Equipment Specification
Document No.: 4350.040
Item No.: 032-82813
Asset Suite: 82813
Originating Department: Distribution Engineering

SINGLE PHASE SOLID DIELECTRIC VACUUM RECLOSER
400 AMPERES

1. Introduction

1.1. This is a general specification that covers single phase solid dielectric vacuum recloser to be used on a 4.16 kV to 13.2 kV LL, 60 Hz distribution system in Puerto Rico. Further information will be provided by LUMA Energy at the time of order placement and will provide information on site specific conditions, quantity, and other requirements. This document includes the general electrical and mechanical characteristics of the material.

1.2. The recloser shall be an outdoor, single pole, and self-powered unit incorporating a fault interrupter module, a microprocessor control, an integral data transceiver, and an integral fault-current sensor.

2. Special Requirements

2.1. Samples shall be furnished as requested by LUMA Energy. Vendors that have supplied this material to LUMA on previous orders, will not have to furnish samples at bid opening. The material will be received at the LUMA's general warehouse (011) at Palo Seco, Puerto Rico. Shipping will include transportation and unloading at the indicated warehouse.

2.2. Products shall be evaluated and approved by LUMA Energy. Samples shall be furnished as requested by LUMA Energy. Vendors will not have to furnish samples of materials previously approved by LUMA.

2.3. Design tests shall be conducted on each design of the recloser and on each significant design change in accordance with latest ANSI C37.60.

2.4. Certified design test reports shall be provided as part of the purchase order.

3. Quantity/Literature

3.1. The vendor must submit equipment outlines, complete schematic, and point-to-point wiring diagrams for LUMA Energy's approval at time of bidding. The vendor must provide hardcopy of the operation and maintenance manuals (O&M Manuals), including diagrams and parts list. Failure to submit documents on time will cause bidder disqualification. If offered product has not been approved previously by LUMA Energy, bidder must submit all these requirements to be evaluated with their offer. The literature must include the following:

a. Instruction book giving complete instructions for installation and operation of the equipment and all information necessary for the adjustment, maintenance, and repair of the equipment.

b. A USB drive or other agreed-upon medium that includes the software installed on the unit.

c. Copies of nameplates and operating mechanism.

d. Outline drawing.

e. Control schematic diagram.

f. Wiring diagram showing physical placement of components.

4. Markings, Packing, Shipping, and Storage

4.1. Shipment shall be FOB to destinations. (DAP)

4.2. Recloser assembly must be packaged to ensure none of its components are disturbed or damaged during shipping. All parts and material shall be protected with wooden crate, properly sized, and fabricated to protect the units during transportation (Air, Land, & Sea) and subsequent storage.

4.3. For recloser units stored outdoors open to the elements, packaging must prevent equipment from being damaged by rain, snow, ice, wind, etc...

4.4. Warning Label shall be placed on the equipment for special handling and storage requirement.

4.5. Any additional materials shall be packed in weatherproof boxes and identified with weatherproof labels.

4.6. All materials, elements, parts, and hardware crates shall be shipped on flatbed trailers and stored in such a way so that they can be unloaded by finger lifts. Deliveries in containers or closed platforms where finger lifts cannot be used will not be accepted.

4.7. A copy of each detailed packing list must be sent to LUMA Energy personnel in charge of the requisition, prior to the delivery.

4.8. Each recloser unit shall be packed in individual packages with all necessary accessories and hardware included.

4.9. Containers must be marked outside with LUMA Energy purchase order and item number.

5. Acceptance Criteria

5.1. The recloser must have been tested and rated for at least 30,000 Close/Open operations. An operation is defined as an open and close operation, returning the mechanism contacts to the original state. Additionally, the recloser must have been tested and rated for 400 operations at 100% of the recloser's interrupting rating for more than 4000 A Units.

5.2. Production Tests: Must be performed in accordance with ANSI/IEEE C37.60 on each furnished recloser:

a. The test report shall be provided containing the measurements made during routine testing.

b. Test measurements shall be accompanied by upper and lower control limits.

c. All units must be hi-potted after final assembly, prior to shipment. Minimum hi-pot test shall be 60 Hz, 50 kV for one minute.

d. A complete tabulation on all weights, electrical ratings and capacities shall be provided.

e. The Supplier shall furnish 3 sets of drawings for the first shipment release to the Specification Engineer. The drawing shall include a view displaying overall dimensions and mounting provisions.

f. Purchaser may elect to have his representative present when tests are conducted.

5.3. Provide proof of tests demonstrating equipment can withstand harsh conditions from salt (sea) spray and prolonged ultraviolet exposure.

5.4. Each Recloser shall be built following the latest applicable ANSI/IEEE, NEMA, NEC, IEC, and ASTM Standard and the herein included requirements.

5.5. The following standards shall form a part of this specification unless otherwise stated:

a. ANSI/IEEE C37.60 Standard Requirements for Overhead, Pad-Mounted, Dry Vault, and Subsurface Automatic Circuit Reclosers and Fault Interrupters for Alternating Current Systems Up to 38 kV.

b. IEEE 1247-2005 Standard for Interrupter Switches for Alternating Current, Rated Above 1000 Volts.

c. ANSI/IEEE C37.2 Standard Electrical Power System Device Functions Numbers.

d. ANSI Z535 Sign Standards for Utility Installations specification.

e. ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coating on Iron and Steel Products. Evidence of this must be submitted at proposal for evaluation.

5.6. IEC 60529 IP65 Certification for degree of intrusion protection against foreign bodies (tools, dirt etc.) and moisture by mechanical casings and electrical enclosures.

6. Design and Functional Requirements

6.1. Electrical Requirements

a. Maximum design voltage: 15.5 kV (27 kV is acceptable)

b. Nominal operating voltage: 13.2 kV, 8.32 kV, 7.2 kV, & 4.16 kV

c. Basic insulation level (BIL): 125 kV or 150 kV

d. 60 Hz withstand voltage:

1. Dry, one minute: 50 kV
2. Wet, ten seconds: 45 kV

e. Continuous current rating: 400 A (200 A Minimum) RMS

f. Interrupting rating: 8,000 A RMS

g. All electrical ratings shall comply with ANSI/IEEE C37.60.

h. Any terminal pads shall have flat, machined surfaces in accordance with NEMA standards.

i. Control/device power shall be derived by internal means based on minimum line/load current. Also, current sensing accuracy shall be maintained over the operating range of the recloser.

j. The recloser must have been tested and rated for 400 operations at 100% of the recloser's interrupting rating for >4000 A Units. An operation is defined as an open and close operation, returning the mechanism contacts to the original state.

6.2. Physical Requirements

a. The recloser shall be an outdoor, single pole, and self-powered unit incorporating a fault interrupter module, a programmable microprocessor control, an integral data transceiver, and an integral fault-current sensor.

b. It must include a base with three vertical holes of 11/16" or 13/16" diameter, one at the top of the base, another at 8" from the top hole and the third at 12" from the top hole. The bottom hole could be furnished as a slot type. Distances must be measured center-to-center. Must be made in stainless steel grade 304, minimum.

The recloser unit is to be installed in a steel or concrete pole with hole patterns of 8" spaced between each hole on one face of the pole and 12" on the other face of the pole.

c. The recloser shall be able to be installed using tools and procedures typical to those used for steel and concrete poles and arm mounted attachments.

d. The supplier must provide the adequate wildlife protection guards to protect from animal and direct washing by rain or accumulation of particulate matter from the atmosphere. These guards must be constructed of corrosive resistance material.

6.3. Mechanical Requirements

a. The recloser must have been tested and rated for at least 30,000 Close/Open operations. An operation is defined as an open and close operation, returning the mechanism contacts to the original state.

b. The recloser must have no regular maintenance requirements.

c. An external mechanism must be provided for manual lockout of the recloser. When this mechanism is operated, the device shall be unable to automatically reclose (electronically or otherwise) until the external mechanism is returned to its normal reclosing operating position.

6.4. Environmental Conditions

a. **Temperature & Humidity:** Equipment supplied must be adequate for an operating temperature range of 0°C to 50°C (32°F to 122°F), with humidity up to 100%.

b. **Wind Conditions:** All mounting equipment must be designed and constructed to withstand sustained hurricane-force wind velocities complying with the applicable construction codes, standards or LUMA Energy's design criteria for PR.

c. **Pollution:** The equipment must be designed and constructed for the corrosive environment of a distribution system in a tropical zone close to sea or exposed to strong sea winds and it shall provide reliable performance in environments with high exposure to salt, minerals, chemicals, or wind-borne particulate. The insulator contamination levels for the equipment should be adequate to prevent flashover. All exposed material shall be stainless steel or other material with anti-corrosive capabilities. Any other material shall be submitted for evaluation and approval. LUMA reserve the right to require salt spray test to demonstrate corrosion resistance.

d. **Ultraviolet (UV) Protection:** Each recloser shall be constructed of UV-resistant material and it shall have passed the accelerated UV-exposure test.

6.5. Design and Functional Requirements

a. The recloser shall have up to three reclosing operations (four trip operations total) before opening. Each operation shall be configurable to any protection curve.

b. The recloser shall be configurable with a selection of various fuse and recloser (electronic and hydraulic) curves, including the K, T, QR, KS, NE, NK, S&C Standard, and S&C Coordinating fuse curves; Cooper Form 4, 5, 6, and FX curves; SEL, ABB IEC, and IEEE single phase recloser curves; and the H, 4H, V4H, L, 4VL, 4VE, E, 4E, and DV hydraulic recloser curves.

c. The recloser must provide an interrupting time of 0.03 seconds when experiencing a fault while closed and carry load/line current. It must not depend on an external fuse or fault clearing recloser to achieve fault clearing.

d. The reclosers must have at least a minimum trip current of 30 amperes.

e. The recloser shall "open" and reset at the end of its operating sequence when the line fault is permanent.

f. The recloser shall have a Non-Reclose mode that will operate on a user-configurable standard curve. This Non-Reclose mode shall have user-configurable curves available for cold load pick-up and post-fault pick-up. Placing the recloser in Non-Reclose mode shall be readily accomplished by moving an easily identifiable actuating lever with a hotstick or by remote SCADA control.

g. The recloser controller must have integral transceiver allowing communication directly between the recloser and a laptop using a communication configuration by at least one of the following:

   1. LUMA prefers the latest Wi-Fi communication capabilities (IEEE 802.11) – This Wi-Fi connection must have at least 128-bit encryption for security purposes. The unit must not transmit a Wi-Fi signal until an encrypted wake-up message is sent by the securely recognized laptop or SCADA control to enable/disable. All wireless communication must be adequately encrypted with user definable encryption keys and be password-protected for security purposes. If the proposed equipment cannot provide for this, the bidder could submit a quotation for optional accessories that would allow the equipment to offer this type of communication and requirement.

      Any other communication technology proposed must comply with the security and communication requirement specified above. Technical information must be submitted to the Distribution Materials Section for evaluation and approval.

   2. Local port – This port will allow LUMA Energy to access the controller locally with a laptop using the controller software to operate and interrogate (upload/download) the recloser.

h. It must be possible to download setpoints files and snapshot files containing complete setting information from the unit. It shall be possible to upload setpoint files to the unit also.

i. The recloser must be able to be put through a functional test simulating temporary or permanent faults when connected to the configuration software with no current through its interrupter.

j. The recloser shall have a Sequence Coordination feature used to coordinate with downstream reclosers. If a fault is cleared by a downstream recloser, the recloser shall shift to a user-configurable (usually slower) time current characteristic curve before fault-testing and shall maintain its Sequence Coordination setting until the Coordination Reset time elapses.

k. The recloser shall be capable of operation similar to a sectionalizer, where it operates automatically for faults above its fault clearing capabilities rating. The recloser shall have user-configurable sectionalizing mode settings ranging from 10 A to 8,000 A.

l. The recloser must have an inrush restraint feature that is always enabled. This feature prevents nuisance tripping of the recloser when be closed.

m. The recloser must have a Local-Manual Open feature to allow the operator to locally initiate an Open operation. This feature shall be configured, and enabled or disabled, by the user.

n. When the recloser reaches 10% of its remaining life, an indicator or wear monitoring alarm must be activated. When the interrupter has reached its useful life, it shall not be capable of being reset (requiring unit replacement).

o. The recloser must have an indicator showing contact positions and Auto/Non-Reclose status as well as other user-defined information. At a minimum, the user-defined information must include an operation counter, the life remaining for the unit, the contact position, the Auto/Non-Reclose position, the load current, the software version, and the last fault current. The indicators shall be persistent and shall not require power to maintain display.

6.6. Events Logs

a. The Recloser, as a minimum, shall keep track of the following historical counts in its event log:

1. Number of forced interrupter closes
2. Number of interrupter open operations caused by overcurrent
3. Total number of interrupter open operations
4. Number of open caused by overcurrent
5. Number of opens caused by overload
6. Number of opens caused by sectionalizing
7. Number of opens caused by local manual open
8. Number of opens caused by gang operation
9. Total number of opens

b. The recloser, as a minimum, shall store the following data for trip events:

1. Event name
2. Date

3. Time
4. Fault duration, ms
5. Fault current, A

6.7. Communication Accessories and Features

a. The recloser shall allow for optional DNP 3.0 SCADA communication via a communication gateway. The gateway shall be contained in a waterproof, pad lockable enclosure meeting all previously stated environmental conditions. The enclosure should also be capable to contain a user-specific communication device with battery backup space. Specify any (internal/external) power requirements for the communication gateway device.

b. Up to three recloser, shall be configurable and have the ability to group-operate when one member of the group trips open, either because of permanent fault or a Local Manual Open operation.

c. Ability to receive SCADA commands sent via DNP3 through the communication gateway to the recloser(s).

d. The DNP 3.0 mapping for SCADA shall include, as a minimum, the following:

1. Three-Phase status and control
2. Single-Phase status and control
3. Local/Remote status
4. Profile 1 (Three-phase control) status and control
5. Profile 2 (Single-phase control) status and control
6. Recloser function – status and control
7. Hotline tag status and control
8. Primary voltage for each unit
9. Primary Phase current
10. Battery test and status (if equipped)
11. Fault Indication
12. All events shall be timestamped with local time

e. The communication module shall accept radial/serial Ethernet-based radios, cellular, or fiberoptic interface.

6.8. **Nameplate Information**

In addition to the applicable data required by ANSI C37.60 the nameplate shall include appropriate catalog number, total unit weight, manufacture date (month, year) and the appropriate catalog number, product class (type), voltage class, current rating, operating voltage, customer purchase order number, and manufacturer's serial number for proper and complete identification of the Recloser.

6.9. **Signs**

Any signs placed on the equipment shall comply with the ANSI Z535 Sign Standards for Utility Installations specification of the latest issue. Evidence of this must be submitted at proposal for evaluation.

7. Warranty

7.1. The supplier must guarantee the unit for a period of twenty (24) months after delivery or twelve (12) months from installation that the equipment supplied are free from defects in material and workmanship.

7.2. Replacement costs associated with recloser or internal control failure due to inadequate design, faulty manufacturing, or software errors are to be the responsibility of the manufacturer.

7.3. Non-conformance observed during sampling will require the supplier to bring the reclosers into compliance with the specification 14 days after notification. The units to be brought into compliance with the specification shall be shipped to the Supplier at the Supplier's expense.

8. Proposal Information

8.1. Submitted proposals shall include:

a. Technical information

b. Any exceptions taken to this specification

c. Copies of sample nameplates

d. List of Optional Requirements for accessories/equipment not included as part of the unit price of the recloser. Prices for these optional requirements must be presented along with the proposal.

e. Lists of special and standard maintenance tools

f. List of recommended spare parts

g. Table of Compliance completed with the vendor response. (embedded spreadsheet under Appendix)

— End of Specification —

Appendix

Please open embedded spreadsheet ("Table of Compliance") and provide responses indicating vendor's compliance, exception, or alternative to each of the items listed. Indicate any references if applicable. Please return completed spreadsheet as part of the vendor's proposal to this Equipment Specification.

Document History

Version	1	
Date	01/27/2022	
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