

**THE STATE CORPORATION COMMISSION
OF THE STATE OF KANSAS**

Before Commissioners: Jay Scott Emler, Chairman
Shari Feist Albrecht
Pat Apple

In the Matter of the Complaint Against Kansas }
City Power & Light by Jamie Littich } Docket No. 16-KCPE-195-COM

RESPONSE TO STAFF'S REPORT & RECOMMENDATIONS

I am in general agreement with the Kansas Corporation Commission (KCC) Staff's Report and Recommendations that was filed December 14, 2016. I also understand that my response isn't required. However, I feel it is appropriate to respectfully request expansions and clarifications on the report as described below.

MOTION FOR EXPANSION AND CLARIFICATION

1. **EXECUTIVE SUMMARY, PAGE 1, PARAGRAPH 2:** *"Staff has conducted an investigation into the above described electrical fault and concludes the neutral conductor of KCPL's secondary distribution system serving the Complainant and adjacent customers failed for unknown reasons."*

CLARIFICATION: What were the as-found conditions of the three secondary spools located on the pole south of the transformer? Was there any evidence of repair on any of these spools; if so, a) which spools? b) Did KCPL keep record of the repair? c) Can KCC Staff or KCPL Staff comment on whether or not the failing of the spools is a plausible cause of the event?

2. **BACKGROUND, PAGE 4, PARAGRAPH 1:** *"For this section of lateral, the secondary distribution lines are constructed of two separate conductors of #2 Copper wire that are considered to be bare wire⁸. A third conductor of #2 copper serves as the neutral for both the primary and secondary conductors. Because the secondary conductors are separated by approximately one foot, the secondary configuration is known as an 'open wire' secondary."*

& PAGE 4, FOOTNOTE 8: *"While there is evidence of at least one of the secondary conductors being insulated at one time, the shredded condition of the insulation on the wire renders the wire effectively bare."*

CLARIFICATION A: What standard or design guide has KCC been provided to define the separation of the secondary conductors to be approximately one foot? Has KCC measured the actual separation of the bare secondary conductors downstream of the transformer in question; if so what is the minimum separation measured?

CLARIFICATION B: Following this logical deduction:

- a. Insulation is a dielectric.
- b. Having some dielectric implies there would be less spacing required for insulated conductors compared to bare conductors. (Increased conductor separation is another way of adding dielectric.)

Does the KCPL standard for secondary conductor separation vary depending on whether on or not the conductors are insulated? If so, please explain why or why not.

EXPANSION: Insulated secondary is more prone to conductor burn down than bare secondary due the insulation isolating arcs to a point of failure versus dispersing arcs along the entire length of the conductors. This was a learned observation by KCPL and a known design change; i.e. allowing the secondary to become bare and perform tree interference maintenance. KCPL never adjusted secondary conductor separations based on bare conductor requirements.

3. **BACKGROUND, PAGE 4, PARAGRAPH 2:** *" ... there is at least one instance where a conductor was bent several times (AKA re-sagged) in order to increase the tension in the wire."¹¹ Exhibit 6 provides a photograph of some of the repairs splices and the re-tensioning of the wire."*

CLARIFICATION: Is “re-sag”, more correctly described as “zig-zag”, an approved methodology in KCPL’s standard? If so, please provide said standard. Are de-rates or allowances accounted for in zig-zag applications in that standard?

EXPANSION: The two higher conductors are typically subjected to zig-zag in order to meet NESC sag clearance requirements. The neutral is the most commonly zig-zagged conductor as it is known, under normal operating conditions, to carry the least amount of current between all three secondary conductors. The act of zig-zagging a conductor degrades the ampacity of a conductor. The neutral is most prone to conductor burn down, likely due to un-intended de-rating effects of zig-zag under abnormal conditions such as a bolted fault. Staff’s Report and Recommendation’s Exhibit 6 only shows zig-zagging on the upper most leg of the secondary but the neutral was re-strung prior to this photo being taken, thus the existing zig-zag on the neutral is unknown.

4. **BACKGROUND, PAGE 4, PARAGRAPH 1:** *“This transformer serves ten single family residential homes. KCPL estimates the peak load for the ten customers is 52kW.”*⁷

CLARIFICATION: Please provide response to data request 49.

5. **BACKGROUND, PAGE 4, FOOTNOTE 6:** *“20E fuse requires 40amps to begin melting, Section 5.3, IEEE C37.46 IEEE Standard Specifications for High-Voltage (>1000V) Expulsion and Current-Limiting ...”*

CLARIFICATION: The referenced IEEE standard defines type E fuses being capable of arresting an overcurrent event if the amperage ranges between 200-240% of the rated value for 300 seconds. “Best case” scenario is that the 20E fuse will clear at 40 A for 300 seconds, but a 20E fuse can technically require 48 A for 300 seconds and still meet the IEEE standard. The added 8 amps on the primary allows an additional 240 A on the secondary; so potentially: 1440 amps total per the IEEE standard.

6. **RECONSTRUCTION [OF EVENTS] ..., PAGE 5, PARAGRAPH 2:** *“Exhibit 8 shows the neutral down on both sides of both sides of the transformer pole. This picture, provided by complainant, was taken after the secondary was de-energized.”*

CLARIFICATION: The referenced photo was included in the complainant's submissions but originated from the Shawnee Fire Department fire report. Complainant added comments on top of photo for emphasis.

7. **RECONSTRUCTION [OF EVENTS] ..., PAGE 5, PARAGRAPH 3:** *"The fire was extinguished by 10:01 a.m."*

CLARIFICATION: This was established in the Shawnee Fire Department fire report.

8. **RECONSTRUCTION [OF EVENTS] ..., PAGE 5, PARAGRAPH 4:** *"KCPL did not contact any of its affected customers to inform them of its actions taken or to inquire on the status of the customers' electric systems."*

CLARIFICATION: Please provide a reference for this this statement. The only contact we received was the letter from the city.

9. **KCPL INVESTIGATION OF SECONDARY LINE FAILURES, PAGE 6, PARAGRAPH 2:**
"Staff's investigation- discussed later in this Report- determined KCPL's records do not support this description of the cause of the event or KCPL's response to the event."

CLARIFICATION: Has KCPL been subjected to similar complaints either within the Kansas or Missouri region where the submitted KCPL answers to KCC were derived from those complaints? What was the KCPL resultant response to those complaints?

CLARIFICATION REQUEST TO KCPL: Can KCPL please justify providing false descriptions of the event to affected customers, the city of Mission, Johnson County, and to the Kansas Corporation Commission? If sufficient justification cannot be provided, further inspection through the Kansas Insurance Department complaint process will be pursued.

10. **ANALYSIS, ASSUMPTIONS ..., PAGE 7, PARAGRAPH 1:** *"Exhibit 13 provides a plot of the incremental primary amperage for the time period of the event. KCPL estimates the peak primary amperage load under normal conditions would be 7 amps."*

CLARIFICATION: How did KCPL determine the estimated peak primary amperage load for normal operation? Is there a current transducer (CT) installed on the primary side of the transformer to directly measure this transformer's amperage?

11. ANALYSIS, FUSE COORDINATION ..., PAGE 7, PARAGRAPH 2: *"KCPL uses*

Construction Standard N-902 to select the size of fuse for a given application on its distribution system. Staff's review of this standard shows the selection of a 20E fuse meets the standard."

CLARIFICATION: Has staff been provided a copy of N-902 where the E can be read clearly?

Staff's review of the standard shows that the fuse selected above the transformer correlates with the standard, but has staff been provided sufficient information to support that the N-902 standard is intended for this area?

12. ANALYSIS, FUSE COORDINATION ..., PAGE 7, PARAGRAPH 3: *"When asked if a 10 amp fuse would work in this location, KCPL responded, 'a 10 amp fuse could feasibly be utilized for a 50kVA overhead transformer; however, a 10 amp fuse is more susceptible to transient over voltages than a 20 amp fuse. This susceptibility could lead to more frequent customer outages due to transient (temporary) issues.'"*

CLARIFICATION A: Can KCPL provide a basis for these statements? It is actually over-load scenarios (which have under-voltage characteristics) where the lower rated fuse would be more susceptible (again, which is the purpose of an automatic disconnect device, e.g. fuse, during a bolted fault). Regardless, circuit protection devices can be coordinated (graphed) to verify proper design. Tree trimming would also reduce the fuse's susceptibility even further.

CLARIFICATION B: This question relates to item 10: Has KCPL provided historical peak load data to determine if transformer over-load is common in the KPCL system?

13. KCPL'S COMPLIANCE WITH THE [NESC], PAGE 9:

CLARIFICATION: Please include the following definitions from the NESC.

a. Section 1: Introduction - 015. Intent:

A. The word "shall" indicates provisions that are mandatory.

- The NESC articles referenced by Staff include "shall" language, which clearly indicates a required compliance provision. Some allowance for interpretation/application is given when the word "should" is used.

b. Section 17. Circuit breakers, reclosers, switches, and fuses – 171. Application

Circuit breakers, circuit switches, reclosers, switches, and fuses should be utilized with due regard to their assigned ratings of voltage and continuous and momentary current.

Devices that are intended to interrupt fault current shall be capable of safely interrupting the maximum short-circuit current they are intended to interrupt, and for the circumstances under which they are designed to operate. The interrupting capacity should be reviewed prior to each significant system change.

- Staff included Article 153 which requires that "... transformers shall be provided with means to disconnect automatically the source of supply of current ...".

Article 171 defines automatically disconnecting devices: a) the secondary conductor is not intended to be the disconnecting device b) the coordination of the secondary #2 copper and the 20 A type E transformer fuse show that during a secondary fault, the secondary conductor will always protect the fuse making it, the automatically disconnecting device, incapable of safely interrupting the maximum short-circuit current.

14. KCPL FAILURE ..., PAGE 11, PARAGRAPH 2: *"Staff recommends the observation should include a description of the facilities as-found and as-left. For example, the condition of the conductor, the height of the conductor, and any abnormal circumstances that were evident. ..."*

EXPANSION: We believe this is a reasonable recommendation. It may be interpreted by KCPL as a unilateral burden and unfair cost, but all utilities should be burdened by this if they're in violation (coincidentally just KCPL for now). As circuits come into compliance over time (improved circuit protection and tree trimming), the resource burden to a utility like KCPL will become minimal. The commission should also consider requiring utilities to provide access to the installed transformer fuse for fire investigators to record the fuse's serial number and test continuity. If the fire investigation happens sometime after the event, which may be common depending on the county, utilities should make resources available at the time of the investigation.

15. **RECOMMENDATION, PAGE 12, PARAGRAPH 3:** *"sufficient evidence has been compiled and questions raised that a more extensive proceeding before the Commission is warranted."*

RESPONSE: Agreed. My requested expansions and clarifications can be a part of those proceedings.

ITEMS EXCLUDED OR DERIVED FROM STAFF'S REPORT & RECOMMENDATIONS

1. **RELAY TESTING:** Does KCPL's test software provide an "auto-fill" or "auto-pass" functionality where Relay Testing is recorded but test parameters and results are not manually entered? If so, are the relay tests provided to staff during discovery a product of automatic software record keeping?
2. **MOTION:** Dependent upon KCPL denying responsibility for the electrical event, I motion for KCC to issue an advisory to the effected counties to educate first responders and fire investigators on fires related to this over-sized fuse issue for safety and record keeping purposes. Please consider issuing the advisory when deciding on whether or not to restructure the docket.

Respectfully submitted,



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