System Impact Study
PID 246
37MW Plant

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0	6/25/2010	Posting System Impact Study	MEC	JDH

Contents

Executive Summary

This System Impact Study is the second step of the interconnection process and is based on the PID-246 request for interconnection on Entergy's transmission system at Sulphur, LA. This report is organized in three sections, namely, Energy Resource Interconnection Service (ERIS), short circuit/breaker rating analysis, and stability study.

Requestor for PID-246 requested ERIS only; therefore, under ERIS, a load flow analysis was performed. PID-246 will be a new generation unit. The study evaluates connection of 37MW 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 October 1, 2012.

Results of the System Impact Study indicated that under ERIS, the additional generation due to PID-246 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-246 plant with priors and without priors. Therefore, estimated upgrade costs under ERIS with and without prior is $0. See table below.

Estimated Project Planning Upgrades for PID 246

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

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

Energy Resource Interconnection Service

1. Introduction

This Energy Resource Interconnection Service (ERIS) is based on a request for interconnection on Entergy's transmission system located at the Lone Star Cement 69kV substation. The objective of this study is to assess the reliability impact of the new facility on the Entergy transmission system with respect to the steady state and transient stability performance of the system as well as its effects on the system's existing short circuit current capability. It is also intended to determine whether the transmission system meets standards established by NERC Reliability Standards and Entergy's planning guidelines when plant is connected to Entergy's transmission system. If not, transmission improvements will be identified.

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

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

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

2. Load Flow Analysis

2.1 Model Information

The load flow analysis was performed based on the projected 2014 summer peak load flow model. The loads were scaled based on the forecasted loads for the year. All firm power transactions between Entergy and its neighboring control areas were modeled for the year 2014 excluding short-term firm transactions on the same transmission interface. An economic dispatch was carried out on Entergy generating units after the scaling of load and modeling of transactions. The proposed 37MW generation and the associated facilities were then modeled in the case to build a revised case for the load flow analysis. Transfers were simulated between thirteen (13) control areas and Entergy using requesting generator as the source and adjacent control area as sink.

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. Customer supplied data are shown in Appendix A. The data used to build the load flow and dynamic models are also shown in Appendix A. Stability issues in the Western Region of the Entergy System due to Merchant Generators are shown in Appendix B. All stability study plots are shown in Appendix C.

2.2 Load Flow Analyses

2.2.1 Load Flow Analysis:

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

2.2.2 Performance Criteria

The criteria for overload violations are as follows:

A) With All Lines in Service

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

B) Under Contingencies

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

2.2.3 Power Factor Consideration / Criteria

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

2.3 Analysis Results

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

Table 2-1: Summary of Results for PID-246 – 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	37	0	37	0
AMRN	Ameren Transmission	2014	37	0	37	0
CLEC	CLECO	2014	37	0	37	37
AEP-W	American Electric Power - West	2014	37	0	37	37
EES	Entergy	2014	37	0	37	0
EMDE	Empire District Electric Co	2014	0	0	0	0
LAFA	Lafayette Utilities System	2014	34	0	37	37
LAGN	Louisiana Generating, LLC	2014	37	0	37	37
LEPA	Louisiana Energy & Power Authority	2014	0	0	0	37
OKGE	Oklahoma Gas & Electric Company	2014	37	0	37	37
SMEPA	South Mississippi Electric Power Assoc.	2014	0	0	0	0
SOCO	Southern Company	2014	37	0	37	0
SPA	Southwest Power Administration	2014	0	0	0	0
TVA	Tennessee Valley Authority	2014	37	0	37	37

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

Limiting Element	Est. cost	AECI	AEPW	AMRN	CLECO	EES	EMDE	LAFA	LAGN	LEPA	OKGE	SMEPA	SOCO	SPA	TVA
Addis - Big Cajun 1 230kV	Included in 2010 ICT Base Plan									X					
Bull Shoals - Bull Shoals Dam SPA 161kV	Included in SPP STEP						X								
Lake Conway - Mayflower 115kV	4,587,500													X	
Melbourne - Sage 161kV	Included in 2010 ICT Base Plan						X							X	
North Crowley - Scott1 138kV	Included in 2010 ICT Base Plan							X							
Pleasant Hill 500/161kV transformer	21,000,000						X							X	
Port Hudson 230/138 transformer 1	9,500,000									X					
Port Hudson 230/138 transformer 2	9,500,000									X					
Ray Braswell - Baxter Wilson 500kV	Committed to by Others											X			
Ray Braswell 500/230kV transformer ckt2	Committed to by Others											X			
Vacherie - Waterford 230kV	19,575,000									X					

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

Limiting Elements	Est. Cost	AECI	AEPW	AMRN	CLECO	EES	EMDE	LAFA	LAGN	LEPA	OKGE	SMEPA	SOCO	SPA	TVA
Addis - Big Cajun 1 230kV	Included in 2010 ICT Base Plan									X					
Lakeover 500/115kV transformer	8,100,000											X			
Marshall - Mossville 138kV	20,625,000	X	X	X	X	X	X	X	X	X	X	X	X	X	X
McAdams 500/230kV transformer 1	Included in 2010 ICT Base Plan	X		X		X	X						X	X	
North Crowley - Scott1 138kV	Included in 2010 ICT Base Plan				X			X		X					
Port Hudson 230/138 transformer 1	9,500,000									X					
Port Hudson 230/138 transformer 2	9,500,000									X					
Ray Braswell 500/230kV transformer ckt2	Committed to by Others											X			
Rex Brown W - Rex Brown C 115kV ckt 1	275,000											X			
Semere - Scott2 138kV	Included in 2010 ICT Base Plan				X			X							
Vacherie - Waterford 230kV	19,575,000									X					

TABLE 2-4: 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
Bull Shoals - Bull Shoals Dam SPA 161kV	Included in SPP STEP						X								
Pleasant Hill 500/161kV transformer	21,000,000						X							X	
Ray Braswell - Baxter Wilson 500kV	Committed to by Others									X		X			
Ray Braswell 500/230kV transformer ckt2	Committed to by Others											X			

TABLE 2-5: 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
Lakeover 500/115kV transformer	18,000,000											X			
McAdams 500/230kV transformer 1	Included in 2010 ICT Base Plan	X		X		X	X						X	X	
Ray Braswell 500/230kV transformer ckt2	Committed to by Others											X			
Rex Brown W - Rex Brown C 115kV ckt 1	275,000											X			

2.3.1 DETAILS OF SCENARIO 1 – 2014

AECI

Limiting Element	Contingency Element	ATC
NONE	NONE	37

AEP-W

Limiting Element	Contingency Element	ATC
NONE	NONE	37

AMRN

Limiting Element	Contingency Element	ATC
NONE	NONE	37

CLECO

Limiting Element	Contingency Element	ATC
NONE	NONE	37

EES

Limiting Element	Contingency Element	ATC
NONE	NONE	37

EMDE

Limiting Element	Contingency Element	ATC
Bull Shoals - Bull Shoals Dam SPA 161kV	St. Joe - Hilltop 161kV	0
Bull Shoals - Bull Shoals Dam SPA 161kV	Everton - St. Joe 161kV	0
Bull Shoals - Bull Shoals Dam SPA 161kV	Harrison East - Everton 161kV	0
Melbourne - Sage 161kV	Dell - Independence SES 500kV	0
Pleasant Hill 500/161kV transformer	ANO 500/161/22kV transformer	0
Melbourne - Sage 161kV	ANO - Fort Smith 500kV	0
Melbourne - Sage 161kV	Newport - Newport Industrial 161kV	0
Melbourne - Sage 161kV	Newport AB - Newport Industrial 161kV	0

LAFA

Limiting Element	Contingency Element	ATC
North Crowley - Scott1 138kV	Wells 500/230kV transformer	34

LAGN

Limiting Element	Contingency Element	ATC
NONE	NONE	37

LEPA

Limiting Element	Contingency Element	ATC
Addis - Big Cajun 1 230kV	Enjay - Fancy 230kV	0
Port Hudson 230/138 transformer 2	Port Hudson 230/138 transformer 1	0
Port Hudson 230/138 transformer 1	Port Hudson 230/138 transformer 2	0
Addis - Big Cajun 1 230kV	Enjay - Jaguar 230kV	0
Vacherie - Waterford 230kV	Raceland - Waterford 230kV	0

OKGE

Limiting Element	Contingency Element	ATC
NONE	NONE	37

SMEPA

Limiting Element	Contingency Element	ATC
Ray Braswell 500/230kV transformer ckt2	McAdams - Pickens 230kV	0
Ray Braswell 500/230kV transformer ckt2	Lakeover 500/115kV transformer	0
Ray Braswell 500/230kV transformer ckt2	Canton - Pickens 230kV	0
Ray Braswell 500/230kV transformer ckt2	Canton South - Canton 230kV	0
Ray Braswell 500/230kV transformer ckt2	Attala - McAdams 230kV	0
Ray Braswell 500/230kV transformer ckt2	Attala 230/115kV transformer	0
Ray Braswell 500/230kV transformer ckt2	Ray Braswell 500/115kV transformer 1	0
Ray Braswell 500/230kV transformer ckt2	Coly - Coly REA 69kV ckt 1	0
Ray Braswell 500/230kV transformer ckt2	Franklin - Grand Gulf 500kV	0
Ray Braswell 500/230kV transformer ckt2	Coly - Willow Glen 500kV	0
Ray Braswell 500/230kV transformer ckt2	Base Case	0
Baxter Wilson - Ray Braswell 500kV	Franklin - Grand Gulf 500kV	30
Ray Braswell - Baxter Wilson 500kV	Franklin - Grand Gulf 500kV	30

SOCO

Limiting Element	Contingency Element	ATC
NONE	NONE	37

SPA

Limiting Element	Contingency Element	ATC
Melbourne - Sage 161kV	Dell - Independence SES 500kV	0
Melbourne - Sage 161kV	ANO - Fort Smith 500kV	0
Melbourne - Sage 161kV	Newport - Newport Industrial 161kV	0
Melbourne - Sage 161kV	Newport AB - Newport Industrial 161kV	0
Lake Conway - Mayflower 115kV	Pleasant Hill 500/161kV transformer	0
Pleasant Hill 500/161kV transformer	ANO 500/161/22kV transformer	0
Melbourne - Sage 161kV	Cash - Newport AB 161kV	0
Melbourne - Sage 161kV	Sansouci - Shelby (TVA) 500kV	0

TVA

Limiting Element	Contingency Element	ATC
NONE	NONE	37

2.3.2 DETAILS OF SCENARIO 2 - 2014

AECI

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Choctaw - FrenchCamp 500kV (TVA)	0
Marshall - Mossville 138kV	Cypress - Hartburg 500kV	0
Marshall - Mossville 138kV	Big Three - Carlyss 230kV	0
Marshall - Mossville 138kV	Big Three - Sabine 230kV	28

AEP-W

Limiting Element	Contingency Element	ATC
Marshall - Mossville 138kV	Cypress - Hartburg 500kV	0
Marshall - Mossville 138kV	Big Three - Carlyss 230kV	0
Marshall - Mossville 138kV	Big Three - Sabine 230kV	27

AMRN

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Choctaw - FrenchCamp 500kV (TVA)	0
Marshall - Mossville 138kV	Cypress - Hartburg 500kV	0
Marshall - Mossville 138kV	Big Three - Carlyss 230kV	0
Marshall - Mossville 138kV	Big Three - Sabine 230kV	28

CLECO

Limiting Element	Contingency Element	ATC
North Crowley - Scott1 138kV	Richard - Scott1 138kV	0
North Crowley - Scott1 138kV	Wells 500/230kV transformer	0
Semere - Scott2 138kV	Wells 500/230kV transformer	0
Marshall - Mossville 138kV	Cypress - Hartburg 500kV	0
Marshall - Mossville 138kV	Big Three - Carlyss 230kV	0
Marshall - Mossville 138kV	Big Three - Sabine 230kV	32

EES

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	L-15 Tap - Lone Star 69kV	0
Marshall - Mossville 138kV	Cypress - Hartburg 500kV	0
Marshall - Mossville 138kV	Big Three - Carlyss 230kV	0
Marshall - Mossville 138kV	Big Three - Sabine 230kV	27

EMDE

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Choctaw - FrenchCamp 500kV (TVA)	0
Marshall - Mossville 138kV	Cypress - Hartburg 500kV	0
Marshall - Mossville 138kV	Big Three - Carlyss 230kV	0
Marshall - Mossville 138kV	Big Three - Sabine 230kV	28

LAFA

Limiting Element	Contingency Element	ATC
North Crowley - Scott1 138kV	Richard - Scott1 138kV	0
North Crowley - Scott1 138kV	Wells 500/230kV transformer	0
Semere - Scott2 138kV	Wells 500/230kV transformer	0
Marshall - Mossville 138kV	Cypress - Hartburg 500kV	0
Marshall - Mossville 138kV	Big Three - Carlyss 230kV	0
Marshall - Mossville 138kV	Big Three - Sabine 230kV	33

LAGN

Limiting Element	Contingency Element	ATC
Marshall - Mossville 138kV	Cypress - Hartburg 500kV	0
Marshall - Mossville 138kV	Big Three - Carlyss 230kV	0
Marshall - Mossville 138kV	Big Three - Sabine 230kV	30

LEPA

Limiting Element	Contingency Element	ATC
North Crowley - Scott1 138kV	Richard - Scott1 138kV	0
Port Hudson 230/138 transformer 2	Port Hudson 230/138 transformer 1	0
Port Hudson 230/138 transformer 1	Port Hudson 230/138 transformer 2	0
Addis - Big Cajun 1 230kV	Enjay - Fancy 230kV	0
Vacherie - Waterford 230kV	Raceland - Waterford 230kV	0
Marshall - Mossville 138kV	Cypress - Hartburg 500kV	0
Marshall - Mossville 138kV	Big Three - Carlyss 230kV	0
Marshall - Mossville 138kV	Big Three - Sabine 230kV	31

OKGE

Limiting Element	Contingency Element	ATC
Marshall - Mossville 138kV	Cypress - Hartburg 500kV	0
Marshall - Mossville 138kV	Big Three - Carlyss 230kV	0
Marshall - Mossville 138kV	Big Three - Sabine 230kV	28

SMEPA

Limiting Element	Contingency Element	ATC
Ray Braswell 500/230kV transformer ckt2	McAdams - Pickens 230kV	0
Ray Braswell 500/230kV transformer ckt2	Lakeover 500/115kV transformer	0
Ray Braswell 500/230kV transformer ckt2	Canton - Pickens 230kV	0

Limiting Element	Contingency Element	ATC
Ray Braswell 500/230kV transformer ckt2	Canton South - Canton 230kV	0
Ray Braswell 500/230kV transformer ckt2	Attala - McAdams 230kV	0
Ray Braswell 500/230kV transformer ckt2	Attala 230/115kV transformer	0
Ray Braswell 500/230kV transformer ckt2	Ray Braswell 500/115kV transformer 1	0
Ray Braswell 500/230kV transformer ckt2	Canton - Yandell Road 230kV	0
Ray Braswell 500/230kV transformer ckt2	Indianola - McAdams 230kV	0
Ray Braswell 500/230kV transformer ckt2	Coly - Coly REA 69kV ckt 1	0
Ray Braswell 500/230kV transformer ckt2	Base Case	0
Lakeover 500/115kV transformer	Ray Braswell 500/115kV transformer 1	0
Rex Brown W - Rex Brown C 115kV ckt 1	Ray Braswell 500/115kV transformer 1	0
Marshall - Mossville 138kV	Cypress - Hartburg 500kV	0
Marshall - Mossville 138kV	Big Three - Carlyss 230kV	0
Lakeover 500/115kV transformer	Ray Braswell 500/230kV transformer 1	26
Lakeover 500/115kV transformer	Ray Braswell 500/230kV transformer 2	27
Marshall - Mossville 138kV	Big Three - Sabine 230kV	30

SOCO

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Choctaw - FrenchCamp 500kV (TVA)	0
Marshall - Mossville 138kV	Cypress - Hartburg 500kV	0
Marshall - Mossville 138kV	Big Three - Carlyss 230kV	0
Marshall - Mossville 138kV	Big Three - Sabine 230kV	29

SPA

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Choctaw - FrenchCamp 500kV (TVA)	0
Marshall - Mossville 138kV	Cypress - Hartburg 500kV	0
Marshall - Mossville 138kV	Big Three - Carlyss 230kV	0
Marshall - Mossville 138kV	Big Three - Sabine 230kV	28

TVA

Limiting Element	Contingency Element	ATC
Marshall - Mossville 138kV	Cypress - Hartburg 500kV	0
Marshall - Mossville 138kV	Big Three - Carlyss 230kV	0
Marshall - Mossville 138kV	Big Three - Sabine 230kV	29

2.3.3 DETAILS OF SCENARIO 3 - 2014

AECI

Limiting Element	Contingency Element	ATC
NONE	NONE	37

AEP-W

Limiting Element	Contingency Element	ATC
NONE	NONE	37

AMRN

Limiting Element	Contingency Element	ATC
NONE	NONE	37

CLECO

Limiting Element	Contingency Element	ATC
NONE	NONE	37

EES

Limiting Element	Contingency Element	ATC
NONE	NONE	37

EMDE

Limiting Element	Contingency Element	ATC
Pleasant Hill 500/161kV transformer	ANO 500/161/22kV transformer	0
Bull Shoals - Bull Shoals Dam SPA 161kV	St. Joe - Hilltop 161kV	0
Bull Shoals - Bull Shoals Dam SPA 161kV	Everton - St. Joe 161kV	0
Bull Shoals - Bull Shoals Dam SPA 161kV	Harrison East - Everton 161kV	0
Bull Shoals - Bull Shoals Dam SPA 161kV	Bull Shoals - Lead HL 161kV	0
Bull Shoals - Bull Shoals Dam SPA 161kV	Clevcov - Lead HL 161kV	0

LAFA

Limiting Element	Contingency Element	ATC
NONE	NONE	37

LAGN

Limiting Element	Contingency Element	ATC
NONE	NONE	37

LEPA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV	Franklin - Grand Gulf 500kV	0

OKGE

Limiting Element	Contingency Element	ATC
NONE	NONE	37

SMEPA

Limiting Element	Contingency Element	ATC
Ray Braswell 500/230kV transformer ckt2	McAdams 500/230kV transformer 1	0
Ray Braswell 500/230kV transformer ckt2	McAdams - Pickens 230kV	0
Ray Braswell 500/230kV transformer ckt2	Canton - Pickens 230kV	0
Ray Braswell 500/230kV transformer ckt2	Lakeover 500/115kV transformer	0
Ray Braswell 500/230kV transformer ckt2	Rex Brown - Rex Brown C 230/115kV transformer 1	0
Ray Braswell 500/230kV transformer ckt2	Canton South - Canton 230kV	0
Ray Braswell 500/230kV transformer ckt2	Coly - McKnight 500kV	0
Ray Braswell 500/230kV transformer ckt2	Big Cajun 2 - Webre 500kV	0
Ray Braswell 500/230kV transformer ckt2	Sterlington 500/115kV transformer 2 and 3	0
Ray Braswell 500/230kV transformer ckt2	Sterlington 500/115kV transformer 1 and 3	0
Ray Braswell 500/230kV transformer ckt2	Base Case	0
Ray Braswell 500/230kV transformer ckt2	Franklin - Grand Gulf 500kV	0

SOCO

Limiting Element	Contingency Element	ATC
Bull Shoals - Bull Shoals Dam SPA 161kV	St. Joe - Hilltop 161kV	0
Bull Shoals - Bull Shoals Dam SPA 161kV	Everton - St. Joe 161kV	0
Bull Shoals - Bull Shoals Dam SPA 161kV	Harrison East - Everton 161kV	0

SPA

Limiting Element	Contingency Element	ATC
Pleasant Hill 500/161kV transformer	ANO 500/161/22kV transformer	0

TVA

Limiting Element	Contingency Element	ATC
NONE	NONE	37

2.3.4 DETAILS OF SCENARIO 4 - 2014

AECI

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Choctaw - FrenchCamp 500kV (TVA)	0

AEP-W

Limiting Element	Contingency Element	ATC
NONE	NONE	37

AMRN

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Choctaw - FrenchCamp 500kV (TVA)	0

CLECO

Limiting Element	Contingency Element	ATC
NONE	NONE	37

EES

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	L-15 Tap - Lone Star 69kV	0

EMDE

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Choctaw - FrenchCamp 500kV (TVA)	0

LAFA

Limiting Element	Contingency Element	ATC
NONE	NONE	37

LAGN

Limiting Element	Contingency Element	ATC
NONE	NONE	37

LEPA

Limiting Element	Contingency Element	ATC
NONE	NONE	37

OKGE

Limiting Element	Contingency Element	ATC
NONE	NONE	37

SMEPA

Limiting Element	Contingency Element	ATC
Ray Braswell 500/230kV transformer ckt2	McAdams 500/230kV transformer 1	0
Ray Braswell 500/230kV transformer ckt2	McAdams - Pickens 230kV	0
Ray Braswell 500/230kV transformer ckt2	Lakeover 500/115kV transformer	0
Ray Braswell 500/230kV transformer ckt2	Canton - Pickens 230kV	0
Ray Braswell 500/230kV transformer ckt2	Canton South - Canton 230kV	0
Ray Braswell 500/230kV transformer ckt2	Rex Brown - Rex Brown C 230/115kV transformer 1	0
Ray Braswell 500/230kV transformer ckt2	Coly - McKnight 500kV	0
Ray Braswell 500/230kV transformer ckt2	Big Cajun 2 - Webre 500kV	0

Limiting Element	Contingency Element	ATC
Lakeover 500/115kV transformer	Ray Braswell 500/115kV transformer 1	0
Rex Brown W - Rex Brown C 115kV ckt 1	Ray Braswell 500/115kV transformer 1	0
Lakeover 500/115kV transformer	Ray Braswell 500/230kV transformer 1	0
Lakeover 500/115kV transformer	Ray Braswell 500/230kV transformer 2	0

SOCO

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Choctaw - FrenchCamp 500kV (TVA)	0

SPA

Limiting Element	Contingency Element	ATC
McAdams 500/230kV transformer 1	Choctaw - FrenchCamp 500kV (TVA)	0

TVA

Limiting Element	Contingency Element	ATC
NONE	NONE	37

Short Circuit Analysis / Breaker Rating Analysis

3. 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.

4. Short Circuit Analysis

The method used to determine if any short circuit problems would be caused by the addition of the PID-246 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-246 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-246 generation. Any breakers identified to be upgraded through this comparison are *mandatory* upgrades.

5. Analysis Results

The results of the short circuit analysis indicates that the additional generation due to PID-246 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-246 plant with priors and without priors. The priors included 216, 217, 221, 223, 224, 228, 231, 233, 237, 241 and 242.

As a result of the short circuit analysis no resolution is required.

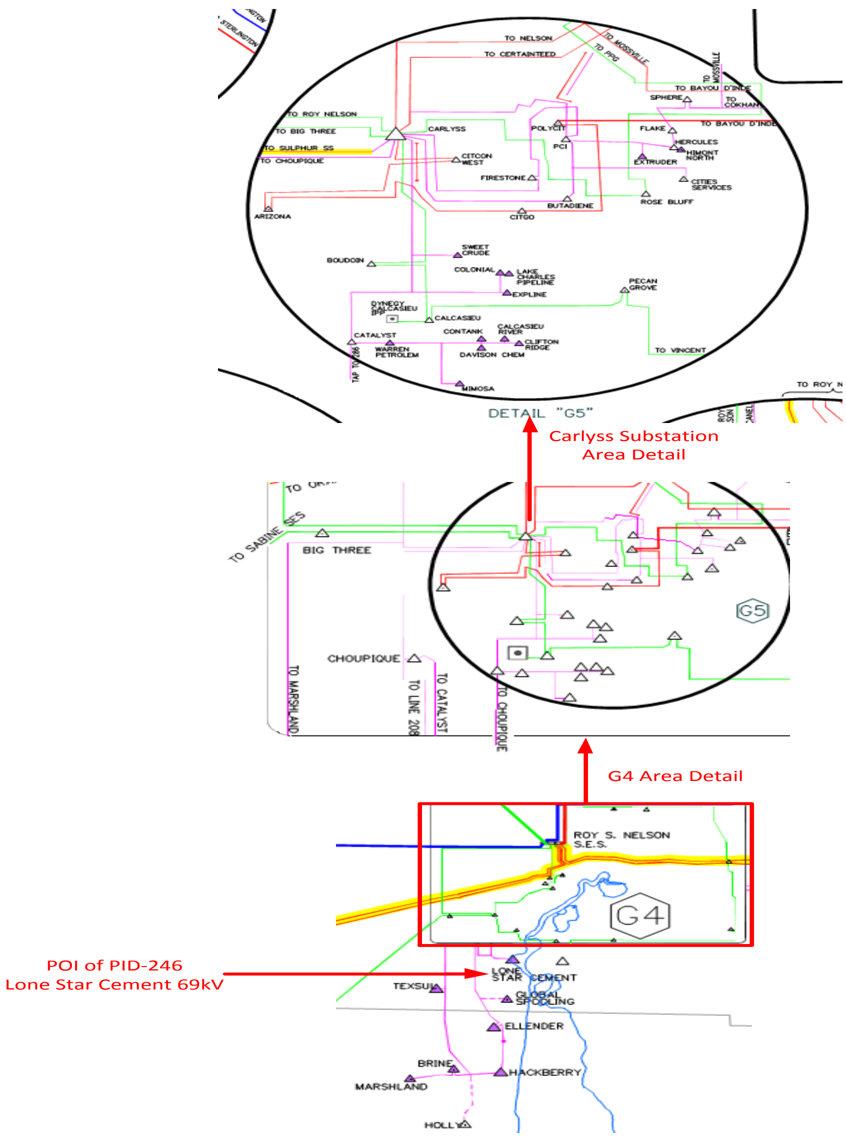
Stability Study

6. Executive Summary

Southwest Power Pool (SPP) commissioned ABB Inc. to perform a stability study for the interconnection of project PID-246. The proposed project is a 36.4MW steam turbine generation unit that is requesting interconnection at the Lone Star Cement 69kV substation in the Entergy transmission system.

The objective of this study is to evaluate the impact of proposed PID-246 project on the stability of the transmission system and nearby generating stations. The study was performed on a 2014 Summer Peak case, provided by SPP-ICT/Entergy.

Figure 6-1: Location of the proposed 36.4MW generation interconnecting station and Lone Star Cement 69kV Substation Vicinity



7. Conclusion

Based on the results of stability analysis, it can be concluded that interconnection of the proposed PID-246 (36.4MW) project at the Lone Star Cement 69kV substation **does not** adversely impact the stability of the Entergy System in the local area. Results indicate that the system is stable following all simulated three-phase normally cleared and single-phase stuck-breaker faults. Also, **no** voltage criteria violations were observed following these faults.

8. Stability Analysis

8.1 Stability Analysis Methodology

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

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

Based on the Entergy study criteria, 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.

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

The stability analysis was performed using the PSS/E dynamics program, which only simulates the positive sequence network. Unbalanced faults involve the positive, negative, and zero sequence networks. For unbalanced faults, the equivalent fault admittance must be inserted in the PSS/E positive sequence model between the faulted bus and ground to simulate the effect of the negative and zero sequence networks. For a single-line-to-ground (SLG) fault, the fault admittance equals the inverse of the sum of the positive, negative and zero sequence Thevenin impedances at the faulted bus. Since PSS/E inherently models the positive sequence fault impedance, the sum of the negative and zero sequence Thevenin impedances needs to be added and entered as the fault impedance at the faulted bus.

8.2 Study Model Development

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

8.2.1 Power Flow Case

A power flow case “EN14S09_U1_r2_Scenario4_unconv.sav” representing the 2014 Summer Peak conditions was provided by SPP/ Entergy. The PID-246 project was modeled by adding a generator terminal bus (“PID246GEN” #335016) connecting to the Lone Star Cement 69kV substation (#335015) through a

69/13.8kV generator step-up transformer. The 45.5 MVA generator and 30 MVA GSU transformer data are provided in Appendix A.

The 36.4MW output of the PID-246 project was dispatched against the 1BLUF unit 1 (#337652).

In this manner, a post-project power flow case with PID-246 was established and named as ‘Post_PID246.sav’.

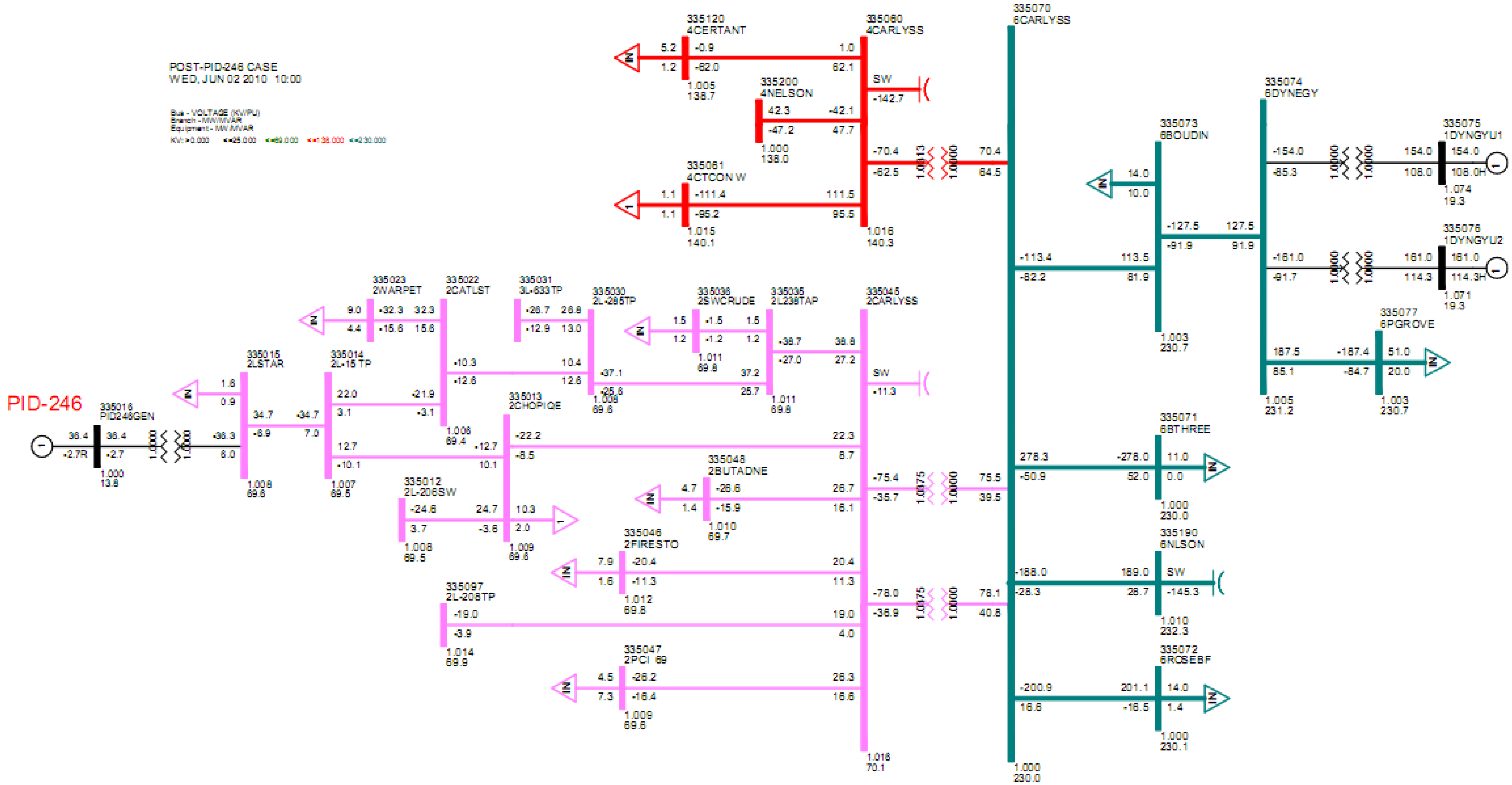
Figure 8-1shows the PSS/E one-line diagram for the local area WITH the PID-246 project, for the 2014 Summer Peak system condition.

8.2.2 Stability Database

A basecase stability database was provided by SPP/Entergy in a PSSE *.dyr file format (‘red11S_newnum.dyr’). The dynamic data for PID-246 was appended to the stability database to create a dynamic database for the Post_PID246 power flow case.

The dynamic data for PID-246 is also provided in Appendix A. The PSS/E power flow and dynamic data for PID-246, used in this study, are included in Appendix B.

Figure8-1: 2014 Summer Peak Flows and Voltages with PID-246



8.3 Transient Stability Analysis

Stability simulations were run to examine the transient behavior of the PID-246 project and its impact on the Entergy system. Stability analysis was performed using the following procedure. First, three-phase faults with normal clearing were simulated. Next, three-phase stuck-breaker faults were simulated. If a three-phase stuck-breaker fault was found to be unstable, then a single-line-to-ground (SLG) fault followed by breaker failure was studied. The fault clearing times used for the simulations are given in Table 8-1.

Table 8-1: Fault Clearing Times

Contingency at kV level	Normal Clearing	Delayed Clearing
230/69	5 cycles	5+9 cycles

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

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

2) The fault remains in place for three-phase and single-phase stuck-breakers.

3) 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 8-2 lists all the fault cases that were simulated in this study, including normally cleared three-phase faults, three-phase and single-phase stuck-breaker faults. Figure 8-2 to Figure 8-7 show the layout diagrams of the nearby 230kV and 69kV 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 8-2: List of Simulated Faults

Fault #	Fault location	Fault Type	Fault Clearing (in cy)		Stuck-breaker	Breaker Clearing		Facilities Tripped When Primary Breaker(s) Open	Facilities Tripped When Back-up Breaker(s) Open
			Primary	Back-up		Primary	Back-up		
Fault_01	Calcasieu 230 kV	3PH	5	--	--	27120, 27125, 27070, 27075	--	Calcasieu - Boudoin 230 kV	--
Fault_01a	Calcasieu 230 kV	3PH	5	9	27120	27125, 27070, 27075	27115	Calcasieu - Boudoin 230 kV	GEN U2
Fault_01b	Calcasieu 230 kV	3PH	5	9	27125	27120, 27070, 27075	27130, 18365	Calcasieu - Boudoin 230 kV	Calcasieu - Pecan Grove 230 kV; GEN U1 & U2
Fault_02	Calcasieu 230 kV	3PH	5	--	--	27125, 27130, 18365	--	Calcasieu - Pecan Grove 230 kV	--
Fault_02a	Calcasieu 230 kV	3PH	5	9	27130	27125, 18365	27115	Calcasieu - Pecan Grove 230 kV	GEN U1
Fault_02b	Calcasieu 230 kV	3PH	5	9	27125	27130, 18365	27120, 27070, 27075	Calcasieu - Pecan Grove 230 kV	Calcasieu - Boudoin 230 kV; GEN U1 & U2
Fault_03	Carlyss 230 kV	3PH	5	--	--	13505, 13580, 27050, 27055	--	Carlyss - Boudoin 230 kV	--
Fault_03a	Carlyss 230 kV	3PH	5	9	13505	13580, 27050, 27055	13500, 13240, 13245	Carlyss - Boudoin 230 kV	Carlyss - Sabine 230 kV
Fault_03a _1PH	Carlyss 230 kV	1PH	5	9	13505	13580, 27050, 27055	13500, 13240, 13245	Carlyss - Boudoin 230 kV	Carlyss - Sabine 230 kV
Fault_04	Carlyss 230 kV	3PH	5	--	--	13145, 13155, 13025, 13140	--	Carlyss - Nelson 230 kV	--
Fault_04a	Carlyss 230 kV	3PH	5	9	13155	13145, 13025, 13140	13150	Carlyss - Nelson 230 kV	Carlyss 230/138kV Xfmr
Fault_04a _1PH	Carlyss 230 kV	1PH	5	9	13155	13145, 13025, 13140	13150	Carlyss - Nelson 230 kV	Carlyss 230/138kV Xfmr
Fault_04b	Carlyss 230 kV	3PH	5	9	13145	13155, 13025, 13140	13480, 13500	Carlyss - Nelson 230 kV	Carlyss - Rose Bluff 230 kV
Fault_04b _1PH	Carlyss 230 kV	1PH	5	9	13145	13155, 13025, 13140	13480, 13500	Carlyss - Nelson 230 kV	Carlyss - Rose Bluff 230 kV

Fault_05	Carlyss 230 kV	3PH	5	--	--	13500, 13505, 13240, 13245	--	Carlyss - Sabine 230 kV	--
Fault_05a	Carlyss 230 kV	3PH	5	9	13505	13500, 13240, 13245	13580, 27050, 27055	Carlyss - Sabine 230 kV	Carlyss - Boudoin 230 kV
Fault_05a _1PH	Carlyss 230 kV	1PH	5	9	13505	13500, 13240, 13245	13580, 27050, 27055	Carlyss - Sabine 230 kV	Carlyss - Boudoin 230 kV
Fault_05b	Carlyss 230 kV	3PH	5	9	13500	13505, 13240, 13245	13145, 13480	Carlyss - Sabine 230 kV	Carlyss - Rose Bluff 230 kV
Fault_05b _1PH	Carlyss 230 kV	1PH	5	9	13500	13505, 13240, 13245	13145, 13480	Carlyss - Sabine 230 kV	Carlyss - Rose Bluff 230 kV
Fault_06	Carlyss 230 kV	3PH	5	--	--	13480, 27015, 27010	--	Carlyss - Rose Bluff 230 kV	--
Fault_07	Carlyss 230 kV	3PH	5	--	--	13150, 13155, 17550	--	Carlyss 230/138kV Xfmr	--
Fault_08	Carlyss 69 kV	3PH	5	--	--	8775, 18825	--	Carlyss - Choupique 69 kV	--
Fault_09	Carlyss 69 kV	3PH	5	--	--	7840, 18805, 17950	--	Carlyss - Catalyst 69 kV; Carlyss - Col.A. 69 kV	--
Fault_10	Carlyss 69 kV	3PH	5	--	--	7895, 8205	--	Carlyss - PCI 69 kV	--
Fault_11	Lone Star Cement 69 kV	3PH	5	--	--	18820, 18815, BRKX	--	Long Star Cement - Choupique 69 kV; Long Star Cement - Catalyst 69 kV; PID-246	--

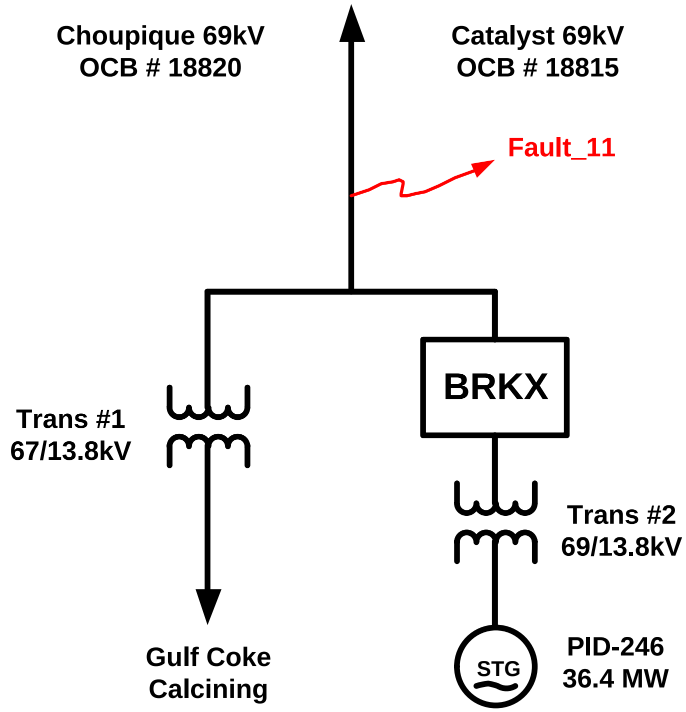


Figure 8-2: Layout Diagram for Lone Star Cement 69kV Substation

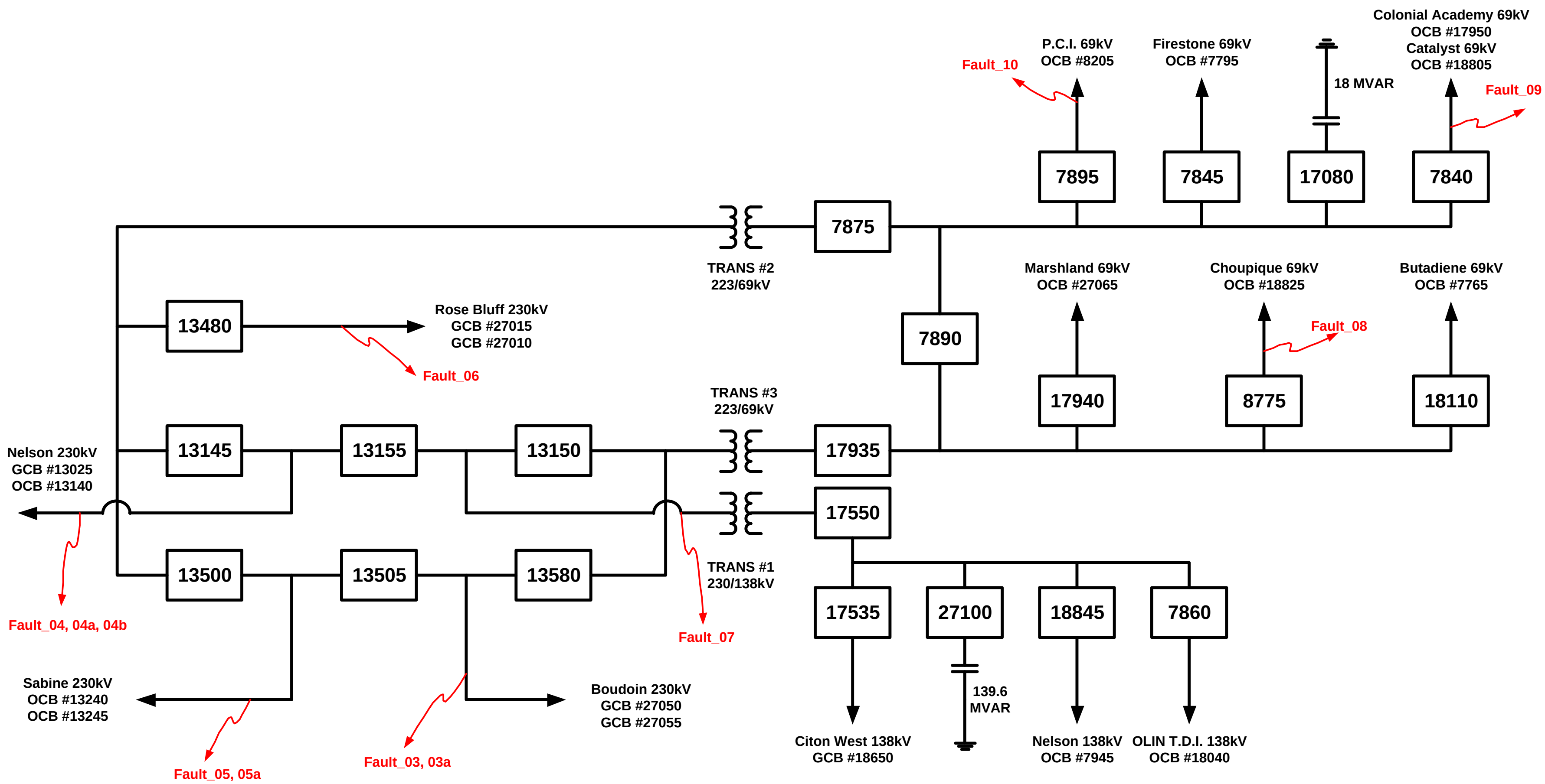


Figure 8-3: Layout Diagram for Carlyss 230/138/69kV Substation

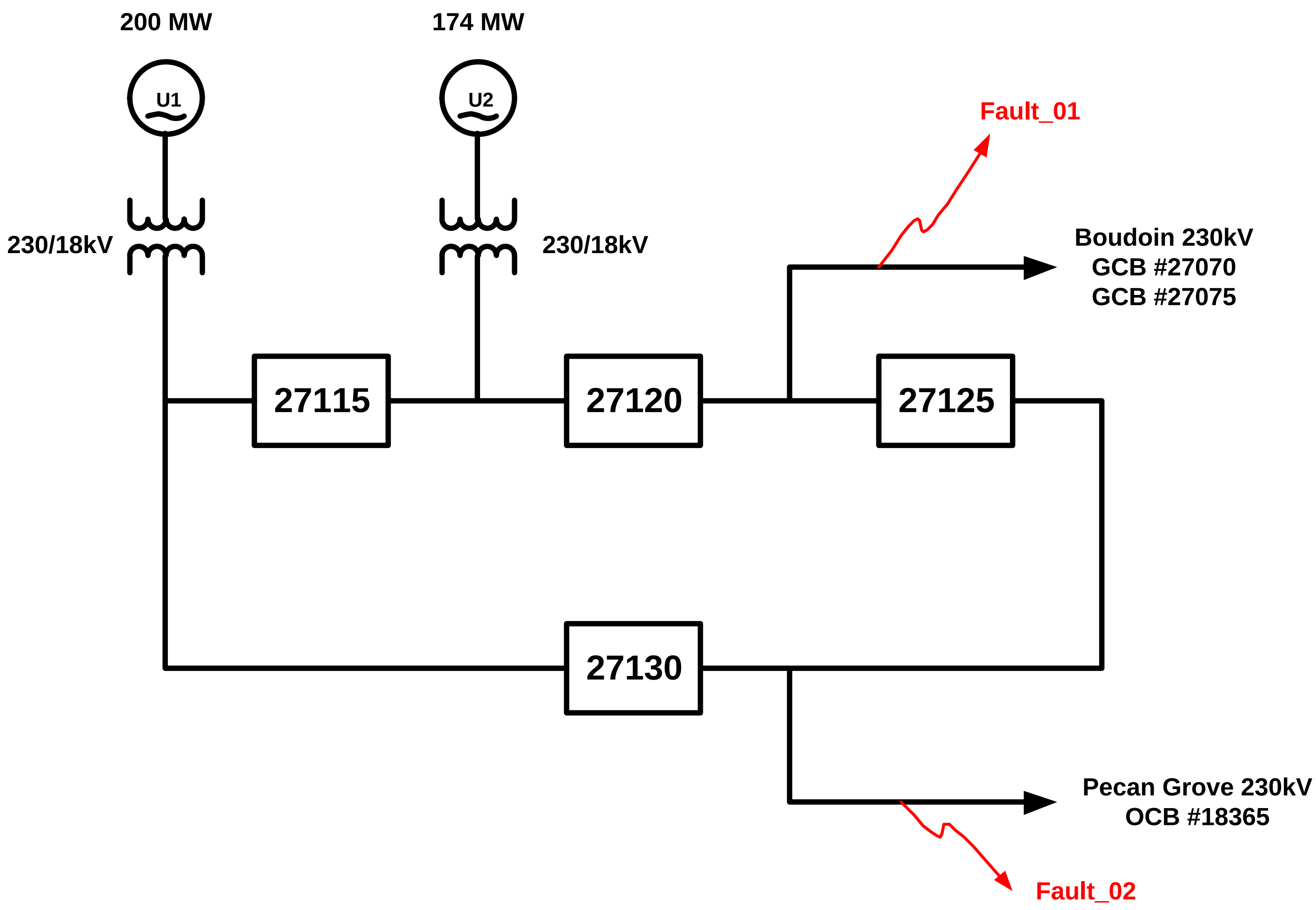


Figure 8-4: Layout Diagram for Calcasieu 230kV Substation

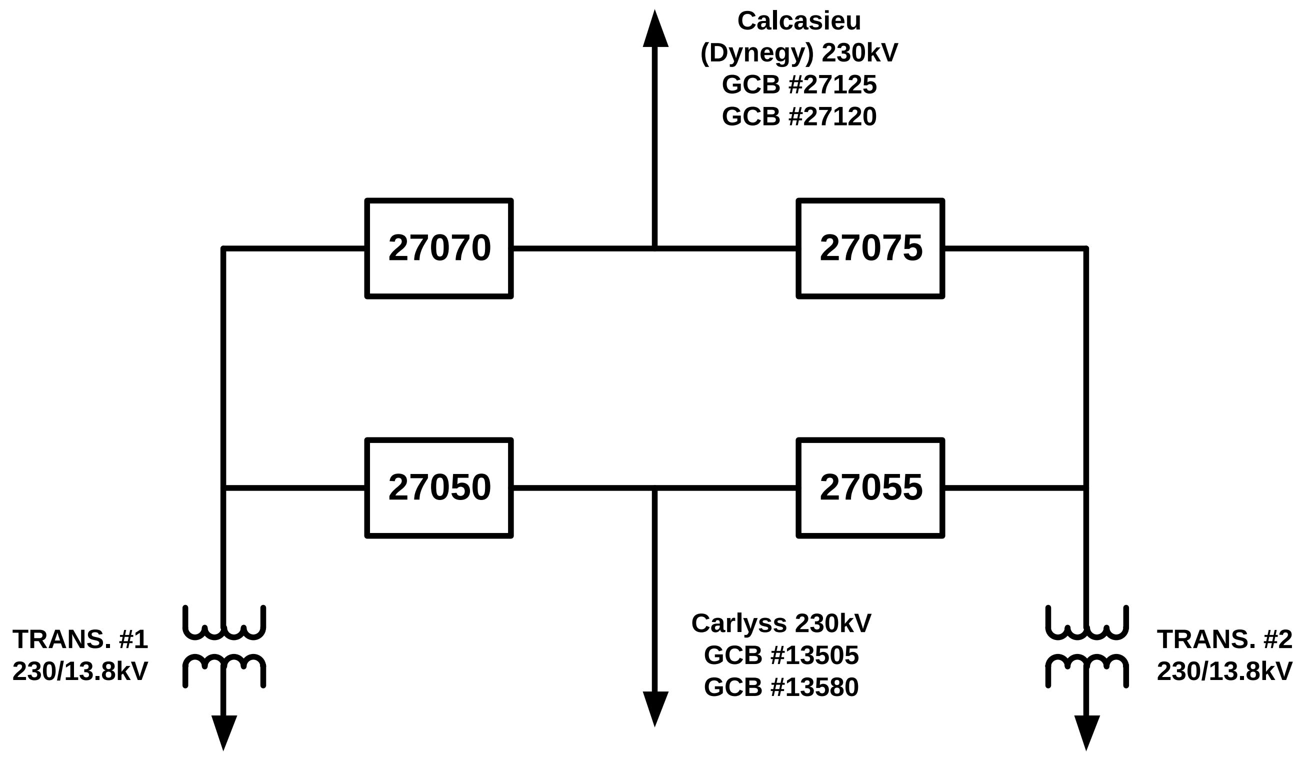


Figure 8-5: Layout Diagram for Boudoin 230kV Substation

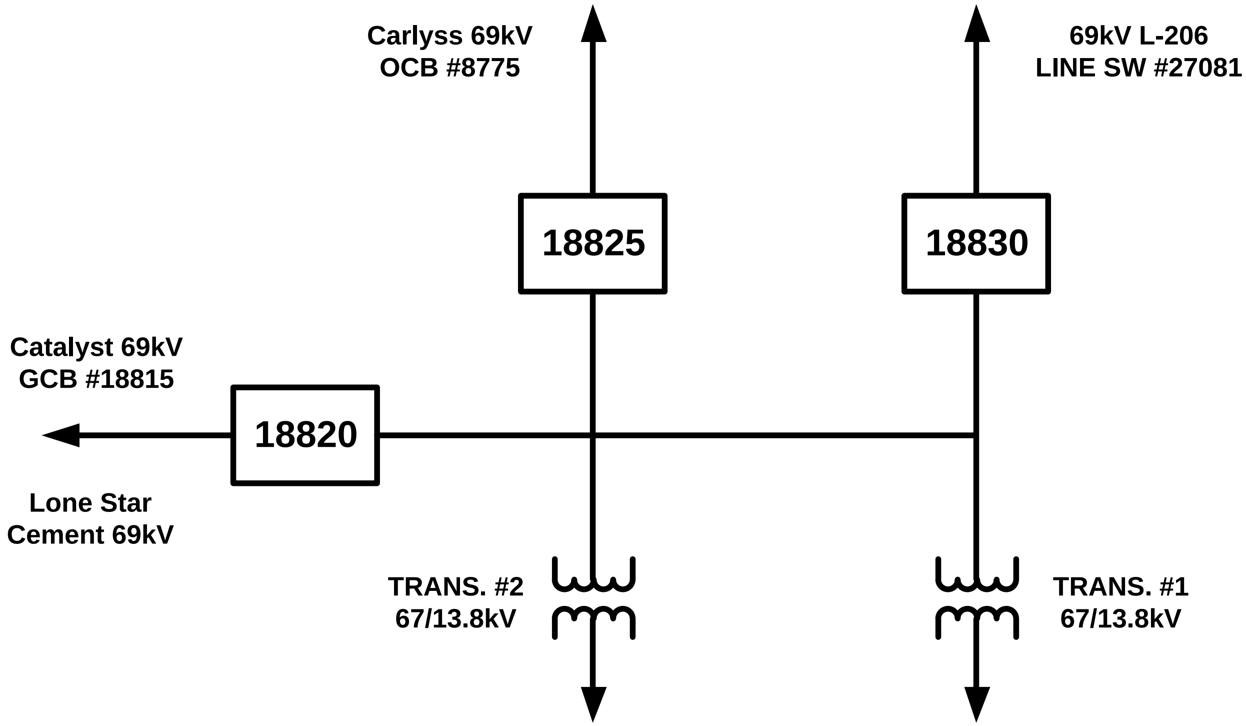


Figure 8-6: Layout Diagram for Choupique 69kV Substation

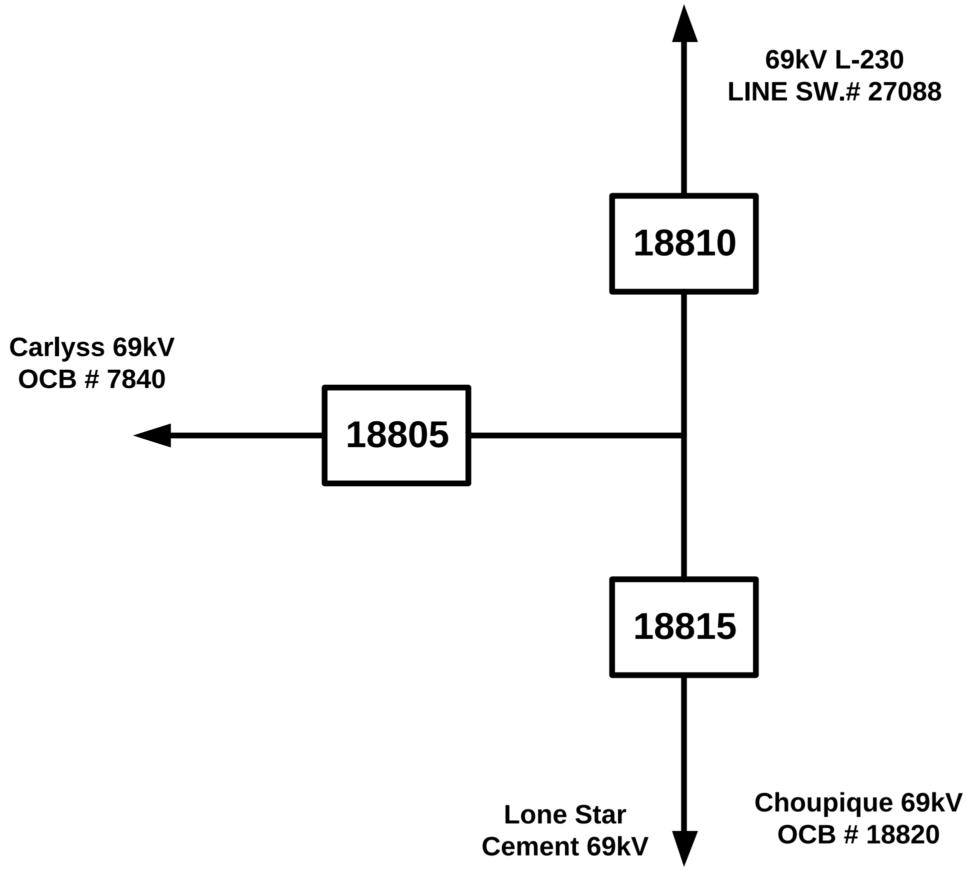


Figure 8-7: Layout Diagram for Catalyst 69kV Substation

Preliminary simulations on the post-project case showed the system to be stable following all the normally cleared three-phase faults. However, the system was found to be unstable following three-phase stuck-breaker faults 03a, 04a, 04b, 05a, and 05b. These faults were repeated assuming single-phase stuck-breaker faults and no system instability was found. The results are summarized in Table 8-3 and Table 8-4.

Figure 8-8 and Figure 8-9 show the PID-246 project responses following a three-phase stuck-breaker fault and a single-phase breaker fault at Carlyss 230kV substation, respectively. As described in Table 8-4, the proposed PID-246 project was unstable following the three-phase stuck-breaker fault while being stable following the single-phase stuck-breaker fault.

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

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

- Three-phase faults with normal clearing resulting in the loss of two or more components (generator, transmission circuit or transformer), and SLG fault with delayed clearing resulting in the loss of one or more components:
  Not to exceed 20% for more than 40 cycles at any bus
  Not to exceed 30% at any bus

The duration of the transient voltage dip excludes the duration of the fault. The transient voltage dip criteria are not applicable for three-phase stuck-breaker faults unless the determined impact is extremely widespread.

The voltages at all buses in the PID-246 project area (69kV and above) were monitored during each of the fault cases as appropriate. No voltage criteria violations were observed following normally cleared three-phase faults.

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

Table 8-3: Three-Phase Normally Cleared Fault Simulation Results

Three-Phase Normally Cleared Fault	Result
Fault_01	STABLE
Fault_02	STABLE
Fault_03	STABLE
Fault_04	STABLE
Fault_05	STABLE
Fault_06	STABLE
Fault_07	STABLE
Fault_08	STABLE
Fault_09	STABLE
Fault_10	STABLE
Fault_11	STABLE

Table 8-4: Stuck Breaker Fault Simulation Results

Three-Phase Stuck-Breaker Fault	Result	Single-Phase Stuck-Breaker Fault	Result
Fault_01a	STABLE	--	--
Fault_01b	STABLE	--	--
Fault_02a	STABLE	--	--
Fault_02b	STABLE	--	--
Fault_03a	UNSTABLE	Fault_03a_1PH	STABLE
Fault_04a	UNSTABLE	Fault_04a_1PH	STABLE
Fault_04b	UNSTABLE	Fault_04b_1PH	STABLE
Fault_05a	UNSTABLE	Fault_05a_1PH	STABLE
Fault_05b	UNSTABLE	Fault_05b_1PH	STABLE

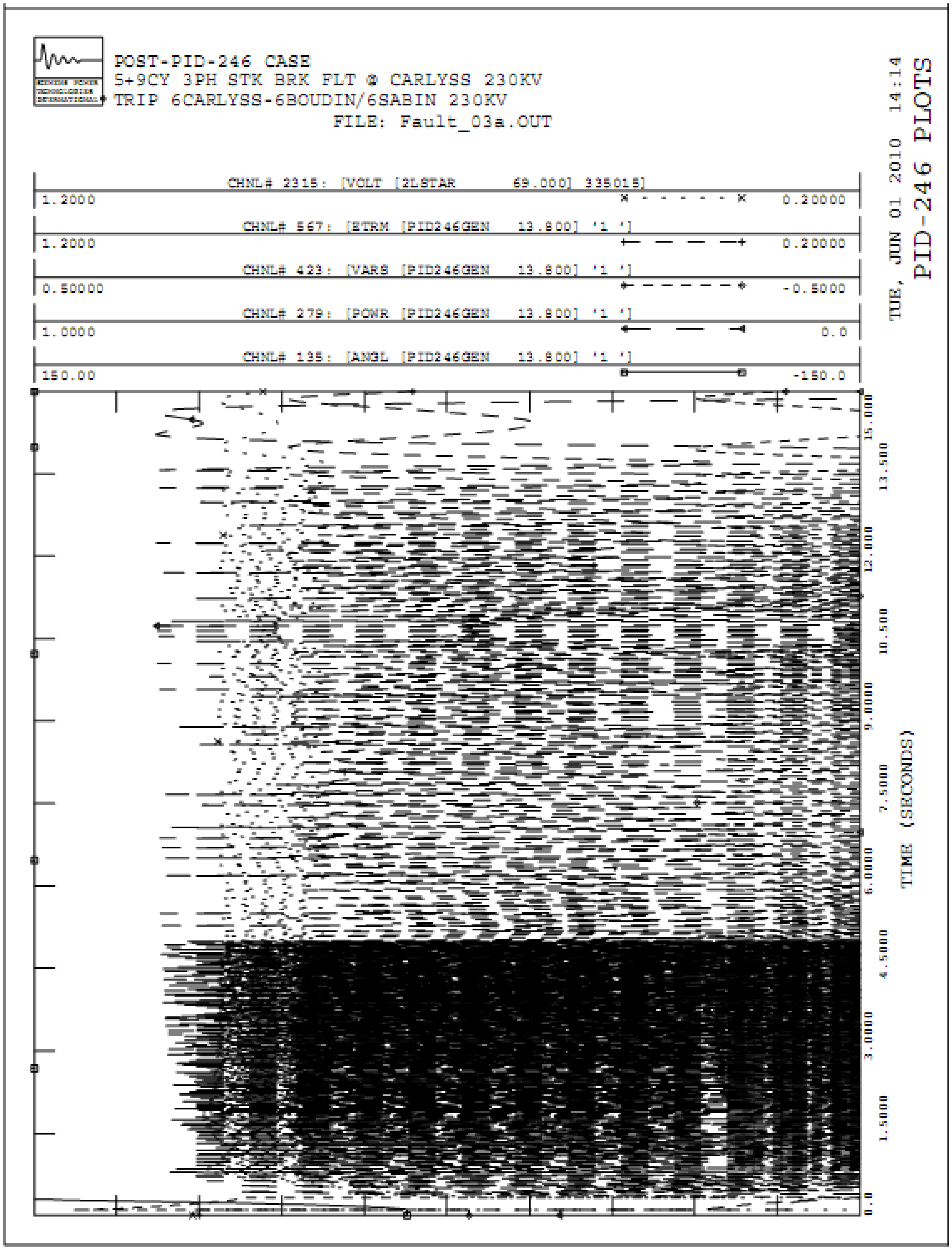


Figure 8-8: PID-246 Responses Following Three-Phase Stuck-Breaker Fault_03a

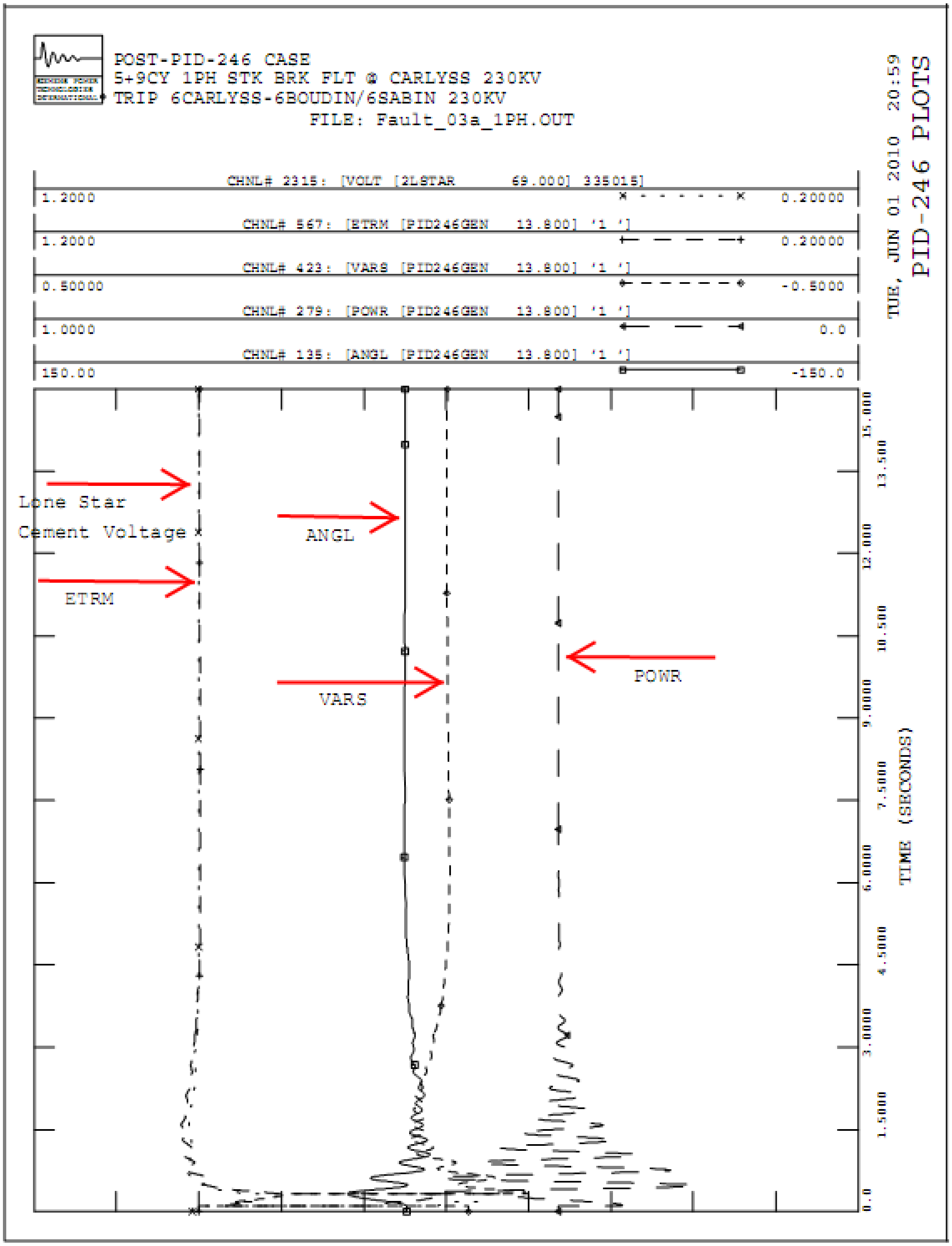


Figure 8-9: PID-246 Responses Following Single-Phase Stuck-Breaker Fault_03a_1PH

9. CONCLUSION

Based on the results of stability analysis, it can be concluded that interconnection of the proposed PID-246 (36.4MW) project at the Lone Star Cement 69kV substation **does not** adversely impact the stability of the Entergy System in the local area. Results indicate that the system is stable following all simulated three-phase normally cleared and single-phase stuck-breaker faults. Also, **no** voltage criteria violations were observed following these faults.

APPENDIX A: Data Provided By Customer

Attachment A to Appendix 1
Interconnection Request

LARGE GENERATING FACILITY DATA

UNIT RATINGS

kVA 45,500 °F 248 Voltage 13,800
Power Factor 0.8
Speed (RPM) 1800 Connection Wye
Short Circuit Ratio 0.468 Frequency, Hertz 60
Stator Amperes at Rated kVA 1904 Field Volts 162
Max Turbine MW 36.4 °F 248

COMBINED TURBINE-GENERATOR-EXCITER INERTIA DATA

Inertia Constant, H = 0.9 kW sec/kVA
Moment-of-Inertia, WR^2 = 54,944 lb. $ft.^2$

REACTANCE DATA (PER UNIT-RATED KVA)

	DIRECT AXIS		**QUADRATURE AXIS**	
Synchronous – saturated	X_{dv}	2.10	X_{qv}	0.96
Synchronous – unsaturated	X_{di}	2.35	X_{qi}	1.235
Transient – saturated	X'_{dv}	0.256	X'_{qv}	0.25
Transient – unsaturated	X'_{di}	0.31	X'_{qi}	0.31
Subtransient – saturated	X''_{dv}	0.16	X''_{qv}	0.189
Subtransient – unsaturated	X''_{di}	0.21	X''_{qi}	0.277
Negative Sequence – saturated	$X2_v$	0.16		
Negative Sequence – unsaturated	$X2_i$	0.213		
Zero Sequence – saturated	$X0_v$	0.13		
Zero Sequence – unsaturated	$X0_i$	0.137		
Leakage Reactance	Xl_m	0.14		

FIELD TIME CONSTANT DATA (SEC)

Open Circuit	T'_{do}	6.95	T'_{qo}	1.2
Three-Phase Short Circuit Transient	T'_{d3}	0.92	T'_{q}	0.16
Line to Line Short Circuit Transient	T'_{d2}	1.2		
Line to Neutral Short Circuit Transient	T'_{d1}	1.4		
Short Circuit Subtransient	T''_{d}	0.033	T''_{q}	0.043
Open Circuit Subtransient	T''_{do}	0.048	T''_{qo}	0.192

ARMATURE TIME CONSTANT DATA (SEC)

Three Phase Short Circuit	T_{a3}	0.279
Line to Line Short Circuit	T_{a2}	0.279
Line to Neutral Short Circuit	T_{a1}	0.22

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	0.00677
Negative	R_2	0.028
Zero	R_0	0.184

Rotor Short Time Thermal Capacity I_2^2t = 30

Field Current at Rated kVA, Armature Voltage and PF = 587 amps

Field Current at Rated kVA and Armature Voltage, 0 PF = 755 amps

Three Phase Armature Winding Capacitance = 0.108 microfarad

Field Winding Resistance = 0.194 ohms 20 °C

Armature Winding Resistance (Per Phase) = 0.00835 ohms 20 °C

CURVES

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

See Attachments

GENERATOR STEP-UP TRANSFORMER DATA RATINGS

Capacity / Self-cooled/ Maximum Nameplate

30,000 / 50,000 kVA

Voltage Ratio (Generator Side/System side/Tertiary)

13,800 / 69,000 / kV

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

Delta / Wye /

Fixed Taps Available

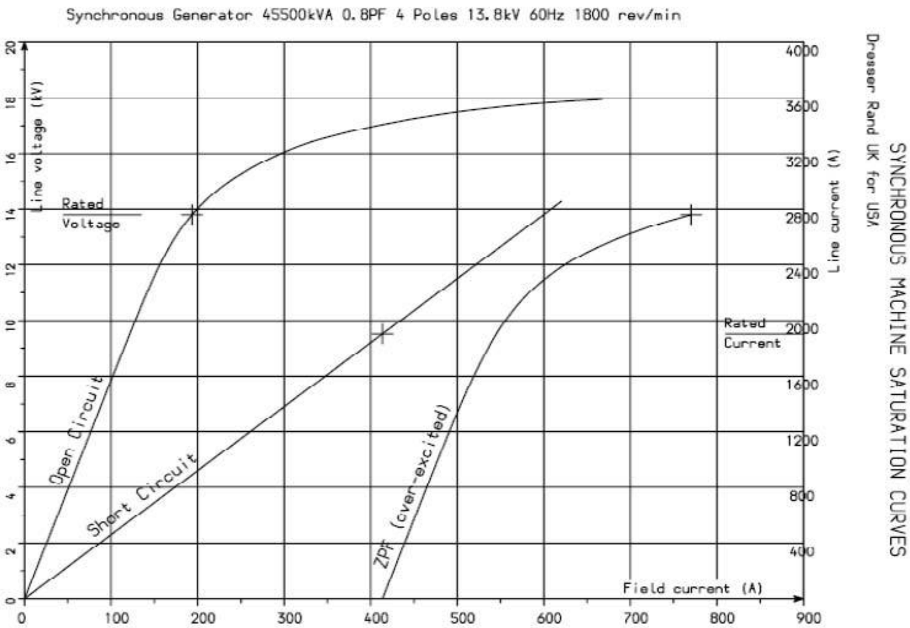
+/-2.5%,5%

Present Tap Setting

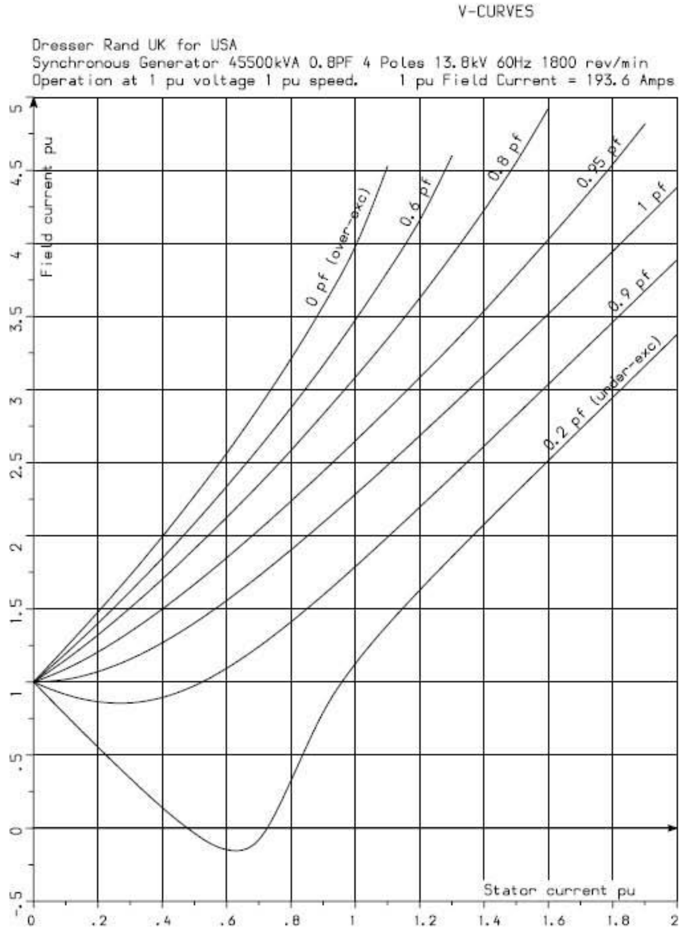
69,000 V

IMPEDANCE

Positive	Z_1 (on self-cooled kVA rating) 7.5% %	35	X/R
Zero	Z_0 (on self-cooled kVA rating) 7.5% %	35	X/R



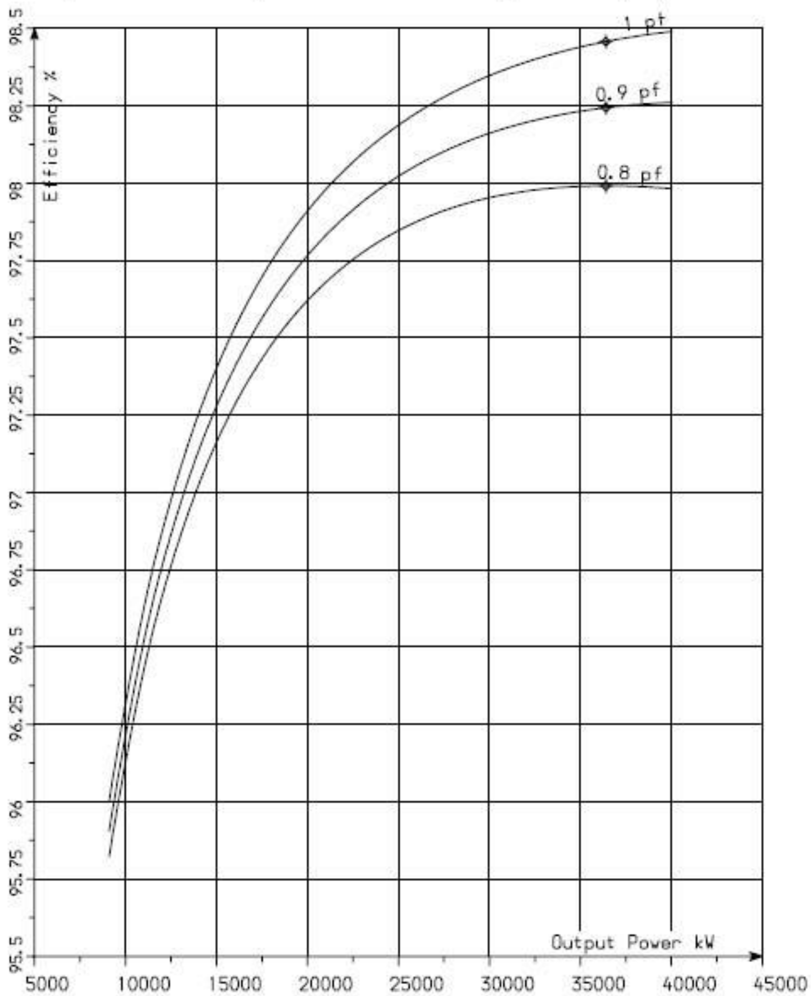
Synchronous Generator 45500kVA 0.8PF 4 Poles 13.8kV 60Hz 1800 rev/min
SYNCHRONOUS MACHINE SATURATION CURVES
Dresser Rand UK for USA
Line voltage (kV)
Line current (A)
Field current (A)
Rated Voltage
Rated Current
Open Circuit
Short Circuit
ZPF (over-excited)

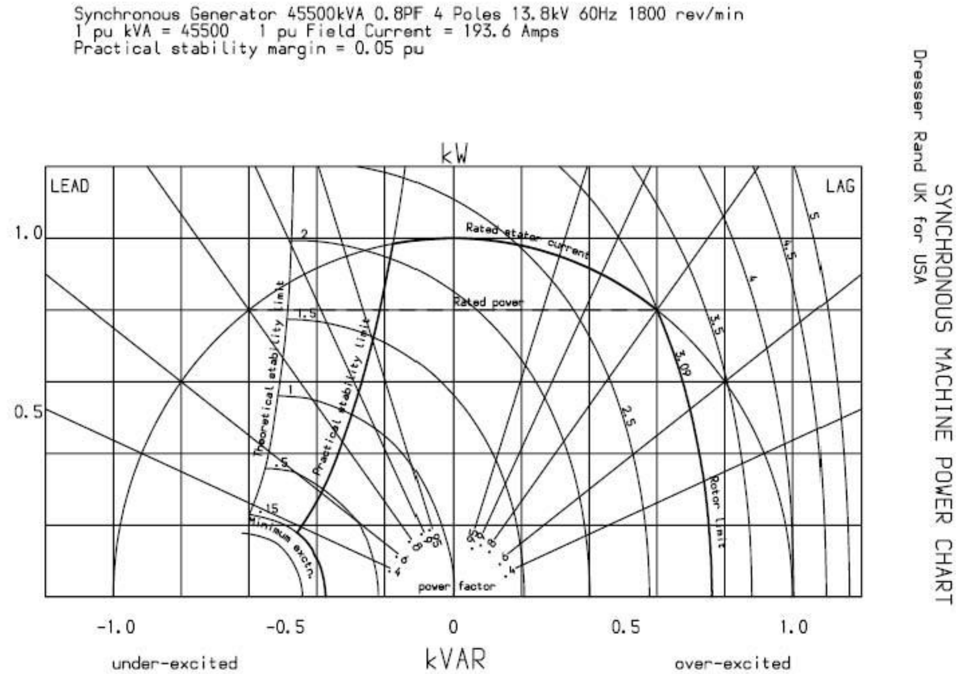

V-CURVES
Dresser Rand UK for USA
Synchronous Generator 45500kVA 0.8PF 4 Poles 13.8kV 60Hz 1800 rev/min
Operation at 1 pu voltage 1 pu speed.   1 pu Field Current = 193.6 Amps
Field current pu
Stator current pu
0 pf (over-exc)
0.6 pf
0.8 pf
0.95 pf
1 pf
0.9 pf
0.2 pf (under-exc)
-.5
0
.5
1
1.5
2
2.5
3
3.5
4
4.5
5
0
.2
.4
.6
.8
1
1.2
1.4
1.6
1.8
2

EFFICIENCY - OUTPUT POWER

Dresser Rand UK for USA
Synchronous Generator 45500kVA 0.8PF 4 Poles 13.8kV 60Hz 1800 rev/min

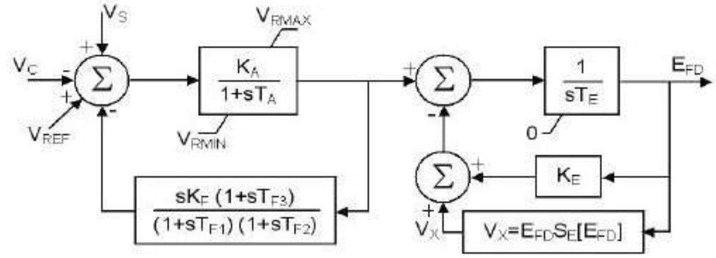
Efficiency is calculated in accordance with NEMA for a
temperature of 95 Deg C and for rated voltage and frequency.




Synchronous Generator 45500kVA 0.8PF 4 Poles 13.8kV 60Hz 1800 rev/min
1 pu kVA = 45500   1 pu Field Current = 193.6 Amps
Practical stability margin = 0.05 pu
SYNCHRONOUS MACHINE POWER CHART
Dresser Rand UK for USA
kW
LEAD
LAG
1.0
0.5
Rated stator current
Rated power
Theoretical stability limit
Practical stability limit
Minimum exctn.
Rotor limit
power factor
-1.0
-0.5
0
0.5
1.0
kVAR
under-excited
over-excited

EXCITER MODEL
IEEE Type: AC5A

CONSTANTS	
K_A	400
T_A	0.02
V_{RMAX}	7.3
V_{RMIN}	-7.3
T_E	0.8
K_E	1.0
$S_E[E_{FD1}]$	0.86
E_{FD1}	5.6
$S_E[E_{FD2}]$	0.5
E_{FD2}	0.75 x E_{FD1}
K_F	0.03
T_{F1}	1.0
T_{F2}	0.0
T_{F3}	0.0



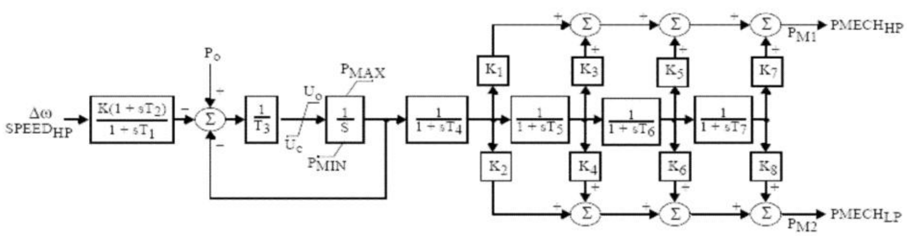
NOTES:

1. Constants are from sample data, Appendix H.9 of IEEE 421.5

GOVERNOR MODEL

IEEEG1: 1981 IEEE Type 1 Turbine-Governor

CONSTANTS	
K	20
T1 (sec)	0
T2 (sec)	0
T3 (sec)	0.2
Uo (pu/sec)	0.05
Uc (pu/sec)	-0.1
PMAX (pu)	1
PMIN (pu)	0
T4 (sec)	1
K1	1
K2	0
T5 (sec)	0.0
K3	0.0
K4	0.0
T6 (sec)	0.0
K5	0.0
K6	0.0
T7 (sec)	0.0
K7	0.0
K8	0.0



NOTES:

APPENDIX B: POWER FLOW AND STABILITY DATA

Following data is presented in PSS/E VER 30.3.3 format

Powerflow Data

```
0,   100.00        / PSS/E-30.3    WED, JUN 02 2010  13:09

POST-PID-246 CASE
335016,'PID246GEN   ',  13.8000,2,     0.000,     0.000, 351, 112,1.00000, -52.7210,  37
0 / END OF BUS DATA, BEGIN LOAD DATA
0 / END OF LOAD DATA, BEGIN GENERATOR DATA
335016,'1 ',     0.000,     0.000,    27.300,   -27.300,1.00000,     0,    45.500,   0.00677,    0.24350,   0.00000,
0.00000,1.00000,1,  100.0,    36.400,     0.000,  37,1.0000
0 / END OF GENERATOR DATA, BEGIN BRANCH DATA
0 / END OF BRANCH DATA, BEGIN TRANSFORMER DATA
335015,335016,     0,'1 ',1,2,1,   0.00000,   0.00000,2,'            ',1,  37,1.0000
   0.00214,   0.07500,    30.00
1.00000,   0.000,   0.000,    50.00,    50.00,    50.00, 0,      0, 1.10000, 0.90000, 1.10000, 0.90000,   5, 0, 0.00000, 0.00000
1.00000,   0.000
0 / END OF TRANSFORMER DATA, BEGIN AREA DATA
0 / END OF AREA DATA, BEGIN TWO-TERMINAL DC DATA
0 / END OF TWO-TERMINAL DC DATA, BEGIN VSC DC LINE DATA
0 / END OF VSC DC LINE DATA, BEGIN SWITCHED SHUNT DATA
0 / END OF SWITCHED SHUNT DATA, BEGIN IMPEDANCE CORRECTION DATA
0 / END OF IMPEDANCE CORRECTION DATA, BEGIN MULTI-TERMINAL DC DATA
0 / END OF MULTI-TERMINAL DC DATA, BEGIN MULTI-SECTION LINE DATA
0 / END OF MULTI-SECTION LINE DATA, BEGIN ZONE DATA
0 / END OF ZONE DATA, BEGIN INTER-AREA TRANSFER DATA
0 / END OF INTER-AREA TRANSFER DATA, BEGIN OWNER DATA
0 / END OF OWNER DATA, BEGIN FACTS DEVICE DATA
0 / END OF FACTS DEVICE DATA
```

Dynamics Data

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS/E   WED, JUN 02 2010 13:10

POST-PID-246 CASE

PLANT MODELS

REPORT FOR ALL MODELS   BUS 335016 [PID246GEN   13.800] MODELS

```
** GENROU **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S
        335016 PID246GEN    13.800 1  130945-130958  51267-51272

         MBASE     Z S O R C E         X T R A N       GENTAP
          45.5  0.00677+J 0.24350  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
 6.95 0.048  1.20 0.192   0.90  0.00 2.3500 1.2350 0.3100 0.3100 0.2435 0.1400

                       S(1.0)  S(1.2)
                       0.1143  0.6429


** ESAC5A **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S     VAR
        335016 PID246GEN    13.800 1  130959-130973  51273-51277    8326

   TR      KA     TA   VRMAX   VRMIN     KE     TE     KF     TF1    TF2    TF3
 0.000  100.00  0.020  7.300  -7.300   1.000  0.800  0.030  1.000  0.000  0.000

              E1     S(E1)    E2     S(E2)        KE VAR
             4.2000  0.5000  5.6000  0.8600        0.0000


** IEEEG1 **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S     V A R S
        335016 PID246GEN    13.800 1  130974-130993  51278-51283    8327-8328

    K      T1      T2      T3     UO      UC    PMAX   PMIN     T4      K1
  20.00   0.000   0.000   0.200  0.050  -0.100 1.0000 0.0000   1.000   1.000

   K2      T5      K3      K4      T6      K5      K6      T7      K7      K8
 0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
```

APPENDIX C: PLOTS FOR STABILITY SIMULATIONS

Plots will be posted in a separate posting titled *Study Number 246 - System Impact Study Report Stability Plots*.

The plots can be viewed at the following link:

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

APPENDIX D: Approved Projects and Transactions in Study Mode

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

Year	Approved Future Projects
	2010S ETI Temco and Shepherd 138kV Substations.idv
	2010S ETI Western Region Reliability Improvement Plan Phase 3 Interim (Part 1).idv
	2010W ETI Western Region Reliability Improvement Plan Phase 3 Interim (Part 3).idv
	2011S ETI Grand Gulf Uprate Project.idv
	2011S ETI Western Region Reliability Improvement Plan Phase 3 Interim (Part 2).idv
	2011W ETI Tamina to Cedar Hill 138 kV line.idv

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

PID	Substation	MW	In Service Date
PID 221	Wolfcreek	875	In Service
PID 223	PID-223 Tap	125	10/1/2010
PID 224	PID-224 Tap	100	12/1/2009
PID 233	PID-233	150	4/30/2011
PID 237	Lakeover 500kV	550	9/1/2010
PD 244	Big Cajun 2, Unit 1	13	12/31/2011

Prior transmission service requests that were included in this study:

OASIS #	PSE	MW	Begin	End
1668165	Entergy Services (SPO)	600	1/1/2013	1/1/2043
73595626	NRG Power Marketing	13	1/1/2012	1/1/2017
73619116	NRG Power Marketing	300	1/1/2012	1/1/2017