

Facility Connection Requirements (FAC-001-1)

BRUNSWICK ELECTRIC MEMBERSHIP CORPORATION

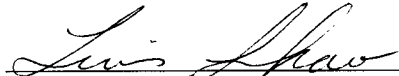
SHALLOTTE, NORTH CAROLINA

November 25, 2013

**Brunswick Electric Membership Corporation
Facility Connection Requirements**

Approval

Signature indicates BEMC has changed and/or reviewed this document as per the subject description of change and/or reason. This document becomes effective on the Effective Date as listed on the first page.

 / Lewis Shaw / 11/25/2013
Approver's Signature / *Approver's Name (Print or Typed)* / *Date*

Revision History:

Approval Date	Rev. No.	Description of Change and/or Reason	Reviewed/Approved by And Title
4/29/2011	0	Created- Previously BEMC used PEC's FCR Document as their requirements	Lewis Shaw, Manager, Engineering (BEMC)
1/5/2012	0	Reviewed	Bob Beadle, Manager, Transmission Resources (NCEMC)
11/6/2012	1	Updated to include signature block and headers and footers. Revision history block format updated. Added language about planning horizon and joint studies. Rearranged sections to match requirement numbers.	Lewis Shaw, Manager, Engineering (BEMC)
8/23/2013	1	Reviewed	Lewis Shaw, Manager, Engineering (BEMC)
11/25/2013	2	Update document to match new version FAC-001-1	Lewis Shaw, Manager, Engineering (BEMC)

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Brunswick Electric Membership Corporation Facility Connection Requirements

1. Summary and Applicability

The Energy Policy Act of 2005 requires all entities which own, operate, or use a portion of the bulk electric system to register with a Regional Reliability Organization (RRO) identifying the functions for which the RRO is responsible and to comply with all applicable reliability standards. The North American Electric Reliability Corporation (NERC) has been designated the Electric Reliability Organization (ERO) by the Federal Energy Regulatory Commission (FERC), and identified the SERC Reliability Corporation (SERC) as the RRO and charged it with compliance monitoring and enforcement responsibilities for the region. Entities registered as a Transmission Owner (TO) are required to document, maintain, and publish facilities connection requirements to ensure compliance with NERC reliability standards as well as applicable RRO, subregional, power pool, Rural Utilities Service (RUS), and individual transmission owner planning criteria. Brunswick Electric Membership Corporation (BEMC) has developed these Facility Connection Requirements (Connection Requirements) to address connection requirements to applicable facilities for generation facilities, transmission facilities, and end-user facilities.

The Connection Requirements stated in this document are to be considered minimum connection requirements. Additional connection requirements may be necessary to ensure the desired performance of the integrated facilities throughout the planning horizon, depending on the location and/or characteristics of the proposed interconnection facility, which will be addressed on a case-by-case basis. Finally, these Connection Requirements ensure BEMC's compliance with NERC Reliability Standard FAC-001-1, Facility Connection Requirements, requirements R1, R3, and R4.

2. Connection Requirements

The facility connection requirements contained in this document shall address the following items

2.1. Written Summary of Plans to Achieve Required Performance Throughout Planning Horizon

Proposed modifications to existing facilities must be mutually planned, coordinated, and integrated into NCEMC's system and the interconnected transmission system throughout the planning horizon, and may require joint studies with entities responsible for regional reliability, such as a Regional Reliability Organization or PJM.

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2.1.1. Coordinated Joint Studies of New Facilities and Their Impact on Interconnected Transmission System(s)

These Connection Requirements outline the minimum requirements for the connection to BEMC-owned transmission facilities, without adverse impacts to the reliability of the BES. The proposed connection and resulting performance of the system after connection is determined by conducting various studies including steady-state, short circuit, and dynamics studies. BEMC will utilize the latest available power flow case and/or coordinate directly with the upstream transmission owner(s) to consider the fault duty, stability, power flow, or transfer capability impacts resulting from the proposed interconnection.

All arrangements for system studies, engineering design, construction, maintenance, operations, metering, or any other activities needed to coordinate the interconnection of requested facilities will be set forth in a separate agreement between BEMC and the party requesting the interconnection. If additional equipment is required to accommodate the facility interconnection, BEMC will retain operational control of the equipment added to the BES. The cost associated with any equipment modifications shall be the responsibility of the requesting party. The requesting party shall also be responsible for obtaining any required Right-of-Way (ROW) or easements from landowners, as well as any required permits needed for the interconnection. The following requirements must be satisfied by any entity seeking to connect generation, transmission, and/or end-user facilities to the BEMC transmission and/or generation system.

2.1.2. Notification of New or Modified Facilities

Any entity seeking to interconnect generation, transmission, or end-user facilities with BEMC's Bulk Electric System (BES) transmission and/or generation facilities shall contact the following individual as soon as feasible:

Attn: Manager, Engineering
Brunswick EMC
PO Box 826
Shallotte, NC 28459
Phone: (910) 755-4262

Due to the applicable OATT requirements and/or the potential impact on upstream BES facilities owned by other entities, BEMC may require the requesting party to file/queue the interconnection request or

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initiate an affected system study with one or more upstream entities. BEMC will notify any upstream transmission provider of the proposed interconnection in accordance with the requirements of its network service agreements. The requesting entity shall provide all required technical information needed to evaluate the impact of the proposed facilities on the BES transmission and/or generation facilities.

2.1.3. Voltage Level and MW/MVAR Capacity at the Point of Connection

Transmission facility connection requirements are for balanced three phase 60 hertz alternating current connections. The BEMC system includes facilities operated at a nominal 230kV transmission voltage. When requesting an interconnection, the customer should address all of the following design requirements as part of their request: Facility electrical system design (transformer tap settings or LTC's, voltage regulators, motors or other loads, generator exciter, or other voltage sensitive systems) should not restrict or adversely affect any mode of operation within the transmission system's allowable voltage and regulation range. The interconnected facilities should also have the tap ranges, reactive support, and voltage regulation necessary to operate within the transmission system's allowable voltage range. The interconnection impact on any adjacent transmission owners/operators' voltage or reactive compensation devices will also need to be considered as part of the interconnection study evaluation. If black start capability is to be included as part of the proposed generation facility, the requesting party shall be responsible for all equipment procurement and installation costs or other start-up or testing/verification requirements associated with this equipment.

If the interconnection study results indicate a need for the use of power system stabilizers, the requesting party shall be responsible for the installation and proper tuning of the equipment in accordance with applicable requirements established by the Balancing Authority (BA), and the SERC Power System Stabilizer Guideline.

2.1.4. Breaker Duty and Surge Protection

BEMC shall review the breaker duty and surge protection of the interconnecting customer's proposed facilities to identify any additions required to maintain an acceptable level of availability, reliability, equipment insulation margins, and safety. The interconnecting party shall provide all interrupting device ratings and short circuit equipment capability data needed to evaluate the compatibility of the proposed facility interconnection with the BES.

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2.1.5. System Protection and Coordination

BEMC's system protection requirements are intended to protect BEMC's transmission and generation systems from equipment damage, to ensure the safety of the general public, BEMC, and other utility personnel, to minimize any adverse operating conditions affecting BEMC and its members, to comply with any NERC, SERC, Transmission Operator (TOP), Balancing Authority (BA), or BEMC operating criteria, and to promote reliable operation of the BES. As part of the proposed interconnection study, BEMC will review the grounding, short circuit, stability, power quality, coordination of protective devices, and the specification of RTU protocols and other communication devices for the proposed facility as required to maintain the reliability of the BES. Additional protective relays or other equipment may be required to protect the generation, transmission, and end-user facilities of entities requesting connection of such facilities to the BEMC system. The interconnecting party shall also be responsible for communicating any proposed changes or modifications to the protective relay settings to BEMC. In addition to the initial interconnection study, BEMC will review any proposed modifications and coordinate transmission impacts with other upstream transmission owners, and will provide confirmation to the interconnecting party as to whether the proposed relay setting changes can be accommodated. Other coordination and/or equipment changes may also become necessary due to increased fault current or other changes on the system.

To meet the reliability requirements of NERC and SERC, underfrequency and/or undervoltage load shedding, or other protection schemes may be required. Any load or reactive device connected to the BEMC system will be expected to participate in underfrequency or undervoltage load shedding if BEMC determines such action is necessary to maintain system reliability. The device owner shall establish a testing program in compliance with applicable NERC or SERC standards and shall coordinate data reporting as required.

Other generation-specific facility protective device requirements that may be included in the interconnection study or as part of other protective device reviews include a review of the parallel operation and synchronizing with the transmission system and protection against islanding, as applicable to the proposed facility.

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2.1.6. Metering and Telecommunications

All electrical energy delivered to the point of interconnection shall be measured by revenue-class metering equipment, except as mutually agreed upon by both the interconnection customer and BEMC. The metering interface equipment shall be compatible with the data acquisition systems of both BEMC and the customer. BEMC may install, own, operate, and maintain all metering equipment at the customer's expense. The customer shall provide suitable accessible space for the metering equipment at no additional cost to BEMC. Typical metering data requirements may include the following: kW, kWh, kVAR (leading and lagging), kVAR-hour, kV, recorded at peak and integrated values at a rate and in a data format to be determined by BEMC. The method of communications and mode of data transmission, as well as provisions for maintaining continuity will be addressed as part of an Interconnection Operating agreement between the requesting party and BEMC.

2.1.7. Grounding and Safety Issues

Modifications to the ground grids of existing substations may be necessary to keep grid voltage rise within safe levels. The ground grid should be designed to ANSI/IEEE Standard 80-1986, IEEE Guide for Safety in AC Substation Grounding.

Equipment shall be operated and maintained in accordance with the manufacturer's recommendations, good utility practice, and all applicable environmental and safety standards. BEMC may require additional equipment to ensure a reliable interconnection and to safeguard the proper operating conditions of its power system. The interconnection substation shall have a ground grid that solidly grounds all metallic structures and other non-energized equipment. The grid shall limit the ground potential gradients to voltage and current levels that will not endanger the safety of people or damage equipment located in or adjacent to the substation under both normal and fault conditions.

2.1.8. Insulation and Insulation Coordination

A transmission line switching study may be required to evaluate transient overvoltages caused by switching operations involving a proposed new transmission facility. This study may be required for transmission facilities exceeding the 200kV voltage class to address insulation coordination requirements due to potential switching surges.

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Also proposed lower voltage transmission lines electrically close to higher voltage facilities may require a switching surge study, at BEMC's discretion, in order to determine the Basic Insulation Level (BIL) requirements and/or breaker closing resistor requirements for the proposed new facilities.

2.1.9. Voltage, Reactive Power, and Power Factor Control

The power factor for both Generation and End-User facilities shall be measured at the interconnection point. BEMC typically designs and operates transmission facilities which can be operated at voltage levels between 0.95 – 1.05 per unit during normal conditions and between 0.90 – 1.10 per unit during emergency conditions. Projects shall have the capability to operate within the full voltage range at the point of interconnection so as not to restrict the operational range of the transmission system. Owners of end-user facilities are strongly encouraged to install their own voltage regulation equipment and coordinate any voltage set points or time delays with the normal transmission bandwidths.

Generation facilities shall incorporate voltage regulator load compensation or droop compensation, if required to control voltage at the generator terminals or at a point beyond the generator terminals. The generation facility owner shall also put in place a testing program to verify the gross and net reactive power capability in compliance with applicable NERC or SERC Planning Standards.

Power factor correction capacitors added to End-User facilities to meet the power factor requirements may need to be switchable (while energized). Depending on the size of the facility and location on the system, these capacitors may need to be switched to participate in voltage regulation. The control methods and set points for switching these capacitors may need to be coordinated with the area voltage schedules maintained by the TOP.

2.1.10. Power Quality Impacts

The customer shall take responsibility for limiting harmonic voltage, harmonic/current distortion, voltage flicker, voltage imbalance, voltage fluctuation, or any other transient or temporary over- or undervoltage condition caused by their equipment. Power output at the facility shall be in accordance with the power quality standards contained in IEEE Standard 519, and the facility will not introduce any

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waveform, telephone, or carrier interference that is inconsistent or conflicts with IEEE Standard 519.

Customers with unusual load characteristics which create or have the potential to create damaging torsional oscillations on motors and generators shall install the requisite electrical equipment (filtering and/or damping) needed to modify their load characteristics so that it does not harm BEMC or member facilities. The installation of power monitoring equipment may also be required to ensure compliance with proper power factor quality performance.

2.1.11. Equipment Ratings

The customer's facilities shall be rated according to good utility practice or other acceptable industry standard methods and assumptions, including IEEE Standard 1109-1990 and IEEE Standard 1547-2003. Maintenance of equipment shall be consistent with NERC and RRO standards, as applicable. The customer's facilities should be consistent with the ratings used for BEMC's facilities and be able to operate in a normal operational state without undue maintenance or a reduced lifespan.

2.1.12. Synchronizing of Facilities

Any customer requesting an interconnection shall ensure that adequate protection is provided that will allow appropriate equipment to be verifiably de-energized prior to making the interconnection, or that the voltage magnitude, angle, and slip speed are within tolerance to consummate the interconnection without causing undue stress on equipment.

Following the execution of an Interconnection Operating agreement and the successful completion of all construction, inspection, and facility checkout procedures, the interconnected facility will be released for energization. The initial synchronization shall be supervised by and in cooperation with BEMC personnel. Subsequent synchronizations will be authorized by the TOP designated in the Interconnection Operating agreement.

2.1.13. Maintenance Coordination

The owner of installed equipment shall be responsible for its proper operational calibration and maintenance. Equipment shall be operated and maintained on a regular schedule in accordance with the

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manufacturer's recommendations, prudent utility practices, and applicable environmental and safety standards. The facility owner shall coordinate maintenance activity with BEMC. BEMC may require additional equipment to ensure a reliable interconnection and to safeguard the proper operating conditions of its power system. Authorization and protocols for notification of outages and work clearance requests shall be addressed in the Interconnection Operating agreement.

2.1.14. Operational Issues

To the extent practical, facility connection evaluation and studies shall identify any operational issues (including abnormal frequency and/or voltage conditions) associated with the proposed interconnection and provide suggested remedies to mitigate the material degradation of reliability or operation. Proposed remedies shall comply with applicable NERC and SERC standards and accepted operating procedures used by the authorized TOP and the Reliability Coordinator (RC).

2.1.15. Inspection Requirements

Protective relays and control systems must be inspected and tested by functional trip test checking prior to putting any interconnected facility in service. Only after a satisfactory inspection is completed will the new interconnection facilities be authorized for energization and synchronization. Future inspection protocols during maintenance and testing activity will be stipulated in the Interconnection Operating agreement between BEMC and the interconnecting customer.

2.1.16. Communications and Procedures During Normal and Emergency Operating Conditions

All communications and operating procedures during normal and emergency operating conditions, including system restoration events will be coordinated with BEMC's designated TOP in accordance with applicable NERC and SERC standards. Standard operating procedures shall be coordinated with BEMC and provided to the TOP. Special operating considerations shall be submitted in advance to BEMC and the TOP for review. Other conditions may be stipulated in the Interconnection Operating agreement.

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3. Maintaining, Updating, and Publishing Facility Connection Requirements

BEMC shall maintain and update its Facility Connection Requirements document as necessary. BEMC's FAC standards subject matter expert, with input from other Transmission Resources and Engineering department staff, shall be responsible for maintaining and updating these Facility Connection Requirements and making its Facility Connection Requirements available to requesting entities within 5 business days.

BEMC has also made its Facility Connection Requirements available to the users of the BES transmission system, the SERC region, and to NERC by publishing its Facility Connection Requirements document on BEMC's website as listed below:

Brunswick Electric Membership Corporation
(<http://www.bemc.org/renewableenergy.cfm>)