



# **Lee County Electric Cooperative, Inc.**

**(LCEC)**

## **Bulk Electric Facility Connection Requirements**

**Revision: July 16, 2012**

## **Introduction, Purpose, and Scope**

This document:

- has been prepared to provide procedural guidelines and technical requirements for connecting facilities to the LCEC Bulk Electric (Transmission) System.
- will be revised periodically reflect changes or clarifications in planning, operating, or interconnection policies.
- will be maintained and published/posted on the FRCC Operating Entities Posting Area-BAs/TOPs.
- is not intended to serve as a design standard nor as an operating agreement or interconnection agreement.

The guidelines and requirements:

- apply to new connections or substantial modifications of existing connections.
- apply to the interconnection of generating units, transmission facilities, and end user delivery points.
- comply with NERC Reliability Standards although the facilities are not subject to the Standards.
- comply with applicable Regional Reliability Organization (and sub-regional, if any) planning criteria and facility connection requirements.

The information contained in this document is:

- a guideline.
- not intended as a detailed specification.
- an overview of the objectives and requirements needed in the design of facility connections.

Final design of any facility connection to the LCEC Bulk Electric (Transmission) System will be subject to review and LCEC approval.

## NOTES:

1. These requirements are designed to comply with NERC Reliability Standard FAC-001 (current revision) and are applicable to LCEC's Bulk Electric System facilities. The requirements shall address, but are not limited to, the items listed in FAC-001 (current revision). The list of items follows these notes.
2. Facility Connection Requirements to LCEC's Bulk Electric System are referenced in LCEC's FAC-001-0 "Facility Connection Requirements" procedure.
3. Excerpts from "Facility Connection Requirements" procedure:
  - As per a joint agreement between SECI, FPL, and LCEC, any connections to the LCEC Bulk Electric System are subject to joint planning and operations between these parties.
  - Upon notification of possible replacement, additions, modifications, changes, expansions, etc. to the existing LCEC Bulk Electric System, the joint planning and operations committee consisting of representatives of SECI, FPL, and LCEC will convene to determine the specific facility connection requirements for the subject activity.
  - Upon establishment of the specific requirements, they will be documented and provided to the relevant parties.
  - Until such time as specific requirements are established, these requirements will stand as LCEC's Facility Connection Requirements to LCEC's Bulk Electric System as required by NERC Reliability Standard FAC-001 (current revision).

List of items that shall be addressed at minimum as per FAC-001-0:

- Procedures for coordinated joint studies of new facilities and their impacts on the interconnected transmission systems.
- Procedures for notification of new or modified facilities to others (those responsible for the reliability of the interconnected transmission systems) as soon as feasible.
- Voltage level and MW and MVAR capacity or demand at point of connection.
- Breaker duty and surge protection.
- System protection and coordination.
- Metering and telecommunications.
- Grounding and safety issues.
- Insulation and insulation coordination.
- Voltage, Reactive Power, and power factor control.
- Power quality impacts.
- Equipment Ratings.
- Synchronizing of facilities.
- Maintenance coordination.
- Operational issues (abnormal frequency and voltages).
- Inspection requirements for existing or new facilities.
- Communications and procedures during normal and emergency operating conditions.

## **Table of Contents**

- I. General Requirements & Information
- II. Specific Requirements Applicable to FAC-001-1, Requirement 2

## **General Requirements & Information**

NERC Reliability Standard FAC-001 is applicable to Transmission Owners of the Bulk Electric System. The requirements contained herein apply to LCEC's Bulk Electric System facilities.

NERC Reliability Standard FAC-001 addresses connection requirements for generation facilities, transmission facilities, and end-user facilities. LCEC is not aware of any Federal, State, or Local governmental authority having jurisdiction over LCEC that requires interconnecting generation facilities, transmission facilities, and end-user facilities to LCEC's Bulk Electric System transmission facilities. These requirements, although developed, will only be utilized in the event that LCEC decides to allow an interconnection or discovers that interconnection is required.

LCEC has an "all requirements" Wholesale Power Agreement with Seminole Electric Cooperative, Inc. (SECI). SECI has a Network Operating Agreement with Florida Power & Light (FPL) that defines certain operating conditions and requirements at the LCEC Electric System Delivery Points. Some specific operational requirements (e.g., permissible operating voltage ranges) defined in this document may be from the FPL-SECI Network Operating Agreement. Whenever applicable, specific industry standards are cited. However, whenever specific standards are not appropriate, the facility connection requirements are based on good utility practices.

Finally, LCEC reserves the right to take such actions as deemed necessary to ensure the reliability of the interconnected transmission system – even if such actions conflict with the requirements contained herein.

## **Specific Requirements Applicable to FAC-001-1, Requirement 2**

### **R2.1. Provide a written summary of its plans to achieve the required system performance as described above throughout the planning horizon:**

Results and mitigation requirements from system assessments, conducted per the requirements of the TPL Reliability Standards, may be incorporated into these requirements and/or into any specific interconnection requirements developed for a specific interconnection request.

#### **R2.1.1. Procedures for coordinated joint studies of new facilities and their impacts on the interconnected transmission systems.**

LCEC shall perform impact studies for accepted requests of interconnection to the LCEC Bulk Electric System. The studies will include (as applicable) but are not limited to the following: Fault Duty, Stability, Power Flow, and Transfer Capability.

LCEC will utilize the FRCC Regional Transmission Planning Process in the instances that LCEC performed studies indicate any impact on the FRCC Bulk Electric System.

#### **R2.1.2. Procedures for notification of new or modified facilities to others (those responsible for the reliability of the interconnected transmission systems) as soon as feasible.**

LCEC will, as required and necessary, advise other regional entities of any proposed and/or implemented new or modified facilities interconnected to the LCEC Bulk Electric System. This may be communicated in one or more methods included but not limited to: email, land mail, FRCC Equipment Status Report, etc. At minimum, such notice should include FPL and SECI.

An organization that has been granted interconnection to the LCEC Bulk Electric System shall provide to LCEC its implementation timetable. Any changes to the timetable will be provided to LCEC in a timely manner. Although the specific details of updating LCEC will be defined at the time of authorizing interconnection, it is anticipated that the requirement will be monthly – as this will correspond to the FRCC Equipment Status Report schedule of updates.

#### **R2.1.3. Voltage level and MW and MVAR capacity or demand at point of connection.**

Entities requesting interconnection to LCEC's Bulk Electric Transmission System must provide LCEC with proposed design and/or operational plans that include and/or address (as applicable):

Design requirements that should be addressed include:

- Load following capability
- AGC
- Reactive power output
- Minimum operating capability
- Remote control functions
- Coordination of generation control system settings
- Load shedding
- Black start capability
- Dynamic stability and the use of power system stabilizers
- Internal plant systems design (e.g., transformer rating/taps/impedance, cooling systems, generator/exciter rating) should be designed to support continuous reactive capability requirements at the point of transmission interconnection.
- Transmission interconnected equipment should have the tap ranges and self-regulation necessary to accommodate the transmission system's reactive power flow requirements.
- Load power factor
- Generator power factor
- Load equivalent sources of reactive power, if acceptable
- Generator equivalent sources of reactive power, if acceptable
- Transmission interconnections impact on adjacent areas' voltage and reactive power flow requirements

Operational requirements that should be addressed include:

- Operation at 60Hz nominal
- Mode of frequency control
- Operation of generators during frequency decline conditions
- Coordination between generator controls and underfrequency load shedding programs
- Speed droop setting
- Responsibility for coordination with the appropriate operating entity
- Verification of reactive support capability per NERC Reliability Standards and corresponding FRCC documents
- Generator step-up transformer (GSU) tap changes as necessary to meet voltage schedule and reactive support requirements

#### **R2.1.4. Breaker duty and surge protection.**

Entities requesting interconnection to LCEC's Bulk Electric Transmission System must provide LCEC with proposed design plans that include and/or address (as applicable):

- Short circuit capabilities of current carrying elements
- Ratings of interrupting devices
- Existing and planned future fault current levels

- Responsibility for required changes in existing facilities due to increased fault currents (Generator and Transmission Projects only)
- Arrester applications

#### **R2.1.5. System protection and coordination.**

Entities requesting interconnection to LCEC's Bulk Electric Transmission System must provide LCEC with proposed design and/or operational plans that include and/or address (as applicable):

Design and Operational requirements that should be addressed include:

- Safety of the general public
- Prevention/minimization of equipment damage
- Minimization of equipment outage time
- Minimization of system outage area
- Minimization of system voltage disturbances
- Maintenance of protective system coverage for abnormal conditions
- Performance of all appropriate studies: grounding, short circuit, stability, power quality, and coordination of protective devices
- Specification of RTU protocols and other communication channels
- Coordination of remote trip schemes, underfrequency load shedding schemes, undervoltage load shedding schemes and special protective systems
- Relay and device coordination with existing system protection

Generation-specific facility requirements that should be addressed include:

- Synchronizing with the transmission system
- Parallel operation with the transmission system
- Protection against islanding

#### **R2.1.6. Metering and telecommunications.**

Entities requesting interconnection to LCEC's Bulk Electric Transmission System must provide LCEC with proposed design plans that include and/or address (as applicable):

Typical metering data requirements could include the following:

- kW
- kWh
- kVAR, leading and lagging
- kVAR-hour
- kV<sup>2</sup>-hour

- voltage

Design requirements that should be addressed include:

- Loss compensation
- Bi-directionality
- Metering accuracy
- Ancillary equipment specifications (e.g., CT's, PT's)
- Provisions for maintenance and calibration
- Data protocol
- Mode of data transmission (e.g., fiber optic cable, phone line)
- Provisions for maintaining continuity and meeting reliability criteria

Supervisory Control and Data Acquisition (SCADA)

Typical data requirements could include the following:

- Status of interrupting devices
- MW flow
- MVAR flow
- Voltage

Design requirements that should be addressed include:

- Communication protocol
- Mode of data transmission (e.g. fiber optic cable, phone line)
- Control functionality (breakers, switches, etc.)
- Provisions for maintaining continuity and meeting reliability criteria (e.g., dual DC sources, dual port RTUs)

### **R2.1.7. Grounding and safety issues.**

Entities requesting interconnection to LCEC's Bulk Electric Transmission System must provide LCEC with proposed design plans that include and/or address (as applicable):

- Grounding study
- Compatibility with LCEC's system
- Construction techniques and inspection requirements (if any) of LCEC
- Testing
- Periodic maintenance
- Personnel safety considerations
- Interconnection of grounding system to LCEC grounding system(s)
- Transmission line shielding provisions

- Cathodic protection

#### **R2.1.8. Insulation and insulation coordination.**

Entities requesting interconnection to LCEC's Bulk Electric Transmission System must provide LCEC with proposed design plans that include and/or address (as applicable):

- Identification of general design parameters and practices of LCEC (e.g., shielding, attachment details, surge protection, current-carrying elements, basic insulation levels, etc.)
- Provision for LCEC review of facility design and specifications

#### **R2.1.9. Voltage, Reactive Power, and power factor control.**

Entities requesting interconnection to LCEC's Bulk Electric Transmission System must provide LCEC with proposed design and/or operational plans that include and/or address (as applicable):

Design requirements that should be addressed include:

- Internal plant electrical system design (e.g., transformers, tap settings, motors & other loads, generator/exciter, voltage regulator) should not restrict any mode of project operation within the transmission system's allowable voltage range and regulation.
- Transmission interconnected equipment should have the tap ranges and self-regulation necessary to operate within the transmission system's voltage range and regulation.
- Voltage regulator load compensation, if required, to control voltage at a point beyond the generator terminals
- Voltage regulator droop compensation, if required, for generators whose terminals are directly connected (i.e., cross-compound, hydro)

Operational requirements that should be addressed include:

- Load and/or generation operation within the acceptable voltage range and regulation as specified by LCEC
- Excitation system/voltage regulator allowable operating modes (e.g., automatic/manual)
- Generator voltage schedules
- Coordination of any reactive compensation devices

#### **R2.1.10. Power quality impacts.**

Entities requesting interconnection to LCEC's Bulk Electric Transmission System must provide LCEC with proposed design and/or operational plans that include and/or address (as applicable):

- Power quality studies to define acceptable operating ranges and limits. Studies may identify additional equipment necessary to meet power quality standards. Studies may include, but not be limited to:
  - Voltage Unbalance
  - Voltage Flicker
  - Voltage Fluctuation
  - Harmonic Distortion
  - Transient Overvoltage
  - Temporary Overvoltage
  - Temporary Undervoltage
  - Insulation Coordination
  - Operating Frequency
  - Power Factor Range
  - Interruption/Outage Frequency
- Connection of a generator, transmission facility, or end-user load to LCEC's system should not unacceptably compromise or degrade the power quality of existing customers.
- Installation of power quality monitoring equipment by LCEC to verify facility owner/operator compliance with power quality performance requirements

#### **R2.1.11. Equipment Ratings.**

Entities requesting interconnection to LCEC's Bulk Electric Transmission System must provide LCEC with proposed design plans that include and/or address (as applicable):

- Establishment and communication of equipment ratings in accordance with the current approved version of NERC Reliability Standards FAC-008 and FAC-009 or their successor.
- Identification of general design parameters and practices of LCEC (e.g., shielding, attachment details, surge protection, current-carrying elements, basic insulation levels, etc.) identified during the study and/or application process.
- Provision for LCEC review of facility design and specifications as they impact the reliability and operation of the transmission system.
- Special requirements due to atmospheric, geological, seismic, or environmental conditions.
- Responsibility for changes to existing transmission system made necessary by the project.

#### **R2.1.12. Synchronizing of facilities.**

Entities requesting interconnection to LCEC's Bulk Electric Transmission System must provide LCEC with proposed design and/or operational plans that include and/or address (as applicable):

- The responsibility associated with synchronizing generation and transmission facilities to the power system.
- Required communications necessary between LCEC and the generation/transmission facility operator.
- Synchronizing equipment
- Test plans
- Applicable reclosing requirements and prohibitions for generation and transmission facilities

**R2.1.13. Maintenance coordination.**

Entities requesting interconnection to LCEC’s Bulk Electric Transmission System must provide LCEC with proposed design and/or operational plans that include and/or address (as applicable):

- The facility owner/operator responsibility for the regularly scheduled calibration and/or maintenance of its equipment, should include, but is not limited to:
  - Circuit breakers
  - Generators
  - Power transformers
  - Protective relays
  - Revenue metering
  - Communications
  - Trip circuits
  - Interrupters
  - Power DC sources
  - Grounding system
  - Transmission facilities

The maintenance practices of the generator and transmission facility Owner/Operator, and end-user on their transmission-connected equipment should be performed at a level that ensures the reliability and continuity of service of the interconnected transmission system. Relevant maintenance records should be maintained.

Other Operational requirements that should be addressed include:

- Definition of maintenance programs, responsibilities and performance objectives
- Authorization, notification and clearances for work
- Generation: such planning should take into account unit commitment obligations, replacement power, and / or contractual obligations that impact the performance of the bulk power system.
- End-Users: the maintenance practices of the end-user on their transmission-connected equipment should be performed at a level that ensures the reliability of the interconnected transmission system.

- Transmission Interconnections: requirements (if any) for advanced publication of maintenance schedules, including any need to observe limitations imposed by generation maintenance and dispatch schedules, maintenance of associated facilities, transmission transaction schedules, area protection or voltage requirements.

**R2.1.14. Operational issues (abnormal frequency and voltages).**

Entities requesting interconnection to LCEC's Bulk Electric Transmission System must provide LCEC with proposed design and/or operational plans that include and/or address (as applicable):

- Consideration for abnormal voltage conditions
- Consideration for abnormal frequency conditions
- Consideration for generators connected through a tapped transmission line (e.g., islanding)
- Relay coordination to maintain stability
- Load shedding implementation
- Provisions for abnormal voltage conditions
- Provisions for abnormal frequency conditions
- Provisions for load shedding
- Special procedures for coordination

**R2.1.15. Inspection requirements for existing or new facilities.**

Entities requesting interconnection to LCEC's Bulk Electric Transmission System must provide LCEC with proposed design and/or operational plans that include and/or address (as applicable):

- Initial (pre-operational) inspection by LCEC and/or copies of pre-operational test reports to be provided to LCEC. This may include requirements established by LCEC prior to commercial operation and may include the option of LCEC to specify additional testing.
- If applicable, required right of access to the facility by LCEC for purposes of conducting inspections, observing tests, and auditing records required by NERC standards and established reporting procedures.
- Requirements for facility Owner/Operator to modify operations to reasonably comply with LCEC testing requirements.

**R2.1.16. Communications and procedures during normal and emergency operating conditions.**

Entities requesting interconnection to LCEC's Bulk Electric Transmission System must provide LCEC with proposed design and/or operational plans that include and/or address (as applicable):

- Provision for a point of contact - Each generation and transmission facility operator and end-user facility should include a provision for establishing a contact person for communications with LCEC. This contact person should have the authority and capability to operate the facilities according to the instructions of LCEC.
- Provision for reliable communication - All Generator Operators and all Transmission Operators should have a provision for reliable communications with LCEC. In addition, all Transmission Operators should have provisions for reliable communications with other Transmission Operators as appropriate.
- The generation and transmission facility operators and end-users should communicate with and should cooperate with LCEC to support the recovery efforts during emergency conditions. This may include, but may not be limited to (as appropriate):
  - Switching operations
  - VAR support
  - Adjustments in real or reactive generation net output
  - Tripping of generating unit(s)
  - Starting of generating unit(s) including black start units
  - Implementation of emergency communication procedures
  - Transmission facility restoration efforts

**Revision History:**

<b>Document Date</b>	<b>Modifications</b>	<b>Author</b>
11/1/2009	Establishment of a document that will stand as LCEC's Facility Connection Requirements to LCEC's Bulk Electric System as required by NERC Reliability Standard FAC-001 (current revision).	Clark Hawkins
10/23/2010	Added revision history.	Clark Hawkins
9/1/2011	Reviewed with no changes.	Clark Hawkins
7/16/2012	Reviewed with no changes.	Clark Hawkins