

# JONES-ONSLOW ELECTRIC MEMBERSHIP CORPORATION

## Standard for Interconnecting Distributed Resources Less than 500 kW with Jones-Onslow Electric Membership Corporation (“JOEMC”) (Interconnection Standard)

### 1. Overview

This Interconnection Standard contains the requirements, in addition to applicable tariffs and service regulations, for parallel interconnection of non-utility owned single- or three-phase distributed resource (“DR”) systems which are rated less than 500 kW and are consistent with Section 3 below. Procedures for application and acceptance of an interconnection request for such DRs are included in Section 10.

DRs meeting the criteria and conditions included and/or referenced herein will normally be approved for interconnection except in extenuating site specific circumstances.

#### 1.1. **Scope:**

This Standard applies only to DRs less than 500 kW installed at existing radial fed JOEMC distribution customers, with a determination of minimal impact. Any DR of 500 kW or greater is subject to the approval process of North Carolina Electric Membership Corporation Rate Policy 335, adopted June 12, 2002, and any subsequent amendments. All DR of 500 kW or greater is to be covered by Interconnection documents and agreements between the DR and North Carolina Electric Membership Corporation coordinated through JOEMC.

#### 1.2. **Limitations:**

Although outside the scope of this document, DRs failing to meet the requirements of this Standard may still be considered for interconnection after more detailed review specific to the proposed application and DR and compliance.

### 2. Definitions:

2.1. **EPS:** Electric Power System: The electric facilities of JOEMC.

2.2. **Closed Transition of Loads:** A make-before-break load transfer scheme, in which the DR is operated in parallel with the JOEMC EPS to ensure that the load is maintained while in transition from the Company to the DR or vice versa.

- 2.3. **Parallel DR:** A paralleling switch scheme which meets the JOEMC requirements and allows continuous parallel operation of the DR with the JOEMC EPS while serving all or a portion of the customer's load.
- 2.4. **Customer:** The electric Customer of record for the location where the distributed resource will be interconnected.
- 2.5. **Distributed Resources ("DR"):** Sources of electric power that are not directly connected to a bulk power transmission system. Distributed Resources include both generators and energy storage technologies.
- 2.6. **DR Isolation Device:** A manual load-break disconnect switch or safety switch with a clear visible indication of switch position between JOEMC EPS and the DR. The switch must have pad lock provisions for locking in the open position. The switch must be visible to, and accessible to JOEMC personnel. The switch must be in close proximity, and visible from, the Customer's point of electrical interconnection with the JOEMC EPS. The switch must be labeled "DR Disconnect Switch". The switch may isolate the DR system and its associated load from JOEMC or disconnect only the DR from JOEMC.

JOEMC shall have access to the Isolation Device at all times.

- 2.7. **JOEMC:** Jones-Onslow Electric Membership Corporation and its electrical system for delivering power to its members.
- 2.8. **Point of Common Coupling ("PCC"):** The point in the interconnection of a customer-DR facility with an electric delivery system and shall have the same meaning as in the latest published edition of IEEE Standard 1547.

### **3. Interconnection Requirements:**

#### **3.1. Protection Requirements for New or Modified DR Interconnections with JOEMC EPS:**

3.1.1. **General Requirements:** Any facility desiring to interconnect with JOEMC EPS or modify an existing interconnection must meet minimum specifications, where applicable, as set forth in the following documents, standards, and requirements in this Section and must utilize all utility grade equipment and relays.

- IEEE Standard 1547, the latest published edition of "IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems."
- UL Standard 1741, the latest published edition of "Invertors, Converters and Charge Controllers for Use in Independent Power Systems."

- IEEE Standard 929, the latest published edition of "IEEE Recommended Practice for Utility Interface of Photovoltaic ("PV") systems."

The specifications and requirements listed herein are intended to mitigate possible adverse impacts caused by the DR on JOEMC's equipment and personnel and on other Interconnecting Customers on the JOEMC EPS. They are not intended to address protection of the DR itself or its internal load. It is the responsibility of the Interconnecting Customer to comply with the requirements of all appropriate standards, codes, statutes and authorities to protect itself and its load.

JOEMC shall not be responsible for the protection of the DR. The Interconnecting Customer shall be responsible for protection of its system against possible damage resulting from parallel operation with JOEMC so long as JOEMC adheres to Good Utility Practice. If requested by the Interconnecting Customer, JOEMC will provide system protection information for the line terminal(s) directly related to the interconnection. This protection information contained herein is provided exclusively for use by the Interconnecting Customer to evaluate protection of its DR during parallel operation

At its sole discretion, JOEMC may consider approving alternatives that satisfy the intent of the requirements contained in this Section.

**3.1.2 Protection Requirements:** All facilities must meet performance requirements set forth in relevant sections of the latest published edition of IEEE Standard 1547. The following text is excerpted from this standard and applies to this section only.

- Voltage regulation: The DR shall not actively regulate the voltage at the PCC. The DR shall not cause the Area EPS service voltage at other Local EPS's to go outside the requirements of ANSI C84.1-1995, Range A.
- Integration with Area EPS grounding: The grounding scheme of the DR interconnection shall not cause overvoltages that exceed the rating of the equipment connected to the Area EPS and shall not disrupt the coordination of the ground fault protection on the Area EPS.
- Synchronization: The DR unit shall parallel with the Area EPS without causing a voltage fluctuation at the PCC greater than  $\pm 5\%$  of the prevailing voltage level of the Area EPS at the PCC, and meet the flicker requirements below.
- Surge withstand performance: The interconnection system shall have the capability to withstand voltage and current surges in accordance with the

environments defined in IEEE Standard C62.41.2-2002 or IEEE C37.90.1-2002 as applicable.

- Response to Area EPS abnormal conditions: Abnormal conditions can arise on the Area EPS that require a response from the connected DR. This response contributes to the safety of utility maintenance personnel and the general public, as well as the avoidance of damage to connected equipment, including the DR. All voltage and frequency parameters specified in these subclauses shall be met at the PCC, unless otherwise stated.
- Area EPS faults: The DR unit shall cease to energize the Area EPS for faults on the Area EPS circuit to which it is connected.
- Area EPS reclosing coordination: The DR shall cease to energize the Area EPS circuit to which it is connected prior to reclosure by the Area EPS.
- Voltage: The protection functions of the interconnection system shall detect the effective (rms) or fundamental frequency value of each phase-to-phase voltage, except where the transformer connecting the Local EPS to the Area EPS is a grounded wye-wye configuration, or single-phase installation, the phase-to-neutral voltages shall be detected. Coordination of this shall be approved by JOEMC.
- Frequency: When the system frequency is in a range outside that approved by JOEMC, the DR shall cease to energize the Area EPS within the clearing time as approved by JOEMC.
- Reconnection to Area EPS: After an Area EPS disturbance, no DR reconnection shall take place until the Area EPS voltage is within the range and frequency approved by JOEMC.

The DR interconnection system shall include an adjustable delay (or fixed delay of five minutes) that may delay reconnection for up to five minutes after the Area EPS steady-state voltage and frequency are restored to the ranges approved by JOEMC.

- Limitation of flicker induced by the DR: The DR shall not create objectionable flicker for other customers on the Area EPS.
- Harmonics: When the DR is serving balanced linear loads, harmonic current injection into the Area EPS at the PCC shall not exceed the limits approved by JOEMC.
- Unintentional Islanding: For an unintentional island in which the DR energizes a portion of the Area EPS through the PCC, the DR

interconnection system shall detect the island and cease to energize the Area EPS within two seconds of the formation of an island.

- 3.2. **Protection System Changes:** The Interconnecting Customer must provide JOEMC with reasonable advance notice of any proposed changes to be made to the protective relay system, relay settings, operating procedures or equipment that affect the interconnection. JOEMC will determine if such proposed changes require re-acceptance of the interconnection under the terms of this Interconnection Standard.
- 3.3. **Transient Voltage Conditions:** Because of unusual events in JOEMC's EPS, there may be transient voltage fluctuations, which will result in voltages exceeding the limits of the approved ranges. These transient voltage fluctuations, which generally last only a few milliseconds, arise due to EPS disturbances including, but not limited to, lightning strikes, clearing of faults, and other switching operations. The magnitude of transient voltage fluctuations varies with EPS configuration, grounding methods used, local short circuit availability and other parameters, which vary from point-to-point and from time-to-time on JOEMC's EPS.

Transient voltages should be evaluated in the design of the DR.

- 3.4. **Voltage Level:** All electricity flow across the PCC shall be in the form of single-phase or three-phase 60 Hz alternating current at a voltage class determined by mutual agreement of the Parties.
- 3.5. **Acceptance for Interconnection:** Each application and DR is evaluated individually and accepted or denied for interconnection with the JOEMC EPS. Any such evaluation is from the perspective of the impact of the interconnection on JOEMC and its system. The Customer is solely responsible for ensuring the safe installation and operation of the DR. DRs shall not be interconnected until the requirements and process described in this Standard have been satisfied.

The acceptance for interconnection is for the original applicant only. Subsequent owners or occupants of a site with an interconnected DR must submit a new Application to JOEMC. The existing customer assumes the responsibility of ensuring a new customer is aware the new customer must re-apply and obtain JOEMC's written acceptance or the equipment must be removed or disabled to prevent future interconnection and/or operation. The application fee for the re-applying new customer is waived and the technical requirements may be grandfathered for subsequent owners as long as the DR's maximum output capacity has not been changed and/or the interconnection protection system has not been modified.

- 3.6. **Waiver of Requirements:** All requirements of this Standard must be met although JOEMC may, in its sole discretion, waive all or some of the requirements of this Standard. Waivers must be issued in writing.
- 3.7. **Interconnect Cost:** The Customer will bear all the cost of interconnection on the Customer's side of the point of interconnection as well as necessary changes or upgrades to JOEMC including, but not limited to, the cost necessary to meet all technical and protection requirements to address any power quality, reliability or safety issues caused by the DR's operation or connection to JOEMC.
- 3.8. **Isolating or Disconnecting the DR:** JOEMC may isolate the Customer's premises and/or DR from the JOEMC EPS when necessary in order to construct, install, repair, replace, remove, investigate, or inspect any of JOEMC's equipment or part of JOEMC's system; or JOEMC determines that isolation of the Customer's premises and/or DR from the JOEMC EPS is necessary because of emergencies, forced outages, force majeure or compliance with prudent electrical practices. Whenever feasible, JOEMC shall give the Customer reasonable notice of the isolation of the Customer's premises and/or DR from the JOEMC EPS. Notwithstanding any other provision of this Standard, if at any time JOEMC determines that either the DR may endanger the JOEMC's personnel or other persons or property, or the continued operation of the Customer's DR may endanger the integrity or safety of the JOEMC's electric system, JOEMC shall have the right to isolate the Customer's premises and/or DR from the JOEMC EPS.

JOEMC may disconnect its EPS electric service to any DR determined to be malfunctioning, or not in compliance with this Standard. The Customer must provide proof of compliance with this Standard before the electrical service will be reconnected.

- 3.9. **Limitation of Liability:** Each party's liability to the other party for any loss, cost, claim, injury, liability, or expense, including reasonable attorney's fees, relating to or arising from any act or omission hereunder, shall be limited to the amount of direct damage actually incurred. In no event shall either party be liable to the other party for any indirect, special, incidental, consequential, or punitive damages of any kind.
- 3.10. **Indemnification:** The parties shall at all times indemnify, defend and save the other party harmless from any and all damages, losses, claims, including claims, and actions relating to injury or death of any person or damage to property, demand, suits, recoveries, costs and expenses, court costs, attorney's fees, and all other obligations by or to third parties, arising out of or resulting from the other party's action or inaction of its obligations

hereunder on behalf of the indemnifying party, except in cases of gross negligence or intentional wrongdoing by the indemnified party.

- 3.11. **Access to and Operation of the DR:** The Customer shall limit access to the operation of the DR to qualified persons and assumes the responsibility of maintaining control of the operation of the DR.
- 3.12. **Insurance:** The Customer shall obtain and retain, for as long as its DR is interconnected with JOEMC's system, liability insurance which protects the Customer from claims for bodily injury and/or property damage. For a non-residential Customer the minimum coverage shall be comprehensive general liability insurance with coverage of at least \$300,000 per occurrence and for a residential Customer the minimum coverage shall be at a standard homeowner's insurance policy with liability coverage in the amount of at least \$100,000 per occurrence. This insurance shall be primary for all purposes. The Customer shall provide certificates evidencing this coverage as required by JOEMC. JOEMC reserves the right to refuse to establish, or continue the interconnection of the Customer's DR with JOEMC's system, if such insurance is not in effect.
- 3.13. **DR Alterations:** Changes to the DR output capacity and/or modification to the protection system required to meet this Standard are prohibited without submitting a new "Application to Interconnect Distributed Resources less than 500 kW" and obtaining a new acceptance from JOEMC.
- 3.14. **Discontinuing Operation:** The Customer shall notify JOEMC prior to permanently discontinuing operation of the DR interconnected with JOEMC.
- 3.15. **Interconnection Application Fee:** The nonrefundable interconnection application fee covers only the application process for interconnection of DRs and shall be one of the following:
  - 3.15.1 For residential customers: \$100.00
  - 3.15.2 For nonresidential customers: \$250.00

#### **4. General Design Considerations**

Interconnecting Customers shall design and construct the DR in accordance with the applicable manufacturer's recommended maintenance schedule and in compliance with all aspects of JOEMC's Interconnection Standard. Interconnecting Customer agrees to cause its DR to be constructed in accordance with applicable specifications that meet or exceed those provided under this section of the Interconnection Standard.

## 5. Operating Requirements:

- 5.1 **General Operating Requirements:** Interconnecting Customer shall operate and maintain the DR in accordance with the applicable manufacturer's recommended maintenance schedule, in compliance with all aspects of JOEMC's Interconnection Standard.
- 5.2 **No Adverse Effects: Non-interference:** JOEMC shall notify Interconnecting Customer if there is evidence that the operation of the DR could cause disruption or deterioration of service to other Customers served from the JOEMC EPS or if operation of the DR could cause damage to JOEMC's EPS. Each party will notify the other of any emergency or hazardous condition or occurrence with its equipment or facilities which could affect safe operation of the other Party's equipment or facilities. Each Party shall use reasonable efforts to provide the other Party with advance notice of such conditions.

If the Interconnecting Customer demonstrates that the JOEMC EPS is adversely affecting the operation of the DR and if the adverse effect is a result of a JOEMC deviation from Good Utility Practice, JOEMC shall take appropriate action to eliminate the adverse effect.

- 5.3 **Safe Operation and Maintenance:** Each Party shall operate, maintain, repair and inspect, and shall be fully responsible for the facility or facilities that it may now or hereafter own unless otherwise specified in the Interconnection Agreement. Each Party shall be responsible for the maintenance, repair and condition of its respective lines and appurtenances on its respective side of the PCC. JOEMC and the Interconnecting Customer shall each provide equipment on its respective side of the PCC that adequately protects JOEMC's EPS, personnel and other persons from damage and injury.
- 5.4 **JOEMC and Interconnecting Customer Representatives:** Each Party shall provide and update as necessary the telephone number that can be used at all times to allow either Party to report an emergency.
- 5.5 **JOEMC Right to Access JOEMC-owned Facilities and Equipment:** If necessary for the purposes of this Interconnection Standard and in the manner it describes, the Interconnecting Customer shall allow JOEMC access to its own equipment and facilities located on the Interconnecting Customer's or Customer's premises. To the extent that the Interconnecting Customer does not own all or any part of the property on which JOEMC is required to locate its equipment or facilities to serve the Interconnecting Customer under this Interconnection Standard, the Interconnecting Customer shall secure and provide in favor of JOEMC the necessary rights to obtain access to such



equipment and/or facilities, including easements if the circumstance so require.

- 5.6 **Right to Review Information:** JOEMC shall have the right to review the Interconnecting Customer's information pertaining to the operation under the terms of this Standard. Confidentiality shall be maintained on all such information and its use shall be limited to the purposes allowed in the Interconnection Standard.

## **6. DR Inverter and Protective Equipment Technical Requirements:**

- 6.1 **General:** JOEMC may elect to visit the site and verify compliance with any requirement of these Standards.
- 6.2 **Required Standards:** The Customer must certify the following requirements:
- 6.2.1 The installation of the DR and all equipment in the system must comply with the latest published editions of IEEE 929 and IEEE 1547 as applicable.
  - 6.2.2 The Customer's inverter or interconnection protection system must be tested and listed for compliance with the latest published edition of Underwriters Laboratories, Inc. (UL) 1741, and must be approved by JOEMC.
  - 6.2.3 The DR must pass the anti-islanding test in UL 1741.
  - 6.2.4 Any protection settings affecting anti-islanding performance must not be adjusted after passing anti-islanding tests.
- 6.3 **Additional PV (Photovoltaic) Systems Requirements:** The Customer must certify that the DR meets the following requirements:
- 6.3.1 The installation of the DR and all equipment in the system comply with the latest published edition of IEEE 929.
  - 6.3.2 The DR is a non-islanding type as defined in IEEE 929.
- 6.4 **Electrical Contractors and NEC Code Inspections:** All installed wiring, protection devices, cabinets and connectors, etc. must comply with the latest published edition of the NEC as used by the local jurisdiction and all applicable local codes. An approved electrical inspection by the authority having jurisdiction is required.

- 6.5 **Isolation Device:** An Isolation device as defined in Section 2.5 is required. JOEMC in its sole discretion determines if the device is suitable and fully complies with utility standards and utility grade relaying.

## **7. Screens and Requirements for determination of minimal impact:**

### **7.1 Limitations of JOEMC EPS Facilities:**

- 7.1.1 **General:** The DR shall meet each of the following requirements to qualify for interconnection and each requirement must be maintained after commissioning.
- 7.1.2 **JOEMC EPS Capacity Limitation:** The maximum rated output of the DR or total aggregate of multiple DRs shall not exceed the capacity or ratings of the JOEMC EPS facilities as determined by JOEMC.
- 7.1.3 **Secondary, Service and Service Entrance Limitation:** The DR capacity shall be less than the capacity of the JOEMC EPS owned secondary, service and service entrance cable connected to the Point of Common Coupling. JOEMC will make this determination after reviewing JOEMC EPS installed facilities.
- 7.1.4 **Transformer Loading Limitation:** The DR shall not have the ability to overload the JOEMC EPS transformer or any EPS transformer winding beyond manufacturer or nameplate ratings.
- 7.1.5 **Integration with JOEMC EPS Grounding:** The grounding scheme of the DR shall comply with the latest published edition of IEEE 1547.
- 7.1.6 **Balance Limitation:** The DR shall not create a voltage imbalance of more than 5% if the JOEMC EPS transformer, with the secondary connected to the Point of Common Coupling, is a three-phase transformer.
- 7.1.7 **Any changes or upgrades to the JOEMC EPS to accommodate the DR will be pursuant to Section 3.7 above.**

## **8. Commissioning, Maintenance and Inspections:**

- 8.1 **General:** The Customer or Customer's authorized representative shall perform commissioning, and maintenance as outlined in this section for all DR equipment. All testing shall be documented and JOEMC shall be granted the right to audit the documentation. JOEMC reserves the right to require and witness testing of the Customer's DR.

The Customer's DR is subject to inspection by JOEMC representative at a mutually agreeable time, as JOEMC deems necessary.

JOEMC's inspection and/or witnessing the testing of the Customer's equipment shall not be construed as JOEMC warranting or implying that the Customer's equipment is safe or reliable. JOEMC shall not be liable to the Customer or others as a result of inspection and witnessing of tests of the Customer's DR or equipment

- 8.2 **Commissioning:** The manufacturer's recommended and required commissioning, installation and functional tests shall be completed, with successful results, in accordance with the manufacturer's published recommendations. Commissioning tests in the latest published editions of IEEE 1547 and IEE 959 shall also be completed with successful results unless these tests are duplications of the manufacturer tests. After obtaining the final electrical inspection, the Customer shall invite JOEMC to the commissioning test and perform the test at a mutually agreed date but not later than 25 days after the invitation.
- 8.3 **Maintenance and Testing:** Maintenance shall be performed in accordance with the manufacturer's published maintenance procedures. Periodic testing shall be completed with successful results in accordance with the manufacturer's published recommendations for periodic testing at, or before, the recommended testing intervals. If the manufacturer does not publish recommendations for periodic testing, suitable testing shall be performed that assures proper protection for JOEMC EPS, at an interval not to exceed two years. All test results shall be documented and available to JOEMC for review upon request.
- 8.4 **Failure of Test:** If a DR fails any test, it shall be disabled and the Isolation Device must be opened until the equipment is repaired.

## 9. **Metering**

Each DR whose interconnection allows for power flow into the JOEMC EPS must have installed a meter with the capacity to provide the Customer with a credit for such power flow separate from the amount recorded for revenue metering for service from JOEMC to the Interconnecting Customer. Such meter shall be as close to the PCC as practicable.

JOEMC shall furnish, read and maintain all metering equipment. The Interconnecting Customer shall provide suitable space within the DR facility for the installation of the metering equipment and any communication equipment required at no cost to JOEMC.

## 10. Procedures

- 10.1 **Interconnection Request:** The Customer submits to JOEMC an "Application to Interconnect Distributed Resource Less than 500 kW" accompanied with the appropriate Interconnection Application Fee to a designated JOEMC contact or department.
- 10.2 **Queue Position:** JOEMC considers the application based on the date a completed application is received by JOEMC in reference to priority when evaluating the JOEMC EPS screen limits.
- 10.3 **Impact Screens:** JOEMC accepts or rejects the application for interconnection after reviewing the application and performing the screens outlined in this Standard. If the application is rejected, the Customer may request JOEMC to reconsider interconnection outside the scope of this Standard. If the application is accepted the process will continue.

It may be necessary to visit the site to gather information on the JOEMC EPS facilities or the Customer's DR equipment.

JOEMC will complete the Impact Screen process within 30 days (absent extenuating circumstances) of receipt of a complete "Application to Interconnect Distributed Resources less than 500 kW." Extenuating circumstances include, but are not limited to, Force Majeure, adverse weather conditions, and system emergencies.

- 10.4 **Agreement for Interconnection:** After all previous items in the process are complete, JOEMC will provide an agreement to the Customer within 10 days of the completion of the Impact Screens as stated in 10.3. Once the Customer returns the executed Agreement to JOEMC, JOEMC will execute the Agreement and return a copy to the Customer. Customer shall not interconnect the DR to JOEMC EPS Facilities unless an Agreement between Customer and JOEMC has been executed by both parties.
- 10.5 **Installation and Inspections:** The Customer installs the DR and the Customer is responsible for obtaining an approved electrical inspection from the local authority having jurisdiction for the DR installation. The Customer shall request the inspector to forward a copy of the approved inspection to the Company contact processing the DR interconnect request.
- 10.6 **JOEMC EPS Facilities:** If the JOEMC EPS requires additional installations or alterations to existing installations to accommodate the interconnection, the Customer will pay the incremental expenses reasonably incurred by JOEMC.
- 10.7 **Commissioning Test:** The Customer performs the required commissioning test and forwards a confirmation letter to JOEMC unless JOEMC witnesses the

test and it is successful. The Customer shall invite JOEMC to the commissioning test and perform the test at a mutually agreed date and time if JOEMC elects to attend.

- 10.8 **Completion of Application/Expiration Process:** The application shall be valid for no less than one year once the Impact Screen process is completed.