASIS web page at http://www.oatioasis.com/EES/EESDocs/Disclaimer.html

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 2013 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 90MW 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 the requesting generator as the source and adjacent control areas as the sink. The generator step-up transformers, generators, and interconnecting lines were modeled according to the information provided by the customer.

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.

3.2 Load Flow Analysis

3.2.1 Load Flow Analysis:

The load flow analysis was performed as a DC analysis using PSS/E and PSS/MUST software by Power Technologies Incorporated (PTI). A Transmission Reliability Margin (TRM) value that effectively reduced line ratings by 5% was used in the model.

With the above assumptions implemented, the First Contingency Incremental Transfer Capability (FCITC) values were 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. The details of each scenario list each limiting element, the contingency for the limiting element, and the Available Transfer Capacity (ATC). The ATC is equal to the FCITC.

3.2.2 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).
- Voltage should be greater than 0.95pu.

B) Under Contingencies

- The MVA flow through any facility should not exceed Rate A.
- Voltage should be greater than 0.92pu.

3.2.3 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.

3.3 Analysis Results

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

Table 3.3.1: Summary of Results for PID 256 – 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.	2013	-1085	-474	-1099	-491
AEPW	American Electric Power West	2013	-594	-259	-620	-277
AMRN	Ameren Transmission	2013	-2018	-1851	-1156	-516
CLEC	CLECO	2013	90	90	90	90
EES	Entergy	2013	-239	-408	90	90
EMDE	Empire District Electric Co	2013	-949	-414	-969	-433
LAFA	Lafayette Utilities System	2013	-206	-418	90	-173
LAGN	Louisiana Generating, LLC	2013	-313	-479	90	-362
LEPA	Louisiana Energy & Power Authority	2013	-720	-858	-341	-487
OKGE	Oklahoma Gas & Electric Company	2013	-818	-357	-843	-376
SMEPA	South Mississippi Electric Power Assoc.	2013	-755	-692	*	-30
SOCO	Southern Company	2013	-1525	-1399	-1513	-676
SPA	Southwest Power Administration	2013	-1003	-438	-1020	-456
TVA	Tennessee Valley Authority	2013	-1829	-1677	-1361	-608

*Actual rating of supplemental upgrade was not used to calculate FCITC

4. Interconnection Facilities

The interconnection customer's designated Point of Interconnection (POI) is a new 230kV substation that will be constructed and cut-in on Entergy's Vincent - Graywood 230kV transmission line. The interconnection customer is responsible for constructing all facilities needed to deliver generation to the POI. The estimated cost for a 230kV, 3-element ring bus configuration substation is $9 Million. The cost is based on parametric estimating techniques for a "typical" site. The cost may change significantly based on specific project parameters that are not known at this time. Costs specific to this interconnection will be developed during the Facilities Study.

TABLE 3.2: DETAILS OF SCENARIO 1 RESULTS: (WITHOUT 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	SPA	TVA
Bonin - Cecelia 138kV	11,760,000									X					
Carroll 230/138kV transformer (CLECO)	Other Ownership	X	X	X			X				X		X	X	X
Conroe 1 - Conroe 2 138kV	TBD		X												
Flander - Segura 138kV (CLECO)	Other Ownership									X					
Florence - South Jackson 115kV - Supplemental Upgrade	TBD											X			
French Settlement - Sorrento 230kV	7,200,000	X	X	X			X				X	X	X	X	X
Habetz - Richard 138kV	Included in 2011 ICT Base Plan							X		X					
International Paper - Mansfield 138kV (CLECO)	Other Ownership	X	X	X			X				X		X	X	X
International Paper - Wallake 138kV (CLECO)	Other Ownership	X	X	X			X				X		X	X	X
Meaux - Abbeville 138kV	5,880,000									X					
Mid County - Port Neches Bulk 138kV	1,680,000		X												
Moril - Cecelia 138kV	21,000,000									X					
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	TBD							X	X	X		X	X		X
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	TBD											X			

Limiting Elements	Est. Cost	AECI	AEPW	AMRN	CLECO	EES	EMDE	LAFA	LAGN	LEPA	OKGE	SMEPA	SOCO	SPA	TVA
Semere - Scott2 138kV	13,440,000							X		X					
Toledo - Leesville (CLECO) 138kV	Other Ownership	X	X	X			X				X			X	X
Toledo - VP Tap 138kV	Included in 2011 ICT Base Plan	X	X	X		X	X		X	X	X	X	X	X	X

TABLE 3.3: 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	SPA	TVA
Bonin - Cecelia 138kV	11,760,000									X					
Carlyss - CitCon West 138kV	840,000					X									
Carroll 230/138kV transformer (CLECO)	Other Ownership	X	X	X			X				X		X	X	X
Champagne - Plaisance (CLECO) 138kV	Other Ownership							X	X	X					
Coly - Vignes 230kV - Supplemental Upgrade	TBD					X				X		X			
Coughlin - Plaisance 138kV (CLECO)	Other Ownership							X	X	X					
Flander - Segura 138kV (CLECO)	Other Ownership									X					
Florence - South Jackson 115kV - Supplemental Upgrade	TBD											X			
French Settlement - Sorrento 230kV	7,200,000			X								X	X		X
Habetz - Richard 138kV	Included in 2011 ICT Base Plan							X		X					
International Paper - Mansfield 138kV (CLECO)	Other Ownership	X	X	X			X				X		X	X	X

Limiting Elements	Est. Cost	AECI	AEPW	AMRN	CLECO	EES	EMDE	LAFA	LAGN	LEPA	OKGE	SMEPA	SOCO	SPA	TVA
International Paper - Wallake 138kV (CLECO)	Other Ownership	X	X	X			X				X		X	X	X
Jackson Miami - Jackson Monument Street 115kV	2,520,000											X			
Jackson Miami - Rex Brown 115kV	1,680,000											X			
Judice - Scott1 138kV	6,720,000									X					
Meaux - Abbeville 138kV	5,880,000									X					
Moril - Cecelia 138kV	21,000,000									X					
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Other Ownership							X		X					
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	TBD							X	X	X		X	X		X
Semere - Scott2 138kV	13,440,000							X		X		X			

TABLE 3.4: DETAILS OF SCENARIO 3 RESULTS: (WITH 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	SPA	TVA
Bonin - Cecelia 138kV	11,760,000									X					
Carroll 230/138kV transformer (CLECO)	Other Ownership	X	X	X			X				X		X	X	X
Conroe 1 - Conroe 2 138kV	TBD		X												
Flander (CLECO) - Youngsville 138kV	Other Ownership									X					
International Paper - Mansfield 138kV (CLECO)	Other Ownership	X	X	X			X				X		X	X	X
International Paper - Wallake 138kV (CLECO)	Other Ownership	X	X	X			X				X		X	X	X
Meaux - Abbeville 138kV	5,880,000									X					
Moril - Cecelia 138kV	21,000,000									X					
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	TBD											X			
Semere - Scott2 138kV	13,440,000									X					

TABLE 3.5: DETAILS OF SCENARIO 4 RESULTS: (WITH FUTURE PROJECTS AND WITH PENDING TRANSMISSION SERVICE & STUDY REQUEST)

Limiting Element	Est. Cost	AECI	AEPW	AMRN	CLECO	EES	EMDE	LAFA	LAGN	LEPA	OKGE	SMEPA	SOCO	SPA	TVA
Bonin - Cecelia 138kV	11,760,000									X					
Carroll 230/138kV transformer (CLECO)	Other Ownership	X	X	X			X				X		X	X	X
Champagne - Plaisance (CLECO) 138kV	Other Ownership							X	X	X					
Coughlin - Plaisance 138kV (CLECO)	Other Ownership							X	X	X					
Flander - Acadian 230kV (LAFA)	Other Ownership							X							
Flander (CLECO) - Youngsville 138kV	Other Ownership									X					
Florence - South Jackson 115kV - Supplemental Upgrade	TBD											X			
International Paper - Mansfield 138kV (CLECO)	Other Ownership	X	X	X			X				X		X	X	X
International Paper - Wallake 138kV (CLECO)	Other Ownership	X	X	X			X				X		X	X	X
Jackson Miami - Rex Brown 115kV	1,680,000											X			
Meaux - Abbeville 138kV	5,880,000							X		X					

Limiting Element	Est. Cost	AECI	AEPW	AMRN	CLECO	EES	EMDE	LAFA	LAGN	LEPA	OKGE	SMEPA	SOCO	SPA	TVA
Moril - Cecelia 138kV	21,000,000									X					
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Other Ownership							X		X					
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	TBD							X	X	X		X	X		X
Semere - Scott2 138kV	13,440,000									X					
Youngsville - Segura (CLECO) 138kV	Other Ownership									X					

STABILITY STUDY

Executive Summary

The purpose of this report is to present the results of the stability analysis performed to evaluate the impact of the proposed PID 256 project on the Entergy's system dynamic performance.

The PID256 consists of a generation interconnection of 90 MW steam turbine generator, that will interconnect to the Entergy system between the Graywood and Vincent 230 kV substations, tapping the 230 kV line through a three-ring bus.

Stability models for the PID 256 interconnection request were added to the Entergy's dynamic database, based on the technical documentation provided by the developer. The tests performed to the Excitation system, PSS and Turbine governor models indicate properly damped performance, which indicates adequate set of parameters provided for PID 256.

Three-phase faults with stuck breaker (Faults 21 to 34 listed in Table 3-2) were simulated. The stability analysis demonstrates that:

- The PID 256 proposed project, did not lose synchronism with the system following any of the contingencies tested.
- All other synchronous generators in the monitored areas were stable and remained in synchronism following all contingencies and the system conditions considered.
- Acceptable damping and voltage recovery was observed, within applicable standards, that is, no violations to the voltage dip criteria.

The PID 256 project does not cause any detrimental impact on the Entergy system, in terms of dynamic performance, for the conditions and contingencies tested. Therefore PID 256 project is able to deliver its full power output to the Entergy transmission system without compromising the system reliability.

Introduction

Background

A Large Generating Facility Customer requested interconnection of a 90 MW steam turbine generator between the Graywood and Vincent 230 kV substations, tapping the 230 kV line through a three-ring bus. The Project has the queue denomination of PID 256.

The purpose of this report is to present the results of the stability analysis performed to evaluate the impact of the proposed PID 256 project on the Entergy's system dynamic performance.

The PID 256 project was evaluated at 100% output MW capacity.

Transient stability analysis was performed using the package provide by SPP. It contains the latest stability database in PSS®E version 30.3.3. The stability package also includes the dynamic data for the previously queued projects.

Purpose

The stability analysis was performed to determine the ability of the proposed generation facility to remain in synchronism and within applicable planning standards following system disturbances. Three possible types of system faults were considered for the simulations:

a) three phase faults with stuck breaker

b) three phase normally cleared faults

c) single line to ground faults with stuck breaker

Based on the Entergy study criteria, if system is unstable following a three-phase stuck breaker fault, the simulation is then repeated assuming a single-phase stuck breaker fault.

Siemens PTI modeled the PID 256 project in the base case and tested the simulation models with the results presented in Section 2. Section 3 describes the methodology and criteria adopted in the study. Section 4 presents and discusses the simulation results and the PID impact on the Entergy transmission grid. The Appendices, in turn, document the PID 256 models and data, as well as present the simulation plots, illustrating the system's dynamic performance.

Model Development

The study has considered the 2014 Summer Peak load flow model with the PID 256 project modeled. The base case also contains significant previous queued generation interconnection projects in the interconnection queue.

A. Power Flow Data

The PID256 consists in a generation interconnection of 90 MW steam turbine generator. Table 2-1 presents the size of the generation project, the type of the prime mover, the reactive capability of the generator, the project's point of interconnection, as well as the PSS®E bus number in the load flow model.

Table 2-1 – Details of the PID 256 Interconnection Request

Request	Size	Type of Turbine	Reactive Capability of Project		Point of Interconnection	Bus Number
			Max (Mvar)	Min (Mvar)		
PID 256	90 MW	Steam Generation	56.0	-40.0	Tap Graywood – Vincent 230 kV line	999912

The line parameters for the project Gen-Tie were modeled based on typical parameters of a 230 kV line. Table 2-1 presents the values obtained in per unit on 100 MVA base.

Table 2-1 – 230 kV Line Parameters for PID 256 Gen-Tie

Per Unit on 100 MVA Base				
Transmission Line	Line Length (mi)	R+	X+	B+
PID 256 Gen-Tie 230 kV	2.5	0.000500	0.003700	0.007450

Figure 2-1 presents the surrounding area of the PID 256 point of interconnection. The single line diagram show the line flows and voltage profile for the summer peak scenario, on which the study is based

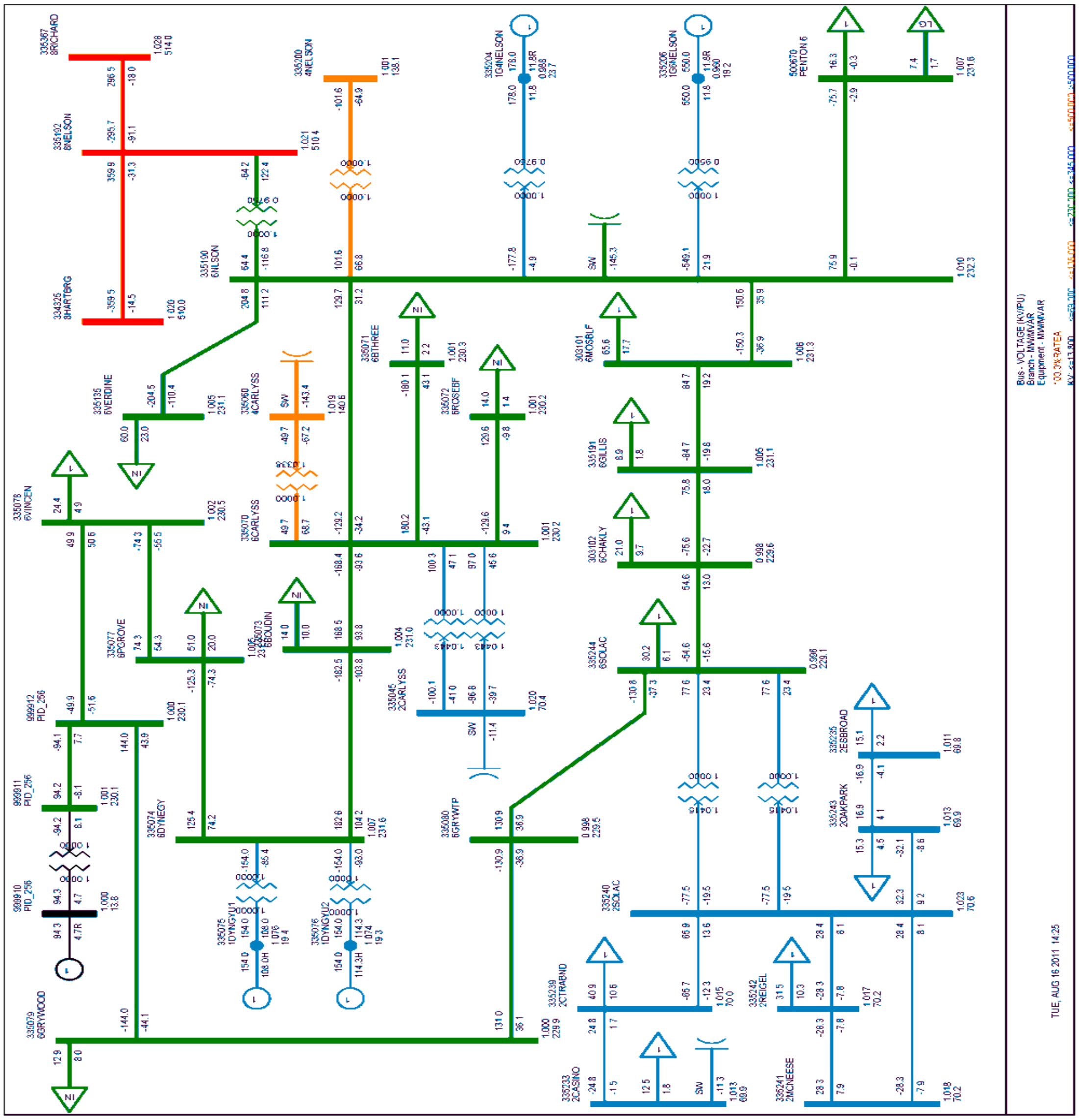


Figure 2-1 – PID 256 Interconnection Surrounding Area

Figures A-1 in Appendix A present the single line diagrams showing for the PID 256 project the modeling details and impedance data of the Gen-Tie and Step-Up transformer.

Stability Database

The transient stability analysis was performed using the data provided by SPP. Stability models for the PID 256 interconnection request were added to the dynamic database, based on the technical documentation provided by the developer.

Siemens PTI performed different simulations performed by PTI using its software PSS®E to assess the performance and adequacy of the proposed PID 256 simulation models: generator, excitation system, and turbine/speed governor.

The PSS®E dynamic models output list is shown in Appendix B, documenting the dynamic models and parameters for the PID 256 project.

Open Circuit Voltage Setpoint Step Test

In this test, the generator is initially set to nominal speed on open circuit, similar to a typical condition prior to its synchronization to the grid. The terminal voltage is set to the generator rated voltage (1.000 pu terminal voltage) with the excitation system in automatic control. The initial generator field voltage E_{FD} is equal to 1+S(1.0), where S(1.0) is the generator saturation factor for 1.000 pu terminal voltage. This value should correspond to the no load field voltage, usually specified on the generator datasheet.

A 5% step change to the voltage reference of the automatic voltage regulator V_{ref} is applied at t = 0 seconds and the dynamic response of the excitation system is monitored. Figure 2-2 shows the results obtained.

The exciter model shows a properly damped response with a small overshoot following the step change in the voltage reference. The rise time of the terminal voltage is approximately 0.56 seconds and the settling time is about 2.4 seconds, which is appropriate for the type of voltage regulator and excitation system in use.

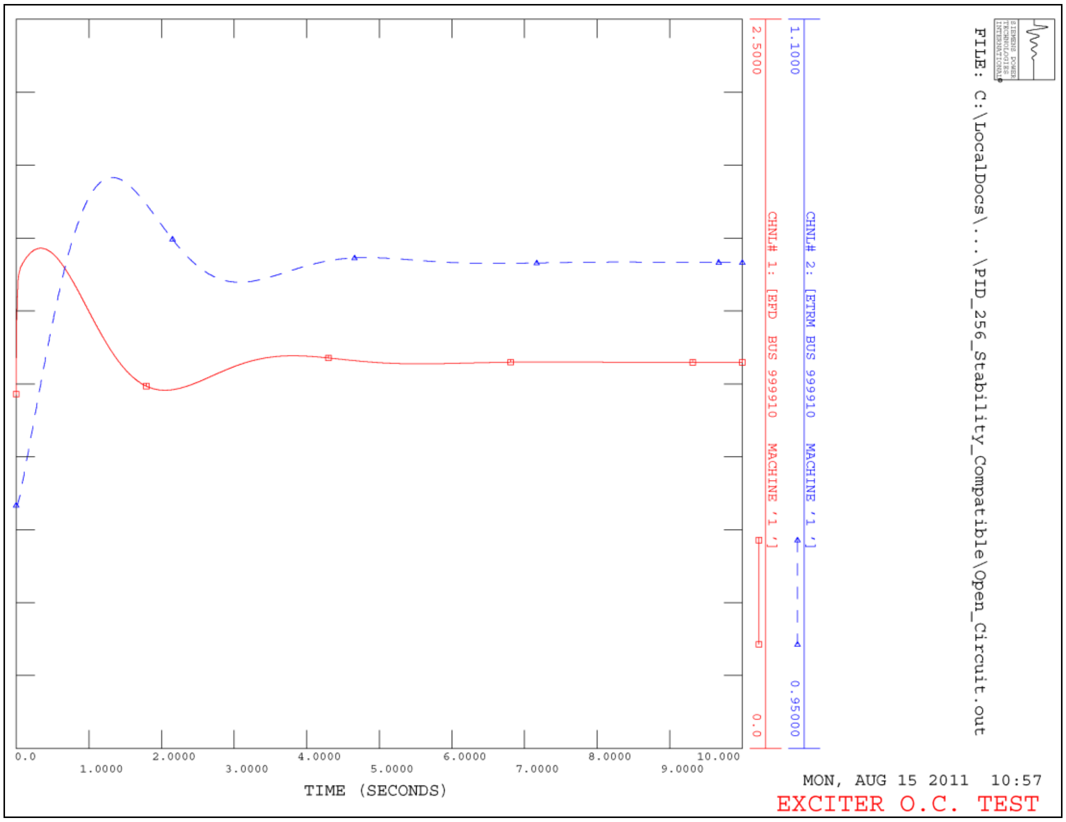


Figure 2-2 – Open Circuit 5% Step Response for the PID 256 Excitation System

Speed Governor Response Test

The speed governor response test considered the PID 256 generator operating in an isolated mode, supplying an initial electrical load P_0 with unity power factor, as shown in Figure 2.3. A sudden increase in the load demand □P is applied, resulting in an imbalance between generation and load. This power imbalance results in a deceleration of the generation unit and thus a decrease in speed/frequency. The speed governor reacts to the deviation and increases the turbine mechanical power output to restore the balance between generation and load.

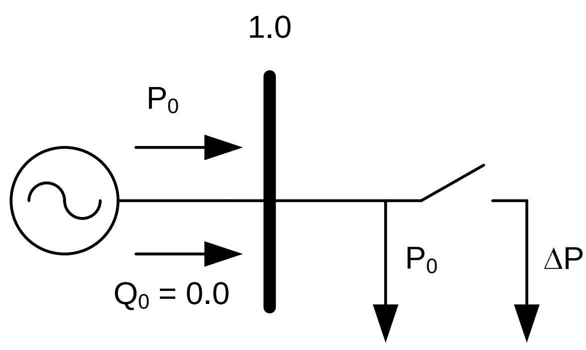


Figure 2.3 – System Configuration for the Speed Governor Response Test

For this test, the initial electrical load P_0 is set to 80% of the generator's Pmax. The electrical load is suddenly increase by 5% of the generator's Pmax. Figure 2-4 presents the simulated results of the speed governor response test following the step change in load. The oscillations are properly damped, considering the inertia and other characteristics of the equipment.

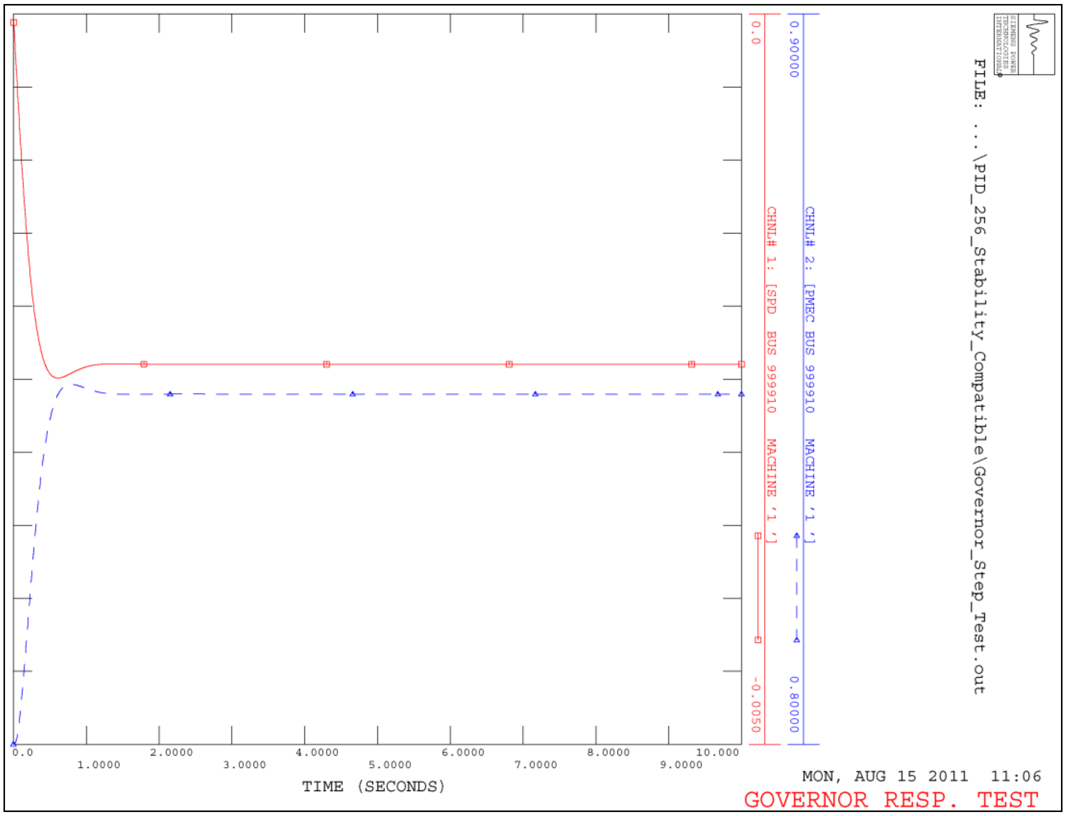


Figure 2-4– Speed Governor Response Test Results for the PID 256 Steam Turbine

Power System Stabilizer

In the PSS tests performed, in order to introduce a relatively small disturbance designed to highlight the linear response of the generator and excitation system, a reactor with 25% of the generator MVA rating (27.75 Mvar) is connected to the high-voltage side of the generator step-up transformer for 6 cycles and then it is removed without changing the network configuration. Two different simulations were carried out: with and without the PSS model implemented.

Figure 2-5 presents the simulation results. The two curves represent the electrical power output with and without the power system stabilizer model implemented. It can be seen that the power system stabilizer model does not adversely impact the system oscillation damping.

These results do not intend to evaluate the PSS tuning. They simply indicate that the power system stabilizer and its tuned transfer function cause no harm to the overall system performance.

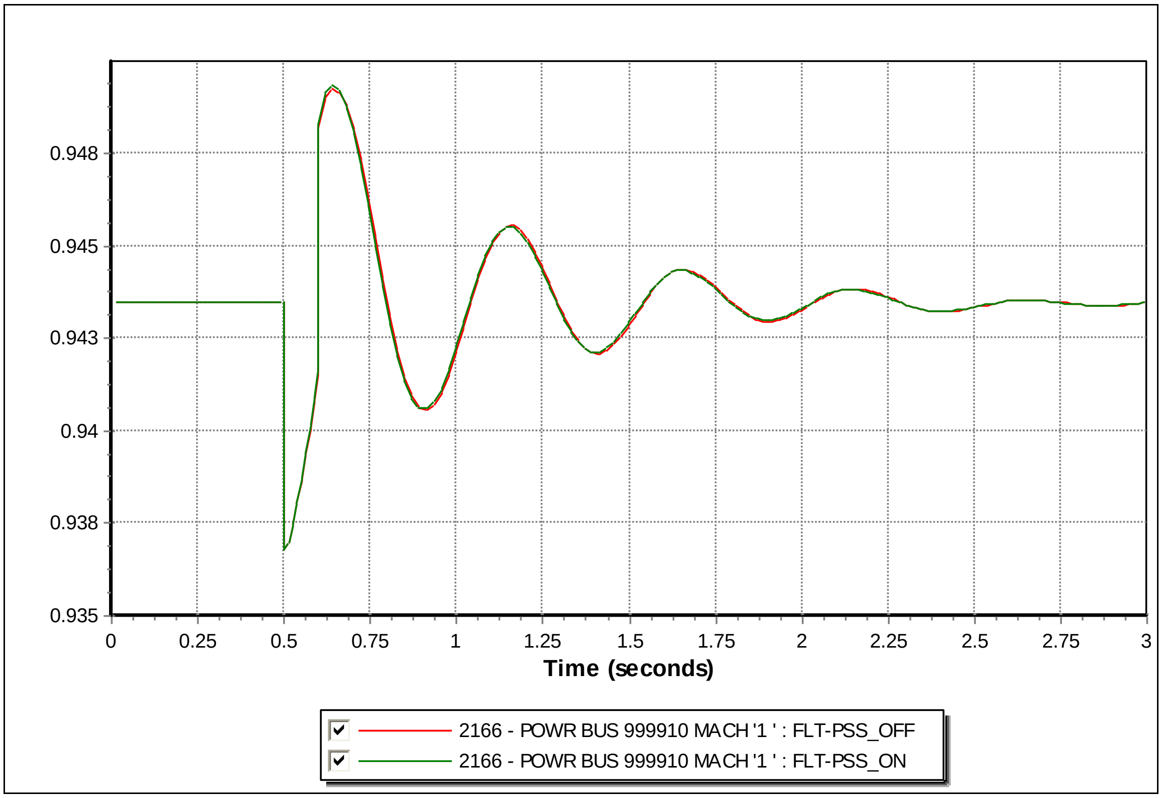


Figure 2.5 – PID 256 Power System Stabilizer Test

Methodology and Assumptions

The study considered the 2014 Summer Peak and 2009 Winter Peak power flow cases with the required interconnection generation requests modeled as described in Section 2. The base case also contains all the significant previous queued projects in the interconnection queue.

The monitored areas in this study are shown in Table 3-1.

Table 3-1 – Areas of Interest

Area Number	Area Name
351	EES
332	LAGN
502	CELE

Methodology

Stability Simulations

The dynamic simulations were performed using the PSS®E version 30.3.3 with the latest stability database provided by SPP. Three-phase faults and single-phase faults in the neighborhood of PID 256 Point of interconnection were simulated. Any adverse impact on the system stability was documented and further investigated with appropriate solutions to determine whether a static or dynamic VAR device is required or not.

The system performance was evaluated in terms of its the ability, for a given initial operating condition, to regain a state of operating equilibrium after being subjected to a physical disturbance.

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

1) For three phase fault or single-line-ground fault with normal clearing resulting in the loss of a single component or even single outage 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

2) For three phase faults with normal clearing resulting in loss of two or more components (generator, transmission circuit or transformer), and SLG fault with delayed clearing resulting in loss of one or more components:

APPENDIX A

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

Notes:

- The time period on which the transient voltage dip is accounted for 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.

Disturbances for Stability Analysis

The faults are defined as single line to ground, and three phase faults. The fault clearing includes delayed clearing for selected contingencies.

Three possible types of system faults were considered for the simulations:

a) three phase faults with stuck breaker
b) three phase normally cleared faults
c) single line to ground faults with stuck breaker

if system presents unstable behavior or poor dynamic performance following a three-phase stuck breaker fault, the simulation is then repeated assuming both three phase fault with normal clearing and a single-phase to ground fault with stuck breaker.

The disturbances evaluated are listed in the following Table 3-2:

Table 3-2 – Contingencies Considered for the PID 256 Stability Analysis

Fault #	Line on which Fault occurs	Fault Location (For Simulation)	Fault Type	Fault Clearing (Cycles)		Stuck Breaker	Breaker Clearing		Tripped Facilities
				Primary	Back - up		Primary	Back-up	
FAULT_1	Solac - Chalkey 230 kV	Solac 230 kV	3 Phase	6	9	None	17430 (Solac), 18235 (Chalkey)	None	Solac - Chalkey 230 kV line
FAULT_2	Solac - Grywood 230 kV line	Solac 230 kV	3 Phase	6	9	None	17425 (Solac), 27270, 27275 (Graywood)	None	Solac - Grywood 230 kV line
FAULT_3	Solac 230 kV- Solac 69 kV Ckt 1 (transformer 1)	Solac 230 kV	3 Phase	6	9	None	17420, 17430, 18300 (Solac)	None	Solac 230 kV- Solac 69 kV Ckt 1 (transformer 1) and Solac - Grywood 230 kV line

Fault #	Line on which Fault occurs	Fault Location(For Simulation)	Fault Type	Fault Clearing (Cycles)		Stuck Breaker	Breaker Clearing		Tripped Facilities
				Primary	Back-up		Primary	Back-up	
FAULT_4	Chalkey - Gillis 230 kV line	Chalkey 230 kV	3 Phase	6	9	None	18240 (Chalkey), 143F (Gillis), 18105 (Moss Bluff)	None	Chalkey - Gillis 230 kV line, Gillins 230/13.8 kV transformer # 1, Gillis - Moss Bluff 230 kV line
FAULT_5	Gillis - Moss Bluff 230 kV line	Gillis 230 kV	3 Phase	6	9	None	18240 (Chalkey), 143F (Gillis), 18105 (Moss Bluff)	None	Chalkey - Gillis 230 kV line, Gillis 230/13.8 kV transformer # 1, Gillis - Moss Bluff 230 kV line
FAULT_6	Moss Bluff - Nelson 230 kV line	Moss Bluff 230 kV	3 Phase	6	9	None	18100 (Moss Bluff), 18205, 18210 (Nelson)	None	Moss Bluff - Nelson 230 kV line
FAULT_7	Nelson - Penton Road 230 kV line	Nelson 230 kV	3 Phase	6	9	None	18145 (Nelson)	None	Nelson - Penton Road 230 kV
FAULT_8	Nelson - Carlyss 230 kV line	Nelson 230 kV	3 Phase	6	9	None	13140, 13025 (Nelson), 13145, 13155 (Carlyss)	None	Nelson - Carlyss 230 kV line
FAULT_9	Nelson - Verdine 230 kV line	Nelson 230 kV	3 Phase	6	9	None	18205, 18190 (Nelson), 18890, 18895 (Verdine)	None	Nelson - Verdine 230 kV line

Fault #	Line on which Fault occurs	Fault Location (For Simulation)	Fault Type	Fault Clearing (Cycles)		Stuck Breaker	Breaker Clearing		Tripped Facilities
				Primary	Back -up		Primary	Back-up	
FAULT_10	Nelson 230 kV - Nelson 20 kV (Unit number 6 transformer)	Nelson 230 kV	3 Phase	6	9	None	18160, 18170	None	Nelson 230 kV - Nelson 20 kV (Unit number 6 transformer), Nelson Unit 6
FAULT_11	Nelson - Richard 500 kV line	Nelson 500 kV	3 Phase	6	9	None	13060, 13105 (Nelson), 13000, 13070 (Richard)	None	Nelson - Richard 500 kV line
FAULT_12	Nelson - Hartburg 500 kV line	Nelson 500 kV	3 Phase	6	9	None	13105, 13110 (Nelson), 13635,13645 (Hartburg)	None	Nelson - Hartbrg 500 kV line
FAULT_13	Carlyss - Big Three 230 kV line	Carlyss 230 kV	3 Phase	6	9	None	13500, 13505 (Carlyss), 13240, 13245 (Sabine)	None	Carlyss - Big Three 230 kV line and Big Three - Sabine 230 kV line
FAULT_14	Carlyss - Boudin 230 kV line	Carlyss 230 kV	3 Phase	6	9	None	13505, 13580 (Carlyss), 27050, 27055 (Boudoin)	None	Carlyss - Boudin 230 kV line
FAULT_15	Calcasieu - Pecan Grove 230 kV line	Pecan Grove 230 kV	3 Phase	6	9	None	27130, 27125 (Calcasieu), 18365 (Pecan Grove)	None	Calcasieu - Pecan Grove 230 kV line

Fault #	Line on which Fault occurs	Fault Location (For Simulation)	Fault Type	Fault Clearing (Cycles)		Stuck Breaker	Breaker Clearing		Tripped Facilities
				Primary	Back - up		Primary	Back-up	
FAULT_16	Calcasieu - Boudoin 230 kV line	Boudoin 230 kV line	3 Phase	6	9	None	27120, 27125 (Calcasieu), 27070,27075 (Boudoin)	None	Calcasieu - Boudoin 230 kV line
FAULT_17	Calcasieu 230 kV - Dynegy GTG 002 18 kV (GTG -002 unit)	Calcasieu 230 kV	3 Phase	6	9	None	27115, 27130 (Calcasieu)	None	Calcasieu 230 - Dynegy 18 kV transformer (Dynegy GTG -002 unit)
FAULT_18	Pecan Grove - Vincent 230 kV line	Pecan Grove 230 kV	3 Phase	6	9	none	18370 (Pecan Grove), PID_256 breaker	None	Pecan Grove - Vincent 230 kV line and Vincent to PID_256 230 kV line
FAULT_19	Graywood 230 kV - PID_256 kV line	Graywood 230 kV	3 Phase	6	9	none	27280, 27285 (Graywood), PID_256 breaker	None	Graywood 230 kV - PID_256 kV line
FAULT_20	Solac - Contraband 69 kV line	Solcac 69 kV	3 Phase	6	9	None	17415 (Solac), 37310 (Contraband)	None	Solac - Contraband 69 kV line
FAULT_21	Solac - Chalkey 230 kV line	Solac 230 kV	1 LGSB	6	9	17430 (Solac)	18235 (Chalkey)	18300, 17420 (Solac)	Solac - Chalkey 230 kV line and Solact 230 - Solac 69 kV ckt 1 (transformer # 1)
FAULT_22	Nelson - Carlyss 230 kV line	Nelson 230 kV	1 LGSB	6	9	13140 (Nelson)	13025(Nelson), 13145, 13155 (Carlyss)	18210, 13035, 18155, 18165, 18160, 18145 (Nelson)	Nelson - Carlyss 230 kV line and Nelson - Cleco Penton Road 230 kV

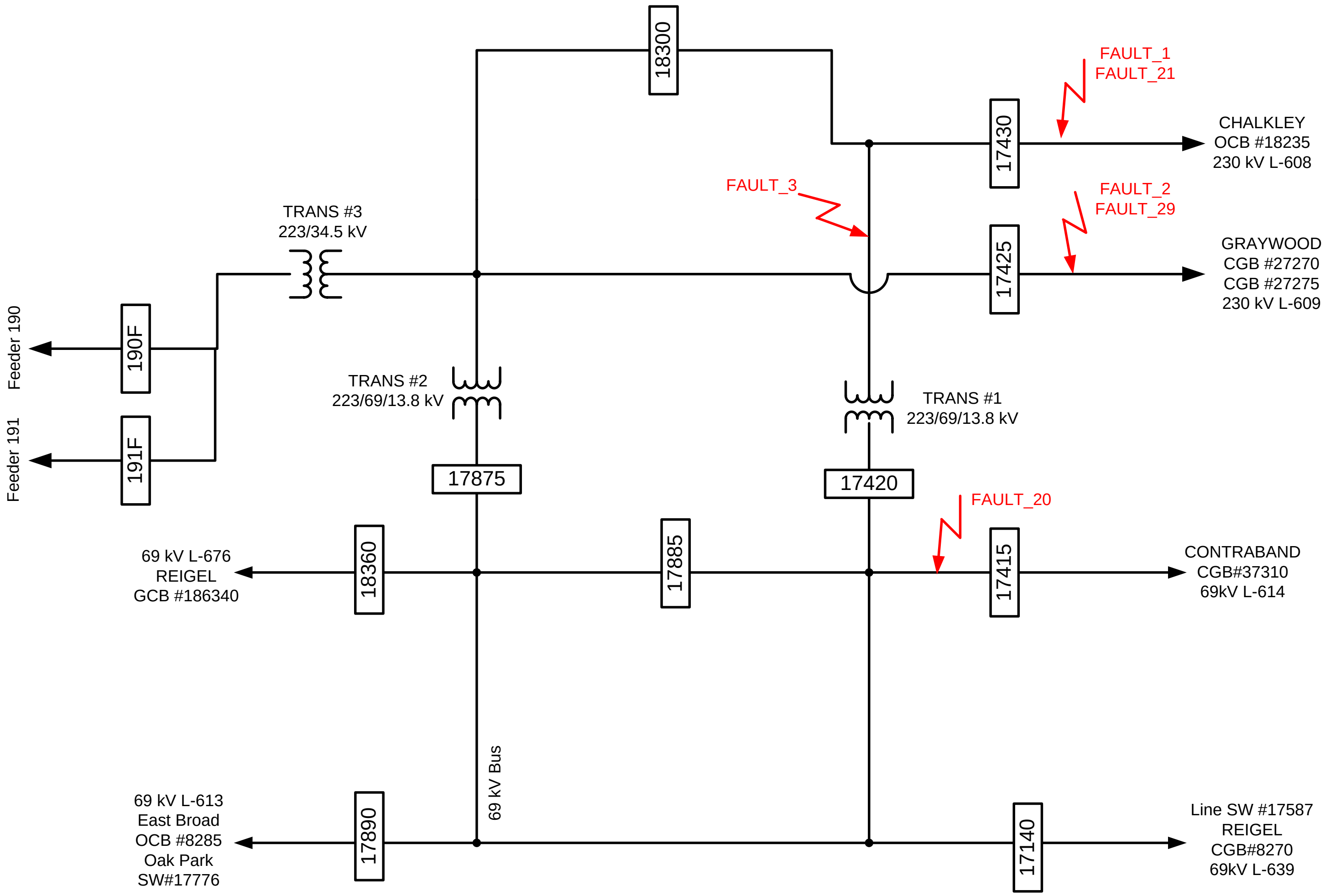
Fault #	Line on which Fault occurs	Fault Location (For Simulation)	Fault Type	Fault Clearing (Cycles)		Stuck Breaker	Breaker Clearing		Tripped Facilities
				Primary	Back -up		Primary	Back-up	
FAULT_23	Gillis - Moss Bluff 230 kV line	Gillis 230 kV	1 LGSB	6	9	18105 (Moss Bluff)	18240 (Chalkey), 143F (Gillis)	4020, 18100, 4010 (Moss Bluff), 18210, 18205 (Nelson)	Chalkey - Gillis 230 kV line, Gillis 230/13.8 kV transformer # 1, Gillis - Moss Bluff 230 kV line, Moss Bluff - Nelson 230 kV line, Moss Bluff 230 -69 kV transformers # 1 and 2
FAULT_24	Carlyss - Big Three 230 kV line	Carlyss 230 kV	1 LGSB	6	9	13505 (Carlyss)	13500 (Carlyss), 13240, 13245 (Sabine)	13580 (Carlyss), 27050, 27055 (Boudoi n)	Carlyss - Big Three 230 kV line, Big Three - Sabine 230 kV line and Carlyss - Boudoin 230 kV line
FAULT_25	Carlyss - Boudoin 230 kV line	Carlyss 230 kV	1 LGSB	6	9	13580 (Carlyss)	13505 (Carlyss)	13150 (Carlyss)	Carlyss 230/69 kV transformer # 3 and Carlyss - Boudoin 230 kV line
FAULT_26	Carlyss - Big Three 230 kV line	Carlyss 230 kV	1 LGSB	6	9	13500 (Carlyss)	13505 (Carlyss), 13240, 13245 (Sabine)	13145,1 3480 (Carlyss), 27010, 27015 (Rose Bluff)	Carlyss - Big Three 230 kV line, Big Three - Sabine 230 kV line and Carlyss - Rose Bluff 230 kV line and Carlyss 230/69 kV transformer # 2
FAULT_27	Carlyss - Nelson 230 kV line	Carlyss 230 kV	1 LGSB	6	9	13145 (Carlyss)	13155 (Carlyss)	13500,1 3480 (Carlyss)	Carlyss - Nelson 230 kV line, Carlyss - Rose Bluff 230 kV line and Carlyss 230/69 kV transformer # 2

Fault #	Line on which Fault occurs	Fault Location (For Simulation)	Fault Type	Fault Clearing (Cycles)		Stuck Breaker	Breaker Clearing		Tripped Facilities
				Primary	Back - up		Primary	Back-up	
FAULT_28	Nelson - Verdine 230 kV line	Nelson 230 kV	1 LGSB	6	9	18205 (Nelson)	18190 (Nelson), 18890, 18895 (Verdine)	18210 (Nelson), 18100 (Moss Bluff)	Nelson - Verdine 230 kV line and Nelson - Moss Bluff 230 kV
FAULT_29	Solac - Grywood 230 kV line	Solac 230 kV	1 LGSB	6	9	17425 (Solac)	27270, 27275 (Graywood)	17875, 18300, 190F, 191F (Solac)	Solac - Grywood 230 kV line, Solac 230/69/13.8 kV transformer # 2, Solac 230/34.5 transformer 3
FAULT_30	Calcasieu - Boudoin 230 kV line	Calcasieu 230 kV	1 LGSB	6	9	27125 (Calcasieu)	27120 (Calcasieu)	27130 (Calcasieu), 18365 (Pecan Grove)	Calcasieu - Boudoin 230 kV and Calcasieu - Pecan Grove 230 kV
FAULT_31	Nelson 230/20 kV transformer (Main transformer unit # 6)	Nelson 230 kV	1 LGSB	6	9	18160 (Nelson)	18170(Nelson)	18210, 13035, 18155, 18165, 13140, 18145 (Nelson)	Nelson 230/2 kV transformer (main transformer unit # 6) and Nelson - Cleco Penton Road 230 kV
FAULT_32	Pecan Grove - Vincent 230 kV line	Pecan Grove 230 kV	1 LGSB	6	9	18370	PID-256 Breaker	18375 (Pecan Grove)	Pecan Grove - Vincent 230 kV line, Vincent to PID_256 230 kV line and Pecan Grove 230/13.8 kV transformer 1 and 3

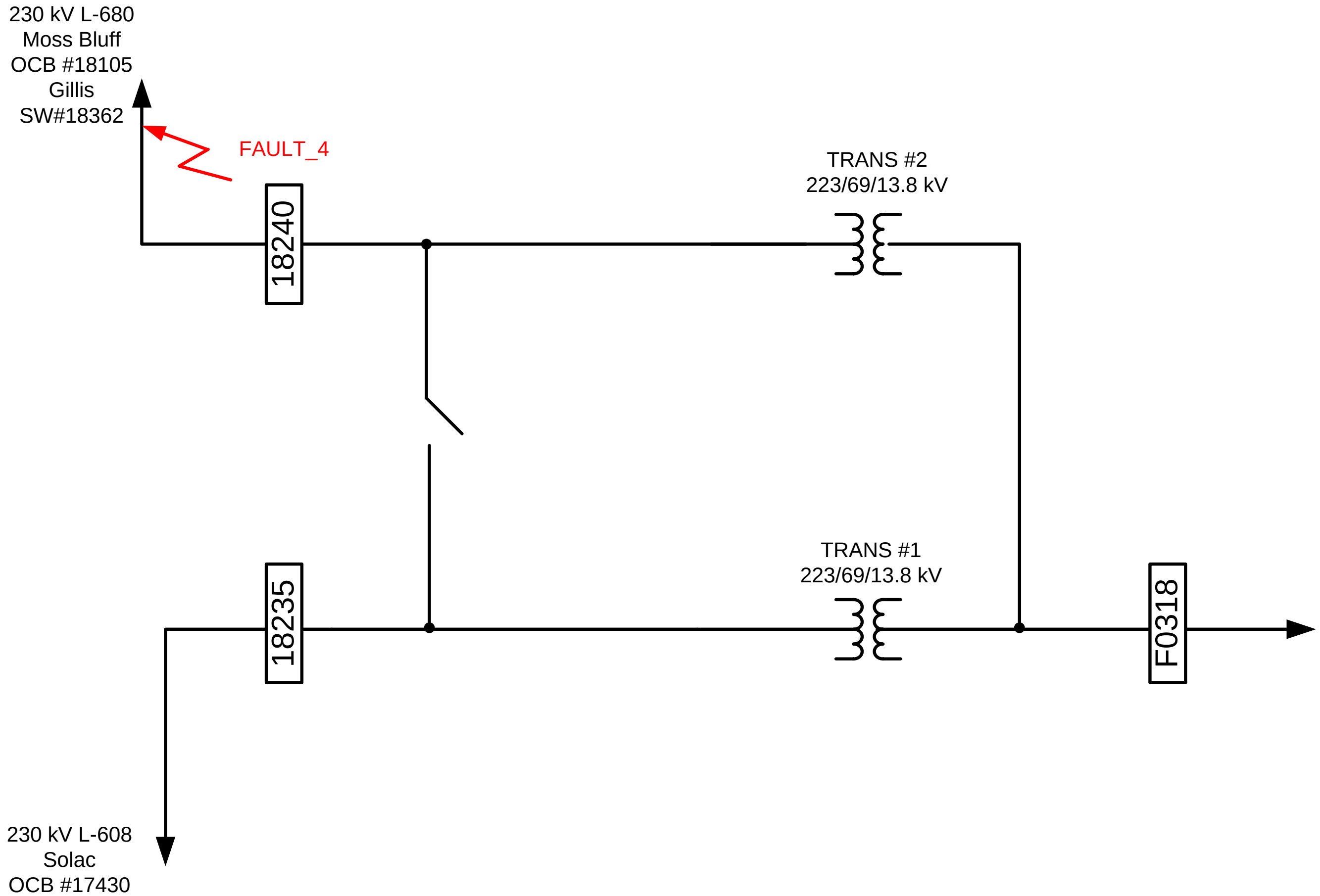
Fault #	Line on which Fault occurs	Fault Location (For Simulation	Fault Type	Fault Clearing(Cycles)		Stuck Breaker	Breaker Clearing		Tripped Facilities
				Primary	Back-up		Primary	Back-up	
FAULT_33	Graywood - Solac 230 kV line	Graywood 230 kV	1 LGSB	6	9	27270	17425 (Solac), 27275 (Graywood)	27280, 840F (Solac)	Solac - Grywood 230 kV line, Graywood 230/13.8 kV transformer # 2,
FAULT_34	Graywood - Vincent 230 kV line	Graywood 230 kV	1 LGSB	6	9	27280	27285 (Graywood), 18370 (Pecan Groove))	27270, 840F (Solac)	Grywood - Vincent 230 kV line, Graywood 230/13.8 kV transformer # 2

PID 256 - Fault Locations Indicated in the Substation's Single Line Diagrams

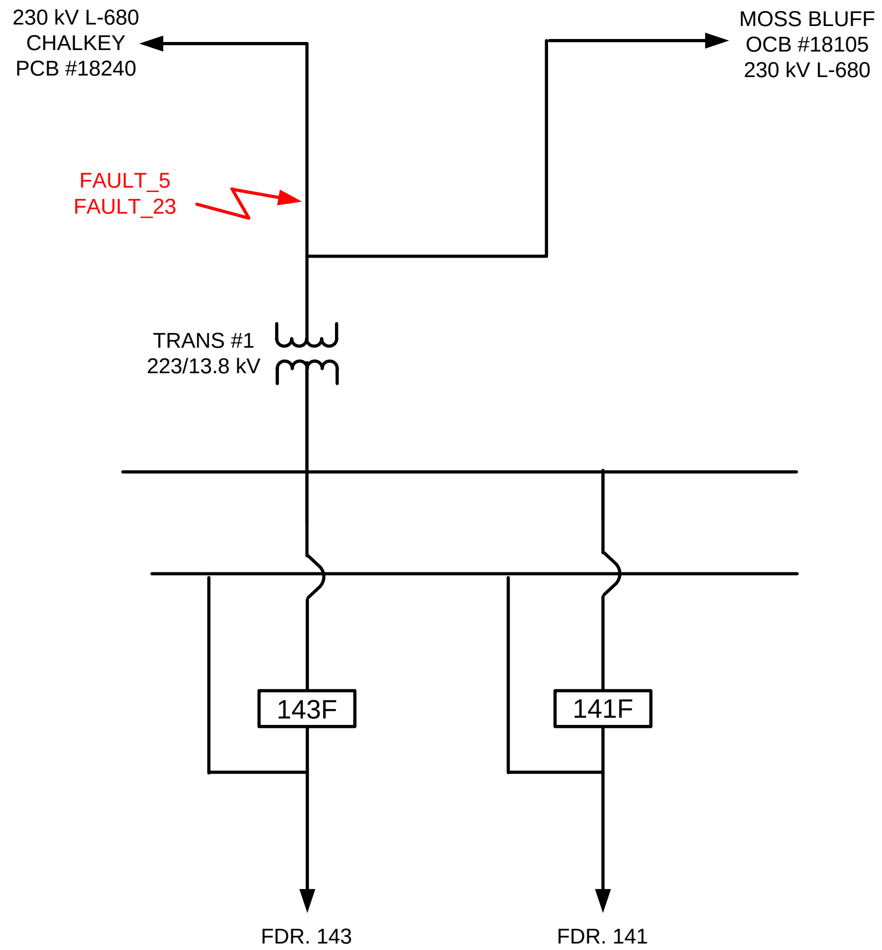
- ***Solac 230 kV***



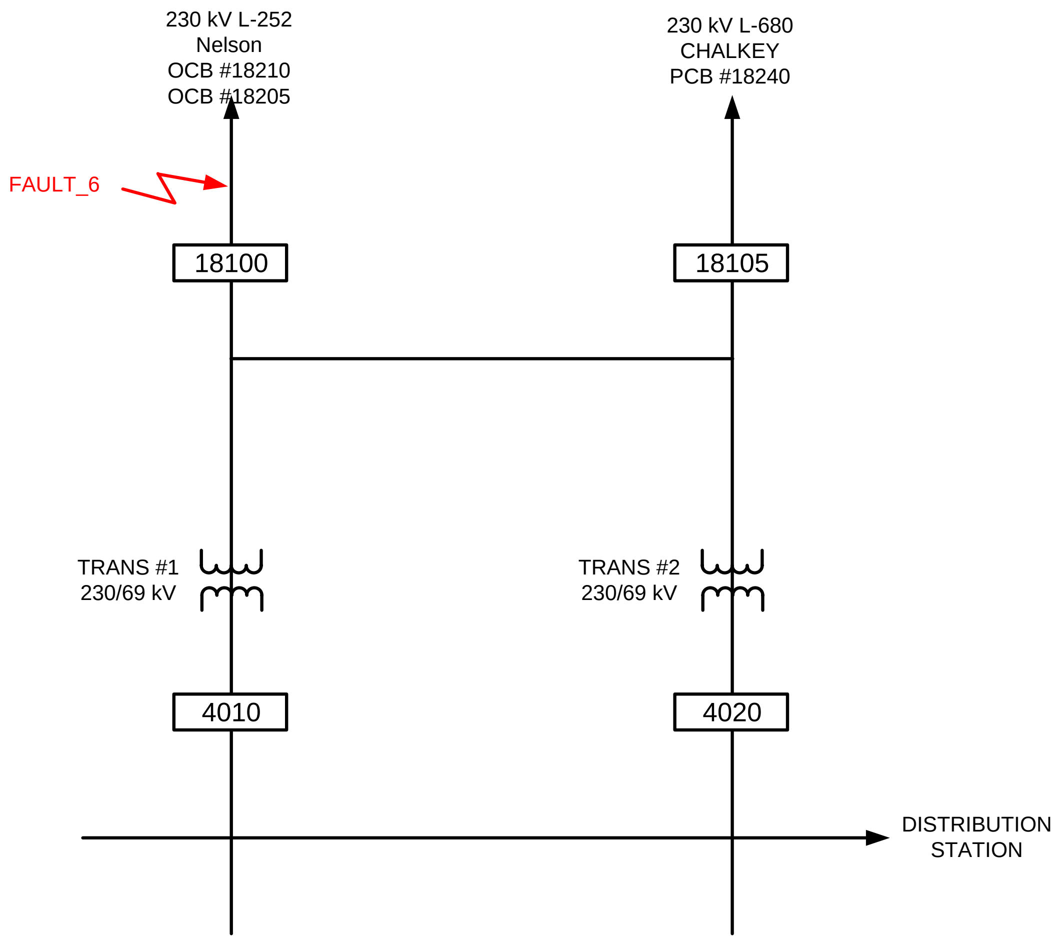
- ***Chalkley 230 kV***



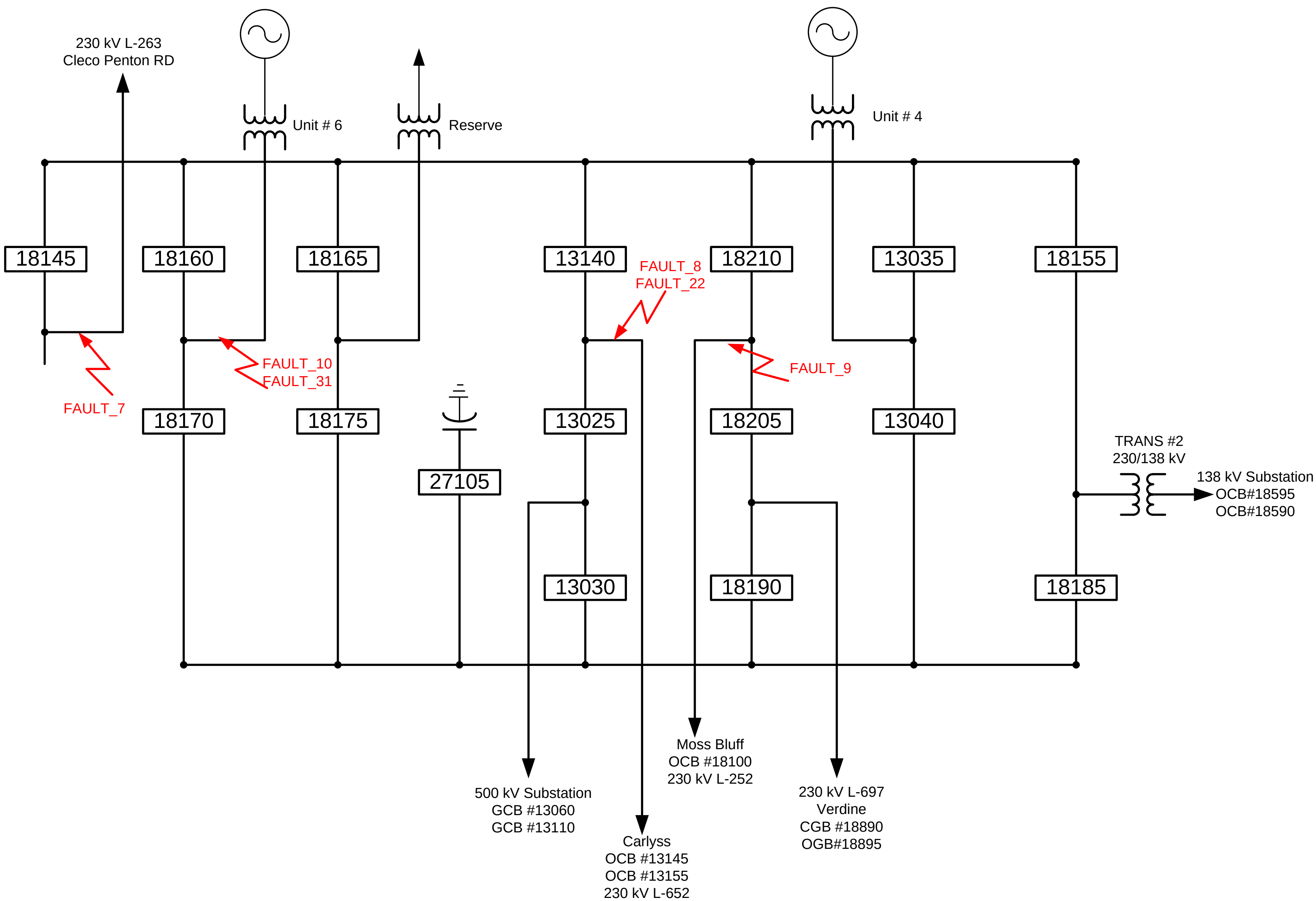
- ***Gillis 230 kV***



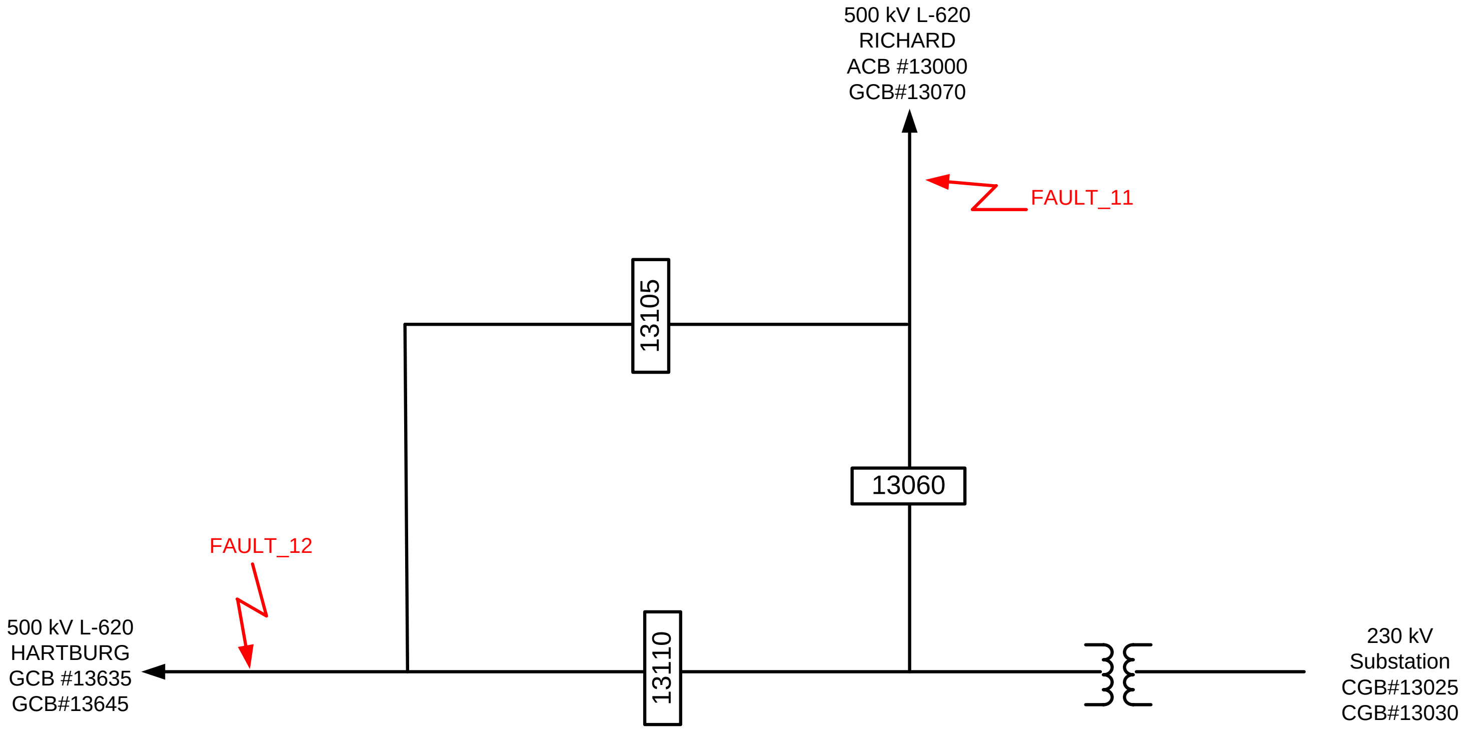
- ***Moss Bluff 230 kV***



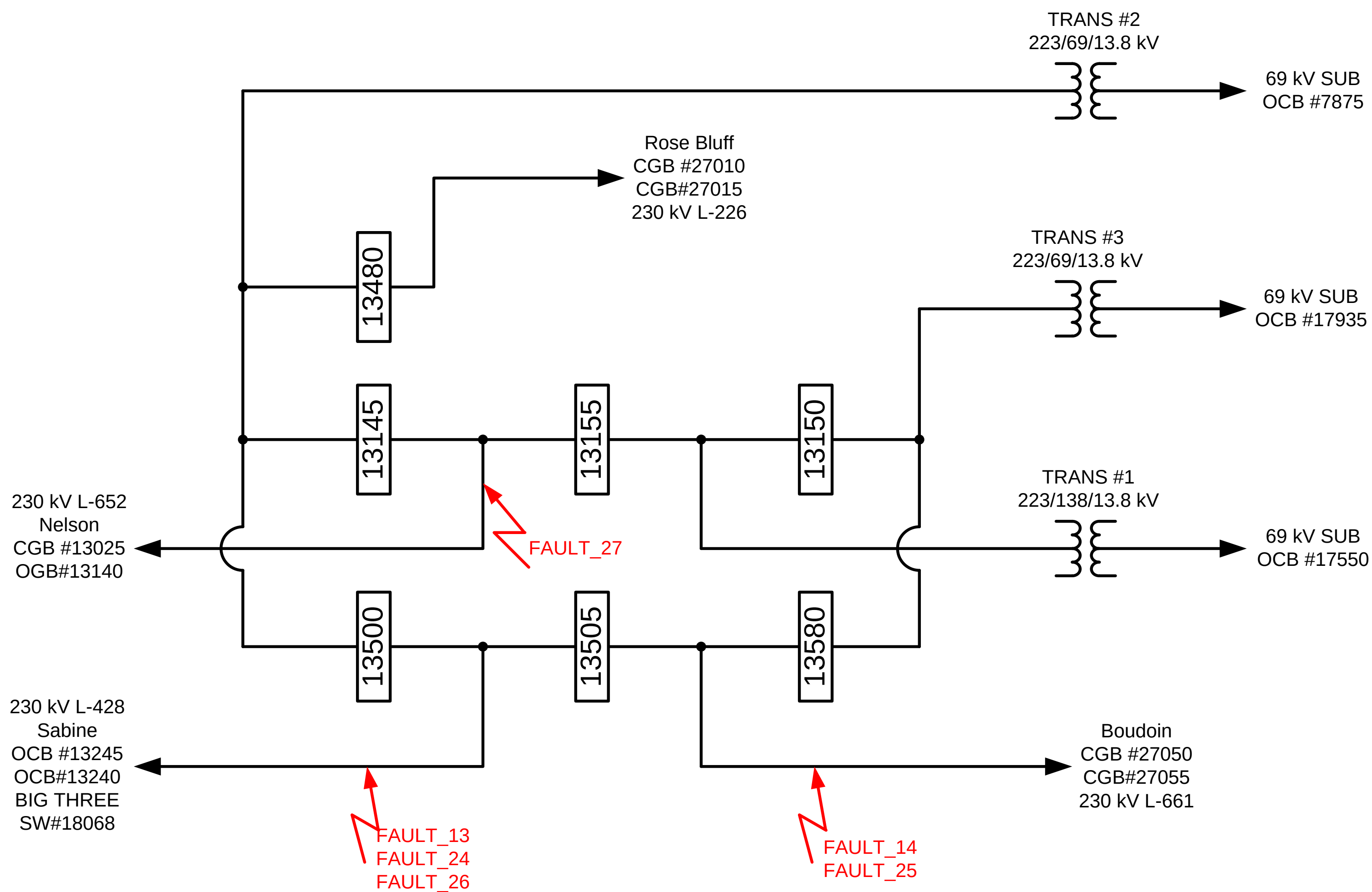
- ***Nelson 230 kV***



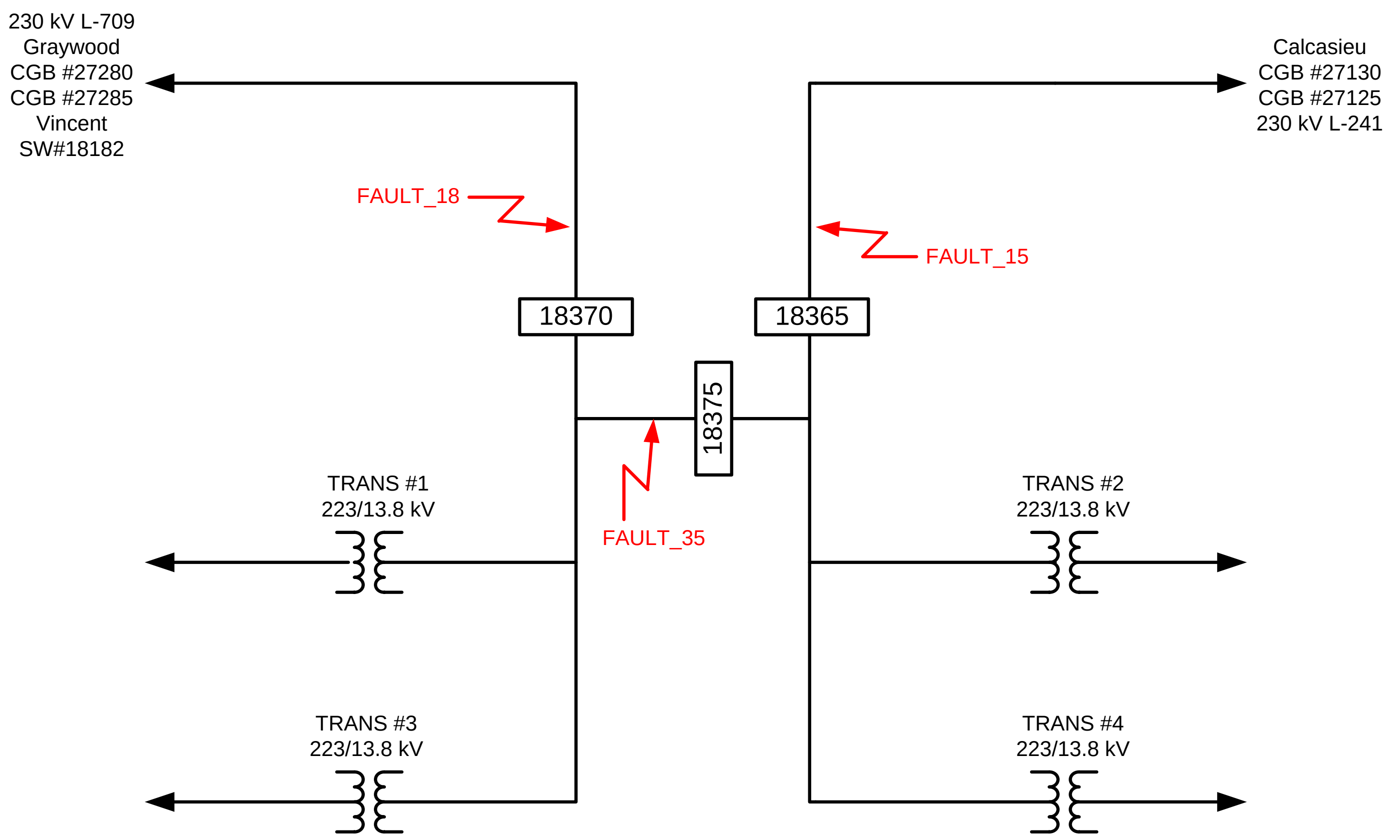
- ***Nelson 500 kV***



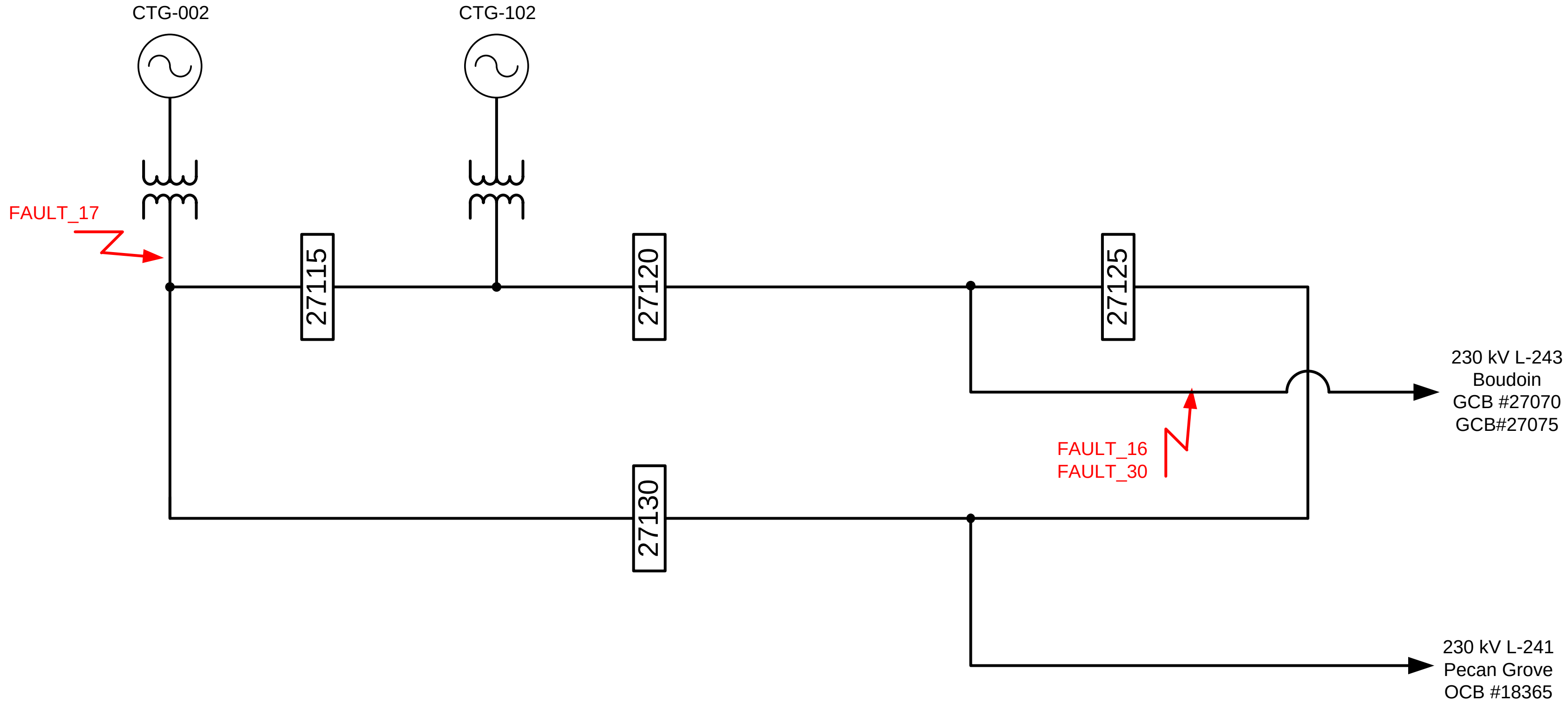
- ***Carlyss 230 kV***



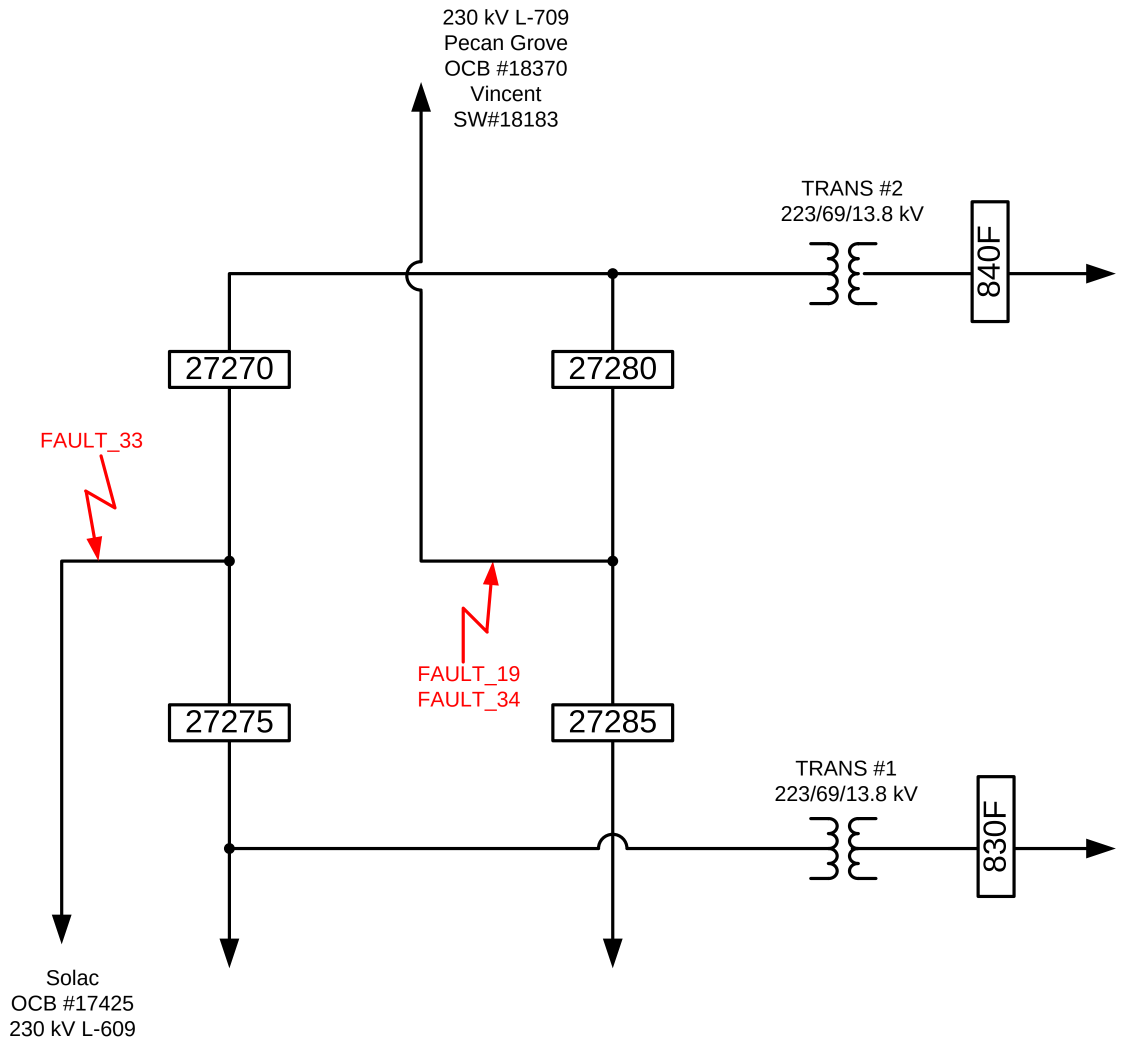
- ***Pecan Grove 230 kV***



- ***Calcasieu 230 kV***



- ***Graywood 230 kV***



Stability Results

The stability analysis was performed to determine the ability of the proposed generation facility to remain in synchronism and within applicable planning standards following system disturbances.

Three-phase faults with stuck breaker (Faults 21 to 34) were simulated for the specified duration and system voltages, as well as synchronous machine rotor angles were monitored in order to verify if the system maintained synchronism following fault removal and line outages. Table 4-1 summarizes the results obtained from the stability simulations for the PID 256 impact evaluation.

Table 4-1: Results Obtained – PID 256 Stability Analysis

Name	Dynamic System Performance
FAULT_21	*Stable. Acceptable damping and voltage recovery*
FAULT_22	*Stable. Acceptable damping and voltage recovery*
FAULT_23	*Stable. Acceptable damping and voltage recovery*
FAULT_24	*Stable. Acceptable damping and voltage recovery*
FAULT_25	*Stable. Acceptable damping and voltage recovery*
FAULT_26	*Stable. Acceptable damping and voltage recovery*
FAULT_27	*Stable. Acceptable damping and voltage recovery*
FAULT_28	*Stable. Acceptable damping and voltage recovery*
FAULT_29	*Stable. Acceptable damping and voltage recovery*
FAULT_30	*Stable. Acceptable damping and voltage recovery*
FAULT_31	*Stable. Acceptable damping and voltage recovery*
FAULT_32	*Stable. Acceptable damping and voltage recovery*
FAULT_33	*Stable. Acceptable damping and voltage recovery*
FAULT_34	*Stable. Acceptable damping and voltage recovery*

The Entergy system, including the PID 256 Project, presented a well behaved performance under the contingencies tested, that is, all generators remained in synchronism following the disturbances. Acceptable damping and voltage recovery was observed; therefore there is no need to perform the simulation of the Faults 1 to 20 listed in Table 3-2, as they represent less severe conditions.

The PID 256 project does not cause any detrimental impact on the Entergy system, in terms of dynamic performance, for the conditions and contingencies tested.

Stability plots of the contingencies evaluated are presented in Appendix C.

Conclusions

The PID 256 project, consisting of 90 MWs of steam generation, was modeled in the Entergy system, interconnecting in the 230 kV line between Graywood and Vincent substations. The project was evaluated to determine its impact on the Entergy's system performance under contingency conditions.

Stability models for the PID 256 interconnection request were added to the dynamic database, based on the technical documentation provided by the developer. The tests performed to the Excitation system, PSS and Turbine governor models indicate properly damped performance, which indicates adequate set of parameters provided for PID 256.

Three-phase faults with stuck breaker (Faults 21 to 34 listed in Table 3-2) were simulated. The stability analysis demonstrates that the interconnection of the proposed PID-256 project does not adversely impact the stability of the Entergy System in the study area for the conditions and contingencies tested.

The simulation results obtained also indicate that the generators in the monitored areas were stable and remained in synchronism following all simulated three-phase stuck breaker faults. No voltage criteria violations were verified following these events.

PID 256 Modeling Detail

This appendix contains the PSS®E raw data file and a single line diagram, documenting the steady state modeling for the PID 256.

```
   1,   100.00          / PSS/E-30.3

 999910,'PID_256     ',  13.8000,2,     0.000,     0.000, 351, 112,1.00000,  -1.8799,
1
999911,'PID_256     ', 230.0000,1,     0.000,     0.000, 351, 112,1.00017,  -9.6783,   1
999912,'PID_256     ', 230.0000,1,     0.000,     0.000, 351, 112,0.99998,  -9.8801,   1
0 / END OF BUS DATA, BEGIN LOAD DATA
0 / END OF LOAD DATA, BEGIN GENERATOR DATA
999910,'1 ',    94.350,     5.059,    56.000,   -40.000,1.00000,     0,   111.000,
0.00000,   0.23000,   0.00000,   0.00000,1.00000,1,  100.0,    94.350,     0.000,
1,1.0000
0 / END OF GENERATOR DATA, BEGIN BRANCH DATA
335078,-999912,'1 ',   0.00043,   0.00256,   0.01123,  685.00,  685.00,    0.00,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.87,   1,1.0000
335079, 999912,'1 ',   0.00022,   0.00128,   0.00562,  685.00,  685.00,    0.00,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.43,   1,1.0000
999911, 999912,'1 ',   0.00050,   0.00370,   0.00745,    0.00,    0.00,    0.00,
0.00000,  0.00000,  0.00000,  0.00000,1,   0.00,   1,1.0000
0 / END OF BRANCH DATA, BEGIN TRANSFORMER DATA
999911,999910,     0,'1 ',1,2,1,   0.00000,   0.00000,2,'PID_256     ',1,   1,1.0000
   0.00126,   0.09500,    66.00
1.00000, 230.000,   0.000,   110.00,   110.00,   110.00, 0,      0, 1.10000, 0.90000,
1.10000, 0.90000,  33, 0, 0.00000, 0.00000
1.00000,  13.800
0 / END OF TRANSFORMER DATA, BEGIN AREA DATA
 351,337653,   125.900,    10.000,'EES         '
```

```
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
 112,'GSLLCH      '
0 / END OF ZONE DATA, BEGIN INTER-AREA TRANSFER DATA
0 / END OF INTER-AREA TRANSFER DATA, BEGIN OWNER DATA
   1,'DEFAULT     '
0 / END OF OWNER DATA, BEGIN FACTS DEVICE DATA
0 / END OF FACTS DEVICE DATA
```

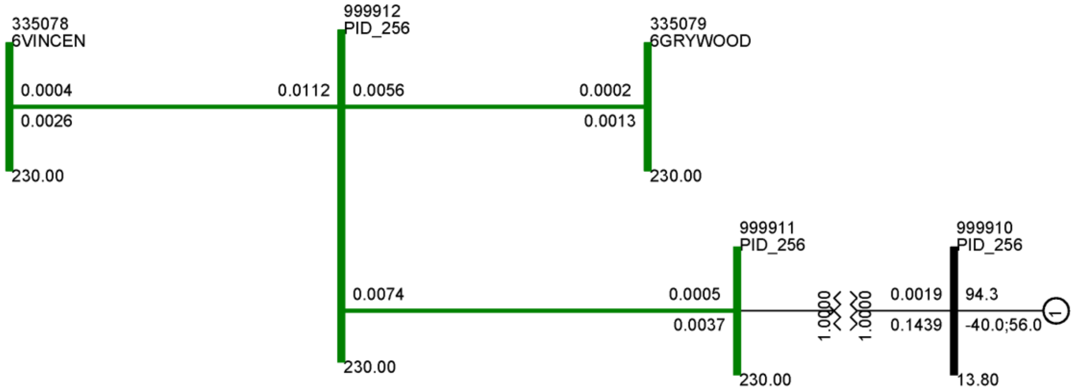


Figure A-1 – PID 256 Modeling Detail

Stability Models

This appendix shows the PSS®E dynamic models and parameters used to represent the PID 256 project in the stability simulations.

Synchronous Machine

```
** GENROU **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S

            999910 PID_256      13.800 1  154272-154285  59436-59441

             MBASE     Z S O R C E         X T R A N       GENTAP

             111.0  0.00000+J 0.23000  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

  5.38 0.015  0.48 0.043   2.70  0.00 2.3200 2.2100 0.3300 0.4800 0.2300 0.2000

                                S(1.0)  S(1.2)

                               0.2149  0.4118
                               0.2150
```

Power System Stabilizer (PSS)

```
** 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

            999910 PID_256     13.800 1  154286-154302  59442-59457   14324-14327    7079-
7084

                    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     0.225     1.000

       T8        T9       KS1        T1        T2        T3        T4       VSTMAX   VSTMIN

      0.500     0.100     4.000     0.150     0.030     0.150     0.030     0.100   -0.100
```

Excitation System

```
 ** ESST4B **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S

           999910 PID_256      13.800 1  154303-154319  59458-59461

    TR     KPR      KIR      VRMAX     VRMIN     TA      KPM      KIM     VMMAX    VMMIN

  0.000   1.000   2.500   1.000   -0.870   0.010   1.000   0.000   1.000  -0.870


            KG       KP       KI    VBMAX     KC       XL    THETAP

          0.000   8.010   0.000  10.010   0.110  0.0000   0.000
```

Turbine Governor

```
 ** TGOV1 **   BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S     VAR

           999910 PID_256      13.800 1  154320-154326  59462-59463   14328

       R         T1        VMAX       VMIN       T2         T3         DT

     0.050      0.020      1.000      0.000      0.000      0.100      0.000
```

Stability Plots

The stability plots for the evaluated contingencies are shown in this appendix. There are 4 plots per page, which include the following channels:

- Bus Voltages.
- PID 256 Project Mechanical Power and Speed Deviation.
- PID 256 P & Q output.
- Rotor Angles for the Synchronous Machines in the Study Area

APPENDIX A: Prior Generation Interconnection and Transmission Service Requests in Study Models

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

PID	Substation	MW	In Service Date
	NONE		

Prior transmission service requests that were included in this study:

OASIS #	PSE	MW	Begin	End
74597193	NRG Power Marketing	300	1/1/2013	1/1/2018
74597198	NRG Power Marketing	300	1/1/2013	1/1/2018
74799834	Cargill Power Markets	101	7/1/2012	7/1/2017
74799836	Cargill Power Markets	101	7/1/2012	7/1/2017
74799837	Cargill Power Markets	101	7/1/2012	7/1/2017
74799848	Cargill Power Markets	101	7/1/2013	7/1/2018
74799851	Cargill Power Markets	101	7/1/2013	7/1/2018
74799853	Cargill Power Markets	101	7/1/2013	7/1/2018
74846159	AEPM	65	1/1/2015	1/1/2020
74899933	Entergy Services (SPO)	322	2/1/2011	2/1/2041
74899972	Entergy Services (SPO)	1	1/1/2015	1/1/2045
74899974	Entergy Services (SPO)	1	1/1/2015	1/1/2045
74899976	Entergy Services (SPO)	1	1/1/2015	1/1/2045
74899980	Entergy Services (SPO)	584	1/1/2015	1/1/2045
74899996	Entergy Services (SPO)	450	6/1/2012	6/1/2042
74900000	Entergy Services (SPO)	620	6/1/2012	6/1/2042
74900014	Entergy Services (SPO)	35	6/1/2012	6/1/2042
74900016	Entergy Services (SPO)	20	6/1/2012	6/1/2042

APPENDIX B: Details of Scenario 1 – 2013

AECI

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-1085
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-578
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-556
French Settlement - Sorrento 230kV	Fairview - Gypsy 230kV	-320
French Settlement - Sorrento 230kV	Fairview - Madisonville 230kV	-293
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-143
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-36
French Settlement - Sorrento 230kV	Franklin - Mcknight 500kV	-25
Toledo - Leesville (CLECO) 138kV	Colfax - Rodemacher 230kV	75

AEPW

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-594
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-395
French Settlement - Sorrento 230kV	Fairview - Gypsy 230kV	-393
French Settlement - Sorrento 230kV	Fairview - Madisonville 230kV	-360
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-304
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-110
French Settlement - Sorrento 230kV	Franklin - Mcknight 500kV	-29
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-28
Toledo - Leesville (CLECO) 138kV	Colfax - Rodemacher 230kV	56
Conroe 1 - Conroe 2 138kV	Oak Ridge - Porter 138kV	74
Mid County - Port Neches Bulk 138kV	Big Three - Carlyss 230kV	89

AMRN

Limiting Element	Contingency Element	ATC
French Settlement - Sorrento 230kV	Bogalusa - Franklin 500kV	-2018
French Settlement - Sorrento 230kV	Bogalusa - Adams Creek 500/230kV transformer	-2018
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-1143
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-603
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-585
French Settlement - Sorrento 230kV	Fairview - Gypsy 230kV	-308
French Settlement - Sorrento 230kV	Fairview - Madisonville 230kV	-283
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-147
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-37

Limiting Element	Contingency Element	ATC
French Settlement - Sorrento 230kV	Franklin - Mcknight 500kV	-24
Toledo - Leesville (CLECO) 138kV	Colfax - Rodemacher 230kV	78

CLECO

Limiting Element	Contingency Element	ATC
NONE	NONE	90

EES

Limiting Element	Contingency Element	ATC
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-239
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-61

EMDE

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-949
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-531
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-486
French Settlement - Sorrento 230kV	Fairview - Gypsy 230kV	-335
French Settlement - Sorrento 230kV	Fairview - Madisonville 230kV	-307
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-135
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-34
French Settlement - Sorrento 230kV	Franklin - Mcknight 500kV	-26
Toledo - Leesville (CLECO) 138kV	Colfax - Rodemacher 230kV	70

LAFA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	*
Semere - Scott2 138kV	Bonin - Cecelia 138kV	-206
Habetz - Richard 138kV	Acadian - Bonin 230kV (LAFA)	-115
Habetz - Richard 138kV	Flander - Acadian 230kV (LAFA)	-11
Semere - Scott2 138kV	Flander - Segura 138kV (CLECO)	13

LAGN

Limiting Element	Contingency Element	ATC
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-313
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-262
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-80

LEPA

Limiting Element	Contingency Element	ATC
Bonin - Cecelia 138kV	Colonial Academy - Richard 138kV	-720
Bonin - Cecelia 138kV	Acadia GSU - Colonial Academy 138kV	-594
Bonin - Cecelia 138kV	Acadia GSU - Scanlan 138kV	-513
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-323
Habetz - Richard 138kV	Acadian - Bonin 230kV (LAFA)	-301
Moril - Cecelia 138kV	Flander - Segura 138kV (CLECO)	-251
Semere - Scott2 138kV	Bonin - Cecelia 138kV	-163
Meaux - Abbeville 138kV	Flander - Segura 138kV (CLECO)	-163
Bonin - Cecelia 138kV	Scanlan - Scott2 138kV	-130
Bonin - Cecelia 138kV	Semere - Scott2 138kV	-120
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-106
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-82
Bonin - Cecelia 138kV	Flander - Segura 138kV (CLECO)	-47
Habetz - Richard 138kV	Flander - Acadian 230kV (LAFA)	-28
Semere - Scott2 138kV	Flander - Segura 138kV (CLECO)	15
Moril - Cecelia 138kV	Meaux - Abbeville 138kV	20
Flander - Segura 138kV (CLECO)	Meaux - Abbeville 138kV	37

OKGE

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-818
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-484
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-419
French Settlement - Sorrento 230kV	Fairview - Gypsy 230kV	-352
French Settlement - Sorrento 230kV	Fairview - Madisonville 230kV	-323
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-127
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-32
French Settlement - Sorrento 230kV	Franklin - Mcknight 500kV	-27
Toledo - Leesville (CLECO) 138kV	Colfax - Rodemacher 230kV	65

SMEPA

Limiting Element	Contingency Element	ATC
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	McAdams - Pickens 230kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Canton - Pickens 230kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Canton South - Canton 230kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Lakeover 500/115kV transformer	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Laurel East (SOCO) - Hatisburg Southwest (SOCO) 230kV	*

Limiting Element	Contingency Element	ATC
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Rex Brown - Rex Brown C 230/115kV transformer 1	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Colum (SMEPA) - Morow (SMEPA) 161kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	McAdams 500/230kV transformer 2	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	McAdams 500/230kV transformer 1	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Attala - McAdams 230kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Base Case	*
French Settlement - Sorrento 230kV	Bogalusa - Franklin 500kV	-755
French Settlement - Sorrento 230kV	Bogalusa - Adams Creek 500/230kV transformer	-755
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-199
French Settlement - Sorrento 230kV	Fairview - Gypsy 230kV	-168
French Settlement - Sorrento 230kV	Fairview - Madisonville 230kV	-154
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-80
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-51
French Settlement - Sorrento 230kV	Franklin - Mcknight 500kV	-19
French Settlement - Sorrento 230kV	Front Street - Michoud 230kV	50
Florence - South Jackson 115kV - Supplemental Upgrade	Bogalusa - Adams Creek 500/230kV transformer	66
Florence - South Jackson 115kV - Supplemental Upgrade	Bogalusa - Franklin 500kV	66

SOCO

Limiting Element	Contingency Element	ATC
French Settlement - Sorrento 230kV	Bogalusa - Adams Creek 500/230kV transformer	-1525
French Settlement - Sorrento 230kV	Bogalusa - Franklin 500kV	-1525
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-1510
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-773
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-759
French Settlement - Sorrento 230kV	Fairview - Gypsy 230kV	-265
French Settlement - Sorrento 230kV	Fairview - Madisonville 230kV	-243
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-173
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-170
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-43
French Settlement - Sorrento 230kV	Franklin - Mcknight 500kV	-24
French Settlement - Sorrento 230kV	Front Street - Michoud 230kV	78

SPA

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-1003
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-545
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-514
French Settlement - Sorrento 230kV	Fairview - Gypsy 230kV	-334
French Settlement - Sorrento 230kV	Fairview - Madisonville 230kV	-306
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-138
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-35
French Settlement - Sorrento 230kV	Franklin - Mcknight 500kV	-25
Toledo - Leesville (CLECO) 138kV	Colfax - Rodemacher 230kV	72

TVA

Limiting Element	Contingency Element	ATC
French Settlement - Sorrento 230kV	Bogalusa - Adams Creek 500/230kV transformer	-1829
French Settlement - Sorrento 230kV	Bogalusa - Franklin 500kV	-1829
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-1358
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-695
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-682
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-350
French Settlement - Sorrento 230kV	Fairview - Gypsy 230kV	-286
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-350
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-159
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-40
Toledo - Leesville (CLECO) 138kV	Colfax - Rodemacher 230kV	86

APPENDIX C: Details of Scenario 2 – 2013

AECI

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-474
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	15
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	56

AEPW

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-259
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	11
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	30

AMRN

Limiting Element	Contingency Element	ATC
French Settlement - Sorrento 230kV	Bogalusa - Adams Creek 500/230kV transformer	-1851
French Settlement - Sorrento 230kV	Bogalusa - Franklin 500kV	-1851
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-499
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	16
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	59

CLECO

Limiting Element	Contingency Element	ATC
NONE	NONE	90

EES

Limiting Element	Contingency Element	ATC
Coly - Vignes 230kV - Supplemental Upgrade	A.A.C. - Polsky Carville 230kV	-408
Coly - Vignes 230kV - Supplemental Upgrade	A.A.C. - Licar 230kV	-370
Coly - Vignes 230kV - Supplemental Upgrade	Belle Helene - Licar 230kV	-239
Carlyss - CitCon West 138kV	Mossville - Roy S. Nelson 138kV	7

EMDE

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-414

Limiting Element	Contingency Element	ATC
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	14
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	49

LAFA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	*
Semere - Scott2 138kV	Bonin - Cecelia 138kV	-418
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-216
Habetz - Richard 138kV	Acadian - Bonin 230kV (LAFA)	-182
Champagne - Plaisance (CLECO) 138kV	Cocodrie - Vil Plat 230kV	-171
Semere - Scott2 138kV	Flander - Segura 138kV (CLECO)	-139
Habetz - Richard 138kV	Flander - Acadian 230kV (LAFA)	-77
Coughlin - Plaisance 138kV (CLECO)	Vil Plat - West Fork 230kV	-76
Champagne - Plaisance (CLECO) 138kV	Vil Plat - West Fork 230kV	-31
Semere - Scott2 138kV	Habetz - Richard 138kV	-20
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Rodemacher (CLECO) - Sherwood (CLECO) 230kV	-9

LAGN

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	*
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-479
Champagne - Plaisance (CLECO) 138kV	Cocodrie - Vil Plat 230kV	-380
Coughlin - Plaisance 138kV (CLECO)	Vil Plat - West Fork 230kV	-168
Champagne - Plaisance (CLECO) 138kV	Vil Plat - West Fork 230kV	-69

LEPA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	*
Bonin - Cecelia 138kV	Colonial Academy - Richard 138kV	-858
Bonin - Cecelia 138kV	Acadia GSU - Colonial Academy 138kV	-732
Bonin - Cecelia 138kV	Acadia GSU - Scanlan 138kV	-651
Habetz - Richard 138kV	Acadian - Bonin 230kV (LAFA)	-474
Moril - Cecelia 138kV	Flander - Segura 138kV (CLECO)	-399
Semere - Scott2 138kV	Bonin - Cecelia 138kV	-332
Meaux - Abbeville 138kV	Flander - Segura 138kV (CLECO)	-309
Bonin - Cecelia 138kV	Scanlan - Scott2 138kV	-268
Bonin - Cecelia 138kV	Semere - Scott2 138kV	-258
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-243
Coly - Vignes 230kV - Supplemental Upgrade	A.A.C. - Polsky Carville 230kV	-214
Habetz - Richard 138kV	Flander - Acadian 230kV (LAFA)	-201
Coly - Vignes 230kV - Supplemental Upgrade	A.A.C. - Licar 230kV	-194

Limiting Element	Contingency Element	ATC
Champagne - Plaisance (CLECO) 138kV	Cocodrie - Vil Plat 230kV	-192
Bonin - Cecelia 138kV	Flander - Segura 138kV (CLECO)	-175
Semere - Scott2 138kV	Flander - Segura 138kV (CLECO)	-163
Moril - Cecelia 138kV	Meaux - Abbeville 138kV	-129
Coly - Vignes 230kV - Supplemental Upgrade	Belle Helene - Licar 230kV	-125
Flander - Segura 138kV (CLECO)	Meaux - Abbeville 138kV	-109
Coughlin - Plaisance 138kV (CLECO)	Vil Plat - West Fork 230kV	-85
Champagne - Plaisance (CLECO) 138kV	Vil Plat - West Fork 230kV	-35
Semere - Scott2 138kV	Habetz - Richard 138kV	-34
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Rodemacher (CLECO) - Sherwood (CLECO) 230kV	-15
Moril - Cecelia 138kV	Leblanc - Abbyville 138kV	21
Flander - Segura 138kV (CLECO)	Leblanc - Abbyville 138kV	32
Semere - Scott2 138kV	Richard - Wells 500kV	53
Judice - Scott1 138kV	Meaux - SELLRD (CLECO) 230kV	57
Judice - Scott1 138kV	Meaux 230/138kV transformer 1	68

OKGE

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-357
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	13
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	42

SMEPA

Limiting Element	Contingency Element	ATC
French Settlement - Sorrento 230kV	Bogalusa - Franklin 500kV	-692
French Settlement - Sorrento 230kV	Bogalusa - Adams Creek 500/230kV transformer	-692
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-692
Coly - Vignes 230kV - Supplemental Upgrade	A.A.C. - Polsky Carville 230kV	-376
Coly - Vignes 230kV - Supplemental Upgrade	A.A.C. - Licar 230kV	-341
Jackson Miami - Rex Brown 115kV	South Jackson 230/115kV transformer 1	-252
Florence - South Jackson 115kV - Supplemental Upgrade	Bogalusa - Franklin 500kV	-236
Florence - South Jackson 115kV - Supplemental Upgrade	Bogalusa - Adams Creek 500/230kV transformer	-236
Coly - Vignes 230kV - Supplemental Upgrade	Belle Helene - Licar 230kV	-219
Florence - South Jackson 115kV - Supplemental Upgrade	Choctaw MS (TVA) - Clay (TVA) 500kV	-124
Florence - South Jackson 115kV - Supplemental Upgrade	South Jackson - Pop Spring 115kV	-42
Florence - South Jackson 115kV -	Franklin - Grand Gulf 500kV	-23

Limiting Element	Contingency Element	ATC
Supplemental Upgrade		
Florence - South Jackson 115kV - Supplemental Upgrade	Georgetown - Pop Spring 115kV	-22
Florence - South Jackson 115kV - Supplemental Upgrade	Georgetown - Silver Creek 115kV	-16
Florence - South Jackson 115kV - Supplemental Upgrade	Angie - Adams Creek 230kV	10
Florence - South Jackson 115kV - Supplemental Upgrade	Ellicott (SOCO) - BarryCC2 (SOCO) 230kV	16
Florence - South Jackson 115kV - Supplemental Upgrade	Ellicott (SOCO) - BarryCC1 (SOCO) 230kV	16
Jackson Miami - Jackson Monument Street 115kV	South Jackson 230/115kV transformer 1	52
Semere - Scott2 138kV	Richard - Wells 500kV	87

SOCO

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	*
French Settlement - Sorrento 230kV	Bogalusa - Adams Creek 500/230kV transformer	-1399
French Settlement - Sorrento 230kV	Bogalusa - Franklin 500kV	-1399
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-659
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	20
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	77

SPA

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-438
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	15
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	51

TVA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	*
French Settlement - Sorrento 230kV	Bogalusa - Franklin 500kV	-1677
French Settlement - Sorrento 230kV	Bogalusa - Adams Creek 500/230kV transformer	-1677
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-593
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	18
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	69

APPENDIX D: Details of Scenario 3 – 2013

AECI

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-1099
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-558
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-546

AEPW

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-620
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-366
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-315
Conroe 1 - Conroe 2 138kV	Oak Ridge - Porter 138kV	75

AMRN

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-1156
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-587
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-571

CLECO

Limiting Element	Contingency Element	ATC
NONE	NONE	90

EES

Limiting Element	Contingency Element	ATC
NONE	NONE	90

EMDE

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-969
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-500
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-492

LAFA

Limiting Element	Contingency Element	ATC
NONE	NONE	90

LAGN

Limiting Element	Contingency Element	ATC
NONE	NONE	90

LEPA

Limiting Element	Contingency Element	ATC
Meaux - Abbeville 138kV	Flander (CLECO) - Youngsville 138kV	-341
Meaux - Abbeville 138kV	Youngsville - Segura (CLECO) 138kV	-258
Bonin - Cecelia 138kV	Flander (CLECO) - Youngsville 138kV	-202
Moril - Cecelia 138kV	Flander (CLECO) - Youngsville 138kV	-190
Semere - Scott2 138kV	Bonin - Cecelia 138kV	-136
Bonin - Cecelia 138kV	Semere - Scott2 138kV	-125
Bonin - Cecelia 138kV	Youngsville - Segura (CLECO) 138kV	-112
Moril - Cecelia 138kV	Youngsville - Segura (CLECO) 138kV	-106
Flander (CLECO) - Youngsville 138kV	Meaux - Abbeville 138kV	-89
Flander (CLECO) - Youngsville 138kV	Meaux - SELLRD (CLECO) 230kV	26
Flander (CLECO) - Youngsville 138kV	Meaux 230/138kV transformer 1	30
Flander (CLECO) - Youngsville 138kV	Leblanc - Abbyville 138kV	51
Moril - Cecelia 138kV	Meaux - Abbeville 138kV	69
Meaux - Abbeville 138kV	Acadian - Bonin 230kV (LAFA)	86

OKGE

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-843
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-453
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-428

SMEPA

Limiting Element	Contingency Element	ATC
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	McAdams - Pickens 230kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Canton - Pickens 230kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Canton South - Canton 230kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Lakeover 500/115kV transformer	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Laurel East (SOCO) - Hatisburg Southwest (SOCO) 230kV	*

Limiting Element	Contingency Element	ATC
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Rex Brown - Rex Brown C 230/115kV transformer 1	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Colum (SMEPA) - Morow (SMEPA) 161kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	McAdams 500/230kV transformer 2	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	McAdams 500/230kV transformer 1	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Coly - McKnight 500kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Base Case	*

SOCO

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-1513
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-769
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-722

SPA

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-1020
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-518
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-515

TVA

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-1361
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-692
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-648

APPENDIX E: Details of Scenario 4 – 2013

AECI

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-491
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	50
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	67

AEPW

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-277
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	28
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	45

AMRN

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-516
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	53
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	70

CLECO

Limiting Element	Contingency Element	ATC
NONE	NONE	90

EES

Limiting Element	Contingency Element	ATC
NONE	NONE	90

EMDE

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-433
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	44
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	61

LAFA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	*
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-173
Champagne - Plaisance (CLECO) 138kV	Cocodrie - Vil Plat 230kV	-123
Meaux - Abbeville 138kV	Acadian - Bonin 230kV (LAFA)	-88
Coughlin - Plaisance 138kV (CLECO)	Vil Plat - West Fork 230kV	-22
Champagne - Plaisance (CLECO) 138kV	Vil Plat - West Fork 230kV	27
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Rodemacher (CLECO) - Sherwood (CLECO) 230kV	45
Flander - Acadian 230kV (LAFA)	Habetz - Richard 138kV	85

LAGN

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	*
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-362
Champagne - Plaisance (CLECO) 138kV	Cocodrie - Vil Plat 230kV	-258
Coughlin - Plaisance 138kV (CLECO)	Vil Plat - West Fork 230kV	-47
Champagne - Plaisance (CLECO) 138kV	Vil Plat - West Fork 230kV	57

LEPA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	*
Meaux - Abbeville 138kV	Flander (CLECO) - Youngsville 138kV	-487
Meaux - Abbeville 138kV	Youngsville - Segura (CLECO) 138kV	-405
Bonin - Cecelia 138kV	Flander (CLECO) - Youngsville 138kV	-334
Moril - Cecelia 138kV	Flander (CLECO) - Youngsville 138kV	-327
Semere - Scott2 138kV	Bonin - Cecelia 138kV	-269
Bonin - Cecelia 138kV	Semere - Scott2 138kV	-255
Bonin - Cecelia 138kV	Youngsville - Segura (CLECO) 138kV	-244
Moril - Cecelia 138kV	Youngsville - Segura (CLECO) 138kV	-244
Flander (CLECO) - Youngsville 138kV	Meaux - Abbeville 138kV	-234
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-185
Champagne - Plaisance (CLECO) 138kV	Cocodrie - Vil Plat 230kV	-132
Flander (CLECO) - Youngsville 138kV	Meaux - SELLRD (CLECO) 230kV	-121
Flander (CLECO) - Youngsville 138kV	Meaux 230/138kV transformer 1	-117
Flander (CLECO) - Youngsville 138kV	Leblanc - Abbyville 138kV	-94
Moril - Cecelia 138kV	Meaux - Abbeville 138kV	-68
Youngsville - Segura (CLECO) 138kV	Meaux - Abbeville 138kV	-54
Meaux - Abbeville 138kV	Acadian - Bonin 230kV (LAFA)	-54
Coughlin - Plaisance 138kV (CLECO)	Vil Plat - West Fork 230kV	-24
Champagne - Plaisance (CLECO) 138kV	Vil Plat - West Fork 230kV	29
Meaux - Abbeville 138kV	Flander - Acadian 230kV (LAFA)	64
Rapidies (CLECO) - Rodemacher (CLECO)	Rodemacher (CLECO) - Sherwood	71

Limiting Element	Contingency Element	ATC
230kV	(CLECO) 230kV	
Youngsville - Segura (CLECO) 138kV	Meaux - SELLRD (CLECO) 230kV	85
Youngsville - Segura (CLECO) 138kV	Leblanc - Abbyville 138kV	87
Moril - Cecelia 138kV	Leblanc - Abbyville 138kV	89
Youngsville - Segura (CLECO) 138kV	Meaux 230/138kV transformer 1	89

OKGE

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-376
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	38
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	55

SMEPA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	*
Florence - South Jackson 115kV - Supplemental Upgrade	Bogalusa - Adams Creek 500/230kV transformer	*
Florence - South Jackson 115kV - Supplemental Upgrade	Bogalusa - Franklin 500kV	*
Florence - South Jackson 115kV - Supplemental Upgrade	Choctaw MS (TVA) - Clay (TVA) 500kV	*
Jackson Miami - Rex Brown 115kV	South Jackson 230/115kV transformer 1	-30
Florence - South Jackson 115kV - Supplemental Upgrade	South Jackson - Pop Spring 115kV	-29
Florence - South Jackson 115kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-11
Florence - South Jackson 115kV - Supplemental Upgrade	Georgetown - Pop Spring 115kV	-9
Florence - South Jackson 115kV - Supplemental Upgrade	Georgetown - Silver Creek 115kV	-3
Florence - South Jackson 115kV - Supplemental Upgrade	Angie - Adams Creek 230kV	11
Florence - South Jackson 115kV - Supplemental Upgrade	Ellicott (SOCO) - BarryCC2 (SOCO) 230kV	27
Florence - South Jackson 115kV - Supplemental Upgrade	Ellicott (SOCO) - BarryCC1 (SOCO) 230kV	27

SOCO

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	*
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-676
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	69

Limiting Element	Contingency Element	ATC
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	88

SPA

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-456
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	46
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	63

TVA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	*
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-608
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	62
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	79

APPENDIX F: DATA PROVED BY CUSTOMER

Attachment A (Page 1)
To Appendix 1
Interconnection Request

LARGE GENERATING FACILITY DATA

UNIT RATINGS

KVA **111,000** ºF **85 °F Water** Voltage **13.8 kV**
Power Factor **0.85**
Speed (RPM) **3600** Connection (e.g. Wye) **WYE**
Short Circuit Ratio **0.50** Frequency, Hertz **60**
Stator Amperes at Rated kVA **4644** Field Volts **320**
Max Turbine MW **94.35 [Gross]** ºF **90 °F Ambient**

COMBINED TURBINE-GENERATOR-EXCITER INERTIA DATA

Inertia Constant, H = **2.7** kW sec/kVA
Moment-of-Inertia, WR2 = **61,044** lb. ft.^{2}

REACTANCE DATA (PER UNIT-RATED KVA)

	DIRECT AXIS	QUADRATURE AXIS
Synchronous – saturated	Xdv **2.32**	Xqv **2.21**
Synchronous – unsaturated	Xd **2.32**	Xqi **2.21**
Transient – saturated	X'dv **0.25**	X'qv **0.48**
Transient – unsaturated	X'di **0.33**	X'qi **0.48**
Subtransient – saturated	X''dv **0.17**	X''qv **0.17**
Subtransient – unsaturated	X''di **0.23**	X''qi **0.23**
Negative Sequence – saturated	X2v **0.16**	
Negative Sequence – unsaturated	X2i **0.26**	
Zero Sequence – saturated	X0v **0.11**	
Zero Sequence – unsaturated	X0i **0.13**	
Leakage Reactance	Xlm **0.20**	

Attachment A (Page 2)
To Appendix 1
Interconnection Request

FIELD TIME CONSTANT DATA (SEC)

Open Circuit	Tdo	**5.38**	Tqo	**0.48**
Three-Phase Short Circuit Transient	Td3	**0.57**	Tq	**0.48**
Line to Line Short Circuit Transient	Td2	**0.89**		
Line to Neutral Short Circuit Transient	Td1	**1.08**		
Short Circuit Subtransient	Td	**0.015**	Tq	**0.015**
Open Circuit Subtransient	Tdo	**0.022**	Tqo	**0.043**

ARMATURE TIME CONSTANT DATA (SEC)

Three Phase Short Circuit	Ta3	**0.36**
Line to Line Short Circuit	Ta2	**0.36**
Line to Neutral Short Circuit	Ta1	**0.32**

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

MW CAPABILITY AND PLANT CONFIGURATION GENERATING FACILITY DATA

ARMATURE WINDING RESISTANCE DATA (PER UNIT)

Positive	R1	**0.004**
Negative	R2	**0.016**
Zero	R0	**0.008**

Rotor Short Time Thermal Capacity I_2^2t	= **10**	
Field Current at Rated kVA, Armature Voltage and PF	= **949**	amps
Field Current at Rated kVA and Armature Voltage, 0 PF	= **1158**	amps
Three Phase Armature Winding Capacitance	= **1.298**	microfarad
Field Winding Resistance	= **0.287**	ohms @ 20 °C
Armature Winding Resistance (Per Phase)	= **0.0020**	ohms @ 20 °C

Attachment A (Page 3)
To Appendix 1
Interconnection Request

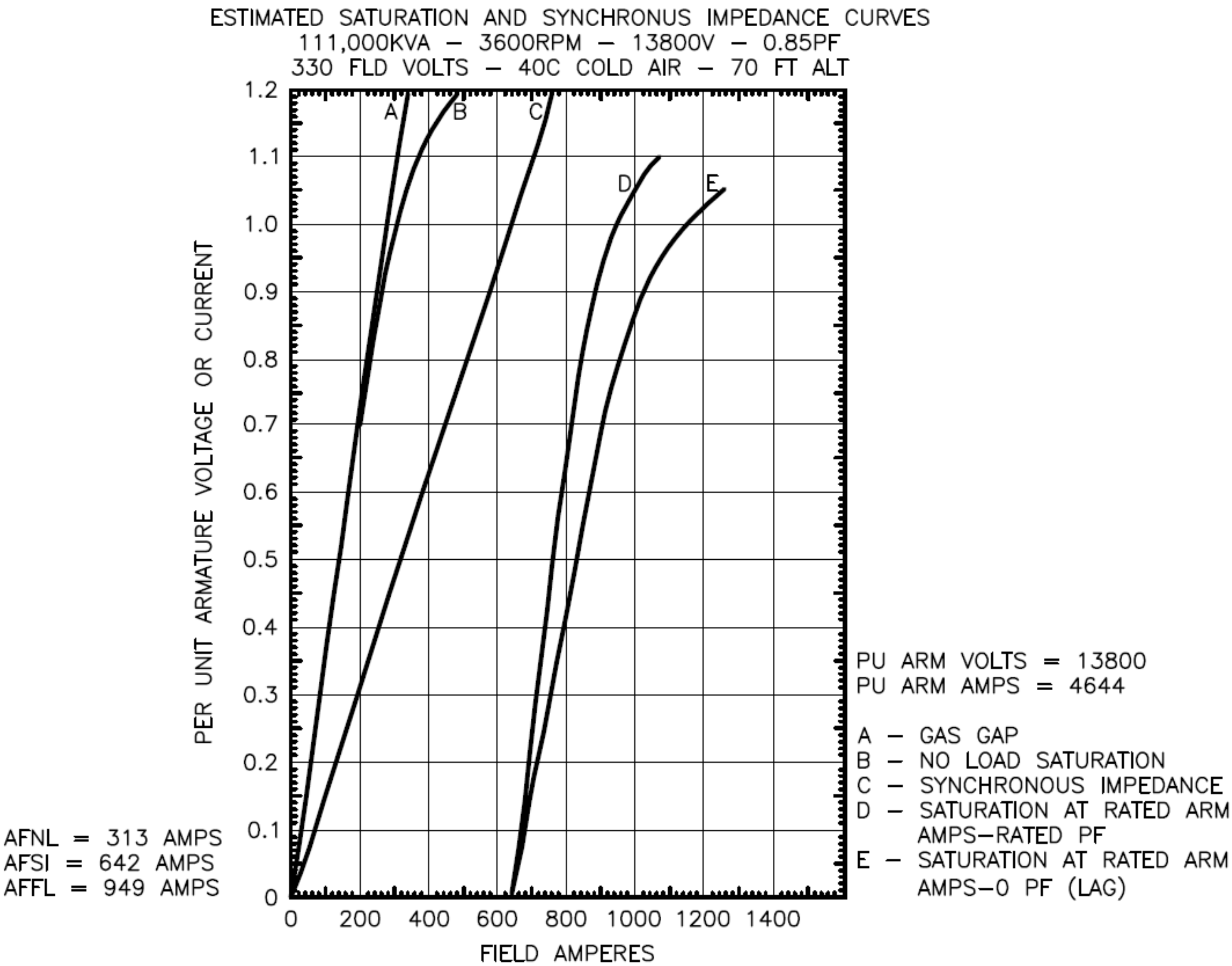
CURVES

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

Generator Saturation, Excitation Vee and Reactive Capability Curves attached below. Temperature Correction Curves are not applicable.

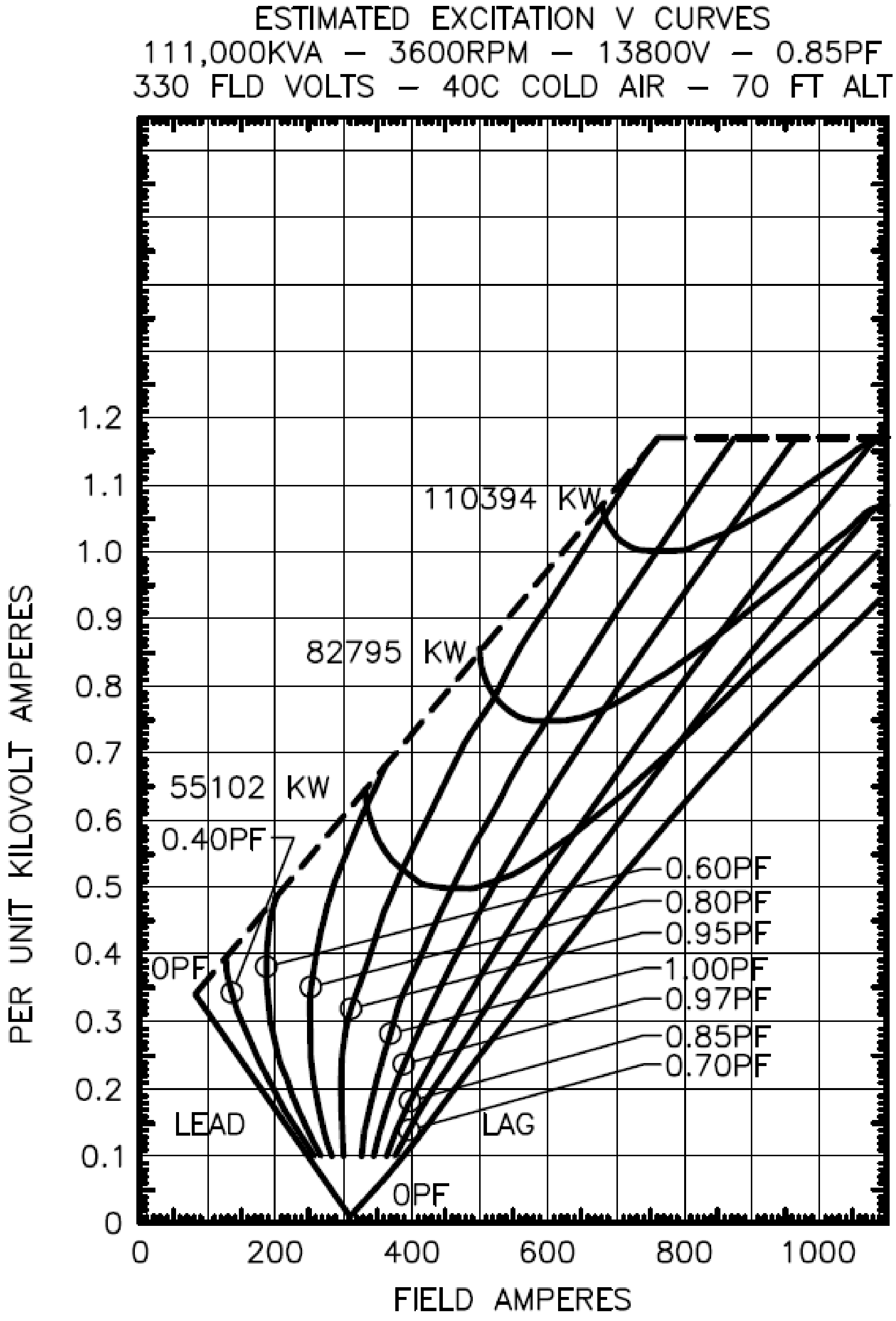
Attachment A (Page 4)
To Appendix 1
Interconnection Request

GENERATOR SATURATION CURVE



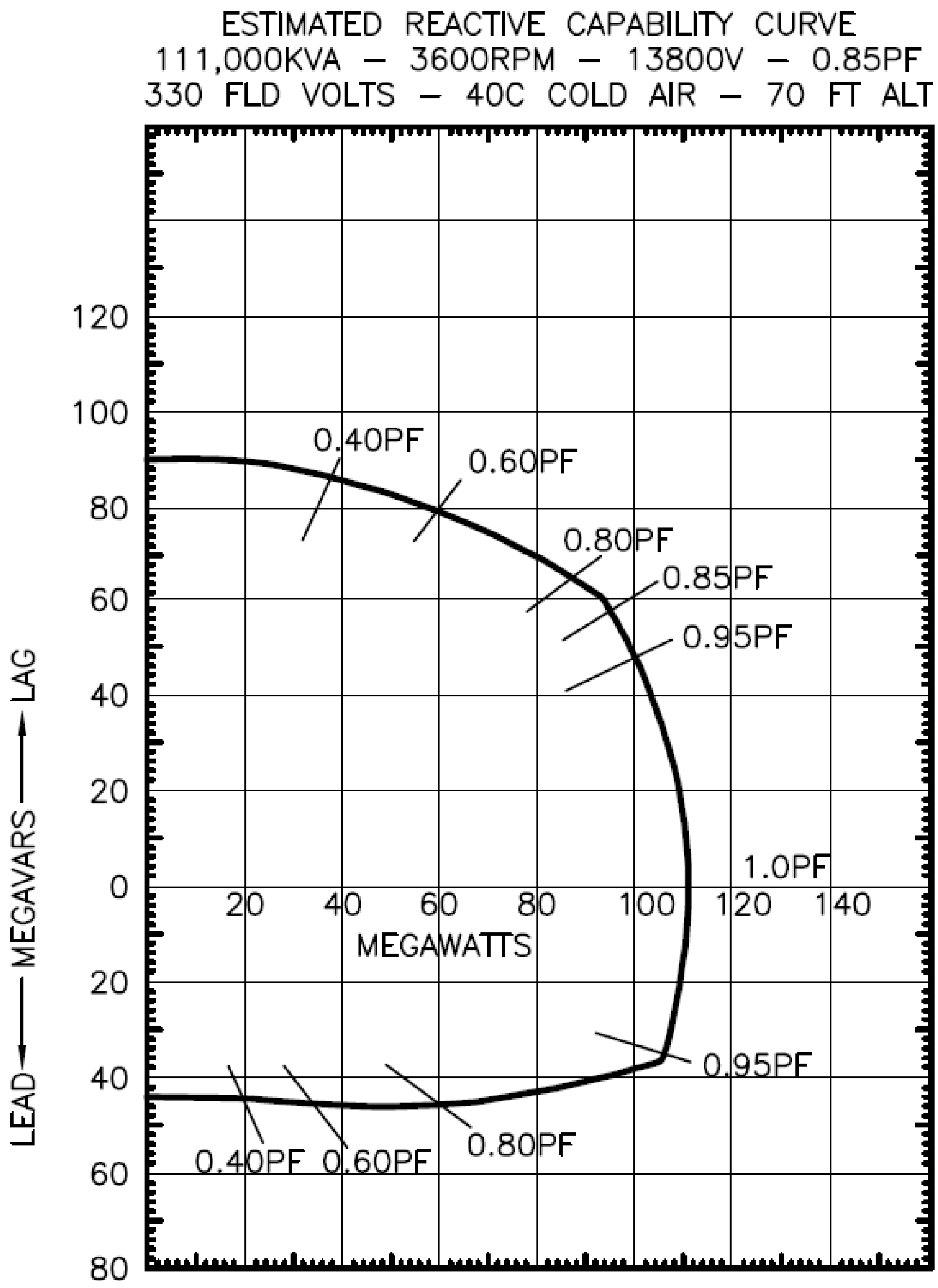
Attachment A (Page 5)
To Appendix 1
Interconnection Request

GENERATOR VEE CURVES



Attachment A (Page 6)
To Appendix 1
Interconnection Request

GENERATOR REACTIVE CAPABILITY CURVE



Attachment A (Page 7)
To Appendix 1
Interconnection Request

GENERATOR STEP-UP TRANSFORMER DATA

RATINGS

Capacity Self-cooled/maximum nameplate
66,000/88,000/110,000 ______________ kVA

Voltage Ratio (Generator side/System side/Tertiary)
13.8 kV / **230 kV**

Winding Connections (Low V/High V/Tertiary V (Delta or Wye)
DELTA / **GROUNDED WYE**

Fixed Taps Available

218.5/224.25/230.0/235.75/241.5 kV

Present Tap Setting

To be determined

IMPEDANCE

Positive	Z1 (on self-cooled kVA rating)	**9.5 @ 66 MVA** %	**75** X/R
Zero	Z0 (on self-cooled kVA rating)	**9.5 @ 66 MVA** %	**75** X/R

Note: Applicable data sheets are required for all multiple transformers and/or multiple winding transformers.

Attachment A (Page 8)
To Appendix 1
Interconnection Request

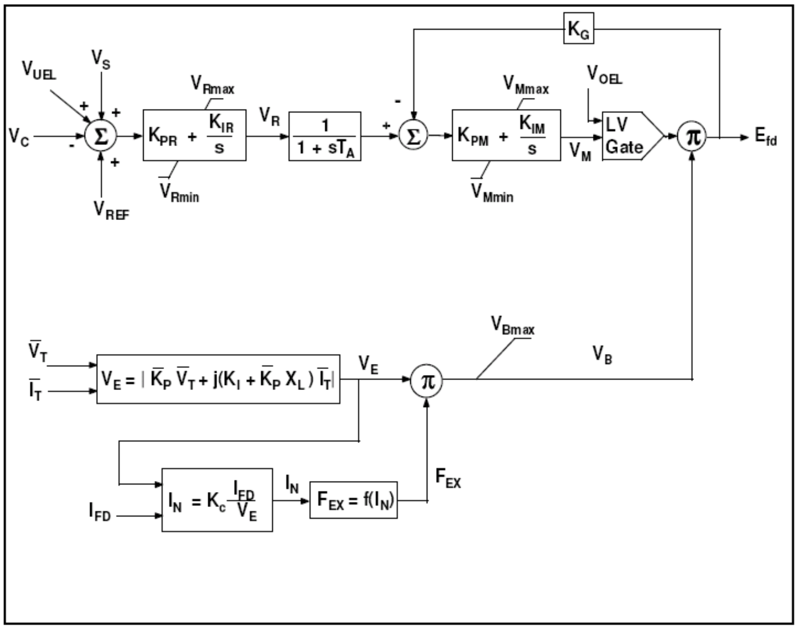
EXCITATION SYSTEM DATA

Identify appropriate IEEE model block diagram of excitation system and power system stabilizer (PSS) for computer representation in power system stability simulations and the corresponding excitation system and PSS constants for use in the model.

GENERATOR EXCITATION MODEL – IEEE TYPE ST4B

EX2100 Busfed Exciter Model Parameters

IEEE ST4B Model Format		Exciter Nominal Response at rated input	3.9
TR	0	KC	0.11
KPR	2.50	KIR	2.50
VRMAX	1.00	VRMIN	-0.87
TA	0.01	KG	0
KPM	1.00	KIM	0
VMMAX	1.00	VMIMIN	-0.87
KP	8.01	KI	0
VBMAX	10.01	XL	0



"Computer Models for Representation of Digital-Based Excitation Systems",
IEEE Trans. EC, Vol. 11, No. 3, September 1996, pp 607-615.

Attachment A (Page 9)
To Appendix 1
Interconnection Request

GENERATOR EXCITATION MODEL – IEEE TYPE ST4B [continued]

TR	AC sensor time constant
KPR	AVR proportional gain
KIR	AVR integral gain
VRMAX	Maximum AVR Output
VRMIN	Minimum AVR output
TA	AVR time constant
KG	Field voltage feedback gain
KPM	Inner loop proportional gain
KIM	Inner loop integral gain
VMMAX	Maximum inner loop output
VMIMIN	Minimum inner loop output
VBMAX	Maximum source voltage
KP	Potential source constant
KI	Current source constant
XL	Source leakage reactance
KC	Rectifier loading factor
VS	Stabilizing input
VOEL	Over Excitation limit input
VUEL	Under excitation limit input
VC	Compensated terminal voltage
VREF	Terminal voltage setpoint
EFD	Field voltage
IFD	Field current
VT	Terminal voltage
IT	Terminal current

Issued by: Randall Helmick
Vice President, Transmission

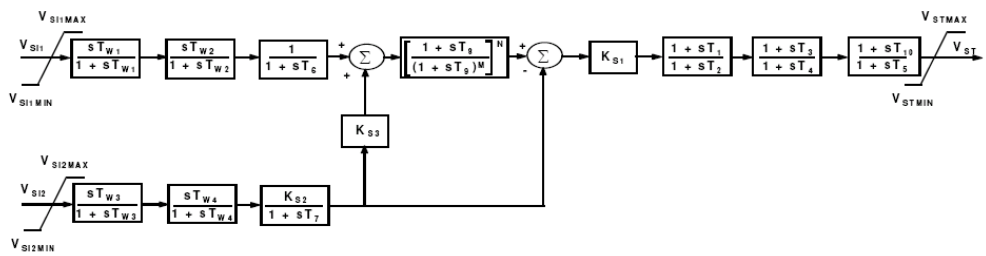
Effective: July 13, 2007

Issued on: July 13, 2007

POWER SYSTEM STABILIZER MODEL – IEEE TYPE PSS2A

PSS:

**TYPICAL EX2100 Power System Stabilizer (PSS)
IPS102936G3**



Ref. IEEE 421.5-1992 Type PSS2A
Note: Parameters shown with ranges give the typical or useful ranges actual setting ranges are usually much wider.
VSI1 = speed input
VSI2 = electrical power input
VSI1max, VSI1min - input #1 limits +/- 0.08 pu (fixed)
VSI2max, VSI2min - input #2 limits +/- 1.25 pu (fixed)
*T1 = lead #1 0.15 (range 0.1 - 2.0 sec) *T2 = lag #1 0.03 (range 0.01 - 1.0 sec)
*T3 = lead #2 0.15 (range 0.1 - 2.0 sec) *T4 = lag #2 0.03 (range 0.01 - 1.0 sec)
T5 = lag #3 0.0 (fixed not used in GE design) can be used if there are three lead lags or for equivalent torsional filter time constant which may be required for some units (determined by studies)
T6 = 0.0 (fixed) T7 = TW 2.0 sec (range 2 - 15 sec)
T8 = 0.5 sec (fixed) T9 = 0.1 sec (fixed)
T10 = Lag #3 = 0.0 (fixed not used in GE design)
N = 1 (fixed) M = 5 (fixed)
*KS1 = PSS gain = 4 - (range 3 - 20 typical)
KS2 = 0.225 = TW/(2H) - where H = combined turbine-gen. Inertia constant
KS3 = 1.0
VSTmax = (range 0.05 to 0.1) VSTmin = (range -0.05 to -0.1)
TW1 = TW see note on T7 above TW2 = TW see note on T7 above
TW3 = TW see note on T7 above TW4 = 0.0 (fixed)

* Note:Lead/Lags and Gain must be Determined by Studies

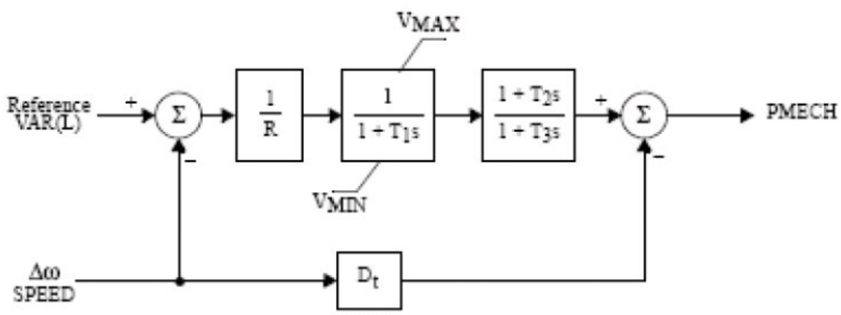
**Attachment A (Page 11)
To Appendix 1
Interconnection Request**

GOVERNOR SYSTEM DATA

Identify appropriate IEEE model block diagram of governor system for computer representation in power system stability simulations and the corresponding governor system constants for use in the model.

GOVERNOR MODEL – IEEE TYPE TGOV1

Speed Droop (pu)	R	0.05
Time constant	T_1 (>0)	0.02
Max. fuel valve opening (pu)	V_{MAX}	1
Min. fuel valve opening (pu)	V_{MIN}	0
Time constant	T_2	0
Time constant	T_3 (>0)	0.1
Turbine Dumping Factor	D_t	0



Issued by: Randall Helmick
Vice President, Transmission

Effective: July 13, 2007

Issued on: July 13, 2007

WIND GENERATORS

Number of generators to be interconnected pursuant to this Interconnection Request:
_**Not Applicable**__

Elevation: ______________ ____________Single Phase _____ Three Phase

Inverter manufacturer, model name, number, and version:
____

List of adjustable setpoints for the protective equipment or software:

Note: A completed General Electric Company Power Systems Load Flow (PSLF) data sheet or other compatible formats, such as IEEE and PTI power flow models, must be supplied with the Interconnection Request. If other data sheets are more appropriate to the proposed device, then they shall be provided and discussed at Scoping Meeting.

Attachment A (Page 13)
To Appendix 1
Interconnection Request

INDUCTION GENERATORS:

(*) Field Volts: _____**N/A**_________
(*) Field Amperes: ______**N/A**_____
(*) Motoring Power (kW): ____**N/A**__
(*) Neutral Grounding Resistor (If Applicable): _______**N/A**__
(*) I22t or K (Heating Time Constant): _____**N/A**____
(*) Rotor Resistance: _____**N/A**____
(*) Stator Resistance: _____**N/A**____
(*) Stator Reactance: _____**N/A**_____
(*) Rotor Reactance: _____**N/A**_____
(*) Magnetizing Reactance: ____**N/A**____
(*) Short Circuit Reactance: ____**N/A**____
(*) Exciting Current: ______**N/A**________
(*) Temperature Rise: ____**N/A**_________
(*) Frame Size: ______**N/A**______
(*) Design Letter: ____**N/A**_____
(*) Reactive Power Required In Vars (No Load): ___**N/A**__
(*) Reactive Power Required In Vars (Full Load): __**N/A**___
(*) Total Rotating Inertia, H: __**N/A**__Per Unit on KVA Base

Note: Please consult Transmission Provider prior to submitting the Interconnection Request to determine if the information designated by (*) is required