



COMMONWEALTH OF PENNSYLVANIA
PENNSYLVANIA PUBLIC UTILITY COMMISSION
BUREAU OF TECHNICAL UTILITY SERVICES
400 NORTH STREET, HARRISBURG, PA 17120

IN REPLY PLEASE
REFER TO OUR FILE

December 22, 2016

Docket No. M-2009-2094773

KIMBERLY A KLOCK
SENIOR COUNSEL
PPL ELECTRIC UTILITIES CORPORATION
TWO NORTH NINTH STREET
ALLENTOWN PA 18101-1179

**Re: Biennial Inspection, Maintenance, Repair and Replacement Plan
Docket No. M-2009-2094773**

Dear Ms. Klock:

On September 30, 2016, PPL Electric Utilities Corporation (PPL) filed its Biennial Inspection, Maintenance, Repair and Replacement Plan (Plan), pursuant to 52 Pa. Code § 57.198(a), to be made effective on January 1, 2018.

The Commission's regulations require EDCs to file, every two years by October 1, a biennial plan for the periodic inspection, maintenance, repair and replacement of facilities that is designed to meet reliability performance benchmarks and standards set forth in 52 Pa. Code §§ 57.191-57.197. The Commission's Implementation Order, entered August 13, 2009, identified PPL as one of six (6) EDCs in Compliance Group 2 which must file their Plan by October 1, 2010, and every two years thereafter. The Plan must cover the two calendar years beginning 15 months after filing and remain in effect for two calendar years thereafter (January 1, 2018, thru December 31, 2019).

PPL has proposed changes to its original plan, which will be discussed herein.

Plan Consistency

52 Pa. Code § 57.198(b) Plan consistency. The plan must be consistent with the National Electrical Safety Code, Codes and Practices of the Institute of Electrical and Electronic Engineers, Federal Energy Regulatory Commission Regulations, and provisions of the American National Standards Institute, Inc.

The PPL plan generally complies with this requirement.

Time Frames

52 Pa. Code § 57.198(c) Time frames. The plan must comply with the inspection and maintenance standards in subsection (n). A justification for the inspection and maintenance time

frames selected shall be provided, even if the time frame falls within the intervals prescribed in subsection (n). However, an EDC may propose a plan that, for a given standard, uses intervals outside the Commission standard, provided the deviation can be justified by the EDC's unique circumstances or a cost/benefit analysis to support an alternative approach that will still support the level of reliability required by law.

PPL has proposed modifications, discussed *infra*, for the following programs, or parts of programs:

- Pole loading calculations
- Distribution Overhead Line Inspection Interval
- Distribution Overhead Transformer Inspection Interval
- Distribution Pad Mounted Transformer Inspection Interval
- Recloser Inspection Interval
- Substation Inspections

Record Keeping

52 Pa. Code § 57.198(m) Recordkeeping. An EDC shall maintain records of its inspection and maintenance activities sufficient to demonstrate compliance with its distribution facilities inspection, maintenance, repair and replacement programs as required by sub52 Pa. Code § (n). The records shall be made available to the Commission upon request within 30 days. Examples of sufficient records include:

- (1) *Date-stamped records signed by EDC staff who performed the tasks related to inspection.*
- (2) *Maintenance, repair and replacement receipts from independent contractors showing when and what type of inspection, maintenance, repair or replacement work was done.*

The plan generally complies with this requirement.

Vegetation Management

52 Pa. Code § 57.198(n)(1) Vegetation management. The Statewide minimum inspection and treatment cycle for vegetation management is between 4-8 years for distribution facilities. An EDC shall submit a condition-based plan for vegetation management for its distribution system facilities explaining its treatment cycle.

The plan generally complies with this inspection and maintenance interval.

Pole Inspections

52 Pa. Code § 57.198(n)(2) Pole inspections. Distribution poles shall be inspected at least as often as every 10-12 years except for the new southern yellow pine creosoted utility poles which shall be initially inspected within 25 years, then within 12 years annually after the initial inspection. Pole inspections must include:

- (i) *Drill tests at and below ground level,*
- (ii) *A shell test.*

- (iii) *Visual inspection for holes or evidence of insect infestation.*
- (iv) *Visual inspection for evidence of unauthorized backfilling or excavation near the pole.*
- (v) *Visual inspection for signs of lightning strikes.*
- (vi) *A load calculation.*

The Plan states that PPL will visually inspect distribution wood poles on a ten (10) year cycle. PPL included a previously approved exemption from performing pole load calculations as part of pole inspections. The Plan is consistent with the previously approved Plan and complies with Section 57.198(n)(2).

Therefore, PPL is granted exemption from performing load calculations as part of its pole inspection program. However, PPL shall conduct subsequent assessments of pole strength prior to attachment of non-company facilities.

Pole Inspection Failure

52 Pa. Code § 57.198(n)(3) Pole inspection failure. If a pole fails the groundline inspection and shows dangerous conditions that are an immediate risk to public or employee safety or conditions affecting the integrity of the circuit, the pole shall be replaced within 30 days of the date of inspection.

The Plan states that wood poles and supporting structures with recorded defects that PPL could reasonably expect to endanger life or property will be repaired or replaced within 30 days. All remaining deficiencies will be evaluated and prioritized on a case-by-case basis.

The Plan generally complies with Section 57.198(n)(3).

Distribution Overhead Line Inspections

52 Pa. Code § 57.198(n)(4) Distribution overhead line inspections. Distribution lines shall be inspected by ground patrol a minimum of once every 1-2 years. A visual inspection must include checking for:

- (i) *Broken insulators.*
- (ii) *Conditions that may adversely affect operation of the overhead transformer.*
- (iii) *Other conditions that may adversely affect operation of the overhead distribution line.*

PPL included a previously approved exemption from performing distribution overhead line inspections by the required minimum of once every 1-2 years. The Plan is consistent with the previously approved Plan and complies with Section 57.198(n)(4).

Therefore, PPL is granted exemption from performing distribution overhead line inspections by the required minimum of once every 1-2 years and instead utilizing a condition-based methodology. However, PPL shall perform a 100% infrared visual inspection of drivable multi-phase overhead lines and components on a 2 year cycle and visual inspection using condition based selected line segments.

Inspection Failure

52 Pa. Code § 57.198(n)(5) Inspection failure. If critical maintenance problems are found that affect the integrity of the circuits, they shall be repaired or replaced no later than 30 days from discovery.

The Plan generally complies with Section 57.198(n)(5).

Distribution Transformer Inspections

52 Pa. Code § 57.198(n)(6) Distribution transformer inspection. Overhead distribution transformers shall be visually inspected as part of the distribution line inspection every 1-2 years. Above-ground pad-mounted transformers shall be inspected at least as often as every 5 years and below-ground transformers shall be inspected at least as often as every 8 years. An inspection must include checking for:

- (i) Rust, dents or other evidence of contact.*
- (ii) Leaking oil.*
- (iii) Installation of fences or shrubbery that could adversely affect access to and operation of the transformer.*
- (iv) Unauthorized excavation or changes in grade near the transformer.*

PPL included a previously approved exemption from performing overhead distribution transformer inspections every 1-2 years. Overhead transformers are inspected as part of PPL's overhead visual line inspections, infrared inspections of overhead multi-phase distribution lines, and pole inspections. PPL also identifies overhead transformer locations for remediation based on locations that consistently exceed load demand design parameters.

PPL also included a previously approved exemption from performing inspections on pad mounted transformers once every 5 years. PPL inspects pad mounted transformers in accordance with condition based selected line segments, and when performing Underground Residential Development Cable Testing, which tests 500 sections per year.

The Plan is consistent with the previously approved Plan and complies with Section 57.198(n)(6).

Recloser Inspections

52 Pa. Code § 57.198(n)(7) Recloser inspections. Three-phase reclosers shall be inspected on a cycle of 8 years or less. Single-phase reclosers shall be inspected as part of the EDC's individual distribution line inspection plan.

PPL included a previously approved exemption for inspecting three-phase oil circuit reclosers (OCRs). PPL has an upgrade program by which all three-phase OCRs will not be inspected and instead be replaced with more reliable vacuum circuit reclosers (VCRs) on a 10-year cycle that started in 2015. Three-phase VCRs are included in the two-year infrared line inspection program. Single phase reclosers are inspected as part of the distribution line inspection program. The Plan is consistent with the previously approved Plan and complies with Section

57.198(n)(7).

Substation Inspections

52 Pa. Code § 57.198(n)(8) Substation inspections. Substation equipment, structures and hardware shall be inspected on a cycle of 5 weeks or less.

Other than the exemption request discussed, below, the Plan is consistent with the previously approved Plan and complies with Section 57.198(n)(8).

PPL Waiver Request

PPL has requested an exemption to this requirement effective Jan 1, 2018 thru Dec 31, 2019 to reduce the frequency of substation inspections to quarterly from every 5 weeks or less. PPL averred the basis for this change request is partially due to upgraded substation equipment that will remotely monitor critical equipment parameters more cost effectively than manual monthly reading. PPL also noted that their studies have determined that over the past 4 years, none of the repairs identified due to monthly inspections were significant and could have waited 90 additional days for discovery and remediation. Finally, PPL claimed costs associated with substation inspections would be reduced by 75% annually if done quarterly instead of every 5 weeks.

Discussion

The Bureau of Technical Utility Services (TUS) requested additional information regarding the justification for PPL's proposed exemption and met with PPL engineering staff on November 15, 2016. At that meeting, TUS staff noted that the substation inspection timeline of a cycle of 5 weeks or less is an industry recognized best practice and that a previous request for an exemption to the timeline was rejected.¹ Based on the additional information provided by PPL and its filed plan, substation inspections cost approximately \$1.8 million per year. If the cost was reduced by 75% as averred in its filed plan, PPL would save approximately \$1.35 million, or less than \$1 per customer, per year. The Order rejecting the previous substation inspection timeline exemption request clearly indicated that a similar small cost per customer (\$1.09) for substation inspections is well worth the potential increase in safety and reliability of utility service that may result from the requirement.² Given the preceding factors, PPL would need to provide substantial evidence that the reduction in the frequency of the substation inspections would not reduce the safety or reliability of their service.

PPL provided more information on its substation inspection program and its impact to reliability in response to TUS staff requests and at the November 15 meeting. PPL noted that since 2010, the substation contribution to SAIFI had been reduced by 61%.³ PPL's substation SAIFI contribution went from approximately 0.17 in 2014 to approximately 0.07 in 2016 (projected). For reference, PPL's overall SAIFI as of third quarter 2016 is 0.8. PPL also noted that the CMI

¹ See "Petition of West Penn Power Company d/b/a Allegheny Power for Appeal from Action of Staff Concerning Waiver Request of Frequency of Substation Inspections," Opinion and Order entered April 16, 2010 at Docket No. M-2009-2094773.

² *Id.* at 4.

³ SAIFI, or system average interruption frequency index, measures the average frequency of sustained interruptions per customer occurring during the analysis period. For PUC reporting, SAIFI is typically measured on a 12-month rolling basis per quarter as well as on a 12-month rolling annual basis.

avoidance for substation issues for 2015 and 2016 (projected) was substantially reduced from previous years, despite nearly the same expenditures for the inspections and remediation measures.⁴ PPL also noted a 67% reduction in the quantity of corrective work identified in the substation inspection program since 2014. As noted before, PPL averred that no “emergency” repairs were identified through the inspection program over the past 4 years. PPL claimed that any cost savings realized through quarterly substation inspections, instead of monthly, would be utilized for vegetation management.

PPL also provided TUS staff with the substation inspection general log sheet procedures (DDI S-101) and an example of a completed log sheet. PPL reviewed the specifics of the substation inspection process and procedures with TUS staff at the November 15 meeting. Based on the abovementioned information provided by PPL and discussions with PPL staff, TUS staff identified a number of issues with the substation log sheets and procedures. A review of the current inspection documents and procedures provided by PPL indicated potential problems with how inspectors record readings and how readings are followed up on, i.e., how and when adjustments or corrective actions were taken for out-of-specification readings. Also, it was not clear how gauges such as pressure, temperature, level, and voltage are uniquely numbered and identified on the log sheets, or what the acceptable tolerance levels were. PPL indicated that it would review TUS staff findings and implement any necessary corrective actions.

Determination

Despite the issues identified with PPL’s substation inspection program, there is still merit to consider modifications of the frequency of substation component inspections based on the apparent diminishing returns on reliability improvement from monthly inspections, as well as the utilization of remote monitoring and communication technologies. If the inspection frequency is to be reduced, it is prudent that an inspection program capture objective observations that have acceptability ranges and out-of-specification observations are identified and corrected. It is also imperative that there is no reduction in the safety and reliability PPL’s distribution service due to any such change. PPL provided substantial evidence of recently improved substation reliability and safety performance, but it is too early to determine if this trend will continue with or without the reduction in frequency in the inspections.

Therefore, TUS staff will grant PPL a provisional exemption to reduce the frequency of its substation inspections to quarterly from every 5 weeks or less effective Jan 1, 2018 thru Dec 31, 2019. The requirements for the granting of this exemption are detailed, below, but effectively require PPL to demonstrate that the change in frequency has no impact on the continued safety and reliability of its distribution service and that PPL has addressed the issues identified in regards to its substation inspection log sheets and accountability measures. TUS staff may revoke the provisional exemption depending on their review of the information provided by PPL.

The requirements are:

1. PPL shall review its substation inspection log sheet reading processes and accountability measures. This review should include, but not be limited to:
 - a. reviewing inclusion of actual acceptability ranges/acceptance criteria for

⁴ CMI, or customer minutes interrupted, is one measure PPL utilizes to determine the cost efficiency of reliability improvement measures.

- equipment readings and observations;
 - b. ensuring gauges are uniquely numbered and identified on the log sheets; reviewing how out-of-specification readings, nonconforming conditions, deficiencies, and irregularities found during the inspection are to be documented and resolved;
 - c. developing a more detailed procedure to describe responsibilities and accountabilities;
 - d. a process for documenting the log sheet change/revision process to ensure submitted changes are properly reviewed and approved prior to implementation;
 - e. ensuring gages are incorporated in a calibration program;
 - f. incorporating manufacturer's recommendations for equipment inspections and frequency;
 - g. re-training all responsible personnel on any log sheet process and procedure changes;
 - h. And conducting periodic audits to ensure readings are accurately being performed and reviewed.
2. PPL shall provide the Reliability and Emergency Preparedness Section of TUS with a report that provides a summary of the review required in No. 1, above, along with a detailed description of any corrective actions and procedural changes as a result of the review. This report shall be filed no later than June 30, 2017 to allow for TUS staff review before the January 1, 2018 effective date of the PPL Plan.
3. Beginning with the first quarter of 2017 and continuing through fourth quarter 2019, PPL will provide information on substation inspections and substation reliability metrics. PPL shall report this information in its Quarterly Reliability Reports. The information shall include:
- a. the number of corrective work orders by type (low-priority, mid-priority, urgent) identified during the substation inspections for the quarter and year-to-date total;
 - b. the amount spent on substation inspections for the quarter and year-to-date total;
 - c. the amount spent on distribution vegetation management for the quarter and year-to-date total;
 - d. the projected CMI avoidance for the quarter and year-to-date total;
 - e. the distribution customer minutes and number of distribution customers affected due to sustained outages originating from substation system for the quarter and year-to-date total;
 - f. the substation contribution to SAIFI for the quarter and year-to-date total;
 - g. And the number of substations that have been upgraded to include remote monitoring and communication technologies by quarter and year-to-date total.

Conclusion

Upon review of PPL Biennial Inspection, Maintenance, Repair and Replacement Plan filed on September 30, 2016 it appears the filing generally complies to the requirements of 52 Pa. Code § 57.198. Furthermore, as discussed *supra*, the other exemptions requested by PPL are approved unconditionally except for the substation inspection frequency exemption, which is given provisional approval. This approval is contingent upon the possibility that subsequent audits,

reviews and inquiries, in any Commission proceeding, may be conducted pursuant to 52 Pa. Code § 57.197(a).

This plan must remain in effect for two calendar years, beginning January 1, 2018. PPL may, however, request Commission approval of subsequent revisions to its approved Plan, in accordance with 52 Pa. Code § 57.198(l). Revisions must be submitted to the Commission as an addendum to PPL quarterly reliability report filed pursuant to § 57.195, including prospective and past revisions to its Plan and a justification for the revisions.

If you are dissatisfied with the resolution of this matter, you may, as set forth in 52 Pa. Code § 5.44, file a petition with the Commission within twenty (20) days after the date of this letter. Please direct any questions regarding this filing to David Washko, Electrical Reliability Engineer, Bureau of Technical Utility Services at (717) 425-7401, or dawashko@pa.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Paul T. Diskin".

Paul T. Diskin, Director
Bureau of Technical Utility Services

cc: Robert Young, Law Bureau
Darren Gill, TUS
Dan Searforce, TUS