System Impact Study
PID 250
50MW Plant

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Rev	Issue Date	Description of Revision	Revised By	Project Manager
0	6/9/11	Posting System Impact Study	EC	BR

Contents

Executive Summary

This System Impact Study is the second step of the interconnection process and is based on the PID 250 request for interconnection on Entergy's transmission system between the Woodville and Warren 138kV substations located at PID 250 substation. This report is organized in three sections, namely, Energy Resource Interconnection Service (ERIS), Short Circuit/Breaker Rating Analysis, and Stability Study.

Requestor for PID 250 requested ERIS only; therefore, under ERIS, a load flow analysis was performed. PID 250 will be a new generation unit. The study evaluates connection of 50MW 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 ERIS is May 1, 2013.

Results of the System Impact Study indicated that under ERIS the additional generation due to PID 250 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 250 plant with priors and without priors. Results also indicated that the system is stable following all simulated three-phase normally cleared and stuck breaker faults. No dynamic voltage problems were noted. Therefore, estimated upgrade costs under ERIS with and without priors is $0.

The estimated cost of interconnection facilities is $7.5 Million; which covers the cost of the construction of a new 3-element 138 kV ring bus substation at the Customer's point of interconnection. The estimated costs of the interconnection facilities are planning estimates only. Detailed cost estimates, accelerated costs, and solutions for any identified limiting elements will be provided in the Facilities Study.

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 will be provided in the Facilities Study.

Energy Resource Interconnection Service

1. Introduction

This Energy Resource Interconnection Service (ERIS) is based on the Customer's request for 50MW interconnection on Entergy's transmission system between the Woodville and Warren 138kV substations located at PID 250 substation. The proposed commercial operation date of the project is May 1, 2013. The objective of this study is to assess the reliability impact of the new facility on the Entergy transmission 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 is performed to determine if the generation would cause the available fault current to surpass the fault duty of existing equipment within the Entergy transmission system.

This ERIS System Impact Study 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 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. 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 250 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 250 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 250 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 250 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 250 plant **with and without priors**. Priors included are: 221, 231, 238, 240, 244, and 247.

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 2014 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 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 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 PID 250 generation interconnection point was modeled on the existing Woodville – Warren 138kV transmission line. These 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 area as sink.

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 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. 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).

B) Under Contingencies

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

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

It was determined there are no Entergy Transmission System upgrades required for this ERIS request. Summary of the analysis results are documented in Table 3.3.1 for each scenario. Detailed results for each of the thirteen (13) studied interfaces for Scenarios 1, 2, 3 and 4 are included in Tables 3.3.2 - 3.3.5.

Table 3.3.1: Summary of Results for PID 250 – 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	-879	-972	-928	-1026
AEPW	American Electric Power West	2014	-488	-726	-532	-601
AMRN	Ameren Transmission	2014	-933	-1031	-983	-1086
CLEC	CLECO	2014	-226	-814	50	50
EES	Entergy	2014	-878	-1977	-935	-2039
EMDE	Empire District Electric Co	2014	-773	-854	-823	-909
LAFA	Lafayette Utilities System	2014	-624	-1404	-612	-1334
LAGN	Louisiana Generating, LLC	2014	-807	-1815	-846	-1844
LEPA	Louisiana Energy & Power Authority	2014	-853	-1002	-360	-785
OKGE	Oklahoma Gas & Electric Company	2014	-679	-750	-728	-805

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
SMEPA	South Mississippi Electric Power Assoc.	2014	-908	-1241	-779	-788
SOCO	Southern Company	2014	-1230	-1359	-1283	-1417
SPA	Southwest Power Administration	2014	-816	-902	-864	-955
TVA	Tennessee Valley Authority	2014	-1213	-1878	-1153	-1910

4. Facilities at the Point of Interconnection

The Interconnection Customer's designated Point of Interconnection (POI) is a new 138kV substation that will be constructed and cut-in on Entergy's Woodville – Warren 138kV transmission line. The interconnection customer is responsible for constructing all facilities needed to deliver generation to the POI. The estimated cost for a 138kV, 3 element ring bus configuration substation is $7.5 Million. This cost is based on parametric estimating techniques for a "typical" site. Cost may significantly change based on specific project parameters that are not known at this time. Costs specific to this interconnection will be developed during the Facility Study.

TABLE 3.3.2: 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
Champagne - Plaisance (CLECO) 138kV	10,920,000							X	X	X		X			
Conroe 1 - Conroe 2 138kV	TBD		X												
Coughlin - Plaisance 138kV (CLECO)	Other Ownership							X	X	X		X			
French Settlement - Sorrento 230kV	7,200,000											X	X		X
Habetz - Richard 138kV	Included in 2011 ICT Base Plan				X			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
Jackson Miami - Jackson Monument Street 115kV	2,520,000											X			
Judice - Scott1 138kV	6,720,000									X					
North Crowley - Scott1 138kV	14,280,000				X			X		X					
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Other Ownership							X	X	X					
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Committed to by Others					X		X	X	X		X	X		X
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Committed to by Others											X			

Limiting Elements	Est. Cost	AECI	AEPW	AMRN	CLECO	EES	EMDE	LAFA	LAGN	LEPA	OKGE	SMEPA	SOCO	SPA	TVA
Richard - Scott1 138kV	23,520,000							X		X					
Scott1 - Bonin 138kV	4,200,000							X		X					
Semere - Scott2 138kV	13,440,000							X		X					
Toledo - VP Tap 138kV	Included in 2011 ICT Base Plan	X	X	X	X	X	X	X	X	X	X	X	X	X	X

TABLE 3.3.3: 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					
Brookhaven - Mallalieu (MEPA) 115kV	Included in 2011 ICT Base Plan											X			
Carroll 230/138kV transformer (CLECO)	Other Ownership	X	X	X			X				X		X	X	X
Champagne - Plaisance (CLECO) 138kV	10,920,000							X	X	X		X			
Colonial Academy - Richard 138kV	9,240,000							X		X					
Conroe 1 - Conroe 2 138kV	TBD		X												
Coughlin - Plaisance 138kV (CLECO)	Other Ownership							X	X	X		X			
French Settlement - Sorrento 230kV	7,200,000											X	X		X
Habetz - Richard 138kV	Included in 2011 ICT Base Plan	X	X	X	X	X	X	X	X	X	X	X	X	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
Jackson Miami - Jackson Monument Street 115kV	2,520,000											X			

Limiting Elements	Est. Cost	AECI	AEPW	AMRN	CLECO	EES	EMDE	LAFA	LAGN	LEPA	OKGE	SMEPA	SOCO	SPA	TVA
Judice - Scott1 138kV	6,720,000									X					
North Crowley - Scott1 138kV	14,280,000	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Pleasant Hill 500/161kV transformer	Included in 2011 ICT Base Plan													X	
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Other Ownership							X	X	X					
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Committed to by Others					X		X	X	X		X	X		X
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Committed to by Others											X			
Richard - Scott1 138kV	23,520,000	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Scott1 - Bonin 138kV	4,200,000							X		X					
Semere - Scott2 138kV	13,440,000							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	X	X

TABLE 3.3.4: 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
Carroll 230/138kV transformer (CLECO)	Other Ownership	X	X	X			X				X		X	X	X
Conroe 1 - Conroe 2 138kV	TBD		X												
Coughlin - Plaisance 138kV (CLECO)	Other Ownership							X	X	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
Jackson Miami - Jackson Monument Street 115kV	2,520,000											X			
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Committed to by Others					X		X	X	X		X	X		X
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Committed to by Others											X			

TABLE 3.3.5: 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
Carroll 230/138kV transformer (CLECO)	Other Ownership	X	X	X			X				X		X	X	X
Champagne - Plaisance (CLECO) 138kV	10,920,000							X	X	X		X			
Conroe 1 - Conroe 2 138kV	TBD		X												
Coughlin - Plaisance 138kV (CLECO)	Other Ownership							X	X	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
Jackson Miami - Jackson Monument Street 115kV	2,520,000											X			
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Other Ownership							X	X	X					
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Committed to by Others					X		X	X	X		X	X		X
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Committed to by Others											X			

Stability Study

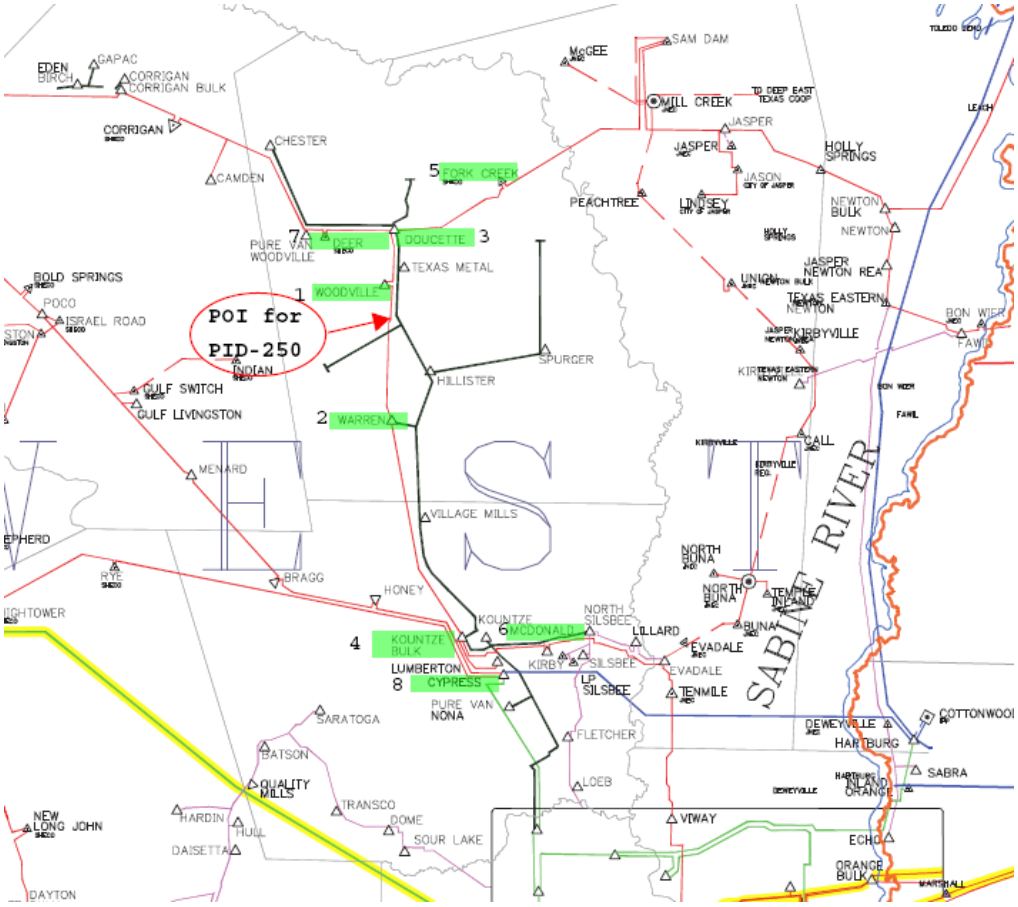
5. Executive Summary

Southwest Power Pool (SPP) commissioned ABB Inc. to perform a stability study for the interconnection of project PID 250. The proposed project is a 50 MW biomass unit (steam turbine-generator) that is requesting interconnection on the Woodville-Warren 138kV transmission line (approximately 1.8 miles from Woodville and 8.9 miles from Warren substations) in the Entergy service territory.

The objective of this study is to evaluate the impact of proposed PID 250 project on the stability of the Entergy transmission system. The study was performed on a 2014 Summer Peak case, provided by SPP-ICT/Entergy. Figure 5.1 below shows the location of the proposed 50MW biomass unit interconnecting station.

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

Figure 5.1: Location of the proposed 50MW biomass interconnecting station



6. Final conclusions

Based on the results of stability analysis, it can be concluded that interconnection of the proposed PID 250 (50MW) project at Woodville-Warren 138kV transmission line in the Entergy service territory does not adversely impact the stability of the Entergy System in the local area. Results indicated that the system is stable following all simulated three-phase normally cleared and stuck breaker faults. No dynamic voltage problems were noted.

7. Stability Analysis

7.1 Stability Analysis Methodology

The goal of stability analysis is to verify that the response to dynamic events (e.g. faults) is acceptable (no out-of-step condition, no voltage recovery issues, damped behavior) with the proposed PID 250 in service.

Three-phase faults with normal clearing and delayed clearing were simulated. If system is unstable following a three-phase stuck breaker fault, it will be repeated assuming a single-phase stuck breaker fault. 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. Bus voltages were monitored to check any voltage recovery issues. The fault clearing times used for the simulations are given in Table 7.1 below.

Table 7.1: Fault Clearing Times

Contingency at kV level	Normal Clearing	Delayed Clearing
138	6 cycles	6+9 cycles

The following transient voltage criteria were used:

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

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

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

Stability analysis was performed using the PSS/ETM dynamics program V30.3.3 CVF build. PSS/ETM 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).

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.

7.2 Study Model Development

PID 250 is comprised of a 50MW biomass unit (steam turbine-generator). This generator has a 0.85 p.f. capability and is connected to the grid using a 13.8/138kV generator step-up transformer. The study model consists of power flow case and dynamics database that was developed as described below.

7.2.1 Power Flow Case

A pre-project power flow case representing 2014 Summer Peak conditions, 'EN14S10_U1_CP_finalr2_PID250_unconv.sav' was provided by SPP/ Entergy.

A post-project case was developed by adding the PID 247 and PID 250 projects. The representation of PID 250 was updated to reflect data for 50MW biomass steam-turbine generator. The biomass unit was modeled as shown in Figure 7.1 The generator was modeled at a 13.8kV bus with a 13.8/138.0kV step-up transformer connecting the biomass unit to the Woodville-Warren 138kV transmission line. Both projects were dispatched against other generators in the Entergy footprint area (outside of Entergy Texas).

Figure 7.1 shows the PSS/E one-line diagram for the local area with PID 250 project for the 2014 Summer Peak system condition.

7.2.2 Stability Database

A base case stability database was provided by SPP/Entergy in a PSSE *.dyr file format ('red11S_newnum.dyr'). This stability database was updated with the PID 247 model provided by SPP.

SPP also provided the dynamic data for the PID 250 project. This included the generator, excitation system, and turbine-governor model data as shown in Table 7.2. The dynamic data was reviewed to identify any suspicious data. The following changes were made so as to be consistent with typical values for machines of this size and vintage:

1. $T'Q_0$: The typical value for the q-axis open circuit transient time constant is approximately 0.4 sec.

2. The saturation constants for the generator were checked against manufacturer data (see Figure 7.2). The computed values for S(1.0) and S(1.2), the saturation values at 100% and 120% of the rated generator voltage are respectively, 0.1 and 0.44. The original values shown in Table 7.2(a) were replaced with these values.

3. Based on exciter type shown in Table 7.2(b), an exciter model was selected (EX2000 in PSSE which represents IEEE Type AC7B). Some of the exciter parameters were found inconsistent and therefore replaced with typical values (see entries in blue in Table 7.2(b)).

4. For the governor data, the droop value (in per unit) as given by SPP (see Table 7.1) seemed to be 1/R (value of 20; R = 1/20 = 0.05).The droop values are generally provided on MW base but in PSS/E it has to be entered on machine MVA base. Therefore we converted the droop value of 0.05 onto 58 MVA base which gives a value of 0.059.

The revised parameters based on the above four (4) items are shown in Table 7.3(a) through 7.3(c). The changes to the original parameters are highlighted in blue.

With these revised parameters, the following exciter and governor response tests were performed on PID 250:

Excitation System Response Ratio Test
This test is used to check the following quantities: full load excitation voltage, excitation system ceiling, and excitation system response ratio. The test is particularly useful in checking the field-forcing capability of the excitation system.

Standard PSS/E activities were used to perform this test. The generator was initialized to rated MW and MVAr. At time t=0 seconds, the voltage regulator reference settings were automatically raised such that its excitation system is driven to its ceiling as rapidly as possible. PSS/E then automatically calculates and prints the response ratio.

The results from the excitation system test are plotted in Figure 7.3. The exciter output voltage and the response ratio (computed value of 1.30) looked reasonable.

Excitation System Open-Circuit Step Test
While the response ratio test gives information on excitation system ceiling and response ratio, it gives no information on whether the excitation system gains and time constants are well tuned. The excitation system open-circuit step test can be used to make this assessment.

For the purposes of this test, the generator is initialized to 1.0 pu terminal voltage on open-circuit. At time t=0 seconds, a step change of 5% is introduced in the excitation system voltage reference. The resulting generator field voltage and terminal voltage responses are plotted in Figure 7.4. The exciter open-circuit step test showed acceptable performance with the exciter response (Efd) increasing quickly in response to the step change in reference voltage and then returned to its initial value.

Turbine-Governor Step Test
This test is used to check the performance of the turbine-governor model. It is intended to check whether the governor gains and time-constants correspond to a well tuned and damped response.

For the purposes of this test, generator is isolated from the system and is connected to a load. The load on the generator is adjusted to 80% of the generator rated MVA. At time t=0 seconds, a step increase of 5% is introduced in the load. The resulting generator mechanical power and per-unit speed deviation are plotted. The result from governor response test is plotted in Figure 7.5, which indicates a well damped response. Such a performance is considered acceptable.

Revised dynamic data for PID 250 were appended to the stability database to create a dynamic database for the Post-PID 250 power flow case. The PSS/E power flow and dynamic data for PID-250 are included in Appendix A.

Figure 7.1: One-line diagram for the local are with PID 250 project

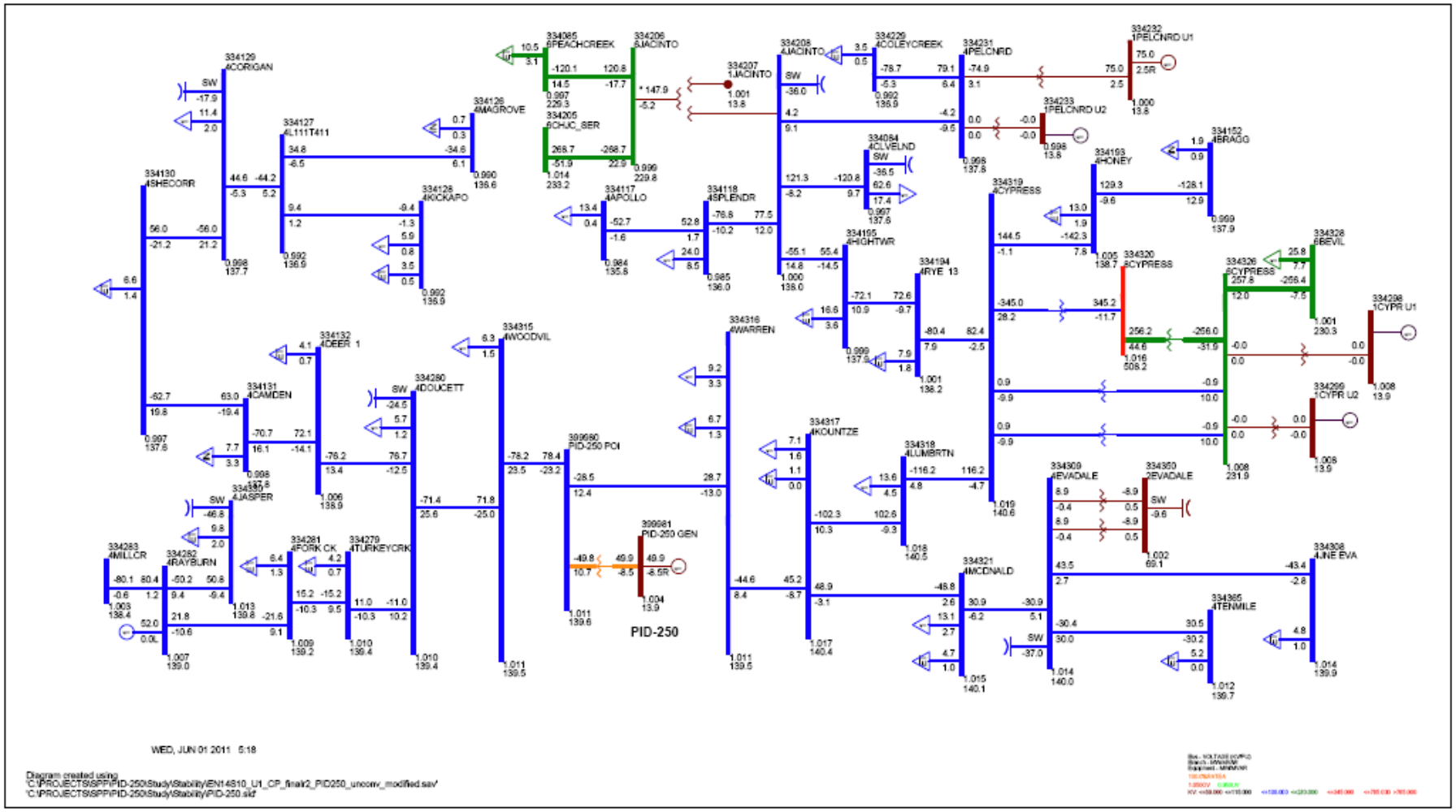


Table 7.2(a): Original Generator Parameters (File Name: Attachment A)

T'D0	T''D0	T'Q0	T''Q0	H	DAMP	XD	XQ	X'D	X'Q	X''D	XL	S(1.0)	S(1.2)
6.8	0.05	2.1	0.05	2.26	0	1.94	1.77	0.165	0.2	0.119	0.107	1	1.8

Table 7.2(b): Original Exciter Parameters (File Name: Attachment A)

KPR	KIR	VRMAX	VRMIN	KPA	KIA	VAMAX	VAMIN	KP	KL	TE	VFEMAX	KE	KC	KD
15	1.88	3.2	-3.2	80.49	0	30.9	-39.15	1000	10000	1.2	11.3	1	0.67	1.95
KF1	**KF2**	**E1**	**S(E1)**	**E2**	**S(E2)**	**KV/HZ**	**KRCC**	**TR**	**IFDREF1**	**IFDREF2**	**IFDREF3**	**IFDREF4**	**I1**	**T1**
0	0.075	7.4	0.32	9.9	3.74	0	0	0.01	-	-	-	-	-	-
I2	**T2**	**I3**	**T3**	**I4**	**T4**	**TLEAD**	**TLAG**	**KPIFD**	**KIIFD**	**IFDLIMP**	**IFDLIMN**	**IFDADVLIM**	**VEMIN**	**REFLIMP**
-	-	-	-	-	-	-	-	-	-	-	-	-	0	-

Table 7.2(c): Original Governor Parameters (File Name: Attachment A)

R	T1	VMAX	VMIN	T2	T3	DT
20	0.4	1	0	0.4	0.02	0

Figure7.2: Generator Saturation curve – Excerpt from Manufacturer's Data

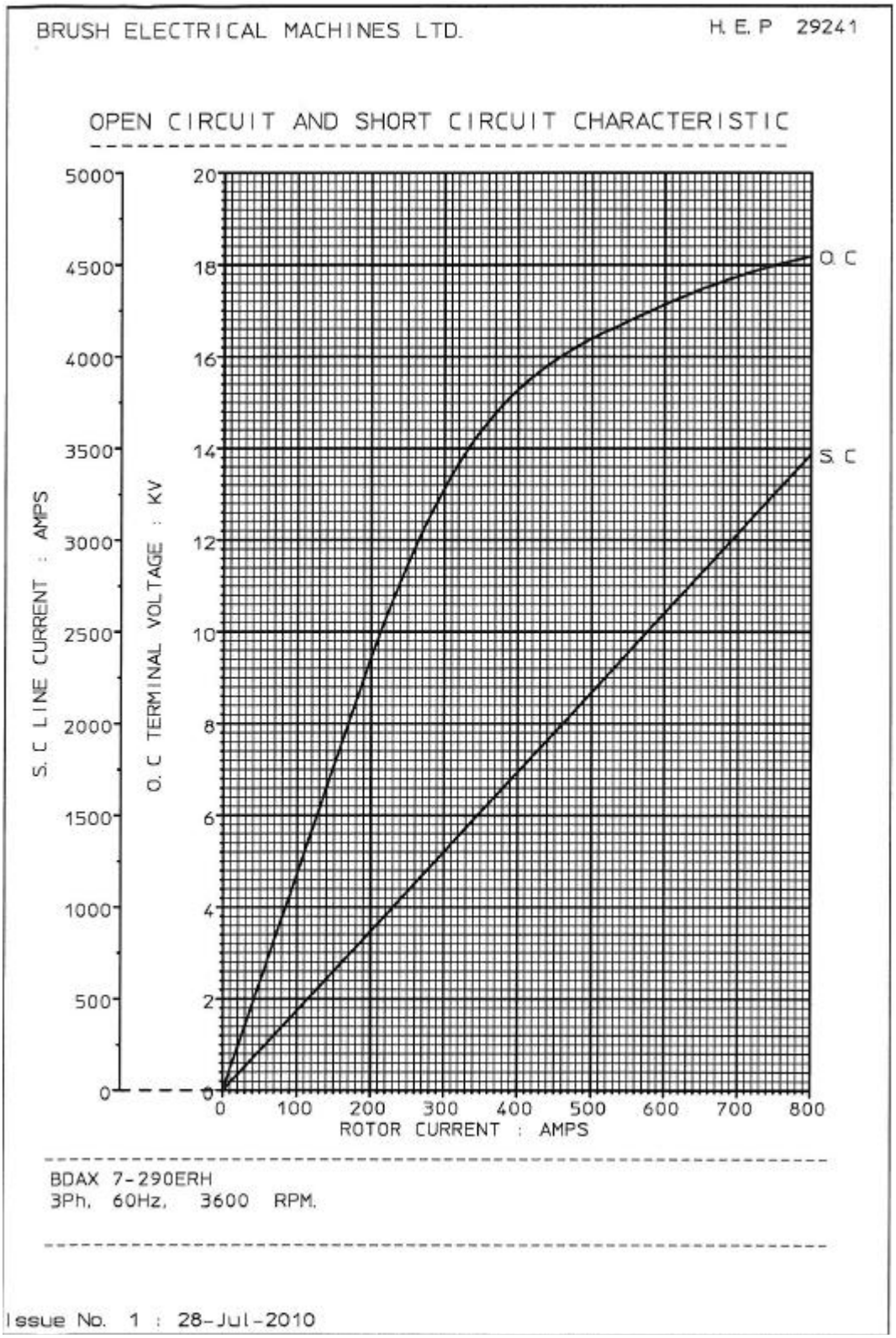


Table 7.3(a): Revised Generator Parameters

T'D0	T''D0	T'Q0	T''Q0	H	DAMP	XD	XQ	X'D	X'Q	X''D	XL	S(1.0)	S(1.2)
6.8	0.05	**0.4**	0.05	2.26	0	1.94	1.77	0.165	0.2	0.119	0.107	**0.1**	**0.44**

Table 7.3(b): Revised Exciter Parameters

KPR	KIR	VRMAX	VRMIN	KPA	KIA	VAMAX	VAMIN	KP	KL	TE	VFEMAX	KE	KC	KD
15	1.88	3.2	-3.2	80.49	0	**2**	**-2**	**5**	**10**	1.2	11.3	1	**0.14**	**0.3**
KF1	**KF2**	**E1**	**S(E1)**	**E2**	**S(E2)**	**KV/HZ**	**KRCC**	**TR**	**IFDREF1**	**IFDREF2**	**IFDREF3**	**IFDREF4**	**I1**	**T1**
0.367	**0**	**3.25**	**0.205**	**4**	**0.35**	**0**	**0**	**0**	**3.25**	**2**	**2.25**	**3.25**	**2.5**	**60**
I2	**T2**	**I3**	**T3**	**I4**	**T4**	**TLEAD**	**TLAG**	**KPIFD**	**KIIFD**	**IFDLIMP**	**IFDLIMN**	**IFDADVLIM**	**VEMIN**	**REFLIMP**
3	**30**	**4.25**	**15**	**5**	**7**	**1.5**	**0.25**	**2.5**	**5.25**	**1**	**-1**	**0.75**	0	**1.1**

Table 7.3(c): Revised Governor Parameters

R	T1	VMAX	VMIN	T2	T3	DT
0.059	0.4	1	0	0.4	0.02	0

Figure 7.3: Exciter Response Ratio Test - Revised Data

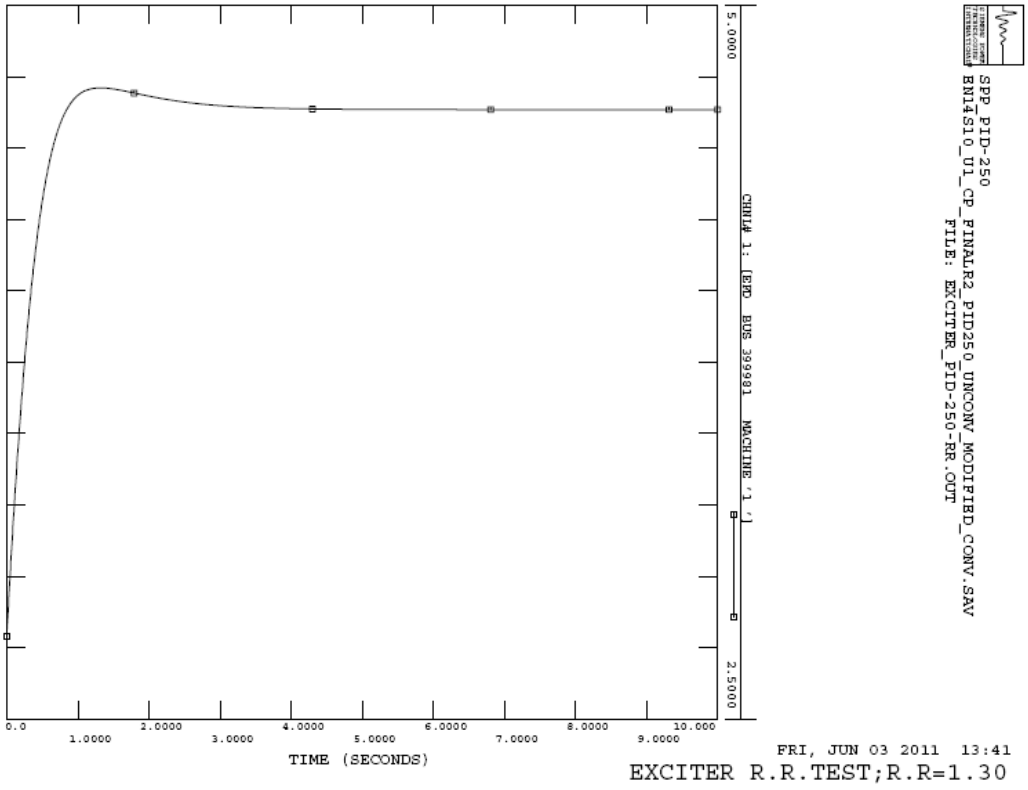


Figure 7.4: Exciter Open Circuit Test - Revised Data

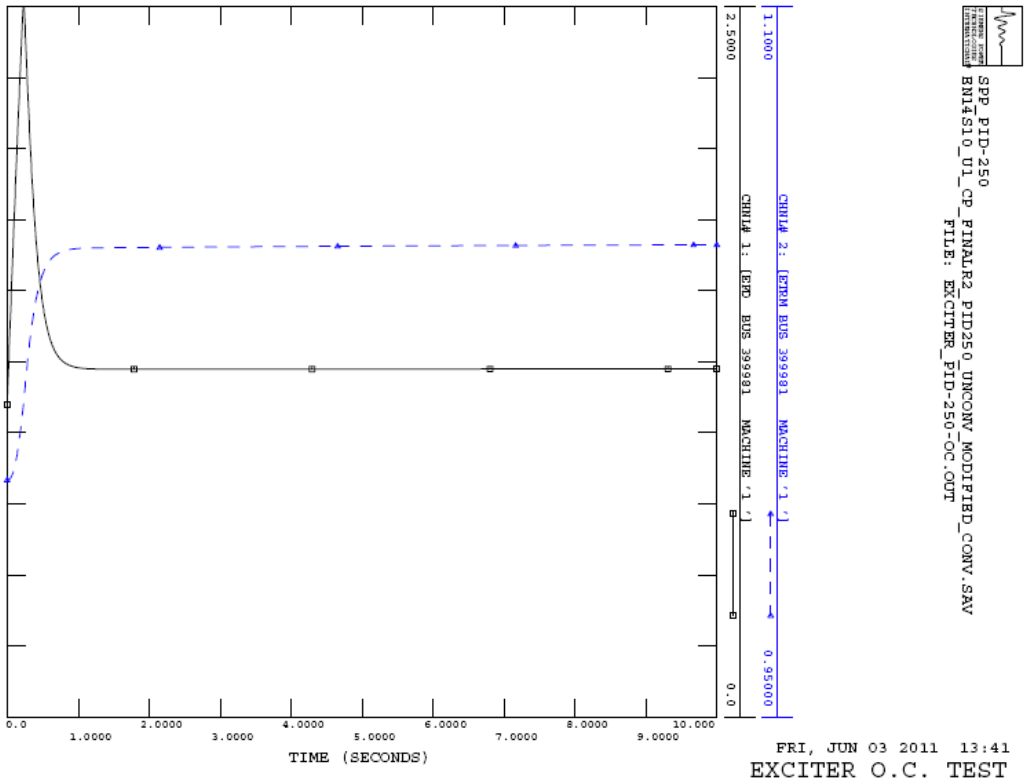
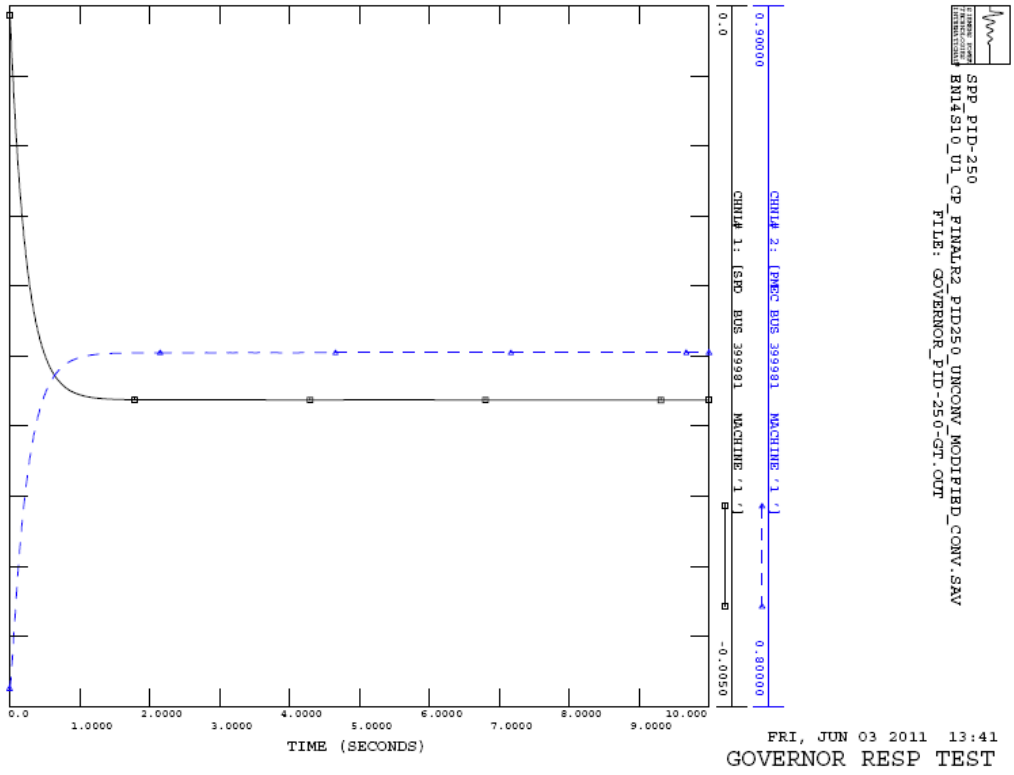


Figure 7.5: Governor Response Test - Revised Data



7.3 Transient Stability Analysis

Stability simulations were run to examine the transient behavior of the PID 250 project and its impact on the Entergy system.

Three-phase faults were chosen in the vicinity of PID 250 and simulated as either normally clearing or with stuck-breaker conditions.

Breaker configuration at the point of interconnection of PID 250 was unavailable and therefore we assumed a three-breaker ring bus configuration at the 138kV POI.

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.
Breaker failure scenarios were simulated with the following sequence of events:

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

2) The fault is then cleared by back-up clearing.

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

Table 7.4 lists all the fault cases that were simulated in this study, including normally cleared three-phase faults and three-phase stuck breaker faults. Figure 7.6 to Figure 7.10 shows the layout diagrams of the nearby 138kV substations where faults were simulated, as well as fault locations.

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

Table 7.4: List of Simulated Faults

Fault #	Line on which Fault occurs	Fault Location (For Simulation)	Fault Type	Fault Clearing (CY)		Stuck Breaker	Breaker Clearing		Tripped Facilities
				Primary	Back-up		Primary	Back-up	
FAULT_1	Woodville - PID-250 POI 138kV	Woodville 138kV	3PH	6	None	None	2, 3 (PID-250 POI), 3515 (Doucette)	None	PID-250 POI-Woodville-Doucette; All are 138kV facilities, Woodville Transformers#1 & 2 disconnected
FAULT_1A	PID-250 POI – Woodville 138kV	PID-250 POI 138kV	3PH	6	None	None	2, 3 (PID-250 POI), 3515 (Doucette)	None	PID-250 POI-Woodville-Doucette; All are 138kV facilities, Woodville Transformers#1 & 2 disconnected
FAULT_2	Warren - PID-250 POI 138kV	Warren 138kV	3PH	6	None	None	24050 (Warren), 1, 3 (PID-250 POI)	None	Warren-PID-250 POI; 138kV line
FAULT_2A	PID-250 POI - Warren 138kV	PID-250 POI 138kV	3PH	6	None	None	24050 (Warren), 1, 3 (PID-250 POI)	None	Warren-PID-250 POI; 138kV line
FAULT_3	Warren 134/34.5kV Transformer#1	Warren 138kV	3PH	6	None	None	24045, 24050 (Warren)	None	Warren Transformers #1&2 disconnected
FAULT_4	Doucette-Woodville 138kV	Doucette 138kV	3PH	6	None	None	3515 (Doucette), 2, 3 (PID-250 POI)	None	Doucette-Woodville-PID-250 POI; All are 138kV facilities, Woodville Transformers#1 & 2 disconnected
FAULT_5	Doucette-Deer 138kV	Doucette 138kV	3PH	6	None	None	5285 (Doucette), Breaker 6470 at Corrigan (Deer)	None	Doucette-Deer, Deer-Camden, Camden-Shecorr, Shecorr-Corrigan; All are 138kV facilities
FAULT_6	Doucette-Turkey Creek 138kV	Doucette 138kV	3PH	6	None	None	2905 (Doucette), Breaker 32&42 at Rayburn (Turkey Creek)	None	Doucette-Turkey Creek, Turkey Creek-Fork Creek, Fork Creek- Rayburn; All are 138kV facilities
FAULT_7	Kountze-Warren 138kV	Kountze 138kV	3PH	6	None	None	2955, 5380 (Kountze), 24045 (Warren)	None	Kountze-Warren 138kV line
FAULT_8	Kountze-McDonald 138kV	Kountze 138kV	3PH	6	None	None	5380, 5390 (Kountze), Breaker 5365 at Evadale (McDonald)	None	Kountze-McDonald, McDonald-Evadale; All are 138kV lines, McDonald Transformers#1 & 2 also disconnected
FAULT_9	Kountze-Lumberton 138kV	Kountze 138kV	3PH	6	None	None	3520, 5390 (Kountze), 22040, 22045 (Cypress)	None	Kountze-Lumberton, Lumberton-Cypress 138kV lines, Transformer#1 at Lumberton
FAULT_10	Cypress - Honey 138kV	Cypress 138kV	3PH	6	None	None	22970, 22965 (Cypress), Breaker 24035 at Sheco Honey Island	None	Cypress-Honey Island 138kV line
FAULT_11	Cypress - Rye 138kV	Cypress 138kV	3PH	6	None	None	22070, 22075 (Cypress), Breaker 26255 at Sheco High Tower (Rye)	None	Cypress-Rye, Rye-High Tower; All are 138kV facilities

Fault #	Line on which Fault occurs	Fault Location (For Simulation)	Fault Type	Fault Clearing (CY)		Stuck Breaker	Breaker Clearing		Tripped Facilities
				Primary	Back-up		Primary	Back-up	
FAULT_12	Cypress Autotransformer#1 ; 500/138kV	Cypress 138kV	3PH	6	None	None	22045, 22050, 22925, 22930 (Cypress)	None	Cypress Autotransformer#1; 500/138kV tripped
FAULT_13	Warren-Kountze 138kV	Warren 138kV	3PHSB	6	9	24045 (Warren)	2955, 5380 (Kountze)	24050 (Warren)	Warren-Kountze, Warren-PID-250 POI; All are 138kV lines, Transformers #1 &2 at Warren
FAULT_14	Doucette-Woodville 138kV	Doucette 138kV	3PHSB	6	9	3515 (Doucette)	2, 3 (PID-250 POI)	5285, 2905, 22140 (Doucette)	PID-250 POI-Woodville- Doucette, Doucette- Corrigan (Deer), Doucette-Rayburn(Turkey Creek); All are 138kV facilities, Woodville and Doucette Transformers#1 & 2 are also disconnected
FAULT_15	Doucette-Deer 138kV	Doucette 138kV	3PHSB	6	9	5285 (Doucette)	Breaker 6470 at Corrigan (Deer)	22140, 3515, 2905 (Doucette)	Doucette-Deer-Camden-Shecorr-Corringan, Doucette-Turkey Creek-Fork Creek- Rayburn, Doucette-Woodville-PID-250 POI; All are 138kV facilities
FAULT_16	Doucette-Turkey Creek 138kV	Doucette 138kV	3PHSB	6	9	2905 (Doucette)	Breaker 32&42 at Rayburn (Turkey Creek)	22140, 3515, 5285 (Doucette)	Doucette-Turkey Creek- Fork Creek-Rayburn, Doucette-Deer-Camden-Shecorr-Corringan, Doucette-Woodville-PID-250 POI; All are 138kV facilities
FAULT_17	Kountze-Warren 138kV	Kountze 138kV	3PHSB	6	9	5380 (Kountze)	2955 (Kountze), 24045 (Warren)	5390 (Kountze)	Warren-Kountze 138kV line, McDonald 138kV Substation
FAULT_18	Kountze-Warren 138kV	Kountze 138kV	3PHSB	6	9	2955 (Kountze)	5380 (Kountze), 24045 (Warren)	3520 (Kountze)	Warren-Kountze 138kV line, Transformers #1 at Kountze
FAULT_19	Kountze-Lumberton 138kV	Kountze 138kV	3PHSB	6	9	3520 (Kountze)	5390 (Kountze), 22040, 22045 at Cypress (Lumberton)	2955 (Kountze)	Kountze-Lumberton, Lumberton-Cypress 138kV lines, Transformer#1 at Lumberton and Kountze
FAULT_20	Kountze-Lumberton 138kV	Kountze 138kV	3PHSB	6	9	5390 (Kountze)	3520 (Kountze), 22040, 22045 at Cypress (Lumberton)	5380 (Kountze)	Kountze-Lumberton, Lumberton-Cypress; All are 138kV lines, Transformer#1 at Lumberton, McDonald 138kV substation
FAULT_21	Cypress-Lumberton 138kV	Cypress 138kV	3PHSB	6	9	22045 (Cypress)	22040 at Cypress , 3520, 5390 (Kountze)	22050, 22925, 22930 (Cypress)	Cypress-Lumberton-Kountze; 138kV lines, Transformer#1 at Lumberton, Cypress Autotransformer#1 are also disconnected

3PH = Three-phase faults
3PHSB = Three-phase stuck breaker faults
Assumed a three-breaker (#1,2,3) ring bus at the POI

Figure 7.6: One-line diagram for Woodville 138 kV substation

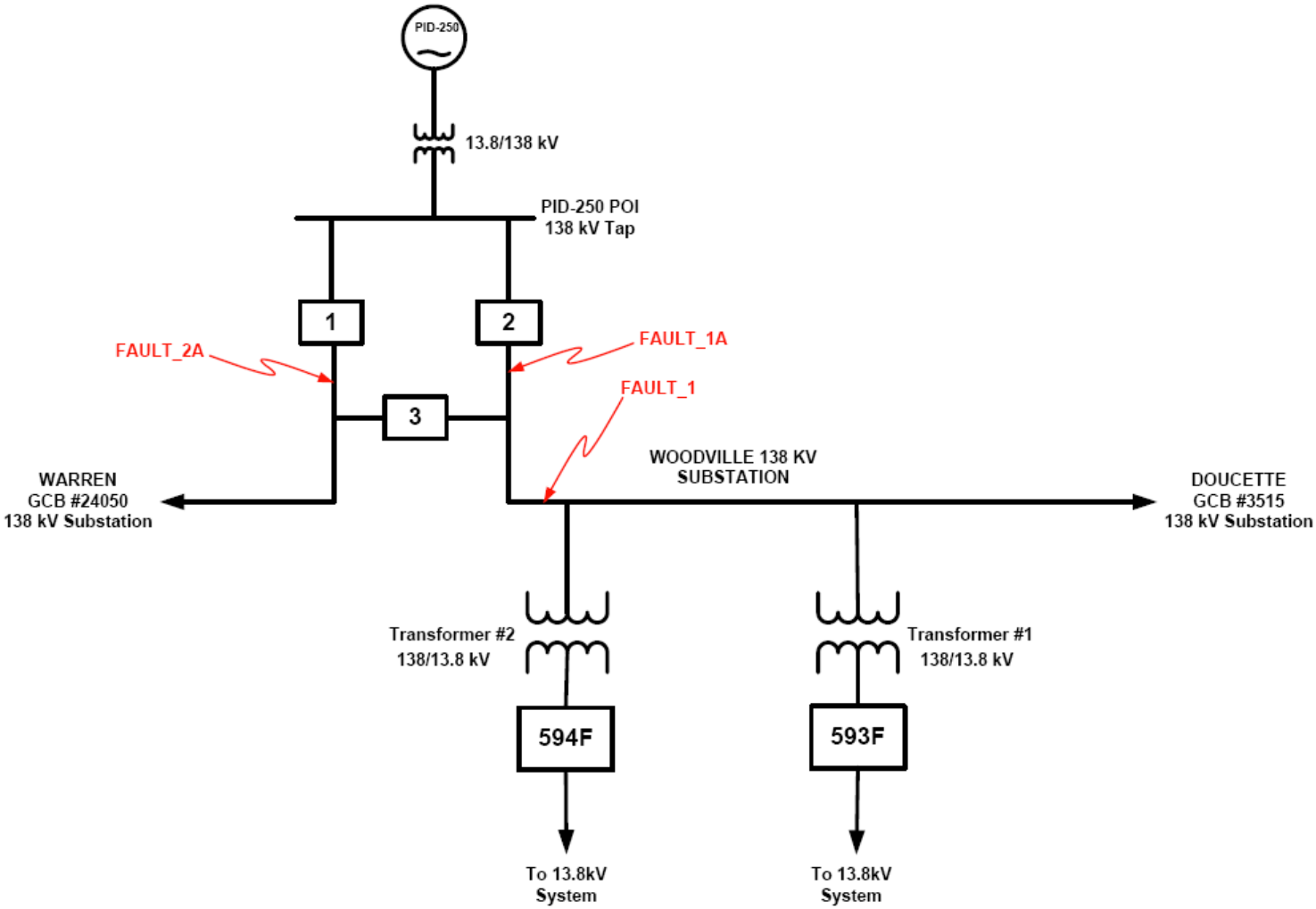


Figure 7.7: One-line diagram for Warren 138 kV substation

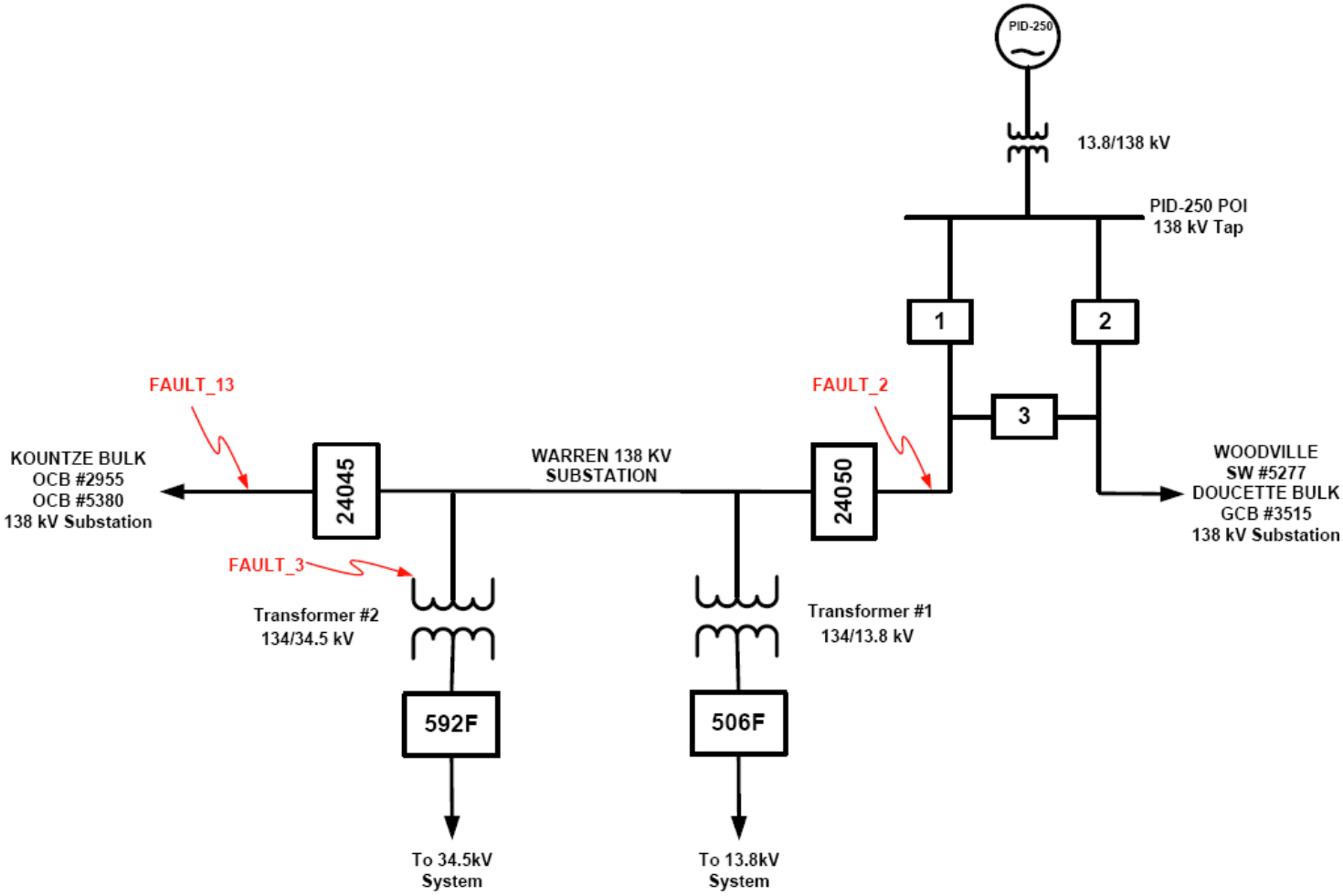


Figure 7.8: One-line diagram for Doucette 138 kV substation

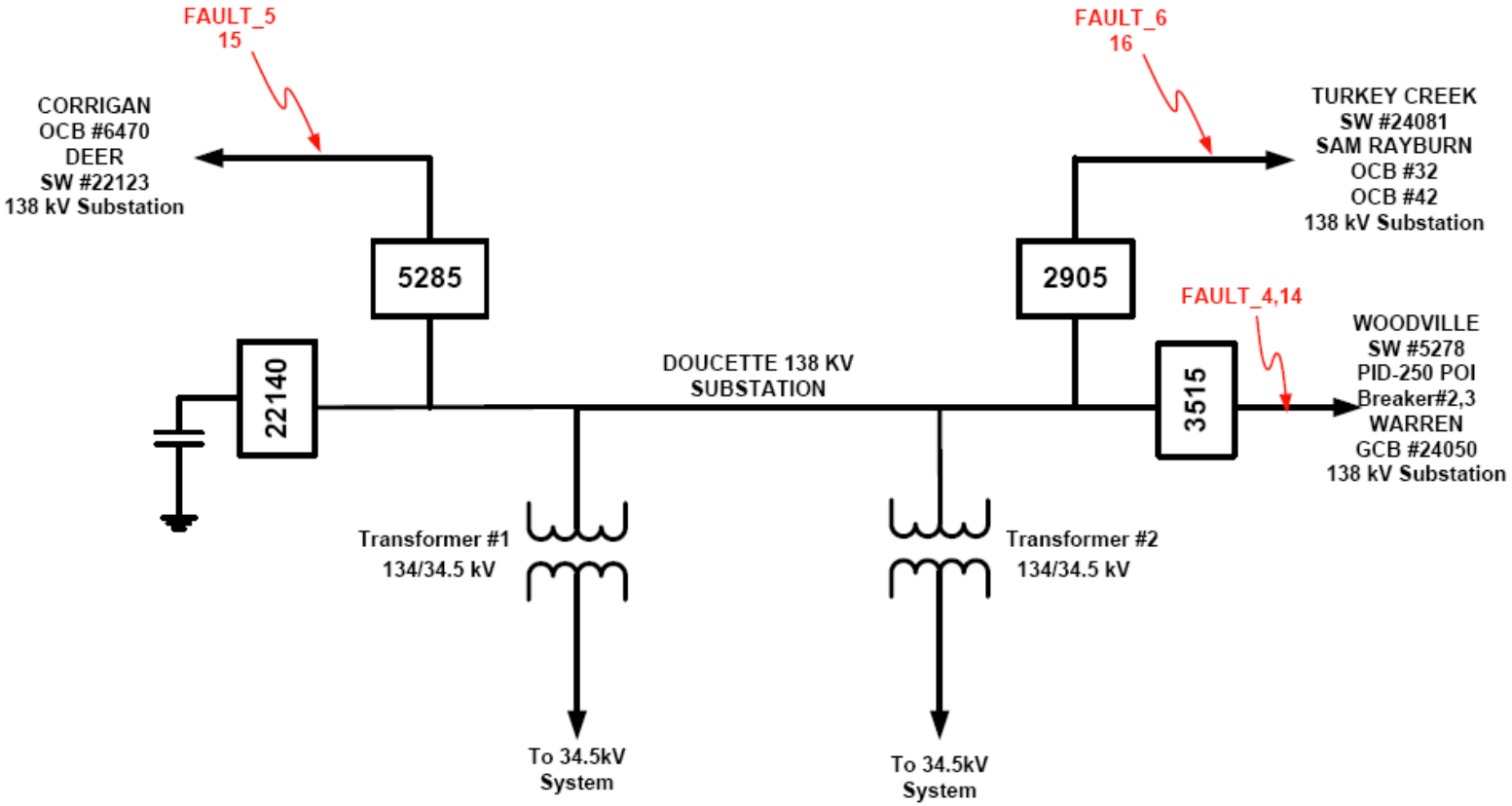


Figure 7.9: One-line diagram for Kountze Bulk 138 kV substation

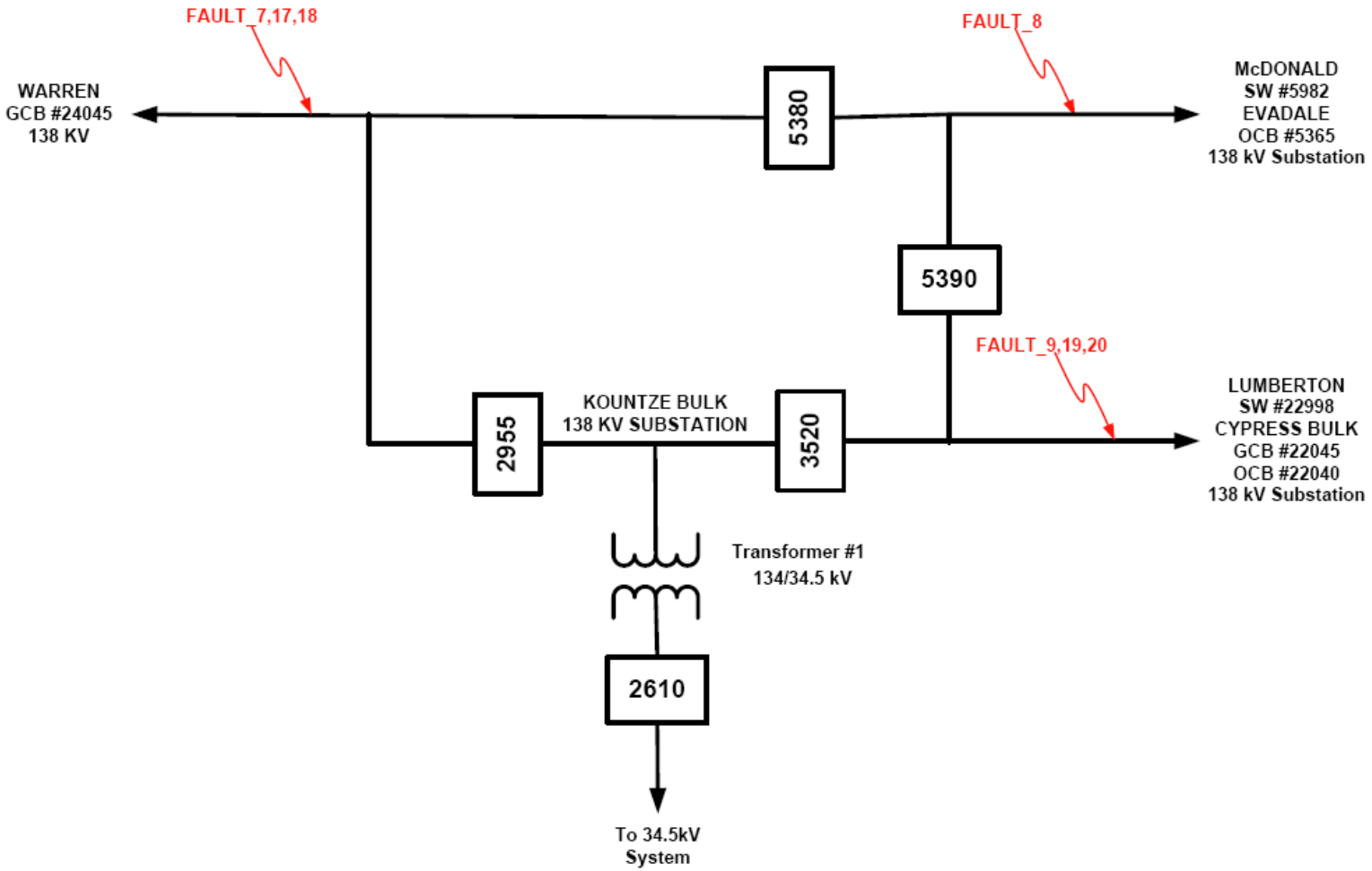
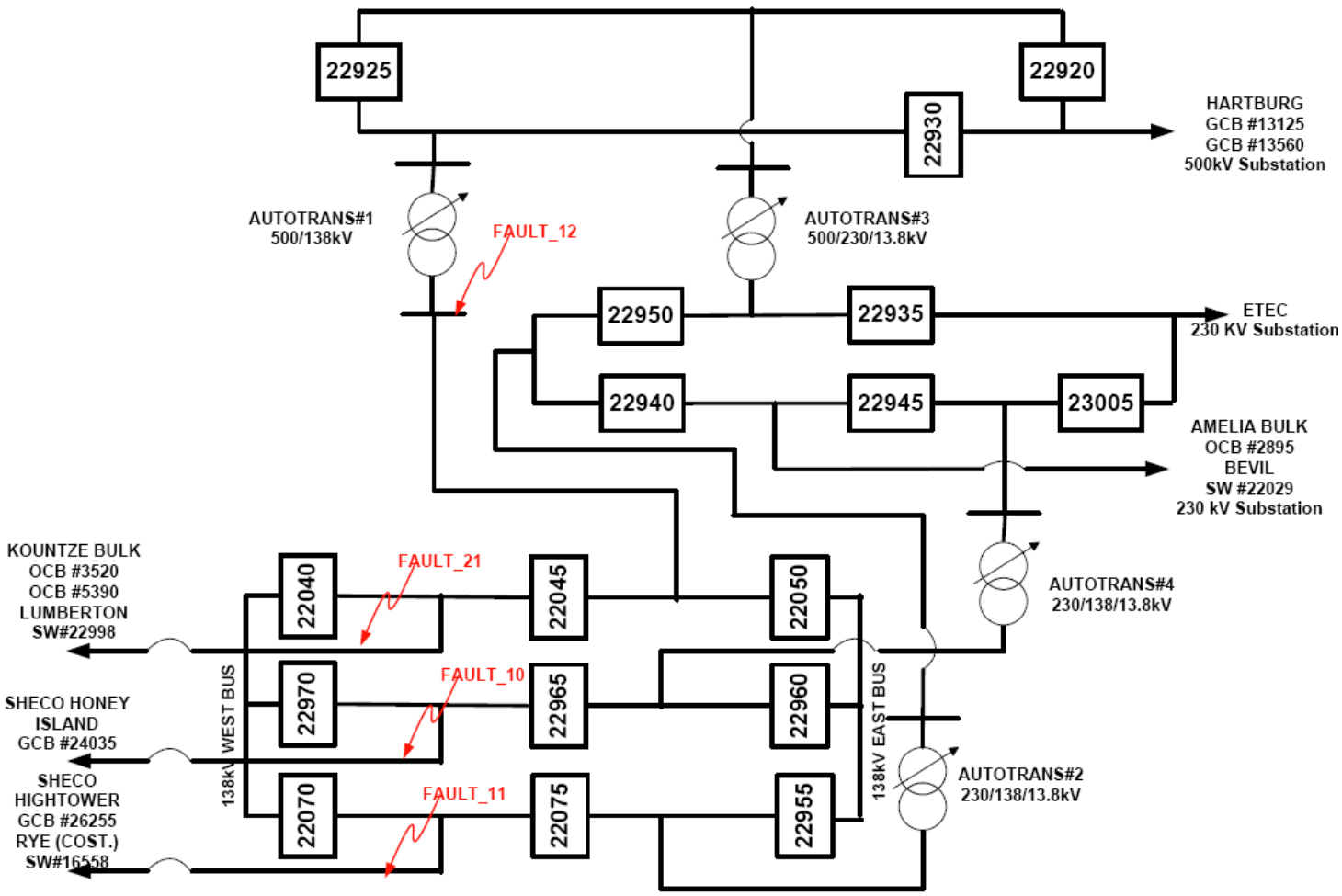


Figure 7.10: One-line diagram for Cypress 500/138 kV substation



Analyses on the post-project case showed the system to be stable following all three-phase normally cleared and stuck breaker faults. Table 7.5 shows the simulation results for the three-phase normally cleared and stuck breaker faults and the plots from simulations are shown in **Error! Reference source not found.**

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 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 7.5: Three-Phase Normally Cleared and Stuck Breaker Faults Simulation Results

Fault #	Comments
FAULT_1	STABLE
FAULT_1A	STABLE
FAULT_2	STABLE
FAULT_2A	STABLE
FAULT_3	STABLE
FAULT_4	STABLE
FAULT_5	STABLE
FAULT_6	STABLE
FAULT_7	STABLE
FAULT_8	STABLE
FAULT_9	STABLE
FAULT_10	STABLE
FAULT_11	STABLE
FAULT_12	STABLE
FAULT_13	STABLE
FAULT_14	STABLE
FAULT_15	STABLE
FAULT_16	STABLE
FAULT_17	STABLE
FAULT_18	STABLE
FAULT_19	STABLE
FAULT_20	STABLE
FAULT_21	STABLE

APPENDIX A: DATA PROVIDED BY CUSTOMER

Attachment A to Appendix 1
Interconnection Request

LARGE GENERATING FACILITY DATA

UNIT RATINGS

KVA 58,710 °F 90 Voltage 13.8 kV
Power Factor 0.85
Speed (RPM) 3600 Connection (e.g. Wye) Wye
Short Circuit Ratio 0.57 Frequency, Hertz 60
Stator Amperes at Rated kVA 2456 Field Volts 155
Max Turbine MW 49.9 °F 90

COMBINED TURBINE-GENERATOR-EXCITER INERTIA DATA

Inertia Constant, H = 2.26 kW sec/kVA
Moment-of-Inertia, WR^2 = 4.432E+04 lb. $ft.^2$

REACTANCE DATA (PER UNIT-RATED KVA)

		DIRECT AXIS		QUADRATURE AXIS
Synchronous – saturated	X_{dv}	1.740	X_{qv}	1.400
Synchronous – unsaturated	X_{di}	1.940	X_{qi}	1.770
Transient – saturated	X'_{dv}	0.165	X'_{qv}	0.200
Transient – unsaturated	X'_{di}	0.202	X'_{qi}	0.290
Subtransient – saturated	X''_{dv}	0.119	X''_{qv}	0.140
Subtransient – unsaturated	X''_{di}	0.149	X''_{qi}	0.180
Negative Sequence – saturated	$X2_v$	0.116		
Negative Sequence – unsaturated	$X2_i$	0.146		
Zero Sequence – saturated	$X0_v$	0.078		
Zero Sequence – unsaturated	$X0_i$	0.078		
Leakage Reactance	Xl_m	0.107		

FIELD TIME CONSTANT DATA (SEC)

Open Circuit	T'_{do}	6.8	T'_{qo}	2.1
Three-Phase Short Circuit Transient	T'_{d3}	0.46	T'_{q}	0.23
Line to Line Short Circuit Transient	T'_{d2}	0.93		
Line to Neutral Short Circuit Transient	T'_{d1}	1.14		
Short Circuit Subtransient	T''_{d}	0.04	T''_{q}	0.04
Open Circuit Subtransient	T''_{do}	0.05	T''_{qo}	0.05

ARMATURE TIME CONSTANT DATA (SEC)

Three Phase Short Circuit	T_{a3}	0.23
Line to Line Short Circuit	T_{a2}	0.23
Line to Neutral Short Circuit	T_{a1}	0.20

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	0.0044
Negative	R_2	0.0225
Zero	R_0	0.0065

Rotor Short Time Thermal Capacity I_2^2t = 30K
Field Current at Rated kVA, Armature Voltage and PF = 825 amps
Field Current at Rated kVA and Armature Voltage, 0 PF = 991 amps
Three Phase Armature Winding Capacitance = 0.57 microfarad
Field Winding Resistance = 0.183 ohms 100 °C
Armature Winding Resistance (Per Phase) = 0.0043 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

32000 / 53000 kVA

Voltage Ratio(Generator Side/System side/Tertiary)
13.8 / 138 / N/A kV

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

Fixed Taps Available
±2x2.5%

Present Tap Setting
N/A

IMPEDANCE

Positive Z_1 (on self-cooled kVA rating) 9.0 % 27.3 X/R

Zero Z_0 (on self-cooled kVA rating) 9.0 % 27.3 X/R

APPENDIX B: POWER FLOW AND STABILITY DATA

Following data is presented in PSS/E Version 30.3.3 format.

Power flow Data

```
399980,'PID-250 POI ', 138.0000,1,     0.000,     0.000, 351, 105,1.01124, -16.2716,   1
399981,'PID-250 GEN ',  13.8000,2,     0.000,     0.000, 351, 105,1.00430, -13.7230,   1
0 / END OF BUS DATA, BEGIN LOAD DATA
0 / END OF LOAD DATA, BEGIN GENERATOR DATA
399981,'1 ',    49.900,    -8.463,    31.000,   -31.000,1.00430,  399981,    58.700,
0.00400,   0.11900,   0.00000,   0.00000,1.00000,1,  100.0,    49.900,     0.000,
1,1.0000
0 / END OF GENERATOR DATA, BEGIN BRANCH DATA
334315, 399980,'1 ',   0.00293,   0.00769,   0.00183,  134.00,  134.00,    0.00,
0.00000,  0.00000,  0.00000,  0.00000,1,   1.82,   1,1.0000
334316,-399980,'1 ',   0.01429,   0.03756,   0.00892,  134.00,  134.00,    0.00,
0.00000,  0.00000,  0.00000,  0.00000,1,   8.91,   1,1.0000
0 / END OF BRANCH DATA, BEGIN TRANSFORMER DATA
399980,399981,     0,'1 ',1,2,1,   0.00000,   0.00000,1,'GSU         ',1,   1,1.0000
   0.00106,   0.02878,    32.00
1.00000, 138.000,   0.000,    32.00,    32.00,    53.00, 0,      0, 1.10000, 0.90000,
1.10000, 0.90000,   5, 0, 0.00000, 0.00000
1.00000,  13.800
0 / END OF TRANSFORMER DATA, BEGIN AREA DATA
 351,337653,    -6.400,    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
 105,'GSTBMR      '
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
```

Dynamics Data

```
      PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS/E      TUE, MAY 31 2011  15:19

 PLANT MODELS

 REPORT FOR ALL MODELS                    BUS 399981 [PID-250 GEN 13.800] MODELS


 ** GENROU **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S
            399981 PID-250 GEN  13.800 1  130500-130513  51045-51050

              MBASE     Z S O R C E         X T R A N       GENTAP
               58.7  0.00400+J 0.11900  0.00000+J 0.00000  1.00000

  T'D0 T''D0  T'Q0 T''Q0     H   DAMP   XD     XQ     X'D    X'Q   X''D    XL
  6.80 0.050  0.40 0.050   2.26  0.00 1.9400 1.7700 0.1650 0.2000 0.1190 0.1070

                               S(1.0)  S(1.2)
                               0.1000  0.4400


 ** EX2000 **  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
            399981 PID-250 GEN  13.800 1  130514-130558  51051-51056    8323-8323
4273-4276

      KPR     KIR    VRMAX  VRMIN    KPA    KIA     VAMAX   VAMIN    KP      KL      TE
   15.000   1.880   3.200  -3.200  80.490   0.000   2.000  -2.000   5.000  10.000   1.200

   VFEMAX    KE      KC      KD     KF1     KF2     E1     S(E1)    E2     S(E2)   KV/HZ
   11.300   1.000   0.140   0.300   0.367   0.000   3.250   0.205   4.000   0.350   0.000

    KRCC     TR   IFDREF1 IFDREF2 IFDREF3 IFDREF4   I1      T1      I2      T2      I3
    0.000   0.000   3.250   2.000   2.250   3.250   2.500  60.000   3.000  30.000   4.250

     T3      I4      T4     TLEAD   TLAG   KPIFD   KIIFD  IFDLIMP IFDLIMN IFDADVLIM VEMIN
REFLIMP
   15.000   5.000   7.000   1.500   0.250   2.500   5.250   1.000  -1.000   0.750   0.000
1.100
 FIELD CURRENT (OVER EXCITATION) LIMITER IS OFF
 MINIMUM GATE 2 OF REFERENCE SIGNAL DIAGRAM IS EXCLUDED


 ** TGOV1 **   BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S     VAR
            399981 PID-250 GEN  13.800 1  130559-130565  51057-51058    8324

        R         T1       VMAX      VMIN       T2        T3        DT
      0.059     0.400     1.000     0.000     0.400     0.020     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: Prior Generation Interconnection and Transsmission Service Requests in Study Models

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

PID	Substation	MW	In Service Date
PID 247	PID-247	180	12/1/2011

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
74728369		Brazos Electric Cooperative	100	1/1/2012	1/1/2017
74728395	Not modeled	Brazos Electric Cooperative	100	1/1/2012	1/1/2017
74728400	Not modeled	Brazos Electric Cooperative	100	1/1/2012	1/1/2017
74728415	Not modeled	Brazos Electric Cooperative	100	1/1/2012	1/1/2017
74728420	Not modeled	Brazos Electric Cooperative	100	1/1/2012	1/1/2017

APPENDIX E: Details of Scenario 1 – 2014

AECI

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-879
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-481
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-355
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-53
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	31

AEPW

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-488
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-325
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-197
Conroe 1 - Conroe 2 138kV	Oak Ridge - Porter 138kV	-116
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-43
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	25

AMRN

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-933
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-506
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-377
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-54
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	31

CLECO

Limiting Element	Contingency Element	ATC
Habetz - Richard 138kV	Wells 500/230kV transformer	-226
North Crowley - Scott1 138kV	Wells 500/230kV transformer	-189
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-124

EES

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-878
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-77
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	45

EMDE

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-773
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-442
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-312
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-51
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	29

LAFA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-624
Coughlin - Plaisance 138kV (CLECO)	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-419
Champagne - Plaisance (CLECO) 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-360
Semere - Scott2 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-341
Coughlin - Plaisance 138kV (CLECO)	Vil Plat (CLECO) - West Fork (CLECO) 230kV	-308
Semere - Scott2 138kV	Vil Plat (CLECO) - West Fork (CLECO) 230kV	-306
Habetz - Richard 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-255
Champagne - Plaisance (CLECO) 138kV	Vil Plat (CLECO) - West Fork (CLECO) 230kV	-248
Habetz - Richard 138kV	Vil Plat (CLECO) - West Fork (CLECO) 230kV	-218
North Crowley - Scott1 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-176
Semere - Scott2 138kV	Wells 500/230kV transformer	-161
North Crowley - Scott1 138kV	Vil Plat (CLECO) - West Fork (CLECO) 230kV	-147
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-137
North Crowley - Scott1 138kV	Richard - Scott1 138kV	-123
Semere - Scott2 138kV	Bonin - Cecelia 138kV	-63
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Rodemacher (CLECO) - Sherwood (CLECO) 230kV	-62
Habetz - Richard 138kV	Wells 500/230kV transformer	-51
North Crowley - Scott1 138kV	Wells 500/230kV transformer	-47
Habetz - Richard 138kV	Acadian - Bonin 230kV (LAFA)	-43
Scott1 - Bonin 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-9
Richard - Scott1 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	14
Scott1 - Bonin 138kV	Vil Plat (CLECO) - West Fork (CLECO) 230kV	31
Richard - Scott1 138kV	Vil Plat (CLECO) - West Fork (CLECO) 230kV	43
Habetz - Richard 138kV	Flander - Acadian 230kV (LAFA)	45

LAGN

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-807
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-597
Champagne - Plaisance (CLECO) 138kV	Cocodrie - Vil Plat 230kV	-420
Coughlin - Plaisance 138kV (CLECO)	Vil Plat - West Fork 230kV	-295
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Rodemacher (CLECO) - Sherwood (CLECO) 230kV	-136
Champagne - Plaisance (CLECO) 138kV	Vil Plat - West Fork 230kV	-118
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-92

LEPA

Limiting Element	Contingency Element	ATC
Semere - Scott2 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-853
Semere - Scott2 138kV	Vil Plat (CLECO) - West Fork (CLECO) 230kV	-767
Habetz - Richard 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-766
Habetz - Richard 138kV	Vil Plat (CLECO) - West Fork (CLECO) 230kV	-655
Coughlin - Plaisance 138kV (CLECO)	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-590
North Crowley - Scott1 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-536
Champagne - Plaisance (CLECO) 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-507
Semere - Scott2 138kV	Wells 500/230kV transformer	-448
North Crowley - Scott1 138kV	Vil Plat (CLECO) - West Fork (CLECO) 230kV	-448
Coughlin - Plaisance 138kV (CLECO)	Vil Plat (CLECO) - West Fork (CLECO) 230kV	-433
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-352
Champagne - Plaisance (CLECO) 138kV	Vil Plat (CLECO) - West Fork (CLECO) 230kV	-350
North Crowley - Scott1 138kV	Richard - Scott1 138kV	-321
Bonin - Cecelia 138kV	Colonial Academy - Richard 138kV	-237
Habetz - Richard 138kV	Wells 500/230kV transformer	-176
North Crowley - Scott1 138kV	Wells 500/230kV transformer	-164
Habetz - Richard 138kV	Acadian - Bonin 230kV (LAFA)	-134
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-95
Semere - Scott2 138kV	Habetz - Richard 138kV	-93
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Rodemacher (CLECO) - Sherwood (CLECO) 230kV	-91
Semere - Scott2 138kV	Richard - Scott1 138kV	-80
Bonin - Cecelia 138kV	Acadia GSU - Colonial Academy 138kV	-77
Semere - Scott2 138kV	Bonin - Cecelia 138kV	-75
Scott1 - Bonin 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-73
Semere - Scott2 138kV	North Crowley - Richard 138kV	-29
Bonin - Cecelia 138kV	Acadia GSU - Scanlan 138kV	27
Richard - Scott1 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	42
Judice - Scott1 138kV	Sellers Road (CLECO) - Labbe (LAFA) 230kV	47
Judice - Scott1 138kV	Sellers Road (CLECO) - Segura (CLECO) 230kV	50

OKGE

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-679
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-405
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-274
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-48
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	28

SMEPA

Limiting Element	Contingency Element	ATC
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Canton - Pickens 230kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Lakeover 500/115kV transformer	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Canton South - Canton 230kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Ray Braswell 500/115kV transformer 1	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Brookhaven - Wesson 115kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	James Road (SMEPA) - Wesson 115kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Vicksburg - Waterways 115kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Brookhaven South - Franklin 115kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Bovina - Flowers 115kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Franklin - Vaughn 115kV	*
Jackson Miami - Jackson Monument Street 115kV	South Jackson 230/115kV transformer 1	-908
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-602
French Settlement - Sorrento 230kV	Bogalusa - Franklin 500kV	-473
French Settlement - Sorrento 230kV	Bogalusa - Adams Creek 500/230kV transformer	-473
Champagne - Plaisance (CLECO) 138kV	Cocodrie - Vil Plat 230kV	-424
Coughlin - Plaisance 138kV (CLECO)	Vil Plat - West Fork 230kV	-297
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-275
Jackson Miami - Jackson Monument Street 115kV	Jackson Forrest Hill - Ray Braswell 115kV	-193
Jackson Miami - Jackson Monument Street 115kV	Jackson HICO - North Jackson 115kV	-154
Jackson Miami - Jackson Monument Street 115kV	Jackson HICO - Rex Brown E 115kV	-154
Champagne - Plaisance (CLECO) 138kV	Vil Plat - West Fork 230kV	-119
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-68
Jackson Miami - Jackson Monument Street 115kV	Jackson Forrest Hill - Southwest Jackson 115kV	-35
Jackson Miami - Jackson Monument Street 115kV	Klean - Jackson Northeast 115kV	17
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	39
Jackson Miami - Jackson Monument Street 115kV	Ray Braswell - West Jackson 115kV	46

SOCO

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-1230
French Settlement - Sorrento 230kV	Bogalusa - Adams Creek 500/230kV transformer	-992
French Settlement - Sorrento 230kV	Bogalusa - Franklin 500kV	-992
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-648
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-511
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-496
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-60
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	35

SPA

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-816
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-454
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-330
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-51
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	30

TVA

Limiting Element	Contingency Element	ATC
French Settlement - Sorrento 230kV	Bogalusa - Franklin 500kV	-1213
French Settlement - Sorrento 230kV	Bogalusa - Adams Creek 500/230kV transformer	-1213
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-1105
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-835
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-576
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-446
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-57
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	33

APPENDIX F: Details of Scenario 2 – 2014

AECI

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-972
North Crowley - Scott1 138kV	Richard - Wells 500kV	-634
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-569
Habetz - Richard 138kV	Richard - Wells 500kV	-546
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-448
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-216
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-133
Richard - Scott1 138kV	Richard - Wells 500kV	-65

AEPW

Limiting Element	Contingency Element	ATC
North Crowley - Scott1 138kV	Richard - Wells 500kV	-726
Habetz - Richard 138kV	Richard - Wells 500kV	-630
Conroe 1 - Conroe 2 138kV	Oak Ridge - Porter 138kV	-626
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-539
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-384
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-248
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-176
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-109
Richard - Scott1 138kV	Richard - Wells 500kV	-75

AMRN

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-1031
North Crowley - Scott1 138kV	Richard - Wells 500kV	-616
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-599
Habetz - Richard 138kV	Richard - Wells 500kV	-531
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-475
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-221
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-136
Richard - Scott1 138kV	Richard - Wells 500kV	-63

CLECO

Limiting Element	Contingency Element	ATC
North Crowley - Scott1 138kV	Richard - Wells 500kV	-814
Habetz - Richard 138kV	Richard - Wells 500kV	-764
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-508
Habetz - Richard 138kV	Wells 500/230kV transformer	-369
North Crowley - Scott1 138kV	Wells 500/230kV transformer	-361
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-313
Richard - Scott1 138kV	Richard - Wells 500kV	-84

EES

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-1977
North Crowley - Scott1 138kV	Richard - Wells 500kV	-617
Habetz - Richard 138kV	Richard - Wells 500kV	-538
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-316
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-194
Richard - Scott1 138kV	Richard - Wells 500kV	-63

EMDE

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-854
North Crowley - Scott1 138kV	Richard - Wells 500kV	-655
Habetz - Richard 138kV	Richard - Wells 500kV	-565
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-522
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-394
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-207
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-127
Richard - Scott1 138kV	Richard - Wells 500kV	-67

LAFA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-1404
Coughlin - Plaisance 138kV (CLECO)	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-628
Champagne - Plaisance (CLECO) 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-566
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-563
Coughlin - Plaisance 138kV (CLECO)	Vil Plat (CLECO) - West Fork (CLECO) 230kV	-517
Champagne - Plaisance (CLECO) 138kV	Vil Plat (CLECO) - West Fork (CLECO) 230kV	-455
Semere - Scott2 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-400
Semere - Scott2 138kV	Vil Plat (CLECO) - West Fork (CLECO) 230kV	-366
Semere - Scott2 138kV	Richard - Wells 500kV	-350
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-347
Habetz - Richard 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-307
Habetz - Richard 138kV	Vil Plat (CLECO) - West Fork (CLECO) 230kV	-270
North Crowley - Scott1 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-238
North Crowley - Scott1 138kV	Richard - Wells 500kV	-238
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Rodemacher (CLECO) - Sherwood (CLECO) 230kV	-222
North Crowley - Scott1 138kV	Richard - Scott1 138kV	-219
North Crowley - Scott1 138kV	Vil Plat (CLECO) - West Fork (CLECO) 230kV	-209
Semere - Scott2 138kV	Wells 500/230kV transformer	-200
Habetz - Richard 138kV	Richard - Wells 500kV	-196
Semere - Scott2 138kV	Bonin - Cecelia 138kV	-191
Coughlin - Plaisance 138kV (CLECO)	Wells (CLECO) - West Fork (CLECO) 230kV	-188
Semere - Scott2 138kV	Habetz - Richard 138kV	-136
Champagne - Plaisance (CLECO) 138kV	Wells (CLECO) - West Fork (CLECO) 230kV	-112

Limiting Element	Contingency Element	ATC
Habetz - Richard 138kV	Acadian - Bonin 230kV (LAFA)	-96
North Crowley - Scott1 138kV	Wells 500/230kV transformer	-90
Habetz - Richard 138kV	Wells 500/230kV transformer	-83
Richard - Scott1 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-47
Richard - Scott1 138kV	Richard - Wells 500kV	-24
Scott1 - Bonin 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-24
Richard - Scott1 138kV	Vil Plat (CLECO) - West Fork (CLECO) 230kV	-18
Habetz - Richard 138kV	Flander - Acadian 230kV (LAFA)	-8
Scott1 - Bonin 138kV	Vil Plat (CLECO) - West Fork (CLECO) 230kV	17
Colonial Academy - Richard 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	18

LAGN

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-1815
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-1230
Champagne - Plaisance (CLECO) 138kV	Cocodrie - Vil Plat 230kV	-1045
Coughlin - Plaisance 138kV (CLECO)	Vil Plat - West Fork 230kV	-927
North Crowley - Scott1 138kV	Richard - Wells 500kV	-789
Champagne - Plaisance (CLECO) 138kV	Vil Plat - West Fork 230kV	-742
Habetz - Richard 138kV	Richard - Wells 500kV	-669
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Rodemacher (CLECO) - Sherwood (CLECO) 230kV	-490
Coughlin - Plaisance 138kV (CLECO)	Wells (CLECO) - West Fork (CLECO) 230kV	-455
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-377
Champagne - Plaisance (CLECO) 138kV	Wells (CLECO) - West Fork (CLECO) 230kV	-270
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-232
Richard - Scott1 138kV	Richard - Wells 500kV	-81

LEPA

Limiting Element	Contingency Element	ATC
Semere - Scott2 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-1002
Habetz - Richard 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-924
Semere - Scott2 138kV	Vil Plat (CLECO) - West Fork (CLECO) 230kV	-916
Coughlin - Plaisance 138kV (CLECO)	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-884
Habetz - Richard 138kV	Vil Plat (CLECO) - West Fork (CLECO) 230kV	-813
Champagne - Plaisance (CLECO) 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-797
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-792
Coughlin - Plaisance 138kV (CLECO)	Vil Plat (CLECO) - West Fork (CLECO) 230kV	-727
North Crowley - Scott1 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-725
Champagne - Plaisance (CLECO) 138kV	Vil Plat (CLECO) - West Fork (CLECO) 230kV	-640
North Crowley - Scott1 138kV	Vil Plat (CLECO) - West Fork (CLECO) 230kV	-636
North Crowley - Scott1 138kV	Richard - Scott1 138kV	-570
Semere - Scott2 138kV	Wells 500/230kV transformer	-559
Coughlin - Plaisance 138kV (CLECO)	Vil Plat - West Fork 230kV	-461
Semere - Scott2 138kV	Richard - Wells 500kV	-445
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-388
Champagne - Plaisance (CLECO) 138kV	Vil Plat - West Fork 230kV	-369
North Crowley - Scott1 138kV	Richard - Wells 500kV	-335
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Rodemacher (CLECO) - Sherwood (CLECO) 230kV	-329
Bonin - Cecelia 138kV	Colonial Academy - Richard 138kV	-314
North Crowley - Scott1 138kV	Wells 500/230kV transformer	-313
Habetz - Richard 138kV	Acadian - Bonin 230kV (LAFA)	-301
Habetz - Richard 138kV	Wells 500/230kV transformer	-287
Semere - Scott2 138kV	Habetz - Richard 138kV	-281
Habetz - Richard 138kV	Richard - Wells 500kV	-278
Semere - Scott2 138kV	Richard - Scott1 138kV	-272
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-239
Coughlin - Plaisance 138kV (CLECO)	Wells (CLECO) - West Fork (CLECO) 230kV	-226
Scott1 - Bonin 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-190
Bonin - Cecelia 138kV	Acadia GSU - Colonial Academy 138kV	-154
Richard - Scott1 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	-144
Champagne - Plaisance (CLECO) 138kV	Wells (CLECO) - West Fork (CLECO) 230kV	-134
Richard - Scott1 138kV	Vil Plat (CLECO) - West Fork (CLECO) 230kV	-56
Bonin - Cecelia 138kV	Acadia GSU - Scanlan 138kV	-49
Richard - Scott1 138kV	Richard - Wells 500kV	-34
Judice - Scott1 138kV	Sellers Road (CLECO) - Labbe (LAFA) 230kV	-28
Habetz - Richard 138kV	Flander - Acadian 230kV (LAFA)	-26
Judice - Scott1 138kV	Sellers Road (CLECO) - Segura (CLECO) 230kV	-25
Judice - Scott1 138kV	Segura (CLECO) 230/138kV transformer'	-20
Colonial Academy - Richard 138kV	Cocodrie (CLECO) - Vil Plat (CLECO) 230kV	46

OKGE

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-750
North Crowley - Scott1 138kV	Richard - Wells 500kV	-677
Habetz - Richard 138kV	Richard - Wells 500kV	-585
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-478
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-346
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-198
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-122
Richard - Scott1 138kV	Richard - Wells 500kV	-70

SMEPA

Limiting Element	Contingency Element	ATC
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade LookforTestContingency	Canton - Pickens 230kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade LookforTestContingency	Lakeover 500/115kV transformer	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade LookforTestContingency	Canton South - Canton 230kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade LookforTestContingency	Ray Braswell 500/115kV transformer 1	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade LookforTestContingency	Brookhaven - Wesson 115kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade LookforTestContingency	Vicksburg - Waterways 115kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade LookforTestContingency	James Road (SMEPA) - Wesson 115kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade LookforTestContingency	Brookhaven South - Franklin 115kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade LookforTestContingency	Bovina - Flowers 115kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade LookforTestContingency	Franklin - Vaughn 115kV	*
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-1241
Champagne - Plaisance (CLECO) 138kV	Cocodrie - Vil Plat 230kV	-1055
Coughlin - Plaisance 138kV (CLECO)	Vil Plat - West Fork 230kV	-936
Jackson Miami - Jackson Monument Street 115kV	South Jackson 230/115kV transformer 1	-919
Champagne - Plaisance (CLECO) 138kV	Vil Plat - West Fork 230kV	-749
Semere - Scott2 138kV	Richard - Wells 500kV	-708
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-620
North Crowley - Scott1 138kV	Richard - Wells 500kV	-477
Coughlin - Plaisance 138kV (CLECO)	Wells (CLECO) - West Fork (CLECO) 230kV	-459
French Settlement - Sorrento 230kV	Bogalusa - Adams Creek 500/230kV transformer	-429
French Settlement - Sorrento 230kV	Bogalusa - Franklin 500kV	-429
Habetz - Richard 138kV	Richard - Wells 500kV	-409
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-277
Champagne - Plaisance (CLECO) 138kV	Wells (CLECO) - West Fork (CLECO) 230kV	-272
Jackson Miami - Jackson Monument Street 115kV	Jackson Forrest Hill - Ray Braswell 115kV	-197
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-171

Limiting Element	Contingency Element	ATC
Jackson Miami - Jackson Monument Street 115kV	Jackson HICO - North Jackson 115kV	-152
Jackson Miami - Jackson Monument Street 115kV	Jackson HICO - Rex Brown E 115kV	-152
Richard - Scott1 138kV	Richard - Wells 500kV	-49
Jackson Miami - Jackson Monument Street 115kV	Jackson Forrest Hill - Southwest Jackson 115kV	-40
Brookhaven - Mallalieu (MEPA) 115kV	Bogalusa - Adams Creek 500/230kV transformer	-9
Brookhaven - Mallalieu (MEPA) 115kV	Bogalusa - Franklin 500kV	-9
Jackson Miami - Jackson Monument Street 115kV	Klean - Jackson Northeast 115kV	18
Jackson Miami - Jackson Monument Street 115kV	Ray Braswell - West Jackson 115kV	46

SOCO

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-1359
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-1150
French Settlement - Sorrento 230kV	Bogalusa - Adams Creek 500/230kV transformer	-900
French Settlement - Sorrento 230kV	Bogalusa - Franklin 500kV	-900
Semere - Scott2 138kV	Richard - Wells 500kV	-807
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-766
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-626
North Crowley - Scott1 138kV	Richard - Wells 500kV	-543
Habetz - Richard 138kV	Richard - Wells 500kV	-467
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-246
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-152
Richard - Scott1 138kV	Richard - Wells 500kV	-56

SPA

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-902
North Crowley - Scott1 138kV	Richard - Wells 500kV	-655
Habetz - Richard 138kV	Richard - Wells 500kV	-565
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-536
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-416
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-210
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-129
Richard - Scott1 138kV	Richard - Wells 500kV	-67
Pleasant Hill 500/161kV transformer	ANO 500/161/22kV 3 Winding Transformer	47

TVA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-1878
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-1221
French Settlement - Sorrento 230kV	Bogalusa - Adams Creek 500/230kV transformer	-1100
French Settlement - Sorrento 230kV	Bogalusa - Franklin 500kV	-1100
Semere - Scott2 138kV	Richard - Wells 500kV	-866
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-681
North Crowley - Scott1 138kV	Richard - Wells 500kV	-581
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-563
Habetz - Richard 138kV	Richard - Wells 500kV	-500
Toledo - VP Tap 138kV	Colfax - Rodemacher 230kV	-234
Toledo - VP Tap 138kV	Colfax - Montgomery 230kV	-144
Richard - Scott1 138kV	Richard - Wells 500kV	-60

APPENDIX G: Details of Scenario 3 – 2014

AECI

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-928
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-504
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-394

AEPW

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-532
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-333
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-226
Conroe 1 - Conroe 2 138kV	Oak Ridge - Porter 138kV	-87

AMRN

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-983
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-531
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-417

CLECO

Limiting Element	Contingency Element	ATC
NONE	NONE	50

EES

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-935

EMDE

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-823
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-460
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-349

LAFA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-612
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-26

LAGN

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-846
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-55

LEPA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-360
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-29

OKGE

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-728
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-420
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-309

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	Sweatt (SOCO) - Lost Gap (SOCO) 115kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	McAdams 500/230kV transformer 2	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Lost Gap (SOCO) - Hickory MS (SOCO) 115kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Newton (SOCO) - Hickory MS (SOCO) 115kV	*
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	*
Jackson Miami - Jackson Monument Street 115kV	South Jackson 230/115kV transformer 1	-779
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-283
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-56
Jackson Miami - Jackson Monument Street 115kV	Jackson Forrest Hill - Ray Braswell 115kV	-20

SOCO

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-1283
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-686
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-545
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-531

SPA

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-864
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-474
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-367

TVA

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-1153
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-876
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-608
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-490

APPENDIX H: Details of Scenario 4 – 2014

AECI

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-1026
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-588
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-492

AEPW

Limiting Element	Contingency Element	ATC
Conroe 1 - Conroe 2 138kV	Oak Ridge - Porter 138kV	-601
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-588
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-388
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-282

AMRN

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-1086
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-619
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-521

CLECO

Limiting Element	Contingency Element	ATC
NONE	NONE	50

EES

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-2039

EMDE

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-909
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-536
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-436

LAFA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-1334
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-320
Champagne - Plaisance (CLECO) 138kV	Cocodrie - Vil Plat 230kV	-240
Coughlin - Plaisance 138kV (CLECO)	Vil Plat - West Fork 230kV	-180
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Rodemacher (CLECO) - Sherwood (CLECO) 230kV	-124

Limiting Element	Contingency Element	ATC
Champagne - Plaisance (CLECO) 138kV	Vil Plat - West Fork 230kV	-99
Coughlin - Plaisance 138kV (CLECO)	Wells (CLECO) - West Fork (CLECO) 230kV	39

LAGN

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-1844
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-668
Champagne - Plaisance (CLECO) 138kV	Cocodrie - Vil Plat 230kV	-500
Coughlin - Plaisance 138kV (CLECO)	Vil Plat - West Fork 230kV	-376
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Rodemacher (CLECO) - Sherwood (CLECO) 230kV	-238
Champagne - Plaisance (CLECO) 138kV	Vil Plat - West Fork 230kV	-207

LEPA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-785
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-353
Champagne - Plaisance (CLECO) 138kV	Cocodrie - Vil Plat 230kV	-264
Coughlin - Plaisance 138kV (CLECO)	Vil Plat - West Fork 230kV	-198
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Rodemacher (CLECO) - Sherwood (CLECO) 230kV	-169
Champagne - Plaisance (CLECO) 138kV	Vil Plat - West Fork 230kV	-110
Coughlin - Plaisance 138kV (CLECO)	Wells (CLECO) - West Fork (CLECO) 230kV	43

OKGE

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-805
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-489
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-386

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	Sweatt (SOCO) - Lost Gap (SOCO) 115kV	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	McAdams 500/230kV transformer 2	*
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Lost Gap (SOCO) - Hickory MS (SOCO) 115kV	*

Limiting Element	Contingency Element	ATC
Ray Braswell 500/230kV transformer ckt2 - Supplemental Upgrade	Newton (SOCO) - Hickory MS (SOCO) 115kV	*
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	*
Jackson Miami - Jackson Monument Street 115kV	South Jackson 230/115kV transformer 1	-788
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-675
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-616
Champagne - Plaisance (CLECO) 138kV	Cocodrie - Vil Plat 230kV	-505
Coughlin - Plaisance 138kV (CLECO)	Vil Plat - West Fork 230kV	-380
Champagne - Plaisance (CLECO) 138kV	Vil Plat - West Fork 230kV	-210
Jackson Miami - Jackson Monument Street 115kV	Jackson Forrest Hill - Ray Braswell 115kV	-24

SOCO

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-1417
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-1156
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-800
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-680

SPA

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-955
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-553
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-458

TVA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-1910
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-1274
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-709
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-611