Southwest Power Pool

Impact Study For Generation Interconnection Request GEN-2005-006

SPP Tariff Studies

(#GEN-2005-006)

November, 2005

Executive Summary

<OMITTED TEXT> (Customer) has requested a System Impact Study under the Southwest Power Pool Open Access Transmission Tariff (OATT) for interconnection of up to an 150 MW wind powered generation facility in Ellis County, Oklahoma to the transmission system of Oklahoma Gas & Electric (OG&E). The wind powered generation facility will be comprised of sixty-five (65) individual 2.3MW Siemens/Bonus Mk II wind turbines. The requested in-service date for the 150MW facility is December 31, 2006.

The generation facility will interconnect into the Woodward 138/69kV substation at the 138kV bus. The interconnection facilities are estimated at $439,825, which does not include the cost of the customer substation or the 138kV line leading from the Woodward substation to the Customer substation. The cost of the necessary facilities will be further refined in a Facility study if requested by the Customer.

The Customer substation will be required to have a minimum of 31.2MVAR of staged capacitor banks on the 138kV bus to maintain required power factor at the wind farm facility and for transmission support needed to export power from the interconnection point.

Three seasonal base cases were used in the study to analyze the stability impacts of the proposed generation facility. The cases studied were the 2006 winter peak, 2007 fall case, and the 2009 summer peak case. Each case was modified to include prior queued projects that are discussed in the body of the report. The Siemens/Bonus Mk II wind turbines were modeled using information provided by the manufacturer. Eighteen contingencies were simulated.

Stability Study results show that the system is stable for all simulated contingencies studied. The wind farm stays on-line for all but two of the contingencies studied.

Nothing in this study should be construed as a guarantee of transmission service. If the customer wishes to sell power from the facility, a separate request for transmission service shall be requested on Southwest Power Pool's OASIS by the Customer.

1.0 Introduction

<OMITTED TEXT> (Customer) has requested a System Impact Study under the Southwest Power Pool Open Access Transmission Tariff (OATT) for interconnecting up to an 150 MW wind powered generation facility in Ellis County, Oklahoma to the transmission system of Oklahoma Gas & Electric (OG&E). The wind powered generation facility studied was comprised of sixty-five (65) individual 2.3MW Siemens Mk II wind turbines. The requested in-service date for the 150MW facility is December 31, 2006. The wind powered generation facility will interconnect to the existing OG&E Woodward substation 138kV bus.

2.0 Purpose

The purpose of the Interconnection System Impact Study is to evaluate the impact of the proposed interconnection on the reliability of the Transmission System. The Impact Study considers the Base Case as well as all Generating Facilities (and with respect to (iii) below, any identified Network Upgrades associated with such higher queued interconnection) that, on the date the Interconnection System Impact Study is commenced: (i) are directly interconnected to the Transmission System; (ii) are interconnected to Affected Systems and may have an impact on the Interconnection Request; (iii) have a pending higher queued Interconnection Request to interconnect to the Transmission System; and (iv) have no Queue Position but have executed an LGIA or requested that an unexecuted LGIA be filed with FERC.

There are several previously queued projects ahead of this request in the SPP Generation Interconnection queue. It was assumed for purposes of this study that not all of those projects would be in-service if this project is built. Any changes to this assumption, i.e. one or more of the previously queued projects not included in the study signing an interconnection agreement, may require a re-study of this request at the expense of the customer. Other wind farms modeled in the case (GEN-2001-014, GEN-2001-037, GEN-2002-005, and GEN-2005-005) which have higher queue priority than this request, were modeled in this case.

Nothing in this System Impact Study constitutes a request for transmission service or confers upon the Interconnection Customer any right to receive transmission service.

3.0 Facilities

3.1 Generating Facility

The generating facility was studied with the assumption that it would be using the Siemens/Bonus Mk II 2.3MW wind turbines. The nameplate rating of each turbine is 2300kW with a machine base of 2500kVA. The turbine output voltage is 690V. The turbine comes with a power converter that allows the generator to produce power at a power factor of 0.90 lagging (producing vars) to 0.90 leading (absorbing vars).

The facility was studied with sixty-five (65) turbines feeding into six collector circuits. The collector circuits range in length from 4835 feet to 10.2 miles including both overhead and underground line. Each feeder collects from 12, 15, 15, 11, 3, and 9 turbines respectively.

3.2 Customer's Interconnection Substation

The Customer substation contains 34.5kV circuit breakers for all the collector circuits and a 138-34.5kV, 100/133/167 MVA transformer with Z=9.0%. The substation connects back to OG&E's Woodward substation via 23 miles of radial 795 MCM ACSR overhead line.

Required Capacitor Banks - Even though the Siemens turbines are capable of producing vars at a 0.90 PF, the distance of the wind turbines from the Woodward interconnection point causes large MW and MVAR losses on the wind turbine collectors and 138kV radial transmission line. To maintain a unity power factor at the interconnection point at Woodward substation and to maintain an acceptable voltage profile from Woodward to the wind generators, capacitance must be added to the 138kV bus at the Customer's substation. Under summer peak conditions, a minimum of 31.2 MVAR, preferably staged, must be added to the 138kV bus.

A one-line of the customer's substation is shown below in Figure 1.

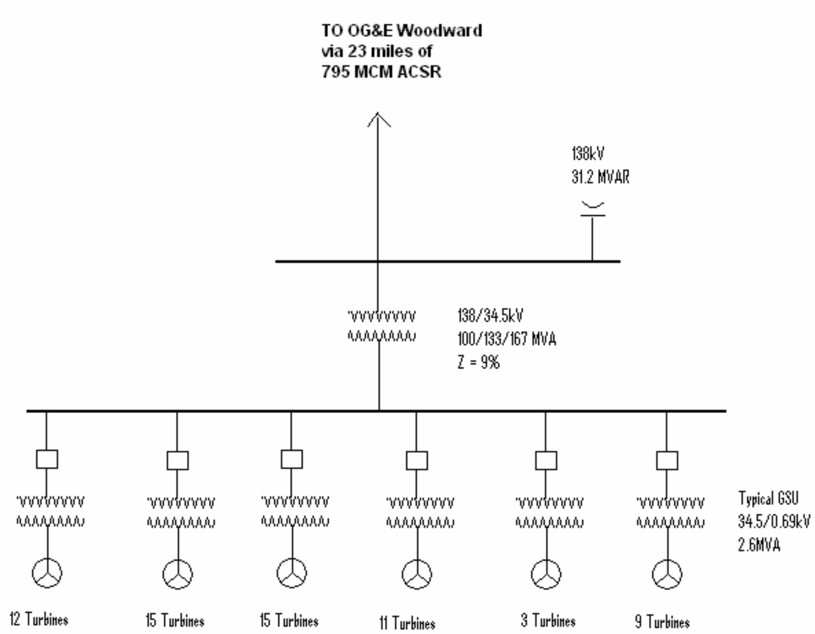


Figure 1. Proposed Customer Facility

3.3 Interconnection Facility

The Customer has proposed to interconnect into the OG&E Woodward substation at the 138kV bus. OG&E will build a new terminal at the Woodward substation to accommodate the interconnection. The Customer will build approximately 23 miles of 795MCM ACSR overhead transmission line from the Customer substation to the OG&E Woodward substation

The total cost for adding a new 138kV terminal at Woodward substation is $439,825 and does not include the Customer substation, the Customer 138kV capacitor banks, or the 23 miles of transmission line. The costs for all interconnection facilities can be further refined by a Facility study, if the customer chooses to have a Facility study conducted. Figure 2 shows a one-line of the proposed interconnection point.

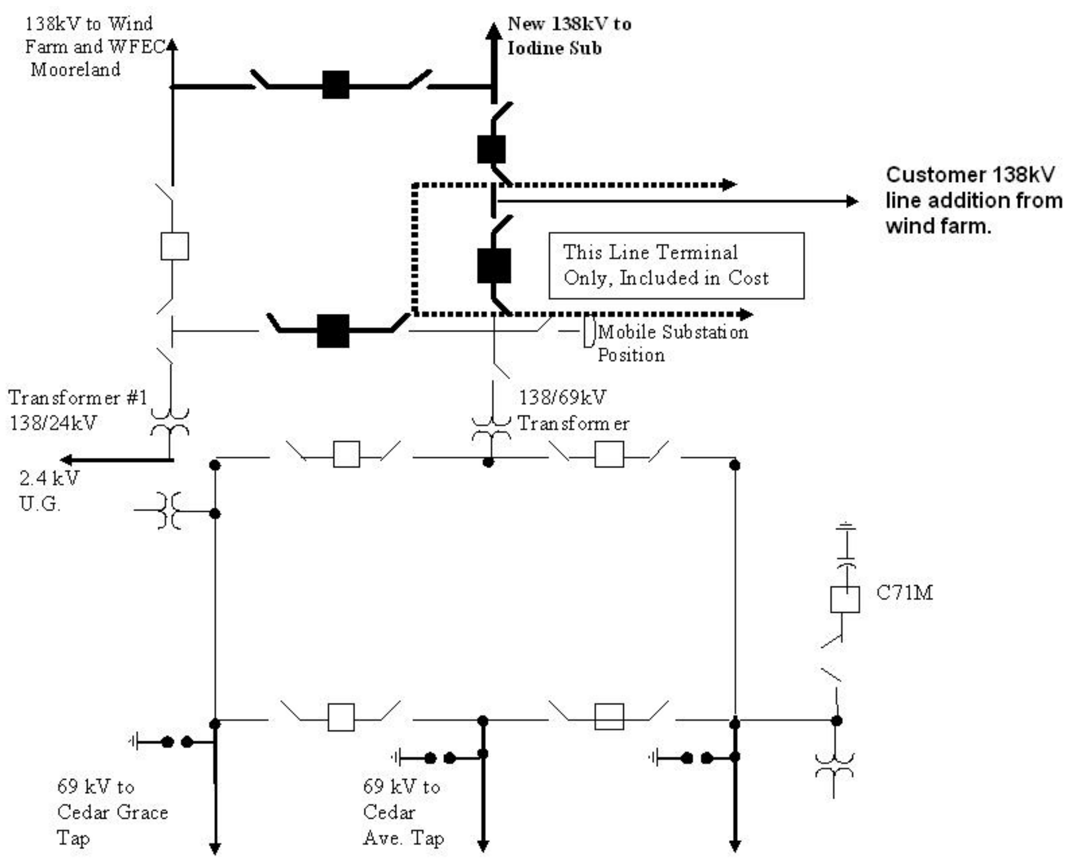


Figure 2. Proposed Interconnection Point

4.0 Stability Analysis

4.1 Objective

The objective of the stability study is to determine the impact on system stability of connecting the proposed GEN-2005-006 wind farm to OG&E's 138 kV transmission system.

4.2 Equivalent Modeling of the Wind Generating Facility

The rated output of the generation facility is 150MW, comprised of sixty-five (65) Siemens Mk II wind turbines. The base voltage of the Siemens turbine is 690 V, and a generator step up transformer (GSU) of 2600kVA connects each unit to the high side of 34.5kV. The rated power output of each turbine is 2.3 MW while the actual power output depends on the wind.

In performing a system impact study, the wind farm generation from the study customer and previously queued customers is dispatched into the SPP footprint.

The generating facility 138/34.5 substation will consist of (1) 138/34.5kV transformer assumed to be 9% on a 100MVA OA Base with a top rating of 167MVA. From the one-line diagram received from the customer, on the 34.5kV side of the transformer, 6 feeder circuits will extend from the Customer's 138/34.5kV substation. Each feeder will collect from 12, 15, 15, 11, 3, and 9 wind turbines respectively. Each turbine then has its own pad-mounted transformer rated 690V/34.5kV and 2.6MVA.

4.3 Modeling of the Wind Turbines in the Power Flow

In order to simplify the model of the wind farm while capturing the effect of the different impedances of cables (due to change of the conductor size and length), the wind turbines connected to the same 34.5kV feeder end points were aggregated into one equivalent unit. An equivalent impedance of that feeder is represented in the load flow database by taking the equivalent series impedances of the different feeders connecting the wind turbines. Using this approach, the wind farm was modeled with equivalent units as shown in Figure 3. The number of individual wind turbines that are aggregated at each bus is shown.

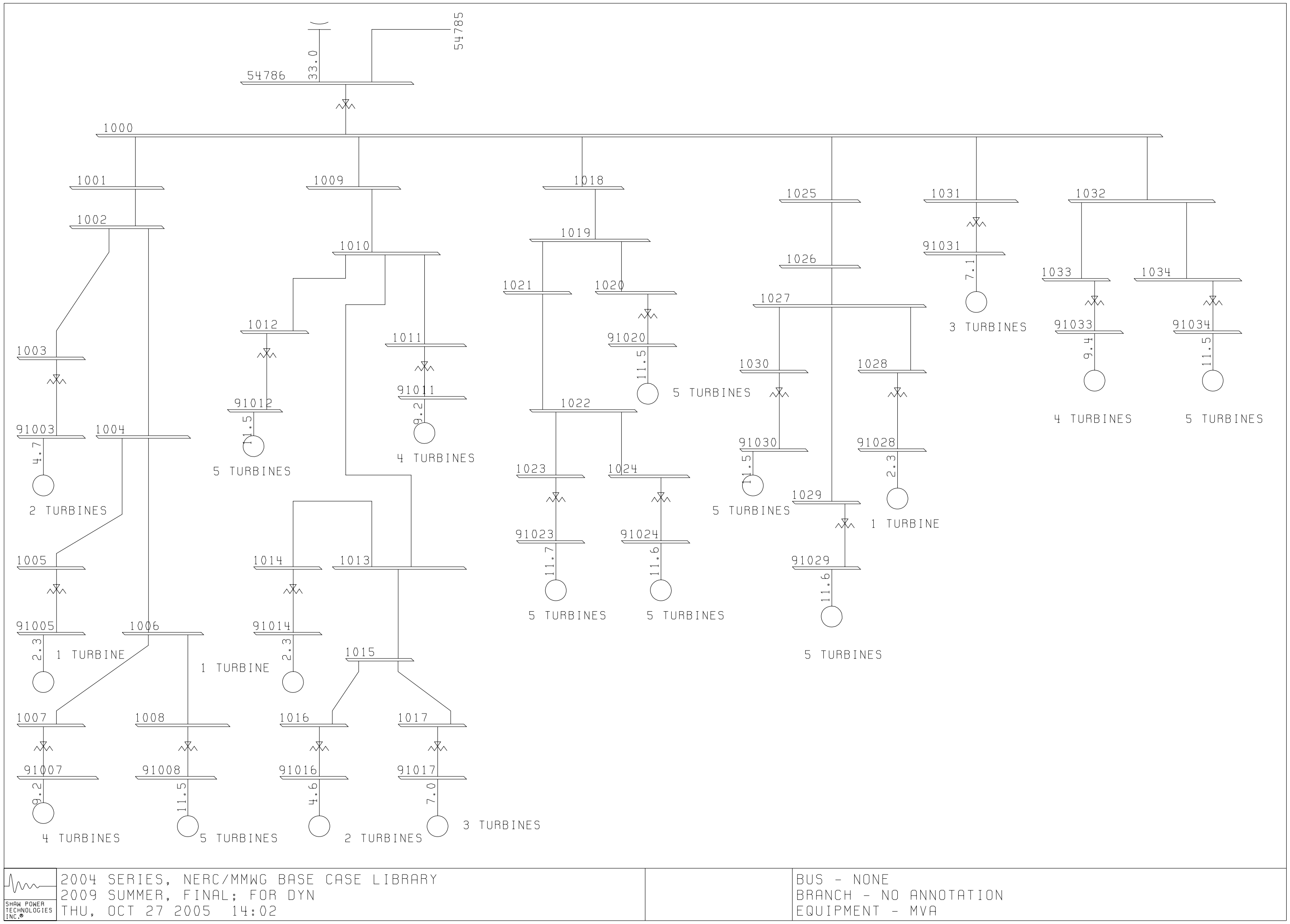


Figure 3. Power-flow Representation of the GEN-2005-006 Facility

4.4 Modeling of the Wind Turbines for the Stability Simulation

4.4.1 Machine Dynamics Data

The generating facility was studied with the assumption that it would be using the Siemens/Bonus Mk II 2.3MW wind turbines. The nameplate rating of each turbine is 2300kW with a machine base of 2500kVA. The turbine output voltage is 690V. The turbine comes with a power converter that allows the generator to produce power at a power factor of 0.90 lagging (producing vars) to 0.90 leading (absorbing vars).

The wind turbine manufacturer provided a wind turbine model package for use on PTI's PSS/E simulation software. This package was used exclusively in modeling this wind farm. The model package used is version 2.2 Beta.

The Siemens model package consists of an Excel spreadsheet that creates the dynamic stability data for the wind farm based on inputs from the user. The data is then copied into a PSS/E *.dyr file.

Details such as the generator Pgen, Qmax, Qmin, Zsource, Transformer Z, and similar data must be created by the user using the PSS/E interface.

The wind farm was dispatched directly by the program to the level specified (100% rated power). For this study, it was assumed the turbines were set to operate in voltage control mode controlling the generator buses at 1.05 per unit. Default protection schemes were used for the turbines

4.4.2 Turbine Protection Schemes

The Siemens turbines have an under-voltage/over-voltage protection scheme and an under-frequency/over-frequency protection scheme. The various protection schemes are designed to protect the wind turbines in the case of system disturbances that can cause damage to the mechanical systems or power electronics on board the turbine. Generally, the protection schemes will disconnect the generator from the electric grid if the sampled frequency or voltage is outside of a specified band for a specified amount of time.

The voltage protection scheme is outlined in Table 1 on the next page:

Voltage	Time Limit
1.20pu +	0.2 second
1.10pu – 1.20 pu	1 second
0.90pu – 1.10 pu	Continuous operation
0.70pu – 0.90 pu	5 seconds
0.15pu - 0.70pu	1 second
< 0.15pu	9 cycles (0.15s)

Table 1: Siemens Turbine Voltage Protection

The frequency protection scheme is outlined in Table 2 below:

Frequency (per unit)	Time Limit
0.98-1.08	Continuous Operation
0.98	0.10 seconds
1.08	0.10 seconds

Table 2: Siemens Turbine Frequency Protection

4.5 Contingencies Simulated

Eighteen (18) contingencies were considered for the transient stability simulations which included three phase faults, as well as single phase line faults, at the locations defined by SPP. Single-phase line faults were simulated by applying a fault impedance to the positive sequence network at the fault location to represent the effect of the negative and zero sequence networks on the positive sequence network. The fault impedance was computed to give a positive sequence voltage at the specified fault location of approximately 60% of pre-fault voltage. This method is in agreement with SPP current practice. The faults are listed in Table 3.

Table 3. FAULT DESCRIPTIONS

Fault Name	Fault Description
FAULT_1_3PH	3PH Fault on Mooreland - GEN-2001-037 Wind Farm 138kV line near Mooreland a. Apply Fault at the Mooreland Bus (55999). b. Clear Fault after 5 cycles by removing the line from 55999 - 55785. c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FAULT_2_1PH	SLG Fault on Mooreland - GEN-2001-037 Wind Farm 138kV line near Mooreland a. Apply Fault at the Mooreland Bus (55999). b. Clear Fault after 5 cycles by removing the line from 55999 - 55785. c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FAULT_3_3PH	3PH Fault on the Mooreland (55999) - Iodine (55957) 138kV line, near Mooreland a. Apply Fault at the Mooreland Bus (55999). b. Clear Fault after 5 cycles by removing the line from 55999 - 55957. c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FAULT_4_1PH	SLG Fault on the Mooreland (55999) - Iodine (55957) 138kV line, near Mooreland a. Apply Fault at the Mooreland Bus (55999). b. Clear Fault after 5 cycles by removing the line from 55999 - 55957. c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FAULT_5_3PH	3PH Fault on the Mooreland (55999) – Morewood Switch (56001) 138kV line, near Mooreland a. Apply Fault at the Mooreland Bus(55999). b. Clear Fault after 5 cycles by removing the line from 55999 - 56001. c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FAULT_6_1PH	SLG Fault on the Mooreland (55999) – Morewood Switch (56001) 138kV line, near Mooreland a. Apply Fault at the Mooreland Bus(55999). b. Clear Fault after 5 cycles by removing the line from 55999 - 56001. c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FAULT_7_3PH	3PH Fault on the Morewood Switch (56001)-Elk City (54121) 138kV line, near Morewood a. Apply Fault at the Morewood Bus(56001). b. Clear Fault after 5 cycles by removing the line from 56001-54121. c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Fault Name	Fault Description
FAULT_8_1PH	SLG Fault on the Morewood Switch (56001)-Elk City (54121) 138kV line, near Morewood a. Apply Fault at the Morewood Bus(56001). b. Clear Fault after 5 cycles by removing the line from 56001-54121. c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FAULT_9_3PH	3PH Fault on the Mooreland (55999) – Taloga (56065) 138kV line, near Mooreland a. Apply Fault at the Mooreland Bus(55999). b. Clear Fault after 5 cycles by removing the line from 55999 - 56065. c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FAULT_10_1PH	SLG Fault on the Mooreland (55999) – Taloga (56065) 138kV line, near Mooreland a. Apply Fault at the Mooreland Bus(55999). b. Clear Fault after 5 cycles by removing the line from 55999 - 56065. c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FAULT_11_3PH	3PH Fault on the Mooreland (55999) – Glass Mtn. (54788) 138kV line, near Mooreland a. Apply Fault at the Mooreland Bus(55999). b. Clear Fault after 5 cycles by removing the line from 55999 - 54788. c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FAULT_12_1PH	SLG Fault on the Mooreland (55999) – Glass Mtn. (54788) 138kV line, near Mooreland a. Apply Fault at the Mooreland Bus(55999). b. Clear Fault after 5 cycles by removing the line from 55999 - 54788. c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FAULT_13_3PH	3PH Fault on the Woodward (54785) – Iodine (54796) 138kV line, near Woodward a. Apply Fault at the Woodward Bus(54785). b. Clear Fault after 5 cycles by removing the line from 54785 - 54796. c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FAULT_14_1PH	SLG Fault on the Mooreland (55999) – Cedardale (55848) 138kV line, near Mooreland a. Apply Fault at the Mooreland Bus(55999). b. Clear Fault after 5 cycles by removing the line from 55999 - 54788. c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Fault Name	Fault Description
FAULT_15_3PH	Fault on the Elk City (54121) – Clinton North (54148), 138kV line, near Elk City. a. Apply fault at the Elk City (54121). b. Clear fault after 5 cycles by removing the line from 54121-54148. c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FAULT_16_1PH	SLG Fault on the Elk City (54121) – Clinton North (54148), 138kV line, near Elk City. a. Apply fault at the Elk City (54121). b. Clear fault after 5 cycles by removing the line from 54121-54148. c. Wait 20 cycles, and then re-close the line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FAULT_17_3PH	3PH Fault on the Elk City (54121) – Clinton AFB (54109), 138kV line, near Elk City a. Apply fault at the Elk City bus (54121). b. Clear fault after 5 cycles by removing line from 54121-54109 c. Wait 20 cycles, and then re-close line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FAULT_18_1PH	SLG Fault on the Elk City (54121) – Clinton AFB (54109), 138kV line, near Elk City a. Apply fault at the Elk City bus (54121). b. Clear fault after 5 cycles by removing line from 54121-54109 c. Wait 20 cycles, and then re-close line in (b) into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

4.6 Further Model Preparation

The above cases were run for the following conditions (Voltage Control was enabled on the Siemens machines for all scenarios):

- 2009 Summer Peak Loading
- 2006 Winter Peak Loading
- 2007 Fall Loading

The previously queued projects which were added to the stability base case are summarized in Table 4.

Study Plant	Total MW
GEN-2001-014	96
GEN-2001-037	102
GEN-2002-005	120
GEN-2005-005	18

Table 4. – Summary of Prior Queued Projects

4.7 Stability Results

Results for all the disturbances simulated are summarized in Table 4. The results indicate that the system is stable for contingencies studied.

Previously queued projects GEN-2001-014, GEN-2001-037, and GEN-2002-005 are tripped off for several contingencies. However, these projects are also tripped off in the base case before the study generation is added.

The study project, GEN-2005-006, is tripped for Contingency #1 and #3 in the 2009 summer peak case. Due to design of the Siemens model, it is not completely evident from the model output if the tripping was due to frequency or voltage. Additional simulations were run with voltage tripping disabled and frequency tripping disable and it was determined that the turbines were tripping for frequency excursion.

FAULT	FAULT DEFINITION	2006 WP	2007 Fall	2009 SP
FLT_1_3_PH	3PH Fault on Mooreland - GEN-2001-037 Wind Farm 138kV line near Mooreland	GEN-2001-014 tripped GEN-2001-037 tripped	GEN-2001-014 tripped GEN-2001-037 tripped	GEN-2001-014 tripped GEN-2001-037 tripped GEN-2005-006 tripped
FLT_2_1_PH	SLG same as FLT_1_3_PH	GEN-2001-014 tripped GEN-2001-037 tripped	GEN-2001-014 tripped GEN-2001-037 tripped	GEN-2001-014 tripped GEN-2001-037 tripped
FLT_3_3_PH	3PH Fault on the Mooreland (55999) - Iodine (55957) 138kV line, near Mooreland	GEN-2001-014 tripped GEN-2001-037 tripped	GEN-2001-014 tripped GEN-2001-037 tripped	GEN-2001-014 tripped GEN-2001-037 tripped GEN-2005-006 tripped
FLT_4_1_PH	SLG same as FLT_3_3_PH	GEN-2001-014 tripped GEN-2001-037 tripped	GEN-2001-014 tripped GEN-2001-037 tripped	GEN-2001-014 tripped GEN-2001-037 tripped
FLT_5_3_PH	3PH Fault on the Mooreland (55999) – Morewood Switch (56001) 138kV line, near Mooreland	GEN-2001-014 tripped GEN-2001-037 tripped	GEN-2001-014 tripped GEN-2001-037 tripped	GEN-2001-014 tripped GEN-2001-037 tripped
FLT_6_1_PH	SLG same as FLT_5_3_PH	GEN-2001-014 tripped GEN-2001-037 tripped	GEN-2001-014 tripped GEN-2001-037 tripped	GEN-2001-014 tripped GEN-2001-037 tripped
FLT_7_3_PH	3PH Fault on the Morewood Switch (56001)-Elk City (54121) 138kV line, near Morewood	GEN-2002-005 tripped	GEN-2002-005 tripped	GEN-2002-005 tripped
FLT_8_1_PH	SLG same as FLT_7_3_PH	STABLE	STABLE	STABLE
FLT_9_3_PH	3PH Fault on the Mooreland (55999) – Taloga (56065) 138kV line, near Mooreland	GEN-2001-014 tripped GEN-2001-037 tripped	GEN-2001-014 tripped GEN-2001-037 tripped	GEN-2001-014 tripped GEN-2001-037 tripped
FLT_10_1_PH	SLG same as FLT_9_3_PH	GEN-2001-014 tripped GEN-2001-037 tripped	GEN-2001-014 tripped GEN-2001-037 tripped	GEN-2001-014 tripped GEN-2001-037 tripped
FLT_11_3_PH	3PH Fault on the Mooreland (55999) – Glass Mtn. (54788) 138kV line, near Mooreland	GEN-2001-014 tripped GEN-2001-037 tripped	GEN-2001-014 tripped GEN-2001-037 tripped	GEN-2001-014 tripped GEN-2001-037 tripped GEN-2002-005 tripped
FLT_12_1_PH	SLG same as FLT_11_3_PH	GEN-2001-014 tripped GEN-2001-037 tripped	GEN-2001-014 tripped GEN-2001-037 tripped	GEN-2001-014 tripped GEN-2001-037 tripped
FLT_13_3_PH	3PH Fault on the Iodine (54796) – Woodward (55999) 138kV line, near Mooreland	GEN-2001-014 tripped GEN-2001-037 tripped	GEN-2001-014 tripped GEN-2001-037 tripped	STABLE
FLT_14_1_PH	SLG same as FLT_13_3_PH	STABLE	STABLE	STABLE
FLT_15_3_PH	Fault on the Elk City (54121) – Clinton North (54148), 138kV line, near Elk City.	GEN-2002-005 tripped	GEN-2002-005 tripped	GEN-2002-005 tripped
FLT_16_1_PH	SLG same as FLT_15_3_PH	STABLE	STABLE	STABLE
FLT_17_3_PH	3PH Fault on the Elk City (54121) – Clinton AFB (54109), 138kV line, near Elk City	GEN-2002-005 tripped	GEN-2002-005 tripped	GEN-2002-005 tripped
FLT_18_1_PH	SLG same as FLT_17_3_PH	STABLE	STABLE	STABLE

Table 5. SUMMARY OF FAULT SIMULATION RESULTS

5.0 Conclusion

No stability concerns presently exist for the GEN-2005-006 wind farm as proposed and studied.

Due to collector system losses, the Customer is required to install a 138kV, 31.2 MVAR staged capacitor bank at the Customer substation 138kV bus.

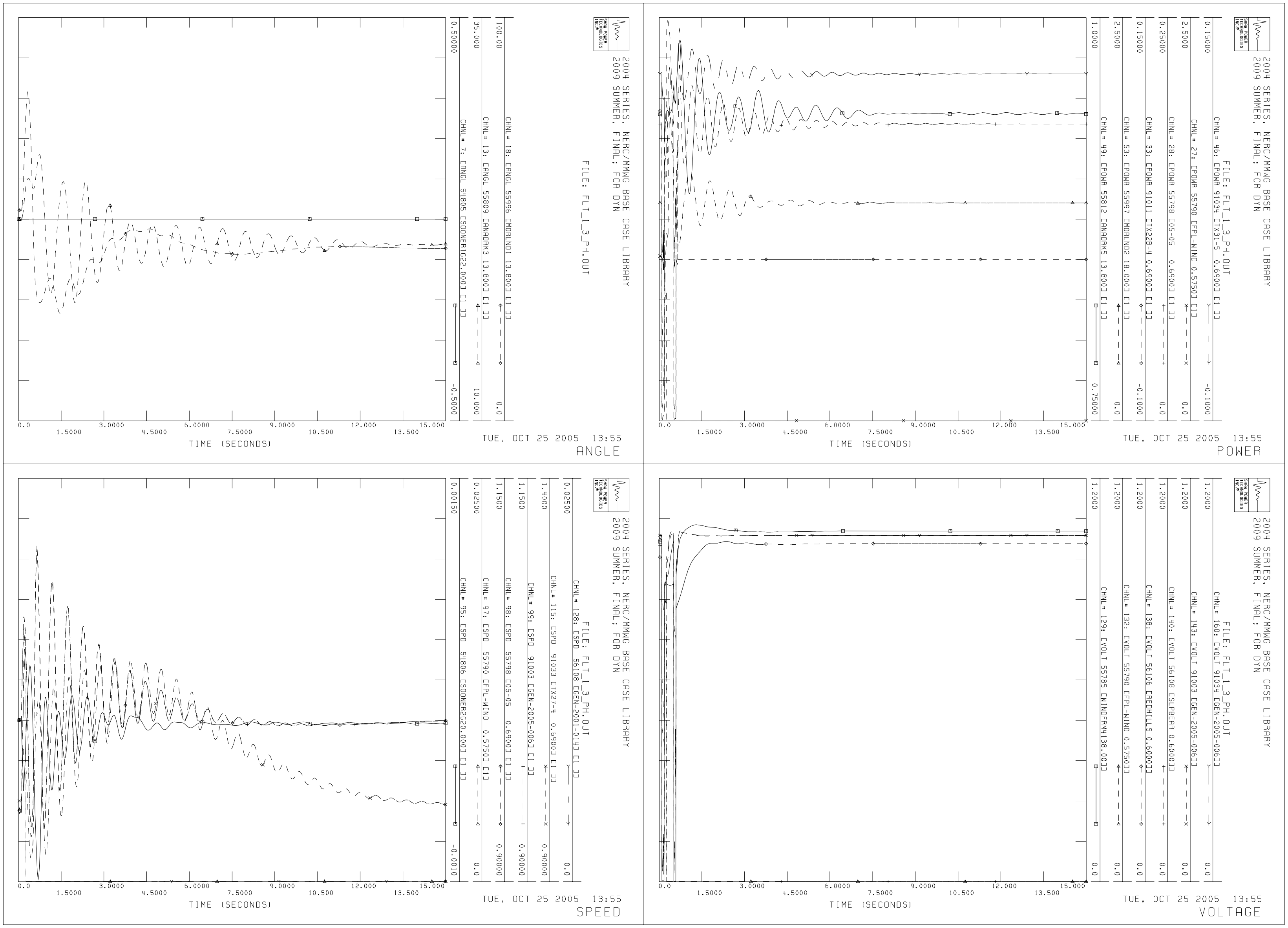
The Network Upgrade cost of interconnecting the Customer project approximately $439,785. The interconnection facilities will be further defined by a Facility Study if requested by the Customer. This figure does not address the cost of the Customer substation, the 138kV capacitor bank, or the transmission line between the Customer substation and the OG&E Woodward substation.

The costs do not include any costs associated with the deliverability of the energy to final customers. These costs are determined by separate studies if the Customer requests transmission service through Southwest Power Pool's OASIS. It should be noted that the models used for simulation do not contain all SPP transmission service.

APPENDIX A.

SELECTED STABILITY PLOTS

All Plots available upon request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TUE, OCT 25 2005 13:55
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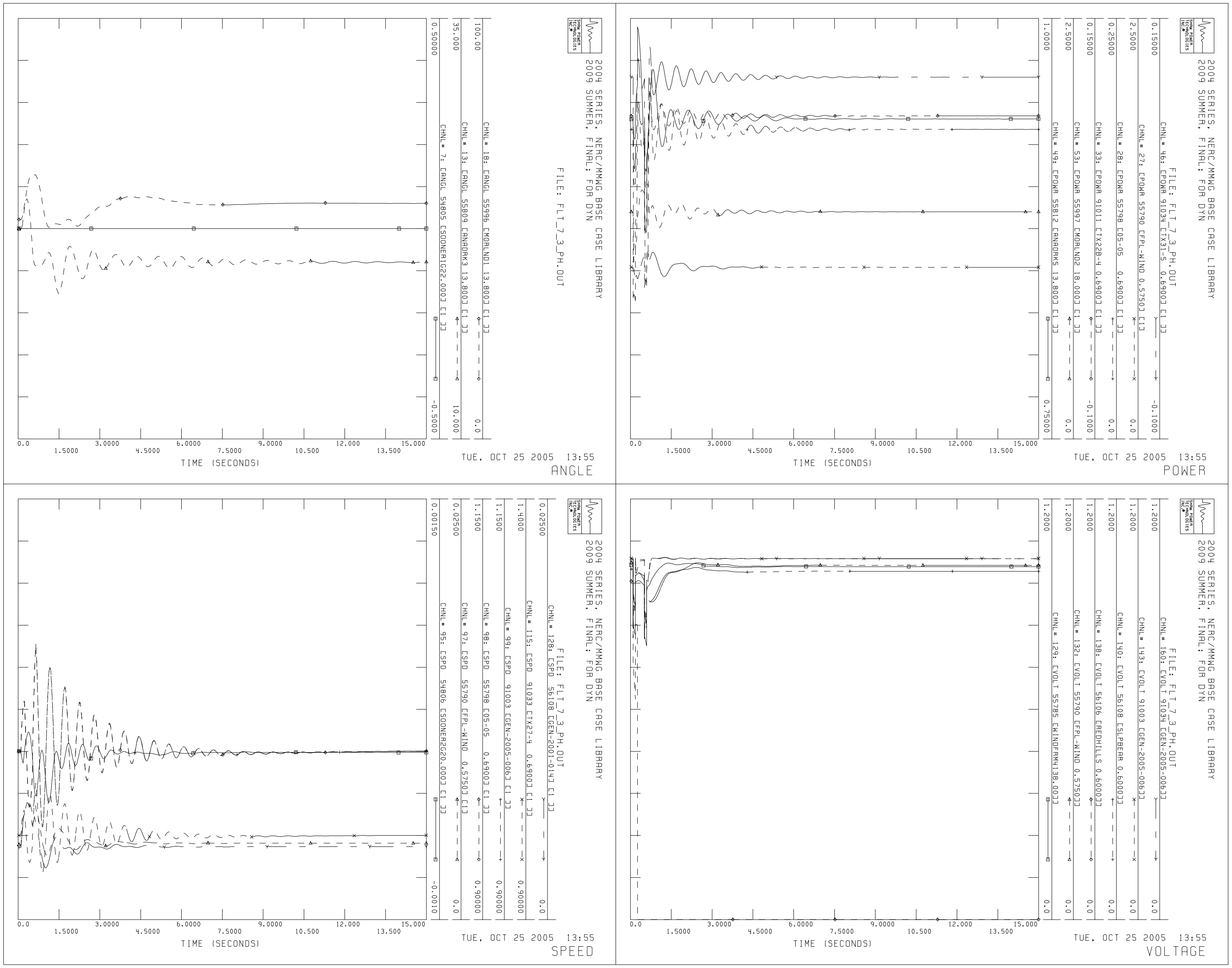
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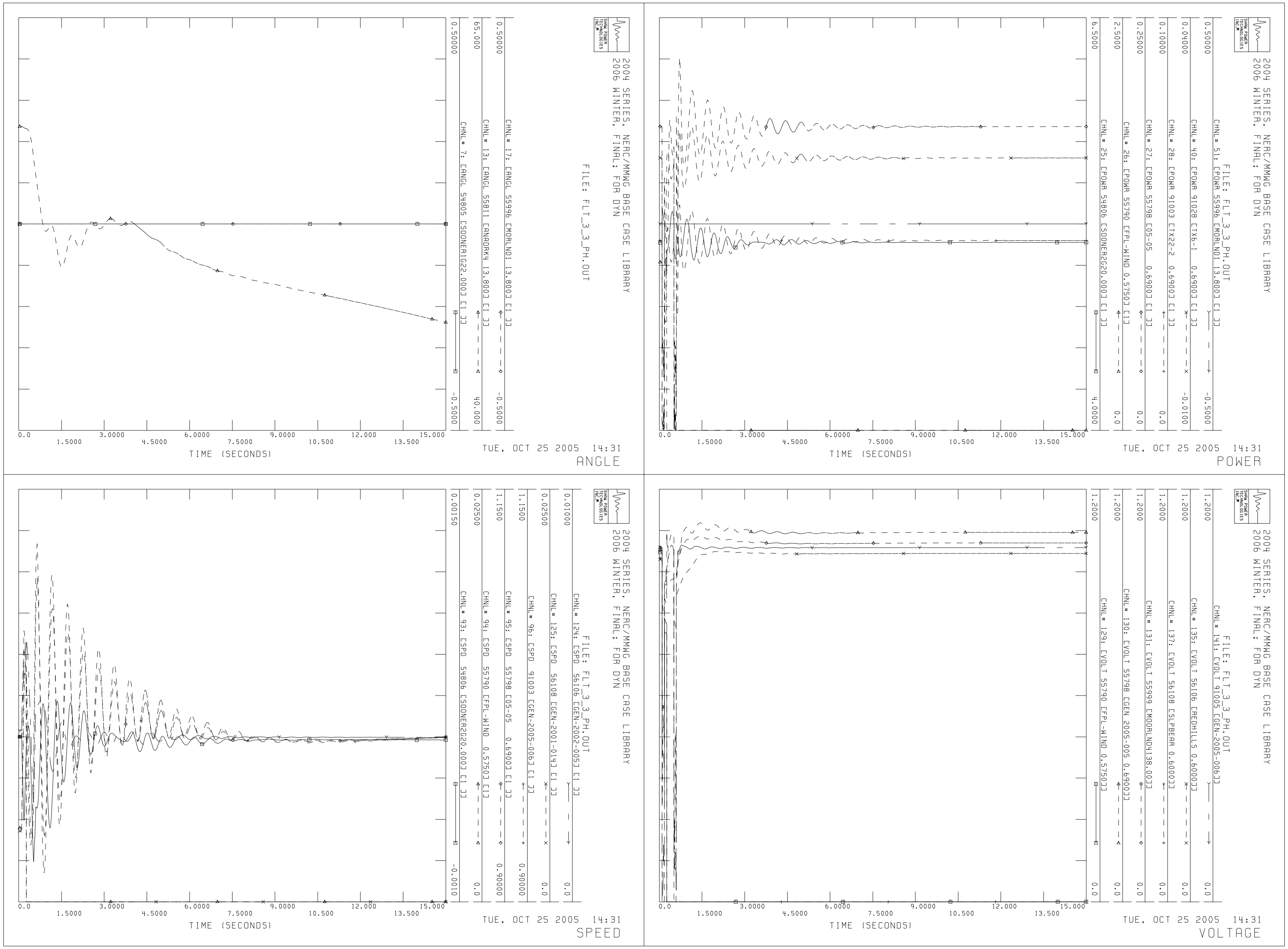
TIME (SECONDS)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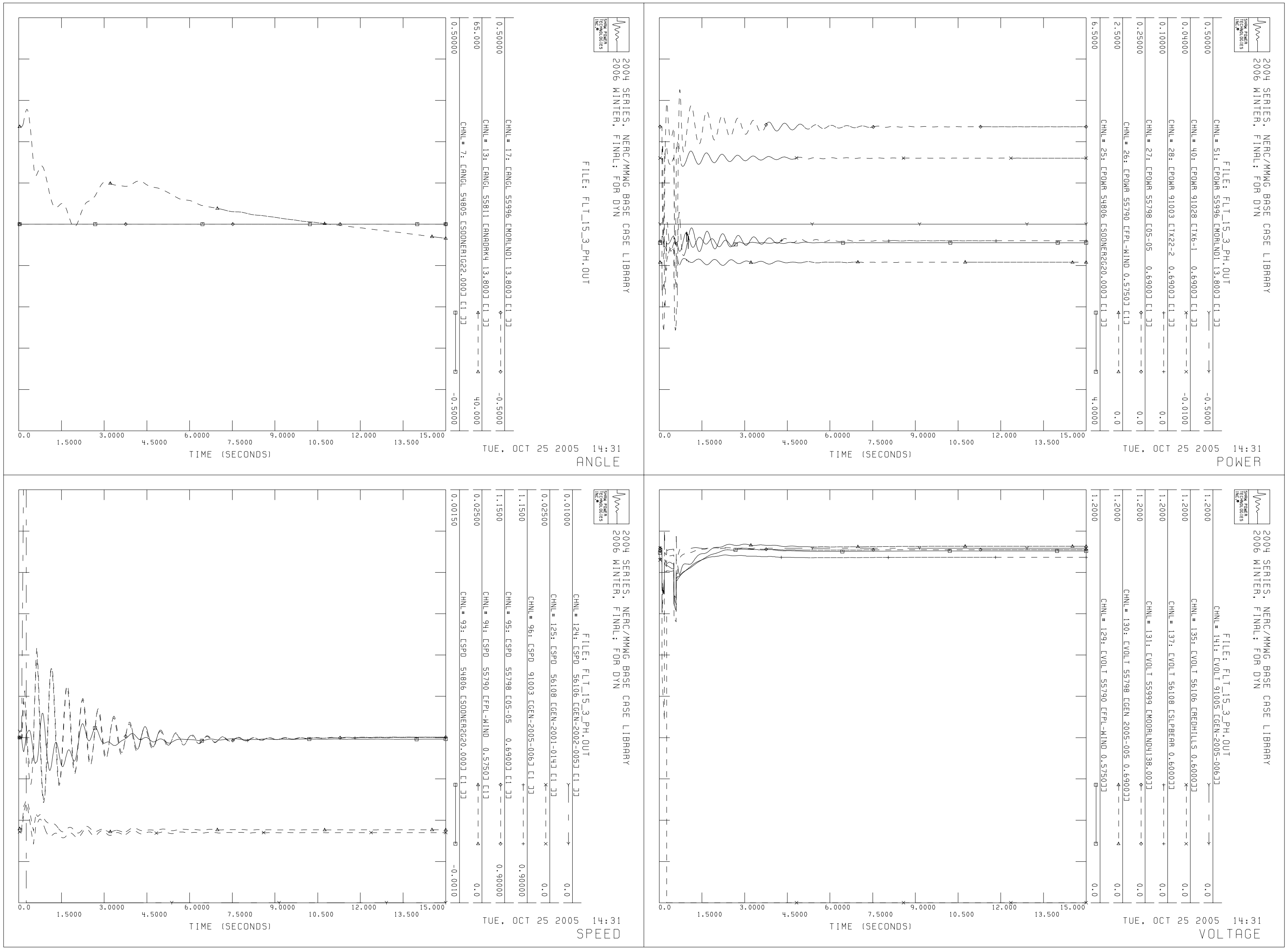
VOLTAGE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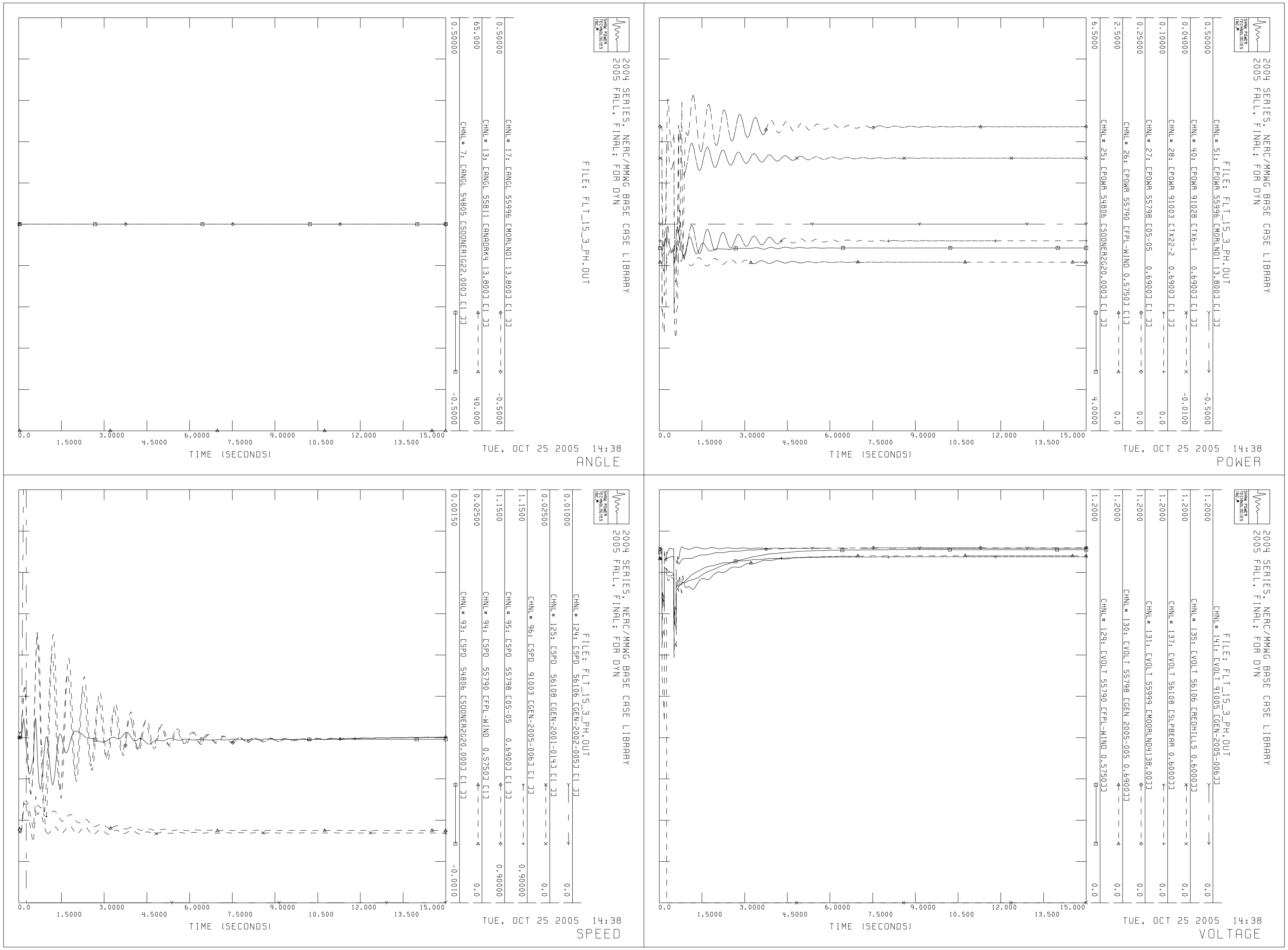
SPEED
VOLTAGE


2004 SERIES, NERC/MMWG BASE CASE LIBRARY
2005 FALL, FINAL, FOR DYN
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CHNL# 17: [ANGL 55996 [MORLND1 13.800] [1]]
CHNL# 13: [ANGL 55811 [MNAORK4 13.800] [1]]
CHNL# 7: [ANGL 54805 [SOONERIG22.000] [1]]
TIME (SECONDS)
TUE, OCT 25 2005 14:38
ANGLE
CHNL# 51: [POWR 55996 [MORLND1 13.800] [1]]
CHNL# 40: [POWR 91028 [TX6-1 0.690] [1]]
CHNL# 28: [POWR 91003 [TX22-2 0.690] [1]]
CHNL# 27: [POWR 55798 [O5-05 0.690] [1]]
CHNL# 26: [POWR 55790 [FPL-WIND 0.575] [1]]
CHNL# 25: [POWR 54806 [SOONER2G20.000] [1]]
TIME (SECONDS)
TUE, OCT 25 2005 14:38
POWER
CHNL# 124: [SPD 56106 [GEN-2002-005] [1]]
CHNL# 125: [SPD 56108 [GEN-2001-014] [1]]
CHNL# 96: [SPD 91003 [GEN-2005-006] [1]]
CHNL# 95: [SPD 55798 [O5-05 0.690] [1]]
CHNL# 94: [SPD 55790 [FPL-WIND 0.575] [1]]
CHNL# 93: [SPD 54806 [SOONER2G20.000] [1]]
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TUE, OCT 25 2005 14:38
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CHNL# 141: [VOLT 91005 [GEN-2005-006]]
CHNL# 135: [VOLT 56106 [REDHILLS 0.600]]
CHNL# 137: [VOLT 56108 [SLPBEAR 0.600]]
CHNL# 131: [VOLT 55999 [MOORLND4138.00]]
CHNL# 130: [VOLT 55798 [GEN 2005-005 0.690]]
CHNL# 129: [VOLT 55790 [FPL-WIND 0.575]]
TIME (SECONDS)
TUE, OCT 25 2005 14:38
VOLTAGE