PPL companies

AOP

Electric APPROVED OPERATING POLICIES

Subject
Capacitor Inspection

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Policy
ELECTRIC DISTRIBUTION FIXED AND CONTROLLED CAPACITOR BANKS INSPECTION

SECTION 1 – PURPOSE

This policy documents the inspection requirements for electric distribution fixed and controlled capacitor banks at Louisville Gas and Electric Company (LG&E) and Kentucky Utilities Company (KU). The inspection program is intended to identify, where possible, problems or potential problems that could have an adverse effect on safety, customer service and/or the orderly and efficient operation of the electric distribution system. It is structured to assure that assets are properly inspected, apparent deficiencies identified and documented, and records retained to ensure compliance with company procedures.

SECTION 2 – SCOPE

2.1 This policy details the requirements for a periodic, ground-based inspection program for electric distribution fixed and controlled capacitor banks.

2.2 The objectives of the distribution system inspection program are to:

2.2.1 Enhance public safety and the safety of LG&E and KU employees and contractors by periodically inspecting all distribution fixed and controlled capacitor banks for recognizable damage, defects and/or unsafe conditions.

2.2.2 Improve system reliability, where possible, by identifying defective and/or damaged structures or equipment and other operating conditions which could result in outages or failures.

2.2.3 Provide documentation of inspections, deficiencies found and corrective actions taken.

2.2.4 Maintain compliance with the NESC regarding distribution inspections.

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SECTION 3 – REFERENCES

3.1 Kentucky Revised Statutes Chapter 278.042

3.2 Kentucky Administrative Regulations, Title 807 KAR 5:006, Section 26, Inspection of Systems.

3.3 Kentucky Occupational Safety and Health Act ("KOSHA").

3.4 LG&E and KU's Health & Safety Manual, Latest edition.

3.5 National Electrical Safety Code, Latest edition.

3.6 EOMI-SI-001-2017

SECTION 4 – RESPONSIBILITIES

4.1 Asset Management's Electric System Codes and Standards section shall have responsibility for revising and communicating the requirements of this policy. Revisions to this policy shall be reviewed and approved by the positions listed in Section 2.

4.2 At LG&E and KU, inspections for fixed and controlled capacitor banks and the associated record keeping are performed by the individual operations centers. Specifically, these centers are located in Louisville, Lexington, Richmond, Danville, Shelbyville, Elizabethtown, Maysville, Pineville, London and Earlington.

4.3 Records shall be stored electronically and/or filed in the appropriate operations center offices and kept for the time prescribed in Section 11 – Record Keeping.

SECTION 5 – DISCUSSION

5.1 This policy and the KPSC regulations impose minimum standards for frequency, content of inspections and record requirements. Nothing in this document shall be construed as limiting more frequent and/or more rigorous inspections and/or more stringent record requirements at the discretion of the individual operations center.

5.2 Inspection methods, timing of inspections and labor resources (utility personnel/contractor) utilized to complete inspections may vary by center provided they meet the minimum requirements contained in this document.

SECTION 6 – POLICY

6.1 Inspection Frequency for Fixed and Controlled Capacitor Banks

6.1.1 At intervals not to exceed one year:

a) Electric distribution fixed and non-SCADA (Supervisory Control and Data Acquisition) connected capacitor banks.

6.1.2 At intervals not to exceed two years:

a) Electric distribution SCADA connected capacitor banks. The inspection for these banks will be completed bi-annually according to the inspections outlined in EOMI-SI-001-2017.

6.1.3 Upon receipt of any report of a potentially hazardous condition all portions of the system which are the subject of the report shall be inspected as soon as practical.

6.2 Intent of Inspections

6.2.1 Inspections will be completed by utility personnel or contractors qualified to perform field inspections.

6.2.2 The intent of the inspection is to perform a detailed technical assessment of each component of every capacitor bank and visually inspect looking for apparent unsafe conditions, while identifying, where possible, damaged and/or defective equipment and other operating conditions that may affect system reliability or safety. A listing of items commonly checked during inspections can be found in the Appendix of this document.

6.2.3 Distribution Fixed, non-SCADA and SCADA connected Capacitor Banks

6.2.3.1 The inspection of fixed, non-SCADA and SCADA connected capacitor banks will consist of a ground (via foot or vehicle) based visual inspection. The most effective method to achieve this requirement will be determined by the operating center based on the characteristics of the bank being inspected. Aerial inspections shall not be used as the basis for compliance.

6.2.3.2 Fixed, non-SCADA and SCADA connected capacitor banks placed on foreign owned structures will be inspected to the same extent as facilities on the utility's own structures. It is not the responsibility of the utility to inspect foreign owned structures, lines or equipment. However, defects or structural deficiencies with foreign owned structures and attachments identified during routine inspections will be reported to the facility owner whenever such deficiencies could have a detrimental impact on safety or operation of either of the utilities' lines and equipment. Any such deficiencies shall be documented in the same manner as deficiencies on the utility's own structures and tracked in the same manner until all deficiencies have been corrected.

SECTION 7 - SAFETY

7.1 Personnel performing the duties related to system inspection shall perform the necessary tasks in a safe manner and in compliance with company and departmental Safety Manuals, procedures and policies using the required Personal Protective Equipment (PPE). Special attention will be directed to the hazards related to terrain, insects, snakes, other animals, and plants as well as vehicular hazards.

SECTION 8 – ENVIRONMENTAL

8.1 Oil-filled equipment found to be passively leaking will be noted as part of the inspection process. Equipment found to be actively leaking requires immediate notification of the appropriate responsible department(s) so that compliance with utility oil spill response procedures can be assured.

SECTION 9 – TRAINING AND QUALIFICATIONS

9.1 All inspectors must be knowledgeable of company Health & Safety Manual, safety policies and procedures and have a working knowledge of the NESC as it applies to the facilities being inspected. Capacitor bank inspectors shall have complete familiarity with the construction and operation of distribution lines, equipment and structures as well as a working knowledge of company construction standards.

SECTION 10 – EQUIPMENT

10.1 Inspectors shall be equipped with and qualified in the use of all PPE appropriate for the work and facilities being inspected.

10.2 Inspectors shall carry a cellular phone and/or a company radio at all times while performing inspection work suitable for contacting the appropriate emergency response personnel in the event of an emergency or appropriate company personnel in the event an active oil leak or potentially dangerous condition is found during the course of inspection.

SECTION 11 – RECORD KEEPING

11.1 Records of Inspection – Distribution Fixed, non-SCADA and SCADA connected Capacitor Banks

11.1.1 Distribution capacitor banks (fixed and switched) inspections must be performed so that Distribution Equipment Tracking System (DETS) inspection sheets can be properly completed. These forms must be printed from DETS. See example of this form in the appendix of this document.

11.1.2 Each inspection record must contain the inspector's name and the completion date of the inspection.

11.1.3 A work order must be created for deficiencies found during inspections. Work orders are to be generated in Asset and Resource Management (ARM) with a unique Work Request (WR) number.

11.1.4 The DETS generated forms will be given to the responsible distribution operation center's engineer.

11.1.5 Inspection completion and WR generation is the responsibility of the distribution operation's service technicians, with complete DETS forms routed through the operation center engineer for tracking. Inspection progress updates will be sent quarterly to the Codes & Standards engineer. This update will consist of: Banks inspected, banks online, banks offline, work orders requested, work orders complete, kVAR online from completed work orders, and expected completion date of remaining work orders.

11.2 Documentation – Distribution Fixed, non-SCADA and SCADA connected Capacitor Banks

11.2.1 The engineer for each area shall retain the originals of the inspection forms. A copy will be sent to the standards engineer in the Codes & Standards department.

11.2.2 The Codes & Standards engineer will be responsible for giving the copies to the group leader of Asset management who will input inspection results into DETS.

11.2.3 When a defect, deficiency, or other condition is found that poses an imminent hazard to safety or customer service, the inspector must immediately notify (by phone or radio) the appropriate department for corrective action. If the condition represents a present safety hazard to customers or to the general public, such as a live wire down, the inspector must guard the area until maintenance crews arrive to make the area safe.

Appendix – Guidelines for Inspection

A.1.0 Guidelines for Distribution Fixed and Non-SCADA connectedCapacitor Banks Inspection (conditions to be reported)

A.1.1 Fixed and Controlled Capacitor Bank

a) All Banks – General
- ✓ External damage
- ✓ Broken or damaged
- ✓ Oil leaks
- ✓ Structurally damaging rust (does not include minor surface rusting)
- ✓ Bulged
- ✓ Overheating (discolored terminals or melted insulation)
- ✓ Flashed or broken bushings or terminals
- ✓ Not bolted securely to structure
- ✓ Blown fuses
- ✓ Blown lightning arresters
- ✓ Cutouts and switches not properly terminated and fully closed

b) Miscellaneous Support Brackets, and Hardware
- ✓ Flashed or broken
- ✓ Not securely bolted to structure
- ✓ Loose or missing hardware

c) Insulators
- ✓ Cracks, chips and signs of flashing/tracking
- ✓ Excessive dirt, soot or other possible contamination
- ✓ Improper insulator attachment (suspension insulators are properly attached to pole, crossarm or other support, pin insulators are properly seated on pin or secured to support arm, pole, etc.) Conductor improperly secured to insulators (conductor floating)

A.1.2 Controlled Banks

a) Controller Box
- ✓ External damage (vehicles, vandals, etc.)
- ✓ Objectionable graffiti
- ✓ Damaged or missing lock
- ✓ Holes (screw holes, bolt holes, rust holes, etc.)
- ✓ Errors or warning on display (if applicable)

DETS Capacitor Bank Inspection Form Example

DETS
CAPACITOR BANK INSPECTION FORM

Report Run
3/6/2018
8:55:48 AM

Bank No.: **LC1037** Circuit: **HB1141** Substation: **HURSTBOURNE**
Location: **REAR OF 1901 EMBASSY SQUARE BLVD**
KVAR Rating of Bank: **1200** Voltage Rating: **12.47** Bank Type: **Switched**
Control No.: **LCC0779** Control Type: **Current** Control Position: **Automatic**
On Setting 1: **150** Off Setting 1: **135** Multiplier (K): **20**
On Setting 2: Off Setting 2: Time Delay (sec):
Previous Remarks: **21-FEB-17: General Information: N107297: Found ok**
X Coord: **47795** Y Coord: **86849** Latitude: Longitude:
Control: Catalog Number: **4844AASJ-76A** Manufacturer: **Fisher Pierce**
Sensor Location (relative to switch): **Load** (side) Sensor Phase: **C**
Pwr/PT Phase: **A** Last Reading: **4912**
Pwr Same Circuit: **Y** Tagged Out:

Bank Inspection:

Found OK: Yes _____ No _____

	A	B	C
Sensor	O	O	O
Power Source	O	O	O
Fuses Blown	O	O	O
Capacitor Damage	O	O	O
Oil Switch Damage	O	O	O

Same Circuit: Yes_____ No_____

Bank Currents: AΦ _____ BΦ _____ CΦ _____
Line Currents at Time of Inspection: AΦ _____ BΦ _____ CΦ _____

Pole/Crossarm Damage: Yes _____ No _____
Vegetation Control Needed: Yes _____ No _____

Control Inspection:

Found OK: Yes _____ No _____
Test Jack Value(s): _____ Control Operation Position: Auto _____ Manual _____
Switching Status at Time of Inspection: Open _____ Closed _____
Operating Time Delay (sec): _____ Counter Reading: _____
Tagged Out: Yes _____ No _____
Left OK: Yes _____ No _____

Bank Operation Inspections:

1. Manually Operated Capacitor Unit.
2. Verify completed switch operations. Yes _____ No _____
3. Return control and capacitor unit to NORMAL state.

Notes: _____

Inspected by: _____ Date and Time: _____
Temperature: _____