TRANSMISSION LINE & SUBSTATION PROJECTS

COMPANY: ENTERGY GULF STATES LOUISIANA, L.L.C.

CUSTOMER: PID 244

FACILITIES STUDY

EJO NO. F4PPGS0477

PID 244 GENERATOR INTERCONNECTION

Revision:
1

Rev	Issue Date	Description of Revision	Prepared By	Approved By
A	10/11/10	Initial Draft	SRB	BKW
B	2/1/11	Issue for Review	SRB	BKW
C	2/8/11	Issue to ICT	SRB	BKW
0	2/8/11	ICT Review and Upgrade Classification	EC	BR
1	2/28/11	Removal of “combine cycle” wording from Section 1.1 per customer request	EC	BR

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1. PROJECT SUMMARY

1.1. Background and Project Need

The purpose of this Facilities Study is to determine the availability to connect a new generation facility and provide the transfer capability at the point of interconnection. Also increased load flows, produced by making this interconnection, will be identified. This Facility Study will evaluate PID 244 request for interconnection of a 13 MW increase of generation for a total generator output of 588 MW. The customer has requested a 20% estimate.

To evaluate this request, a study was performed on the latest available 2011 summer peak cases, using PSS/E and MUST software by Power Technologies Incorporated (PTI).

The Facilities Study will identify the transmission interconnection requirements, any transmission constraints resulting from the requested power transfer, and any additional study also includes cost estimates to correct any transmission constraints.

The customer has requested Energy Resource Interconnection Service (ERIS). No upgrades have been identified for ERIS.

1.2. Customer Facilities

The customer's existing unit is a coal fired boiler with a GE steam-turbine generator. The unit is located in New Roads, LA.

1.3. Scope Summary

A. Scope for ERIS:

- The ERIS was based on a request for interconnection on Entergy's transmission system located at the Big Cajun #2 500kV Substation. No network upgrades have been identified for ERIS.

- A short circuit analysis was performed to determine if the proposed generation would cause the available fault current to surpass the fault duty of existing equipment within the Entergy transmission system. The analysis determined that additional generation proposed by PID 244 does not cause an increase in short circuit current such that it exceeds the fault interrupting capability of high voltage circuit breakers within the vicinity of PID 244.

- A Stability Study was performed to evaluate the impact of PID 244 on the stability of the Entergy transmission system and nearby generating stations. The study concluded that no stability violations exist following simulated three-phase normally cleared faults and single phase stuck-

breaker faults. Additionally, no voltage criteria violations were observed. A detailed description of the Stability Study analysis is described in Appendix A.

B. Scope for NRIS:

- NRIS was not requested by the Customer.

1.4. Impact of Priors

PID 244 does not depend on other ongoing or planned Entergy Projects. As a result, the status of previously identified Entergy projects does not impact the cost or schedule of this interconnection.

1.5. Cost Summary

A. For ERIS

- The estimated total project cost is $0. This cost does not include Tax Gross Up which may apply.

- The ICT has assigned $0 as Base Plan upgrades and $0 as Supplemental Upgrades based on Attachment "T" of Entergy's ICT (Independent Coordinator of Transmission) filing to the FERC.

B. For NRIS

- NRIS was not requested by the Customer.

1.6. Schedule Summary (Worst Case)

The customer's requested in service date is 4th quarter 2011. There are no network upgrades identified to accommodate this generation increase. Therefore, there is no summary of work for Entergy to perform.

WO Name	Requested ISD	Estimated ISD
N/A	N/A	N/A

1.7. Long Lead and Major Material / Equipment

Quantity	Material Description	Lead Time (Weeks)
N/A	N/A	N/A

2. SAFETY

Safety is a priority with Entergy. Safety will be designed into substations and lines. The designs will be done with the utmost safety for personnel in mind for construction, operation, and maintenance of the equipment.

The *National Electric Safety Code* and the *National Electrical Code* will be used as the standards in the design & construction of the identified projects.

Should the work contained within this Facility Study be approved, a detailed Safety Plan will be formulated and incorporated within the project plan.

3. GENERAL ASSUMPTIONS

- N/A

4. SCOPE OF WORK

4.1. Interconnection Facilities [common to both ERIS & NRIS]

- N/A

4.2. T-Line Task 1

- N/A

4.3. T-Substation Task 1

- N/A

5. COST

The ICT has reviewed and determined whether each required upgrade will be considered a Base Plan Upgrade or a Supplemental Upgrade. For more information on cost responsibility for Base Plan and Supplemental Upgrades, see Attachment T to Entergy's OATT.

The costs shown in the table include all applicable overheads but do not include tax gross up. Entergy incurs a tax liability proportional to the amount of customer contributions.

Estimated Task Costs

Task	2010	2011	2012	2013	Total
N/A	N/A	N/A	N/A	N/A	N/A

6. UPGRADE CLASSIFICATION

The ICT has reviewed and determined whether each required upgrade will be considered a Supplemental Upgrade. For more information on cost responsibility for Base Plan and Supplemental Upgrades, see Attachment T to Entergy's OATT.

Task	Total Cost	Base Plan	Supplemental	Reference
N/A	N/A	N/A	N/A	N/A

7. SCHEDULE

No network upgrades have been identified for this request. Therefore, there is no schedule associated with any work required of Entergy to accommodate this request. It is assumed that the 13MW increase will take place in the 4th quarter of 2011 as per the customer's Interconnection Request.

Task Name	Estimated Start Date	Estimated ISD/Completion
N/A	N/A	N/A

Notes to Duration Schedules:

- N/A

8. INTERCONNECTION STANDARDS

http://entergy.com/transmission/facility_requirements.aspx

9. RISK ASSESSMENT

- N/A

Risk	Comment	Impact
N/A		

*-low impact to cost, ** - moderate impact to cost, ***- high impact to cost, **** - very high impact to cost.

10. CONFIRMED RESERVATIONS

The following modifications were made to the base cases to reflect the latest information available:

- Non-Firm IPPs within the local region of the study generator were turned off and other non-firm IPPs outside the local area were increased to make up the difference.

- Confirmed firm transmission reservations were modeled.

- Approved transmission reliability upgrades for 2011 – 2013 were included in the base case. These upgrades can be found at Entergy's OASIS web page, http://www.oatioasis.com/EES/EESDocs/INFO.htm under approved future projects.

Prior generator interconnection ERIS requests that were included in this study:

PID	Substation	MW	In Service Date
PID 226	Grand Gulf	206	6/1/2012
PID 231	Good Hope	31	4/30/2010
PID 233	Marshall-Botkinburg	150	12/31/2013

11. ATTACHMENTS

A. Table of Acronyms

ACSR	Aluminum Conductor Steel Reinforced
ACSS	Aluminum Conductor Steel Supported
ADEQ	Arkansas Department of Environmental Quality
AFUDC	Allowance for Funds Used During Construction
ATC	Available Transfer Capability
EES	Entergy Control Area
EHV	Extra-High Voltage
ERIS	Energy Resource Interconnection Service
ICT	Independent Coordinator of Transmission
kV	Kilo-Volt
MCM	(M) Thousand Circular Mils
MVA	Mega-Volt Amp
MW	Mega-Watt
NPDES	National Pollution Discharge Elimination System
NOI	Notice of Intent
NRIS	Network Resource Interconnection Service
OASIS	Online Access and Same-time Information System
OATT	Open Access Transmission Tariff
POD	Point of Delivery
POR	Point of Receipt
SES	Steam Electric Station
SOC	System Operations Center
SHV	Super High Voltage
SW	Switch Station
TOC	Transmission Operations Center

B. Scope Summary Diagram / Area Map

- N/A

C. One Line Drawings

- N/A

D. Electrical Arrangement

- N/A

E. Duration Schedule

- N/A

APPENDIX A: STABILITY ANALYSIS

A transient stability analysis was performed to evaluate the impact of the 13MW Big Cajun uprate and the replacement of the existing Alterex systems with a digital AVR controller. Transient stability analysis was performed by the following procedures based on Entergy's criteria. First, a three-phase-to-ground fault was applied on lines nearby the Big Cajun #2 station. Based on the available oneline diagram, due to the implementation of Independent Pole Operation (IPO) on Big Cajun #2 500 kV station, three-phase faults with single-phase breaker failure were simulated for stuck breaker case in between Big Cajun #2-Fancy Point 500 kV line and Big- Cajun #2-Webre 500 kV line. Faults within the 500 kV systems were cleared in 5 cycles (83.3 ms for normal clearance) and 14 cycles (233.3 ms for stuck breaker condition). If one of the fault scenarios caused instability, a single-phase-to-ground fault with single-phase breaker failure was subsequently simulated. The stability analysis was performed using the PSS/E dynamics program. 2013 Summer Peak case was used for the study.

The generators are modeled using the standard PSS/E GENROU model. Exciter model at Big Cajun #2 units have recently been updated from EXAC3 to the IEEE Type AC7B models. A PSS2A power system stabilizer model was provided and used as given. The dynamic data used to represent the proposed generators are shown in Appendix B. A summary of simulation results is given in Appendix C. Table I lists all the fault cases that were simulated in this study.

The transient stability simulations indicated that uprate project in Big Cajun #2 station has no adverse impact on the system. Regarding three-phase faults cleared by primary protection (normal clearing) and three-phase faults followed by a single-phase stuck breaker, no stability problems were observed at Entergy and neighboring units.

Table I – Simulation Results for Normally-Cleared and Stuck-Breaker Faults

Fault Case #	Fault Location	Fault Type	Fault Clrng Time (ms)	SLG Fault Impedance (Ohm)	Stuck Breaker#	Primary Breaker Trip #	Secondary Breaker Trip #	Stable?
1	*Big Cajun #2 500 kV*	*3PH*	*83.3*	-	-	*Big Cajun #2 Brk# 20550, 20555, Webre Brk# 20580, 20565*	-	**Yes**
2	*Webre 500 kV*	*3PH*	*83.3*	-	-	*Big Cajun #2 Brk# 20550, 20555, Webre Brk# 20580, 20565*	-	**Yes**
3	*Big Cajun #2 500 kV*	*3PH*	*83.3*	-	-	*Big Cajun #2 Brk# 20535, 20540, Fancy Point Brk# 20770, 20775*	-	**Yes**
4	*Fancy Point 500 kV*	*3PH*	*83.3*	-	-	*Big Cajun #2 Brk# 20535, 20540, Fancy Point Brk# 20770, 20775*	-	**Yes**
5	*Big Cajun #2 500 kV*	*3PH-SLG*	*233*	*1.414+j21.8*	*Brk #20550*	*Big Cajun #2 Brk# 20555, Webre Brk# 20580, 20565*	*Big Cajun #2 Brk# 20550*	**Yes**
6	*Big Cajun #2 500 kV*	*3PH-SLG*	*233*	*1.414+j21.8*	*Brk #20555*	*Big Cajun #2 Brk# 20550, Webre Brk# 20580, 20565*	*Big Cajun #2 Brk# 20555, 20560*	**Yes**
7	*Big Cajun #2 500 kV*	*3PH-SLG*	*233*	*1.783+j27.7*	*Brk #20535*	*Big Cajun #2 Brk# 20540, Fancy Point Brk# 20770, 20775*	*Big Cajun #2 Brk# 20535*	**Yes**
8	*Big Cajun #2 500 kV*	*3PH-SLG*	*233*	*1.783+j27.7*	*Brk #20540*	*Big Cajun #2 Brk# 20535, Fancy Point Brk# 20770, 20775*	*Big Cajun #2 Brk# 20540, 20545*	**Yes**

APPENDIX B: STABILITY MODEL OF BIG CAJUN #2 UNITS

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS/E WED, JAN 05 2011 16:00

PLANT MODELS

REPORT FOR ALL MODELS BUS 303006 [1BC2 U1 24.000] MODELS

** GENROU ** BUS X-- NAME --X BASEKV MC C O N S S T A T E S
303006 1BC2 U1 24.000 1 40831-40844 18341-18346

MBASE Z S O R C E X T R A N GENTAP
695.0 0.00000+J 0.17120 0.00000+J 0.00000 1.00000

T'D0 T''D0 T'Q0 T''Q0 H DAMP XD XQ X'D X'Q X''D XL
4.36 0.031 0.54 0.063 2.58 0.00 1.8913 1.8126 0.2728 0.4756 0.1712 0.1643

S(1.0) S(1.2)
0.0930 0.4470

** PSS2A ** BUS X-- NAME --X BASEKV MC C O N S S T A T E S V A R S I C O N S
303006 1BC2 U1 24.000 1 53601-53617 27190-27205 1999-2002 2676-2681

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

TW1 TW2 T6 TW3 TW4 T7 KS2 KS3
2.000 2.000 0.000 2.000 0.000 2.000 0.387 1.000

T8 T9 KS1 T1 T2 T3 T4 VSTMAX VSTMIN
0.500 0.100 10.000 0.250 0.020 0.100 0.030 0.050 -0.050

** UAC7B ** BUS X-- NAME --X BASEKV MC C O N S S T A T E S V A R S
303006 1BC2 U1 24.000 1 97699-97725 40354-40359 3525-3528

TR KPR KIR KDR TDR VRMAX VRMIN
0.0000 3.7800 3.7800 0.0000 1.0000 5.0000 0.0000

KPA KIA VAMAX VAMIN KP KL
41.4500 22.0500 1.0000 -0.8000 12.0600 10.0000

KF1 KF2 KF3 TF3 KC KD KE
0.1900 0.0000 0.0000 1.0000 0.0900 0.5000 1.0000

TE VFEMAX VEMIN E1 S(E1) E2 S(E2)
1.8800 9.0300 0.0000 4.5600 0.0730 6.0800 0.9180

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS/E WED, JAN 05 2011 16:00

PLANT MODELS

REPORT FOR ALL MODELS BUS 303007 [1BC2 U2 24.000] MODELS

** GENROU ** BUS X-- NAME --X BASEKV MC C O N S S T A T E S
303007 1BC2 U2 24.000 1 40845-40858 18347-18352

MBASE Z S O R C E X T R A N GENTAP
695.0 0.00000+J 0.17120 0.00000+J 0.00000 1.00000

T'D0 T''D0 T'Q0 T''Q0 H DAMP XD XQ X'D X'Q X''D XL
4.36 0.031 0.54 0.063 2.58 0.00 1.8913 1.8126 0.2728 0.4756 0.1712 0.1643

S(1.0) S(1.2)
0.0930 0.4470

** PSS2A ** BUS X-- NAME --X BASEKV MC C O N S S T A T E S V A R S I C O N S
303007 1BC2 U2 24.000 1 53618-53634 27206-27221 2003-2006 2682-2687

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

TW1 TW2 T6 TW3 TW4 T7 KS2 KS3
2.000 2.000 0.000 2.000 0.000 2.000 0.387 1.000

T8 T9 KS1 T1 T2 T3 T4 VSTMAX VSTMIN
0.500 0.100 10.000 0.250 0.020 0.100 0.030 0.050 -0.050

** UAC7B ** BUS X-- NAME --X BASEKV MC C O N S S T A T E S V A R S
303007 1BC2 U2 24.000 1 97726-97752 40360-40365 3529-3532

TR KPR KIR KDR TDR VRMAX VRMIN
0.0000 3.7800 3.7800 0.0000 1.0000 4.8000 0.0000

KPA KIA VAMAX VAMIN KP KL
41.4500 22.0500 1.0000 -0.8000 12.0600 10.0000

KF1 KF2 KF3 TF3 KC KD KE
0.1900 0.0000 0.0000 1.0000 0.0900 0.5000 1.0000

TE VFEMAX VEMIN E1 S(E1) E2 S(E2)
1.8800 9.0300 0.0000 4.5600 0.0730 6.0800 0.9180

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS/E WED, JAN 05 2011 16:00

PLANT MODELS

REPORT FOR ALL MODELS BUS 303008 [1BC2 U3 24.000] MODELS

```
** GENROU **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S
         303008 1BC2 U3      24.000 1   40859-40872   18353-18358

          MBASE     Z S O R C E         X T R A N       GENTAP
          688.0  0.00000+J 0.17120  0.00000+J 0.00000  1.00000

 T'D0 T"D0  T'Q0 T"Q0     H   DAMP   XD     XQ     X'D    X'Q   X"D    XL
 4.36 0.031  0.54 0.063   2.58  0.00 1.8913 1.8126 0.2728 0.4756 0.1712 0.1643

                      S(1.0)  S(1.2)
                      0.0930  0.4470


 ** PSS2A **   BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S     V A R S      I C O N
S
         303008 1BC2 U3      24.000 1   53635-53651   27222-27237    2007-2010     2688-2693

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

     TW1     TW2     T6      TW3     TW4     T7      KS2     KS3
    2.000   2.000   0.000   2.000   0.000   2.000   0.387   1.000

     T8      T9     KS1      T1      T2      T3      T4     VSTMAX   VSTMIN
    0.500   0.100  10.000   0.250   0.020   0.100   0.030   0.050   -0.050


 **  UAC7B **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S     V A R S
         303008 1BC2 U3      24.000 1   97753-97779   40366-40371    3533-3536

      TR          KPR         KIR         KDR        TDR         VRMAX        VRMIN
     0.0000      3.7800      3.7800      0.0000      1.0000      4.7200      0.0000

     KPA         KIA         VAMAX       VAMIN       KP          KL
    41.4500     22.0500      1.0000     -0.8000     12.0600     10.0000

     KF1         KF2         KF3         TF3         KC          KD          KE
     0.1900      0.0000      0.0000      1.0000      0.0900      0.5000      1.0000

      TE         VFEMAX      VEMIN       E1          S(E1)       E2          S(E2)
     1.8800      9.0300      0.0000      4.5600      0.0730      6.0800      0.9180
```

APPENDIX C: TRANSIENT STABILITY PLOTS

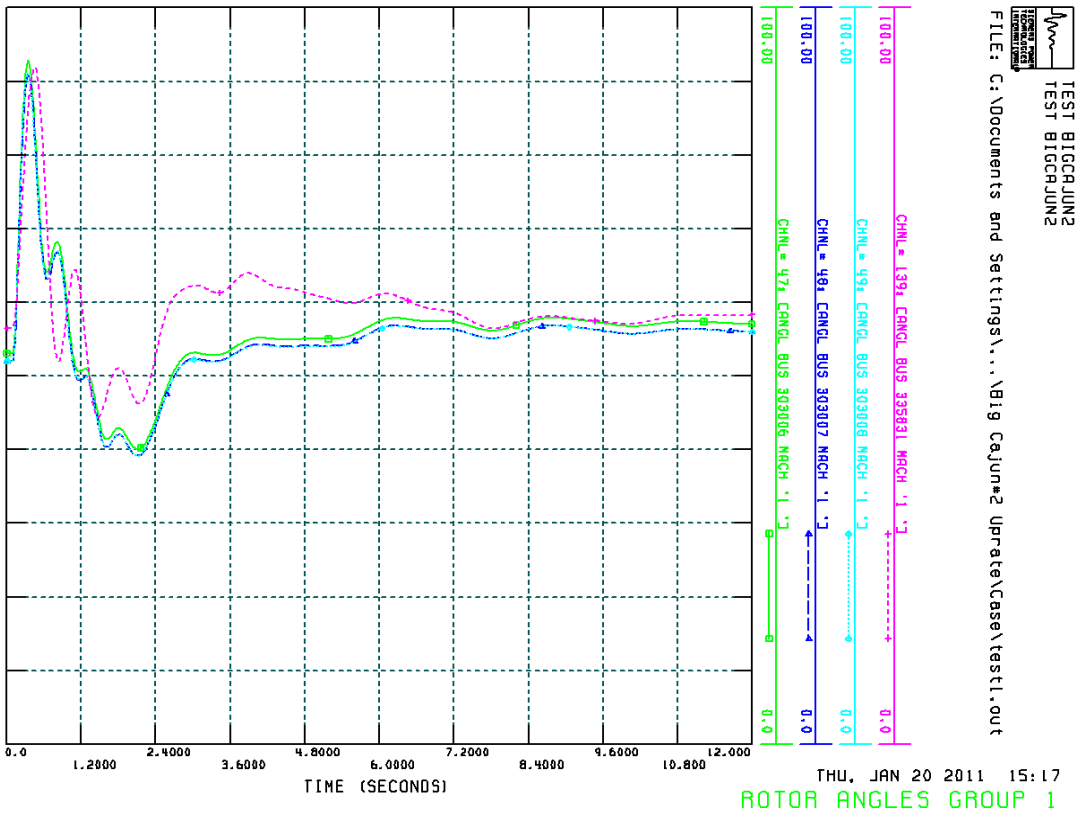
For each case, plots are shown in the following order:

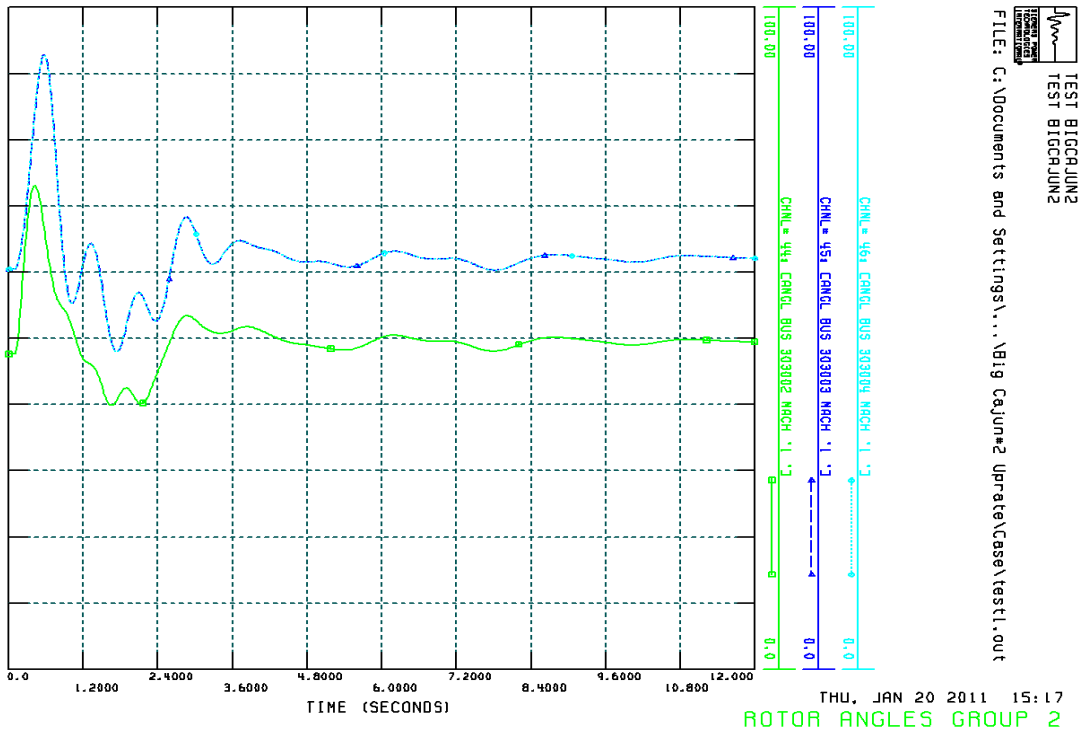
Plots labeled "Rotor Angles Group 1"

i. Rotor angle (deg) Big Cajun #2 U1 unit
ii. Rotor angle (deg) Big Cajun #2 U2 unit
iii. Rotor angle (deg) Big Cajun #2 U3 unit
iv. Rotor angle (deg) Riverbend unit

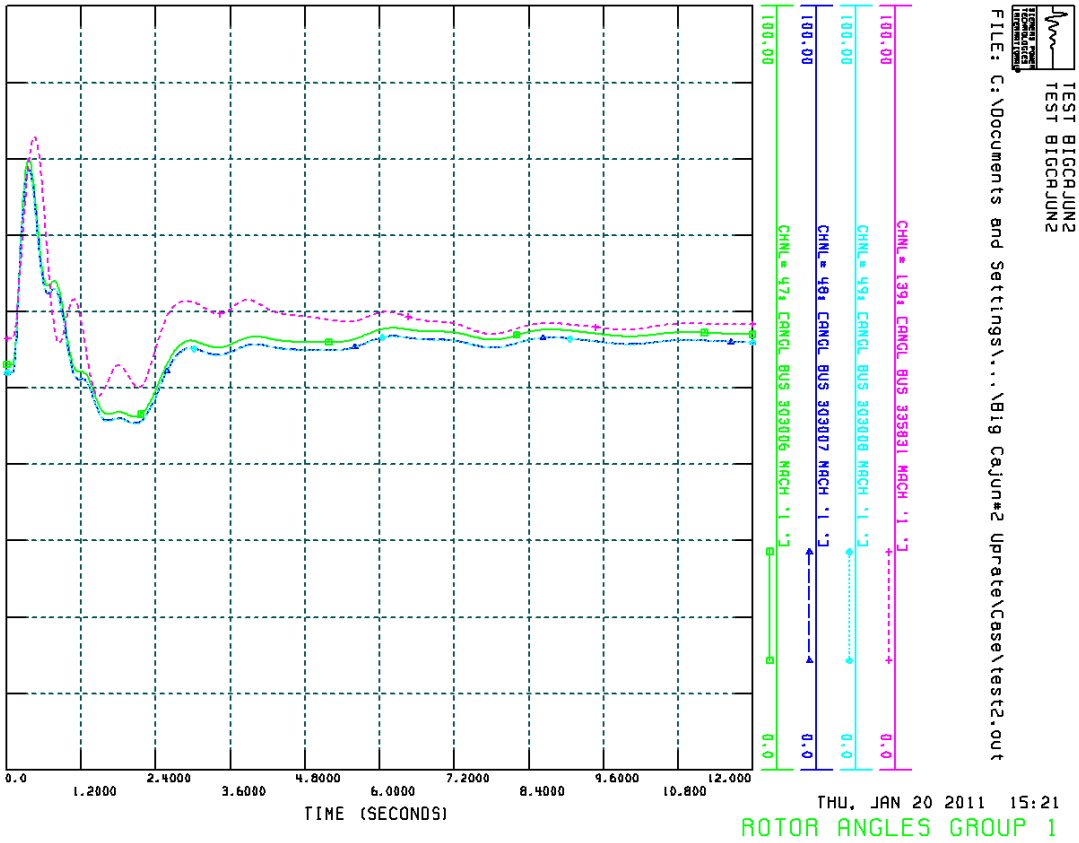
Plots labeled "Rotor Angles Group 2"

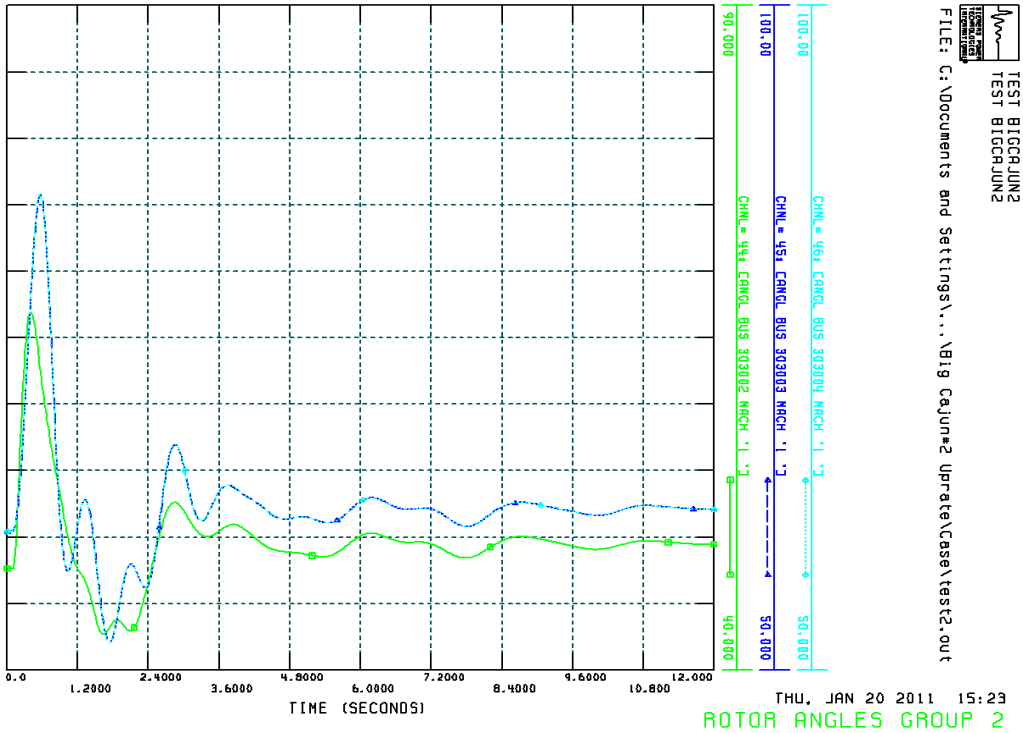
i. Rotor angle (deg) Big Cajun #1 U2 unit
ii. Rotor angle (deg) Big Cajun #1 U3 unit
iii. Rotor angle (deg) Big Cajun #1 U4 unit



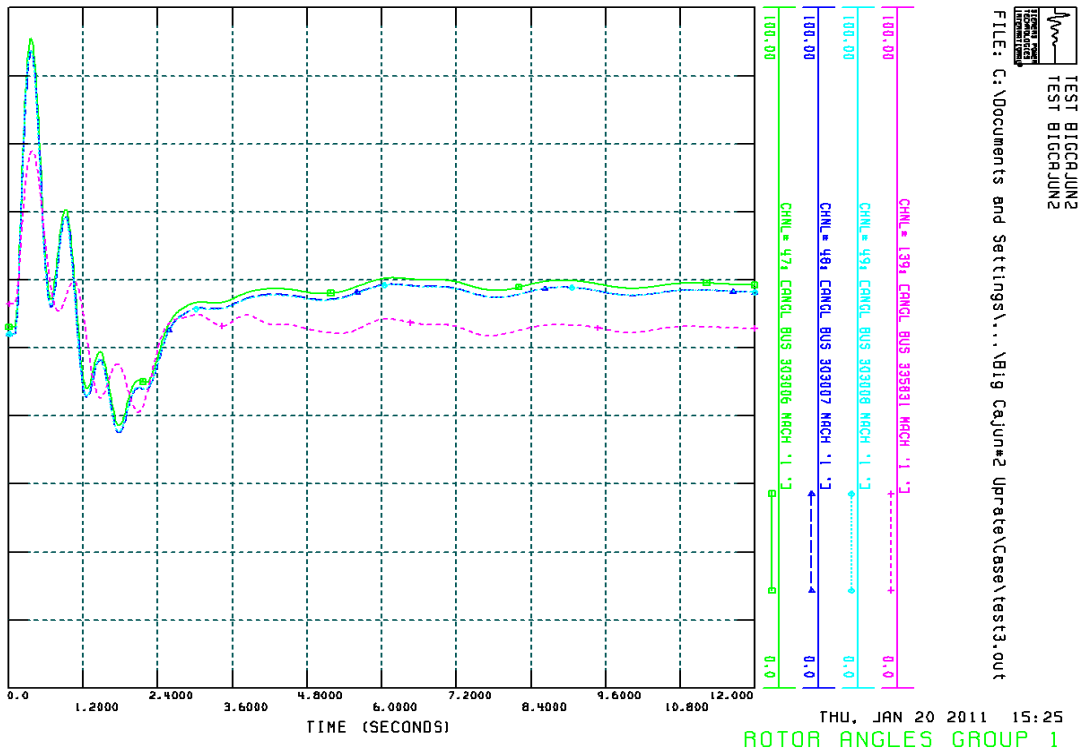


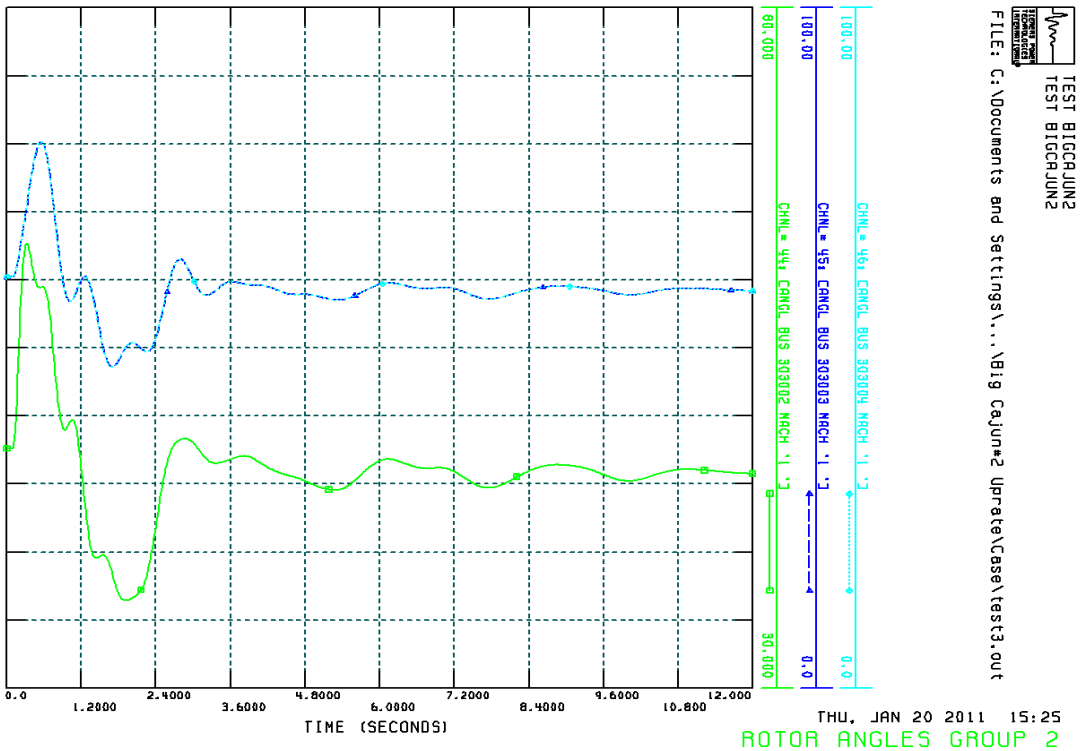
Case 1, 3-ph fault at Big Cajun #2 500 kV bus, Primary Clearing



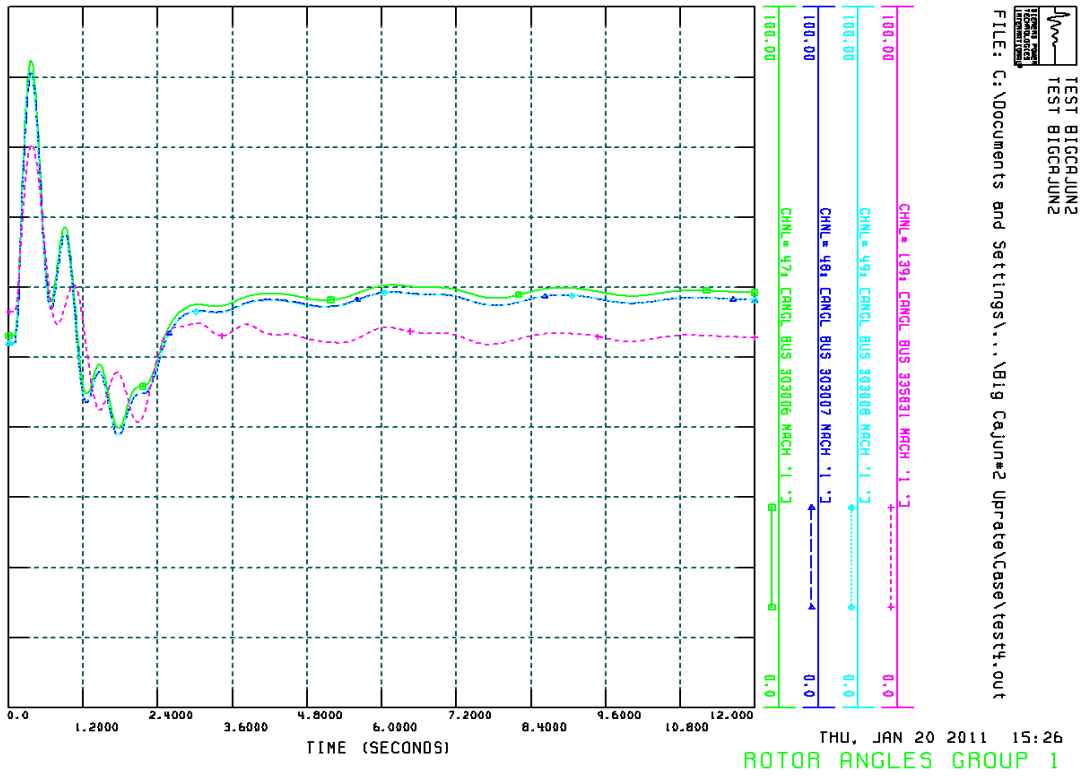


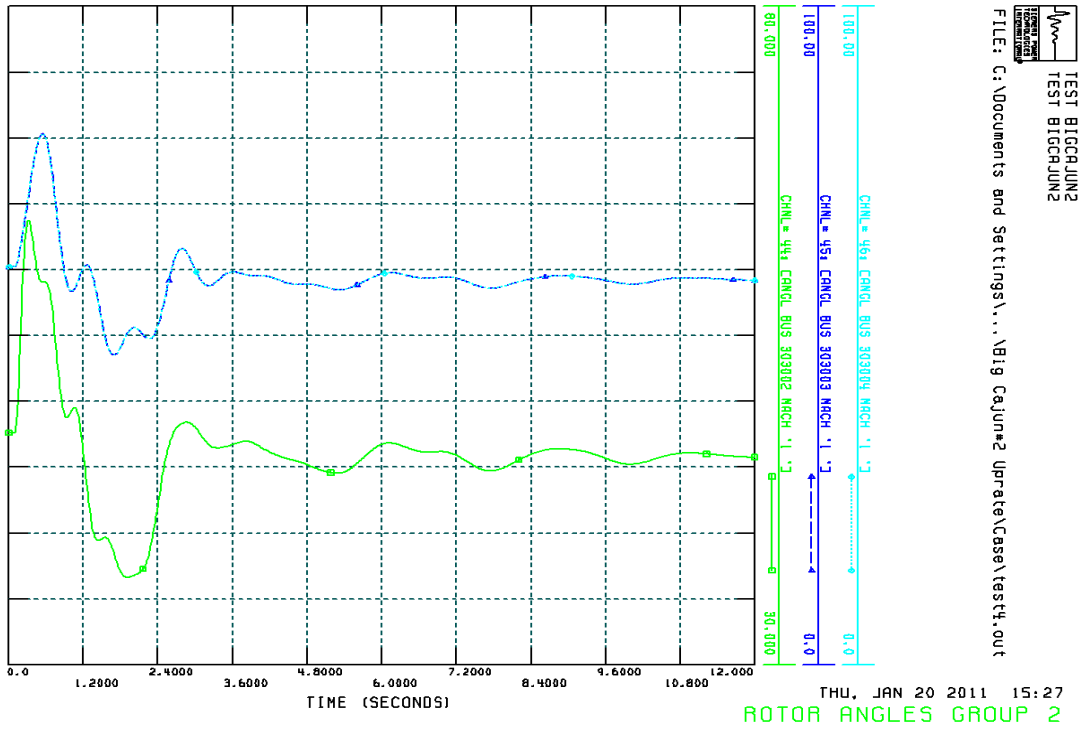
Case 2, 3-ph fault at Webre 500 kV bus, Primary Clearing



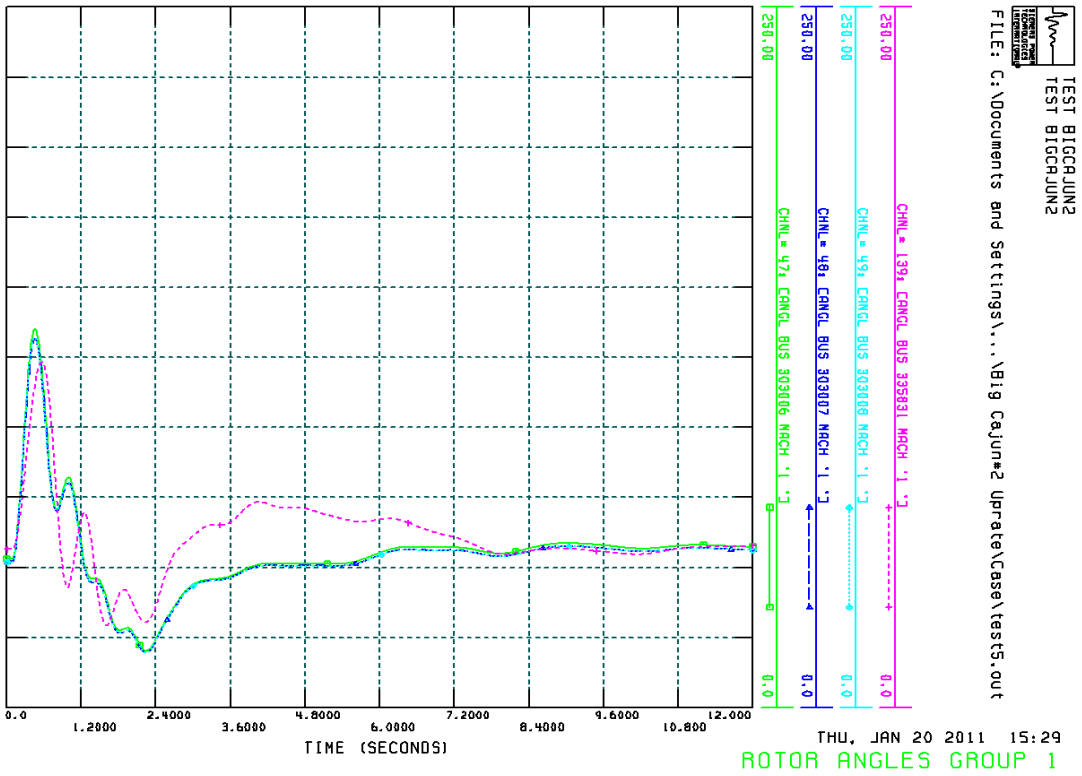


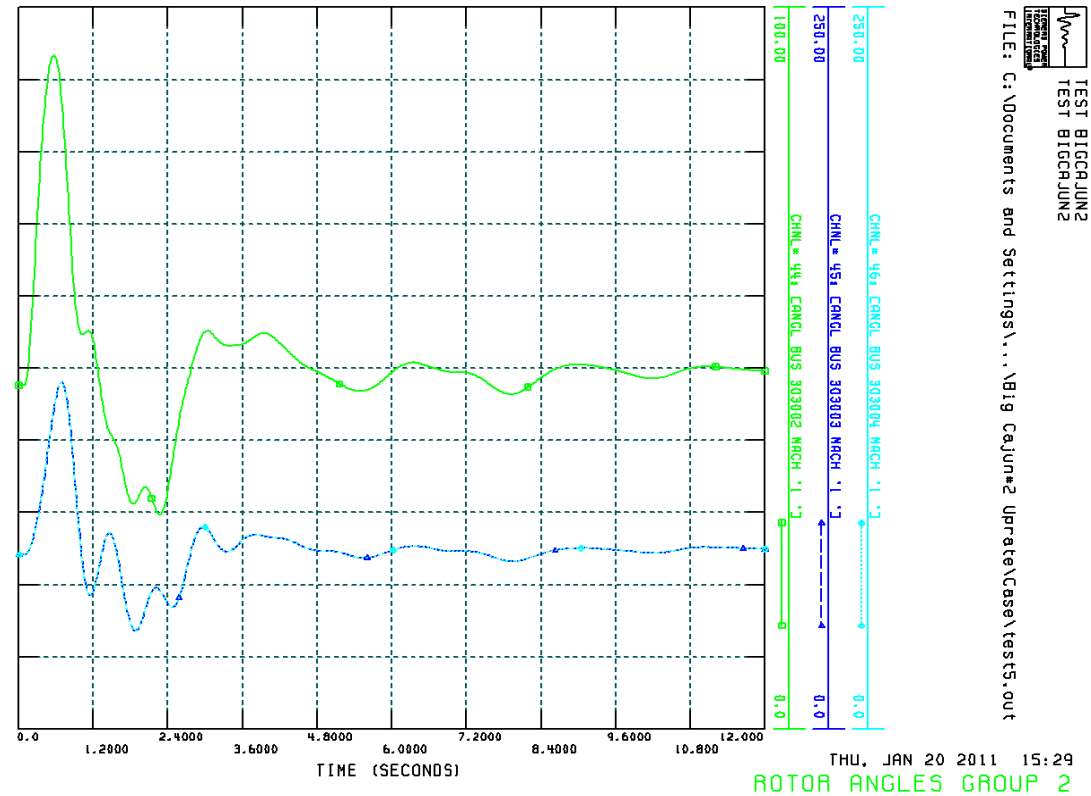
Case 3, 3-ph fault at Big Cajun #2 500 kV bus, Primary Clearing



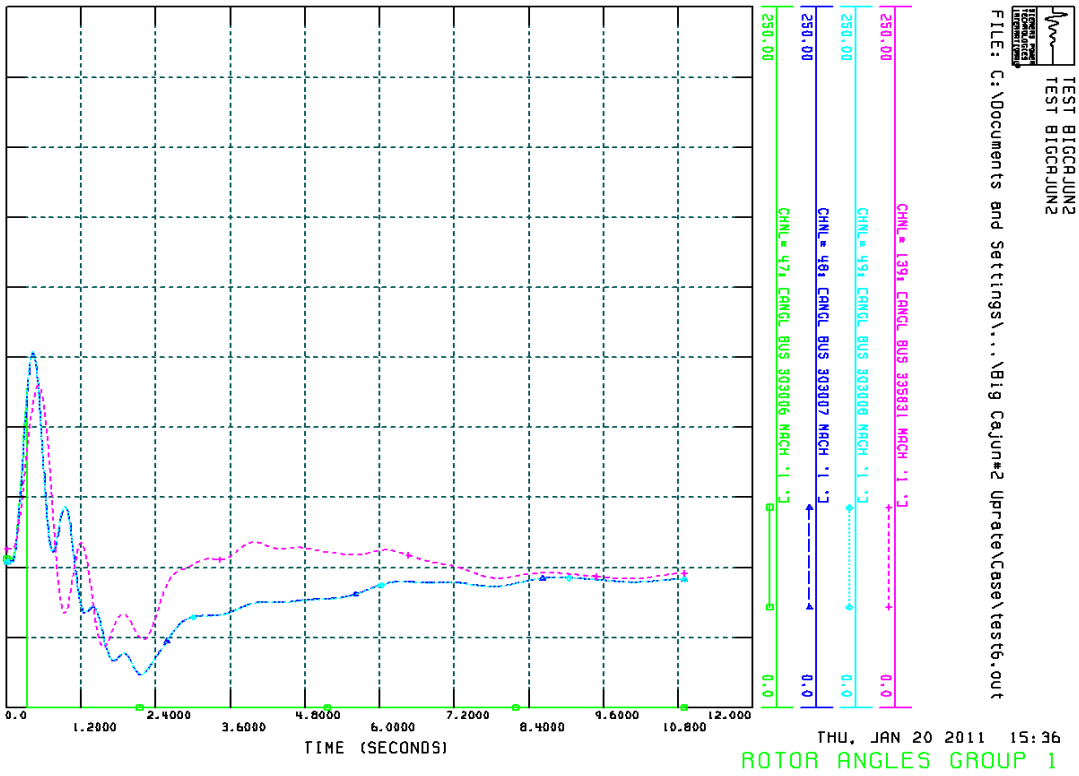


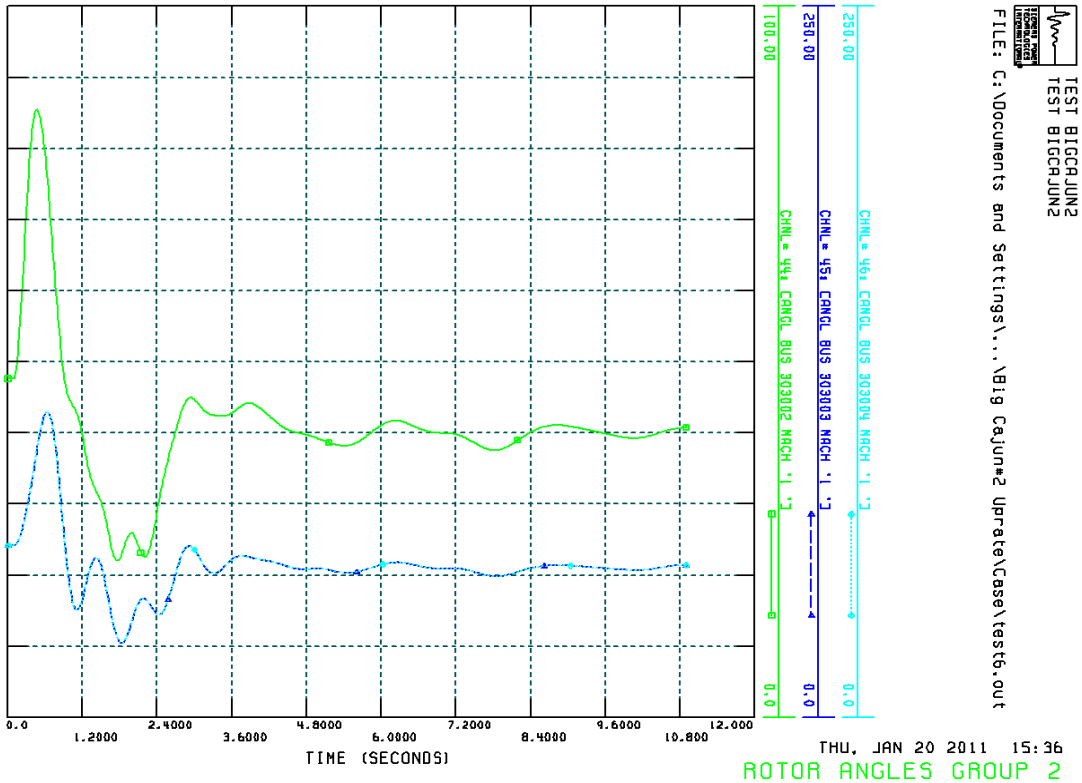
Case 4, 3-ph fault at Fancy Point 500 kV bus, Primary Clearing



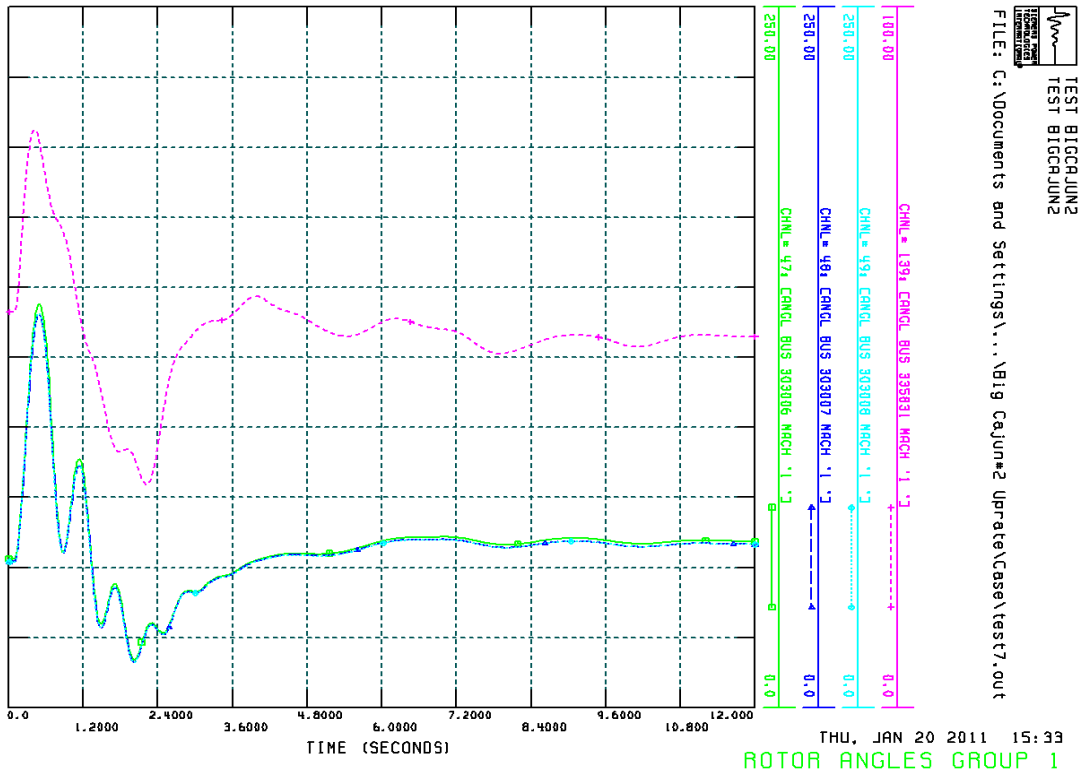


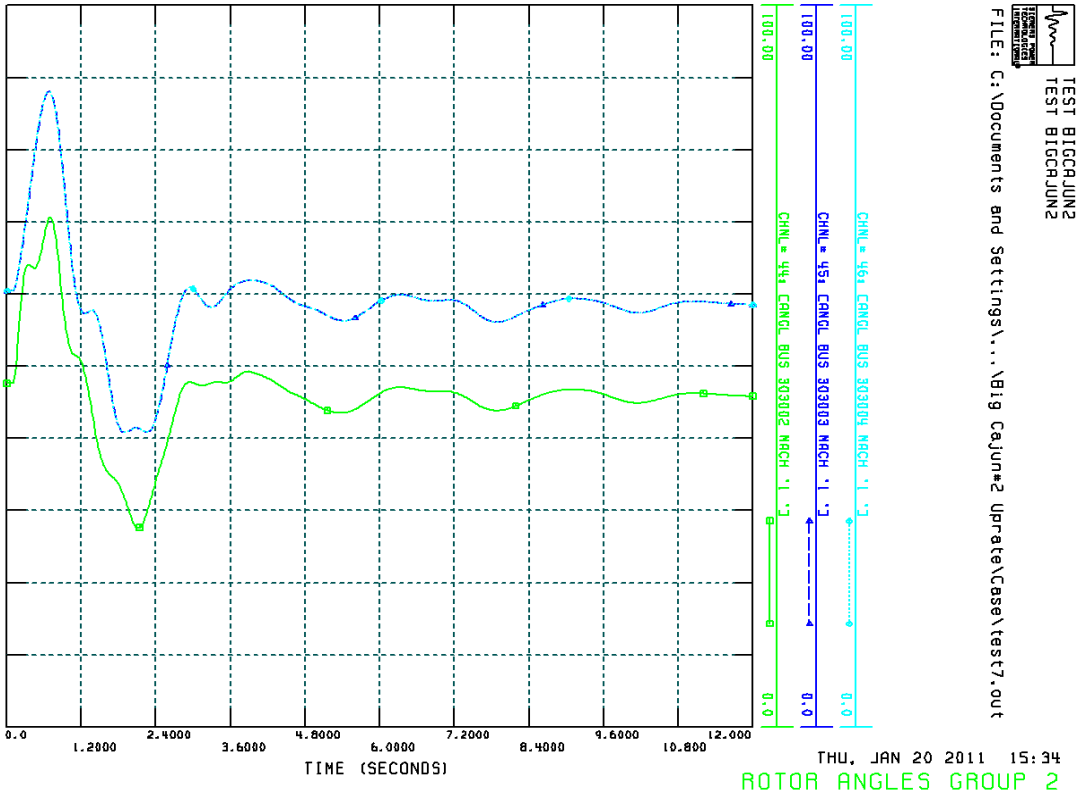
Case 5, 3-ph fault at Big Cajun #2 500 kV bus, Stuck Breaker



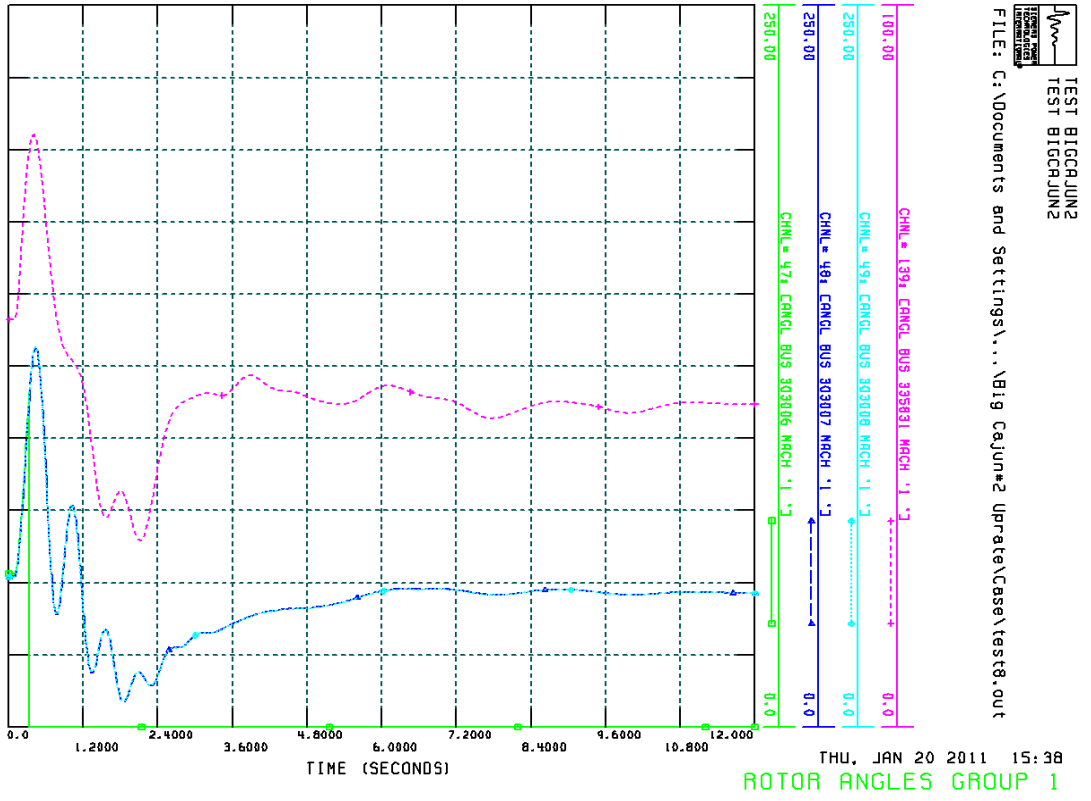


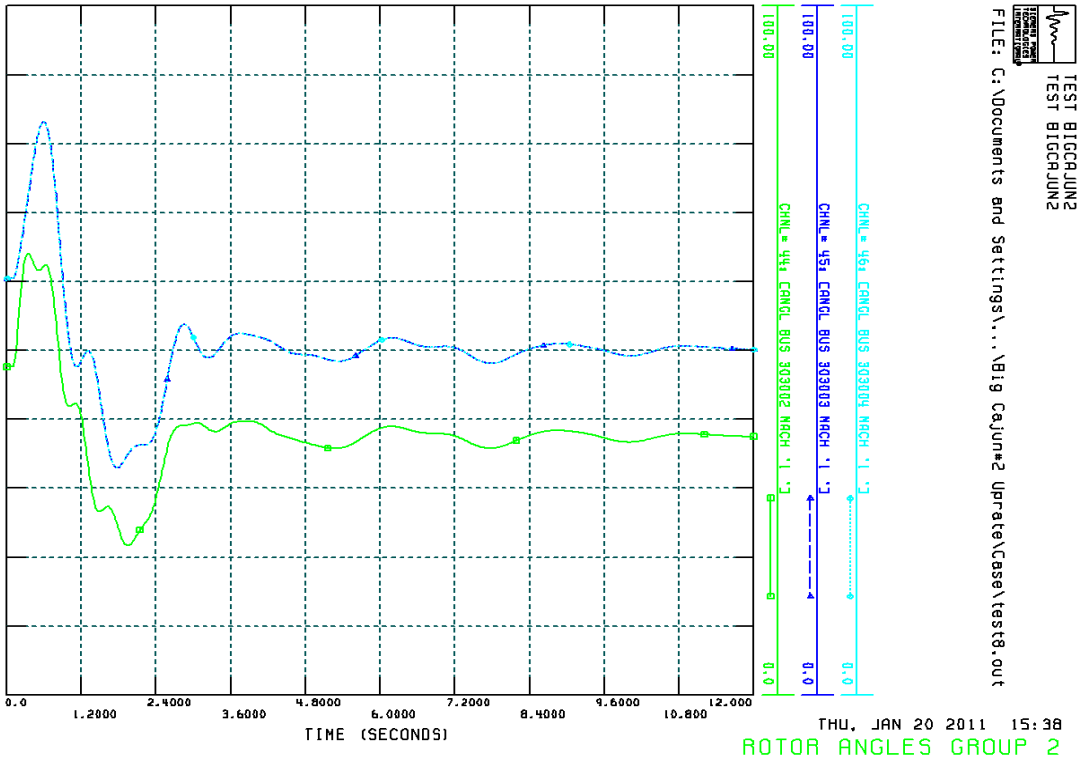
Case 6, 3-ph fault at Big Cajun #2 500 kV bus, Stuck Breaker





Case 7, 3-ph fault at Big Cajun #2 500 kV bus, Stuck Breaker





Case 8, 3-ph fault at Big Cajun #2 500 kV bus, Stuck Breaker