PPL companies

# OM&I

**Electric Operation, Maintenance, and Inspection Plan**

**KENTUCKY REGULATORY INSPECTION**
**ELECTRIC DISTRIBUTION SUBSTATIONS AND LINES**

**Subject**
Distribution System Inspection

**OM&I Number**
EOM&I-SI-001

**Effective Date**
December 1, 2017

## SECTION 1 – PURPOSE

This policy documents the inspection requirements for electric distribution substations, distribution lines and equipment and meters 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 requirements of the Kentucky Public Service Commission (KYPSC) and company procedures. This document is to be filed with the KYPSC per regulation KRS Chapter 278 and 807 KAR Chapter 5 Section 26 - Inspection of Systems.

## SECTION 2 – SCOPE

2.1 This policy details the requirements for a periodic, ground based inspection program for electric distribution substations and electric distribution facilities operating at voltages less than 69,000 volts up to the point of service, including overhead and underground electric lines, equipment, utility owned (leased) lighting and meters. It does not cover the inspection of underground network transformers and network protectors in vaults addressed in EOM&I-SI-002: Regulatory Inspection Downtown Louisville Secondary Network Vaults, current revision.

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 substations, electric lines, structures and equipment 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 KYPSC Regulations and the National Electrical Safety Code (NESC) regarding distribution inspections.

Steve Woodworth
Director Dist Ops and Emerg Prepare

Robert Trimble
Director Electric Distribution

Raymond Connolly
Director Substations and Asset Mgmt

Denise Simon
Director Dist Reliab Analytics Adm

Shannon Montgomery
Director Revenue Integrity

Dan Hawk
Manager Electrical Engineering/Pln

**SECTION 3 – REFERENCES**

3.1 Kentucky Revised Statutes Chapter 278

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 Energy's Health & Safety Manual, Latest edition.

3.5 National Electrical Safety Code, Latest edition.

**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 Directors of Asset Management, Distribution Operations and Metering.

4.2 At LG&E and KU, regulatory inspections for overhead and underground lines and associated equipment operating at less than 69,000 volts 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 At LG&E and KU, regulatory inspections for meters and associated record keeping are performed by Meter Reading and stored electronically in the system(s) of record.

4.4 Regulatory inspections for distribution substations and the associated record keeping are performed by the individual Substation centers. Specifically, these centers are located in Louisville, Lexington, Danville, Pineville, and Earlington.

4.5 Records shall be stored electronically and/or filed in the appropriate substation, metering or operations center offices and kept for the time prescribed in Section 11 – Record Keeping. All records and associated documents must be kept in a manner which allows them to be easily accessed for KYPSC audits.

**SECTION 5 – DISCUSSION**

5.1 This policy and the KYPSC 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 resource (utility personnel/contractor) utilized to complete regulatory inspections may vary by center provided they meet the minimum requirements contained in this document.

**SECTION 6 – POLICY**

6.1 Inspection Frequency for Substations, Distribution Lines, Equipment, and Meters.

The requirements of regulation KY KYPSC 807 KAR 5:006 Section 26 - Inspection of Systems impose the following minimum requirements for inspection frequency for substations, distribution lines, equipment, and meters.

6.1.1 At intervals not to exceed two years:

a) Electric lines, equipment, and meters operating at a voltage less than 69,000 volts.

6.1.2 At intervals not to exceed one year:

a) Distribution substations with primary voltage of less than 69,000 volts.

6.1.3 At intervals not to exceed six months:

a) Distribution substations with primary voltage 69,000 volts or greater.

6.1.4 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 practicable.

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 regulatory inspection is not to perform a detailed technical assessment of every line or structure or to open and inspect every piece of equipment unless a problem is otherwise apparent. The intent is to visually inspect the system 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 Lines and Equipment

6.2.3.1 The inspection of overhead and underground lines and equipment will consist of a ground (foot, vehicle) based visual inspection. The most effective method to achieve this requirement for each portion of line will be determined by the operating center based on the characteristics of the line being inspected. Aerial inspections shall not be used as the basis for compliance.

6.2.3.2 Distribution lines and equipment 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 the utility's 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.

6.2.3.3 It is not the responsibility of the utility to inspect foreign owned lines and equipment located on utility owned structures. However, such deficiencies identified during routine inspections will be reported to the facility owner whenever such deficiencies could have a detrimental impact on safety or operation of the utility's lines and equipment. Any such deficiencies shall be documented in the same manner as deficiencies on the utility's structures and tracked in the same manner until all deficiencies have been corrected.

6.2.3.4 Damage or unsafe conditions on customer-owned wiring or equipment at the utility/customer interface point identified during the course of normal utility inspections shall be documented and reported to the customer, and where necessary the appropriate Authority Having Jurisdiction (AHJ).

6.2.3.5 Utility owned (leased) lighting equipment mounted on overhead distribution line structures and underground fed leased lighting structures will be inspected as part of routine system inspections.

6.2.4 Electric Meters.

The inspection of manually-read meters and walk-by AMR meters will consist of a visual inspection by meter readers during the course of routine meter reading.

6.2.5 Distribution Substations.

The inspection of substations will consist primarily of a field visit to each substation site and a visual inspection of the substation facilities and equipment.

6.3 Patrol along Roads, Cross Country or in Easements

6.3.1 Visual inspections of distribution lines and equipment may be accomplished by patrolling lines from vehicles when distribution facilities are located adjacent to and in reasonable proximity to roadways. Patrolling lines from vehicles is also permitted in off road easements where vehicle access is available. Facilities located in easements on private property where vehicle access is either not available or not practical due to the nature of the line, must be inspected on foot.

6.3.2 Every reasonable attempt should be made to inspect each structure or piece of equipment from its immediate vicinity. If inaccessible, inspection with binoculars is permitted. If access cannot be gained to at least perform a visual inspection, the area or line must be noted on the inspection print and provisions made to inspect at another time. At a minimum, the intent is to visually inspect every structure, line, and piece of equipment each inspection cycle.

**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 Safety Manual, safety policies and procedures and have a working knowledge of the NESC as it applies to the facilities being inspected. Distribution line 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. Meter readers shall have complete familiarity and working knowledge of meter reading and meter inspection requirements. Substation inspectors shall have complete familiarity and working knowledge of substation facilities and equipment.

**SECTION 10 – EQUIPMENT**

10.1 Inspectors shall be equipped with and qualified in the use of all personal protective equipment (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 Lines and Equipment

11.1.1 Distribution line inspections must be performed from inspection records which identify every primary line segment, such as a circuit map, facility map, or electronic mobile mapping technology. Secondary voltage lines and services and leased lighting facilities need not be shown on these records. However, they must be inspected.

11.1.2 Each inspection record must contain the inspector's name and the completion date of the inspection, if inspected in whole on the completion date. If multiple days are required to complete the inspection, each portion inspected will be noted with each line segment being coded by respective date inspected and inspector's name. In addition, an overall completion date for the entire record is required when the inspection is complete.

11.1.3 Deficiencies found during inspections are to be identified by a unique number so that a cross-reference can be established between the inspection record and the deficiency repair order or work request. These records are the tangible basis from which the KYPSC will audit. Keeping records in this manner allows the KYPSC to verify that a facility was inspected, to relate the inspection to deficiencies found, to track the deficiency to a repair order, work request, database or work management system entry and to determine the disposition of work to correct the deficiency.

11.1.4 The inspection and deficiency records will be filed in the appropriate operations center offices and kept for six years. All records and associated documents must be kept in a manner which allows them to be easily accessed for KYPSC audits.

11.2 Records of Inspection – Meter

11.2.1 Meter inspections will be performed using electronic devices that allow for identification of each meter, location, date and time, inspector's name, and deficiency if applicable.

11.2.2 The inspection and deficiency records will be stored electronically or filed in the appropriate metering offices and kept for a minimum of six years. All records and associated documents must be kept in a manner which allows them to be easily accessed for KYPSC audits.

11.3 Records of Inspection – Substations

11.3.1 Substation inspections will document substation name, location, date, inspector's name, and deficiency if applicable.

11.3.2 The inspection and deficiency records shall be filed in the appropriate substation center offices and kept for four years. All records and associated documents must be kept in a manner which allows them to be easily accessed for KYPSC audits.

11.4 Documentation and Tracking of Deficiencies Found – Distribution Lines

11.4.1 When the inspector identifies a deficiency, a sequential or otherwise unique number is to be marked on the inspection record for that location. All pertinent information about the deficiency is to be recorded on a deficiency report form which contains the corresponding number placed on the inspection record, including a description of the problem, the exact location (house number or distance from a known highway intersection, etc.), the pole or coordinate number (if available) and any other pertinent information.

11.4.2 Where deficiency form is to also serve as the final repair record, information must be added to the deficiency form once work is completed which at a minimum includes, the completion date, repair crew information and a description of the corrective actions taken to address the deficiency. Upon completion of the work, the original deficiency form must be filed with the inspection record or retained in another manner such that the status and/or disposition of the corrective work can be tracked from the original inspection record.

11.4.3 Where the deficiency form information is to be transferred to a different work request document, work management system or database to manage the deficiency correction, all appropriate information from the deficiency form is transferred to the work request document or entered into the electronic record. Unless stored in a database that can be queried for the original deficiency form number recorded on the inspection record, each form or data entry must also have a unique identifier assigned that can be tracked to the original deficiency form number. The new work request or data tracking number will be recorded on the original inspection print and/or recorded on the deficiency form where the deficiency form is to be retained separate of the inspection record. At all times continuity must be maintained between the inspection record, deficiency form and any other form or electronic entry used to manage corrective work. Upon completion of work to correct the deficiency, the form or record must be updated with information which at a minimum includes, the completion date, repair crew information and a description of the corrective actions taken to address the deficiency.

11.4.4 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 the public in general, such as a live wire down, the inspector must guard the area until maintenance crews arrive to make the area safe.

11.5 Documentation and Tracking of Deficiencies Found – Electric Meter

11.5.1 Meter deficiencies found will be recorded and identified to the specific meter with a repair order, description of the deficiency, location of meter, and any other pertinent information. The completion date, repair crew information, and appropriate remarks will be added once the work is complete. All records will be maintained by Meter Reading and stored electronically in the system(s) of record.

11.6 Documentation and Tracking of Deficiencies Found - Substations

11.6.1 Substation deficiencies found will be recorded and identified to the specific substation with a corrective work order, description of the deficiency, location, and any other pertinent information. The completion date, repair crew information, and appropriate remarks will be added once the work is complete. All records will be maintained electronically in the substation work management system.

## *Appendix – Guidelines for Inspection*

### A.1.0 Guidelines for Overhead Inspection (conditions to be reported)

A.1.1 Structures

a) All Supporting Structures – General
- ✓ Excessive lean or bowing
- ✓ External damage (vehicles, vandals, etc.)
- ✓ Insufficient clearance from curbs, roads, etc.
- ✓ Physical damage protection/marking (if required)
- ✓ Climbing hazards (including excessive vines and vegetation)
- ✓ Unauthorized foreign attachments (basketball goals, customer wiring/lighting, security cameras, etc.)
- ✓ Presence of any permanent climbing steps or other platforms providing climbing access (at least eight feet above ground level)
- ✓ Equipment and equipment supports are not readily climbable (hardware does not facilitate climbing – eight feet between footholds and handholds starting at not more than six feet above ground)
- ✓ Presence of fences, trees, sheds that would facilitate climbing by members of the public or encourage climbing by children
- ✓ Insufficient or improper grounding
- ✓ Lack of foundation integrity
- ✓ Proper signage when required
- ✓ Objectionable graffiti

b) Wood Poles
- ✓ Externally visible physical damage (external decay, woodpecker holes, excessive checking, damage by fire, vehicle contact, etc.)
- ✓ Ground line deficiencies.
  Wood poles with obvious ground line deficiencies must be sounded from ground line to six feet. If significant external decay is suspected at or just below the ground line, it may become necessary to remove soil from around the base of the pole, where practical, to determine the extent of decay. Poles with decay, infestation, or cracks, sufficient to jeopardize safety or service restoration shall be turned in for replacement or repair. If a pole is sufficiently defective to be a safety hazard to a person climbing the pole or to the public in general, a danger pole tag must be applied to the pole and special attention given to replacing the pole. In areas where poles appear solid, a reasonable attempt to sound a representative sample (approximately 10%) should be made. Exception: Wood pole structures supporting lines crossing limited access highways or railroads must be sounded each inspection cycle.

c) Steel Poles, Guy Beams and Lattice Towers
- ✓ Excessive corrosion or rust affecting structural integrity
- ✓ Missing, loose, damaged foundation bolts and nuts
- ✓ Loose or missing bracing

d) Concrete Poles
- ✓ Spalling
- ✓ Excessive cracking, voids, holes, etc.

A.1.2 Overhead Equipment
- ✓ 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
- ✓ Excessive lean
- ✓ Blown fuses

- ✓ Blown lightning arresters
- ✓ Cutouts and switches not properly terminated and fully closed
- ✓ Ground mounted equipment controls not locked and otherwise secure

A.1.3 Conductor Supports

a) Crossarms
- ✓ Broken, split, twisted, burned, or rotten
- ✓ If steel, excessive (structural) corrosion
- ✓ Not securely bolted to structure
- ✓ Braces not installed and in good working order

b) Miscellaneous Support Brackets, and Hardware
- ✓ Flashed or broken
- ✓ Broken spacer cable brackets or bands
- ✓ 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.1.4 Anchors and Guys
- ✓ Inadequate for loads or slack guying
- ✓ Improper insulation ( insulate or grounded)
- ✓ Improper positioned guy insulators (insulated guys)
- ✓ Guy guards not installed (one per anchor)
- ✓ Anchor rod/eyes and guy-wire not sufficiently above grade to minimize the possibility of guy-wire or guy grip deterioration
- ✓ Anchor pulling out (excessive rod length)
- ✓ Guy wire strands, grips, and/or automatic guy deadends damaged, corroded, or broken
- ✓ Improperly insulated, grounded or guarded guys
- ✓ Guying hardware (guy hooks and eyebolt assemblies) are deteriorated or improperly secured)
- ✓ Insufficient clearances (distance between guy wires and curbs, sidewalks, paths, roads, etc. is not satisfactory)
- ✓ Push poles (improperly connected and structurally sound)
- ✓ Third party guying or lack of proper guying (obvious problems affecting pole loading/leaning/buckling)

A.1.5 Primary and Secondary Conductors and Conductor Hardware
- ✓ Improper clearances (at structure, throughout span, adjacent to other structures, or over ground)
- ✓ Defective conductors, splices, or connections (burns, broken strands or evidence of overloading such as discoloration or melted insulation)
- ✓ Improperly secured to insulators or deadend assemblies
- ✓ Foreign objects (trees, balloons, shoes, etc.)
- ✓ Vegetation (growing into or rubbing against conductors)
- ✓ Illegal services or unmetered load
- ✓ De-energized and/or abandoned lines not properly grounded
- ✓ Apparent easement violations (pools, buildings, private structures, etc.)

A.1.6 Services
- ✓ Low over roads, driveways or parking areas
- ✓ Improperly attached at house and pole
- ✓ Improper clearance over deck, garages and other structures
- ✓ Vegetation (limbs not clear from laying or rubbing on service to cause service integrity problems)
- ✓ Conduit damage (Overhead or UG)

A.1.7 Overhead Lighting

- ✓ Broken or loose mounting arms or fixtures
- ✓ Damaged or broken lighting fixtures

**A.2.0 Guidelines for Underground Inspection (conditions to be reported)**

A.2.1 Area around Equipment

- ✓ Improper clearances (to buildings, roads, fences, etc.)
- ✓ Traffic barriers (if required) not in place or not in satisfactory condition
- ✓ Vegetation (not trimmed to permit opening of cabinet and provide room for switching / maintenance)
- ✓ Dumping/Storage (materials or debris stored in front of or against the equipment)
- ✓ Ground erosion exposing energized cables
- ✓ Fences around open air installation on ground not secure, locked, and properly signed
- ✓ Danger and warning signs not properly applied
- ✓ Penta-head bolt not in subgrade grating

A.2.2 Pad/Foundation

- ✓ Not properly leveled
- ✓ Ground erosion compromising pad stability
- ✓ Damaged (cracked, broken, etc.)

A.2.3 Cabinet/Enclosure/Tank

- ✓ Improper alignment on pad (gaps between cabinet and pad)
- ✓ Holes (screw holes, bolt holes, rust holes, etc.)
- ✓ Mechanical damage due to rust
- ✓ Leaks or swollen areas
- ✓ Door/hood hinges damaged
- ✓ Cabinet doors/hood not properly aligned (no excessive gaps or spaces to permit access to the inside with wires, rods, etc.)
- ✓ Cabinet not properly secured (pentahead bolt and company lock not in place)
- ✓ Proper signage not applied (“Warning” meeting specifications of ANSI Z535, and “No Obstructions/Planting” signs not in place)
- ✓ Paint is not in satisfactory condition to prevent excessive corrosion
- ✓ Objectionable graffiti
- ✓ Lifting hardware has been removed
- ✓ Signs of excessive heating

A.2.4 Miscellaneous

- ✓ Loose or missing lids or covers (splice box lid, pedestal covers, etc.)
- ✓ Terminations show signs of tracking, excessive heating or otherwise damaged.
- ✓ Secondary buswork (open air) not properly insulated with no obvious signs of excessive heating

A.2.5 Underground Fed Lighting Poles and Fixtures

- ✓ Physical damage to pole
- ✓ Severely leaning poles
- ✓ Missing, loose, damaged foundation bolts and nuts
- ✓ Missing hand hole covers/exposed wiring
- ✓ Unauthorized attachments
- ✓ Damaged or missing fixtures, globes, etc.

**A.3.0 Meters (conditions to be reported)**

- ✓ Properly secured (missing seal, lock, cover)
- ✓ Broken glass
- ✓ Damaged meter, meter base, metering cabinets
- ✓ Vegetation (obstructions)

**A.4.0 Substations (specific conditions on the following, including all status indicators, gauges, and metering if applicable, will be checked and deficiencies reported)**

- ✓ Drive and Approach
- ✓ Fence and Gates, Substation Security
- ✓ Warning Signs, Danger Signs and Barriers
- ✓ Structures
- ✓ Annunciator Systems
- ✓ Disconnects and Motor Operated Disconnects
- ✓ Station Grounds
- ✓ Transformers, Tap Changers and Regulators
- ✓ Circuit Breakers and Reclosers
- ✓ Capacitor and Capacitor Protective and Switching Equipment
- ✓ Control House
- ✓ Switchgear
- ✓ Station Yard
- ✓ Metering
- ✓ Spill Prevention Control and Counter Measure
- ✓ Fire Protection System