Southwest Power Pool

Facility Study For Generation Interconnection Request GEN-2008-016

SPP Tariff Studies

(#GEN-2008-016)

June 2010

Summary

Southwestern Public Service Company (SPS) performed the attached study (see Appendix A of this document) at the request of the Southwest Power Pool (SPP) for Generation Interconnection request Gen-2008-016. The request for interconnection was placed with SPP in accordance SPP's Open Access Transmission Tariff, which covers new generation interconnections on SPP's transmission system.

Pursuant to the tariff, Southwestern Public Service Company was asked to perform a detailed Facility Study of the generation interconnection request to satisfy the Facility Study Agreement executed by the requesting customer and SPP.

Interconnection Customer Interconnection Facilities

The Interconnection Customer will be responsible for the 230kV transmission line from the point of interconnection to its 230/34.5kV substation that will contain its 230/34.5kV transformer(s) and wind turbine collector feeders. In addition, the Customer will be required to maintain +/- 0.979 power factor (see ICS-2008-001, Restudy #1, Appendix O) at the point of interconnection (Grassland 230kV substation).

An additional analysis appended to this Facility Study (Appendix B) has determined the requirement to add two (2) 34.5 kV, +/- 2 MVA STATCOM devices (one on each 34.5 kV bus) to its collector substation (see Impact Restudy for Gen-2008-016 in Appendix B of this document). Using the studied Vestas wind turbines, the Customer will also need to install additional capacitors at its substation to meet the required power factor at the point of interconnection.

Transmission Owner Interconnection Facilities and Non Shared Network Upgrades

Per the following Facility Study, the Interconnection Customer is responsible for $895,022 of Transmission Owner Interconnection Facilities and $3,556,555 of non-shared Network Upgrades.

Shared Network Upgrades

The GEN-2008-016 Interconnection Customer is included in the 1st Cluster Study approved in FERC Docket #ER09-262. The Interconnection Customer's shared upgrade costs are $10,828,773. This cost is subject to change depending upon the Facility Study for the shared network upgrades. This cost is also subject to change for restudies conducted by the Transmission Provider in response to the higher queued customers or other customers in the 1st Cluster that withdraw their interconnection request or suspend, terminate, or request unexecuted filings of their LGIAs.

Special Considerations

The transmission line from Jones-Grassland-Borden is scheduled for conversion from 230kV to 345kV within the next 5 years. At that time, Customer will need to convert their 230kV facilities to 345kV operation. This study was performed on the basis that Grassland substation will be interconnected to the Lynn County substation via the existing 115kV line after the completion of this conversion. If these assumptions change, a restudy will be necessary to determine the scope of network upgrades requirements after the conversion to 345kV is accomplished.

Attachment 1: SPS Facility Study

Facilities Study For
Southwest Power Pool (SPP)
248 MW Wind-Generated Energy Facility
Lynn County, Texas
SPP #GEN-2008-016

April 19, 2010

Xcel Energy Services, Inc.
Transmission Planning

Executive Summary

("Interconnection Customer") in 2008 requested the interconnection of a wind energy facility located in Lynn County, Texas to the Southwestern Public Service Company (SPS) transmission network. SPS is a New Mexico Corporation and wholly owned subsidiary of Xcel Energy Inc. This facility has a net capacity of 248 MW. The Interconnection Customer's facility will connect to the existing SPS Grassland 230 kV Interchange located approximately 7 miles east of Tahoka, Texas. The Interconnection Customer's expected commercial operation date and back-feed date is May 1, 2011 and January 10, 2011, respectively.

The Southwest Power Pool (SPP) evaluated the request to interconnect the wind farm facility to the SPS transmission system in a System Impact Study (SIS) GEN-2008-016, completed in July 2009. The interconnection request was studied using one hundred thirty-six (136) Vestas V90 Wind Turbines at 1.8 MW each for a total output of 248 MW. The Interconnection Customer is required to maintain a Power Factor of 0.987 lagging at the Point of Interconnection (POI), and is required to provide 57 MVAR of capacitance at the point of interconnection based on SPP's Impact Cluster #1 Study Table 4-3.

The 230 kV transmission line from SPS' Jones Plant to Grassland Interchange to Borden Interchange is built for 345 kV, but operated at 230 kV. When SPS converts this line to 345 kV, the Interconnection Customer will be required to replace their 230/34.5 kV transformers with 345/34.5 kV transformers, and their interconnecting 230 kV line will need to be converted to 345 kV operation.

SPS requires that all construction for this request be in compliance with the latest revision of the Xcel Energy Interconnection Guidelines for Transmission Interconnection Producer-Owned Generation Greater than 20 MW, Version 3.0 dated Dec 31, 2006, and is available at (http://www.xcelenergy.com/XLWEB/CDA/0,3080,1-1-1_16699_24407-1428-0_0_0-0,00.html). This document describes the requirements for connecting new generation to the Xcel Energy transmission systems including technical, protection, commissioning, operation, and maintenance. SPS will also require that the Interconnection Customer be in compliance with all applicable criteria, guidelines, standards, requirements, regulations, and procedures issued by the North American Electric Reliability Corporation (NERC), Southwest Power Pool (SPP), and the Federal Energy Regulatory Commission (FERC) or their successor organizations.

The Interconnection Customer is responsible for the cost of the Interconnection Facilities, installation of the 57 MVAR of capacitance at the Point of Interconnection and the 34.5kV STATCOM devices and any Direct Assigned Interconnection Facilities; inclusive of all construction required for the 230 kV transmission line from the Interconnection Customer's substation to the SPS Grassland Interchange.

As for this request (GEN-2008-016), it is anticipated that the entire process of adding the new 230 kV line terminal at Grassland Interchange for the acceptance of the wind farm facility output, will require approximately 24 months (based on the new purchase of an autotransformer) to complete after an Interconnection Agreement is signed and an authorization to proceed is received. The cost of these upgrades, inclusive of the Interconnection Customer's cost for the interconnection of this wind farm facility, is shown below in Table 1, with the detailed description of the cost shown in Table 3.

Table 1, Cost Summary[a]

Network Upgrades:	**$ 3,556,555**
Transmission Owner Interconnection Facilities:	**$ 895,022**
Total:	**$ 4,451,577**

[a] The cost estimates are 2009 dollars with an accuracy level of ±20%.

General Description of SPS[b] Facilities

1. **Construction of New Line Terminal:** See Appendix A, Figure A- 1 for general vicinity location map.

1.1. **Location:** SPS will add a new 345 kV line terminal operated at 230 kV at the existing SPS Grassland Interchange. Appendix A, Figure A- 2, shows a one-line of the Grassland Interchange, Figure A-3 shows a typical elevation view of the Point of Interconnection (POI).

1.2. **Bus Design:** The new 345 kV line terminal (operated at 230 kV) will be added to the existing main bus for future breaker and a half expansion at Grassland Interchange to accommodate the outputs from the wind energy facility. This is shown in Appendix A, Figure A-2.

1.3. **Line Terminals:** The 230kV lines and static wire terminals will be designed to accommodate 2,000 pounds per phase conductor at maximum tension, with a maximum 15-degree pull off from normal.

1.4. **Control House:** The existing control house will accommodate the new metering, protective relaying and control devices, terminal cabinets, and any fiber-optic cable terminations, etc. for the new 230 kV line breaker terminal.

1.5. **Security Fence:** The existing security fence shall be extended if required when the new bay is added for the new 345 kV line terminal.

1.6. **Ground Grid**: The existing ground grid shall be extended to accommodate the additional bay required for the new line terminal per ANSI/IEEE STD 80-1986, with our standard 4/0 copper ground mesh on 40-foot centers with ground rods and 20-foot centers in corners and loop outside of fence.

1.7. **Site Grading**: Company contractor, per company specifications, will perform any site grading and erosion control to accommodate the new line terminal. Soil compaction shall be not less than 95% of laboratory density as determined by ASTM-D-698.

1.8. **Station Power**: The existing station power, provided from the local distribution system, will be utilized.

1.9. **Relay and Protection Scheme**: The new 345 kV breaker line terminal (operated at 230 kV) primary protection to the interconnection customer 230 kV transmission line will use line current differential relaying over optical fiber installed in the static of the customer's 230 kV transmission line. Secondary relaying will use mirrored bit, Permissive Overreaching Transfer Trip (POTT) over the optical fiber. An SEL 311L and an SEL 321-1 will be used as primary and secondary relays, respectively. An SEL 279H-2 relay will be installed; however no automatic re-closing scheme will be used. The SEL 279H-2 will be used for line/bus SCADA closing conditions for the 230 kV breaker. Also, a SEL 501-0 will be used for breaker failure. Transfer bus relaying will have to be modified for wind generator.

An SEL DTA-2 will display the bus voltage, GCB amps, MW, MVAR, and fault location. An SEL 2020 will be installed for relay communications and other functions as required.

[b] All modifications to SPS facilities will be owned, maintained and operated by SPS.

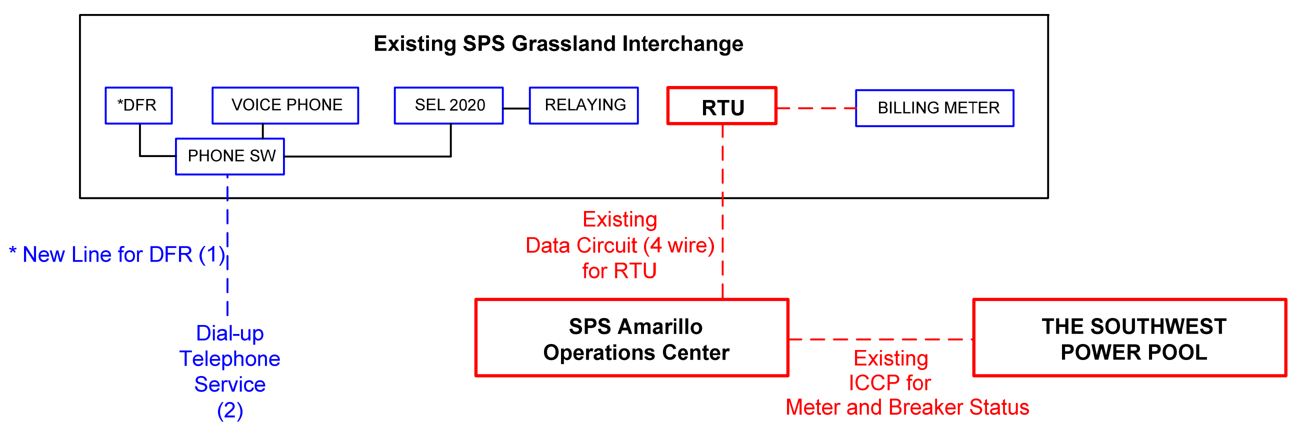
1.10. **Revenue Metering:** On the proposed SPS Grassland Interchange 230 kV line terminal to the Interconnection Customer's substation, an individual billing meter will be installed along with an ION 8400 meter unit, ANSI C12.1 accuracy class 0.2 (3-PT's IEEE C57.13 accuracy class 0.3 and 3 CT's IEEE C57.13 accuracy class 0.15) for full 3 phase 4-wire metering. Also installed for the metering units will be 3-PT's and 3-CT's for full 3-phase 4-wire metering. There will be two meters per line terminal: one will be primary and the other will be back up, each will have full 4 quadrant metering. Pulses out of the primary billing meter will be sent via SCADA to the Transmission Owner's Control Center in Amarillo, Texas.

1.11. **Disturbance Monitoring Device:** Disturbance-monitoring equipment (DFR), capable of recording faults, swings, and long term trending, will be installed to monitor and record conditions in the substation and on the transmission lines. The disturbance equipment shall also be equipped with a GPS time synching clock. This equipment will have communication capability with a dedicated communication circuit. The disturbance equipment will have its own dedicated dial-up communications telephone circuit.

1.12. **Remote Terminal Unit (RTU):** A existing RTU will be utilized for communications for the new 230 kV line terminal at Grassland Interchange. SPS will provide and install if needed additional RTU cards for metering and telemetry as required by the latest Xcel Energy Interconnection Guidelines. The direct cost will be charged to the Interconnection Customer.

1.13. **Communications:** Existing telephone and data circuit at Grassland Interchange to the Amarillo Control Center will be utilized. ***It is the Interconnection Customer's responsibility to make arrangements with the local phone company to provide telephone circuits to the relay communication equipment and disturbance-monitoring equipment at Grassland Interchange and to their wind farm facility. Prior to any construction the Interconnection Customer is required to contact the SPS substation-engineering department for all details.***

A schematic outlining the proposed communications is provided below:



The Interconnection Customer shall be responsible for providing fiber optic communication circuit installed in their overhead transmission line static wire for protective relaying from the customer substation to the existing Grassland Interchange indicated in Section 1.9.

***2.* Transmission Work:**

2.1. The Interconnection Customer will construct, own, operate, and maintain any customer owned 230 kV transmission line from the Interconnection Customer's substation to the Interconnection Point at SPS Grassland Interchange. This line is shown in Appendix A, Figure A- 1 and is estimated to be 2 miles. **The SPS transmission design group prior to any construction by the Interconnection Customer or its contractor on any customer 230 kV transmission lines, or doing work in close proximity to any SPS transmission line, will require an engineering review of the customer's design. It is the Interconnection Customer's responsibility to initiate the design review in a timely manner before construction of any transmission line begins. If the review has not been made or the design at any of the aforementioned locations is deemed inadequate, the crossing(s) and or termination into the Grassland Interchange will be delayed until the matters are resolved. SPS will not be held responsible for these delays.**

3. **Right-Of-Way:**

3.1. **Permitting**: Permitting for the construction of a new 230 kV line terminal at Grassland Interchange is not required from the Public Utility Commission in the State of Texas. The interconnection customer will be responsible for any permitting and right of way of their substation and the 230 kV transmission line from their substation to the Interconnection Point at Grassland Interchange.

4. **Construction Power and Distribution Service:** It is the sole responsibility of the Interconnection Customer to make arrangements for both construction and station power, which may be required for the Interconnection Customer's wind farm facility. **Additionally, if the Interconnection Customer's substation(s) and/or construction site(s) are located outside of the SPS service area, SPS cannot provide station power (retail distribution service) and the Interconnection Customer needs to make arrangements for distribution service from the local retail provider.**

5. **Project and Operating Concerns:**

5.1. Close work between the Transmission group, the Interconnection Customer's personnel and local operating groups will be imperative in order to meet any in-service date that has been established

5.2. It is understood that the Capacitor Banks will be installed at the Interconnection Customer's 34.5 kV bus side to avoid voltage spikes on the 230 kV that could adversely affect the Xcel Energy transmission system. The Interconnection customer will be required to maintain a Power Factor of 0.987 lagging at the Point of Interconnection (POI), which is based on SPP's Impact Cluster #1 Study Table 4-3 and switch the capacitor banks in stages of 20 MVAr or less. This is required to maintain acceptable dynamic voltage rise as per latest revision of the Xcel Energy Interconnection Guidelines for Transmission Interconnection Producer-Owned Generation Greater than 20 MW, Version 3.0 dated Dec 31, 2006, and is available at (http://www.xcelenergy.com/XLWEB/CDA/0,3080,1-1-1_16699_24407-1428-0_0_0-0,00.html).

6. **Fault Current Study:** The available fault current at the interconnection location, without any contribution from the wind farm facilities, is shown in Table 2.

Table 2, - Available fault current at interconnection location

Short Circuit Information without contribution from Wind Farm Facilities (GEN 2008-016)				
Fault Location	Fault Current (Amps)		Impedance (Ω)	
	Line-to-Ground	3–Phase	Z^+	Z^0
230 kV Bus	1,531	5,510	2.410 + j23.981	7.457 + j37.941

Estimated Construction Costs

The projects required for the interconnection of this 248 MW Wind Farm facility consist of the projects summarized in the table below.

Table 3, Required Interconnection Projects[c]

Project	Description	Estimated Cost
	Network Upgrades	
1	Disturbance Monitoring Device	$ 51,346
2	Replace 100/252 MVA 230/115kV Autotransformer	$ 3,505,209
3	Transmission Line Work	$ 0
4	Right-Of-Way	$ 0
	Subtotal:	**$ 3,556,555**
	Transmission Owner Interconnection Facilities (at the Interconnection Customer's expense)	
5	Communications [d]	*$ See footnote*
6	345 kV Breaker Line Terminal (Operated at 230 kV)	$ 657,870
7	Remote Terminal Unit (RTU)	$ 4,500
8	Revenue metering	$ 225,000
9	230 kV Line arrestors	$ 7,652
	Subtotal:	**$ 895,022**
	Total Cost	**$ 4,451,577**

Engineering and Construction:

An engineering and construction schedule for this project is estimated at approximately 24 months based on the new purchase of autotransformer. Other factors associated with clearances, equipment delays and work schedules could cause additional delays. The is applicable after all required agreements are signed and internal approvals are granted.

All additional cost for work not identified in this study is the sole responsibility of the Interconnection Customer unless other arrangements are made.

[c] The cost estimates are 2009 dollars with an accuracy level of ±20%.
[d] It is the Requester's responsibility to provide both the data circuit and both dial-up telephone circuits, see Section 1.13.

Appendix A

Figure A- 1 Approximate location of Grassland Interchange

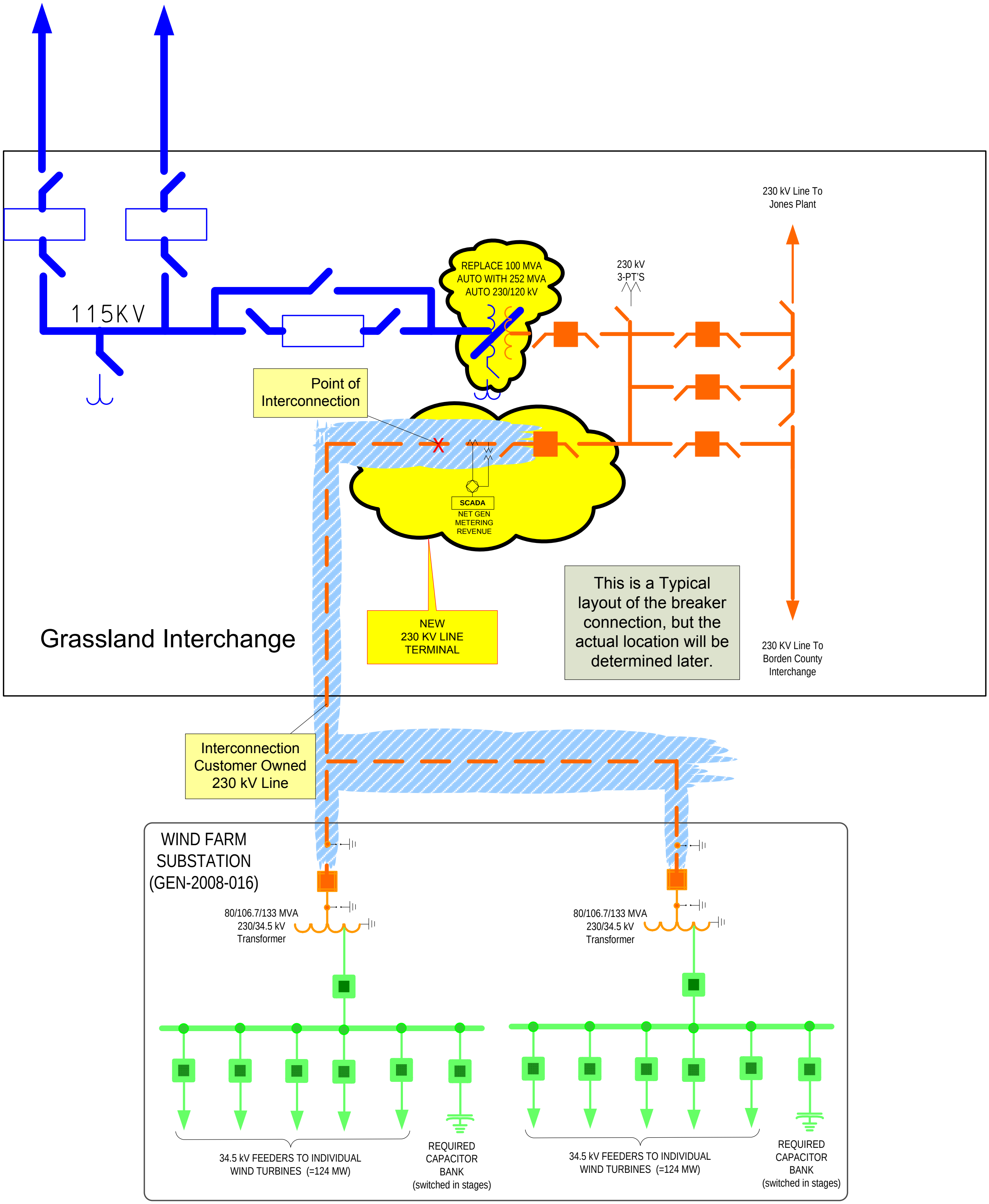


Figure A- 2 One-line Diagram of Grassland Interchange

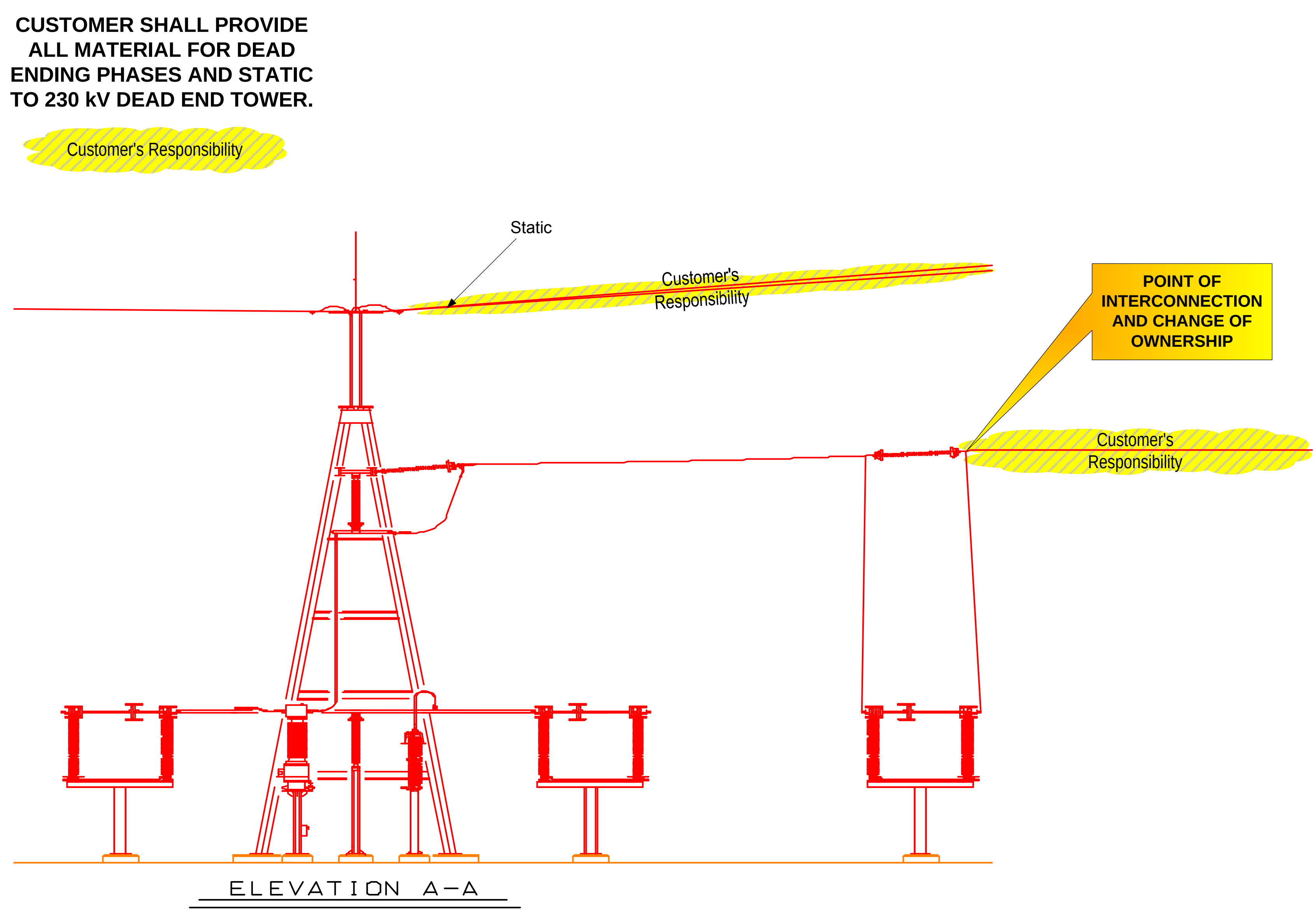


Figure A- 3 Point of Interconnection & Change of Ownership (Typical)

– END OF REPORT –

Attachment 2. Impact Restudy by SPP

Executive Summary

This is a report on the study of the stability impact on the SPP transmission network as a result of interconnecting a new wind farm at Grassland 230kV substation in the Southwest Public Service Company (SPS) control area. The capacity for GEN-2008-016 is 248MW. The proposed in-service date is May 1, 2011.

During the Facility Study for this interconnection request, an additional instability was discovered for the project. The stability models for the ICS-2008-001-1 Impact Study 2010 summer peak and 2010 winter peak were used for the study. Six contingencies were simulated around the Grassland 230kV substation. The first is a three phase fault involving two 230 kV circuits between Grassland and Jones substation near the Grassland bus. The second is a single phase fault between Grassland and Jones substation near the Grassland bus. The third is a three phase fault involving two 230 kV circuits between Grassland and Borden substation near the Grassland bus. The fourth is a single phase fault between Grassland and Jones substation near the Grassland bus. The fifth is a three phase fault involving the Grassland 230/115 kV transformer at the Grassland 230kV side. The sixth is a single phase fault at Grassland 230/115 kV transformer at the Grassland 230kV side.

The results of the stability analysis indicate that for the transmission system remain stable for all the analyzed contingencies, the customer needs to add two (2) 34.5kV, +/-2MVA STATCOM devices (one on each 34.5kV bus) in addition to meeting the required power factor specified in the ICS-2008-001-1 study.

1.0 Introduction

At the request of the SPP Generation Interconnection an impact study was conducted to determine the effects of the addition of a new wind farm on the SPP transmission network dispatching 248MW, the point of interconnection is Grassland 230kV substation. Figure 1 shows the one-line drawing of the area of study. The proposed in-service date is May 1, 2011.

2.0 Purpose

The purpose of this study is to evaluate the stability impact of the proposed additional wind farm at Grassland 230kV substation on the transmission system using the Customer requested Vestes V-90 1.8 MW turbines. Machine specific information is provided in the ICS-2008-001-1 impact study.

3.0 Stability Analysis

The following stability definition was applied in this study:

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

The 2010 MDWG Stability Model, summer and winter peak models were used for the study.

The stability analysis was performed using PSS/E Power System Simulator Version 30.3.3. Several three-phase line and single-phase ground faults were simulated. All the synchronous machine rotor angles were monitored in the SPP footprint.

The GEN-2008-016 was dispatched at 248 MW total. The prior queue requests considered in the study are:
- GEN-2001-033 – 180MW
- GEN-2001-036 – 80MW
- GEN-2005-015 – 150MW
- GEN-2007-034 – 150MW
- GEN-2008-008 – 60MW
- GEN-2008-009 – 60MW
- GEN-2008-014 – 150MW

3.1 Contingencies Simulated

Six (6) contingencies were considered for the transient stability simulations. These contingencies are described in Table 1.

Cont. No.	Cont. Name	Description
53	FLT53-3PH	3 phase fault on the Grassland to Jones 230kV line, near Grassland. a. Apply fault at the Grassland 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
54	FLT54-1PH	*Single phase fault and sequence like previous*
55	FLT55-3PH	3 phase fault on the Grassland to Borden 230kV line, near Grassland. a. Apply fault at the Grassland 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
56	FLT56-1PH	*Single phase fault and sequence like previous*
57	FLT57-3PH	3 phase fault on the Grassland 230/115kV transformer. a. Apply fault at the Grassland 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
58	FLT58-1PH	*Single phase fault and sequence like previous*

Table 1: Contingencies Evaluated

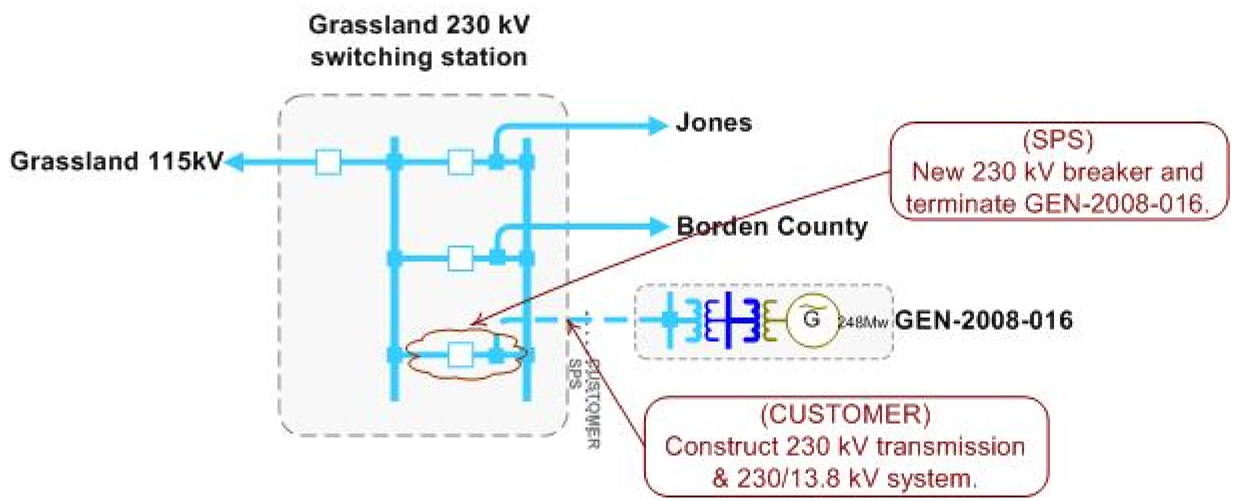


Figure 1: GEN-2008-016 One-line Drawing

4.0 Results

The preliminary results of the stability analysis shown that the case was unstable for the contingency FLT53-3PH summer peak, the same contingency applied during the winter case shown that the case is stable, but the generator terminal voltage does not recover to the initial condition, the voltage steady state value post-contingency is 0.92pu. The Figures 2 and 3 show the contingency results for the mentioned cases.

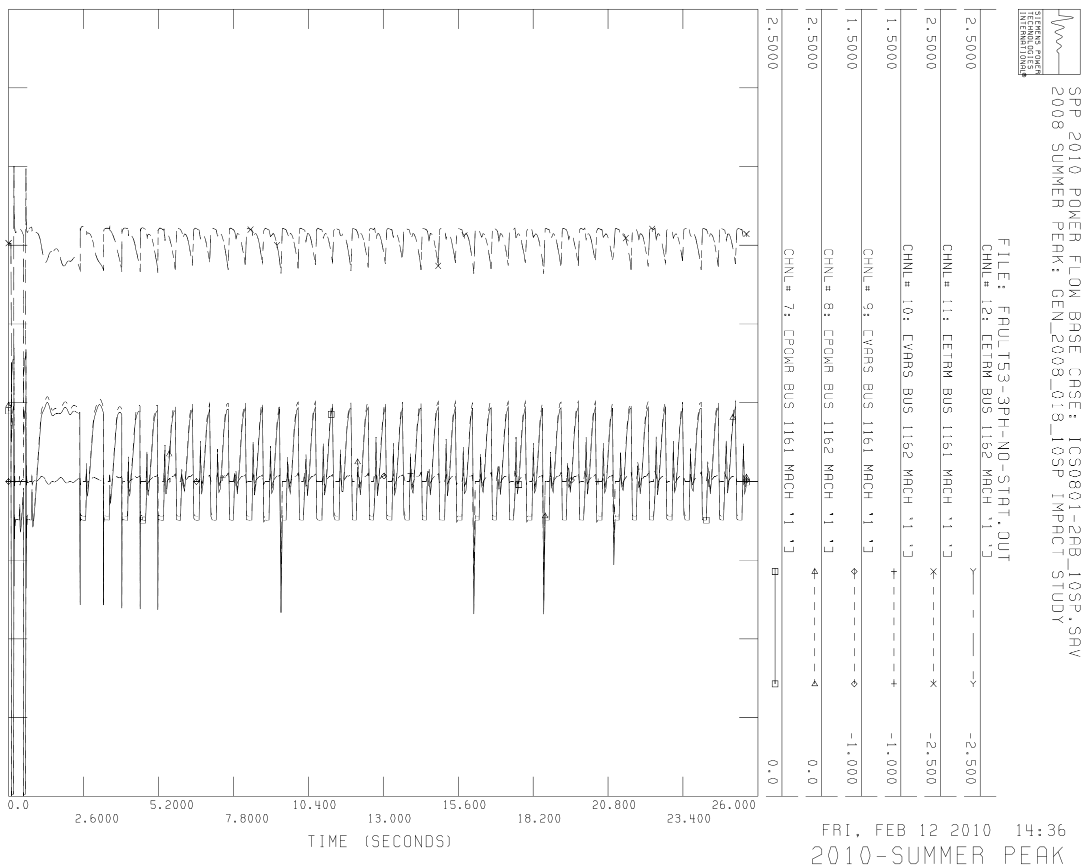


Figure 2: Pelec, Qelec and Eterm for GEN-2008-016 summer peak

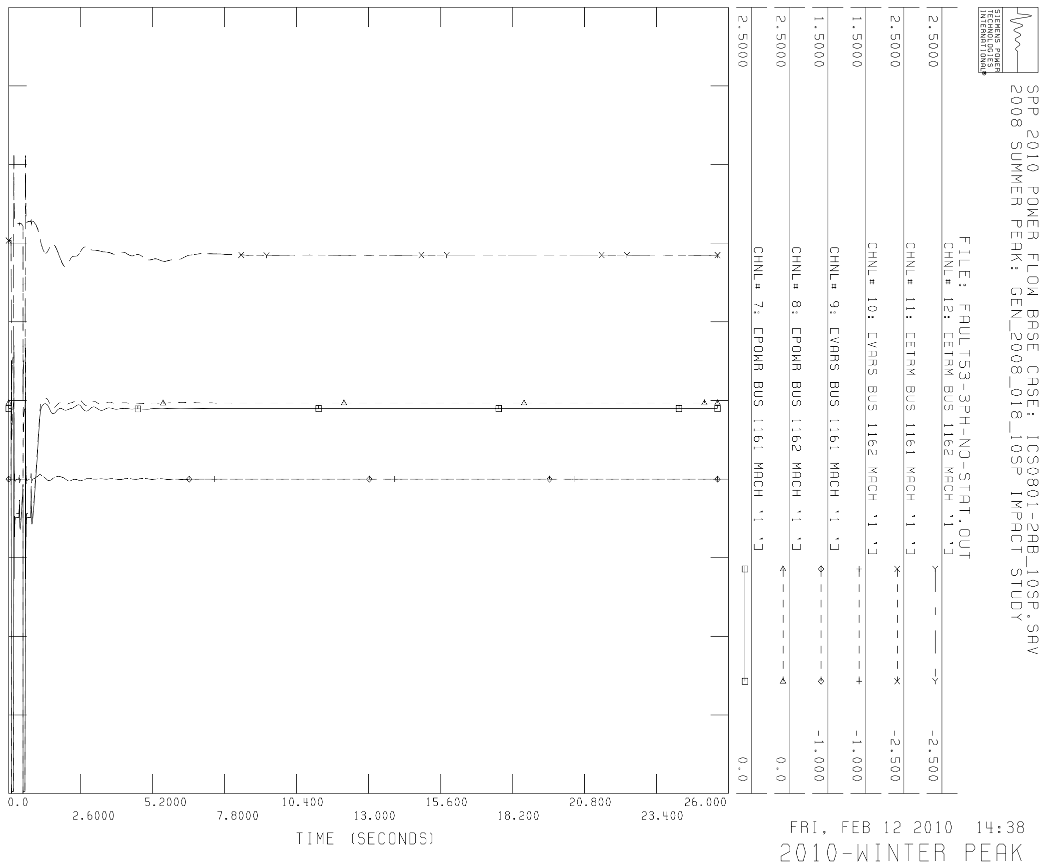


Figure 3: Pelec, Qelec and Eterm for GEN-2008-016 winter peak

5.0 Mitigations for Instability

In order to solve the stability problem a STACOM (2 MVA) device was added in the model, one for each 34.5kV bus in the collector system. Also each bus has a reactive support of 20MVAr. These capacitor banks were installed already in the simulations without the STATCOM.

The results of the stability analysis are summarized in Table 2. The results indicate that for all contingencies simulated the transmission system remained stable after the addition of the STATCOM.

CONTINGENCY	SUMMER	WINTER
FLT53-3PH	STABLE	STABLE
FLT54-1PH	STABLE	STABLE
FLT55-3PH	STABLE	STABLE
FLT56-1PH	STABLE	STABLE
FLT57-3PH	STABLE	STABLE
FLT58-3PH	STABLE	STABLE

Table 2: Results of Simulation

The plots of the active power, reactive power and terminal voltage for the 2008-016 generators are shown in Appendix A. The 2008-016 generators terminal voltage shows the timing of the disturbance. The machines returned to steady state in about 8 seconds for the worst case contingency.

6.0 Power Factor Requirements

The power factor requirements for the interconnection request in the ICS-2008-001-1 impact study remain valid.

7.0 Conclusion

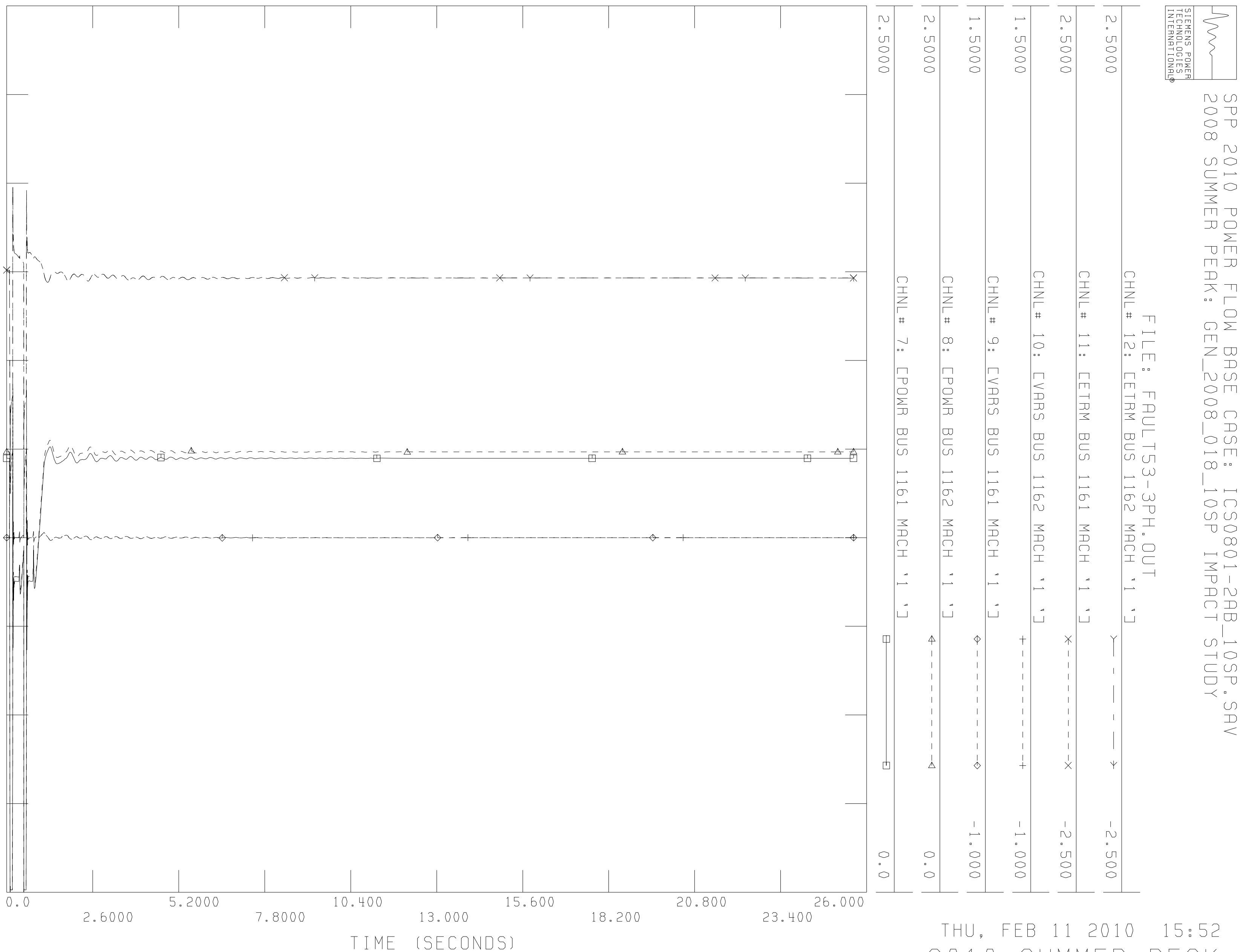
The results of this system impact study indicate that for all contingencies simulated the transmission system remained stable if two (2) 34.5kV STATCOM devices of +/- 2MVA is installed on each of the 34.5kV collector system buses.

APPENDIX A.

SELECTED STABILITY PLOTS – 2010 Summer and Winter Peak

All plots available on request.

Page A2	Contingency FLT53-3PH Summer Peak
Page A3	Contingency FLT54-1PH Summer Peak
Page A4	Contingency FLT55-3PH Summer Peak
Page A5	Contingency FLT56-1PH Summer Peak
Page A6	Contingency FLT57-3PH Summer Peak
Page A7	Contingency FLT58-1PH Summer Peak
Page A8	Contingency FLT53-3PH Winter Peak
Page A9	Contingency FLT54-1PH Winter Peak
Page A10	Contingency FLT55-3PH Winter Peak
Page A11	Contingency FLT56-1PH Winter Peak
Page A12	Contingency FLT57-3PH Winter Peak
Page A13	Contingency FLT58-1PH Winter Peak



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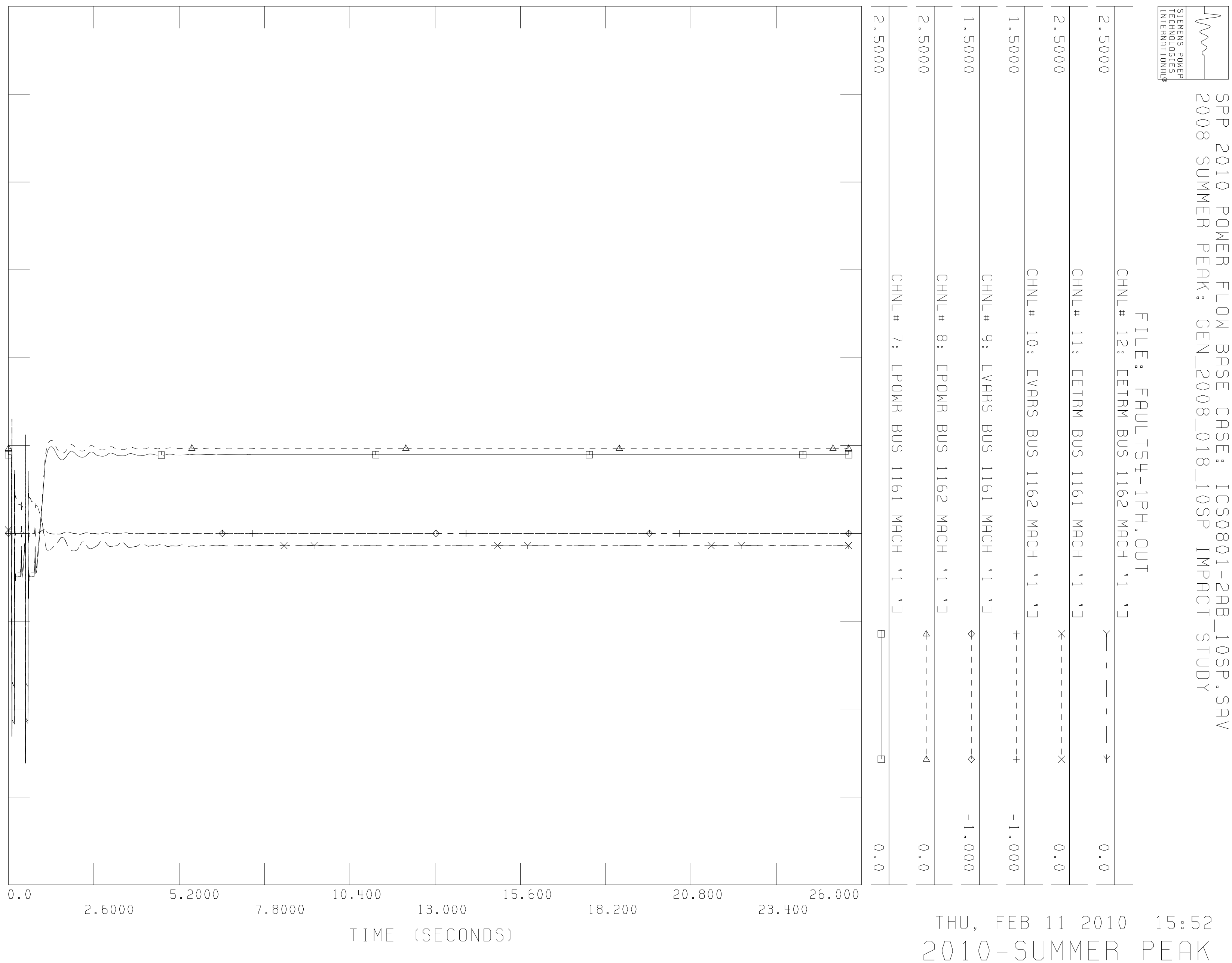
2010-SUMMER PEAK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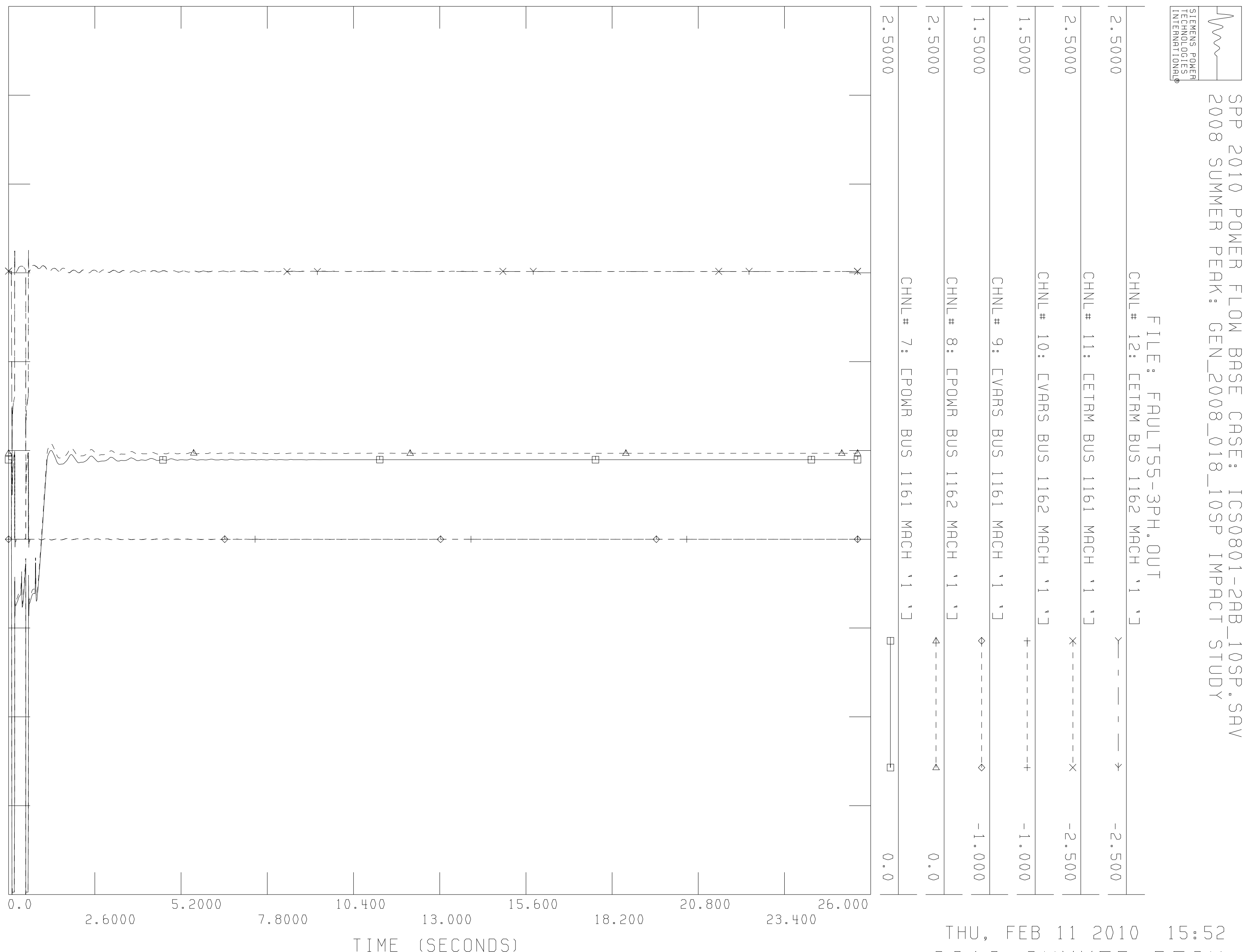
2010-SUMMER PEAK



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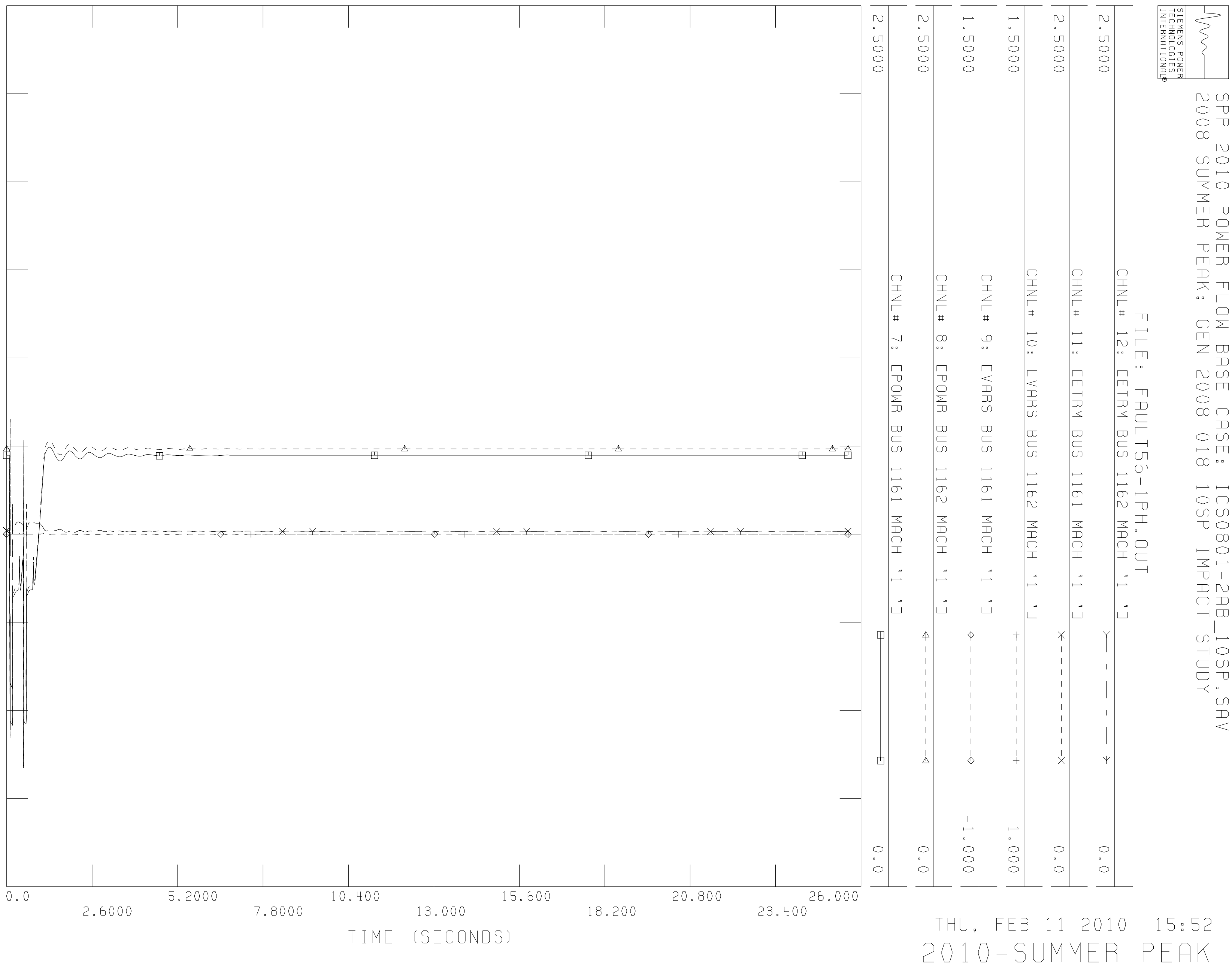
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2008 SUMMER PEAK: GEN_2008_018_10SP IMPACT STUDY
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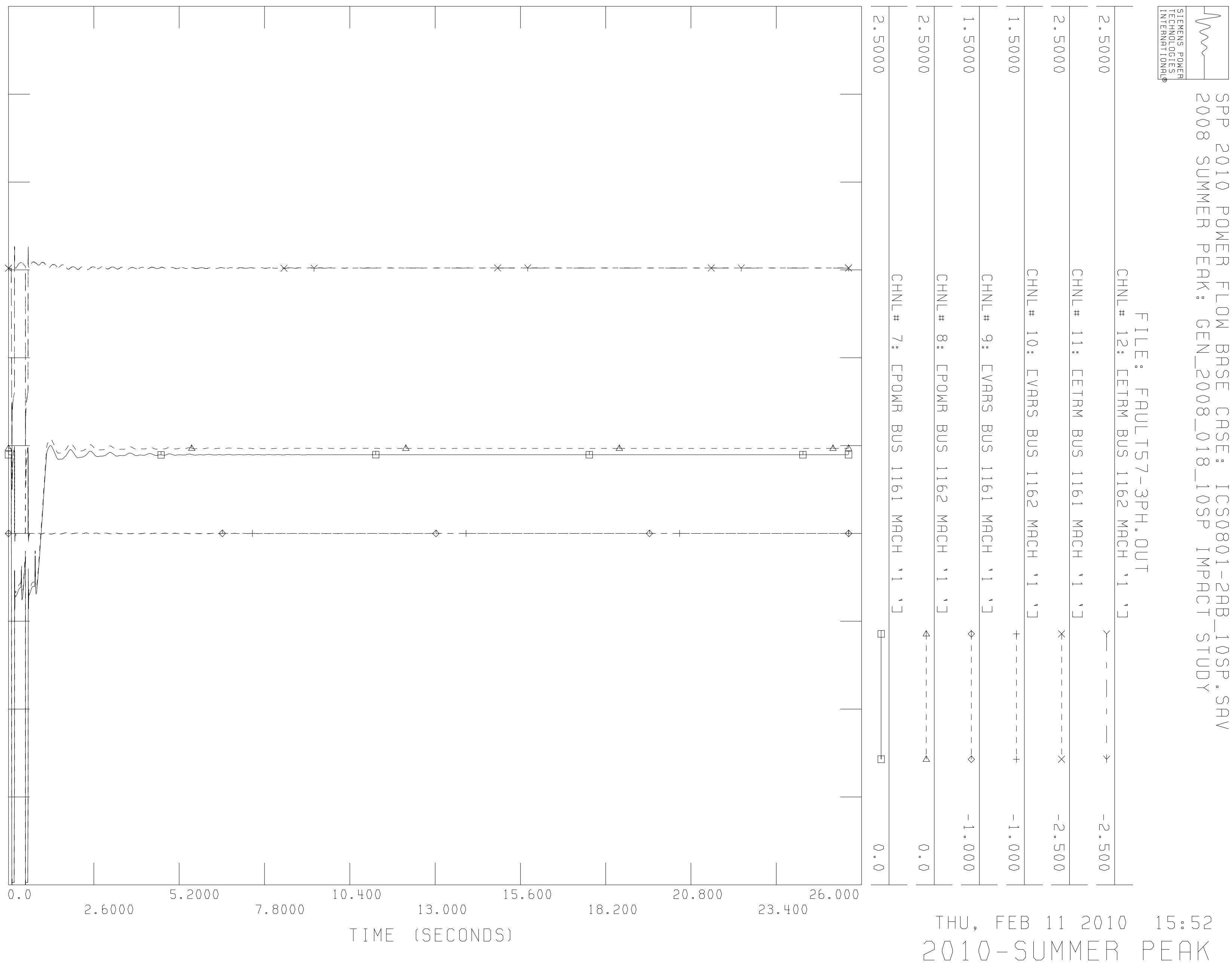
2010-SUMMER PEAK



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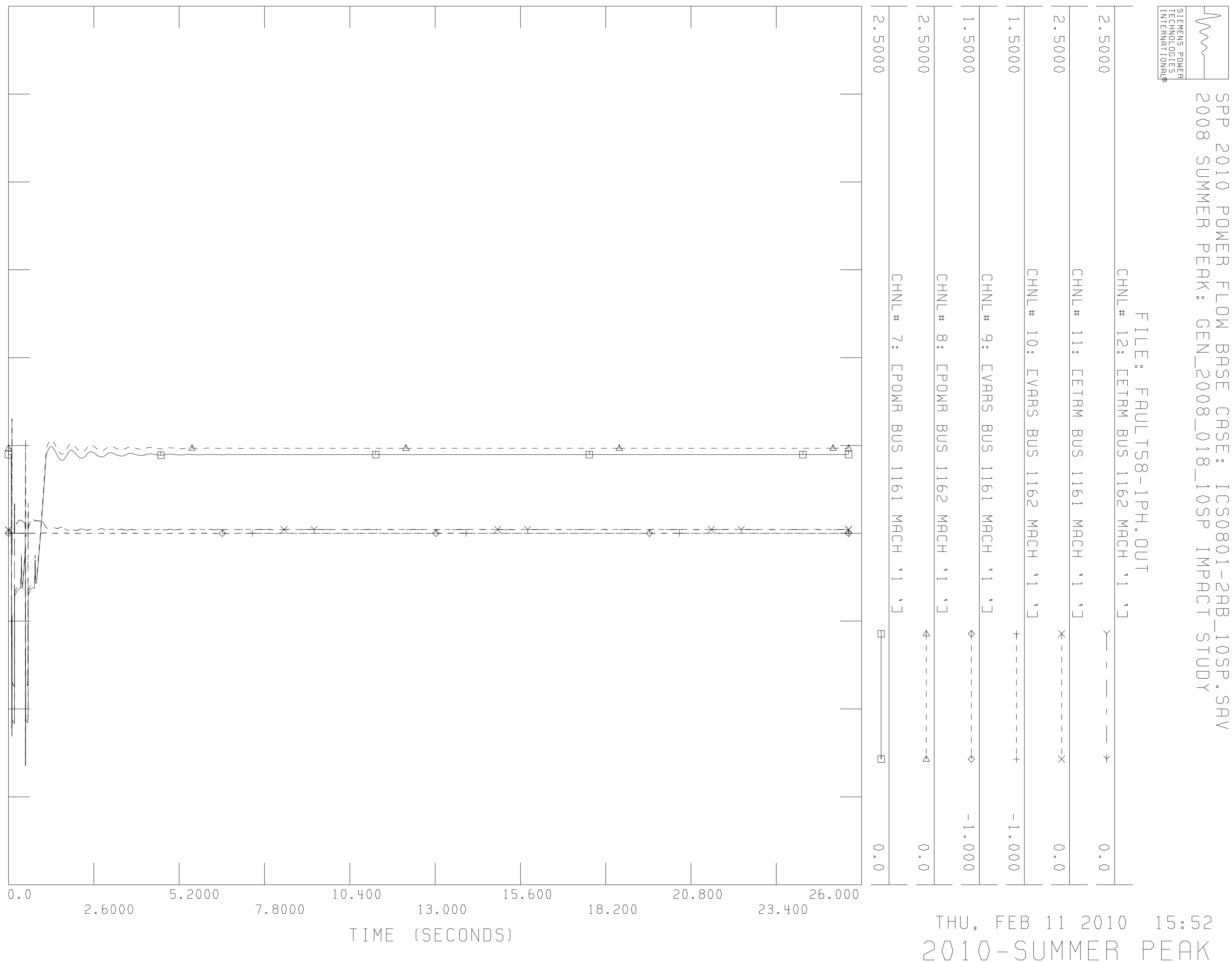
7.8000
10.400
13.000
15.600
18.200
20.800
23.400
26.000
TIME (SECONDS)
THU, FEB 11 2010 15:52
2010-SUMMER PEAK


SIEMENS POWER TECHNOLOGIES INTERNATIONAL
SPP 2010 POWER FLOW BASE CASE: ICS0801-2AB_10SP.SAV
2008 SUMMER PEAK: GEN_2008_018_10SP IMPACT STUDY
FILE: FAULT58-1PH.OUT
CHNL# 12: [ETRM BUS 1162 MACH '1 ']
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0.0
CHNL# 11: [ETRM BUS 1161 MACH '1 ']
2.5000
0.0
CHNL# 10: [VARS BUS 1162 MACH '1 ']
1.5000
-1.000
CHNL# 9: [VARS BUS 1161 MACH '1 ']
1.5000
-1.000
CHNL# 8: [POWR BUS 1162 MACH '1 ']
2.5000
0.0
CHNL# 7: [POWR BUS 1161 MACH '1 ']
2.5000
0.0
0.0
2.6000
5.2000
7.8000
10.400
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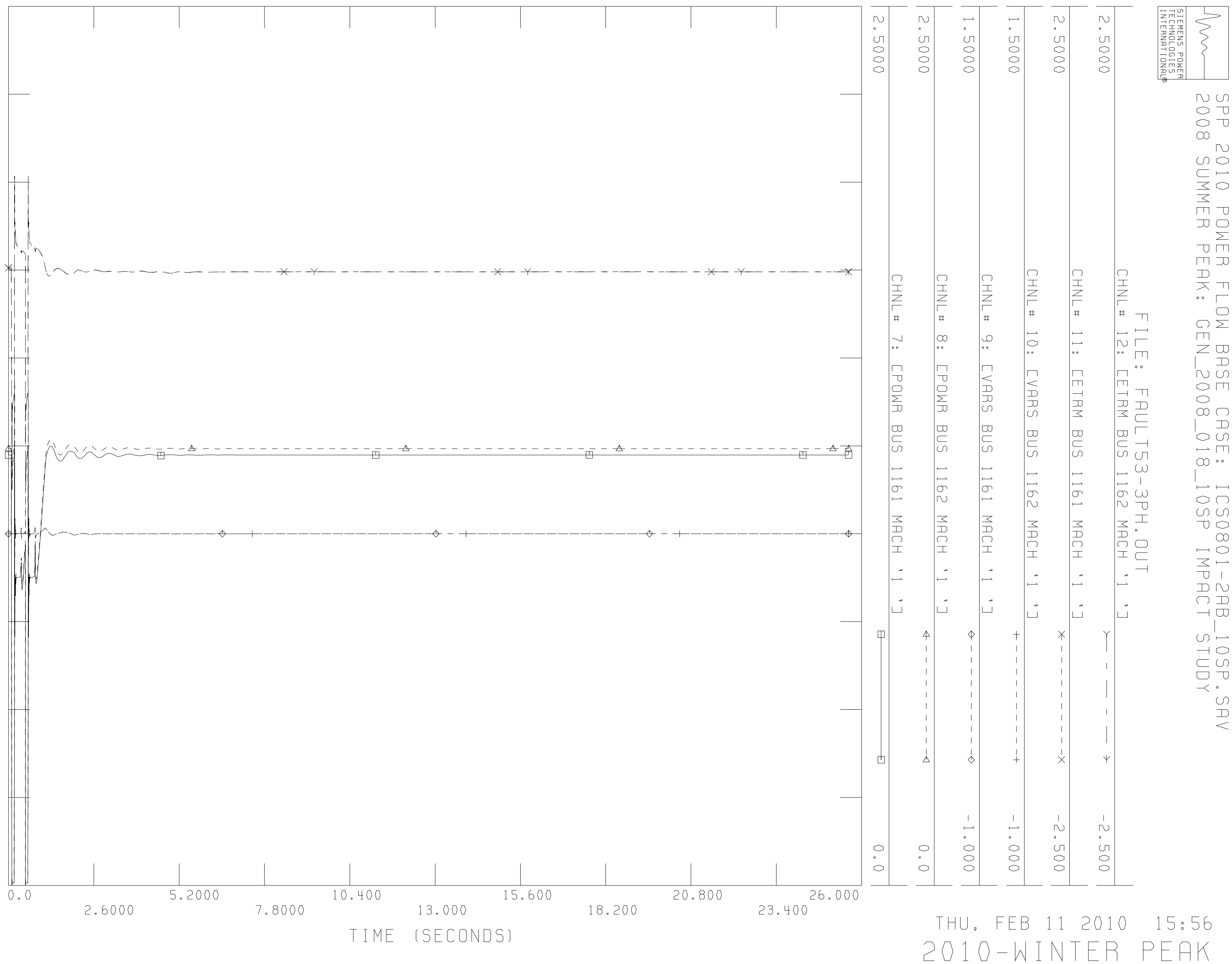
TIME (SECONDS)
THU, FEB 11 2010 15:52
2010-SUMMER PEAK



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2008 SUMMER PEAK: GEN_2008_018_10SP IMPACT STUDY
FILE: FAULT53-3PH.OUT
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
CHNL# 12: [ETRM BUS 1162 MACH '1 '] 2.5000 -2.500
CHNL# 11: [ETRM BUS 1161 MACH '1 '] 2.5000 -2.500
CHNL# 10: [VARS BUS 1162 MACH '1 '] 1.5000 -1.000
CHNL# 9: [VARS BUS 1161 MACH '1 '] 1.5000 -1.000
CHNL# 8: [POWR BUS 1162 MACH '1 '] 2.5000 0.0
CHNL# 7: [POWR BUS 1161 MACH '1 '] 2.5000 0.0
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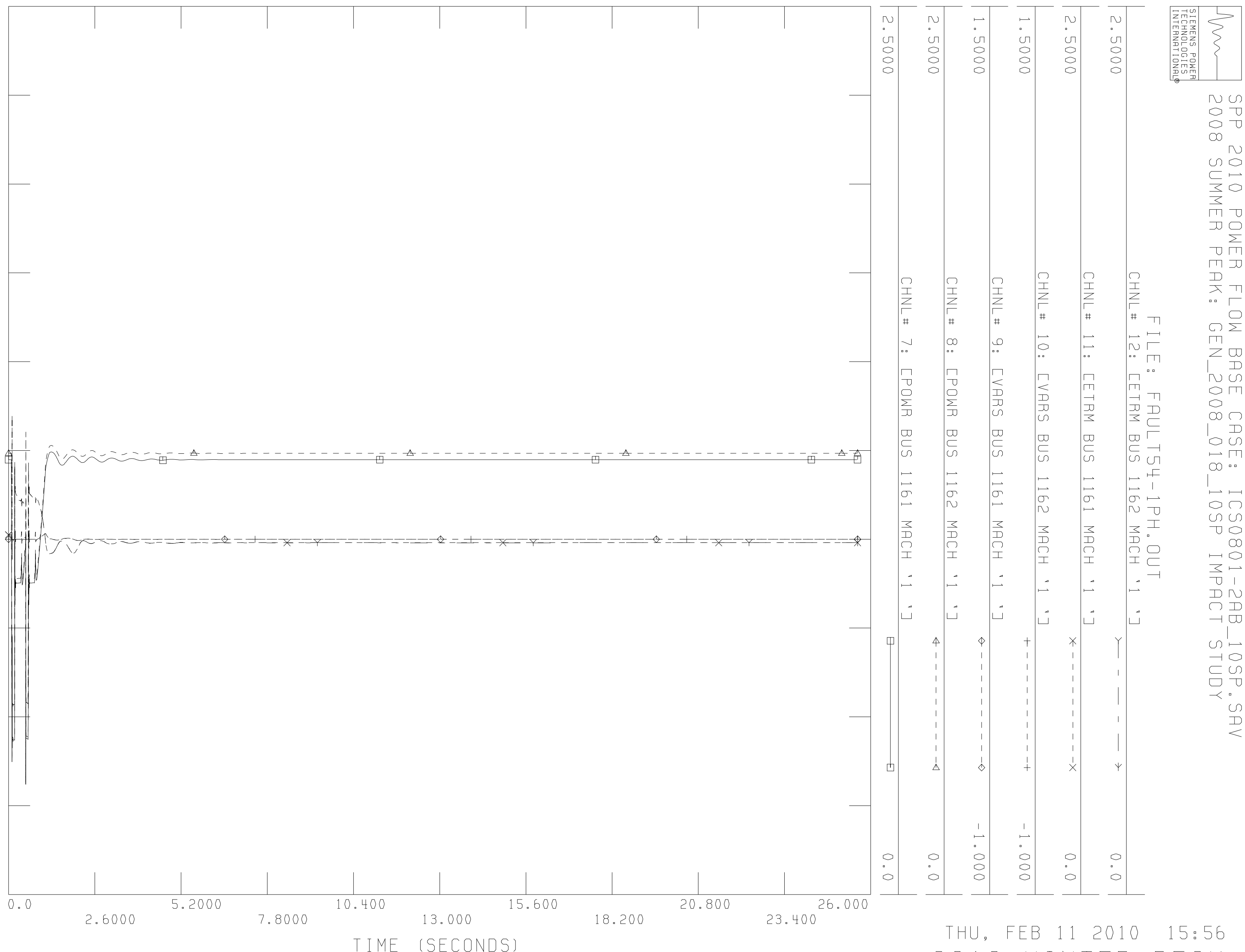
TIME (SECONDS)
THU, FEB 11 2010 15:56
2010-WINTER PEAK



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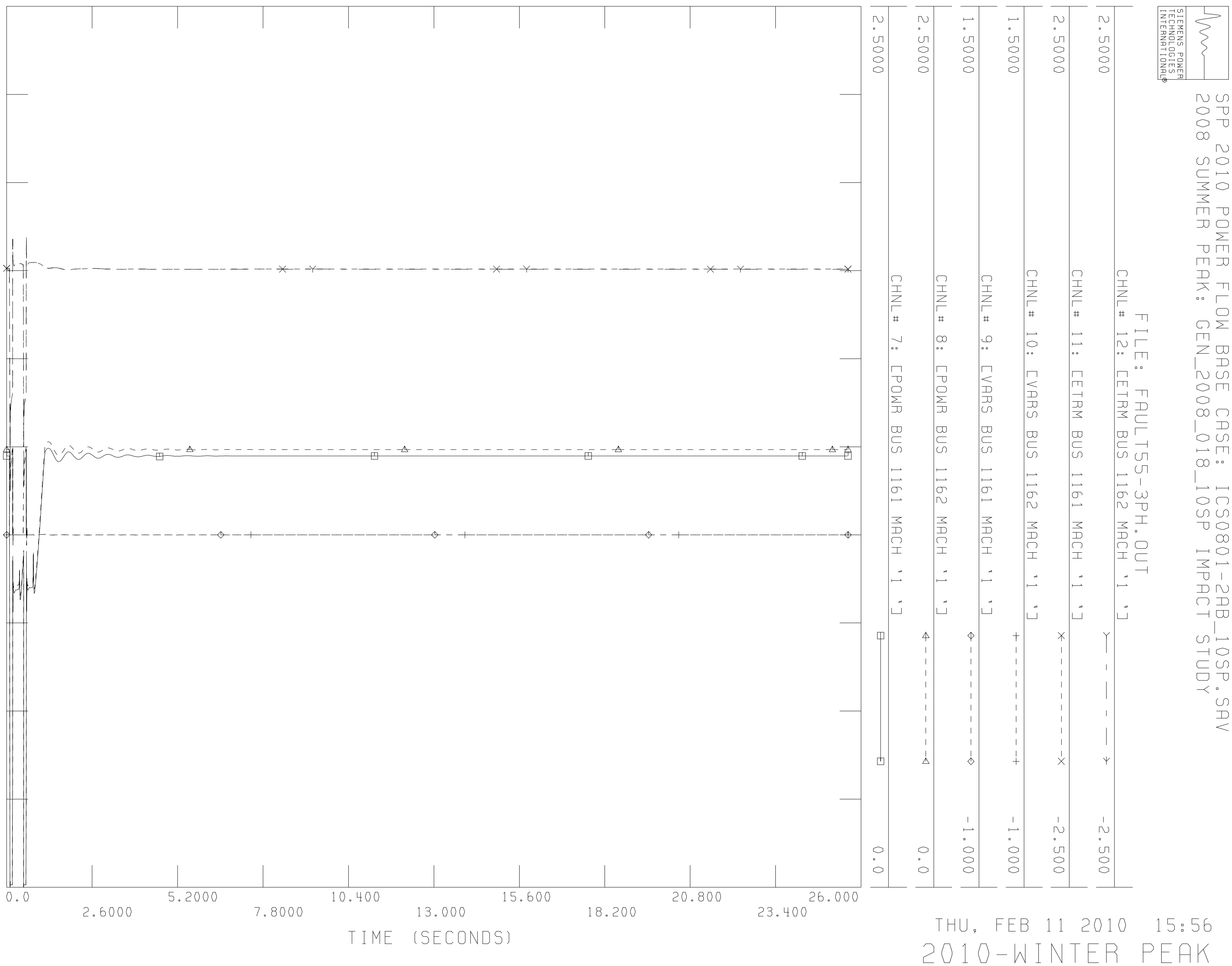
2010-WINTER PEAK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2008 SUMMER PEAK: GEN_2008_018_10SP IMPACT STUDY
FILE: FAULT55-3PH.OUT
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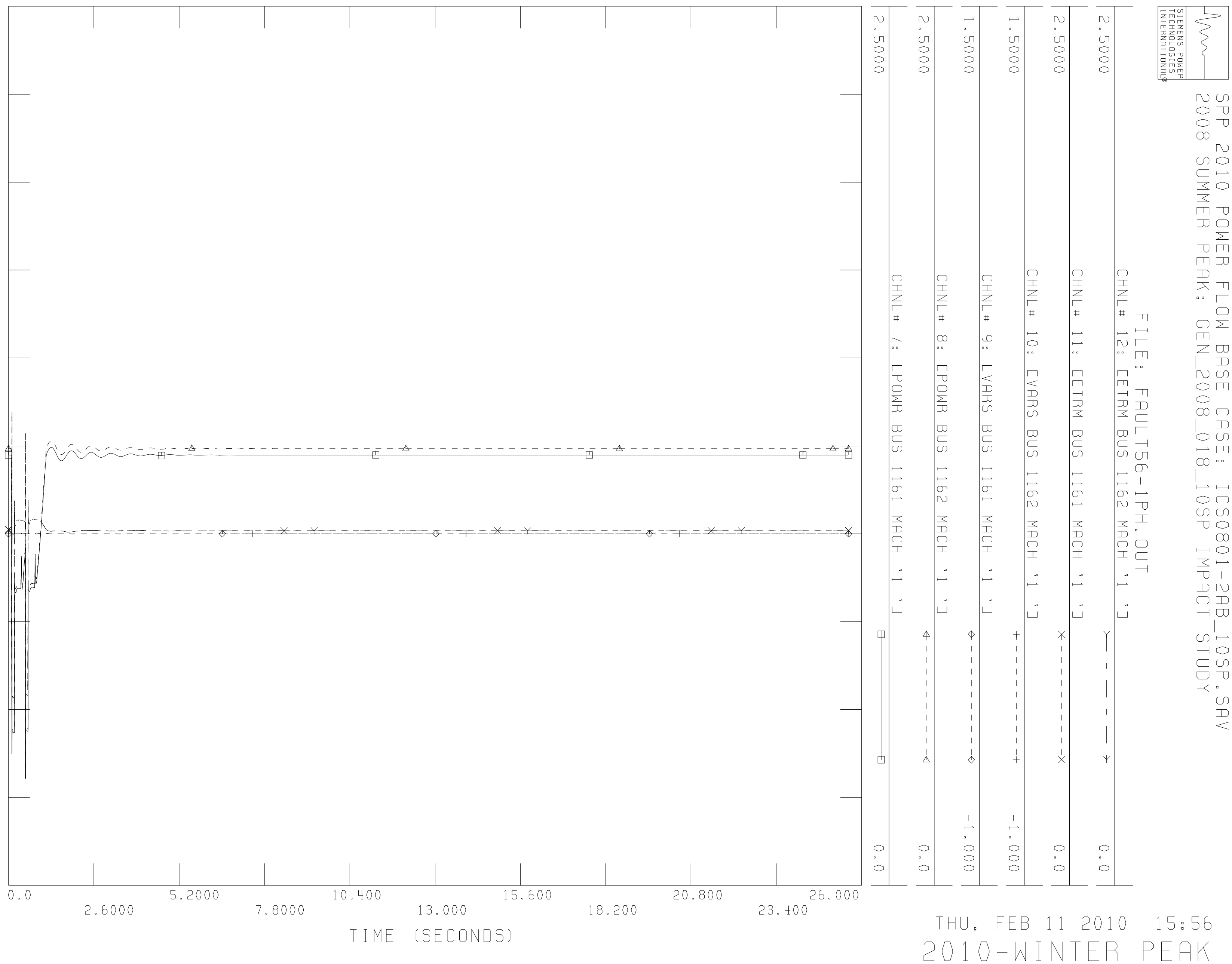
CHNL# 10: [VARS BUS 1162 MACH '1 ']
CHNL# 9: [VARS BUS 1161 MACH '1 ']
CHNL# 8: [POWR BUS 1162 MACH '1 ']
CHNL# 7: [POWR BUS 1161 MACH '1 ']
2.5000 -2.500
2.5000 -2.500
1.5000 -1.000
1.5000 -1.000
2.5000 0.0
2.5000 0.0
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
0.0 2.6000 5.2000 7.8000 10.400 13.000 15.600 18.200 20.800 23.400 26.000
TIME (SECONDS)
THU, FEB 11 2010 15:56
2010-WINTER PEAK


SPP 2010 POWER FLOW BASE CASE: ICS0801-2AB_10SP.SAV
2008 SUMMER PEAK: GEN_2008_018_10SP IMPACT STUDY
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
FILE: FAULT56-1PH.OUT
CHNL# 12: [ETRM BUS 1162 MACH '1 ']
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CHNL# 10: [VARS BUS 1162 MACH '1 ']
1.5000
-1.000
CHNL# 9: [VARS BUS 1161 MACH '1 ']
1.5000
-1.000
CHNL# 8: [POWR BUS 1162 MACH '1 ']
2.5000
0.0
CHNL# 7: [POWR BUS 1161 MACH '1 ']
2.5000
0.0
0.0
2.6000
5.2000
7.8000
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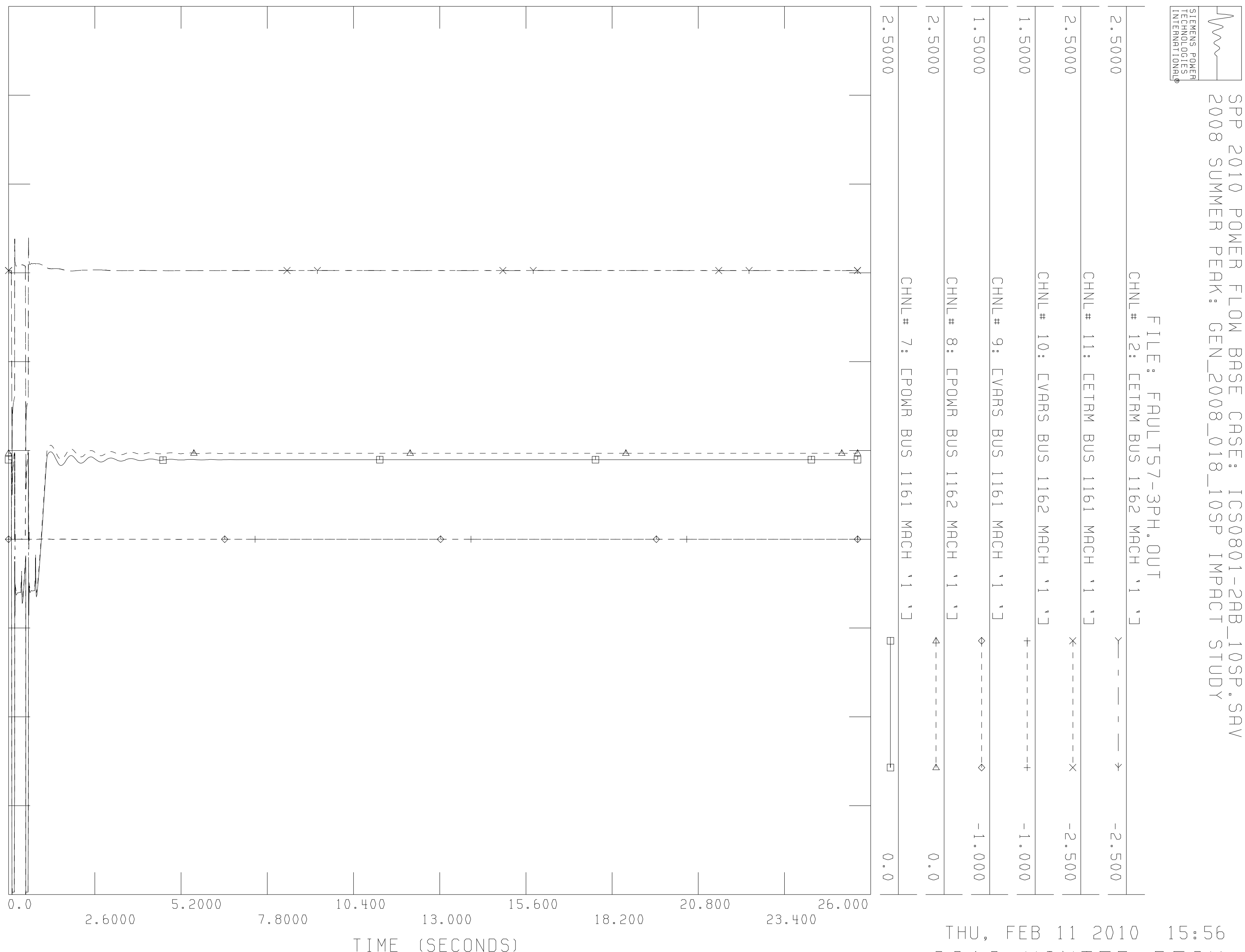
TIME (SECONDS)
THU, FEB 11 2010 15:56
2010-WINTER PEAK



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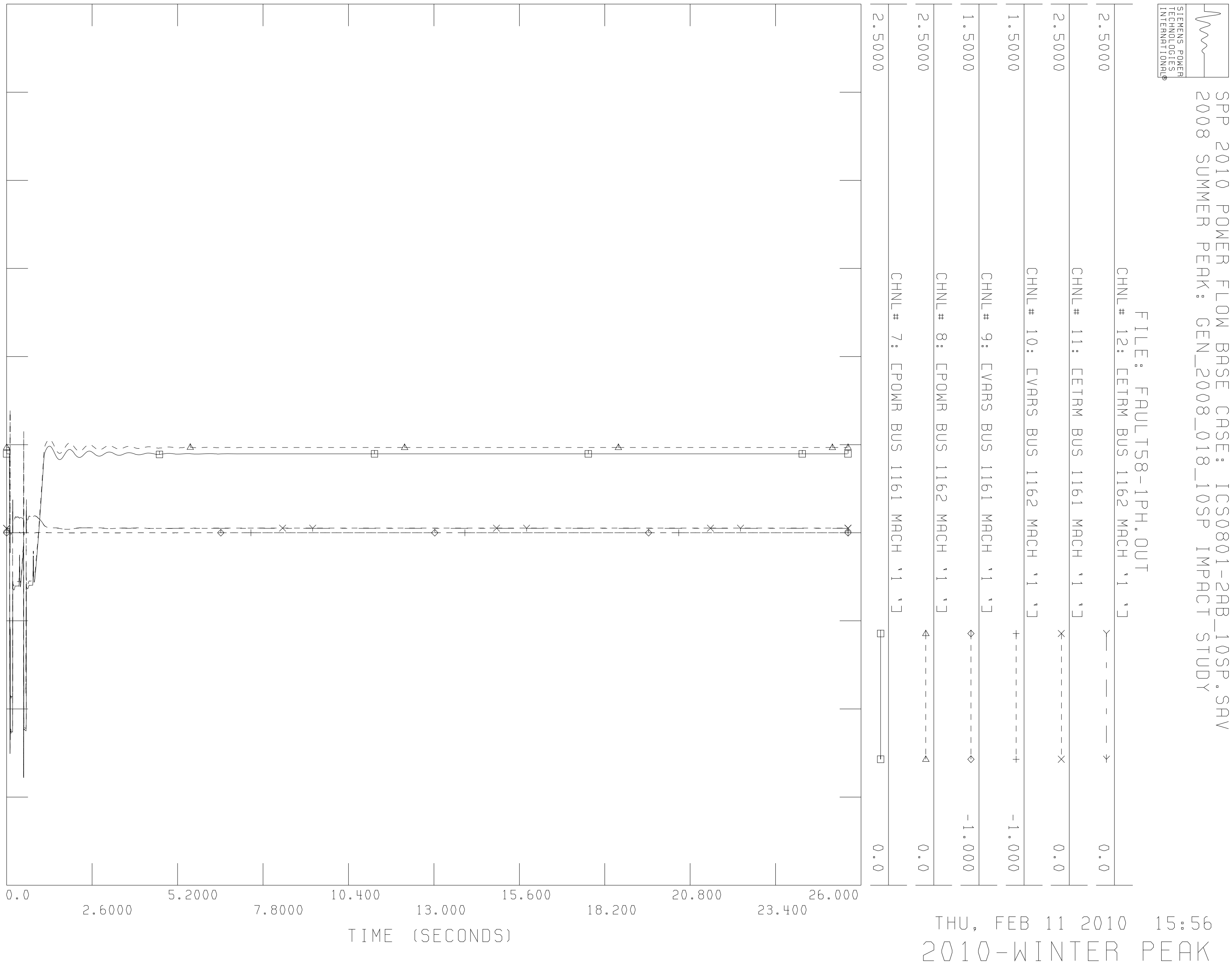
2010-WINTER PEAK


SPP 2010 POWER FLOW BASE CASE: ICS0801-2AB_10SP.SAV
2008 SUMMER PEAK: GEN_2008_018_10SP IMPACT STUDY
FILE: FAULT58-1PH.OUT
SIEMENS POWER TECHNOLOGIES INTERNATIONAL
CHNL# 12: [ETRM BUS 1162 MACH '1 ']
2.5000
0.0
CHNL# 11: [ETRM BUS 1161 MACH '1 ']
2.5000
0.0
CHNL# 10: [VARS BUS 1162 MACH '1 ']
1.5000
-1.000
CHNL# 9: [VARS BUS 1161 MACH '1 ']
1.5000
-1.000
CHNL# 8: [POWR BUS 1162 MACH '1 ']
2.5000
0.0
CHNL# 7: [POWR BUS 1161 MACH '1 ']
2.5000
0.0
0.0
2.6000
5.2000
7.8000
10.400
13.000
15.600
18.200
20.800
23.400
26.000
TIME (SECONDS)
THU, FEB 11 2010 15:56
2010-WINTER PEAK