City of Tallahassee, Electric Utility

# Facility Connection Requirements

October 2007

| Version | Date | Synopsis |
|---|---|---|
| Original | 10/25/07 | Original approval |

Table of Contents

Acronyms

| | |
|---|---|
| ACI | American Concrete Institute |
| AISC | American Institute of Steel Construction |
| ANSI | American National Standards Institute |
| ASCE | American Society of Civil Engineers |
| ASME | American Society of Mechanical Engineers |
| ASTM | American Society of Testing Material |
| CRSI | Concrete Reinforcing Steel Institute |
| ECC | Electric Control Center |
| EPA | Environmental Protective Agency |
| EPAct | Energy Policy Act of 2005 |
| FCR | Facility Connection Requirements |
| FERC | Federal Energy regulatory Commission |
| FRCC | Florida Reliability Coordinating Council |
| ICEA | Insulated Cable Engineers Association |
| IEEE | Institute of Electrical and Electronics Engineers |
| NEC | National Electrical Code |
| NEMA | National Electrical Manufacturers Association |
| NERC | North American Electric Reliability Council |
| NESC | National Electric Safety Code |
| NFPA | National Fire Protection Association |
| NRMCA | National Ready Mixed Concrete Association |
| OATT | Open Access Transmission Tariff |
| OSHA | Occupational Safety and Health Administration |
| PCB | Polychlorinated biphenyl |
| PURPA | Public Utilities Regulatory Policy Act of 1978 |
| UL | Underwriters Laboratories, Incorporated |

## Definitions

| | |
|---|---|
| City | The City of Tallahassee |
| Connection | A connection of generation, transmission or end-use facilities to the City System |
| System | The City electric power system |
| Customer | Any person or entity desiring to connect new facilities or to upgrade existing facilities connected to the System |

## 1.0 Introduction

The City of Tallahassee, Electric Utility ("City") has prepared the *Facility Connection Requirements* ("FCR") document to identify the technical requirements for generation, transmission and end-use facility connections ("Connection") to the City electric power system ("System"). It applies to new Connections or substantial modifications of existing Connections. This document is written to comply with NERC (FAC-001) and PURPA (as amended by 2005 EPAct Subtitle E) standards for Facility Connection Requirements, which requires entities responsible for the reliability of the interconnected transmission systems to maintain and make available a FCR document. The NERC standards require those entities seeking to add facilities or connect to the interconnected transmission system to comply with the FCR document. The NERC Planning Standards are posted on NERC's web site (www.nerc.com/standards).

This document is not intended to be a detailed manual but a general overview of procedural and technical requirements to be met in the design of a Connection. These requirements are written to establish a basis for maintaining reliability, power quality, and a safe environment for the general public, power consumers, maintenance personnel and the equipment. This FCR document will be revised from time to time to reflect changes and/or clarifications in planning, operating, or interconnection policies.

This document references and incorporates certain NERC, FRCC, FERC, OATT, NESC, NEC, IEEE and City standards. There are specific requirements established by FERC, NERC and FRCC for some types of Connections that may expand upon or supersede the procedures outlined in this document. In the event of a conflict between the requirements identified in this document and those in any of the aforementioned standards it is the City's intent that the applicable standard that provides for greater reliability of the Connection and System will be the governing standard. Throughout the document the phrase "industry standards" is used. This term refers to NERC, FRCC, FERC, OATT, NESC, OSHA, NEC, IEEE and City standards as well as electric utility industry best practices.

## 2.0 Requirements

This section addresses the technical requirements that are common to generation facilities, transmission facilities and end-user facility Connections to the System. Some exceptions to these requirements may be made based on the City's preliminary assessment of the Connection's potential system impacts.

General overviews of functional requirements are given in this section. This document is not intended to be a comprehensive design specification. This document references, and therefore is supported by other current, applicable industry standards. Specific design and construction of the electrical facilities are to be in accordance with these standards, which include, but are not limited to the following:

- NFPA 70 – NEC - National Electrical Code
- NESC – National Electrical Safety Code
- NEMA SG-6 – Power Switching Equipment
- ASTM – American Society of Testing Material
- AISC – American Institute of Steel Construction
- ACI – American Concrete Institute
- IEEE – Institute of Electrical and Electronic Engineers, Inc.
- UL – Underwriters Laboratories, Inc.
- EPA – Environmental Protective Agency
- ASME – American Society of Mechanical Engineers
- ASCE – American Society of Civil Engineers
- NFPA – National Fire Protective Association
- NRMCA – National Ready Mixed Concrete Association
- CRSI – Concrete SI – Concrete Reinforcing Steel Institute
- ANSI – American National Standards Institute
- ICEA – Insulated Cable Engineers Association
- PURPA – The Public Utility Regulatory Policies Act of 1978

- EPAct 2005 – The Energy Policy Act of 2005

All persons or entities desiring to connect new facilities or to upgrade existing facilities ("Customers") shall provide the following information to the City as applicable to the type of Connection requested:

- Size of the proposed project (maximum gross and net MW and MVAR, MVA rating, voltage, projected load profile)
- Single-line diagram
- Equipment ratings, impedances, capacitances, time constants, gains, inertia constants, governor, excitation and power stabilizer systems modeling information
- Proposed location, route and interconnection points
- Projected construction schedule including back-feed, station service and in-service dates
- Status of site and ROW acquisition, and environmental permits

All oil-filled equipment, including bushings, shall not contain polychlorinated byphenyls (PCB), and shall be labeled by the manufacturer as non-PCB. Certificates shall be provided to the City certifying all oil-filled equipment as non-PCB. Oil-filled equipment may require an oil spill containment system to comply with EPA, state or local regulations.

All equipment that affects the performance of the System will meet or exceed the City's requirement for similar equipment, must coordinate with the System, and must be approved by the City. Consideration will be given for forecasted system growth in the selection of equipment.

Final design of a Connection to the System shall be subject to City review and approval on an individual case-by-case basis.

## 2.1 Procedure for coordinated joint studies of new facilities and their impacts on the interconnected transmission systems

The City will permit any qualified Customer's generation, transmission or end-use facilities to connect with the System provided that there will be no adverse impacts on:

- The safe and efficient operation of the existing System and sub-transmission systems;
- Neighboring utility systems;
- Planned Connections with an earlier application date;
- The tax-exempt status of any bonds issued by the City to finance facilities needed to provide the requested Connection; or
- The general public.

To establish a Connection with the System a Customer must first submit an application for the Connection and obtain a queue assignment. The City will evaluate all applications, including those made by the City, on an equal basis. The time and date at which the City deems the Customer's application complete will be the official application date and determine the Customer's position in the queue. The queue position will be used to determine the order in which studies will be performed and may be a factor in the determination of cost responsibility.

Modifications to an application may be accepted prior to the start of the System Impact Study described later in this section. These changes may include minor reconfiguration of the requested Connection, reductions in facility size and other changes suggested by or acceptable to the City. Other minor changes (modeling data, facility layouts and schedule delays) may be accepted after completion of the System Impact Study at the sole discretion of the City.

To maintain its queue position the Customer must sign requisite study agreements and pay associated fees prior to study start. Any study fee requirements will be negotiated between the City and the Customer prior to the execution of the requisite study agreements. Customer's failure to adhere to these and other provisions of this FCR will be deemed by the City as withdrawal of Customer's application and result in Customer's loss of queue position. A

Customer that voluntarily withdraws its application or fails to meet the requirements of this FCR will forfeit its queue position and pay all costs incurred by the City for work related to the application. All costs must be paid before any study data or results are provided to the Customer.

Generally three studies are required of requests for Connections to the System. The number, scope and procedures of the required studies will be negotiated between the City and Customer dependent on the size, location and complexity of the requested Connection. Studies will consider without limitation all existing and future facilities (including those interconnected with neighboring systems) that may have an impact on the Connection request.

The scope and procedures for each study will in general be based on those described in the FERC pro forma open access transmission tariff (OATT), large generator interconnection procedure (LGIP) and small generation interconnection procedure (SGIP). A general description of the scope of these studies is provided below in the order that each may be performed.

> Feasibility Study - a preliminary evaluation of the system impact and cost of interconnecting new facilities to the System. The study may consist of a power flow and short circuit analyses and will provide a preliminary list of facilities and a non-binding good faith estimate of cost responsibility and a non-binding good faith estimated time to construct.
>
> System Impact Study - a detailed evaluation of the system impact and cost of interconnecting new facilities to the System. The study may consist of a power flow, short circuit, stability and any other analyses as deemed necessary by the City to ensure reliability. The study will typically provide documentation of the assumptions upon which it is based; the results of the analyses; the requirements or potential impediments to providing the requested Connection; a list of the facility additions and/or modifications required to correct any problems identified in those analyses; a non-binding good faith estimate of cost responsibility; and a non-binding good faith

estimate of the time required to construct new and/or modify existing facilities and implement the Connection.

Facility Study – specifies and estimates the cost of the equipment, engineering, procurement and construction work needed to implement the conclusions of the System Impact Study to interconnect a Customer's facility with the System. The study will typically also identify the configuration of the Connection equipment including without limitation: the transformer, switchgear, meters, and other station equipment; the nature and estimated cost of any Connection facilities and network upgrades necessary to accomplish the Connection; and an estimate of the time required to complete the construction and installation of such facilities. Further analysis beyond that performed in the System Impact Study may be performed including without limitation analysis of power quality and protection coordination requirements.

Additional studies of the requested Connection's potential impact on the regional transmission systems may be required by FRCC and neighboring utilities. The FRCC studies will be performed in accordance with FRCC procedures. Affected neighboring utilities will perform studies according to their own procedures.

Once all requisite studies are completed, interconnection and operating agreements may be negotiated between the City and Customer. These agreements will identify cost; operations, maintenance and reliability standard compliance responsibilities and liabilities; ownership allocations; a construction schedule for any needed facilities needed to accomplish the requested Connection; and any special technical requirements. Construction of any facilities required to accommodate the requested Connection shall not begin until these agreements have been executed. Prior to the execution of requisite interconnection and operating agreements the Customer must demonstrate site control. The Customer's facility must be placed into commercial service no more than 3 years later than the in service date identified at the completion of the Facilities Study. Customer's failure to adhere to these and other provisions of this FCR will be deemed by the City as withdrawal of Customer's application.

## 2.2 Procedure for Notification of FRCC and Others of Proposed Project

Project Notification for Joint Study:

If the proposed project meets certain criteria established by the FRCC and the City, the City will contact the FRCC to set up a joint study. A review of the project will then be initiated per FRCC procedures. If the project does not meet the level of FRCC Review, the City may still contact entities that may be impacted and have them review the project.

Project Notification for Modeling:

Once the project moves into the Facility Study stage (occasionally earlier) it will be added to the FRCC databank and the FRCC project schedule by either the Customer or the City.

## 2.3 Voltage level and MW and MVAR capacity or demand at point of connection

The Customer and the City will discuss the available voltages, MW & MVAR capacity at the point of interconnection and this information shall be included on the preliminary application form.

## 2.4 Breaker duty and surge protection

Equipment used for the Connection to the System must meet or exceed the City’s requirements for similar equipment. The interconnecting line shall be connected to the System through a fully rated circuit breaker; the monitoring and control of which may be required to be through the City’s supervisory control and data acquisition system (“SCADA”) system. The circuit breaker must be capable of interrupting present and future available fault current at the point of interconnection. At least one airbreak disconnect shall be included in series with the circuit breaker. Surge arresters shall also be required at transmission line terminals. Specifications and standards for the City’s are available in the City’s Facility Rating Methodology document.

## 2.5 System protection and coordination

Transmission relaying equipment associated with the interconnection of generators and transmission facilities shall be -utility grade and meet or exceed the City's requirements and applicable ANSI/IEEE standards. The City may require the use of specific microprocessor-based relays for certain relay interface applications.

Interconnected facilities shall have a primary relaying system that provides protection for 100% of the interconnected zone. In addition to the primary relay scheme, the protection shall include a separate second relay system designed to provide for the protection of the interconnected facilities in the event of a failure of the primary breaker and relay system. The protective relay scheme shall be coordinated with the City and may be required by the City to incorporate protection for breaker and relay failure outside the primary zone of protection. Relay settings shall be coordinated between the City and customer in order to comply with regulatory standards and maintain time and sensitivity between the City's electrical system and the customer's generation or transmission system.

Breaker operations (tripping and closing), monitoring and control, including communications equipment and links, shall utilize a DC Station Service power source. The DC Station Service power source shall have a carrying capacity to operate the breaker(s), monitoring and control equipment, and communications links for an eight-hour period with no AC supply. Additionally, an undervoltage alarm shall be provided for the remote monitoring of the DC station service power source by the facilities owner. Prompt action shall be taken to restore power in the event of a failure of one or more of the station service components.

The City may require the installation, by the facilities owner, of a fiber optic communications channel together with associated communications equipment as part of the protective scheme for purposes of monitoring the interconnection facilities and the flow of power and energy across the interconnected point.

Entities connecting to the City's electric system shall investigate and keep a log of all protective relay actions and misoperations as required by the FRCC in compliance with NERC Planning Standards. The most current requirements for analysis and reporting of protection misoperations are available from FRCC staff.

## 2.6 Metering and Telecommunications.

Metering:

Metering for SCADA and revenue shall be required at the point of interconnection.

The metering equipment required will be determined by the rating, size and type of facility. Any metering equipment provided by the Customer for City use shall meet or exceed applicable City and industry standards.

Telecommunications:

The City may require the Customer to provide telecommunications facilities sufficient to meet the City's telephone, radio, system protection, remote meter reading, EMS and SCADA requirements. The City will specify the type, speed and characteristics of the communication channel equipment so that compatibility with existing communications, supervisory control, relaying and telemetering equipment is maintained. The specific type of communication equipment to be furnished by the Customer will be reviewed and approved by the City. The Customer may have to reimburse the City for the costs of any additional facilities provided by the City.

Data Communications during normal and emergency conditions – Communication shall be established between the Customer and City's control center via "fiber" as the primary method. Radio, phone, PLC, etc will only be considered on a case-by –case basis and only if fiber is unavailable and cost prohibitive to install. The decision to allow non-fiber communication will be at the City's sole discretion. Additional costs to integrate non-fiber communications will be borne solely by the Customer.

Fiber optic additions to new or existing City Electric facilities will be considered on a case-by-case basis. Technical analysis of clearances, structural loads and electrical field effects may limit applications. Outage restrictions and maintenance responsibilities may also impact potential paths. The City reserves the right to charge a fee for ROW, pole attachments and/or acquire individual optical fibers on the circuit, per agreement between the Customer and the City.

## 2.7 Grounding and safety issues

The equipment and devices installed as an integral part of the connecting facilities shall be grounded in accordance with all applicable standards and manufacturer's specifications. All metallic structures and other non-energized metallic equipment must be solidly grounded. This grounding system shall be designed to meet the requirements of ANSI/IEEE 80, IEEE Guide for Safety in AC Substation Grounding and ANSI/IEEE C2, National Electrical Safety Code as applicable.

If a substation associated with a Connection is adjacent to or close to a City electrical facility, connecting the two grounding systems is preferred, since they are easier to connect than to isolate. If the grounding systems are to be isolated one from the other, there may be no metallic ground connections between the two substation ground grids and there must also be sufficient physical separation to limit soil conduction. If the grounding systems are connected, the interconnecting cables must have sufficient capacity to handle the fault currents, duration, and duty. The City must approve any connection to a City's grounding system and will extend its grounding system to the interconnecting point as necessary pending agreement on the scope and cost of such extensions.

All transmission lines (line-to-line voltage 69 KV and greater) should have a continuous ground wire shield, not relying on earth as the primary conductor, to transfer fault current between line poles and/or structures, substations and plant switchyards. At the option of the requesting entity, Optical Ground Wire (OPGW) may be substituted if the requesting entity wishes to install their communications link in this location.

The transmission line ground wire shield shall be bonded to the interconnected substation or switching station grounding systems. Any exceptions to a continuous ground wire shall be verified with a system study. All ground wires and bond wires must be adequately sized to handle anticipated maximum fault currents and duty without damage

Interconnections between electrical systems may increase fault current levels at the interconnection point and the adjacent lines, switches, substations, and other devices. Modifications to the aforesaid equipment and grounding systems, including grounding wires, may be necessary. Interconnection studies will determine if modifications are required and the scope and cost of the modifications.

In order to provide for the continued reliability of the System, switches capable of interrupting load and charging current shall be required at all interconnection points. These switches, in the configuration and type to be specified by the City, shall consider both present and forecasted system loading and, pending agreement on the scope and cost of said equipment, be acquired, installed, owned, and operated by the City.

## 2.8 Insulation and insulation coordination

In general, interconnected facilities shall be protected against lightning, switching surges, and other voltage stresses associated with its expected operation. Basic Impulse Level ("BIL") ratings of interconnected facilities shall be equal to, or exceed, the BIL ratings of the City's facilities.

## 2.9 Voltage, Reactive Power, and power factor control

Retail or wholesale interconnections utilized primarily for serving distribution loads shall comply with the City's current power factor requirements for such loads. Equipment for measuring, monitoring, and recording the power factor shall be installed at the interconnection point to the System.

Interconnecting facilities associated with generation are responsible for regulating the voltage and reactive power flow at their interconnection point. The terms and conditions associated with power factor, voltage regulation and reactive power flow at the point of interconnection shall be compliant with industry standards, be equal to or exceed the City's own standards, and will be established in the interconnection agreement pending completion of the interconnecting studies.

All interconnecting facilities points must adhere to applicable power factor standards. Sufficient reactive compensation and control will be required to meet the power factor standard. Once a new Connection is established actual power factor information will be collected. If the power factor standard has not been or is not forecast to be met plans will be developed to make modifications necessary to meet the power factor standard.

## 2.10 Power quality impacts

IEEE recommended Practices and Requirements for Harmonic Control in Electric Power Systems (“IEEE Standard 519”) provides definitions and limits on acceptable levels of voltage fluctuations and harmonics. All interconnecting facilities shall comply with the limits established within the IEEE Standard 519.

## 2.11 Equipment Ratings

Equipment used in the Connection to the System shall meet or exceed the City's requirements for similar equipment

Interconnected facility ratings will be based on results of system studies including short circuit, power flow, stability analysis, and switching studies.  Specifications and standards for the City's equipment are available in the City's most current Facility Ratings and Ratings Methodology documents.

### 2.12. Synchronizing of facilities

Interconnected facilities with generation will be required to have synchronizing check relays that will supervise the closing of circuit breakers and prevent asynchronous closing.

The City would prefer direct control of the generating facilities interconnected to the System. In those instances where it does not maintain direct control, the conditions and terms related to the control of the generating facilities will be negotiated.

The Customer shall be responsible for the proper synchronization of their facility with the System in compliance with NERC, FRCC and City standards. Customers connecting synchronous generators and motors will be required to install equipment required to supervise the Connection and prevent asynchronous breaker closing including but not limited to synchronizing check relays. The specific conditions and terms related to the control of facilities will be negotiated.

## 2.13 Maintenance coordination

The maintenance of equipment used in the Connection is the responsibility of the equipment owner. Maintenance must be performed and documented in accordance with the manufacturer, industry, and regulatory standards. The City will reserve the right to review equipment and maintenance records for all equipment that impacts the System. Entities connecting to the System shall have in place a maintenance program for protective equipment and supply such records upon request to the City, Florida Reliability Coordinating Council (FRCC) and North American Electric Reliability Council (NERC). At intervals described in the documented maintenance program and following any apparent malfunction of the protection equipment, the entity shall perform both calibration and functional trip tests of its protection equipment. The Customer will provide the City with adequate notice of the need to schedule maintenance of their facility and shall coordinate maintenance schedules with the City to minimize adverse impacts on the System. The coordination of maintenance for interconnected equipment shall be directed through the City's System Control division and the Florida Reliability Coordinating Council.

## 2.14 Operational issues (abnormal frequency and voltages)

Power quality factor requirements to minimize the risks associated with frequency and voltage deviations will be established by the "Generator Coordination Requirements" section of the FRCC Standards Handbook. Additional restrictions related to interruptions, outages, or modes of operations may be required by the City.

The installation of disturbance monitoring and/or control equipment as appropriate to the type of Connection requested may be required to comply with NERC, FRCC and/or City standards. The Customer will be responsible for the installation of any such equipment required to satisfy the applicable standards. The Customer's specific requirements for the installation, maintenance, testing and operations of such equipment will be addressed in their interconnection and operating agreements.

### 2.15 Inspection requirements for existing or new facilities

The City will provide for engineering design, specification, construction, and/or modification of its facilities up to the proposed point of interconnection. Cost responsibilities for design and construction work will be negotiated in the interconnection agreement. While the City will not design any portion of the transmission line beyond the agreed point of interconnection, the City will require review and approval of the design to insure compatibility of the design with the System.

The Customer shall maintain its facility in good working order. The Customer-owned facility may be subject to City inspection upon reasonable notice by the City. The Customer shall assume full responsibility for the routine maintenance of the facility and associated equipment and for keeping of records of such maintenance. These records shall be made available to the City for inspection upon request.

## 2.16 Communications and procedures during normal and emergency operating conditions

Open communications will be maintained between the City and Customer under both normal and emergency conditions. The City's Electric Control Center ("ECC") and FRCC Reliability Coordinator are responsible for ensuring the safe and reliable operation of the System and regional electric system. All facilities connected to the System will immediately comply with directives issued by these entities or their designees to ensure compliance with NERC, FRCC and City standards. Communications requirements specific to the Customer will be included in their interconnection and operating agreements.

## 3.0 Documentation Requirements

The City shall maintain and update the Facility Connection Requirements reflected in this document as necessary to maintain compliance with current NERC, FRCC and City standards. Copies of this FCR document will be provided within 5 business days upon request.