"hereof", "herein", "hereto" and words of similar import shall be deemed references to this Agreement as a whole and not to any particular Article or other provision hereof or thereof; (7) "including" (and with correlative meaning "include") means including without limiting the generality of any description preceding such term; and (8) relative to the determination of any period of time, "from" means "from and including", "to" means "to but excluding" and "through" means "through and including".

25.9 Reservation of Rights. Provider shall have the right to make a unilateral filing with the KPSC to modify this Agreement with respect to any rates, terms, and conditions, charges, classifications of service, rule or regulation, and Customer shall have the right to make a unilateral filing with the KPSC to modify this Agreement; provided that each Party shall have the right to protest any such filing by the other Party and to participate fully in any proceeding before the KPSC in which such modifications may be considered.

25.10 No Partnership. This Agreement shall not be interpreted or construed to create an association, joint venture, agency relationship, or partnership between the Parties or to impose any partnership obligation or partnership liability upon either Party. Neither Party shall have any right, power or authority to enter into any agreement or undertaking for, or act on behalf of, or to act as or be an agent or representative of, or to otherwise bind, the other Party.

25.11 Counterparts. This Agreement may be executed in counterparts, each of which shall be deemed to be an original and all of which together shall be deemed to be one and the same instrument.

IN WITNESS WHEREOF, the Parties hereto have caused this Agreement to be duly executed by their duly authorized officers on the day and year first above written.

BIG RIVERS ELECTRIC CORPORATION

5-20-05

By: Michael Core **Date**
Title: Pres / CEO

THOROUGHBRED GENERATING COMPANY, LLC

5/16/05

By: Jacob A. Williams **Date**
Title: Vice President

APPENDIX A - INTERCONNECTION FACILITIES

This Appendix A is a part of the Interconnection and Operating Agreement between Customer and Provider.

Point of Interconnection

The Points of Interconnection between Customer and Provider will be located at the transmission line dead-end structures of each Wilson EHV-to-Thoroughbred 345 kV circuit. These points will be located at or near, but not inside, the Thoroughbred switchyard. See Drawing No. BRSD-200, dated 6-4-04, which drawing is attached hereto and made a part hereof.

Facilities to be Furnished by Provider

Provider shall construct, own, operate, and maintain, at Customer's sole expense, the following Interconnection Facilities made necessary by Customer's interconnection of its Facility with the Transmission System under this Agreement:

None.

Facilities to be Furnished by Customer

Customer shall construct, own, operate, and maintain, at Customer's sole expense, the following Interconnection Facilities made necessary by Provider's interconnection of its Facility with the Transmission Facility under this Agreement:

The Thoroughbred Switchyard and all facilities necessary to terminate and protect two 345 kV circuits. These two 345 kV circuits will connect the Wilson EHV Substation (Big Rivers) to the Thoroughbred Switchyard.

Cost Responsibility

Customer shall bear the expense of constructing, operating, and maintaining the Interconnection Facilities.

APPENDIX B - NETWORK UPGRADES

This Appendix B is a part of the Interconnection and Operating Agreement between Customer and Provider.

Network Upgrades

Pursuant to Section 9.2, Customer shall, in coordination with Provider, arrange for the design, construction, and installation of the following Network Upgrades at its own expense. Customer shall engineer, procure equipment, and construct the Network Upgrades using Good Utility Practice and using standards and specifications provided in advance by Provider.

a. Wilson EHV-to-Thoroughbred 345 kV circuit. On a newly-acquired right-of-way, an 11-mile single circuit H-frame 345 kV line will be constructed.

b. Wilson EHV-to-Thoroughbred double circuit. On the same newly-acquired right-of-way described in paragraph a, an 11-mile double-circuit 345/161 kV single pole tubular steel line will be constructed. The 345 kV portion of this line will be used to connect Wilson EHV to Thoroughbred. The 161 kV portion of the line will be used as part of a Wilson EHV-to-Paradise 161 kV interconnection.

c. Wilson EHV-to-Paradise 161 kV circuit. This circuit will utilize the 161 kV portion of the double-circuit line described in paragraph b. The line will also require 13 miles of newly-acquired right-of-way and the construction of a 161 kV line using a single pole tubular steel design. This circuit will connect the Wilson EHV substation to TVA's Paradise substation with the line routed near Thoroughbred, but not terminated at that location.

d. A new 345 kV switching station will be constructed approximately 9 miles east of Owensboro, Kentucky. This station will connect the existing Wilson EHV-to-Coleman EHV 345 kV circuit (Big Rivers) to the existing Elmer Smith-to-Hardin County 345 kV circuit (Kentucky Utilities Company).

e. 161 kV and 345 kV Wilson EHV terminal facilities and 345 kV Coleman EHV terminal facilities necessary to terminate and protest the facilities described in paragraphs a, b, c, and d.

f. 161 kV facilities as required by TVA to terminate and complete the facility described in paragraphs b and c.

g. Terminal facilities as required by Owensboro Municipal Utilities and Kentucky Utilities Company to complete the facility described in paragraph d.

Owensboro Municipal Utilities, Kentucky Utilities Company, and TVA may require additional Network Upgrades not identified in this Appendix B.

Cost Responsibility

Pursuant to Section 9.2, Customer will arrange for the design, construction, and installation of the Network Upgrades at its own expense. In addition, Customer shall bear the expense of any additional Network Upgrade required by Owensboro Municipal Utilities, Kentucky Utilities Company, and TVA as described in this Appendix B, or any additional Network Upgrades required by third-party transmission providers not identified in this Appendix B, arising from Customer's interconnection.

Cost Estimate

Customer and Provider hereby acknowledge and agree that the cost listed below is only an estimate and that Customer hereby agrees that it is responsible for all actual costs, including any applicable taxes.

The total cost for the Network Upgrades is estimated to be $37,483,361.

Additional Network Upgrade costs will be incurred due to the additions and/or modifications required by Owensboro Municipal Utilities, Kentucky Utilities Company, and TVA as described in this Appendix B, or any additional Network Upgrades required by third-party transmission providers not identified in this Appendix B. Estimates for the cost of these additional Network Upgrades have not been provided to Big Rivers.

APPENDIX C - METERING EQUIPMENT

This Appendix C is a part of the Interconnection and Operating Agreement between Customer and Provider.

The metering facilities made necessary by Provider's interconnection of its Facility with the Transmission Facility under this Agreement shall be located at the following locations:

Metering Facilities to be Furnished by Provider

Provider, at Customer's expense, will provide, own, operate, and maintain metering instrumentation as required for on site metering and telemetering as follows:

[To be determined]

Customer and Provider hereby acknowledge and agree that the cost listed below is only an estimate and that Customer hereby agrees to and shall reimburse Provider for all actual costs, including any applicable taxes associated with Provider's construction of Metering Equipment, or Provider's acquisition of any Metering Equipment provided to Provider by Customer as set forth in this Appendix C. The cost for the Metering Equipment is estimated to be $300,000.

Customer hereby agrees to and Customer shall provide reasonable and adequate security, as determined within Provider's sole reasonable discretion, for payment and performance of obligations set forth in this Appendix C.

Metering Facilities to be Furnished by Customer

Customer, at Customer's expense, will provide, own, operate, and maintain metering instrumentation as required for metering the generation output and telemetering to a location specified by Provider as follows:

[To be determined]

APPENDIX D - DEVELOPMENT AND CONSTRUCTION SCHEDULE

Task/Subtask	Duration (days)	Start Date	Finish Date	Cost
Wilson 345-kV Expansion	**219**	**5/27/2009**	**3/27/2010**	**$3,940,752**
Design	100	5/27/2009	10/11/2009	
Equipment Procurement	120	7/30/2009	1/13/2010	
Construction	120	10/11/2009	3/27/2010	
Wilson 161-kV Expansion	**179**	**7/22/2009**	**3/27/2010**	**$1,363,935**
Design	60	7/22/2009	10/11/2009	
Equipment Procurement	120	7/30/2009	1/13/2010	
Construction	80	12/6/2009	3/27/2010	
EHV Switching Station	**360**	**12/14/2008**	**5/1/2010**	**$5,854,068**
Design	175	12/14/2008	8/15/2009	
Equipment Procurement	120	6/1/2009	11/15/2009	
Preliminary Construction	75	8/30/2009	12/12/2009	
Complete Construction	100	12/13/2009	5/1/2010	
Remote Terminal Modification	20	4/4/2010	5/1/2010	
345/161-kV Transmission Lines	**598**	**1/17/2008**	**5/1/2010**	**$26,224,606**
Permitting/ROW	260	1/17/2008	1/14/2009	
Design	130	11/18/2008	5/16/2009	
Equipment Procurement	80	4/15/2009	8/4/2009	
ROW Clearing	60	8/4/2009	10/24/2009	
Construction	175	9/1/2009	5/1/2010	
Big Rivers Engineering and Oversight				**$100,000**
Total Cost				**$37,483,361**
Thoroughbred First Fire	**May 1, 2010**			

APPENDIX E - OPERATION DATE

[Date

[Customer]
(Address]
[Address]
[Address)

Re: [Facility]

Dear _________________:

On [Date], Big Rivers Electric Corporation (the "Provider") and ____________________________ (the "Customer") completed to their mutual satisfaction all work on the [Facility] and associated interconnection facilities and related equipment required to interconnect the Facility with Transmission System and have energized the Facility in parallel operation with the Transmission System. This letter confirms that the Facility may commence commercial operation of the Facility and associated interconnection facilities effective as of' [Date, plus one day].

Thank you.

[Signature]
[Provider Representative]

APPENDIX F - REQUIREMENTS FOR CONNECTION OF GENERATION FACILITIES

1.0 Introduction

Big Rivers Electric Corporation ("Big Rivers") has prepared this document which outlines the minimum requirements for all generation facilities connecting to the Transmission System.

1.1 Background

In the present electric utility environment characterized by deregulation, open access to the transmission network, wholesale and retail competition, etc., there is wide recognition that electric system reliability, safety and quality of service are to be maintained. Maintaining reliability, safety and quality of service in this changing environment places additional challenges in the planning and operation of electric systems.

Each request to connect to the Big Rivers Transmission System will be reviewed to identify the facility impacts and necessary system improvements on the system. These reviews ensure that comparable treatment is given to all users, and that reliability, safety, and quality of service is maintained.

1.2 Scope

The scope of this document satisfies the NERC Planning Standards by identifying requirements for connections to the bulk transmission system at voltages generally 100 kV and above. This document also applies to connections to those systems designated as subtransmission facilities that are rated at lower voltages, which include 69 kV. Requirements applicable for all types of generation facilities, regardless of generation capacity, are covered. The minimum requirements pertaining to connected facilities are contained herein.

The requirements for initial facility connection apply equally to continued operation of existing connected facilities. Therefore, any upgrades, additions, enhancements, or changes of any kind to an existing connected facility are subject to Big Rivers review to ensure continued compliance with these requirements.

The scope of these documents is limited to the technical requirements for connected facility design and operation. Customers interested in the terms of transmission service should refer to the Big Rivers Open Access Transmission Tariff.

1.3 Objectives

Big Rivers, in its role as a transmission provider, has prepared this document based on the following objectives:

a) Maintain system reliability, personnel and equipment safety, and quality of service as new facilities are added to the transmission network and existing facilities are modified to meet customer load demands.

b) Ensure comparability in the requirements imposed upon the various entities seeking to connect facilities to the transmission network.

c) Satisfy compliance with NERC Planning Standard I.C.S1M1 and ECAR Document 6 pertaining to documentation of facility connection requirements by those entities responsible for system reliability.

d) Inform those entities that seek facility connections to the Big Rivers Transmission System of the various requirements for system reliability, safety of personnel and equipment, and quality of service.

e) Facilitate uniform and compatible equipment specification, design, engineering, and installation practices to promote safety and uniformity of service.

2.0 DESIGN REQUIREMENTS FOR CONNECTION

The Customer is responsible for installing appropriate equipment and facilities so that the generation is compatible with the Big Rivers Transmission System. The Customer is also responsible for meeting any applicable federal, state, and local codes. The minimum Big Rivers Transmission System connection requirements for generation are as follows.

2.1 Generator Frequency

The Customer's generating facility will provide a balanced, symmetrical, three phase interchange of electrical power with the Big Rivers Transmission System at a nominal frequency of 60 Hz.

2.2 System Protection

The Customer is responsible for providing adequate protection to Big Rivers facilities for conditions arising from the operation of generation under all Big Rivers transmission system operating conditions. The Customer is also responsible for providing adequate protection to their facility under any Big Rivers transmission system operating condition whether or not their generation is in operation. Conditions may include but are not limited to:

1. single phasing of supply,
2. transmission system faults,
3. equipment failures,
4. abnormal failures,

5. lightning and switching surges,
6. excessive harmonic voltages,
7. excessive negative sequence voltages,
8. separation from supply,
9. synchronizing generation,
10. re-synchronizing the Owner's generation after electric restoration of the supply.

More complete relaying system requirements are identified in Section 4.0.

2.3 Interrupting Device

All Customers shall provide three-phase circuit interrupting device with appropriate relaying systems (as stated in Section 4.0) to isolate the generation facilities from the Big Rivers supply for all faults, loss of Big Rivers supply, or abnormal operating conditions regardless of whether or not the Customer's generation is in operation.

This device shall be capable of interrupting the maximum available fault current at that location. The three-phase device shall interrupt all three phases simultaneously. The tripping control of the circuit interrupting device shall be powered independently of the utility AC source in order to permit operation upon loss of the Big Rivers transmission system connection.

The specific reclosing times for the Customer's circuit interrupting device will be provided by Big Rivers. It is the Customer's responsibility to design and maintain their interrupting device(s) to properly isolate generation upon loss of the Big Rivers connection until the appropriate Big Rivers facilities are returned to service.

2.4 System Grounding

The grounding of the Customer's system at the transmission voltage level will be considered on a case-by-case basis.

2.5 Voice Communication Circuit

The Customer will be required to established a dedicated voice communication circuit to the Big Rivers Control Center to permit coordination of the synchronization and operation of the generation.

2.6 Disconnecting Devices

A three phase air break switch or a three-pole single-throw disconnect switch shall be installed on each transmission line supply entrance to the Customer's facility and be accessible at all times. The disconnecting device shall be mechanically lockable in the open position with a Big Rivers padlock in order to provide for a visible electric isolation of the Customer's facility and shall be identified with a Big Rivers designated equipment number.

2.7 Disturbance Monitoring

The Customer's facility must have disturbance monitoring equipment per ECAR Document 14 and ECAR Document 10, Requirement 7.

2.8 Excitation Control

In addition to the normal excitation system and automatic voltage regulation equipment, the following controls are also required for each synchronous generator.

2.8.1 Reactive Compensation

A circuit should be provided in the automatic voltage regulator (AVR) to permit the control of voltage beyond the generator terminals. This is known as reactive line drop compensation. The point of control is to be adjustable over a range covering 0 to 15% reactance (on the generator base) beyond the generator terminals. Big Rivers' general practice is to regulate voltage at 6% back from the station bus (toward the generator).

2.8.2 Overcurrent Limiter

The excitation system is to be provided with a current limiting device which will supercede or act in conjunction with the

AVR to automatically reduce excitation so that generator field current is maintained at the allowable limit in the event of sustained under-voltages on the transmission system. This device must not prevent the exciter from going to and remaining at the positive ceiling for 0.1 seconds following the inception of a fault on the power system.

2.8.3 Underexcitation Limiter

A limiter to prevent instability resulting from generator underexcitation is required.

2.8.4 Power System Stabilizer

Studies may identify the need for the use of power system stabilizers, depending on the plant size, excitation system type and settings, facility location, area transmission system configuration and other factors.

2.9 Speed Governing

All synchronous generators shall be equipped with speed governing capability. This governing capability shall be unhindered in its operation consistent with overall economic operation of the generation facility. See also ECAR Document 10, Requirement 6. Overspeed protection in the event of load rejection is the responsibility of the Customer.

2.10 Automatic Generation Control (AGC)

Provision for dispatch control of the generation facility by Big Rivers Control Center AGC system may be required. This will be considered on a case-by-case basis and any provision for control by AGC should be included in a Interconnection Agreement between the Customer and Big Rivers.

2.11 Black Start Capability

The provision of blackstart capability may be required or desirable. A blackstart capable generation facility is one that can be started without the aid of off-site power supplied from the Transmission System.

2.12 Sub-Synchronous Torsional Interactions or Resonances

The provision of high speed reclosing following transmission line faults may result in excessive torsional duties. The Customer must provide Big Rivers with immunity from damaging torsional oscillations resulting from all Big Rivers Transmission System operations, and insure the turbine-generator is not excited into resonance by normal system operations.

2.13 Unbalanced Electric Conditions

2.13.1 Voltage Balance

All three-phase generation shall produce balanced 60 Hz voltages. Voltage unbalance attributable to the Customer combined generation and load shall not exceed 1.0% measured at the point-of-service. Voltage unbalance is defined as the maximum phase deviation from average as specified in ANSI C84-1, "American National Standard for Electric Power Systems and Equipment -- Voltage Ratings, 60 Hertz."

2.13.2 Current Balance

Phase current unbalance attributable to the Customer combined generation and load shall not exceed that which would exist with balanced equipment in service, measured at the point-of-interconnection.

2.14 Harmonics

The Customer shall take responsibility for limiting harmonic voltage and current distortion caused by their generation equipment. Limits for harmonic distortion (including inductive telephone influence factors) are consistent with those published in the latest issues of ANSI/IEEE 519, "Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems." Big Rivers may require the installation of a monitoring system to permit ongoing assessment of compliance with these criteria.

3.0 REQUIREMENTS FOR OPERATION

The Customer is responsible for operating its generation with full regard for the safe practices of, and with full cooperation under the supervision of the Big Rivers Control Center.

Under no circumstances shall a Customer energize Big Rivers transmission facilities which have been de-energized. Circuits which are electrically disconnected from the Big Rivers transmission system and are energized by a Customer constitute a potential safety hazard for both Big Rivers transmission personnel and the general public. Also, the energizing of such circuits at abnormal voltage or frequency could cause damage to electrical equipment of both the Big Rivers Transmission System and the generation.

The minimum requirements for operation of generation on the Big Rivers Transmission System are contained herein.

3.1 Synchronization

The Customer shall assume all responsibility for properly synchronizing their generation for operation with the Big Rivers Transmission System. Upon loss of the Big Rivers supply, the Customer shall immediately and positively cause the generation to be separated from the Big Rivers system. Synchronizing of generation to the Big Rivers Transmission System may be, at Big Rivers' discretion, performed under the direction of the Big Rivers Control Center.

3.2 Voltage Schedule

Specification of the generator voltage schedule will be determined under the direction of the Big Rivers Control Center. See also ECAR Document 10, Requirements 1-3. A steady-state deviation from this schedule between +0.5% to –0.5% of the nominal voltage will be permissible.

3.3 Voltage Range

The generation facility must be capable of continuous non-interrupted operation within a steady-state voltage range during system normal and single facility outage conditions. This range is from 91.7% to 105.8% range. All reasonable measures should be taken to avoid tripping of the generation facility due to high or low voltage.

3.4 Frequency Range

The generation facility must be capable of continuous, non-interrupted operation in the frequency range of 59.5 to 60.5 Hz. Limited time, non-interrupted operation is also expected outside this frequency range in accordance with the generator manufacturer's recommendation.

3.5 Net Demonstrated Real and Reactive Capabilities

The Net Demonstrated real capability in accordance with ECAR Document No. 4, must be provided to Big Rivers annually. Big Rivers reserves the right to witness these tests.

In addition, individual generators in the generation facility must make available the full steady-state over- and under-excited reactive capability given by the manufacturer's generator capability curve at any MW dispatch level. Tests which demonstrate this capability must be conducted and documented not more than at five-year intervals in accordance with ECAR Document 4. Such documentation shall be provided to Big Rivers. Big Rivers reserves the right to witness these tests.

3.6 Other Applicable Operating Requirements

In order to assure the continued reliability of the Big Rivers Transmission System, the Customer may be requested to adhere to other operating requirements and/or encouraged to adopt common operating practices. These include the coordination of maintenance scheduling, performance not to exceed a specified forced outage rate, operations procedures during system emergencies, participation in control area operating reserves, provisions for backup fuel supply or storage, and provisions for emergency availability identified by the North American Electric Reliability Council. Big Rivers, as the Transmission Provider, may require the Customer to provide Interconnected Operation Services defined by NERC under Policy 10.

Conformance with applicable requirements in ECAR Documents, particularly Document 4, "Criteria and Methods for the Uniform Rating of Generation Equipment," Document 10, "Criteria for Generation Control and Documentation," and Document 14, “Disturbance Monitoring Equipment,” is required. All data reportable to ECAR and/or NERC shall also be made available to Big Rivers.

3.7 Make-Before-Break Transfer

Make-before-break transfer is only permitted between two live sources, which are in, or close to, synchronism. A transfer switch designed for automatic make-before-break transition shall be equipped with logic to prevent a transfer if the specifications for either the Customer or the Big Rivers transmission system source fall outside of the synchronizing requirements recommended by the generator equipment manufacturer. Switch transfers made when the synchronizing requirements cannot be met shall be of the break-before-make type of transfer. The time that the Customer’s generation is permitted to operate in parallel with the Big Rivers Transmission System during a make-before-break transfer shall be no greater than 100 milliseconds (6 cycles).

4.0 PROTECTIVE RELAYING

Customer relay requirements are summarized in Section 2.2. Specific requirements are noted below.

4.1 Parallel Generation Facility

The following utility-grade relays shall be provided by the Customer for protection of the Big Rivers system. Use of the transfer trip receiver is conditional as set forth in Section 4.2, Big Rivers Facilities. All relays specified for the protection of the Big Rivers system, including time delay and auxiliary relays, shall be approved by Big Rivers. Relay operation for any of the listed functions shall initiate immediate separation of the Customer’s generation from the Big Rivers Transmission System.

Relay	Function
Frequency	To detect under frequency and over frequency operation.
Overvoltage	To detect overvoltage operation.
Undervoltage	To detect undervoltage operation.
Ground Detector	To detect a circuit ground on the Big Rivers system (applicable to three-phase circuits only).
Directional Overcurrent	To detect the directional flow of current in excess of a desired limit.

Transfer Trip Receiver	To provide tripping logic to the generation for isolation of the generation upon opening of the Big Rivers supply circuits.
Directional Power	To detect under all system conditions, a loss of Big Rivers primary source. The relay shall be sensitive enough to detect transformer magnetizing current supplied by the generation.

The purpose of these relays is to detect the Customer's energization of an Big Rivers circuit that has been disconnected from the Big Rivers system, to detect the generation operating at an abnormal voltage or frequency, or to detect a fault or abnormal condition on the Big Rivers system for which the Customer shall separate their generation.

Output contacts of these relays shall directly energize the trip coil(s) of the generator breaker or an intermediate auxiliary tripping relay which directly energizes the breaker trip coil(s). The relaying system shall have a source of power independent from the AC system or immune to AC system loss or disturbances (e.g., DC battery and charger) to assure proper operation of the protection scheme. Loss of this source shall cause removal of the generation from the Big Rivers system. The protective relays required by Big Rivers and any auxiliary tripping relay associated with those relays shall be utility-grade devices.

Utility grade relays are defined as follows:

1. Meet ANSI/IEEE Standard C37.90, "Relays and Relay Systems Associated with Electric Power Apparatus."

2. Have relay test facilities to allow testing without unwiring or disassembling the relay.

3. Have appropriate test plugs/switches for testing the operation of the relay.

4. Have targets to indicate relay operation.

Big Rivers will specify settings for the Big Rivers-required relays to assure coordination between the generation protective equipment and the Big Rivers system relays. It is the Customer's responsibility to determine that their internal protective equipment coordinates with the required Big Rivers protective equipment and is adequate to meet all applicable standards to which the generation is subject. Big Rivers further reserves the right to modify relay settings when deemed necessary to avoid safety hazards to utility personnel or the public and to prevent any disturbance, impairment, or interference with Big Rivers' ability to serve other customers.

4.2 Big Rivers Facilities

If at any time it is determined that the use of the above relay systems cannot provide adequate protection to the Big Rivers system, the Customer shall furnish and install upon the request of Big Rivers, a transfer trip receiver(s) at its facility to receive tripping signals originating from a Big Rivers location(s). This additional protection would also necessitate the purchase and installation of transfer trip equipment at the Big Rivers' location(s) and a communication channel between the Big Rivers location(s) and the generation facility.

4.3 Other Protection Requirements

The following items should be coordinated with each other.

- Volts/Hz and overexcitation protection/limiting.
- Loss-of- excitation and underexcitation limiting.

See also ECAR Document 10, Requirements 4, 5 and 7.

5.0 SUPERVISORY CONTROL AND DATA ACQUISITION

At the discretion of Big Rivers, generation control facilities and supervisory control and data acquisition of specific electrical devices from the Big Rivers Control Center may be necessary to integrate the generation into Big Rivers' control area. Such additional facilities, including required communication channels, shall, if required, be furnished and installed by the Customer. The requirement for data acquisition and control will depend on the generation capacity, system location and voltage, and the net generation input into Big Rivers System.

Data acquisition and control information will typically include, but not be limited to:

1. III. desired generation MW set point,
2. IV. automatic generation control status (on, off),
3. V. generator availability,
4. VI. generation MW, Mvar output,
5. VII. generator minimum and base MW capability,
6. VIII. generator MW AGC high limit and low limit,
7. IX. connection facilities' breaker status/control/alarms,
8. X. connection facilities' MW and Mvar line values and bus voltage, and
9. XI. generator and substation metering (MWh) data.

6.0 COMMUNICATIONS

6.1 Voice Communications

A. Normal – At Big Rivers' request, the Customer shall provide a dedicated voice communication circuit to the Big Rivers Control Center. Such a dedicated voice communication circuit would originate from the Customer's office staffed 24 hours a day and would be typically required for generation facility synchronization and operation within Big Rivers' Control Area.

All other normal voice communication concerning facility operations shall be conducted through the public telephone network to the Control Center phone number(s) issued by Big Rivers.

B. Emergency – Voice communication in the event of a transmission system or energy emergency shall use the dedicated voice circuits, or public telephone network and phone number(s) designated for emergency use.

In the event of a transmission system or energy emergency, the Customer may be notified by the Big Rivers Control Center. Specific instructions may also be given regarding the operation of the Customer's unit(s) depending on the nature of the emergency. These instructions may consist of voltage schedule changes, real and/or reactive dispatch changes, or instructions to shut down or start-up the Owner's unit(s). It is the Owner's responsibility to ensure that the unit operators follow all instructions given by the Big Rivers Control Center during system emergencies.

APPENDIX G - ESTIMATE OF PROVIDER'S COST FOR OVERSIGHT OF DESIGN, CONSTRUCTION, AND INSTALLATION OF INTERCONNECTION FACILITIES AND NETWORK UPGRADES

Provider expects to incur approximately $100,000 in costs in providing oversight with respect to the design, construction, and installation of the Interconnection Facilities and Network Upgrades and in reviewing, inspecting, and accepting the Interconnection Facilities and Network Upgrades.

The provision by Provider to Customer of this or any other such cost estimate shall not diminish, change, or affect Customer's responsibility and obligation to pay to Provider its actual costs in accordance with Section 13.1 of this Agreement. Provider shall revise such cost estimate from time to time as may be necessary.

APPENDIX H - SCHEDULE OF PAYMENTS

Invoices issued by Provider pursuant to this Agreement shall cover the appropriate share of Estimated Costs identified in Appendix G and any additional costs attributable to the acceleration of the work governed by this Agreement,

The following Schedule shall apply to the issuance and payment of invoices:

Invoices Issued On or About	**Payment Due Date**
Date of Parties' execution of this Agreement	30 days after issuance
[To be determined]	30 days after issuance
[To be determined]	30 days after issuance
[To be determined]	30 days after issuance
and quarterly thereafter	30 days after issuance

Invoices Issued On or About	**Payment Due Date**
Completion of work	30 days after issuance
Cancellation	30 days after issuance

Provider, at its discretion, may include reconciliation costs as part of a standard invoice rather than issue a separate invoice for reconciliation costs alone

APPENDIX I - ESTIMATED O&M SECURITY

Pursuant to Section 6.1.2, during the Transmission Refund Period, at Provider's request, Customer shall provide Provider with O&M Security in an amount equal to Provider's estimated O&M obligations for one year under this Agreement, including any applicable taxes. Provider estimates that its O&M obligations for one year under this Agreement, including any applicable taxes, will be $50,000.

APPENDIX J - DETERMINATION OF CUSTOMER LOSS FACTOR

Initial Calculation of Loss Factor

The initial transmission system loss factor applied to all Thoroughbred transactions will be calculated with a summer peak MMWG power flow base case model and the Big Rivers average system loss rate. The initial calculation will be made no sooner than 12 months prior to the commencement of transmission service. The MMWG model should be the most up-to-date model available at that time. The average system loss rate will be the rate in effect for Big Rivers at the time the calculation is made. A multiplier will be calculated from the power flow model and applied to the average system losses. The resulting loss factor will be applied to all Thoroughbred transactions. The intent of this calculation and resulting Thoroughbred loss factor is to maintain the existing customer loss rates at the most recent pre-Thoroughbred system average loss rate.

This multiplier will be calculated by the following method (the values shown were calculated with a 2010 summer peak model):

1. With the BREC units fully dispatched, total system MW losses will be calculated. This is a "without Thoroughbred" loss amount (22.7 MW which represents a 1.25% loss rate).

2. With the BREC units and Thoroughbred fully dispatched, total system MW losses will be calculated. This is the "with Thoroughbred" loss amount. The "with" total less the "without" total is the losses directly attributable to Thoroughbred (40.4 MW- 22.7 MW = 17.7 MW which represents a 2.36% loss rate when applied to a 750 MW Thoroughbred dispatch).

3. This peak load Thoroughbred loss rate is 1.89 times higher than the "without" loss rate (2.36/1.25=1.888).

4. The multiplier calculated in step 3 should be applied to the system average loss rate in effect when Thoroughbred is put into service. With the existing rate and the 2010 summer study results, the resulting Thoroughbred loss factor would be 1.68% (1.89*.89).

Recalculated Loss Factor

Twelve months after the commercial operation date of the Facility and at the end of each year thereafter(during the Transmission Refund Period), the overall Big Rivers loss rate should be reviewed with the Thoroughbred loss factor recalculated as necessary. The goal of this loss factor recalculation is to maintain the Big Rivers loss rate at the pre-Thoroughbred level for the duration of the Transmission Refund Period. The recalculation will be accomplished by using the actual data from the Big Rivers loss calculation.

The loss factor review will include recalculating the Big Rivers loss rate with Thoroughbred receipts (metered data) and deliveries (receipts less losses calculated with the Thoroughbred loss rate) removed from the loss calculation formula (total energy received by Big Rivers/total energy delivered by Big Rivers = losses). If the resulting loss rate is greater than the pre-Thoroughbred rate, the Thoroughbred loss rate will be increased. Alternatively, the Thoroughbred loss rate will be reduced if the loss rate is lower than the pre-Thoroughbred average annual rate.

An example follows:

Pre-Thoroughbred system loss rate: .89%
Thoroughbred loss factor: 1.68% (applied to receipts)
Total Big Rivers energy receipts (incl. Thoroughbred): 25,300,000 MWh
Total Big Rivers energy delivered (incl. Thoroughbred): 25,000,000 MWh
Resulting overall loss rate: 1.2%
Thoroughbred receipts (metered amounts): 5,000,000 MWh
Thoroughbred calculated losses: 5,000,000*.0168 = 84,000 MWh
Thoroughbred calculated deliveries: 5,000,000 – 84,000 = 4,916,000 MWh

BREC receipts less Thoroughbred receipts: 25,300,000 – 5,000,000 = 20,300,000
BREC deliveries less Thoroughbred deliveries: 25,000,000 – 4,916,000 = 20,084,000
BREC losses: 216,000 MWh
BREC (no Thoroughbred) calculated loss rate: 1.075%

To get to the target rate of .89%:

0.89% = losses/20,084,000 therefore target losses = 178,748 MWh
BREC losses above target: 216,000 - 178,748 = 37,252 MWH
Add 37,252 MWh of losses to Thoroughbred rate:
37,252/5,000,000: loss rate = .745% (increase Thoroughbred rate by this)

Resultant new Thoroughbred loss factor: 1.68% + .745% = 2.425%

The loss rate mechanism will be reviewed if any significant transmission system modifications are made (i.e. generation additions, the loss or addition of any large industrial load, etc.). Customer has the right to audit the initial or recalculated loss factor established for Thoroughbred.

SUMMARY OF TERMS AND CONDITIONS OF THE INTERCONNECTION AND OPERATING AGREEMENT BY AND BETWEEN BIG RIVERS ELECTRIC CORPORATION AND THOROUGHBRED GENERATING COMPANY, LLC DATED AS OF MAY 20, 2005

The Interconnection and Operating Agreement by and between Big Rivers Electric Corporation ("Big Rivers") and Thoroughbred Generating Company, LLC ("Thoroughbred"), dated as of May 20, 2005 ("IOA"), governs the terms and conditions under which Thoroughbred may interconnect its proposed electric generating facility ("Facility") with the transmission system owned and operated by Big Rivers. Big Rivers and Thoroughbred are referred to as "Party" or "Parties".

On February 7, 2001, Thoroughbred applied to Big Rivers for interconnection service for a 750 MW coal-fired electric generating facility to be located in Muhlenberg County, Kentucky. Big Rivers processed Thoroughbred's application for interconnection service pursuant to Big Rivers' standard "Procedures and Requirements for Adding Generation to Big Rivers' Transmission System," and in accordance with those procedures, Big Rivers conducted necessary studies and analyses. After extensive negotiations conducted over the course of thirteen months, Big Rivers and Thoroughbred entered into the IOA on May 20, 2005.

The IOA provides terms and conditions for the development and construction of the "Interconnection Facilities" that will interconnect the Facility with the Big Rivers transmission system and "Network Upgrades" to the Big Rivers transmission system necessary to accommodate the Facility's interconnection; for the parties' respective rights, obligations, and liabilities with respect to the ongoing operation of the Facility and the Interconnection Facilities in parallel with the Big Rivers transmission system; and for the termination of service and disposition of facilities developed pursuant to the IOA. This memo provides a summary of the IOA's substantive terms on an article-by-article basis.

Article 1. Definitions. Article 1 provides definitions for the terms used throughout the IOA.

Article 2. Term and Termination. The IOA is effective as of the Effective Date of May 20, 2005, as identified in the first paragraph of the IOA, provided that the parties' respective obligations will arise upon the receipt of required regulatory approvals. The IOA obligates Big Rivers to file the IOA with the Kentucky Public Service Commission ("KPSC") and the Rural Utilities Service ("RUS") to the extent required by applicable law, contract, regulation, or order.

The term of the IOA commenced on the May 20, 2005, Effective Date, and will continue in effect for an initial term of thirty (30) years. Thereafter the IOA will automatically renew for successive one-year terms until terminated by the parties or by the IOA's own terms.

Article 2 identifies several events under which the IOA will terminate or is terminable: (1) KPSC and/or RUS approval is not obtained; (2) the parties mutually agree to terminate the IOA or Thoroughbred provides ninety (90) days' prior written notice of termination; (3) Big Rivers terminates the IOA for Thoroughbred's failure to make reasonable progress toward meeting the development and construction milestones identified in Appendix D; or (4) either party terminates the IOA pursuant to Article 17 in the event of a party's default.

In the event of a material change in law or regulation that adversely affects, or is reasonably expected to affect, either party's performance under the IOA, the parties will negotiate appropriate amendments to the IOA to adapt it to the change. If the parties are unable to agree to such amendments, Big Rivers (and Thoroughbred, to the extent permitted by law) may file changes to the IOA with the KPSC.

Any termination of the IOA is subject to applicable regulatory requirements, and no termination will be effective until the parties have complied with any such requirements.

Upon termination, Thoroughbred will forfeit any remaining value of transmission credits provided under the IOA. Following termination the parties will disconnect the Facility from the Big Rivers transmission system at Thoroughbred's expense, unless the termination results from Big Rivers' default, and Thoroughbred will retire the Interconnection Facilities. The provisions of the IOA will survive the IOA's termination to the extent necessary to provide for final billings and payments of pre-termination costs, the determination and enforcement of liability and indemnification obligations for pre-termination acts or events, and to allow the parties access to each other's property to allow the decommissioning of facilities and equipment.

Article 2 also governs the disposition of unfinished Network Upgrade facilities if the IOA is terminated before Thoroughbred has completed some or all of the Network Upgrades contemplated by the IOA and transferred them to Big Rivers' ownership. In that event, Big Rivers has the option, at its sole discretion and subject to receipt of KPSC approval and favorable rate treatment, of taking ownership of all or some of the unfinished Network Upgrades. If Big Rivers elects not to take ownership of any of the unfinished Network Upgrades, or elects to take ownership of only a portion of the unfinished Network Upgrades, Thoroughbred will pay all of Big Rivers' costs associated with the development and construction of the unfinished Network Upgrades that Big Rivers will not own, and Thoroughbred will be responsible for the removal, relocation, or other disposition of the unfinished Network Upgrades. Absent Big Rivers' written approval, Thoroughbred may not abandon unfinished Network Upgrade facilities in place.

If Big Rivers elects to take ownership of some or all of the unfinished Network Upgrades, Thoroughbred will be responsible for securing the maintaining the unfinished facilities during the pendency of Big Rivers' KPSC proceeding for approval and rate treatment for the new facilities. In that KPSC filing, Big Rivers will request authorization to reimburse Thoroughbred its costs of constructing the unfinished Network Upgrade facilities that will be transferred to Big Rivers and Thoroughbred's costs of maintaining those facilities prior to transferring them to Big Rivers. If the KPSC approves Big Rivers' acquisition of unfinished Network Upgrades but denies rate treatment that would allow Big Rivers to reimburse Thoroughbred for all its costs with respect to those unfinished facilities, Thoroughbred may refuse to transfer the facilities to Big Rivers, in which case Thoroughbred will bear Big Rivers' KPSC-related costs.

Article 3. Interconnection Service. "Interconnection Service" is defined generally as the services provided by Big Rivers under the IOA and entails Big Rivers' provision of Interconnection Service at the "Points of Interconnection" defined in Appendix A during the term of the IOA, subject to the limitations, terms, and conditions set forth in Article 3. Article 3 more precisely defines the scope of Interconnection Service by specifying what services are not provided under the IOA.

By definition, "Interconnection Service" does not encompass transmission service on the Big Rivers transmission system. Specifically, Big Rivers has no obligation to provide or arrange for transmission service, no obligation to procure station power for the Thoroughbred Facility, and no obligation to pay Thoroughbred for power or ancillary services (other than pursuant to Section 4.6.4, which allows Thoroughbred to charge Big Rivers for reactive power from the Facility if Thoroughbred files an appropriate rate schedule with the Federal Energy Regulatory Commission). The IOA makes clear that Thoroughbred's interconnection service arrangements do not give it a right to take transmission service on the Big Rivers system and do not constitute a request for transmission service. Big Rivers is entitled to suspend its provision of Interconnection Service at times it is entitled, pursuant to Section 4.9, to disconnect the Facility from the Big Rivers transmission system.

Article 3 specifies a number of conditions precedent to Big Rivers' obligation to provide Interconnection Service: (1) Big Rivers has inspected and declared the Interconnection Facilities to be ready for service; (2) Thoroughbred has satisfied the design, specifications, installation, and construction requirements imposed in the IOA and has installed adequate system protection facilities; (3) all Network Upgrades identified in Appendix B have been installed and are operational; and (4) Big Rivers has tested and accepted the metering equipment specified in Appendix D. In addition, Thoroughbred must make arrangements for "generator balancing service" to ensure that its actual Facility energy output to the Big Rivers transmission system matches its scheduled deliveries. The IOA identifies Thoroughbred's options for satisfying its balancing obligations.

Each Party is are required to report to the other if it becomes unable to comply with its obligations under the IOA, and the Parties agree to cooperate to gain restoration of compliance. Big Rivers is not obligated to report to Thoroughbred on third-party interconnections with the Big Rivers transmission system that may affect Thoroughbred's Facility or the availability of transmission service on the Big Rivers transmission system, and Big Rivers makes no guarantees about the availability of transmission service.

The interconnection of the Thoroughbred Facility with the Big Rivers transmission system will cause increased transmission line power losses, and Thoroughbred will be responsible to replacing those increased losses during the transmission refund period established in the IOA. Appendix J establishes a methodology for calculating a loss factor that will apply to transmission service sources from the Facility. Thoroughbred will be responsible for replacing increased losses regardless of whether or not it is the customer taking the transmission service sourced from the Facility.

Article 4. <u>Operations</u>. Thoroughbred will be responsible for all expenses of owing and operating its own property, equipment, and facilities on its side of the Points of Interconnection.

The IOA obligates the Parties to comply with applicable legal, regulatory, and reliability requirements and Big Rivers' "Requirements for Connection Facilities," as specified in Appendix

F. In addition, each Party must operate its relevant facilities and equipment in a safe and reliable manner, in accordance with "Good Utility Practice" and applicable operational and reliable reliability criteria, and in accordance with the provisions of the IOA. The Parties will provide each other with easements and access rights as necessary to permit performance of the IOA and abide by applicable safety rules, including switching and tagging procedures. Big Rivers and Thoroughbred will form an Operating Committee to develop standard operating procedures.

Thoroughbred will supply reactive power to the Big Rivers transmission system as reasonably requested by Big Rivers through a voltage schedule prescribed by Big Rivers and not in excess of the capabilities of the Facility's equipment and facilities in service. The Facility will be designed to maintain a composite power factor at the Points of Delivery between 0.95 leading and 0.95 lagging. If necessary to comply with Big Rivers' voltage schedule, Thoroughbred will increase the Facility's reactive power output to its maximum capability, provided that Big Rivers has requested other generating facilities and other reactive compensating devices in the affected area, including any of Big Rivers' own facilities, to produce their maximum capability of reactive power. During an emergency on the Big Rivers transmission system, as determined by Big Rivers, Big Rivers may direct Thoroughbred to increase or decrease real power and/or reactive power production within the design limitations of the Facility equipment in service at the time in order to maintain system security, provided that Big Rivers must restore system conditions to normal as quickly as possible and must take reasonable steps to equitably allocate demands for increased or decreased real or reactive power production during the emergency among all resources.

If the Facility consistently fails under normal transmission system conditions to maintain a reactive power capability sufficient to maintain a composite power factor at the Points of Interconnection between 0.95 leading and 0.95 lagging, Thoroughbred will take appropriate steps to fix the problem. If Thoroughbred fails to do so, Big Rivers may, at its reasonable discretion, disconnect the Facility from the Big Rivers transmission system, supply or purchase reactive power from other resources at Thoroughbred's expense, or install reactive power compensating devices at Thoroughbred's expense. Similarly, if Thoroughbred fails or refuses during an emergency to increase or decrease real power and/or reactive power production at Big Rivers' direction, Big Rivers may disconnect the Facility or supply or purchase reactive power from other resources at Thoroughbred's expense. If Thoroughbred's willful failure or refusal during an emergency contributes to Big Rivers' inability to maintain transmission system security, Big Rivers may penalize Thoroughbred $5,000 for the first such incident and $10,000 for the second and subsequent incidents.

Thoroughbred will install, operate, and maintain, at its expense, system protection facilities to protect personnel and equipment and minimize any deleterious effects to Big Rivers' electric operations arising from the Facility. The Parties will maintain, test, and operate their respective system protection facilities in coordination with each other. The IOA establishes certain minimum system quality standards that Thoroughbred's Facility must maintain.

The IOA confirms that Big Rivers has all authority to operate its transmission system. The Parties may remove their respective facilities and equipment from service as necessary to perform maintenance or testing or to install or replace equipment, provided that they will use their reasonable efforts to schedule outages at mutually-agreeable times. Thoroughbred must submit planned maintenance schedules to Big Rivers, and Big Rivers can reasonably reschedule such Thoroughbred outages as necessary to maintain transmission system reliability. The Parties will promptly notify each other of unplanned outages and return their facilities to service promptly. Big Rivers may interrupt deliveries of power on the Big Rivers transmission system from the Facility as necessary to safely and reliably operate the system and disconnect the Facility during an emergency as necessary to protect persons or property.

The IOA acknowledges Big Rivers' obligation under Kentucky law to provide higher transmission curtailment priority to native load customers by providing that Big Rivers will implement curtailments, interruptions, or reductions of the Thoroughbred Facility on an equitable, non-discriminatory basis to the extent possible while allowing compliance with that Kentucky state law obligation.

The IOA anticipates Big Rivers' potential transfer of ownership or control of its transmission system to a regional transmission organization ("RTO"). In the event Big Rivers transfers its system to an RTO or to an RTO's control, the Parties will adapt their operations and practices to the RTO's requirements so long as such new operations and practices are consistent with Kentucky law and other applicable laws and regulations.

Article 5. <u>Maintenance</u>. Thoroughbred will be responsible for all expenses of maintaining its own property, equipment, and facilities on its side of the Points of Interconnection.

The Parties will provide each other with easements and access rights as necessary for each other to maintain their respective facilities and equipment, and they will coordinate the planning and scheduling of maintenance. The Parties will perform routine inspections and testing of their respective facilities and equipment and provide each other with prior notice of tests and the opportunity to observe.

Article 6. <u>Operating and Maintenance Expenses</u>. Big Rivers will recover its costs of operating and maintaining the Network Upgrades contemplated by the IOA through the operations and maintenance ("O&M") component of its transmission service rate unless the level of transmission service on the Big Rivers transmission system sourced from the Facility is insufficient to allow Big Rivers to recover those O&M costs. In that event, Thoroughbred will pay Big Rivers the difference between the O&M-related revenues generated by transmission service sourced from the Facility and Big Rivers' actual O&M expense for the Network Upgrades. During the transmission refund period established in the IOA, at Big Rivers' request Thoroughbred will provide Big Rivers with security for its Network Upgrade O&M-related obligations, currently estimated to be $50,000.

Article 7. <u>Emergencies</u>. The Parties will comply with applicable reliability standards for responding to emergencies, as well as with any emergency procedures they establish. Each Party will notify the other when it becomes aware of an emergency that may reasonably be expected to affect the other Party, and each may take reasonable and necessary actions to prevent, avoid, or mitigate injury, danger, and loss. Except where immediate action is required to prevent, avoid, or mitigate injury, danger, and loss, Thoroughbred will obtain Big Rivers' consent prior to performing any manual switching operations involving the Big Rivers transmission system.

Article 8. Safety. Each Party will perform all work that reasonably may be expected to affect the other Party in accordance with all applicable safety-related requirements. Each Party will notify the other of any releases of defined "hazardous substances" or other potential environmental hazards.

Article 9. Construction and Modifications. Thoroughbred will be responsible for the design, procurement, construction, and installation of its Facility and the Interconnection Facilities identified in Appendix A. Thoroughbred will provide its specifications for the Interconnection Facilities, including associated system protection facilities, to Big Rivers for its review to ensure compatibility with Big Rivers' technical specifications and operational control and safety requirements. Big Rivers' review and acceptance of Thoroughbred's specifications will not constitute Big Rivers' endorsement of those plans. Thoroughbred is required to construct its facilities in accordance with the accepted specifications, and Big Rivers will not be required to interconnect Thoroughbred's Facility with the Big Rivers transmission system if the specifications, design, installation, and construction of the Interconnection Facilities are not in accordance with Big Rivers' requirements.

Thoroughbred, at its expense and in coordination with Big Rivers, will be responsible for arranging the design, construction, and installation of the Network Upgrades identified in Appendix B. Thoroughbred must satisfy the same requirements and standards to which Big Rivers would be subject in the engineering, procurement, or construction of the Network Upgrades. Thoroughbred will provide its specifications for the Network Upgrades to Big Rivers for its review to ensure compatibility with Big Rivers' technical specifications and operational control and safety requirements. Big Rivers will not be required to interconnect Thoroughbred's Facility with the Big Rivers transmission system if the specifications, design, installation, and construction of the Network Upgrades are not in accordance with Big Rivers' requirements.

Following Thoroughbred's construction of the Network Upgrades and prior to their placement into service, Thoroughbred will transfer them to Big Rivers.

Big Rivers will be responsible for obtaining, at Thoroughbred's expense, all required licenses and permits required to construct, own, and operate the Network Upgrades, including any certificates of convenience and necessity. Big Rivers and Thoroughbred will grant each other easements, rights-of-way, and other rights in land they own or control as necessary to accomplish the interconnection of the Facility with the Big Rivers transmission system. Where any of the Network Upgrades are to be installed on land owned or controlled by third parties, Thoroughbred will obtain necessary land rights from those third parties in cooperation with Big Rivers and at Thoroughbred's expense. Big Rivers may serve as Thoroughbred's agent in procuring third-party property rights, at Thoroughbred's expense. Thoroughbred will not agree to any purchase price for land rights for the Network Upgrades without Big Rivers' approval, which may not be unreasonably withheld. If Thoroughbred cannot obtain necessary land rights for the Network Upgrades, Big Rivers will, at Thoroughbred's expense, use its reasonable efforts to procure such land rights in a manner consistent with Kentucky law.

Big Rivers will refund the cost of the Network Upgrades to Thoroughbred on a dollar-for-dollar basis as Big Rivers receives payment for transmission service on the Big Rivers transmission system sourced from the Facility. Big Rivers will have no refund obligation to Thoroughbred with respect to transmission service for which it has not been paid, and Big Rivers will have no obligation to pay interest on refund amounts. The monthly refund amount payable to Thoroughbred will be equal to product of the quantity of transmission service on the Big Rivers transmission system, measured in MW, and the non-usage sensitive portion of the point-to-point transmission service rate under Big Rivers' open access transmission tariff, provided that Big Rivers has been paid such amount in the month by the transmission customer. The applicable non-usage sensitive portion of Big River's point-to-point transmission service rate is $570 per MW-month, out of the total point-to-point transmission service rate of $980 per MW-month.

Big Rivers will pay refunds to Thoroughbred commencing the date Thoroughbred notifies Big Rivers that the Facility is available for commercial operations. Big Rivers will pay refunds during a "transmission refund period" that will extend until the earlier of (1) the date Thoroughbred's costs for the Network Upgrades have been fully refunded, or (2) seven (7) years. The transmission refund period will be extended up to twelve (12) months if at the end of such period (1) Thoroughbred has not exhausted the transmission credits owed it, and (2) the actual cost of the Network Upgrades constructed under the IOA exceeds the cost estimate identified in Appendix B.

If the Network Upgrades constructed under the IOA are subject to catastrophic damage such that non-routine repairs or replacements are necessary to permit the Facility's continued interconnection with the Big Rivers transmission system, the Parties will consult and determine what repairs or replacements will be undertaken. If the Parties agree to effect repairs or replacements, Thoroughbred will contribute to the cost of the repairs or replacement not covered by insurance. If all the transmission service over the Network Upgrades subject to repair or replacement is sourced from the Facility, Thoroughbred will fund all the costs not covered by insurance. If only part of the transmission service over the Network Upgrades subject to repair or replacement is sourced from the Facility, Big Rivers will use its reasonable efforts to obtain a contribution to the cost of repairs or replacement from the other users of the affected Network Upgrades, and Thoroughbred will fund the remaining costs not covered by insurance. Big Rivers will refund Thoroughbred its costs of repairing or replacing Network Upgrades subject to catastrophic damage, together with interest, in accordance with the IOA's transmission crediting mechanism, provided that Big Rivers' refund obligation will arise only after the expiration of the transmission refund period for the payment of Thoroughbred's costs for the initial Network Upgrades.

The IOA identifies a development and construction schedule for the Interconnection Facilities and Network Upgrades. Big Rivers may terminate the IOA if Thoroughbred fails to make reasonable progress toward meeting the milestones in the construction schedule, although the milestones may be extended by mutual agreement. If Big Rivers or a customer of Big Rivers requests that a portion or all of the Network Upgrades be constructed on an accelerated basis, Thoroughbred may construct those facilities in advance of the development and construction schedule or allow Big Rivers or the customer to construct the facilities on an advanced schedule. If Big Rivers or its customer constructs Network Upgrade facilities on an advanced schedule, Big Rivers or the customer will pay the initial costs of the construction, and Thoroughbred will reimburse Big Rivers or the customer those costs to the extent they cannot otherwise recover those costs.

Either Party may modify its facilities and equipment. If Thoroughbred intends to modify the Facility in a manner that will increase its generating capacity, Thoroughbred must initiate a new request for interconnection service with Big Rivers and bear the cost of any new or modified Interconnection Facilities or Network Upgrades. Each Party will provide the other with prior notice before making any modifications that reasonably can be expected to affect the other Party's facilities.

Article 10. Metering Equipment and Communications. At Thoroughbred's expense, Big Rivers will provide, install, own, maintain, and test metering equipment and remote terminal units as necessary to meter the output of the Facility and to allow the parties to meet their obligations under the IOA. Thoroughbred will provide and maintain dedicated communications links with Big Rivers' system dispatchers or representatives.

Article 11. Force Majeure. The Parties' obligations under the IOA, other than to pay money when due, are excused during the existence of a force majeure event, provided the affected Party attempts to alleviate the situation (except for labor disputes).

Article 12. Information Reporting. Each Party is obligated to provide the other with reasonably-requested information concerning facilities and equipment that reasonably may be expected to pertain to the reliability of the requesting Party's facilities and equipment.

Article 13. Payments and Billing Procedures. Thoroughbred is obligated to bear all of Big Rivers' actual costs incurred in performing its obligations under the IOA. Big River's initial estimate of its costs is provided in Appendix G. Thoroughbred will prepay Big River's estimated costs on a quarterly basis pursuant to invoices rendered by Big Rivers, and the Parties will true-up Thoroughbred's payments in the event actual costs differ from estimated costs by more than 20% during any six-month period and reconcile any difference in actual costs following completion or cancellation of the Interconnection Facilities and Network Upgrades. At Big Rivers' request, Thoroughbred will provide Big Rivers with security for its obligations for any non-prepaid expenses.

In the event of a dispute over billings and payment, the Parties will continue to perform and make payments. Disputes will be resolved through the IOA's dispute resolution procedures. Interest will accrue on unpaid amounts.

Article 14. Assignment. The IOA is assignable by a Party only with the other Party's consent, provided that assignment without consent is permitted to a creditworthy affiliate or for security purposes. Non-permitted assignments are null and void.

Article 15. Insurance. Thoroughbred is obligated to procure and maintain minimum levels of insurance coverage as specified in the IOA.

Article 16. Indemnity. Each Party identifies the other for third-party claims arising out of or resulting from the indemnifying party's negligence or breach of its obligations under the IOA, except in cases of gross negligence or intentional wrongdoing by the indemnified party. The IOA specifies procedures for claiming indemnification.

In addition, the IOA limits the liability of each Party to the other, providing that neither Party will be liable to the other for special damages, including lost profits or revenues.

Article 17. Breach, Cure, and Default. The IOA provides that a Party will be in breach for its failure to perform or observe any material term or condition, including a failure to make a payment when due; failure to comply with any material term or condition, including representations, warranties, or covenants; insolvency or bankruptcy; assignment in a manner not permitted; failure to provide access rights; failure to provide information; and failure to provide and maintain security. An uncured breach after notice thereof constitutes a default.

Each Party is required to continue to operate and maintain its facilities and equipment during the existence of a breach or default as reasonably necessary to allow the other Party to continue to operate its facilities and equipment. A Party will not be considered in breach with respect to any matter submitted to dispute resolution under the IOA, provided that each Party may take any action it deems necessary to protect its own facilities. A Party may commence an action to compel the other Party to perform its obligations.

Article 18. Termination of Interconnection Service. Interconnection Service for the Facility will terminate at the conclusion of the term of the IOA, or a Party may terminate the IOA upon the other Party's default.

Article 19. Subcontractor. The Parties may use subcontractors to perform their obligations under the IOA. Each Party remains primarily liable to the other for the performance of its subcontractors, and the use of subcontractors does not relieve the hiring Party of its obligations.

Article 20. Confidentiality. The Parties agree to maintain the confidentiality of documents and information designated as confidential by the providing party.

Article 21. Audit Rights. Upon request, each Party agrees to disclose information to the other as necessary for the requesting Party to verify costs and carry out its obligations. In addition, a Party unable to perform for a non-force majeure reasons must notify the other Party and provide information about its inability to perform. Each Party may have reasonable access to the other's accounts and records for audit purposes.

Article 22. Disputes. The Parties will attempt to resolve disputes informally through good faith negotiations. Failing such informal resolution, the Parties will use mutually-agreed upon alternative dispute resolution techniques, which may include arbitration under the Commercial Arbitration Rules of the American Arbitration Association. Either Party may terminate its participation in alternative resolution proceedings prior to the commencement of arbitration and submit a claim to a court or regulatory authority of competent jurisdiction. If the Parties agree to submit a dispute to arbitration, arbitration will be the exclusive means of resolving the dispute.

Article 23. Notices. Notices, demands, and requests must be in writing.

Article 24. Coordinating Committee. The Parties will establish a Coordinating Committee to coordinate their work under the IOA. The Coordinating Committee will meet at least annually and be responsible for the following functions: (1) coordination of development and construction activities for the Interconnection Facilities and Network Upgrades; (2) addressing and resolving accounting and billing issues; (3) making recommendations on operational procedures; and (4) making recommendations on metering issues.

Article 25. Miscellaneous. The IOA contains standard contractual boilerplate addressing waiver, agreement headings, incorporation, binding effect, conflicts, rules of interpretation, reservation of rights, partnership, and execution by counterparts. The IOA specifies Kentucky law as governing law. The IOA may be amended only by a writing executed by both Parties.

THOROUGHBRED

ENERGY

CAMPUS

INTERCONNECTION STUDY

REPORT

Prepared for

Big Rivers Electric Corp.

Participating Utilities:

LG&E Energy
Owensboro Municipal Utilities
Tennessee Valley Authority

Prepared by:

CAI Commonwealth Associates, Inc.
engineers • consultants • construction managers

THOROUGHBRED ENERGY CAMPUS

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Prepared by
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February 26, 2003

Approved for submittal:

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APPENDIX D TRANSIENT STABILITY RESULTS

INTRODUCTION

Peabody Energy has requested that they be allowed to interconnect the Thoroughbred Energy Campus, a planned 1,500-megawatt mine mouth, coal-fueled electric generating station in Muhlenberg County, Kentucky. One of the two proposed 750 MW generators is to be interconnected to the Big Rivers Electric Corporation (BREC) 345 kV Wilson Substation and the second 750 MW generator is to be connected to the Tennessee Valley Authority (TVA) 500 kV Paradise Substation. Since this project jointly impacts BREC, LG&E Energy (LGEE), Owensboro Municipal Utilities (OMU) and TVA, Commonwealth Associates, Inc. (CAI) was contracted by BREC to perform a joint Transmission Interconnection Study combining the interest of all the parties.

The preliminary studies investigated three interconnection concepts, as shown in the one-line drawing B4. Each concept included either one 750 MW generator connected to the 345 kV Wilson Substation or two 750 MW generators connected separately to the 345 kV Wilson Substation and to the 500 kV Paradise Substation.

EXECUTIVE SUMMARY

Power Flow Results

The base case power flow model was developed by modifying the 2005 Summer reference power flow model provided by the North American Electric Reliability Council (NERC), with facility and dispatch changes provided by the participating utilities, to represent conditions expected to be in place on the bulk power transmission system for the summer of 2005. The base case was analyzed under contingent conditions for a variety of base case and study case models to identify transmission facilities that are expected to become overloaded due to the introduction of the new generating station.

A preliminary analysis of these three interconnection options included power flow and short circuit studies. The results of these preliminary studies were jointly reviewed by CAI, Peabody Energy, and the participating utilities, and case 271 (Interconnection Option III) was selected as the preferred interconnection plan. A summary of the preliminary power flow results is shown in Appendix A, Exhibits A21 through A30. Results of the short circuit studies are summarized in Appendix A, Exhibits A2 and A3. Case 271 interconnects both Thoroughbred generators separately, as indicated above, utilizes an existing 345 kV branch circuit between Wilson and Coleman to be looped into Elmer Smith Station (OMU) and also includes a new 161 kV branch circuit between Wilson and Paradise. These new connections are identified in Exhibit B4 by the bold and dashed lines. This case will be referred to as the preferred interconnection plan for all further studies. While the preferred interconnection plan could initially be slightly more expensive than the other alternatives, Peabody Energy desires the most robust and cost effective interconnection.

The interconnection of the second generator connected to the 500 kV Paradise Substation was studied by TVA independently. TVA has forwarded its results to Peabody. Therefore impacts on TVA's system have not been studied in detail.

The new facilities that will be required for interconnecting the Thoroughbred generators in the preferred plan include five transmission lines: one 500 kV line, three 345 kV lines and one 161 kV line, these are shown in Appendix B, drawing B4. In addition, LGEE conducted an independent study (using their in-house model, which includes the underlying 69 kV system) under varying system load levels and determined that an existing 345 kV transmission line between Brown and Pineville should be energized (terminal work at both Brown and Pineville will be required to complete this).

Using the preliminary results of the power flow contingency analysis, the preferred plan was compared to the base case and 17 facilities in the BREC and LGEE systems were identified as being loaded to more than 100 percent of their emergency ratings. After the review of the initial results, ratings were increased on 15 transmission lines and two transformers. There will be costs associated with upgrading the 17 facilities in order to reach these limits. The upgrades may include improving terminal facilities and re-conductoring or re-sagging the transmission lines to eliminate the overloading. These 17 facilities are listed in the table at the end of the executive summary and in Appendix A, Exhibit A11; they are marked with an asterisk. The seven other facilities listed in Exhibit A11 had ratings increased after reviewing the power flow case that modeled the preferred interconnection plan with the MISO IA generators.

Fourteen of the Group 1 facilities (new overloads) shown in Exhibit A1 become overloaded due to either the addition of the MISO generators to the base case or the addition of the MISO generators to the preferred plan. Twelve are facilities in the TVA system, which includes ten transmission lines and two transformers. The other two facilities were one transformer in the Southern Indiana Gas and Electric (SIGE) system and one 161 kV transmission line in the Entergy Electric System (EES). Of these 14 facilities, the overloading on one TVA 500 kV line and one EES 161 kV line was eliminated when the MISO generators were added to the preferred interconnection plan. Overloaded facilities in the TVA system were not studied in greater detail since TVA conducted an independent study and has forwarded their results to Peabody Energy.

Area losses in the bulk power transmission system increased due to the addition of the new generators at the Thoroughbred Energy Campus. The increase in area losses for the preliminary studies when compared to the base case are shown in Exhibit A31. The area losses were reviewed by the participating utilities and were considered to be low; as a result the system losses should be evaluated using the more detailed 69 kV models that each utility has for its own system. The issue of system losses, and compensation for such, is usually addressed when the IPP makes a transmission service request with a particular utility.

Short Circuit Results

A short circuit study was conducted by constructing a short circuit model representing the preferred interconnection plan and including additional data associated with short circuit studies. The short circuit model was prepared by combining data provided by the participating utilities into one common short circuit model. The reference model used to develop the base case short circuit model was the 2005 Summer - 2000 Series, NERC/MMWG Base Case Library. The same facility and dispatch changes used in the 2005 Summer base case power flow model were used in the base case short circuit model.

The short circuit study was performed by simulating faults on transmission facilities in the vicinity of the proposed new generator interconnection and determining the resulting fault current levels. The short circuits applied to this model include both three phase and single line to ground faults. A summary identifying the significant impacts of the fault current levels is shown in the chart in Exhibit A2.

The results of these preliminary short circuit studies were reviewed by the participating utilities and it was determined that at least six breakers in the LGEE system are inadequate for the short circuit requirements; five 138 kV breakers and at least one 69 kV breaker. Since the power flow model does not adequately model the underlying 69 kV system, additional studies will be completed as part of a facilities study.

Light Load Power Flow Results

All further studies focused on the preferred interconnection plan. A light load study was conducted to determine what affect the Thoroughbred project would have under light load conditions. The reference case for the light load model was the 2002 Light Load model provided by NERC. The same facility changes used for the 2005 Summer base case model were used in the light load model but the dispatch of generators in the BREC system was slightly different. Under a light load condition the utilization of the transmission system is different than with a summer peak condition. The light load study model was constructed by modeling the same facilities necessary for interconnecting the Thoroughbred generators in the preferred plan.

A power flow contingency analysis was performed and a comparison between the light load base case and the preferred interconnection plan showed no impacts due to overloaded facilities. There was, however, some concern that available transfer capability (ATC) may be constrained during periods of light load.

MISO Power Flow Results

The Midwest Independent System Operator (MISO) became involved in the project during April 2002 and identified 15 Independent Power Producers (IPP) that have signed Interconnection Agreements (IA) in the MISO generator interconnection request queue. The MISO recommended that these projects, located in MISO's Region 11, as well as AEP projects, be included in the studies for the Thoroughbred project. Without the inclusion of these projects the MISO was concerned that stability and short circuit reliability impacts on the AEP or MISO transmission systems would not be adequately addressed. MISO provided the data used for modeling the generators. The drawing in Appendix B, Exhibit B1 shows the probable location of the MISO generators. Exhibit B2 identifies the north and south group of generators modeled. The chart in Exhibit A9 lists the generators included in the MISO power flow models.

The 2005 Summer base case and preferred interconnection plan power flow models were modified to incorporate the 15 IPPs identified by the MISO. In addition, one IPP located in AEP's control area was also included. The AEP generator went into service in June 2002 and was not represented in the previous power flow studies.

Exhibit A1 compares four study models to the base case. The facilities shown in the bolded boxes identify facilities that become overloaded for each study case. The facilities shown in Group 1 are new overloads; the facilities shown in the box labeled A1 are new overloads due to the addition of the MISO generators to the base case. The facilities shown in the box labeled A1 & B1 are overloaded in both the MISO base case and the preferred interconnection plan with no MISO generators, and the five facilities shown in the box labeled B1 are new overloads due to the preferred interconnection plan with no MISO generators. The facilities contained in the box labeled C1 are new overloads due to the addition of just the south group of MISO generators to the preferred interconnection plan and the facilities in the box labeled D1 are due to the preferred interconnection plan, including the MISO generators. Two of the overloaded facilities shown in the box labeled C1 and the three overloaded facilities shown in the box labeled D1 on Exhibit A1 had ratings changed based on limits due to ground clearances and/or terminal limits. Exhibit A11 lists these facilities. They are shown without an asterisk, and also shown in the table at the end of the executive summary. All of the new impacts identified for BREC and LGEE were resolved through rating changes on the impacted facilities.

These MISO power flow studies identified four new Group 1 facilities due to the addition of the MISO generators to the base case and seven new Group 1 facilities due to addition of the MISO generators to the preferred interconnection plan, although five of these overloads were eliminated through facility upgrades. The addition of the MISO generators to the preferred plan eliminated overloading on two facilities; one 500 kV line and one 161 kV line.

Transient Stability Results

Transient stability is a study conducted to investigate the dynamic response of generators due to a fault or some other type of system disturbance near a generator. CAI identified the critical clearing time required for the protection system to clear the disturbance from the system. Faults that are not cleared from the transmission system before the critical clearing time will cause the generator to become unstable and eventually tripped off line. The charts in Exhibits A4 through A6 show the critical clearing times for several facilities near the Thoroughbred generators.

The figures shown in Exhibit A16 show stable responses for several generators due to a 345 kV fault at Wilson, which was cleared before reaching the critical clearing time. Exhibit A17 shows a stable response at the critical clearing time of 8 cycles and an unstable response with 9 cycle clearing, for the same 345 kV fault at Wilson.

Transient stability of a transmission system is studied by simulating faults, including switching operations caused by the protection systems of varying durations on branch circuits near a generator and observing specific generator parameters to determine when instability will occur. Faults are normally cleared from the transmission system by the operation of protective equipment such as relays and breakers.

The reference model used to develop the base case transient stability model was the 2003 Summer - 2001 Series, NERC/MMWG Base Case Library. The same facility and dispatch changes used in the 2005 Summer base case power flow model were used in the transient stability base case model. Transient stability models are constructed using generator dynamics parameters. The data used for modeling these components is shown in Exhibits A12 through A15. The generator dynamics data is used together with the power flow program to arrive at a solution. Three transient stability models were constructed; a base case, a base case with the MISO generators, and the preferred interconnection plan with the MISO generators. The transient stability summary results are shown in Appendix D, Exhibits A4 through A6. The results for the preferred interconnection plan with the MISO generators are shown in Exhibit A4. Exhibits A5 and A6 are the results for base case with the MISO generators and the base case, respectively. These exhibits list the critical clearing times for all of the cases run. Only those facilities in close proximity to the Thoroughbred generators were studied. No instabilities were identified for primary clearing.

The participating utilities have reviewed the protection schemes for their transmission systems and have determined that the protection systems will operate to clear the faults before reaching the critical clearing time. This will prevent the generator from going into instability. Faults that are not cleared before this time will cause the generator to be tripped off line. Clearing a fault before reaching the critical clearing time can be accomplished by fast acting relays and breaker combinations.

Summary

The power flow analysis for the preferred interconnection of the Thoroughbred generators, including the MISO IA generators, will require six new transmission lines, upgrades or replacements on 22 transmission lines and two transformers in the BREC and LGEE systems. In addition there are 12 overloaded facilities in the TVA system, one overload in the SIGE system, and one overload in the EES system. (These facilities are included for informational purposes only. Any upgrades ultimately required will result from a study prepared by TVA, MISO, or others.) One of the new 345 kV transmission lines was identified by LGEE after making its own independent study with the preliminary preferred interconnection plan under varying system load levels. The short circuit analysis identified six breakers that are inadequate for the fault current duty; five 138 kV breakers and one 69 kV breakers. Additional 69 kV breaker replacements could be identified during the facilities study process. The transient stability analysis identifies the critical clearing times required to avoid generator instability in close proximity to the Thoroughbred Energy Campus. The fault clearing times were reviewed by the participating utilities and no instabilities were noted.

New Facilities

Location	**Distance**
Thoroughbred to Paradise Substation (TVA) 500 kV	8 miles
Thoroughbred to Wilson Substation (BREC) 345 kV	10 miles
Wilson (BREC) to Smith (OMU) 345 kV	9 added miles
Coleman (BREC) to Smith (OMU) 345 kV	9 added miles
Wilson (BREC) to Paradise (TVA) 161 kV	15 miles
Brown to Pineville (LGEE) 345 kV	Terminal Facilities

Overloaded Facilities

Branch Circuit	Old Rating Normal	Old Rating Emergency	New Rating Normal	New Rating Emergency
Big Rivers Electric Corporation				
*Wilson to Coleman 345 kV	598	598	956	956
LG&E Energy				
*Baker Lane to Brown N 138 kV	205	216	224	277
*Earlington N to River Queen Tap 161 kV	184	184	209	257
*Eastview to Stephensburg 69 kV	42	42	56	68
*Elizabethtown to Tharp 69 kV	72	79	90	111
*Green River Steel 138-69 kV Transformer	93	102	93	107
*Green River Steel to OMU 69 kV	72	86	146	181
*Green River to Ohio County 138 kV ckt 1	143	158	179	220
*Green River to Ohio County 138 kV ckt 2	143	158	179	220
*Green River to River Queen Tap 69 kV	55	55	89	110
*Leitchfield 138-69 kV Transformer	72	79	93	107
*Leitchfield to Shrewsbury 138 kV	82	82	179	220
*Newtonville to Cloverport 138 kV	143	143	162	199
*Ohio County to Shrewsbury 138 kV	165	165	179	220
*Smith to Hardin County 345 kV	275	308	1195	1315
*Adams to Tyrone 138 kV	97	97	179	220
Arnold to Delvinta 161 kV	113	113	167	201
Artemus to Farley 161 kV	142	142	209	257
Artemus to Pineville 161 kV	129	129	176	201
Delvinta to West Irvine Tap 161 kV	142	142	176	201
Ghent to Owen County Tap 138 kV	227	227	227	280
Green River Steel to Smith 138 kV	241	241	287	287
Lake Reba Tap to West Irvine Tap 161 kV	165	165	167	223
East Kentucky Power Cooperative				
*Stephensburg to Upton Junction 69 kV	19	19	45	54

Breakers Inadequate for Short Circuit Requirements

Substation	Base kV	Quantity
LG&E Energy		
Green River Substation	69 kV	1
Green River Substation	138 kV	1
Green River Steel Substation	138 kV	4

* Facilities with an asterisk were revised after the preliminary power flow studies
Facilities without an asterisk were revised after the MISO power flow studies
Overloaded facilities requiring upgrades in TVA, SIGE, and EES systems are not shown in this table

ASSUMPTIONS AND CRITERIA

Power Flow Models

The following planning criterion is used to evaluate the power system:

- Normal System Conditions (NS)
  - Loading on transmission lines and transformers should be less than 100 percent of their normal ratings
  - Bus voltages should be no less than 95 percent or greater than 105 percent of nominal
- Single Contingency Conditions
  - Loading on transmission lines and transformers should be less than 100 percent of their emergency ratings
  - Bus voltages should be no less than 90 percent or greater than 105 percent of nominal

Single contingency conditions are defined as the outage of any single transmission facility. The contingencies used to study the system include outages of all of the bulk power transmission lines and transformers (100 kV and above) in a wide neighborhood around the new generation site. This study included 376 single-contingencies that are depicted in the one-line of contingencies, Appendix B, Drawing B5. Two of the single-contingency outages involve multiple elements of three winding transformers located at Montgomery and Hopkinsville Stations in TVA. The 11 multiple contingencies include the simultaneous outage of a generating unit and a transmission facility. A complete list of the contingencies can be found in Appendix A, Exhibit A7. The monitored facilities include the contingent facilities plus all facilities within a four-bus ring around the contingency set.

Short Circuit Models

The criteria used in evaluating short circuit studies is that for a bolted fault (i.e., zero fault impedance), currents seen by the breakers must be less than the breaker rating. The simulated short circuit could be either a three phase or a single line to ground fault.

Transient Stability Models

Criteria used in determining the transient stability of a transmission system demand that the generator not lose synchronism with the electrical system during a transmission line or transformer fault condition which causes the circuit element to be taken off line in order to clear the fault. Transient stability of a transmission system is studied by simulating a fault of varying duration near a generator bus and observing particular generator parameters to determine the time at which instability will occur. In these studies the disturbance simulated was a three phase to ground fault. The time before which a disturbance must be cleared is referred to as the critical clearing time. Faults are normally cleared from the transmission system by the operation of protective equipment such as relays and breakers.

The participating utilities have reviewed the protection schemes for their transmission systems and have determined that their systems can operate to clear the fault before reaching the critical clearing time. This will prevent the generator from unstable operation and tripping off line.

STUDY METHODOLOGY

The power flow study was conducted using CAI's TRANSMISSION 2000® Power Flow (PFLOW) program and its associated Contingency Processor (CP). CP is an automated tool that controls the power flow contingency calculation and summarizes the results. Summary reports for each case are contained in the detailed power flow results found in Volumes I, II, and III, as provided to each of the participating utilities. These include the following reports:

- Overload Summary Report – all overloaded facilities and the number of times overloaded
- Normal System Overload Summary Report
- Undervoltage Summary Report
- Overvoltage Summary Report
- Contingency Summary Report – each contingency and all overloads it causes
- Contingency List
- Various other summary reports

Detailed reports of the results from the most recent studies involving Interconnection Option III, the preferred interconnection plan, are contained in Volume I, Appendices E through J. Preliminary base case studies and studies involving Interconnection I are contained in Volume II, Appendices E through M. Preliminary results from studies involving Interconnections IIA and III are contained in Volume III, Appendices N through Y.

In addition to the summary reports, CAI also prepared a comparison analysis of impacted facilities. Exhibit A1 shows comparisons between the base case, the preferred interconnection plan without MISO, and three study cases:

- Case C271s05 is the preferred interconnection plan, which includes facility rating changes and includes no MISO or AEP IA generators
- Case BS05sMF is the MISO base case with all MISO and AEP IA generators
- Case C271s05MS is the preferred interconnection plan including only the south group of MISO generators, see drawing B2
- Case C271s05MF is the preferred interconnection plan with all MISO and AEP IA generators

The comparisons against the base case were conducted for the above series of cases, and included the base case with the MISO generators and the preferred interconnection plan with and without the MISO generators. The two corresponding study models, representing the loss of a generator in the LGEE system were not modeled for these MISO power flow studies because facilities that were overloaded in these corresponding study cases were the same facilities that were overloaded in the preferred interconnection plan when compared to the base case.

To provide an efficient means for evaluating comparable cases, overloaded facilities are grouped in these exhibits in order of worst overloads at the top of Group 1, to less significant overloads at the bottom of Group 2. These groups are described as follows:

Group 1 - New Overloads (new generation caused an overload)

Group 1 facilities are those that are overloaded in one or more of the study cases but were not overloaded in the base case. The overloads on these facilities are attributed to the additions made in the study cases (i.e., one or two 750 MW generators at the Thoroughbred Energy Campus). We will look closely at these overloaded facilities (i.e., further study) to determine causes and mitigation in Phase 2 of this study.

Group 2 - Pre-existing with increased overloading caused by the new generation

Group 2 facilities are those that are overloaded in the base case and the study cases but showed an increased overloading in the study cases. Depending upon the magnitude of the change and the number of contingencies that cause these facilities to overload, these facilities may or may not require mitigation.

Preliminary Power Flow Study

The reference case used to develop the base case model was the 2000 Series, NERC/MMWG Base Case Library - 2005 Summer. The base case model (BC05s01) incorporates the dispatch and facility changes submitted by the participating parties, shown in Appendix C, Exhibits C1 through C14. The impedance of the various new transmission lines used to interconnect the Thoroughbred generators were calculated based on data from EPRI's "Transmission Line Reference Book 345 kV and Above" (Red Book), dated 1975.

Two additional base case models were developed to represent the loss of two different generating units in two different locations in the LGEE system. Base case model BC05s11 represents the loss of Brown N Unit # 3 generator (441 MW), and BC05s21 represents the loss of Green River Unit # 4 generator (104 MW). In this series of base case models, generation is dispatched (bought) equally from three utilities in the north only; American Electric Power (AEP), AMEREN, and CINergy (CIN). Analysis of these study models was only performed for the preliminary cases represented in interconnection options I, IIA, and III. See Appendix B, Exhibit B4.

Listed below are the assumed distances between the Thoroughbred Energy Campus and the interconnection points.

Interconnection Point	Line Length
Wilson Substation (BREC) 345 kV	10 miles
Paradise Substation (TVA) 500 kV	8 miles

In these study cases, the first Thoroughbred Energy Campus generating unit is connected into the 345 kV Wilson Substation (BREC) using a double circuit transmission line. The second generator is connected into the 500 kV Paradise Substation (TVA) using a 500 kV transmission line (a three conductor bundle). Both generators are connected into the bulk power transmission system via generator step-up transformers (GSU).

For these preliminary studies, a set of nine power flow models was created; three base case models and six study case models. The Thoroughbred Energy Campus generators were individually connected into BREC and also into TVA. The cases are titled as follows:

Base Case Models – Without Thoroughbred Energy Campus Generators

- Case BC05s01 – Base Case with facility upgrades - 2005 Summer
- Case BC05s11 – Same as Case BC05s01 with the loss of Brown N Unit # 3 - 441 MW
- Case BC05s21 – Same as Case BC05s01 with the loss of Green River Unit # 4 - 104 MW

Interconnection I – Original Scope

<u>1-750 MW Plant – Cases 101, 111, and 121</u>
- Case 101 – Interconnected at 345 kV to Wilson Substation (BREC)
- Case 111 – Same as Case 101 with the loss of Brown N Unit # 3 - 441 MW
- Case 121 – Same as Case 101 with the loss of Green River Unit # 4 - 104 MW

<u>2-750 MW Plants – Cases 201, 211, and 221</u>
- Case 201 – Same as Case 101 with a second 750 MW generator individually connected at 500 kV to Paradise Substation (TVA)
- Case 211 – Same as Case 201 with the loss of Brown N Unit # 3 - 441 MW
- Case 221 – Same as Case 201 with the loss of Green River Unit # 4 - 104 MW

Based on the results of the above series of cases, 101 and 201, two alternative interconnections of the Thoroughbred Energy Campus were proposed (not in the original scope for this project). See Appendix B, Drawing B4 for Interconnections IIA and III.

- Interconnection IIA interconnects one 750 MW generator into the 161 kV transmission system at three sites: Wilson Substation (BREC), Green River Substation (LGEE), and Paradise Substation (TVA)
- Interconnection III is a variation of Interconnection I. The Thoroughbred Energy Campus generator is connected at 345 kV to Wilson and the existing 345 kV line between Wilson and Coleman is looped into OMU's Elmer Smith Station. A new 161 kV branch circuit is added between Wilson and Paradise

For the 200 series of cases, the second 750 MW generator is always interconnected to the 500 kV Paradise Substation. Twelve preliminary study models were developed and are described below:

Interconnection IIA – Three Interconnections at 161 kV

<u>1-750 MW Plant – Cases 141, 151, and 161</u>
- Case 141 – Modify Case 101 by removing the 345 kV connection between Wilson and the Thoroughbred Energy Campus and connecting the 750 MW generator into the 161 kV transmission system at three sites; Wilson Substation (BREC), Green River Substation (LGEE), and Paradise Substation (TVA)

- Case 151 – Same as Case 141 with the loss of Brown N Unit # 3 - 441 MW
- Case 161 – Same as Case 141 with the loss of Green River Unit # 4 - 104 MW

<u>2-750 MW Plants – Cases 241, 251, and 261</u>

- Case 241 – Modify Case 201 by removing the 345 kV connection between Wilson and the Thoroughbred Energy Campus and connecting the 750 MW generator into the 161 kV transmission system at three sites; Wilson Substation (BREC), Green River Substation (LGEE), and Paradise Substation (TVA)
- Case 251 – Same as Case 241 with the loss of Brown N Unit # 3 - 441 MW
- Case 261 – Same as Case 241 with the loss of Green River Unit # 4 - 104 MW

Interconnection III – Interconnection to Wilson at 345 kV with Three Additional Circuits

<u>1-750 MW Plant – Cases 171, 181, and 191</u>

- Case 171 – Modify Case 101 by looping the existing 345 kV Wilson to Coleman line into Elmer Smith Station (OMU), plus add a new 161 kV branch circuit between Wilson and Paradise
- Case 181 – Same as Case 171 with the loss of Brown N Unit # 3 - 441 MW
- Case 191 – Same as Case 171 with the loss of Green River Unit # 4 - 104 MW

<u>2-750 MW Plants - Cases 271, 281, and 291</u>

- Case 271 – Modify Case 201 by looping the existing 345 kV Wilson to Coleman line into Elmer Smith Station (OMU), plus add a new 161 kV branch circuit between Wilson and Paradise
- Case 281 – Same as Case 271 with the loss of Brown N Unit # 3 - 441 MW
- Case 291 – Same as Case 271 with the loss of Green River Unit # 4 - 104 MW

In each of the 18 preliminary study cases and the two light load models, the new generator output is dispatched (sold) equally to six utilities; three in the north (AEP, AMEREN and CIN), and three in the south (Duke Power [DUK], Southern Company [SOCO] and Florida Power & Light [FPL]).

All of the detailed results from these preliminary power flow study cases can be found in Volumes II and III. Volume II, Appendices E through M, contains the detailed results for the preliminary power flow cases identified in the original scope, Interconnection Option I. Volume III, Appendices N through Y, contains the detailed power flow results for Interconnection Options IIA and III. Volumes II and III have only been supplied to the participating utilities.

The interconnection of the second generator at the 500 kV Paradise Substation was studied by TVA independently and TVA has already forwarded its results to Peabody. Therefore impacts on the TVA system have not been studied in as great detail.

Appendix C in the report contains the details of the modifications for the reference model as provided by the participating utilities, and is contained in Exhibits C1 through C14. The reference model used for the power flow studies was the 2000 Series, NERC/MMWG Base Case Library Model - 2005 Summer.

After these preliminary studies were performed the preferred interconnection option selected for all further studies was case 271. This preferred interconnection plan includes one Thoroughbred generator connected to the 345 kV Wilson Substation and the second to the 500 kV Paradise Substation. It also includes an additional circuit that takes the existing 345 kV Wilson to Coleman line and loops it into the Elmer Smith Station (OMU). It also incorporates a new 161 kV line between Wilson and Paradise Substations (see Appendix B, Drawing B4).

Volume I contains the results of the most recent studies conducted for the Thoroughbred Energy Campus. The power flow results contained in this volume are for the base case with the MISO generators, the preferred interconnection plan with and without the MISO generators and the light load study cases. Volume I has been supplied only to the participating utilities.

Based on the preliminary results of the power flow studies that include the MISO and AEP IA generators, the participating utilities identified rating changes on several facilities located in the BREC and LGEE systems. The ratings were changed based on limits due to ground clearances and/or terminal limits (see Exhibit A11). The changes in the facility ratings were reflected in the case comparison summary charts shown in Exhibit A1, but the detailed power flow results contained in Volumes II and III were not rerun and do not reflect these facility changes as related to the addition of the MISO generators.

Detailed power flow results of the cases that incorporated the MISO IA generators are included in Volume I, Appendices E through J. Volume I has been provided only to the participating utilities.

A normal system and first contingency analysis was performed using CAI's TRANSMISSION 2000® Contingency Processor (CP). The contingency list is generated automatically, but multiple contingencies, provided by the participating utilities, were added manually.

There were a total of 376 contingencies of which 365 are single element contingencies and 11 are multiple element contingencies. The contingency set is listed in Appendix A7 and includes 291 buses. The contingencies (outages) were evaluated for the three base cases and 18 preliminary study cases. Nine of the multiple element outages include both a generator outage and transmission facility outage; these contingencies are not included in the analysis for the models that include a generator outage (i.e., Brown N Unit # 3 or Green River Unit # 4) since these models already include a generator outage.

The monitored region includes 2859 buses and covers 29 utility areas. The Area and Zone report, shown in Appendix A, Exhibit A8, shows the number of contingent and monitored buses included in this study. When the 15 Region 11 MISO and AEP IA generators were included in the power flow model, the monitored region contained 2865 buses.

Area losses in the bulk power transmission system increased due to the addition of the new generators at the Thoroughbred Energy Campus. The increase in area losses for the preliminary studies when compared to the base case are shown in Exhibit A31. The area losses were reviewed by the participating utilities and were considered to be low; as a result, the system losses should be evaluated using the more detailed 69 kV models that each utility has for its own system. The issue of system losses is addressed when the IPP makes a transmission service request with a particular utility. The affected utilities will determine the expected increase in losses and will factor those costs into the transmission service request.

Short Circuit Study

The short circuit study was conducted using the TRANSMISSION 2000® Short Circuit (SC) program. The reference model used for this study was the 2005 Summer - 2000 Series, NERC/MMWG Base Case Library. The short circuit models were prepared using data received from the participating utility companies. Since this study covers several regions, it was necessary to combine the short circuit data into one common model. Each utility provided its own short circuit models for this study. The additional data needed for short circuit studies was incorporated from the power flow model used in the preliminary studies. Since the data came from three different sources it was decided to convert the bus numbers and names to conform to those in the existing power flow model.

Summaries of the short circuit results for these preliminary cases are contained in Appendix A, Exhibit A2 and A3. These charts list all facilities whose fault current levels increased by between 0 and 10 percent, when compared to the base case. The utilities reviewed the results and identified breakers that were insufficient for the fault current levels. One 69 kV breaker and five 138 kV breakers were identified as exceeding their ratings. These breakers will probably need to be upgraded or replaced. In addition, since the power flow model does not adequately represent the underlying 69 kV, additional breakers could require replacement.

Light Load Power Flow Study

A light load study model was conducted to determine what affect the Thoroughbred project would have under light load conditions. The reference model used to develop the base case light load model was the 2001 Series, NERC/MMWG Base Case Library, 2002 Light Load Case, Trial #7. The same facility changes provided by the utilities for the 2005 Summer Base Case model were used to create the light load base case model (case BC02LL). Per instructions from the utilities, the generation dispatch used in this model is slightly different than that used in the 2005 Summer studies.

Since case C271s05 was selected as the preferred interconnection plan, this was the only study case modeled for the light load condition (case C271LL02). The interconnection and generation dispatch for the Thoroughbred Energy Campus for the light load study model is identical to case C271s05. Light load study models corresponding to the loss of a generating unit in the LGEE system were not studied.

A contingency analysis was conducted using CAI's TRANSMISSION 2000® Contingency Processor (CP). The contingencies (outages) involved 359 contingencies, including eight multiple contingencies and 290 buses. Contingencies for the light load models were evaluated for the base case and study case only. The monitored region included 2743 buses, covering 27 utility areas. The Area and Zone report shown in Exhibit A8 lists the number of contingent and monitored buses used in this study for each of the 27 utilities and also shows zone data, which utilities use to define groups of circuits internal to their own system. Detailed power flow results and case comparisons are contained in Volume I, Appendices F and G.

The result of the comparison between the light load base case and the study case showed no impacts due to overloaded facilities. There was, however, some concern that available transfer capability (ATC) may be constrained during periods of light load. Using their in-house power flow model (including their underlying 69 kV system), LGEE conducted its own independent study based on the preliminary preferred interconnection plan. They reported the following findings; "We have conducted a power flow analysis on Case 271 at varying LG&E Energy system load levels and have found that for load levels in the range of 70%-95% of system peak, we expect the maximum allowable generation at Brown to decrease by 50 to 150 MW due to the Thoroughbred generators. The limit is the flow on the Brown Plant to Fawkes 138 kV line due to an outage of the Brown-Alcalde-Pineville 345 kV line. Also, because this flow is dependent on the level of generation at East Kentucky Power Cooperative's (EKPC) JK Smith plant, the magnitude of the impact could be more severe if EKPC buys off-system rather than dispatching these units."

LGEE made a recommendation for correcting this limitation on the Brown plant generation level. "The limitations at Brown due to Thoroughbred can be eliminated by energizing the Brown to Pineville 345 kV line. This line is currently in place, but requires terminal facilities at both Brown and Pineville in order to allow energization. Energization of this line would return the maximum allowable generation at Brown to at least the level we expect if Thoroughbred is not constructed. This would be a requirement if Option III is adopted." This one 345 kV new transmission facility will be required for the preferred interconnection of the Thoroughbred generators.

MISO Power Flow Study

The MISO became involved in the project during April 2002 and identified 15 Independent Power Producers (IPP) that have signed Interconnection Agreements (IA) in their generator interconnection request queue. The MISO recommended that these projects (located in MISO's Region 11), as well as AEP projects, be included in the studies for the Thoroughbred project. Without the inclusion of these projects the MISO was concerned that stability and short circuit reliability impacts on the AEP or MISO transmission systems would not be adequately addressed.

Since study case C271s05 was selected as the preferred interconnection plan, all further power flow studies were modeled with the Thoroughbred Energy Campus connected as shown in Drawing B4, for case C271s05. Case C271s05 represents Interconnection Option III and includes two 750 MW Thoroughbred generators, one connected to 500 kV at the Paradise Substation (TVA), and the other to 345 kV at the Wilson Substation (BREC), with the existing 345 kV circuit between Wilson and Coleman looped into OMU's Elmer Smith Station. This model also includes an additional new 161 kV branch circuit between Wilson and Paradise Substations.

MISO provided the data used in modeling the IA generators. The chart in Exhibit A9 lists the 15 MISO Region 11 and AEP generators used in the MISO power flow models. It also includes information about the generator control area, location, generator bus number, MISO queue number and queue date, high side bus number and base voltage, and the interconnection status. The 15 IPPs identified by the MISO are expected to be on-line and producing power prior to the completion of the Thoroughbred Energy Campus project.

Drawing B1 shows the probable relative location of the 15 MISO generators on the bulk power transmission system. Each generator is identified with a circle and labeled with the generator numbers provided by MISO. Within the circle is the generation dispatch used in these models, including the MISO generators and the interconnection status of the generator.

The two corresponding study models, representing a loss of a generator in the LGEE system, were not modeled for these power flow studies that include the MISO generators because facilities that were overloaded in these corresponding study cases were the same facilities that were overloaded in the preferred interconnection plan when compared to the base case.

The 15 IPPs identified by MISO were incorporated into both the 2005 Summer Base Case model and the preferred interconnection models. One IPP located in AEP's control area was also included. The AEP generator went into service in June 2002, and was not represented in the previous power flow studies. Three study models were created and include the addition of the MISO IA generators. In these power flow models, the generation is dispatched (sold) equally to six utilities; the three utilities in the south were the same ones used in the previous studies, but dispatch to utilities in the north changed to PJM, Consumers Energy (Cons), and Northern Indiana (NI). Generation dispatch to the north was changed because several of the IPP generators are located in the CINergy control area. The dispatch to the north in the preliminary power flow models was to CINergy, AMEREN, and AEP.

These two MISO power flow models, the base case (BS05sMF) and the preferred interconnection plan (case C271s05MF), incorporate the same generation dispatch and facility changes provided by the participating utilities for the 2005 Summer Base Case. The data used for modeling the MISO generators was provided by MISO. The data used for modeling the AEP generator was provided by C. Bradley of BREC. This AEP generator was not included in the MISO model or previously modeled in the study cases. This AEP generator is request number 21 in the AEP generator interconnection request queue.

The MISO generators were connected into the power flow model as shown in thumbnail Drawing B3. The net change in generation dispatch is shown in Exhibit A10 and is also depicted in Drawing B1. Since the generators in closer proximity to the Thoroughbred Energy Campus have more potential to influence the power flow than those in the north group, the 15 MISO generators were lumped into two groups, shown in Drawing B2, identifying the north and south groups of MISO generators. The south group of MISO generators includes 11 generators. The north group includes four MISO generators and the one AEP generator.

The preferred interconnection plan with the MISO generators was constructed by modifying case 271 to include all the MISO generators listed in Exhibit A9. This MISO power flow model was built in three steps; first, all generators were added to the model with their generation level set to zero output. Second, the 11 generators in the MISO south group (case 271s05MS) were placed on-line with the net change in generation dispatch as indicated in the circle in Drawing B1 (it is also listed in the chart in Exhibit A10). In the final step, generators identified in the MISO north group were added in the same manner so that all of the IPP generators with signed interconnection agreements identified by MISO and the AEP generator are in the final MISO power flow model (case 271s05MF). The base case model with the MISO generators was prepared in the same way (case BS05sMF).

A contingency analysis was conducted on these MISO power flow models using CP. The contingency set includes a total of 375 contingencies, with 11 being multiple contingencies and involving 291 buses. The contingencies were evaluated for both the MISO base case (case BS05sMF) and the preferred interconnection plan with all the MISO generators (case C271s05MF). The monitored region contained 2865 buses covering 29 utility areas. The Area and Zone report shown in Exhibit A8 lists the number of contingent and monitored buses for each utility area and also shows zone data, which utilities use to define groups of circuits internal to their own systems.

Preliminary results of the MISO power flow study were presented to the participating utilities and resulted in rating changes on seven additional facilities in the LGEE system. The ratings were changed based on limits due to ground clearances and/or terminal limits shown in Exhibit A11 with no asterisk. The revised ratings reduced the number of new overloads (Group 1 facilities) and the loading on the circuits shown in Exhibit A1 reflects the rating increases. This exhibit identifies all new overloads resulting from the addition of the 15 MISO generators to both the base case (BS05sMF) and the preferred interconnection plan (case C271s05MF). This exhibit compares four study cases, with and without the MISO generators, to the 2005 Summer Base Case.

A comparison of the MISO base case model to the 2005 Summer Base Case identified nine new overloads (Group 1 facilities) and five pre-existing overloads that were made worse (Group 2 facilities). These nine Group 1 facilities are shown in the box labeled A1. The five Group 2 facilities are shown in the box labeled A2.

A comparison of the preferred interconnection plan with no MISO generators to the 2005 Summer Base Case also identified nine new overloads (Group 1 facilities) and five pre-existing overloads that were made worse (Group 2 facilities). Four of the nine Group 1 facilities are already overloaded in the MISO Base Case and are shown in the boxes labeled A1 and B1. The other five Group 1 facilities are new overloads resulting from the preferred interconnection plan with no MISO generators and are in the box labeled B1. Three of the five Group 2 facilities are already overloaded in the MISO Base Case but two new facilities overload due to the preferred interconnection plan with no MISO generators and are shown in the box labeled B2.

A comparison of the preferred interconnection plan with only the south group of MISO generators to the 2005 Summer Base Case identified two new overloads (Group 1 facilities) and no new pre-existing overloads that were made worse (Group 2 facilities). These facilities are shown in the box labeled C1. Two of the four facilities were overloaded before the ratings were changed to reflect maximum ground clearances or improved terminal facilities. The facilities are shown in Exhibit A11. Facilities in Exhibit A1 that have had their ratings changed, after including the MISO generators, are indicated by an asterisk.

A comparison of the preferred interconnection plan with all the MISO generators to the 2005 Summer Base Case, identified 12 new overloads (Group 1 facilities) and six pre-existing overloads that were made worse (Group 2 facilities). Seven of the 12 new overloads and five of the six pre-existing overloads are also identified as being overloaded in the MISO Base Case. The facilities in the box labeled D1 were overloaded, but after the ratings were changed they were no longer overloaded. The five new Group 1 overloaded circuits are shown in the two sections of facilities shown above the box labeled D1 in Exhibit A1. Three Group 1 facilities outlined in grey boxes indicates that loading was reduced due to the addition of the Thoroughbred project to the base case, with the MISO generators and the Group 1 facilities shown with a cross-hatched background indicates reduced loading due to the addition of the MISO generators to the preferred plan.

A light load power flow model representing the preferred interconnection plan with the MISO and AEP IA generators was not studied. It is expected that most, if not all, of the new generators would not be base load units and therefore would not be operating under light load conditions.

Transient Stability Power Flow Study

The transient stability study was conducted using CAI's TRANSMISSION 2000® Transient Stability (TS) program. The reference model used for developing the transient stability power flow model was the 2001 Series, NERC/MMWG Base Case Library, 2003 Summer Case, Trial #9 (PLI). The generation dispatch and facility changes already provided for the 2005 Summer Base Case model were used to develop the transient stability base case model (case TS03s1aT1). Transient stability is a study conducted to investigate the dynamic performance of generators under fault conditions, and to determine the time at which a generator will go into instability due to the disturbance.

Critical clearing time is the time before which a disturbance must be cleared by the protection system in order to maintain stable operation. Faults that are not cleared from the system before this time will cause the generator to become unstable and to be tripped off line. Transient stability of a transmission system is studied by simulating faults of varying durations on transmission facilities located near a generator and observing specific generator parameters to determine when instability will occur. Faults are normally cleared from the transmission system by the operation of protective equipment such as relays and breakers. In these studies the disturbance simulated is a three-phase fault.

Three transient stability models were constructed; a base case, a base case with the MISO generators, and the preferred interconnection plan with the MISO generators. Since generator dynamics data for the MISO generators was not available, sample data was used to represent the power system components, including a model for a classical round rotor synchronous machine, an exciter model, and a governor model. The data used for modeling these components is shown in Exhibits A12 through A15. The generator dynamics data is used along with the power flow model to form a complete dynamics model. The transient stability model also requires each generator to be connected by a generator step-up transformer (GSU). If a generator was already modeled with a GSU the existing data was used. Otherwise impedance values for the GSU were calculated based on the generator maximum active power and maximum reactive power values.

The transient stability base case model was modified to include the 15 MISO generators. This model was built in three steps; all the generators were modeled with zero output, next the south group of MISO generators were placed online with the net change in generation dispatch as indicated in the circle shown in the drawing in Exhibit B1 (also listed in the chart in Exhibit A10), and finally the north group of MISO generators were placed online and dispatched in the same fashion (case TS03s1aMF). This represents the MISO Final Transient Stability model for 2003 Summer. The generation was dispatched to the six utilities as previously indicated for the MISO power flow models, then the MISO base case model was modified to include the facilities needed for the preferred interconnection of both 750 MW Thoroughbred generators as shown in Exhibit B4 (case TS03s1aMFth). The generation from the Thoroughbred units was dispatched (sold) to the same six utilities used in the preliminary power flow studies.

The results of the transient stability study are summarized in the tables shown in Appendix A, Exhibits A4, A5, and A6. The results for the preferred interconnection plan with the MISO generators are shown in Exhibit A4. Exhibits A5 and A6 are the results for the MISO base case model and the base case model, respectively. These exhibits list the critical clearing times for the facilities in close proximity to the Thoroughbred generators. The graphs in Appendix D, Exhibits D11 through D260 show the dynamic response of the generators for a three-phase fault applied to a transmission facility. The graphs show the change in machine angle and speed resulting from the disturbance for the generator near the fault. For each fault studied the graph identifies the critical clearing time at which generators will go into instability.

The participating utilities reviewed the protection schemes in their transmission systems and determined that it will operate within these parameters to prevent the generators from going into an unstable condition. This is accomplished by fast-acting relay and breaker combinations.

APPENDIX A

EXHIBITS

Exhibit A1

Thoroughbred Energy Campus

Case 271 has 2-750 MW Thoroughbred Generators Connected at 500 kV and at 345 kV with a 345 kV Loop into Smith Station
Base Case Compared to Study Cases With and Without Case 271 and
With and Without the MISO and AEP IA Generators
All Cases are 2005 Summer

Branches Exceeding 100% of Emergency Rating									Ratings		Base Case 2005 Summer				Base Case With All MISO Gens				C271 Without MISO Gens				C271MS With MISO South Gens				C271MF With All MISO Gens			
											Cont	Normal	First Contingency		Cont	Normal	First Contingency		Cont	Normal	First Contingency		Cont	Normal	First Contingency		Cont	Normal	First Contingency	
	From	Name	To	Name	Ckt	Base kV	Area	Zone	Norm	Emer	ID	System%	Emer %	A / B	ID	System%	Emer %	A / B	ID	System%	Emer %	A / B	ID	System%	Emer %	A / B	ID	System%	Emer %	A / B
Group 1	New Overloads										Base Case Not Overloaded																			
																	A1				A1 & B1									
	18743	5SMYRNA	19527	5BLCKMNT	1	161	147	166	235	235	4367	54.3	96.5	0 / 0	4367	61.4	106.3	1 / 0	4367	65.0	109.1	1 / 0	4367	67.6	113.8	1 / 0	4367	69.2	116.3	1 / 0
	18708	5LEBANON	18914	5GLADV T	1	161	147	166	151	151	4370	18.7	95.7	0 / 0	4370	25.5	102.7	0 / 1	4370	25.3	104.6	0 / 1	4370	24.8	107.6	1 / 0	4370	24.6	109.0	1 / 0
	18744	5MURFREE	19527	5BLCKMNT	1	161	147	166	235	235	4367	51.0	92.3	0 / 0	4367	57.8	101.7	0 / 1	4367	61.4	104.5	0 / 1	4367	63.9	109.1	1 / 0	4367	65.5	111.5	1 / 0
	18684	5INTERCH	19083	5HURRICA	1	161	147	166	320	320	4452	57.0	96.5	0 / 0	4452	60.2	101.7	0 / 1	4452	61.6	103.9	0 / 1	4452	62.7	105.9	1 / 0	4452	63.4	106.9	1 / 0
	18007	5MARSHAL	18497	5MAYFIEL	1	161	147	166	307	307	137	60.1	92.6	0 / 0	137	72.2	107.4	1 / 0	137	60.0	92.5	0 / 0	137	66.3	100.2	0 / 1	137	69.6	104.3	0 / 1
	26874	10DUBOIS	26873	10DUBOIS	2	69-138	210	210	112	117	1140	46.2	98.0	0 / 0	1140	49.2	104.0	0 / 1	1140	44.4	94.5	0 / 0	1140	43.8	97.1	0 / 0	1140	47.3	100.2	0 / 1
	18422	8JVILLE	18430	8DAVIDSO	1	500	147	166	1732	1732	57	42.0	93.6	0 / 0	57	45.7	102.1	0 / 1	57	36.0	82.7	0 / 0	57	37.4	86.3	0 / 0	57	38.3	88.6	0 / 0
	18642	5GUNT HP	18024	3GUNTERV	2	161-115	147	166	30	30	—	80.5	—	0 / 0	62	95.8	100.1	0 / 1	62	89.9	97.2	0 / 0	62	98.5	105.8	1 / 7	62	104.6	112.0	***
																					B1									
	18427	8PARADIS	18428	8MONTGO	1	500	147	166	1732	1732	—	58.6	—	0 / 0	—	58.6	—	0 / 0	65	102.2	102.9	***	65	102.2	103.0	***	65	102.3	103.0	***
	99798	5BATEVL	99808	5CUSHMN	1	161	151	159	148	148	30	95.3	97.6	0 / 0	30	88.7	90.9	0 / 0	30	98.8	101.2	0 / 4	30	95.3	97.6	0 / 0	30	92.7	94.9	0 / 0
	18705	5CENTER	18756	5SMTH TN	1	161	147	166	151	151	4367	82.1	92.2	0 / 0	4367	88.7	99.2	0 / 0	4367	91.2	101.1	0 / 1	4367	94.9	105.8	1 / 2	4367	96.8	107.9	2 / 4
1	18016	8SNP	18275	N1 SQN	1	500-22.5	147	167	1200	1200	75	99.5	99.6	0 / 0	62	99.9	99.9	0 / 0	62	99.8	100.6	0 / 10	62	100.1	101.1	***	62	100.5	101.2	***
	18012	5PARADIS	18880	5RUSS.SS	1	161	147	166	350	350	160	70.1	90.3	0 / 0	160	74.0	94.6	0 / 0	160	80.8	100.4	0 / 1	160	84.9	106.1	1 / 0	160	86.8	108.2	1 / 2
	27094	11GR STL	27142	11SMITH	1	138	211	211	287*	287*	—	21.8	—*	0 / 0	—	21.9	—*	0 / 0	1252	57.4	87.8*	0 / 0	1252	57.2	85.3*	0 / 0	1252	56.3	85.9*	0 / 0
																									C1					
	18642	5GUNT HP	18024	3GUNTERV	1	161-115	147	166	30	30	—	79.9	—	0 / 0	62	95.1	99.4	0 / 0	62	89.3	96.5	0 / 0	62	97.8	105.1	1 / 2	62	103.8	111.2	***
	18744	5MURFREE	18890	5LASCASS	1	161	147	166	206	206	4260	65.6	91.6	0 / 0	4260	70.8	99.2	0 / 0	4260	70.0	95.2	0 / 0	4260	73.6	100.4	0 / 1	4260	75.4	102.7	0 / 1
	27034	11LR TAP	27045	11WI TAP	1	161	211	211	167*	223*	1222	77.9	94.1*	0 / 0	—	89.7	—*	0 / 0	1222	70.8	61.1*	0 / 0	1222	86.0	79.1*	0 / 0	1222	84.1	68.5*	0 / 0
	27023	11DELVIN	27045	11WI TAP	1	161	211	211	176*	201*	1222	58.9	91.4*	0 / 0	—	70.6	—*	0 / 0	1222	55.5	54.8*	0 / 0	1222	66.7	75.3*	0 / 0	1225	65.0	57.5*	0 / 0
																													D1	
	27017	11ARNOLD	27023	11DELVIN	1	161	211	211	167*	201*	—	35.4	—*	0 / 0	—	49.7	—*	0 / 0	1225	33.1	31.1*	0 / 0	1225	46.5	51.0*	0 / 0	1225	45.0	41.3*	0 / 0
	27018	11ARTEMU	27027	11FARLEY	1	161	211	211	209*	257*	—	10.5	—*	0 / 0	—	21.6	—*	0 / 0	1225	9.2	18.2*	0 / 0	1225	22.2	53.2*	0 / 0	1225	16.8	29.7*	0 / 0
	27018	11ARTEMU	27037	11PINEV	1	161	211	211	176*	201*	—	13.8	—*	0 / 0	—	15.7	—*	0 / 0	1225	16.3	11.7*	0 / 0	—	15.7	54.4*	0 / 0	1225	13.9	24.8*	0 / 0
Group 2	Pre-existing Overload in Base Case with Increased Overloading in Study Cases										Base Case Overloaded																			
																	A2													
	26851	10CULLEY	26879	10GRNDV	1	138	210	210	156	179	3110	94.1	112.1	1 / 2	3110	109.7	122.8	***	3110	84.2	94.1	0 / 0	1065	91.6	97.3	0 / 0	3110	101.6	105.6	***
	18711	5GALLATI	18890	5LASCASS	1	161	147	166	206	206	4260	80.5	107.6	1 / 0	4260	85.6	114.8	1 / 0	4260	85.1	110.7	1 / 0	4260	88.5	116.2	1 / 2	4260	90.3	118.7	1 / 2
	18450	5WILSNTN	18914	5GLADV T	1	161	147	166	151	151	4370	21.3	101.7	0 / 1	4370	27.6	108.7	1 / 0	4370	28.5	110.7	1 / 0	4370	28.0	113.8	1 / 0	4370	27.8	115.2	1 / 0
2	26874	10DUBOIS	26873	10DUBOIS	1	69-138	210	210	112	117	1142	65.7	102.3	0 / 1	1142	69.8	108.7	1 / 0	1142	62.9	98.5	0 / 0	1142	62.1	101.2	0 / 0	1142	67.2	104.7	0 / 1
	18724	5PIN HOO	18738	5CANE RI	1	161	147	166	271	271	80	61.6	101.0	0 / 1	80	65.2	104.7	0 / 1	80	66.8	107.1	1 / 0	80	66.8	106.5	1 / 0	80	66.9	106.5	1 / 0
																					B2									
	18434	8BFNP	18137	N3 BFN	1	500-20.7	147	166	1200	1200	62	93.4	179.4	10 / 0	62	94.2	179.6	11 / 1	62	96.4	246.2	11 / 1	62	96.8	246.3	10 / 2	62	97.2	246.5	10 / 3
	18691	5BOWL GR	18880	5RUSS.SS	1	161	147	166	180	180	160	53.4	100.7	0 / 1	160	50.3	98.1	0 / 0	160	59.3	110.8	1 / 0	160	57.3	110.2	1 / 0	160	56.4	109.7	1 / 0
	27092	11GHENT	27128	11OC TAP	1	138	211	211	227	280*	1245	72.3	72.9*	0 / 0	1245	77.6	71.2*	0 / 0	—	69.6	67.9*	0 / 0	1245	71.7	71.0*	0 / 0	1245	75.1	77.1*	0 / 0

Notes: * = Rating changed by the utility to eliminate overloading.

1.

								Old Ratings		New Ratings	
From	Name	To	Name	Ckt	Base kV	Area	Zone	Norm	Emer	Norm	Emer
27017	11ARNOLD	27023	11DELVIN	1	161	211	211	113*	113*	167*	201*
27018	11ARTEMU	27027	11FARLEY	1	161	211	211	142*	142*	209*	257*
27018	11ARTEMU	27037	11PINEV	1	161	211	211	129*	129*	176*	201*
27023	11DELVIN	27045	11WI TAP	1	161	211	211	142*	142*	176*	201*
27034	11LR TAP	27045	11WI TAP	1	161	211	211	165*	165*	167*	223*
27092	11GHENT	27128	11OC TAP	1	138	211	211	227	227*	227	280*
27094	11GR STL	27142	11SMITH	1	138	211	211	241*	241*	287*	287*

2. — = Less than the Minimum Reporting Level of 85%
3. *** = Normal System Flow (ie - with No Outages) exceeds the Overload Criteria
4. E = Pre-existing Overload that was changed by less than 2.5% in the new case
5. Count of Contingencies Causing Overloads (A/B Stats)
   A = Serious Overload > 105%
   B = Overloaded Facility between 100% and 105% of Rated Capability
6. = Reduced Loading Caused by Adding Thoroughbred Project to Base Case with All MISO Generators
7. = Reduced Loading Caused by Adding All MISO Generators to the Thoroughbred Project

EXHIBIT A2-1

Thoroughbred Energy Campus Short Circuit Results

Bus					Interconnection I				Interconnection II				Interconnection III			
			Base Case		Case 101		Case 201		Case 141		Case 241		Case 171		Case 271	
#	Name	kV	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps
27604	THORBRD EC 1	500	#N/A	#N/A	12415	14207	12415	14207	18427	18515	18432	18518	13903	15387	13904	15388
27603	THORBRD EC 2	345	#N/A	#N/A	#N/A	#N/A	11486	12715	#N/A	#N/A	11495	12723	#N/A	#N/A	11492	12720
18001	7SHAWNEE	345	19782	19342	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18002	5SHAWNE1	161	60700	51090	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18007	5MARSHAL	161	34249	28376	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18012	5PARADIS	161	30455	21759	[illegible]	[illegible]	[illegible]	[illegible]	**42094**	**29242**	**42141**	**29257**	**36655**	**25828**	**36701**	**25844**
18020	5CALVERT	161	28703	25760	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18021	5KY HY	161	26291	21452	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18026	5BARKLEY	161	24380	19499	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18034	5C-31	161	39556	33270	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18035	5C-33	161	51065	40707	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18037	5C-35	161	27295	19785	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18038	5C-37A	161	41417	33421	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18039	5C-37B	161	47875	39479	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18401	8SHAWNEE	500	15224	13072	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18402	5SHAWNE2	161	60700	51090	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18406	8MARSHAL	500	14316	11452	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18427	8PARADIS	500	9015	9410	[illegible]	[illegible]	**12397**	**13527**	[illegible]	[illegible]	**12409**	**13536**	[illegible]	[illegible]	**12405**	**13533**
18428	8MONTGOM	500	15858	12060	[illegible]	[illegible]	17316	12786	[illegible]	[illegible]	17386	12814	[illegible]	[illegible]	17358	12802
18493	5PADUCAH	161	10471	9178	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18494	5S CALVE	161	23071	20556	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18495	5BENTON	161	9165	6740	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18496	5CLINTON	161	5481	5164	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18497	5MAYFIEL	161	10951	9009	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18502	5MARTIN	161	18425	14615	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18881	5E CALTP	161	25129	21189	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18932	5MOSCO T	161	5388	4985	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18934	5COLMN T	161	9382	7987	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19055	5N STAR	161	26682	21657	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19449	5ENERGY	161	27092	22995	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27006	11HARDN	345	7365	2096	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	**9094**	**4060**	**9094**	**4060**
27012	11SMITH	345	5000	1350	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	**12940**	**6872**	**12941**	**6872**
27028	11GR RV	161	18712	10856	20007	11297	20007	11297	**33748**	**22451**	**33753**	**22453**	**22217**	11788	**22219**	11788

Thoroughbred Energy Campus Short Circuit Results

Bus			Base Case		Interconnection I				Interconnection II				Interconnection III			
					Case 101		Case 201		Case 141		Case 241		Case 171		Case 271	
#	Name	kV	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps
27029	11GRAHVL	161	34216	23021	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27033	11LIV C	161	20438	13707	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27043	11S PADU	161	10964	6487	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27047	11WICKLI	161	6046	3271	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7610	[illegible]	7610
27079	11CLVRPR	138	14335	7145	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	**22803**	3760	**22803**	3760
27094	11GR STL	138	20527	3569	[illegible]	[illegible]	[illegible]	[illegible]	**28178**	3077	**28180**	3077	23549	3152	23550	3153
27095	11GR RVR	138	21648	3010	22420	[illegible]	22420	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	**23890**	3760	**23891**	3760
27142	11SMITH	138	21281	3567	[illegible]	[illegible]	[illegible]	[illegible]	**26503**	[illegible]	**26504**	[illegible]	24756	[illegible]	24757	[illegible]
27216	11GR RVR	69	23913	3682	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27218	11GRAHMV	69	8357	1126	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27298	11WICKLI	69	8501	2770	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27551	14REID 5	161	23133	26941	24884	28607	24884	28607	23875	27624	23876	27625	**25644**	29263	**25645**	29263
27552	14COLE 5	161	19963	21424	21320	22527	21320	22528	20505	[illegible]	20505	[illegible]	**22012**	22195	**22012**	22195
27553	14WILSO5	161	19776	21181	**22850**	**24398**	**22850**	**24399**	**30640**	**30564**	**30643**	**30566**	**30113**	**29971**	**30117**	**29974**
27561	14WILSO7	345	9251	9773	**13730**	**14843**	**13730**	**14843**	**10809**	**11108**	**10809**	**11108**	**16302**	**16308**	**16303**	**16308**
27563	14COLE 7	345	7583	7980	**8720**	**8876**	**8720**	**8876**	8036	8322	8036	8322	**9704**	8417	**9705**	8417
27616	14N.HAR5	161	11295	6543	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6899	[illegible]	6899
27618	14LIVIN5	161	16037	11604	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27620	14MCRAK5	161	22864	15956	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
30282	CAPE GIR	161	13239	8603	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
30825	JOPPA TS	345	18102	14472	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
30830	JOPPA	230	12083	8341	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
30849	KELSO	345	12018	6622	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
30850	KELSO	161	16714	10954	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
31023	MARION S	161	11419	9500	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
31248	MOUND CY	161	4560	3005	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
31924	W.FRKFT	230	10258	7463	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
33351	5MRN_PLN	161	10807	9040	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
33352	5RENSHAW	161	6319	5354	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
33391	JOPPA N	161	29873	17091	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
33392	JOPPA S	161	49981	29401	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
33394	JOPPA TS	161	49208	29402	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

LEGEND

0 - 2 % increase	[illegible]
2 - 5 % increase	10000
5 - 10 % increase	10000
>10 % increase	**10000**

Thoroughbred Energy Campus Short Circuit Results

Bus					Interconnection I				Interconnection II				Interconnection III			
			Base Case		Case 101		Case 201		Case 141		Case 241		Case 171		Case 271	
#	Name	kV	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps
27604	THORBRD EC 1	500	#N/A	#N/A	12415	14207	12415	14207	18427	18515	18432	18518	13903	15387	13904	15388
27603	THORBRD EC 2	345	#N/A	#N/A	#N/A	#N/A	11486	12715	#N/A	#N/A	11495	12723	#N/A	#N/A	11492	12720
18001	7SHAWNEE	345	19782	19342	19784	19343	19790	19347	19787	19345	19792	19349	19784	19365	19790	19369
18002	5SHAWNE1	161	60700	51090	60708	51093	60716	51098	60717	51098	60725	51103	60708	51109	60717	51114
18007	5MARSHAL	161	34249	28376	34291	28396	34309	28404	34343	28431	34361	28439	34295	28400	34313	28408
18012	5PARADIS	161	30455	21759	30463	21762	30508	21778	42094	29242	42141	29257	36655	25828	36701	25844
18020	5CALVERT	161	28703	25760	28751	25787	28764	25794	28815	25840	28828	25847	28757	25791	28770	25798
18021	5KY HY	161	26291	21452	26352	21481	26364	21486	26425	21539	26437	21544	26360	21484	26372	21490
18026	5BARKLEY	161	24380	19499	24436	19524	24448	19529	24479	19555	24491	19561	24443	19529	24455	19534
18034	5C-31	161	39556	33270	39558	33272	39561	33273	39562	33274	39565	33275	39559	33277	39561	33279
18035	5C-33	161	51065	40707	51071	40710	51075	40712	51082	40717	51086	40718	51072	40720	51076	40722
18037	5C-35	161	27295	19785	27295	19786	27296	19786	27296	19786	27296	19786	27295	19812	27296	19812
18038	5C-37A	161	41417	33421	41419	33422	41422	33423	41422	33423	41424	33424	41419	33438	41422	33439
18039	5C-37B	161	47875	39479	47879	39480	47883	39482	47883	39483	47888	39485	47879	39491	47884	39493
18401	8SHAWNEE	500	15224	13072	15227	13073	15234	13077	15231	13075	15238	13079	15227	13085	15235	13089
18402	5SHAWNE2	161	60700	51090	60708	51093	60716	51098	60717	51098	60725	51103	60708	51109	60717	51114
18406	8MARSHAL	500	14316	11452	14321	11454	14334	11459	14327	11457	14340	11462	14321	11458	14335	11463
18427	8PARADIS	500	9015	9410	9015	9410	12397	13527	9027	9419	12409	13536	9022	9415	12405	13533
18428	8MONTGOM	500	15858	12060	15859	12060	17316	12786	15929	12090	17386	12814	15900	12078	17358	12802
18493	5PADUCAH	161	10471	9178	10474	9179	10475	9180	10477	9181	10478	9181	10474	9179	10475	9180
18494	5S CALVE	161	23071	20556	23106	20575	23114	20580	23151	20610	23159	20615	23110	20578	23118	20583
18495	5BENTON	161	9165	6740	9168	6741	9169	6742	9171	6743	9173	6743	9168	6741	9170	6742
18496	5CLINTON	161	5481	5164	5481	5164	5482	5164	5481	5164	5482	5164	5481	5164	5482	5164
18497	5MAYFIEL	161	10951	9009	10954	9010	10956	9011	10957	9012	10959	9013	10954	9011	10956	9012
18502	5MARTIN	161	18425	14615	18426	14615	18436	14620	18427	14616	18438	14620	18426	14615	18437	14620
18881	5E CALTP	161	25129	21189	25168	21209	25178	21214	25220	21247	25230	21252	25173	21212	25183	21216
18932	5MOSCO T	161	5388	4985	5388	4985	5388	4985	5388	4985	5388	4985	5388	4985	5388	4985
18934	5COLMN T	161	9382	7987	9383	7987	9384	7988	9385	7988	9385	7989	9383	7988	9384	7988
19055	5N STAR	161	26682	21657	26716	21672	26726	21677	26759	21701	26770	21705	26719	21674	26730	21679
19449	5ENERGY	161	27092	22995	27131	23015	27143	23020	27184	23053	27195	23058	27136	23018	27148	23023
27006	11HARDN	345	7365	2096	7371	2097	7371	2097	7374	2098	7374	2098	9094	4060	9094	4060
27012	11SMITH	345	5000	1350	5004	1351	5004	1351	5009	1351	5009	1351	12940	6872	12941	6872
27028	11GR RV	161	18712	10856	20007	11297	20007	11297	33748	22451	33753	22453	22217	11788	22219	11788

EXHIBIT A3-2

Thoroughbred Energy Campus Short Circuit Results

Bus					Interconnection I				Interconnection II				Interconnection III			
			Base Case		Case 101		Case 201		Case 141		Case 241		Case 171		Case 271	
#	Name	kV	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps	Three Phase amps	Line-Ground amps
27029	11GRAHVL	161	34216	23021	34221	23022	34222	23023	34228	23026	34230	23027	34221	23025	34223	23026
27033	11LIV C	161	20438	13707	20495	13728	20501	13729	20629	13845	20635	13847	20514	13733	20519	13735
27043	11S PADU	161	10964	6487	10968	6488	10969	6488	10978	6494	10979	6494	10969	6489	10970	6489
27047	11WICKLI	161	6046	3271	6047	3271	6047	3271	6047	3271	6047	3271	6047	3271	6047	3271
27079	11CLVRPR	138	14335	7145	14422	7162	14423	7162	14385	7164	14385	7164	14452	7610	14453	7610
27094	11GR STL	138	20527	3569	20583	3571	20583	3571	20667	3574	20667	3574	22803	3760	22803	3760
27095	11GR RVR	138	21648	3010	22420	3020	22420	3020	28178	3077	28180	3077	23549	3152	23550	3153
27142	11SMITH	138	21281	3567	21335	3569	21335	3569	21416	3572	21416	3572	23890	3760	23891	3760
27216	11GR RVR	69	23913	3682	24268	3687	24269	3687	26503	3719	26504	3719	24756	3694	24757	3695
27218	11GRAHMV	69	8357	1126	8358	1126	8358	1126	8358	1126	8358	1126	8358	1126	8358	1126
27298	11WICKLI	69	8501	2770	8501	2770	8501	2770	8501	2770	8501	2770	8501	2770	8501	2770
27551	14REID 5	161	23133	26941	24884	28607	24884	28607	23875	27624	23876	27625	25644	29263	25645	29263
27552	14COLE 5	161	19963	21424	21320	22527	21320	22528	20505	21850	20505	21850	22012	22195	22012	22195
27553	14WILSO5	161	19776	21181	22850	24398	22850	24399	30640	30564	30643	30566	30113	29971	30117	29974
27561	14WILSO7	345	9251	9773	13730	14843	13730	14843	10809	11108	10809	11108	16302	16308	16303	16308
27563	14COLE 7	345	7583	7980	8720	8876	8720	8876	8036	8322	8036	8322	9704	8417	9705	8417
27616	14N.HAR5	161	11295	6543	11378	6564	11378	6564	11348	6571	11348	6571	11341	6899	11341	6899
27618	14LIVIN5	161	16037	11604	16054	11610	16058	11611	16067	11617	16072	11619	16056	11612	16060	11614
27620	14MCRAK5	161	22864	15956	22866	15956	22867	15957	22868	15957	22870	15958	22866	15958	22868	15958
30282	CAPE GIR	161	13239	8603	13239	8603	13240	8603	13239	8603	13240	8603	13239	8619	13240	8620
30825	JOPPA TS	345	18102	14472	18103	14473	18106	14475	18105	14474	18108	14476	18103	14489	18107	14490
30830	JOPPA	230	12083	8341	12083	8341	12083	8341	12083	8341	12083	8341	12083	8361	12083	8361
30849	KELSO	345	12018	6622	12018	6622	12019	6622	12019	6622	12020	6622	12018	6642	12019	6643
30850	KELSO	161	16714	10954	16714	10954	16715	10955	16714	10954	16715	10955	16714	10979	16715	10979
31023	MARION S	161	11419	9500	11420	9501	11420	9501	11420	9501	11420	9501	11420	9555	11420	9555
31248	MOUND CY	161	4560	3005	4560	3005	4560	3005	4560	3005	4560	3005	4560	3005	4560	3005
31924	W.FRKFT	230	10258	7463	10259	7464	10259	7464	10259	7464	10259	7464	10259	7542	10259	7542
33351	5MRN_PLN	161	10807	9040	10807	9040	10808	9040	10808	9041	10808	9041	10808	9089	10808	9089
33352	5RENSHAW	161	6319	5354	6321	5355	6321	5355	6321	5355	6321	5355	6321	5366	6321	5366
33391	JOPPA N	161	29873	17091	29874	17091	29874	17091	29874	17091	29874	17091	29874	17139	29874	17139
33392	JOPPA S	161	49981	29401	49985	29402	49987	29403	49989	29403	49991	29404	49985	29424	49988	29425
33394	JOPPA TS	161	49208	29402	49211	29403	49214	29404	49215	29404	49218	29405	49212	29426	49214	29427

LEGEND

0 - 2 % increase	10000
2 - 5 % increase	10000
5 - 10 % increase	10000
>10 % increase	**10000**

Exhibit A4

Thoroughbred Energy Campus

Transient Stability Analysis for Preferred Interconnection Plan - 2003 Summer
Preferred Interconnection Plan with MISO

Exhibits D11 - D82

Fault Location Bus No.	Fault Location Bus Name	Fault Location kV	Tripped Facility Bus No.	Tripped Facility Bus Name	Tripped Facility kV	Tripped Facility Bus No.	Tripped Facility Bus Name	kV	Circuit	Figure # 6 cycle Cleraing	Fault Duration cycles	Figure # Critical Clearing Time (cy)	Response	Critical Clearing Time (cy)
WILSON SUBSTATION														
27561	14WILSO7	345	27561	14WILSO7	345	27562	14REID 7	345	1	D11	6	D12	Stable	8
			27561	14WILSO7	345	27012	11SMITH	345	1		6		Stable	9
27553	14WILSO5	161	27553	14WILSO5	161	27561	14WILSO7	345	1		6	D14	Stable	12
			27553	14WILSO5	161	27028	11GR RV	161	1	D15	6	D16	Stable	12
REID SUBSTATION														
27562	14REID 7	345	27562	14REID 7	345	27561	14WILSO7	345	1		6	D22	Stable	18
			27562	14REID 7	345	27551	14REID 5	161	1		6		Stable	17
27551	14REID 5	161	27551	14REID 5	161	27562	14REID 7	345	1		6	D24	Stable	11
			27551	14REID 5	161	27559	14DAVIS5	161	1		6	D26	Stable	11
			27551	14REID 5	161	27560	14HENDR5	161	1		6		Stable	11
			27551	14REID 5	161	27619	14HOPCO5	161	1		6		Stable	11
27554	14REID	69	27554	14REID	69	27551	14REID 5	161	1		8	D28	Stable	28
GREEN RIVER SUBSTATION														
27028	11GR RV	161	27028	11GR RV	161	27020	11CORY T	161	1		6		Stable	18
			27028	11GR RV	161	27042	11RQ TAP	161	1		6		Stable	18
			27028	11GR RV	161	27553	14WILSO5	161	1		6	D32	Stable	16
27095	11GR RVR	138	27095	11GR RVR	138	27028	11GR RV	161	1		6	D34	Stable	15
			27095	11GR RVR	138	27094	11GR STL	138	1		6	D36	Stable	15
			27095	11GR RVR	138	27126	11OHIO C	138	1		6		Stable	15
27216	11GR RVR	69	27216	11GR RVR	69	27095	11GR RVR	138	1		8	D38	Stable	11
COLEMAN SUBSTATION														
27563	14COLE 7	345	27563	14COLE 7	345	27012	11SMITH	345	1		6	D42	Stable	24
27552	14COLE 5	161	27552	14COLE 5	161	27563	14COLE 7	345	1		6	D44	Stable	13
			27552	14COLE 5	161	27564	14NATAL5	161	1		6		Stable	13
			27552	14COLE 5	161	27557	14HANCO5	161	1		6	D46	Stable	13
			27552	14COLE 5	161	26857	10NEWTVL	161	1		6		Stable	12
SMITH SUBSTATION														
27012	11SMITH	345	27012	11SMITH	345	27006	11HARDN	345	1		6	D52	Stable	17
			27012	11SMITH	345	27561	14WILSO7	345	1		6		Stable	17
			27012	11SMITH	345	27563	14COLE 7	345	1		6		Stable	16
27142	11SMITH	138	27142	11SMITH	138	27012	11SMITH	345	1		4	D54	Stable	11
			27142	11SMITH	138	27094	11GR STL	138	1		6	D56	Stable	12
MONTGOMERY SUBSTATION														
18428	8MONTGOM	500	18428	8MONTGOM	500	18430	8DAVIDSO	500	1		4	D60	Stable	5
PARADISE SUBSTATION														
18427	8PARADIS	500									6	D70	Stable	6
THOROUGHBRED SUBSTATION														
27603	THORBRED	500									6	D80	Stable	7
27604	THORBRED	345									6	D82	Stable	9

Exhibit A5

Thoroughbred Energy Campus

Transient Stability Analysis for MISO Base Case - 2003 Summer

MISO Base Case

Exhibits D112 - D160

Fault Location Bus No.	Fault Location Bus Name	Fault Location kV	Tripped Facility Bus No.	Tripped Facility Bus Name	Tripped Facility kV	Tripped Facility Bus No.	Tripped Facility Bus Name	Tripped Facility kV	Circuit	Fault Duration cycles	Figure # Critical Clearing Time (cy)	Response	Critical Clearing Time (cy)
WILSON SUBSTATION													
27561	14WILSO7	345	27561	14WILSO7	345	27562	14REID 7	345	1	6	D112	Stable	16
			27561	14WILSO7	345	27563	14COLE 7	345	1	6		Stable	17
27553	14WILSO5	161	27553	14WILSO5	161	27561	14WILSO7	345	1	6		Stable	11
			27553	14WILSO5	161	27028	11GR RV	161	1	6		Stable	11
REID SUBSTATION													
27562	14REID 7	345	27562	14REID 7	345	27561	14WILSO7	345	1	6	D122	Stable	20
			27562	14REID 7	345	27551	14REID 5	161	1	6		Stable	21
27551	14REID 5	161	27551	14REID 5	161	27562	14REID 7	345	1	6		Stable	11
			27551	14REID 5	161	27559	14DAVIS5	161	1	6		Stable	11
			27551	14REID 5	161	27560	14HENDR5	161	1	6		Stable	11
			27551	14REID 5	161	27619	14HOPCO5	161	1	6		Stable	11
27554	14REID	69	27554	14REID	69	27551	14REID 5	161	1	8		Stable	28
GREEN RIVER SUBSTATION													
27028	11GR RV	161	27028	11GR RV	161	27020	11CORY T	161	1	6		Stable	17
			27028	11GR RV	161	27042	11RQ TAP	161	1	6		Stable	17
			27028	11GR RV	161	27553	14WILSO5	161	1	6	D132	Stable	16
27095	11GR RVR	138	27095	11GR RVR	138	27028	11GR RV	161	1	6		Stable	15
			27095	11GR RVR	138	27094	11GR STL	138	1	6		Stable	15
			27095	11GR RVR	138	27126	11OHIO C	138	1	6		Stable	15
27216	11GR RVR	69	27216	11GR RVR	69	27095	11GR RVR	138	1	8		Stable	10
COLEMAN SUBSTATION													
27563	14COLE 7	345	27563	14COLE 7	345	27561	14WILSO7	345	1	6	D142	Stable	24
27552	14COLE 5	161	27552	14COLE 5	161	27563	14COLE 7	345	1	6		Stable	13
			27552	14COLE 5	161	27564	14NATAL5	161	1	6		Stable	13
			27552	14COLE 5	161	27557	14HANCO5	161	1	6		Stable	13
			27552	14COLE 5	161	26857	10NEWTVL	161	1	6		Stable	13
SMITH SUBSTATION													
27012	11SMITH	345	27012	11SMITH	345	27006	11HARDN	345	1	6	D152	Stable	34
27142	11SMITH	138	27142	11SMITH	138	27012	11SMITH	345	1	4		Stable	12
			27142	11SMITH	138	27094	11GR STL	138	1	6		Stable	11
MONTGOMERY SUBSTATION													
18428	8MONTGOM	500	18428	8MONTGOM	500	18430	8DAVIDSO	500	1	4	D160	Stable	7
PARADISE SUBSTATION													
18427	8PARADIS	500								6		Stable	7

Exhibit A6

Thoroughbred Energy Campus

Transient Stability Analysis for Base Case - 2003 Summer

Base Case

Exhibits D112 - D160

Fault Location Bus No.	Fault Location Bus Name	Fault Location kV	Bus No.	Bus Name	Tripped Facility kV	Tripped Facility Bus No.	Tripped Facility Bus Name	kV	Circuit	Figure # 6 cycle Clearing	Fault Duration cycles	Critical Clearing Time (cy)	Response	Critical Clearing Time (cy)
WILSON SUBSTATION														
27561	14WILSO7	345	27561	14WILSO7	345	27562	14REID 7	345	1	D211	6	D212	Stable	15
			27561	14WILSO7	345	27563	14COLE 7	345	1		6		Stable	17
27553	14WILSO5	161	27553	14WILSO5	161	27561	14WILSO7	345	1		6		Stable	11
			27553	14WILSO5	161	27028	11GR RV	161	1	D215	6	D216	Stable	11
REID SUBSTATION														
27562	14REID 7	345	27562	14REID 7	345	27561	14WILSO7	345	1		6	D222	Stable	20
			27562	14REID 7	345	27551	14REID 5	161	1		6		Stable	21
27551	14REID 5	161	27551	14REID 5	161	27562	14REID 7	345	1		6		Stable	11
			27551	14REID 5	161	27559	14DAVIS5	161	1		6		Stable	11
			27551	14REID 5	161	27560	14HENDR5	161	1		6		Stable	11
			27551	14REID 5	161	27619	14HOPCO5	161	1		6		Stable	11
27554	14REID	69	27554	14REID	69	27551	14REID 5	161	1		8		Stable	28
GREEN RIVER SUBSTATION														
27028	11GR RV	161	27028	11GR RV	161	27020	11CORY T	161	1		6		Stable	17
			27028	11GR RV	161	27042	11RQ TAP	161	1		6		Stable	17
			27028	11GR RV	161	27553	14WILSO5	161	1		6	D232	Stable	16
27095	11GR RVR	138	27095	11GR RVR	138	27028	11GR RV	161	1		6		Stable	15
			27095	11GR RVR	138	27094	11GR STL	138	1		6		Stable	15
			27095	11GR RVR	138	27126	11OHIO C	138	1		6		Stable	15
27216	11GR RVR	69	27216	11GR RVR	69	27095	11GR RVR	138	1		8		Stable	10
COLEMAN SUBSTATION														
27563	14COLE 7	345	27563	14COLE 7	345	27561	14WILSO7	345	1		6	D242	Stable	25
27552	14COLE 5	161	27552	14COLE 5	161	27563	14COLE 7	345	1		6	D244	Stable	13
			27552	14COLE 5	161	27564	14NATAL5	161	1		6		Stable	13
			27552	14COLE 5	161	27557	14HANCO5	161	1		6		Stable	13
			27552	14COLE 5	161	26857	10NEWTVL	161	1		6		Stable	13
SMITH SUBSTATION														
27012	11SMITH	345	27012	11SMITH	345	27006	11HARDN	345	1		6	D252	Stable	33
27142	11SMITH	138	27142	11SMITH	138	27012	11SMITH	345	1		4		Stable	12
			27142	11SMITH	138	27094	11GR STL	138	1		6		Stable	11
MONTGOMERY SUBSTATION														
18428	8MONTGOM	500	18428	8MONTGOM	500	18430	8DAVIDSO	500	1		4	D260	Stable	6
PARADISE SUBSTATION														
18427	8PARADIS	500									6		Stable	7

Thoroughbred Energy Campus
Case 271MF - 2005 Summer
All MISO Gens Add Brown N to Pineville
11/1/2002

No.	Contingency	Ckt	Base kV	Area	Zone
27	outage of 18401 8SHAWNEE to 18001 7SHAWNEE	1	500-345	147	166
30	outage of 18401 8SHAWNEE to 18402 5SHAWNE2	1	500-161	147	166
32	outage of 18401 8SHAWNEE to 18406 8MARSHAL	1	500	147	166
40	outage of 18406 8MARSHAL to 18007 5MARSHAL	1	500-161	147	166
42	outage of 18406 8MARSHAL to 18425 8CUMBERL	1	500	147	166
45	outage of 18422 8JVILLE to 18425 8CUMBERL	1	500	147	166
47	outage of 18422 8JVILLE to 18430 8DAVIDSO	1	500	147	166
57	outage of 18425 8CUMBERL to 18430 8DAVIDSO	1	500	147	166
62	outage of 8PARADIS to 8MONTGOM (& Redispatch)		500	147	166
65	outage of 18428 8MONTGOM to 18430 8DAVIDSO	1	500	147	166
67	outage of 18428 8MONTGOM to 18449 8WILSON	1	500	147	166
70	outage of 18428 8MONTGOM to 19415 0MONT MP	1	500-1	147	166
72	outage of 18430 8DAVIDSO to 18431 5DAVIDSO	1	500-161	147	166
75	outage of 18430 8DAVIDSO to 18432 8MAURY	1	500	147	166
77	outage of 18430 8DAVIDSO to 18579 8PIN HOO	1	500	147	166
80	outage of 18430 8DAVIDSO to 18698 5DAVSN 2	1	500-161	147	166
82	outage of 18432 8MAURY to 18433 5MAURY	1	500-161	147	166
110	outage of 18449 8WILSON to 18450 5WILSNTN	1	500-161	147	166
112	outage of 18449 8WILSON to 18579 8PIN HOO	1	500	147	166
115	outage of 18579 8PIN HOO to 18724 5PIN HOO	1	500-161	147	166
132	outage of 18007 5MARSHAL to 18020 5CALVERT	1	161	147	166
135	outage of 18007 5MARSHAL to 18493 5PADUCAH	1	161	147	166
137	outage of 18007 5MARSHAL to 18495 5BENTON	1	161	147	166
140	outage of 18007 5MARSHAL to 18497 5MAYFIEL	1	161	147	166
142	outage of 18007 5MARSHAL to 19055 5N STAR	1	161	147	166
155	outage of 18012 5PARADIS to 18686 5HOPKINV	1	161	147	166
157	outage of 18012 5PARADIS to 18686 5HOPKINV	2	161	147	166
160	outage of 18012 5PARADIS to 18691 5BOWL GR	1	161	147	166
162	outage of 18012 5PARADIS to 18866 5CROSSPN	1	161	147	166
165	outage of 18012 5PARADIS to 18880 5RUSS.SS	1	161	147	166
167	outage of 18012 5PARADIS to 18926 5ABERD T	1	161	147	166
170	outage of 18012 5PARADIS to 19472 5ELKTNTP	1	161	147	166
172	outage of 18020 5CALVERT to 18195 1ARPR&CH	1	161-13	147	166
175	outage of 18020 5CALVERT to 18494 5S CALVE	1	161	147	166
177	outage of 18020 5CALVERT to 19449 5ENERGY	1	161	147	166
180	outage of 18021 5KY HY to 18026 5BARKLEY	1	161	147	166
182	outage of 18021 5KY HY to 18026 5BARKLEY	2	161	147	166
185	outage of 18021 5KY HY to 18494 5S CALVE	1	161	147	166
195	outage of 18026 5BARKLEY to 18526 5DOVER	1	161	147	166
197	outage of 18026 5BARKLEY to 18953 5PRINC T	1	161	147	166
205	outage of 18027 5SUMMER to 18713 5LAFAYET	1	161	147	166

No.	Contingency	Ckt	Base kV	Area	Zone
207	outage of 18027 5SUMMER to 19006 5GLASG T	1	161	147	166
317	outage of 18686 5HOPKINV to 18794 5LEWISBG	1	161	147	166
320	outage of 18686 5HOPKINV to 19190 5SUPGRTP	1	161	147	166
322	outage of 18686 5HOPKINV to 19213 5CADIZT	1	161	147	166
325	outage of 18686 5HOPKINV to 19411 0HOPK MP	1	161-1	147	166
330	outage of 18690 5RUSV KY to 19515 5NRUSLVL	1	161	147	166
332	outage of 18691 5BOWL GR to 18692 5E BOWL	1	161	147	166
335	outage of 18691 5BOWL GR to 18880 5RUSS.SS	1	161	147	166
337	outage of 18691 5BOWL GR to 18928 5SBOWL T	1	161	147	166
340	outage of 18692 5E BOWL to 18697 5SCOTTSV	1	161	147	166
342	outage of 18692 5E BOWL to 18926 5ABERD T	1	161	147	166
345	outage of 18692 5E BOWL to 19007 5BRSTO T	1	161	147	166
395	outage of 18716 5LOGAN A to 18880 5RUSS.SS	1	161	147	166
477	outage of 18794 5LEWISBG to 18880 5RUSS.SS	1	161	147	166
480	outage of 18880 5RUSS.SS to 19515 5NRUSLVL	1	161	147	166
487	outage of 18953 5PRINC T to 19213 5CADIZT	1	161	147	166
495	outage of 19055 5N STAR to 19071 5PENWL T	1	161	147	166
497	outage of 19071 5PENWL T to 19449 5ENERGY	1	161	147	166
585	outage of 18020 5CALVERT to 18881 5E CALTP	1	161	147	166-165
587	outage of 18021 5KY HY to 18881 5E CALTP	1	161	147	166-165
600	outage of 18449 8WILSON to 18461 8ROANE	1	500	147	166-167
670	outage of 18020 5CALVERT to 27033 11LIV C	1	161	147-211	166-211
672	outage of 18021 5KY HY to 27033 11LIV C	1	161	147-211	166-211
680	outage of 18007 5MARSHAL to 27618 14LIVIN5	1	161	147-214	166-214
682	outage of 18007 5MARSHAL to 27620 14MCRAK5	1	161	147-214	166-214
685	outage of 18012 5PARADIS to 27616 14N.HAR5	1	161	147-214	166-214
687	outage of 18026 5BARKLEY to 27618 14LIVIN5	1	161	147-214	166-214
690	outage of 18026 5BARKLEY to 27619 14HOPCO5	1	161	147-214	166-214
695	outage of 18001 7SHAWNEE to 30825 JOPPA TS	1	345	147-356	166-310
697	outage of 18001 7SHAWNEE to 32339 E WFT IP	1	345	147-357	166-357
717	outage of 22673 05SULLVA to 22653 05BREED	1	765-345	205	252
720	outage of 22673 05SULLVA to 22653 05BREED	2	765-345	205	252
760	outage of 25143 07MEROM5 to 25162 07WORTHN	1	345	207	207
767	outage of 25162 07WORTHN to 25044 07WORTH8	1	345-138	207	207
772	outage of 25034 07RATTS to 25094 07TASWL1	1	161	207	207
775	outage of 25034 07RATTS to 25146 07RATTS8	1	161-138	207	207
777	outage of 25093 07TAS_2 to 25094 07TASWL1	1	69-161	207	207
780	outage of 25094 07TASWL1 to 25180 07BEDFRD	1	161	207	207
785	outage of 25154 07WORTH to 25044 07WORTH8	1	161-138	207	207
825	outage of 25143 07MEROM5 to 25948 08GIBSON	1	345	207-208	207-281
832	outage of 25181 07RAMSY5 to 25948 08GIBSON	1	345	207-208	207-281
837	outage of 25044 07WORTH8 to 26047 08BEDFRD	1	138	207-208	207-281
847	outage of 25094 07TASWL1 to 26857 10NEWTVL	1	161	207-210	207-210
850	outage of 25146 07RATTS8 to 27871 16PETE	1	138	207-216	207-216
875	outage of 25947 08BEDFRD to 25948 08GIBSON	1	345	208	281

No.	Contingency	Ckt	Base kV	Area	Zone
877	outage of 25947 08BEDFRD to 26047 08BEDFRD	1	345-138	208	281
880	outage of 25947 08BEDFRD to 26047 08BEDFRD	2	345-138	208	281
882	outage of 25947 08BEDFRD to 26161 08LOST R	1	345	208	281
885	outage of 25948 08GIBSON to 26081 08GIB	1	345-138	208	281
940	outage of 26047 08BEDFRD to 26048 08ROGRST	1	138	208	281
950	outage of 26047 08BEDFRD to 26075 08EDWRDS	1	138	208	281
972	outage of 26075 08EDWRDS to 26082 08VIN	1	138	208	281
975	outage of 26075 08EDWRDS to 26083 08PEATAP	1	138	208	281
977	outage of 26075 08EDWRDS to 26129 08HE GRN	1	138	208	281
982	outage of 26076 08VIN J to 26077 08WASHMU	1	138	208	281
985	outage of 26076 08VIN J to 26139 08MAIN J	1	138	208	281
987	outage of 26078 08OKLND to 26079 08PRNCTN	1	138	208	281
990	outage of 26079 08PRNCTN to 26081 08GIB	1	138	208	281
992	outage of 26082 08VIN to 26139 08MAIN J	1	138	208	281
1005	outage of 26174 08EDSPRT to 26075 08EDWRDS	1	69-138	208	281
1007	outage of 26181 08OKLND to 26078 08OKLND	1	69-138	208	281
1025	outage of 26078 08OKLND to 26905 10TOYOTA	1	138	208-210	281-210
1027	outage of 25949 08SPEED to 27005 11GHENT	1	345	208-211	281-211
1030	outage of 25950 08BATESV to 27005 11GHENT	1	345	208-211	281-211
1040	outage of 25947 08BEDFRD to 27824 16PETE	1	345	208-216	281-216
1042	outage of 25948 08GIBSON to 27824 16PETE	1	345	208-216	281-216
1045	outage of 26161 08LOST R to 27824 16PETE	1	345	208-216	281-216
1047	outage of 26076 08VIN J to 27871 16PETE	1	138	208-216	281-216
1050	outage of 26078 08OKLND to 27871 16PETE	1	138	208-216	281-216
1055	outage of 25948 08GIBSON to 30008 ALBION	1	345	208-356	281-323
1057	outage of 26082 08VIN to 30931 LAWRNCVL	1	138	208-356	281-323
1060	outage of 26855 10NEWTVL to 26857 10NEWTVL	1	138-161	210	210
1062	outage of 26851 10CULLEY to 26866 10CASTLE	1	138	210	210
1065	outage of 26851 10CULLEY to 26873 10DUBOIS	1	138	210	210
1067	outage of 26851 10CULLEY to 26875 10ANGMND	1	138	210	210
1070	outage of 26851 10CULLEY to 26879 10GRNDVW	1	138	210	210
1082	outage of 26853 10HEIDEL to 26854 10NW	1	138	210	210
1085	outage of 26853 10HEIDEL to 26875 10ANGMND	1	138	210	210
1087	outage of 26854 10NW to 26856 10NE	1	138	210	210
1090	outage of 26854 10NW to 26858 10MTVERN	1	138	210	210
1092	outage of 26854 10NW to 26861 10ABBRWN	1	138	210	210
1095	outage of 26855 10NEWTVL to 26879 10GRNDVW	1	138	210	210
1097	outage of 26856 10NE to 26861 10ABBRWN	1	138	210	210
1100	outage of 26856 10NE to 26866 10CASTLE	1	138	210	210
1102	outage of 26856 10NE to 26877 10ELLIOT	1	138	210	210
1105	outage of 26858 10MTVERN to 26861 10ABBRWN	1	138	210	210
1107	outage of 26858 10MTVERN to 26888 10POINT	1	138	210	210
1110	outage of 26859 10MTVERN to 26858 10MTVERN	1	69-138	210	210
1112	outage of 26859 10MTVERN to 26858 10MTVERN	2	69-138	210	210
1122	outage of 26861 10ABBRWN to 26888 10POINT	1	138	210	210

No.	Contingency	Ckt	Base kV	Area	Zone
1127	outage of 26867 10CASTLE to 26866 10CASTLE	1	69-138	210	210
1132	outage of 26869 10CATO to 26868 10CATO	1	69-138	210	210
1135	outage of 26871 10CULLEY to 26851 10CULLEY	1	69-138	210	210
1137	outage of 26873 10DUBOIS to 26904 10CATO_T	1	138	210	210
1140	outage of 26874 10DUBOIS to 26873 10DUBOIS	1	69-138	210	210
1142	outage of 26874 10DUBOIS to 26873 10DUBOIS	2	69-138	210	210
1145	outage of 26876 10ANGMND to 26875 10ANGMND	1	69-138	210	210
1147	outage of 26877 10ELLIOT to 26905 10TOYOTA	1	138	210	210
1150	outage of 26878 10ELLIOT to 26877 10ELLIOT	1	69-138	210	210
1152	outage of 26880 10GRNDVW to 26879 10GRNDVW	1	69-138	210	210
1155	outage of 26881 10HEIDEL to 26853 10HEIDEL	1	69-138	210	210
1157	outage of 26884 10NE to 26856 10NE	1	69-138	210	210
1160	outage of 26884 10NE to 26856 10NE	2	69-138	210	210
1162	outage of 26886 10NEWTVL to 26855 10NEWTVL	1	69-138	210	210
1165	outage of 26886 10NEWTVL to 26855 10NEWTVL	2	69-138	210	210
1167	outage of 26887 10NW to 26854 10NW	1	69-138	210	210
1170	outage of 26887 10NW to 26854 10NW	2	69-138	210	210
1172	outage of 26890 10POINT to 26888 10POINT	1	69-138	210	210
1175	outage of 26890 10POINT to 26888 10POINT	2	69-138	210	210
1207	outage of 26855 10NEWTVL to 27079 11CLVRPR	1	138	210-211	210-211
1210	outage of 26857 10NEWTVL to 27552 14COLE 5	1	161	210-214	210-214
1212	outage of 26861 10ABBRWN to 27617 14HENDR4	1	138	210-214	210-214
1215	outage of 26904 10CATO_T to 27871 16PETE	1	138	210-216	210-216
1217	outage of 27000 11PINEV to 27001 11POCKET	1	500	211	211
1220	outage of 27000 11PINEV to 27011 11PINEVI	1	500-345	211	211
1222	outage of 27002 11ALCALD to 27004 11BRWN N	1	345	211	211
1225	outage of 27002 11ALCALD to 27011 11PINEVI	1	345	211	211
1227	outage of 27002 11ALCALD to 27016 11ALCALD	1	345-161	211	211
1230	outage of 27004 11BRWN N to 11HARDN	1	345	211	211
1232	outage of 27004 11BRWN N to 27011 11PINEVI	1	345	211	211
1235	outage of 27004 11BRWN N to 27015 11W LEXN	1	345	211	211
1237	outage of 27004 11BRWN N to 27064 11BRWN N	1	345-138	211	211
1240	outage of 27004 11BRWN N to 27064 11BRWN N	2			
1242	outage of 27005 11GHENT to 27014 11W FRNK	1	345	211	211
1245	outage of 27005 11GHENT to 27015 11W LEXN	1	345	211	211
1247	outage of 27005 11GHENT to 27092 11GHENT	1	345-138	211	211
1250	outage of 27005 11GHENT to 27092 11GHENT	2	345-138	211	211
1252	outage of 27006 11HARDN to 27012 11SMITH	1	345	211	211
1253	Multiple outage of 27006 11HARDN to 27012 11SMITH & SMITH #2(250MW)		345	211	211
1255	outage of 27006 11HARDN to 27100 11HARDN	1	345-138	211	211
1256	outage of 27006 11HARDN to 27100 11HARDN	2	345-138	211	211
1257	outage of 27011 11PINEVI to 27038 11PINEVI	1	345-161	211	211
1260	outage of 27012 11SMITH to 27142 11SMITH	1	345-138	211	211
1262	outage of 27015 11W LEXN to 27153 11W LEXN	1	345-138	211	211
1272	outage of 27020 11CORY T to 27028 11GR RV	1	161	211	211

No.	Contingency	Ckt	Base kV	Area	Zone
1275	outage of 27020 11CORY T to 27035 11MORGNF	1	161	211	211
1280	outage of 27022 11CRITTE to 27033 11LIV C	1	161	211	211
1282	outage of 27022 11CRITTE to 27035 11MORGNF	1	161	211	211
1285	outage of 27022 11CRITTE to 27191 11CRITTE	1	161-69	211	211
1287	outage of 27025 11EARL N to 27033 11LIV C	1	161	211	211
1290	outage of 27025 11EARL N to 27042 11RQ TAP	1	161	211	211
1295	outage of 27025 11EARL N to 27198 11EARL N	1	161-69	211	211
1297	outage of 27028 11GR RV to 27042 11RQ TAP	1	161	211	211
1300	outage of 27028 11GR RV to 27095 11GR RVR	1	161-138	211	211
1302	outage of 27028 11GR RV to 27095 11GR RVR	2	161-138	211	211
1303	outage of 27028 11GR RV to 27095 11GR RVR	3	161-138	211	211
1305	outage of 27029 11GRAHVL to 27043 11S PADU	1	161	211	211
1320	outage of 27033 11LIV C to 27043 11S PADU	1	161	211	211
1322	outage of 27035 11MORGNF to 27255 11MORGNF	1	161-69	211	211
1337	outage of 27043 11S PADU to 27276 11S PADU	1	161-69	211	211
1345	outage of 27051 11ADAMS to 27097 11HAEFLI	1	138	211	211
1347	outage of 27051 11ADAMS to 27148 11TYRONE	1	138	211	211
1350	outage of 27057 11BKR LN to 27064 11BRWN N	1	138	211	211
1352	outage of 27057 11BKR LN to 27101 11HIGBY	1	138	211	211
1355	outage of 27058 11BARDST to 27063 11BRWNCT	1	138	211	211
1357	outage of 27058 11BARDST to 27124 11NELSON	1	138	211	211
1360	outage of 27061 11BONNIE to 27141 11SHREWS	1	138	211	211
1362	outage of 27061 11BONNIE to 27152 11W LEBA	1	138	211	211
1365	outage of 27061 11BONNIE to 27173 11BONNI	1	138-69	211	211
1367	outage of 27063 11BRWNCT to 27064 11BRWN N	1	138	211	211
1370	outage of 27063 11BRWNCT to 27066 11BRWNT1	1	138	211	211
1372	outage of 27063 11BRWNCT to 27067 11BRWNT2	1	138	211	211
1375	outage of 27064 11BRWN N to 27066 11BRWNT1	1	138	211	211
1377	outage of 27064 11BRWN N to 27067 11BRWNT2	1	138	211	211
1380	outage of 27064 11BRWN N to 27078 11CLAYS	1	138	211	211
1382	outage of 27064 11BRWN N to 27101 11HIGBY	1	138	211	211
1385	outage of 27064 11BRWN N to 27132 11PISGAH	1	138	211	211
1387	outage of 27064 11BRWN N to 27148 11TYRONE	1	138	211	211
1390	outage of 27065 11BRWN P to 27066 11BRWNT1	1	138	211	211
1392	outage of 27065 11BRWN P to 27067 11BRWNT2	1	138	211	211
1397	outage of 27065 11BRWN P to 27118 11MERCR	1	138	211	211
1407	outage of 27078 11CLAYS to 27101 11HIGBY	1	138	211	211
1410	outage of 27079 11CLVRPR to 27094 11GR STL	1	138	211	211
1412	outage of 27079 11CLVRPR to 27099 11HARDBG	1	138	211	211
1415	outage of 27079 11CLVRPR to 27144 11TIPTOP	1	138	211	211
1422	outage of 27085 11ETOWN to 27100 11HARDN	1	138	211	211
1425	outage of 27085 11ETOWN to 27124 11NELSON	1	138	211	211
1427	outage of 27085 11ETOWN to 27203 11ETOWN	1	138-69	211	211
1430	outage of 27088 11FAWKES to 27209 11FAWKES	1	138-69	211	211
1432	outage of 27088 11FAWKES to 27209 11FAWKES	2	138-69	211	211

No.	Contingency	Ckt	Base kV	Area	Zone
1437	outage of 27091 11FFRT E to 27148 11TYRONE	1	138	211	211
1440	outage of 27092 11GHENT to 27120 11MIDWAY	1	138	211	211
1442	outage of 27094 11GR STL to 27095 11GR RVR	1	138	211	211
1445	outage of 27094 11GR STL to 27142 11SMITH	1	138	211	211
1447	outage of 27094 11GR STL to 27215 11GR STL	1	138-69	211	211
1450	outage of 27095 11GR RVR to 27126 11OHIO C	1	138	211	211
1452	outage of 27095 11GR RVR to 27126 11OHIO C	2	138	211	211
1455	outage of 27095 11GR RVR to 27216 11GR RVR	1	138-69	211	211
1457	outage of 27095 11GR RVR to 27216 11GR RVR	2	138-69	211	211
1460	outage of 27097 11HAEFLI to 27149 11VILEY	1	138	211	211
1462	outage of 27097 11HAEFLI to 27153 11W LEXN	1	138	211	211
1465	outage of 27099 11HARDBG to 27100 11HARDN	1	138	211	211
1467	outage of 27100 11HARDN to 27138 11ROGERS	1	138	211	211
1470	outage of 27100 11HARDN to 27222 11HARDN	1	138-69	211	211
1472	outage of 27100 11HARDN to 27222 11HARDN	2	138-69	211	211
1477	outage of 27101 11HIGBY to 27136 11REYNOL	1	138	211	211
1480	outage of 27101 11HIGBY to 27225 11HIGB A	1	138-69	211	211
1482	outage of 27101 11HIGBY to 27226 11HIGB B	1	138-69	211	211
1487	outage of 27108 11LEBANO to 27118 11MERCR	1	138	211	211
1490	outage of 27108 11LEBANO to 27152 11W LEBA	1	138	211	211
1492	outage of 27108 11LEBANO to 27239 11LEBANO	1	138-69	211	211
1495	outage of 27108 11LEBANO to 27239 11LEBANO	2	138-69	211	211
1500	outage of 27109 11LEITCH to 27240 11LEITCH	1	138-69	211	211
1502	outage of 27120 11MIDWAY to 27153 11W LEXN	1	138	211	211
1505	outage of 27126 11OHIO C to 27141 11SHREWS	1	138	211	211
1507	outage of 27126 11OHIO C to 27259 11OHIO C	1	138-69	211	211
1510	outage of 27132 11PISGAH to 27153 11W LEXN	1	138	211	211
1512	outage of 27132 11PISGAH to 27266 11PISGAH	1	138-69	211	211
1515	outage of 27135 11POND C to 27144 11TIPTOP	1	138	211	211
1517	outage of 27138 11ROGERS to 27144 11TIPTOP	1			
1520	outage of 27138 11ROGERS to 27274 11ROGERS	1	138-69	211	211
1522	outage of 27142 11SMITH to 27261 11OMU	1	138-69	211	211
1525	outage of 27142 11SMITH to 27261 11OMU	2	138-69	211	211
1527	outage of 27142 11SMITH to 27261 11OMU	3	138-69	211	211
1530	outage of 27142 11SMITH to 27261 11OMU	4	138-69	211	211
1532	outage of 27142 11SMITH to 27261 11OMU	5	138-69	211	211
1535	outage of 27142 11SMITH to 27261 11OMU	6	138-69	211	211
1537	outage of 27148 11TYRONE to 27289 11TYRONE	1	138-69	211	211
1540	outage of 27149 11VILEY to 27153 11W LEXN	1	138	211	211
1615	outage of 27216 11GR RVR to 27306 11GR RVR	1	69-34.5	211	211
1685	outage of 27028 11GR RV to 27553 14WILSO5	1	161	211-214	211-214
1687	outage of 27079 11CLVRPR to 27615 14N.HAR4	1	138	211-214	211-214
1690	outage of 27099 11HARDBG to 27615 14N.HAR4	1	138	211-214	211-214
1725	outage of 27561 14WILSO7 to 27553 14WILSO5	1	345-161	214	214
1730	outage of 27561 14WILSO7 to 27562 14REID 7	1	345	214	214

No.	Contingency	Ckt	Base kV	Area	Zone
1732	outage of 27561 14WILSO7 to 27563 14COLE 7	1			
1735	outage of 27562 14REID 7 to 27551 14REID 5	1	345-161	214	214
1740	outage of 27563 14COLE 7 to 27552 14COLE 5	1	345-161	214	214
1745	outage of 27551 14REID 5 to 27559 14DAVIS5	1	161	214	214
1747	outage of 27551 14REID 5 to 27560 14HENDR5	1	161	214	214
1750	outage of 27551 14REID 5 to 27619 14HOPCO5	1	161	214	214
1752	outage of 27552 14COLE 5 to 27557 14HANCO5	1	161	214	214
1755	outage of 27552 14COLE 5 to 27564 14NATAL5	1	161	214	214
1765	outage of 27557 14HANCO5 to 27559 14DAVIS5	1	161	214	214
1767	outage of 27558 14SKILM5 to 27564 14NATAL5	1	161	214	214
1770	outage of 27558 14SKILM5 to 27616 14N.HAR5	1	161	214	214
1775	outage of 27560 14HENDR5 to 27617 14HENDR4	1	161-138	214	214
1780	outage of 27615 14N.HAR4 to 27616 14N.HAR5	1	138-161	214	214
1790	outage of 27618 14LIVIN5 to 33352 5RENSHAW	1	161	214-361	214-352
1815	outage of 27824 16PETE to 27871 16PETE	E	345-138	216	216
1817	outage of 27824 16PETE to 27871 16PETE	W	345-138	216	216
1912	outage of 31350 NORRIS to 31351 NORRIS	1	345-138	356	321
1915	outage of 31289 MUDDY to 31351 NORRIS	1	138	356	321
1917	outage of 30008 ALBION to 30009 ALBION R	1	345-138	356	323
1920	outage of 30009 ALBION R to 30010 ALBION	1	138	356	323
1922	outage of 30010 ALBION to 30439 CROSSVL	1	138	356	323
1927	outage of 30010 ALBION to 31367 OLNEY	1	138	356	323
1930	outage of 30878 KINMUNDY to 30966 LOUISVL	1	138	356	323
1932	outage of 30931 LAWRNCVL to 31367 OLNEY	1	138	356	323
1935	outage of 30966 LOUISVL to 31331 NEWTON	1	138	356	323
1937	outage of 30966 LOUISVL to 31367 OLNEY	1	138	356	323
1940	outage of 30931 LAWRNCVL to 31626 ROBNSNAM	1	138	356	323-310
1947	outage of 31331 NEWTON to 31626 ROBNSNAM	1	138	356	323-310
1950	outage of 30439 CROSSVL to 31351 NORRIS	1	138	356	323-321
2010	outage of 27097 11HAEFLI to 27053 11AMERI	1	138	211	211
2012	outage of 25949 08SPEED to 25181 07RAMSY5	1	345	207-208	207-281
2015	outage of 26128 08WASH J to 26083 08PEATAP	1	138	208	281
2017	outage of 26128 08WASH J to 26077 08WASHMU	1	138	208	281
3010	Multiple element outage Three Winding Transformer at Montgomery 500-1 147 1			147	166
3040	Multiple element outage Three Winding Transformer at Hopkinsville 161-1 147			147	166
3120	Multiple outage of 27028 11GR RV to 27553 14WILSO5 & SMITH #2(250MW)		161	211-214	211-214
3130	Multiple outage of 27028 11GR RV to 27553 14WILSO5 & PARADISE (358MW)		161	211-214	211-214
3510	Multiple outage of 27094 11GR STL to 27142 11SMITH & SMITH #2(250MW)		138	211	211
3520	Multiple outage of 27094 11GR STL to 27142 11SMITH & SMITH #1(150MW)		138	211	211
3530	Multiple outage of 27012 11SMITH to 27142 11SMITH & SMITH #2(250MW)		345-138	211	211
3540	Multiple outage of 27012 11SMITH to 27142 11SMITH & SMITH #1(150MW)		345-138	211	211
3600	Multiple outage of OMU ESS SMITH Unit #1 & #2 (400MW)				
4230	outage of 18429 5MONTGOM to 18658 5 E	1	161	147	166
4232	outage of 18429 5MONTGOM to 18683 5CLARKSV	1	161	147	166
4235	outage of 18429 5MONTGOM to 18844 5BARKERS	1	161	147	166

No.	Contingency	Ckt	Base kV	Area	Zone
4237	outage of 18429 5MONTGOM to 19162 5UNION C	1	161	147	166
4240	outage of 18429 5MONTGOM to 19221 5KRKWD T	1	161	147	166
4242	outage of 18431 5DAVIDSO to 18719 5W NASH	1	161	147	166
4245	outage of 18431 5DAVIDSO to 18720 5RADNOR	1	161	147	166
4247	outage of 18433 5MAURY to 18671 5MONSNT	1	161	147	166
4255	outage of 18433 5MAURY to 19040 5HENPECK	1	161	147	166
4257	outage of 18433 5MAURY to 19121 5RLLYHLT	1	161	147	166
4260	outage of 18450 5WILSNTN to 18711 5GALLATI	1	161	147	166
4262	outage of 18450 5WILSNTN to 18731 5HERMITA	1	161	147	166
4265	outage of 18450 5WILSNTN to 18914 5GLADV T	1	161	147	166
4267	outage of 18450 5WILSNTN to 19086 5CENT PK	1	161	147	166
4270	outage of 18450 5WILSNTN to 19131 5LKEVIE	1	161	147	166
4287	outage of 18645 5OAK PLA to 18683 5CLARKSV	1	161	147	166
4290	outage of 18645 5OAK PLA to 19207 5BEARWAL	1	161	147	166
4295	outage of 18673 5KNG SPR to 18698 5DAVSN 2	1	161	147	166
4300	outage of 18683 5CLARKSV to 18980 5DUNBAR	1	161	147	166
4305	outage of 18683 5CLARKSV to 19163 5ST BETH	1	161	147	166
4347	outage of 18695 5FRNK KY to 18796 5PORT SS	1	161	147	166
4350	outage of 18697 5SCOTTSV to 19031 5S. SCOT	1	161	147	166
4352	outage of 18698 5DAVSN 2 to 18740 5DAVSNRD	1	161	147	166
4355	outage of 18698 5DAVSN 2 to 19070 5GRASL T	1	161	147	166
4357	outage of 18710 5GALTN P to 19509 5HOEGANT	1	161	147	166
4360	outage of 18710 5GALTN P to 19206 5LAKEVIE	1	161	147	166
4362	outage of 18710 5GALTN P to 18885 5GALLAT2	1	161	147	166
4365	outage of 18861 5CAIRO B to 18885 5GALLAT2	1	161	147	166
4367	outage of 18711 5GALLATI to 18890 5LASCASS	1	161	147	166
4370	outage of 18711 5GALLATI to 19020 5LEB IPT	1	161	147	166
4372	outage of 18711 5GALLATI to 19154 5HARTSVI	1	161	147	166
4380	outage of 18713 5LAFAYET to 19031 5S. SCOT	1	161	147	166
4382	outage of 18713 5LAFAYET to 19154 5HARTSVI	1	161	147	166
4390	outage of 18715 5SPRNGFD to 19225 5COOPERT	1	161	147	166
4397	outage of 18717 5N NASH to 18722 5WHITES	1	161	147	166
4402	outage of 18717 5N NASH to 18727 5SAUNDER	1	161	147	166
4412	outage of 18718 5S NASH to 18719 5W NASH	1	161	147	166
4415	outage of 18718 5S NASH to 18730 5DONELSO	1	161	147	166
4417	outage of 18719 5W NASH to 18722 5WHITES	1	161	147	166
4420	outage of 18719 5W NASH to 18740 5DAVSNRD	1	161	147	166
4422	outage of 18719 5W NASH to 19398 5GALLOWY	1	161	147	166
4425	outage of 18718 5S NASH to 19053 5CRAIGHE	1	161	147	166
4427	outage of 18728 5ELYSIAN to 19053 5CRAIGHE	1	161	147	166
4430	outage of 18719 5W NASH to 19543 5ASHLDTP	1	161	147	166
4432	outage of 18720 5RADNOR to 18728 5ELYSIAN	1	161	147	166
4435	outage of 18720 5RADNOR to 18737 5NOLNVLE	1	161	147	166
4437	outage of 18720 5RADNOR to 18747 5E.FRANK	1	161	147	166
4440	outage of 18720 5RADNOR to 18763 5BRENTWO	1	161	147	166

No.	Contingency	Ckt	Base kV	Area	Zone
4442	outage of 18720 5RADNOR to 19070 5GRASL T	1	161	147	166
4450	outage of 18724 5PIN HOO to 18738 5CANE RI	1	161	147	166
4452	outage of 18724 5PIN HOO to 18743 5SMYRNA	1	161	147	166
4455	outage of 18724 5PIN HOO to 19037 5MURF RD	1	161	147	166
4457	outage of 18724 5PIN HOO to 19083 5HURRICA	1	161	147	166
4460	outage of 18724 5PIN HOO to 19086 5CENT PK	1	161	147	166
4465	outage of 18727 5SAUNDER to 19131 5LKEVIE	1	161	147	166
4467	outage of 18730 5DONELSO to 18731 5HERMITA	1	161	147	166
4470	outage of 18737 5NOLNVLE to 18738 5CANE RI	1	161	147	166
4472	outage of 18747 5E.FRANK to 18763 5BRENTWO	1	161	147	166
4475	outage of 18747 5E.FRANK to 19040 5HENPECK	1	161	147	166
4485	outage of 18913 5HNDRV T to 19187 5OCANA T	1	161	147	166
4490	outage of 18980 5DUNBAR to 19472 5ELKTNTP	1	161	147	166
4492	outage of 19006 5GLASG T to 19007 5BRSTO T	1	161	147	166
4500	outage of 19162 5UNION C to 19163 5ST BETH	1	161	147	166
4502	outage of 19207 5BEARWAL to 19543 5ASHLDTP	1	161	147	166
4505	outage of 19221 5KRKWD T to 19225 5COOPERT	1	161	147	166
4942	outage of 26047 08BEDFRD to 26049 08HARDSB	1	138	208	281
5700	outage of 27061 11BONNIE to 29227 20BONNIE	1	138-69	211-220	211-220

Area	Area Name	Zone	Zone Name	Contingency Buses	Monitored Buses
130	AECI				
		130	AECI	0	22
		133	AECI-CNT	0	18
		134	AECI-KMO	0	2
		135	AECI-SMP	0	53
		136	AECI-M&A	0	25
				0	120
141	CPLW				
		106	CPL-W	0	1
				0	1
146	SOCO				
		140	GA-ITS	0	56
		141	APC	0	20
				0	76
147	TVA				
		165	TVAWEST	1	284
		166	TVANS	110	547
		167	TVAEAST	1	376
				112	1207
148	DOE				
		170	DOE	0	5
				0	5
151	EES				
		157	EES_EAST	0	25
		158	EES_CNTR	0	15
		159	EES_NOR	0	146
				0	186
170	ENSE				
		169	ENRON	0	7
				0	7
171	ENCA				
		169	ENRON	0	10
				0	10
172	ENNA				
		169	ENRON	0	10
				0	10
173	ENGL				
		169	ENRON	0	5
				0	5
205	AEP				
		250	AEP-AP	0	9
		252	AEP-IM	2	4
		444	MISO_IA	0	1
				2	14
207	HE				
		207	HE	10	24
				10	24
208	CIN				

Area	Area Name	Zone	Zone Name	Contingency Buses	Monitored Buses
		281	PSI	21	5
				21	5
210	SIGE				
		210	SIGE	30	52
				30	52
211	LGEE				
		211	LGEE	80	324
		444	MISO_IA	0	4
				80	328
214	BREC				
		214	BREC	17	24
				17	24
216	IPL				
		216	IPL	2	1
				2	1
220	EKPC				
		220	EKPC	1	20
				1	20
356	AMRN				
		306	EASTERN	0	4
		310	REG E-IL	2	90
		311	FRKNJEFF	0	17
		312	ST FRAN	0	30
		313	STCHMOED	0	25
		314	LKSDMP&L	0	32
		315	GREENHIL	0	2
		316	SEMO	0	12
		317	N METRO	0	36
		318	S METRO	0	45
		319	ILL-IOWA	0	12
		321		3	24
		322		0	28
		323		9	49
		329		0	14
				14	420
357	IP				
		357	IP	1	263
				1	263
361	SIPC				
		351	EEC	0	9
		352	SEIEC	1	11
		361	SIPC	0	7
		444	MISO_IA	0	1
				1	28
362	EEI				
		362		0	6
				0	6
515	SWPA				
		515		0	41
				0	41
520	CESW				
		520		0	1

Area	Area Name	Zone	Zone Name	Contingency Buses	Monitored Buses
				0	1
524	OKGE	524		0	3
				0	3
536	WERE	537		0	4
				0	4
541	KACP	541		0	1
				0	1
544	EMDE	544		0	1
				0	1
546	SPRM	546		0	2
				0	2
				291	2865

Exhibit A9

MISO REGION 11 and AEP GENERATORS WITH A SIGNED INTERCONNECTION AGREEMENT, AS OF JUNE 6, 2002, ADDED TO THE POWER FLOW MODEL

MISO		Generator				High Side Bus							Generator				
													Output		Maximun Capability		Base
Queue No.	Queue Date	Bus Number	Bus Name	ID	Control Area	Number	Base kV	Location	Net Plant Max. MW (1)	In-Service Date	Study Status	IA(2) Status	MW	MVAr	MW	MVAr	MVA
AEP-21	NONE	22741	05DESORENAEP	1	AEP	22740 05DESOREN	345	Montpelier, IN	400	6/1/2001	In-Service		135	70	400	70	455
G002	12/1/1998	27234	11TRIM#5	5	LGEE	27013 11TRIMBL	345	Trimble, KY	174	6/1/2002	IC/FC		152	45	152	115	234
G003	12/1/1998	27242	11TRIM#6	6	LGEE	27013 11TRIMBL	345	Trimble, KY	174	6/1/2002	IC/FC		152	45	152	115	234
G008	7/30/1999	29701	21WHTLD3	1	CIN	29700 21WEATL	345	Wheatland, IN	640	6/1/2004	IC/FC	IAF	126	20	134	65	146
G008	7/30/1999	29702	21WHTLD4	1	CIN	29700 21WEATL	345	Wheatland, IN					125	20	134	65	146
G008	7/30/1999	29711	22WHTLD1	1	CIN	29710 22WEATL	345	Wheatland, IN					58	3	134	65	146
G008	7/30/1999	29712	22WHTLD2	1	CIN	29710 22WEATL	345	Wheatland, IN					68	4	134	65	146
G009	7/30/1999	90030	08VIGO G09	G1	CIN	90033 08VIGO	345	S.W. Vigo, IN	640	6/1/2003	IC/FC		170	63	170	85	208
G009	7/30/1999	90031	08VIGO G09	G2	CIN	90033 08VIGO	345	S.W. Vigo, IN					170	63	170	85	208
G009	7/30/1999	90032	08VIGO G09	S1	CIN	90033 08VIGO	345	S.W. Vigo, IN					300	112	300	150	340
G010	8/13/1999	25652	08SCR#G1	G1	CIN	25391 08SCRK M	345	Vigo, IN	500	6/1/2002	IC/FC		150	72	150	75	239
G010	8/13/1999	25817	08SCR#G2	G2	CIN	25391 08SCRK M	345	Vigo, IN					150	72	150	75	239
G010	8/13/1999	25890	08SCR#S1	S1	CIN	25391 08SCRK M	345	Vigo, IN					200	83	200	100	251
G015	11/22/1999	26337	08BED G1	G1	CIN	26333 08BED MP	345	Bedford.IN	800	10/1/2004	IC/FC	IAF	180	30	180	90	218
G015	11/22/1999	26338	08BED S1	S1	CIN	26333 08BED MP	345	Bedford.IN					120	30	120	60	137
G015	11/22/1999	26339	08BED G2	G2	CIN	26333 08BED MP	345	Bedford.IN					180	30	180	90	218
G015	11/22/1999	26340	08BED S2	S2	CIN	26333 08BED MP	345	Bedford.IN					120	30	120	60	137
G015	11/22/1999	26341	08BED G3	G3	CIN	26333 08BED MP	345	Bedford.IN					180	30	180	90	218
G015	11/22/1999	26342	08BED S3	S3	CIN	26333 08BED MP	345	Bedford.IN					120	30	120	60	137

Exhibit A9

MISO REGION 11 and AEP GENERATORS WITH A SIGNED INTERCONNECTION AGREEMENT, AS OF JUNE 6, 2002, ADDED TO THE POWER FLOW MODEL

MISO		Generator				High Side Bus							Generator				
													Output		Maximun Capability		Base
Queue No.	Queue Date	Bus Number	Bus Name	ID	Control Area	Number	Base kV	Location	Net Plant Max. MW (1)	In-Service Date	Study Status	IA(2) Status	MW	MVAr	MW	MVAr	MVA
G016	12/1/1999	27367	11TRIM#7	7	LGEE	27013 11TRIMBL	345	Trimble, KY	174	6/1/2004	IC/FC		152	24	152	115	234
G017	12/1/1999	27368	11TRIM#8	8	LGEE	27013 11TRIMBL	345	Trimble, KY	174	6/1/2004	IC/FC		152	46	152	115	234
G018	12/1/1999	27369	11TRIM#9	9	LGEE	27013 11TRIMBL	345	Trimble, KY	174	6/1/2005	IC/FC		152	46	152	115	234
G019	12/7/1999	27371	11BUCKNR#1	1	LGEE	27338 11BUCKNR	345	Oldham, KY	750	4/1/2002	IC/FC	IAF	1	30	175	85	228
G019	12/7/1999	27372	11BUCKNR#2	2	LGEE	27338 11BUCKNR	345	Oldham, KY					1	30	175	85	228
G019	12/7/1999	27373	11BUCKNR#3	3	LGEE	27338 11BUCKNR	345	Oldham, KY					1	30	175	85	228
G021	12/14/1999	33389	1MRNG5	6	SIPC	33351 5MRN_PL	161	Williamson. IL	142	6/1/2003	IC/FC	UC	71	30	71	30	90
G022	12/14/1999	33389	1MRNG5	7	SIPC	33351 5MRN_PL	161	Williamson. IL					71	30	71	30	90
G025	1/5/2000	27988	16STOUGT	1G	IPL	27889 16STOUTS	138	Marion, IN	189	5/1/2002	IC/FC	UC	22	7	27	12	30
G025	1/5/2000	27988	16STOUGT	2G	IPL	27889 16STOUTS	138	Marion, IN					22	7	25	12	30
G025	1/5/2000	27988	16STOUGT	3G	IPL	27889 16STOUTS	138	Marion, IN					29	9	25	12	30
G064	10/27/2000	26328	08NOBCT1	3	CIN	25641 08NOBLSV	69	Noblesville, IN	210	6/1/2003	IC/FC		70	-18	70	35	77
G064	10/27/2000	26329	08NOBCT2	4	CIN	25641 08NOBLSV	69	Noblesville, IN					70	4	70	35	77
G064	10/27/2000	26330	08NOBCT3	5	CIN	25641 08NOBLSV	69	Noblesville, IN					70	4	70	35	77
G069	12/21/2000	27370	11TRIM#10	10	LGEE	27013 11TRIMBL	345	Trimble, KY	174	6/1/2006	IC/FC		152	46	152	115	234

Status abbreviations

W	Withdrawn or Cancelled
H	Holding (Subject to Move to Bottom of Queue)
IP	Inter
IE	Inter
IC	Inter
FP	Facility Study Agreement Pending
FE	Facility Study Agreement Executed
FC	Facility Study Completed
IAP	Interconnection & Operating Agreement Pending
IAE	Interconnection & Operating Agreement Executed
IAF	Interconnection & Operating Agreement Filed
CP	Construction of Interconnection Facilities Pending
UC	Interconnection Facilities Under Construction
IS	In-service
QPF	Queue Position Forfeited

Notes: (1) Net Plant Max or Net Change @ Existing Plant; (2) IA - Interconnection Agreement

Exhibit A10

Generation Dispatch
When Including MISO and AEP IA Generators

Area Name	MISO Queue No.	High Side Bus No	High Side Base kV	Generator Bus No	Gen Bus Name	Case ID: C271s05 No MISO gens MW	Case ID: C271s05MF MISO & AEP MW	Per C. Bradley AEP_21	Net Change in Generation for Case C271s05MF MW	**Net Change in Generation Dispatch for Case C271s05MF**
MISO Generators in the South										
LGEE	G002	27013	345	27201	11TRIM#5	0	152		152	**915**
	G003	27013	345	27201	11TRIM#6	0	152		152	
	G016	27013	345	27199	11TRIM#7	N/A	152		152	
	G017	27013	345	27199	11TRIM#8	N/A	152		152	
	G018	27013	345	27199	11TRIM#9	N/A	152		152	
	G069	27013	345	27199	11TRIM#10	N/A	152		152	
	G019	27338	345	27339	11BUCKNR#1	N/A	1		1	
	G019	27338	345	27339	11BUCKNR#2	N/A	1		1	
	G019	27338	345	27339	11BUCKNR#3	N/A	1		1	
ENWC	G008	29700	345	29701	21WHTLD3	75	125		50	**100**
	G008	29700	345	29702	21WHTLD4	75	125		50	
ENWI	G008	29710	345	29711	22WHTLD1	75	57		-18	**-25**
	G008	29710	345	29712	22WHTLD2	75	68		-7	
SIPC	Not in Que	33351	161	33369	1MRNG5	75	71		-4	**-4**
	G21&G22	33351	161	33389	1MRNG5	142	142		0	
CIN	G015	90062	345	90066	08BED G1	N/A	180		180	**900**
	G015	90062	345	90067	08BED S1	N/A	120		120	
	G015	90062	345	90068	08BED G2	N/A	180		180	
	G015	90062	345	90069	08BED S2	N/A	120		120	
	G015	90062	345	90070	08BED G3	N/A	180		180	
	G015	90062	345	90071	08BED S3	N/A	120		120	
MISO and AEP Generators in the North										
CIN	G009	90033	345	90031	08VIGO G09	N/A	170		170	**640**
	G009	90033	345	90031	08VIGO G09	N/A	170		170	
	G009	90033	345	90032	08VIGO G09	N/A	300		300	
CIN	G010	26331	345	26332	08SCR#G1	N/A	150		150	**500**
	G010	26331	345	26332	08SCR#G2	N/A	150		150	
	G010	26331	345	26333	08SCR#S1	N/A	200		200	
IPL	G025	27889	138	27988	16STOUGT	70	73		3	**3**
CIN	G064	26482	69	90051	08NOBCT1	N/A	70		70	**210**
	G064	26482	69	90052	08NOBCT2	N/A	70		70	
	G064	26482	69	90053	08NOBCT3	N/A	70		70	
AEP	AEP_21	22580	345	22581	05DESORNAEP	N/A	135	135	135	**135**

Overloaded Facilities for Preliminary and MISO Power Flow Studies

Exhibit A11

Branch Circuit	Circuit	Old Rating Normal	Old Rating Emergency	New Rating Normal	New Rating Emergency
Big Rivers Electric Corporation					
*Wilson to Coleman 345 kV		598	598	956	956
LG&E Energy					
*Baker Lane to Brown N 138 kV		205	216	224	277
*Earlington N to River Queen Tap 161 kV		184	184	209	257
*Eastview to Stephensburg 69 kV		42	42	56	68
*Elizabethtown to Tharp 69 kV		72	79	90	111
*Green River Steel 138-69 kV Transformer		93	102	93	107
*Green River Steel to OMU 69 kV		72	86	146	181
*Green River to Ohio County 138 kV	1	143	158	179	220
*Green River to Ohio County 138 kV	2	143	158	179	220
*Green River to River Queen Tap 69 kV		55	55	89	110
*Leitchfield 138-69 kV Transformer		72	79	93	107
*Leitchfield to Shrewsbury 138 kV		82	82	179	220
*Newtonville to Cloverport 138 kV		143	143	162	199
*Ohio County to Shrewsbury 138 kV		165	165	179	220
*Smith to Hardin County 345 kV		275	308	1195	1315
*Adams to Tyrone 138 kV		97	97	179	220
Arnold to Delvinta 161 kV		113	113	167	201
Artemus to Farley 161 kV		142	142	209	257
Artemus to Pineville 161 kV		129	129	176	201
Delvinta to West Irvine Tap 161 kV		142	142	176	201
Ghent to Owen County Tap 138 kV		227	227	227	280
Green River Steel to Smith 138 kV		241	241	287	287
Lake Reba Tap to West Irvine Tap 161 kV		165	165	167	223
East Kentucky Power Cooperative					
*Stephensburg to Upton Junction 69 kV		19	19	45	54

*Facilities with an asterisk were revised after reviewing the preliminary power flow studies
Facilities without an asterisk were revised after reviewing the MISO power flow studiies
Overloaded facilities requiring upgrades in TVA, SIGE and EES systems are not shown in this table

Exhibit A12

ROTOR MODELS
TYPE GENROU

MISO Queue No.	Bus Number	NAME	ID	T'do	T''do	T'qo	T''qo	H	D	Xd	Xq	X'd	X'q	X''d	Xl	S10	S12
AEP_21	22741	08DESOREN	1	5.9	0.04	0.58	0.07	3.00	0	2.11	1.99	0.27	0.46	0.20	0.13	0.07	0.58
G002	27234	11TRIM#5	5	5.9	0.04	0.58	0.07	4.84	0	2.11	1.99	0.27	0.46	0.20	0.13	0.07	0.58
G003	27242	11TRIM#6	6	5.9	0.04	0.58	0.07	4.84	0	2.11	1.99	0.27	0.46	0.20	0.13	0.07	0.58
G009	90030	08VIGO G09	G1	5.9	0.04	0.58	0.07	3.00	0	2.11	1.99	0.27	0.46	0.20	0.13	0.07	0.58
G009	90031	08VIGO G09	G2	5.9	0.04	0.58	0.07	3.00	0	2.11	1.99	0.27	0.46	0.20	0.13	0.07	0.58
G009	90032	08VIGO G09	SG1	5.9	0.04	0.58	0.07	3.00	0	2.11	1.99	0.27	0.46	0.20	0.13	0.07	0.58
G016	27367	11TRIM#7	7	5.9	0.04	0.58	0.07	4.84	0	2.11	1.99	0.27	0.46	0.20	0.13	0.07	0.58
G017	27368	11TRIM#8	8	5.9	0.04	0.58	0.07	4.84	0	2.11	1.99	0.27	0.46	0.20	0.13	0.07	0.58
G018	27369	11TRIM#9	9	5.9	0.04	0.58	0.07	4.84	0	2.11	1.99	0.27	0.46	0.20	0.13	0.07	0.58
G019	27371	11BUCKNR#1	1	9.0	0.04	0.90	0.09	5.42	0	2.26	2.18	0.22	0.42	0.17	0.14	0.09	0.35
G019	27372	11BUCKNR#2	2	9.0	0.04	0.90	0.09	5.42	0	2.26	2.18	0.22	0.42	0.17	0.14	0.09	0.35
G019	27373	11BUCKNR#3	3	9.0	0.04	0.90	0.09	5.42	0	2.26	2.18	0.22	0.42	0.17	0.14	0.09	0.35
G021	33389	1MRNG5	6	5.9	0.04	0.58	0.07	3.00	0	2.11	1.99	0.27	0.46	0.20	0.13	0.07	0.58
G022	33389	1MRNG5	7	5.9	0.04	0.58	0.07	3.00	0	2.11	1.99	0.27	0.46	0.20	0.13	0.07	0.58
G069	27370	11TRIM#10	10	5.9	0.04	0.58	0.07	4.84	0	2.11	1.99	0.27	0.46	0.20	0.13	0.07	0.58
N/A	27601	THRBRED#1	1	4.7	0.02	0.66	0.03	2.48	0	1.99	1.93	0.27	0.44	0.21	0.18	0.07	0.58
N/A	27602	THRBRED#2	1	4.7	0.02	0.66	0.03	2.48	0	1.99	1.93	0.27	0.44	0.21	0.18	0.07	0.58

EXHIBIT A13

EXCITER MODELS
TYPE EXST1

MISO Queue No.	Bus Number	NAME	ID	Tr	Vimax	Vimin	Tc	Tb	Ka	Ta	Vrmax	Vrmin	Kc	Kf	Tf
AEP_21	22741	05DESOREN	1	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G002	27234	11TRIM#5	5	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G003	27242	11TRIM#6	6	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G008	29701	21WHTLD3	1	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G008	29702	21WHTLD4	1	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G008	29711	22WHTLD1	1	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G008	29712	22WHTLD2	1	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G009	90030	08VIGO G09	G1	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G009	90031	08VIGO G09	G2	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G009	90032	08VIGO G09	S1	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G010	25652	08SCR#G1	G1	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G010	25817	08SCR#G2	G2	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G010	25890	08SCR#S1	S1	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G015	26337	08BED G1	G1	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G015	26338	08BED S1	S1	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G015	26339	08BED G2	G2	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G015	26340	08BED S2	S2	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G015	26341	08BED G3	G3	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G015	26342	08BED S3	S3	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G016	27367	11TRIM#7	7	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G017	27368	11TRIM#8	8	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G018	27369	11TRIM#9	9	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G019	27371	11BUCKNR#1	1	0.00	999	-999	1	8	250	0.10	6.1	0.0	0.0	0.00	10.00
G019	27372	11BUCKNR#2	2	0.00	999	-999	1	8	250	0.10	6.1	0.0	0.0	0.00	10.00
G019	27373	11BUCKNR#3	3	0.00	999	-999	1	8	250	0.10	6.1	0.0	0.0	0.00	10.00
G021	33389	1MRNG5	6	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G022	33389	1MRNG5	7	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00
G069	27370	11TRIM#10	10	0.00	999	-999	1	10	100	0.01	1.0	0.0	0.0	0.00	10.00

GOVERNOR MODELS
TYPE GAST

MISO Queue No.	Bus Number	NAME	ID	R	T1	T2	T3	AT	Kt	Vmax	Vmin	Dturb
AEP_21	22741	05DESOREN	1	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G002	27234	11TRIM#5	5	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G003	27242	11TRIM#6	6	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G008	29701	21WHTLD3	1	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G008	29702	21WHTLD4	1	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G008	29711	22WHTLD1	1	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G008	29712	22WHTLD2	1	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G009	90030	08VIGO G09	G1	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G009	90031	08VIGO G09	G1	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G009	90032	08VIGO G09	G1	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G010	25652	08SCR#G1	G1	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G010	25817	08SCR#G2	G2	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G010	25890	08SCR#S1	S1	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G015	26337	08BED G1	G1	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G015	26338	08BED S1	S1	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G015	26339	08BED G2	G2	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G015	26340	08BED S2	S2	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G015	26341	08BED G3	G3	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G015	26342	08BED S3	S3	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G016	27367	11TRIM#7	7	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G017	27368	11TRIM#8	8	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G018	27369	11TRIM#9	9	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G019	27371	11BUCKNR#1	1	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G019	27372	11BUCKNR#2	2	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G019	27373	11BUCKNR#3	3	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G021	33389	1MRNG5	6	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G022	33389	1MRNG5	7	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G064	26328	08NOBCT1	3	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G064	26329	08NOBCT2	4	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G064	26330	08NOBCT3	5	0.05	0.4	0.1	3	1	2	1.0	0.0	0
G069	27370	11TRIM#10	10	0.05	0.4	0.1	3	1	2	1.0	0.0	0

EXHIBIT A15

GOVERNOR MODEL FOR THOROUGHBRED
TYPE TGOV1

MISO Queue No.	Bus Number	NAME	ID	R	T1	Vmax	Vmin	T2	T3	Dt
N/A	27601	THRBRED#1	1	0.05	0.49	1.0	0.0	2.1	7	0
N/A	27602	THRBRED#2	1	0.05	0.49	1.0	0.0	2.1	7	0

EXHIBIT A16

Figure A16A
2003 Summer - Base Case
Fault at Wilson 345 kV - Cleared in 6 cycles

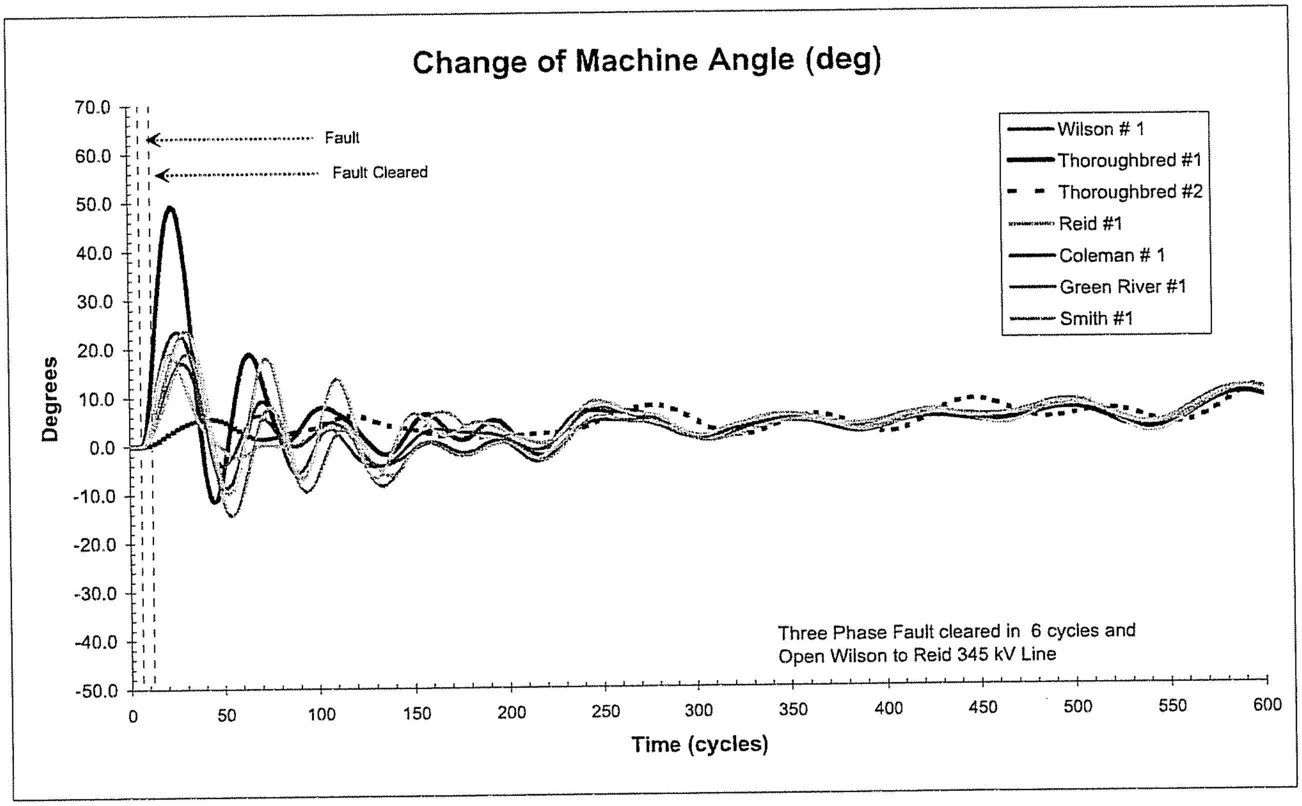


Figure A16B
2003 Summer - Base Case
Fault at Wilson 345 kV - Cleared in 6 cycles

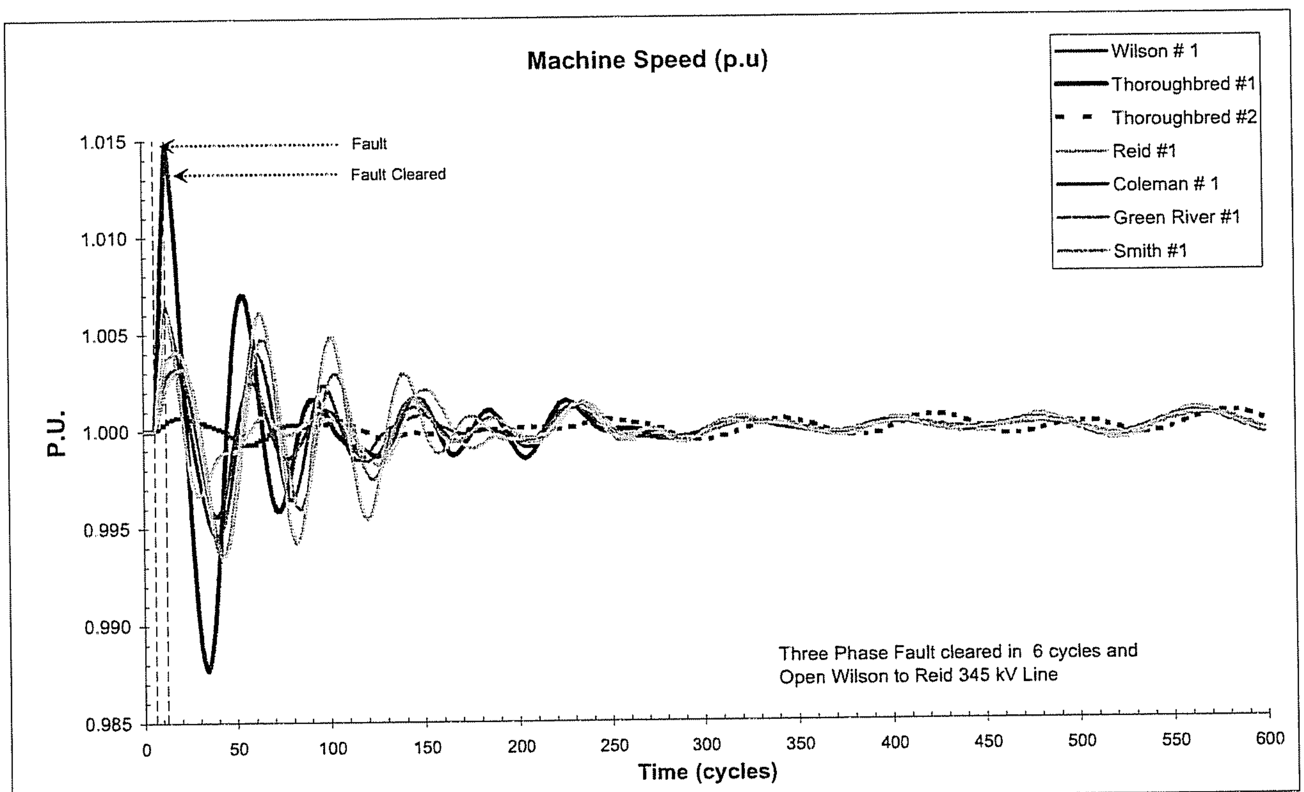


Figure A17A
2003 Summer - Base Case
Fault at Wilson 345 kV - Critical Clearing, 8 cycles

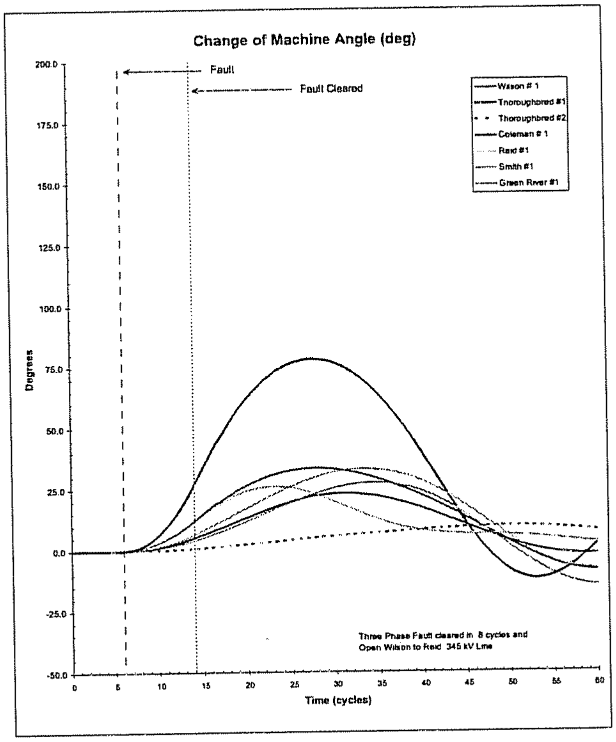


Figure A17B
2003 Summer - Base Case
Fault at Wilson 345 kV - Unstable Clearing, 9 cycles

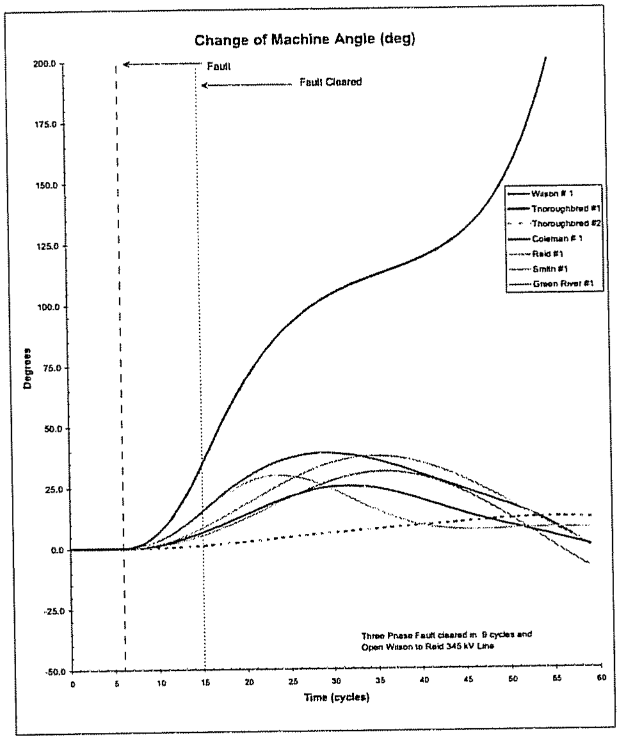


Figure A17C
2003 Summer - Base Case
Fault at Wilson 345 kV - Critical Clearing, 8 cycles

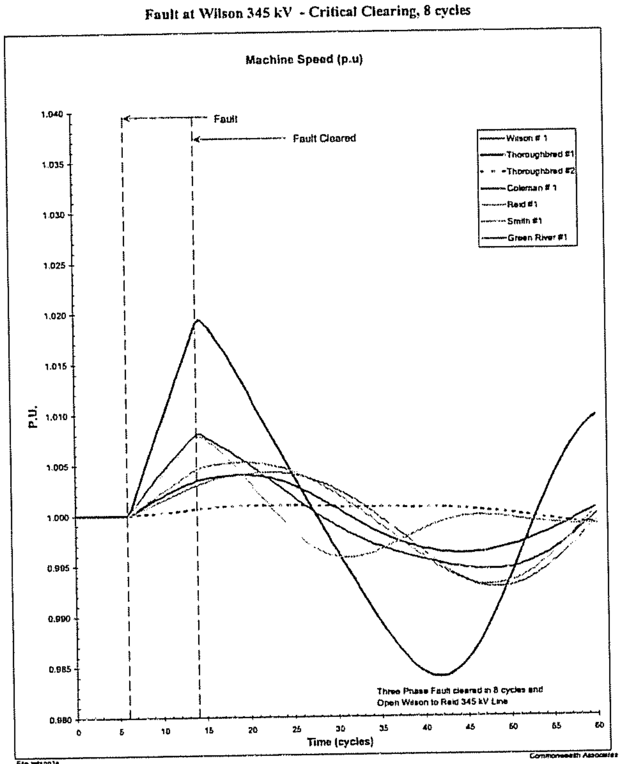
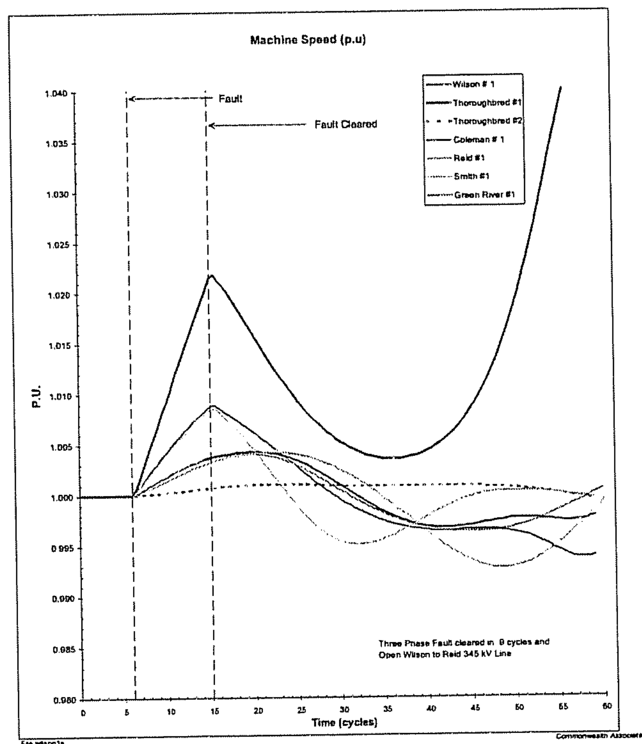


Figure A17D
2003 Summer - Base Case
Fault at Wilson 345 kV - Unstable Clearing, 9 cycles



Thoroughbred Energy Campus
Impacted Facilities
Worst of All Preliminary Case Studies

	Branches Exceeding 100% of Emergency Rating									Ratings		Max Of Base Series	INTERCONNECTION (see drawing B4) I		II A		III	
	Facility ID	From	Name	To	Name	Ckt	Base kV	Area	Zone	Norm	Emer	%Emer	Max Of Series 100 %Emer	Max Of Series 200 %Emer	Max Of Series 140 %Emer	Max Of Series 240 %Emer	Max Of Series 170 %Emer	Max Of Series 270 %Emer
Group 1	New Overloads																	
	101	26857	10NEWTVL	27552	14COLE 5	1	161	210-214	210-214	265	265	---	154	158	---	---	---	---
	102	26855	10NEWTVL	26857	10NEWTVL	1	138-161	210	210	168	176	94	153	153	102	103	---	---
	103	27551	14REID 5	27559	14DAVIS5	1	161	214	214	265	265	97	141	144	105	109	90	90
	104	27028	11GR RV	27553	14WILSO5	1	161	211-214	211-214	530	558	---	142	141	---	---	---	---
	105	27028	11GR RV	27095	11GR RVR	2	161-138	211	211	100	120	---	131	139	117	125	---	---
	106	27028	11GR RV	27095	11GR RVR	3	161-138	211	211	100	120	---	131	139	117	125	---	---
	107	27028	11GR RV	27095	11GR RVR	1	161-138	211	211	100	120	---	131	138	116	124	---	---
	108	27552	14COLE 5	27564	14NATAL5	1	161	214	214	265	265	---	133	129	---	---	---	---
	110	27558	14SKILM5	27564	14NATAL5	1	161	214	214	265	265	---	128	125	---	---	---	---
	111	27094	11GR STL	27095	11GR RVR	1	138	211	211	143	179	91	125	128	123	128	---	---
	112	27558	14SKILM5	27616	14N.HAR5	1	161	214	214	265	265	---	118	115	---	---	---	---
	113	27094	11GR STL	27215	11GR STL	1	138-69	211	211	93	107	---	114	117	105	109	---	---
	114	27551	14REID 5	27619	14HOPCO5	1	161	214	214	265	265	---	116	112	---	---	---	---
	115	18711	5GALLATI	19154	5HARTSVI	1	161	147	166	206	206	94	104	113	99	106	99	106
1	116	18450	5WILSNTN	18914	5GLADV T	1	161	147	166	151	151	102	104	111	105	112	104	111
	117	18711	5GALLATI	18890	5LASCASS	1	161	147	166	206	206	94	110	109	113	112	112	111
	118	18026	5BARKLEY	27619	14HOPCO5	1	161	147-214	166-214	265	265	---	102	98	---	---	---	---
	119	27061	11BONNIE	29227	20BONNIE	1	138-69	211-220	211-220	44	59	---	102	101	92	92	---	---
	201	18743	5SMYRNA	19527	5BLCKMNT	1	161	147	166	235	235	97	99	109	103	111	100	110
	202	18708	5LEBANON	18914	5GLADV T	1	161	147	166	151	151	96	98	105	99	106	98	105
	203	18744	5MURFREE	19527	5BLCKMNT	1	161	147	166	235	235	92	95	105	99	106	96	105
	204	18684	5INTERCH	19083	5HURRICA	1	161	147	166	320	320	97	98	104	101	105	98	104
	205	18427	8PARADIS	18428	8MONTGO	1	500	147	166	1732	1732	---	---	103	---	103	---	103
	206	27094	11GR STL	27142	11SMITH	1	138	211	211	241	241	---	100	101	95	97	108	108
	207	18705	5CENTER	18756	5SMTH TN	1	161	147	166	151	151	87	95	101	97	103	96	102
	208	99798	5BATEVL	99808	5CUSHMN	1	161	151	159	148	148	98	98	101	99	101	98	101
	141	18012	5PARADIS	18880	5RUSS.SS	1	161	147	166	350	350	90	95	93	114	110	105	102
	142	18012	5PARADIS	18926	5ABERD T	1	161	147	166	350	350	90	91	93	105	106	98	98
	143	18692	5E BOWL	18926	5ABERD T	1	161	147	166	350	350	85	89	91	102	103	95	96
Group 2	Pre-existing Overload in Base Cases with Increased Overloading in Study Cases																	
	131	26886	10NEWTVL	26855	10NEWTVL	2	69-138	210	210	60	63	205	217	220	211	208	209	206
	132	26886	10NEWTVL	26855	10NEWTVL	1	69-138	210	210	67	70	184	195	198	190	188	188	185
2	133	26851	10CULLEY	26879	10GRNDV	1	138	210	210	156	179	112	117	116	108	106	97	96
	134	18691	5BOWL GR	18880	5RUSS.SS	1	161	147	166	180	180	103	106	110	116	119	109	113
	135	18724	5PIN HOO	18738	5CANE RI	1	161	147	166	271	271	101	106	107	106	106	100	107

Note: --- = Less than the Minimum Reporting Level of 85%

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Exhibit A22

Thoroughbred Energy Campus

Comparison of Base Case to Worst of Case Studies
Thoroughbred Interconnection I - Thoroughbred/750 MW and Thoroughbred/1500 MW
All Base Case Generators in Service

Branches Exceeding 100% of Emergency Rating									Ratings		BC05s01					C101s05r1					C201s05r1				
											Base Case 01 - 2005 Summer					Thoroughbred/750 MW					Thoroughbred/1500 MW				
											Cont	Normal	First Contingency			Cont	Normal	First Contingency			Cont	Normal	First Contingency		
	From	Name	To	Name	Ckt	Base kV	Area	Zone	Norm	Emer	ID	System%	Norm %	Emer %	A / B	ID	System%	Norm %	Emer %	A / B	ID	System%	Norm %	Emer %	A / B
Group 1	New Overloads											Not Overloaded						Overload 2					Overload 3		
	26857	10NEWTVL	27552	14COLE 5	1	161	210-214	210-214	265	265	680	35	---	---	0 / 0	3120	87	154	154	7 / 0	3120	92	158	158	7 / 4
	26855	10NEWTVL	26857	10NEWTVL	1	138-161	210	210	168	176	1070	57	97	92	0 / 0	3120	93	161	153	9 / 2	3120	95	160	153	9 / 3
	27551	14REID 5	27559	14DAVIS5	1	161	214	214	265	265	3110	50	97	97	0 / 0	3110	58	141	141	2 / 0	3110	60	144	144	2 / 0
	27028	11GR RV	27553	14WILSO5	1	161	211-214	211-214	530	558	497	54	---	---	0 / 0	1732	108	144	137	***	1732	106	143	136	***
	27552	14COLE 5	27564	14NATAL5	1	161	214	214	265	265	1685	36	---	---	0 / 0	3130	75	133	133	4 / 0	3130	73	129	129	4 / 0
	27558	14SKILM5	27564	14NATAL5	1	161	214	214	265	265	1685	33	---	---	0 / 0	3130	71	128	128	3 / 1	3130	69	125	125	3 / 1
	27094	11GR STL	27095	11GR RVR	1	138	211	211	143	179	3600	41	114	91	0 / 0	3600	88	157	125	3 / 0	3600	90	160	128	3 / 0
	27558	14SKILM5	27616	14N.HAR5	1	161	214	214	265	265	1685	26	---	---	0 / 0	3130	63	118	118	3 / 0	3130	61	115	115	3 / 0
	27094	11GR STL	27215	11GR STL	1	138-69	211	211	93	107	3510	35	---	---	0 / 0	3510	36	132	114	1 / 0	3510	35	135	117	1 / 0
	27551	14REID 5	27619	14HOPCO5	1	161	214	214	265	265	1685	22	---	---	0 / 0	1685	63	115	115	3 / 0	1685	59	112	112	3 / 0
	27028	11GR RV	27095	11GR RVR	2	161-138	211	211	100	120	1210	47	---	---	0 / 0	1303	94	135	113	5 / 0	1303	95	137	114	5 / 0
	27028	11GR RV	27095	11GR RVR	3	161-138	211	211	100	120	1297	47	---	---	0 / 0	1302	94	135	113	5 / 0	1302	95	137	114	5 / 0
	27028	11GR RV	27095	11GR RVR	1	161-138	211	211	100	120	3110	47	---	---	0 / 0	1302	94	135	112	5 / 0	1302	95	136	113	5 / 0
1	18450	5WILSNTN	18914	5GLADV T	1	161	147	166	151	151	4370	21	---	---	0 / 0	4370	21	103	103	0 / 1	4370	29	111	111	1 / 0
	18711	5GALLATI	18890	5LASCASS	1	161	147	166	206	206	115	81	94	94	0 / 0	4260	82	110	110	1 / 0	4260	84	109	109	1 / 0
	18743	5SMYRNA	19527	5BLCKMNT	1	161	147	166	235	235	4367	54	---	---	0 / 0	===	===	===	===	===	4367	65	109	109	1 / 0
	18711	5GALLATI	19154	5HARTSVI	1	161	147	166	206	206	342	76	89	89	0 / 0	4260	70	100	100	0 / 1	4357	79	107	107	2 / 0
	18708	5LEBANON	18914	5GLADV T	1	161	147	166	151	151	4370	19	---	---	0 / 0	===	===	===	===	===	4370	25	104	104	0 / 1
	18744	5MURFREE	19527	5BLCKMNT	1	161	147	166	235	235	4367	51	---	---	0 / 0	===	===	===	===	===	4367	61	104	104	0 / 1
	18684	5INTERCH	19083	5HURRICA	1	161	147	166	320	320	4452	57	---	---	0 / 0	===	===	===	===	===	4452	62	104	104	0 / 1
	18427	8PARADIS	18428	8MONTGO	1	500	147	166	1732	1732	682	59	---	---	0 / 0	===	===	===	===	===	65	102	103	103	***
	18026	5BARKLEY	27619	14HOPCO5	1	161	147-214	166-214	265	265	1685	9	---	---	0 / 0	1685	49	102	102	0 / 2	===	===	===	===	===
	27094	11GR STL	27142	11SMITH	1	138	211	211	241	241	3600	26	---	---	0 / 0	===	===	===	===	===	3600	23	101	101	0 / 1
	27061	11BONNIE	29227	20BONNIE	1	138-69	211-220	211-220	44	59	1732	87	---	---	0 / 0	1362	105	135	101	***	===	===	===	===	===
	18705	5CENTER	18756	5SMTH TN	1	161	147	166	151	151	75	82	87	87	0 / 0	===	===	===	===	===	4367	90	101	101	0 / 1
	99798	5BATEVL	99808	5CUSHMN	1	161	151	159	148	148	30	95	98	98	0 / 0	===	===	===	===	===	30	98	101	101	0 / 2
Group 2	Pre-existing Overload in Case1 with Increased Overloading in Case2											Overload 1			< Less Than <			Overload 2					Overload 3		
	26886	10NEWTVL	26855	10NEWTVL	2	69-138	210	210	60	63	1162	125	215	205	***	1162	133	226	215	***	1162	136	231	220	***
	26886	10NEWTVL	26855	10NEWTVL	1	69-138	210	210	67	70	1165	112	193	184	***	1165	119	203	194	***	1165	122	207	198	***
2	18691	5BOWL GR	18880	5RUSS.SS	1	161	147	166	180	180	160	53	101	101	0 / 1	160	55	104	104	0 / 1	160	59	108	108	1 / 0
	18724	5PIN HOO	18738	5CANE RI	1	161	147	166	271	271	80	62	101	101	0 / 1	===	===	===	===	===	80	67	107	107	1 / 0
	26851	10CULLEY	26879	10GRNDV	1	138	210	210	156	179	3110	94	129	112	1 / 2	3110	77	135	117	1 / 1	3110	74	134	116	1 / 1

1. --- =Less than the Minimum Reporting Level of 85%
2. *** = Normal System Flow (ie - with No Outages) exceeds the Overload Criteria
3. === = Facility did not overload
4. Count of Contingencies Causing Overloads (A/B Stats)
   A = Serious Overload > 105%
   B = Overloaded Facility between 100% and 105% of Rated Capability

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Exhibit A23

Thoroughbred Energy Campus

Comparison of Base Case to Worst of Case Studies

Thoroughbred Interconnection i - Thoroughbred/750 MW and Thoroughbred/1500 MW

Loss of Brown N Unit # 3 (441 MW)

	Branches Exceeding 100% of Emergency Rating										BC05s11					C111s05r1					C211s05r1				
											Loss of Brown N - 2005 Summer					Thbred/750 MW & Loss of Brown N					Thbred/1500 MW & Loss of Brown N				
									Ratings		Cont	Normal	First Contingency			Cont	Normal	First Contingency			Cont	Normal	First Contingency		
	From	Name	To	Name	Ckt	Base kV	Area	Zone	Norm	Emer	ID	System%	Norm %	Emer %	A / B	ID	System%	Norm %	Emer %	A / B	ID	System%	Norm %	Emer %	A / B
Group 1	New Overloads											Not Overloaded						Overload 2		Worst of			Overload 3		
	26857	10NEWTVL	27552	14COLE 5	1	161	210-214	210-214	265	265	---	36	---	---	0 / 0	1685	86	154	154	5 / 0	1685	90	157	157	5 / 3
	26855	10NEWTVL	26857	10NEWTVL	1	138-161	210	210	168	176	1070	58	99	94	0 / 0	1685	95	156	149	7 / 2	1685	95	155	148	8 / 2
	27028	11GR RV	27553	14WILSO5	1	161	211-214	211-214	530	558	---	56	---	---	0 / 0	1732	109	145	138	***	1732	108	144	137	***
	27552	14COLE 5	27564	14NATAL5	1	161	214	214	265	265	---	39	---	---	0 / 0	1685	78	131	131	2 / 0	1685	76	128	128	2 / 0
	27558	14SKILM5	27564	14NATAL5	1	161	214	214	265	265	---	35	---	---	0 / 0	1685	74	127	127	2 / 0	1685	72	123	123	2 / 0
	27551	14REID 5	27559	14DAVIS5	1	161	214	214	265	265	1752	51	90	90	0 / 0	1732	59	124	124	1 / 0	1732	61	127	127	1 / 0
	27028	11GR RV	27095	11GR RVR	2	161-138	211	211	100	120	---	53	---	---	0 / 0	1303	99	143	119	4 / 0	1303	100	144	120	***
	27028	11GR RV	27095	11GR RVR	3	161-138	211	211	100	120	---	53	---	---	0 / 0	1302	99	143	119	4 / 0	1302	100	144	120	***
	27028	11GR RV	27095	11GR RVR	1	161-138	211	211	100	120	---	53	---	---	0 / 0	1302	99	142	119	4 / 0	1303	100	144	120	4 / 0
	27094	11GR STL	27095	11GR RVR	1	138	211	211	143	179	---	49	---	---	0 / 0	1732	94	145	116	1 / 0	1732	97	148	118	1 / 0
	27558	14SKILM5	27616	14N.HAR5	1	161	214	214	265	265	---	29	---	---	0 / 0	1685	66	117	117	1 / 0	1685	64	114	114	1 / 0
1	27551	14REID 5	27619	14HOPCO5	1	161	214	214	265	265	---	19	---	---	0 / 0	1685	61	114	114	1 / 0	1685	57	110	110	1 / 0
	18711	5GALLATI	19154	5HARTSVI	1	161	147	166	206	206	342	80	94	94	0 / 0	4260	75	104	104	0 / 2	4357	83	113	113	2 / 0
	18450	5WILSNTN	18914	5GLADV T	1	161	147	166	151	151	---	22	---	---	0 / 0	4370	22	104	104	0 / 1	4370	29	111	111	1 / 0
	18743	5SMYRNA	19527	5BLCKMNT	1	161	147	166	235	235	---	55	---	---	0 / 0	===	===	===	===	===	4367	65	109	109	1 / 0
	18711	5GALLATI	18890	5LASCASS	1	161	147	166	206	206	115	80	93	93	0 / 0	4260	82	109	109	1 / 0	4260	83	108	108	1 / 0
	18708	5LEBANON	18914	5GLADV T	1	161	147	166	151	151	---	19	---	---	0 / 0	===	===	===	===	===	4370	26	105	105	0 / 1
	18744	5MURFREE	19527	5BLCKMNT	1	161	147	166	235	235	---	51	---	---	0 / 0	===	===	===	===	===	4367	62	105	105	0 / 1
	18684	5INTERCH	19083	5HURRICA	1	161	147	166	320	320	---	57	---	---	0 / 0	===	===	===	===	===	4452	62	104	104	0 / 1
	18427	8PARADIS	18428	8MONTGO	1	500	147	166	1732	1732	---	59	---	---	0 / 0	===	===	===	===	===	65	102	103	103	***
	27061	11BONNIE	29227	20BONNIE	1	138-69	211-220	211-220	44	59	---	82	---	---	0 / 0	1362	101	137	102	***	1362	98	136	101	0 / 1
	18026	5BARKLEY	27619	14HOPCO5	1	161	147-214	166-214	265	265	---	7	---	---	0 / 0	1685	46	101	101	0 / 1	===	===	===	===	===
	18705	5CENTER	18756	5SMTH TN	1	161	147	166	151	151	75	82	87	87	0 / 0	===	===	===	===	===	4367	90	101	101	0 / 1
Group 2	Pre-existing Overload in Case1 with Increased Overloading in Case2											Overload 1		< Less Than <				Overload 2		Worst of			Overload 3		
	26886	10NEWTVL	26855	10NEWTVL	2	69-138	210	210	60	63	1162	124	213	203	***	1162	134	228	217	***	1162	134	228	218	***
2	26886	10NEWTVL	26855	10NEWTVL	1	69-138	210	210	67	70	1165	111	191	183	***	1165	120	204	195	***	1165	120	205	196	***
	18691	5BOWL GR	18880	5RUSS.SS	1	161	147	166	180	180	160	55	103	103	0 / 1	160	56	106	106	1 / 0	160	60	110	110	1 / 0
	18724	5PIN HOO	18738	5CANE RI	1	161	147	166	271	271	80	61	101	101	0 / 1	===	===	===	===	===	80	66	107	107	1 / 0

1. --- =Less than the Minimum Reporting Level of 85%
2. *** = Normal System Flow (ie - with No Outages) exceeds the Overload Criteria
3. === = Facility did not overload
4. Count of Contingencies Causing Overloads (A/B Stats)
   A = Serious Overload > 105%
   B = Overloaded Faclity between 100% and 105% of Rated Capability

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