



Big Rivers
Electric Corporation

Procedure Documentation

PROCEDURES AND REQUIREMENTS FOR ADDING GENERATION TO THE BIG RIVERS TRANSMISSION SYSTEM

PL-FAC-4

Document Information		
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TABLE OF CONTENTS

1.0 INTRODUCTION	1
2.0 PROCEDURES FOR ARRANGING THE STUDY OF NEW INTERCONNECTIONS	2
3.0 FACILITIES STUDY: SCOPING OF PROJECT	5
4.0 LETTER OF INTENT TO PROCEED	6
5.0 CONTRACTS & AGREEMENTS	6

Disclaimer: These guidelines are subject to change as determined by Big Rivers. Until such time as Big Rivers files these procedures and requirements with the Kentucky Public Service Commission or another applicable regulatory agency, Big Rivers reserves all rights to change these procedures and requirements unilaterally. After filing of such procedures and requirements, future revisions and updates will be made as determined by Big Rivers and such revisions and updates will be filed with the Kentucky Public Service Commission or another applicable regulatory agency.

1.0 Introduction

The addition of a generator onto the Big Rivers transmission system may have a significant impact on the operation of the system. Several factors may be affected and must be analyzed prior to the addition of generation. These include system stability, fault duty of existing equipment, overloading problems, and voltage violations.

All proposals for new or materially changed generation or tie-line interconnection in the Big Rivers control area and region must follow standard procedures to initiate and complete the Big Rivers Transmission Interconnection Study process. All studies may require the creation of an ad-hoc committee made-up of potentially impacted transmission owners/operators. Big Rivers will determine the proper make-up of each committee.

All requests for interconnections will be studied in the same manner. Currently, requests for interconnections are being studied in the order received based on the date of receipt of the Interconnection Study Letter Agreement. Requests for interconnections are studied independently from one another until such time that an Interconnection and Operating Agreement is executed.

The Interconnection Study uses a system model containing transmission and generation facilities which either exist or are reasonably certain to exist during the study time frame. The study is not based upon transmission or generation facilities that may be contemplated but are not reasonably certain to exist during the study time frame. Big Rivers will have sole discretion to determine what is a reasonable certainty. The results of the study are valid as of the date of the study report. While the transmission system is relatively static, Big Rivers is not responsible for changes in the generation or transmission facilities that occur subsequent to the date of the study report and which change the results contained therein.

The following is a step-by-step procedure for Big Rivers and its Customers to use as a guideline before additional generation can be connected to Big Rivers' transmission system. The timeline for this procedure is shown in **Attachment 1**.

2.0 Procedures for Arranging the Study of New Interconnections

Application

To request a study for generation interconnection, the applicant shall complete the "Interconnection Study Letter Agreement" (**Attachment 2**) and return it to Big Rivers along with any pertinent data available at that time. The typical Interconnection Study data requirement form is shown in **Attachment 3**.

Big Rivers will review the completed application and then execute the study request by placing it in the interconnection study queue.

Interconnection Study

The prospective Customer signs an Interconnection Study Letter Agreement to initiate the Interconnection Study, which has two parts: Feasibility Study and Detailed Interconnection Study. The studies will determine the impact of connecting the facility to the Big Rivers transmission system and the impact of delivering energy from the facility to the local Big Rivers transmission system. The studies will be performed to ensure the adequacy of Big Rivers' transmission system facilities, not Customer facilities. The impact of delivering energy from the facility to a remote location will not be addressed as part of the Interconnection Study. A separate analysis, known as a System Impact Study,¹ will be required to determine the impact of such a transaction. Note that each Interconnection Study will investigate a single interconnection arrangement. If multiple sites, configurations, or generation output levels are desired, separate Interconnection Study agreements must be signed.

The Feasibility Study and the Detailed Interconnection Study will be performed for **summer peak operating conditions** for the projected in-service date and the interconnection configuration/MW generation specified by the Customer.

Feasibility Study

The Feasibility Study determines the local area transmission constraints for various generation output levels up to the Customer specified generation output level. The generator will be modeled at the location and during the time period specified in the Interconnection Study Letter Agreement. This study uses a load flow program to identify the generator output level(s) at which system modifications are required to avoid equipment overloads.

¹ The System Impact Study has a process and study queue separate from the Interconnection Study queue. The System Impact Study determines if available transfer capability ("ATC") exists to accommodate the transfer of power out of or into the Big Rivers transmission system. For this study, the generator must specify a specific source and sink combination and the requested time period.

The Feasibility Study can be completed within 45 business days. After this study is completed and upon the Customer's written request, Big Rivers will continue the process and initiate a Detailed Interconnection Study. Failure to notify Big Rivers within 20 days in writing, as specified in the Interconnection Study Letter Agreement, will result in the Customer losing its place in the Interconnection Study queue.

Feasibility Study Results

The results of the Feasibility Study will be compiled into a report that identifies the transmission constraints with various generation output levels up to the Customer specified generation level. A rough cost estimate for relieving each constraint also will be provided. If the constraint has been identified previously in an existing Big Rivers transmission system planning document, it will be noted as such. Refined estimates on costs and other project details, such as schedules and Customer requirements, will be determined in the Detailed Interconnection Study and Facility Study if the Customer chooses to continue with the study process.

Detailed Interconnection Study

The Detailed Interconnection Study is a refinement of the Feasibility Study. Unlike the Feasibility Study, this study will identify the transmission constraints for a fixed level of generation output as specified by the Customer. The Detailed Interconnection Study is estimated to take approximately eight to ten weeks to complete once initiated, but this time period may vary depending upon the number of studies in the interconnection study queue. To ensure the integrity of the interconnection study queue, Big Rivers' transmission planning personnel perform each study in the order that the Interconnection Study Letter Agreements are received. While several studies may be performed concurrently, they are performed independently of one another. Studies may be performed either by Big Rivers' personnel or by external contractors.

There are three components of the Detailed Interconnection Study: (1) Load Flow Analysis, (2) Short Circuit/Breaker Rating Analysis, and (3) Transient Stability Analysis.

1. Load Flow Analysis

A load flow analysis is conducted with and without the new generation so that the proposed generator's impact on the local area can be identified. The results of load flow analysis include power flow magnitudes and voltage levels under single contingency conditions. The results of the load flow study will be used to identify equipment overloads and excessive voltage deviations that may be encountered due to the addition of new generation.

2. Short Circuit/Breaker Rating Analysis

A short circuit (i.e., fault current) analysis will be performed to determine the effect that the new generation will have on the system fault currents.

The new fault current levels will be used to evaluate the impact of the new generation on the fault duty (i.e., fault current interrupting capability or rating) of existing equipment, such as circuit breakers and switches. The results of this analysis may identify which equipment would have to be replaced as a result of the new generation.

3. Transient Stability Analysis

A transient stability analysis will be performed to determine generator unit response due to a fault on the system and unit outages. The study will focus in the area of the added generation. The transient stability analysis will determine:

1. Unit stability during faults
2. Voltage levels, frequency levels, and frequency deviation at the point of interconnections
3. Synchronous generator rotor oscillations and real and reactive power outputs.

This information will be collected before the disturbance, at the time of the disturbance, at discrete time intervals during the disturbance, and after the removal of the disturbance from the system.

Detailed Interconnection Study Requirements

Big Rivers requires the following data to begin the Detailed Interconnection Study:

1. Synchronous machine data
2. Exciter data and models
3. Governor data and models
4. Step-up transformer data (positive and zero sequence)
5. Line impedance to interconnection point (positive and zero sequence)
6. System configuration (one-line diagram)
7. Power system stabilizer data (if installed)
8. Site load data
9. Short circuit data
10. Power factor rating of the units
11. Detailed location map
12. Expected in-service date

Detailed Interconnection Study Results

The Detailed Interconnection Study report will compile results from the Load Flow Analysis, Short Circuit/Breaker Rating Analysis, and Transient Stability Analysis. It will also contain a description of the necessary facilities, along with planning level cost estimates, for which the Customer is responsible. Examples of such facilities are the reconductoring of a line section, replacement of an autotransformer, replacement of circuit breakers, facilities to interconnect to the transmission system, etc. A list of assumptions and preliminary, high-level schedule also will be included.

The successful study of new interconnections to the Big Rivers system in no way provides for or guarantees transmission service. Transmission service may be arranged for separately under the terms and conditions of Big Rivers' Open Access Transmission Tariff.

Customers with incomplete data will be placed on hold until the required information is provided. Accordingly, a Customer that is on hold because it has failed to provide adequate information may receive its final interconnection study report later than the next Customer in the queue. Utilizing this process allows those Customers that have provided the necessary information not to be delayed by those Customers that have not yet provided such information.

3. Facilities Study: Scoping of Project

Upon completion of the Interconnection Study, the Customer may desire a more definitive cost estimate and scope of work. To initiate this, the Customer signs a "Facilities Study Letter Agreement" (**Attachment 4**) for Big Rivers to initiate a Facilities Study, whereby Big Rivers personnel will scope the project. These personnel will look at the proposed facilities identified in the Interconnection Study Report and refine the cost estimates. The personnel also may propose alternative solutions that may be more cost-effective. The deliverables of this study will be a "Scope Document" that includes:

- 1) The work scope of the project
 - a. Supervisory Control and Data Acquisition (SCADA) requirements
 - b. Metering requirements
 - c. Relay modifications on Big Rivers' system
 - d. Equipment replacement
 - e. Reconductoring of transmission lines
- 2) A list of assumptions used in developing the scope
- 3) An estimated construction schedule

4) A definitive project cost estimate (+/- 10%)

4. Letter of Intent to Proceed

If the Customer chooses to proceed with the project on the basis of the preliminary estimates provided in the Interconnection Study results, a Letter of Intent (LOI) will be prepared for the Customer to sign. The LOI authorizes Big Rivers to perform detailed engineering design, material procurement, and construction. Included in the LOI will be the high-level project scope, preliminary cost estimates, method and timing of reimbursement, and a cancellation clause. At this time, Big Rivers will also require a secured letter of credit from the Customer in order to proceed with the project.

Additionally, neighboring transmission system owners/operators, reliability coordinators, and other significantly impacted parties will be notified of the generation addition (location and capacity). The confidentiality of the customer identity will be maintained. Any concerns or study results provided by these parties will be summarized and provided to the customer.

After execution of an Interconnection and Operating Agreement, Big Rivers will then include the generation addition in power flow models submitted by Big Rivers to the regional reliability council. The generation addition will also be identified in the regional transmission system assessments as appropriate.

5. Contracts and Agreements

The Customer should be coordinating with Big Rivers personnel in order to develop an Interconnection and Operating Agreement. The agreement allows a physical interconnection of the generator to the Big Rivers transmission grid. Other documents may also be required depending on the individual circumstances. These include, but are not limited to, a Transmission Service Agreement, which allows the seller of the power to use the Big Rivers transmission grid to transmit power under the terms and conditions of the pro forma tariffs.

The results of the short circuit and transient stability analyses are subject to change. They are based upon the current configuration of the Big Rivers transmission system at the time of the study. Should other Customers sign interconnection agreements with Big Rivers prior to the generation developer signing its interconnection agreement, this analysis would have to be repeated with the additional generation. Big Rivers will inform the developer should this situation occur.

Attachment 1

[Attached as separate file]

**Interconnection Study Letter Agreement Between
Big Rivers Electric Corporation
and**

This Letter Agreement is made and entered into this _____ day of _____, 2008, between _____, a corporation organized and existing under the laws of the State of _____ ("Customer") and Big Rivers Electric Corporation, a cooperative corporation organized and existing under the laws of the Commonwealth of Kentucky ("Big Rivers").

RECITALS

WHEREAS, Customer is proposing to develop a ___ MW generating facility to be located in _____ ("Facility") with a projected in-service date of _____; and

WHEREAS, the Facility is not connected to the Big Rivers transmission system and Customer intends to connect the proposed generating facility to the Big Rivers transmission system as follows (specify interconnection voltage, substation, and configuration):

_____ ; and

WHEREAS, Customer is currently proposing to establish an interconnection with the Big Rivers transmission system in order to transmit power from the Facility; and

WHEREAS, Customer has requested that Big Rivers prepare a study to determine the impact of interconnection of, and the delivery of energy from, the Facility to the Big Rivers transmission system;

NOW THEREFORE, Big Rivers and Customer agree as follows:

Big Rivers will perform an Interconnection Study, as more fully described in the "Customer Guidelines and Requirements for Adding Generation to Big Rivers' Transmission System" document, to determine the impact of connecting the Facility to the Big Rivers transmission system and the impact of delivery of energy from the Facility to the Big Rivers transmission system. The Interconnection Study consists of two phases, Feasibility Study and Detailed Interconnection Study. Big Rivers will first perform the Feasibility Study and inform Customer of the results. Big Rivers will proceed to the Detailed Interconnection Study only upon Customer's written request.

The Feasibility Study and, to the extent applicable, the Detailed Interconnection Study, will be performed on the basis of summer peak operating conditions for the projected in-service date and with the interconnection configuration provided by Customer. The operating conditions will include: a) the existing system prior to the addition of the Facility (to serve as a benchmark), and b) the addition of the Facility with the total output of the Facility being transmitted to the Big Rivers transmission system.

In performing these studies, Big Rivers will rely, to the extent reasonably practicable, on existing transmission planning studies and on current Big Rivers standards and good engineering practice. The studies will be performed, either by Big Rivers personnel or external contractors, to assure the adequacy of Big Rivers system facilities, not Customer facilities. Big Rivers will proceed with the Feasibility Study based on the technical information provided by the Customer. The results of the Feasibility Study, which should be available to Customer within forty-five (45) business days after receipt of necessary information from Customer, will be provided to Customer upon completion. Customer is required, within twenty (20) business days of receipt of the results of the Feasibility Study, to notify Big Rivers in writing if Customer desires to have Big Rivers proceed to conduct the Detailed Interconnection Study. Failure by Customer to notify Big Rivers in writing within twenty (20) business days of Customer's desire to proceed with the Interconnection Study will be deemed to be an election by Customer not to proceed with the Interconnection Study, and will result in Customer losing its place in the interconnection study queue. Customer recognizes and acknowledges that changes to the Big Rivers system during the time between the completion of the feasibility study and the Detailed Interconnection Study may provide different results. In the event that changes to the Customer's basis requirements are made, the studies may also change. Customer must provide Big Rivers with specific data requirements, including system configuration, as outlined in the "Customer Guidelines and Requirements for Adding Generation to Big Rivers' Transmission System" document no later than one month prior to Big Rivers beginning the Detailed Interconnection Study. Big Rivers will notify Customer in writing of the projected start date of the Interconnection Study and the last date to provide the required data, and Big Rivers will attempt to complete the Interconnection Study within a reasonable time after having received the required Customer data in a timely manner. Failure to provide the data in a timely manner will result in the Interconnection Study being moved to the subsequent position in the queue. The data provided by Customer is subject to verification by Big Rivers after installation of the equipment. If, in Big Rivers' reasonable judgment, the study or installed data materially differs from the original Interconnection Study request data, the Interconnection Study may not be valid, and interconnection may be delayed or a new Interconnection Study may be required.

Deliverables

Feasibility Study

- Summary of study results

Detailed Interconnection Study

- Summary of study results and input assumptions.
- Identification of system constraints.

The total cost of both the feasibility study and the subsequent detailed interconnection study, if requested by Customer in accordance with the above stated provisions, is estimated to be _____. Big Rivers will charge, and Customer shall pay, for the actual cost of the two studies. Customer agrees that it will remit payments to Big Rivers within thirty (30) days following receipt of invoice. Notwithstanding the above, Customer acknowledges and agrees that the minimum dollar amount to be paid to Big Rivers for the Feasibility Study and/or the Detailed Interconnection Study is _____. This minimum is applicable even if Customer elects not to proceed with the Detailed Interconnection Study phase after receiving results of the Feasibility Study.

IN WITNESS WHEREOF, Big Rivers Electric Corporation and Customer have caused this Agreement to be executed by their respected authorized officials.

BIG RIVERS ELECTRIC CORPORATION

[CUSTOMER]

By: _____

By:

Title: _____

Title:

Date: _____

Date:

Attachment 3 Interconnection Study Data Requirement

[Attached as separate file]

**Facilities Study Letter Agreement Between
Big Rivers Electric Corporation
and**

This Letter Agreement is made and entered into this _____ day of _____, 2000, between _____, a corporation organized and existing under the laws of the State of _____ ("Customer") and Big Rivers Electric Corporation, a cooperative corporation organized and existing under the laws of the Commonwealth of Kentucky ("Big Rivers").

RECITALS

WHEREAS, Customer is proposing to develop a ___ MW generating facility to be located in _____ ("Facility") with a projected in-service date of _____; and

WHEREAS, the Facility is not connected to the Big Rivers transmission facilities; and

WHEREAS, Customer is currently proposing to establish an interconnection with the Big Rivers transmission system in order to transmit power from the Facility; and

WHEREAS, Customer has requested that Big Rivers prepare a study to determine the impact of interconnection of the Facility to Big Rivers, and the impact of delivery of capacity and energy from the Facility to the Big Rivers transmission system; and

WHEREAS, Big Rivers has completed the Interconnection Study, identified system constraints, and presented a summary of the study results to the Customer;

NOW THEREFORE, Big Rivers and Customer agree as follows:

Big Rivers will perform a Facilities Study, based on the results of the Interconnection Study, to determine the required modifications to the Big Rivers transmission system, including the cost and scheduled completion dates of such modifications.

In performing this study Big Rivers will rely on current Big Rivers standards and good engineering practice. The study will be performed to assure adequacy of Big Rivers system facilities, not Customer facilities. Big Rivers proposed to proceed with the study based on the technical information provided by Customer. In the event changes to the Customer's basic requirements are made, the studies also may change.

Deliverables

- Identification of any required system additions/modifications.
- Estimated costs associated with any system additions/modifications.
- Estimated project schedule.

The total cost of this study is estimated to be _____, however, Big Rivers will charge for the actual cost of the study. Customer agrees that it will remit payment to Big Rivers within thirty (30) days following receipt of invoice.

IN WITNESS WHEREOF, Big Rivers Electric Corporation and Customer have caused this Agreement to be executed by their respected authorized officials.

BIG RIVERS ELECTRIC CORPORATION

[CUSTOMER]

By: _____

By:

Title: _____

Title:

Date: _____

Date: