

MEMORANDUM

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PUBLIC SERVICE COMMISSION

TO: Missouri Public Service Commission Official Case File
Case No. GO-91-277, The Kansas Power and Light Company (KPL)
FROM: John D. Kottwitz and Robert R. Leonberger *gdk* *RL* *fm*
Energy Department - Gas Safety

SUBJECT: Staff Recommendations on the Cast Iron and Unprotected Steel
Main Programs

DATE: March 9, 1992

REVIEWED BY: *Sam Glanville* 3/10/92 *Manjula* 3/10/92 *JMS* 3/10/92
Utility Operations Division/date General Counsel's Office/date

This memorandum will address the following areas related to The Kansas Power and Light Company's (KPL or Company) Case No. GO-91-277:

1. KPL Activity Regarding Mains in 1989, 1990, and 1991;
2. Rule, KPL Program, and Docket Background;
3. Energy Department-Gas Safety Staff (Staff) Data Request;
4. Revisions to the KPL Program;
5. Staff Response to the Unprotected Steel Main Program;
6. Staff Response to the Cast Iron Main Program, and;
7. Staff Recommendations.

1. KPL Activity Regarding Mains in 1989, 1990, and 1991

U.S. Department of Transportation (DOT) Annual Report forms were submitted by KPL for the calendar years 1988, 1989, and 1990 in accordance with State and Federal requirements. KPL reported 711 miles of cast iron main in Missouri at the end of 1988, 707 miles at the end of 1989, and 697 miles at the end of 1990. This indicates that KPL replaced 4 miles of cast iron main in 1989 and 10 miles in 1990.

In conjunction with KPL's latest Missouri rate case, GR-91-291, the Staff requested verification of the 1989 and 1990 cast iron main replacement amounts and information concerning its 1991 activity. In a response received by the Staff on July 19, 1991, KPL verified the 4 and 10 miles indicated above. The total cast iron replacements made during the first five months of 1991 amounted to only 1.1 miles. The Staff requested that the Company explain this low number and project the 1991 total.

In a response received by the Staff on August 7, 1991, KPL responded that street improvement work decreased significantly and that 2.5 miles was the total cast iron replacement planned for 1991. The Staff expressed displeasure with the 1991 projected total being less than the 1989 and 1990 totals in direct testimony filed in Case No. GR-91-291. KPL personnel supplied the Staff with information on October 21, 1991, that the actual cast iron main replacements in 1989 and 1990 were 6.8 and 7.2 miles, respectively, instead of the 4 and 10 miles shown on the DOT Annual Reports. On October 23, 1991, an updated KPL response stated that actually 4.8 miles were replaced in the first five months of 1991, and that a total of 5.6 miles were replaced through September of 1991. On the 1991 DOT Annual Report, KPL recently reported 692 miles at the end of 1991, indicating that 5 miles of cast iron main were replaced in 1991.

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KPL reported 904 miles of unprotected bare steel mains in Missouri at the end of 1988, 881 miles at the end of 1989, and 802 miles at the end of 1990. Staff requested the 1989 and 1990 reduction in miles be identified between the amount replaced and the amount cathodically protected, as well as the 1991 activity. The total miles were reduced by 23 miles in 1989 (14 miles replaced), 79 miles in 1990 (17 miles replaced), and 35 miles in the first six months of 1991 (4 miles replaced). Also, the DOT Annual Reports indicated that the 8 miles of unprotected coated steel mains that remained at the end of 1988 were eliminated from that category in 1989. On the 1991 DOT Annual Report, KPL recently reported 636 miles of unprotected bare steel main at the end of 1991, indicating a reduction of 166 miles in 1991.

No expedited replacements of high priority cast iron mains specified under 4 CSR 240-40.030(15)(D), occurred in 1991. Cast iron main replacements based on existing procedures resulted in a lower amount of replacement in 1991 than in 1989 or 1990. The KPL main programs submitted in Case No. GO-91-277 are scheduled to begin in 1992.

2. Rule, KPL Program, and Docket Background

The requirements for a cast iron main replacement program are contained in 4 CSR 240-40.030(15)(D). A program for replacement and/or cathodic protection of high priority, unprotected steel mains is required under subsection (15)(E). These two rule subsections were adopted with an effective date of December 15, 1989. The entire replacement rule section (15) is attached as Attachment 1.

As required by 4 CSR 240-40.030(15)(B), KPL submitted initial programs dated April 30, 1990. KPL proposed to continue its existing procedures, with some modifications, pending the outcome of the Stone & Webster gas safety audit. The Staff notified KPL in a letter dated October 23, 1990, that the programs were inadequate and would prompt a negative Staff recommendation. An opportunity was provided to revise the programs prior to the filing of such a Staff recommendation. Rather than just waiting for the Stone & Webster results, the Staff stated that KPL must develop and implement an acceptable interim program for the numerous high priority pipelines located in KPL's Missouri systems.

KPL modified its initial programs on November 27, 1990, by developing a Construction Priority Index (CPI) for prioritizing replacement of all mains, not just the cast iron and unprotected steel mains. No information was provided on how CPI would be used and what would be replaced. In addition, the CPI evaluation factors were in conflict with some of the requirements contained in 4 CSR 240-40.030(15)(D) and (15)(E). KPL proposed to use CPI alone until a Facility Priority Index (FPI) could be developed to identify projects for CPI to prioritize. FPI was to be a computer program utilizing, among other things, statistical projections developed by ZEI, Inc., a consultant conducting the replacement program analysis portion of the Stone & Webster safety audit.

The Staff recommended Commission approval of seven main programs in Case No. GO-91-239 on December 27, 1990, and indicated that separate dockets would be requested to consider the remaining main programs of four Missouri utilities, one of which was KPL. A Staff Motion requested that a docket be established and Case No. GO-91-277 was established February 8, 1991, to receive the KPL programs.

3. Staff Data Requests

The Staff submitted a data request (DR) on April 18, 1991, requesting details on the miles of main in each of the high priority rule categories and a proposed schedule for elimination for each year through 2000. In a response dated May 16, 1991, KPL indicated that 4 miles of cast iron main would be replaced each year for 1991 through 1995 and that 30 miles of unprotected steel main per year would be cathodically protected in conjunction with the Service Line Replacement Program (SLRP). The cathodic protection under SLRP would not necessarily include any high priority mains. The Staff expressed to Company personnel on May 22, 1991, that the response was inadequate for both the cast iron and the unprotected steel mains.

The KPL response dated May 16, 1991, is attached as Attachment 2. Please note the quantities of high priority mains in Missouri that are provided. Adjusting for overlap, approximately 350 miles of cast iron mains are in these high priority categories: located under continuous pavement, located near general public concentrations, and small in diameter (using four-inch diameter and less). The number of high priority miles of cast iron would increase substantially if six-inch diameter mains were added to the small diameter category. Although not identified by KPL, additional miles would fall under the other high priority categories in the regulations, many of which would overlap with the three categories listed above. KPL reported a total of 692 miles of cast iron main in Missouri at the end of 1991.

Adjusting for overlap, approximately 33 miles of unprotected steel main are located in the high priority categories of beneath continuous pavement and near general public concentrations. Regarding a third high priority category, KPL responds that no unprotected steel mains are subject to stray current. Although not identified by KPL, additional miles would fall under the other high priority categories, especially those mains with leak and corrosion history. KPL reported a total of 636 miles of unprotected steel main in Missouri at the end of 1991.

4. Revisions to the KPL Program

As noted in Section 3 above, the Staff notified KPL on May 22, 1991, that the KPL program contained in the DR response (May 16) failed to meet the requirements. Further discussion occurred between KPL and the Staff regarding the programs in Case No. GO-91-277. Because of the large amount of time that had already lapsed and the related issues in the KPL rate case (GR-91-291), the Staff requested KPL to promptly file a revised program in Case No. GO-91-277 complying with the requirements of rule subsections (15)(D) and (15)(E).

During June of 1991, KPL provided two separate preliminary drafts of the Company's main programs to the Staff for review prior to filing in Case No. GO-91-277. The Staff commented favorably to the Company regarding these drafts, but the draft programs had not yet received the approval of the Company's President's Council. The Staff and Company had a meeting and other phone conversations discussing these draft programs.

On July 22, 1991, KPL personnel presented a proposal for a nine-year program schedule to the Staff. The first three year amounts were reduced from the preliminary drafts, but were considered "firm" and had received approval from the President's Council of KPL. Some changes in the schedule presentation were discussed. KPL personnel indicated they would "clean-up" the schedules and

formally submit the programs in a few days. KPL made a program filing on September 27, 1991, two months later.

At the end of August 1991, KPL was still not sure when their formal filing would be finalized. On August 30, 1991, the Staff sent a DR to KPL requesting the most recent draft of the programs to be filed in Case No. GO-91-277. On September 5, 1991, a proposed program schedule was delivered. That proposed schedule was identical to the filing made on September 27, 1991 (Attachment 3). The September 5 draft differed from the July draft in that the cast iron and bare steel main replacements were reduced and cathodic protection of bare steel mains was more than doubled. The 1992 cast iron replacement miles were lowered to 12.8 miles from the 21.6 miles presented to the Staff by KPL in draft form on July 22, 1991.

The Staff filed direct testimony in Case No. GR-91-291 and attached the September 5 proposed schedule. The direct testimony basically stated the programs would be addressed in Case No. GO-91-277, once KPL made a filing in that docket. The testimony did point out the 1991 deficiency in cast iron main replacements and that the 12.8 miles of cast iron mains scheduled for 1992 were not sufficient. KPL filed a proposed schedule in Case No. GO-91-277 on September 27, 1991, the Friday before the prehearing conference in Case No. GR-91-291. This filing was identical to the draft schedule provided on September 5, 1991, and is provided in Attachment 3. KPL's replacement programs were discussed repeatedly during the rate case and prehearing conference.

Finally, the Staff corresponded with KPL on October 25, 1991, to clarify that actions must be underway for 1992. Since the Staff had been requesting more than the 12.8 miles of cast iron main replacement proposed, actions to replace the 12.8 miles would be the minimum required. The Staff also advised KPL that a program explanation had not been filed with the schedule as required. As of March 9, 1992, no explanation has been filed by KPL.

5. Staff Response to the Unprotected Steel Main Program

First, the KPL filing (Attachment 3) is a schedule and not an explained program as required. The KPL proposal to cathodically protect or replace all of the remaining unprotected steel mains by 1998 is commendable, but is not specifically required. Rule 4 CSR 240-40.030(15)(E) requires only the unprotected steel mains located in high priority areas to be addressed. KPL has identified 33 miles that are located in the high priority areas described in (15)(E)1. and (15)(E)2., which are beneath continuous pavement and near general public concentrations. The schedule filed by KPL in this docket indicates that 1 mile per year will be eliminated in the high priority areas described in (15)(E)3. and (15)(E)4. during 1992, 1993, and 1994; and approximately 4 miles thereafter. The high priority categories of (15)(E)3. and (15)(E)4. involve mains located near construction activities and in areas of public works projects which are hard to estimate into the future. The Staff assumes that up to four miles could be required each year, including 1992 through 1994. KPL has indicated no unprotected steel mains are subject to stray current as described in (15)(E)6.

The other high priority areas that require expedited action are "sections of unprotected steel main that exhibit a history of leakage or corrosion" in accordance with (15)(E)5. To the Staff's knowledge, KPL has not conducted a complete evaluation of historical records to identify the main segments with leak or corrosion history. If KPL has identified these segments, the information has not been placed in the program schedule. In the filed program schedule under

(15)(E)5., KPL indicates that 7 miles will be identified annually using FPI, but the process is not explained. The Staff and KPL personnel met on December 6, 1991, to discuss the CPI, so that the Staff could better understand the factors that drive CPI. FPI and a "5/5/3 Review" were mentioned as two of the methods that would identify mains to be prioritized by CPI. KPL's presentation centered on a document entitled "Main Replacement Program", that included a written explanation of CPI and brief descriptions of the identification methods. The "5/5/3 Review" is conducted quarterly and "identifies unprotected steel segments which have experienced five or more main leaks within a block (approximately 500 feet), over the past three years".

The Staff's understanding of the program schedule filed by KPL is that FPI would identify the 7 miles that a theoretical model predicts has experienced the most corrosion. Although the "5/5/3 Review" is not included in the filed schedule, the Staff understands from the KPL presentation on December 6, 1991, that the identified main segments would be placed into a pool of main segments to be prioritized by CPI. Based on their priority, the identified main segments would be replaced at some point in the future. These two methods fail to meet the rule requirement. The rule requires KPL to identify the unprotected steel mains that have exhibited a history of leakage or corrosion, to prioritize the identified main sections, and to replace or cathodically protect them in an expedited manner. FPI apparently does not involve a historical review. The "5/5/3 Review" is limited to the past three years, requires what the Staff believes is too many leaks (5 leaks) in that period, and does not include corrosion pitting observations. The Staff believes that FPI and the "5/5/3 Review" may be appropriate tools to prioritize the unprotected steel mains that are identified by a complete review. For discussion purposes, if KPL conducts an evaluation of all leak repair and exposed pipe records and identifies 22 miles of unprotected steel main sections that were observed to have corrosion leaks or corrosion pitting, then the prioritized replacement/cathodic protection of 7.3 of those miles in 1992, 1993, and 1994 would meet the rule requirements. The 7.3 miles figure corresponds with the FPI line of the proposed schedule filed in this docket. KPL needs to conduct the identification process as soon as possible, if this has not yet been completed.

In the proposed schedule (Attachment 3), KPL has included the cathodic protection of large quantities of unprotected steel mains that are not in high priority areas and reduced the miles of high priority cast iron mains. In 1992, the cast iron replacement miles are cut almost in half from the July 22 proposal, from 21.6 miles to 12.8 miles. This conflicts with the rule requirement to replace the high priority areas in an expedited manner. Whatever the reason for the changes in the schedules, rule compliance for 1992 deteriorated. Investment should be switched to the required replacement of high priority cast iron mains from unprotected steel main action that is not specifically required.

The KPL proposed schedule in this docket has 52 total miles of unprotected steel mains for 1992 through 1994 in the "PROTECTION-INDEPENDENT" category, which are not in high priority areas. The Staff believes this cathodic protection activity must not detract from the expedited replacement of high priority areas. Therefore, the "PROTECTION-INDEPENDENT" category should either be eliminated from the program schedule, or simply recognized as reduction in the miles of existing unprotected steel main, over and above, but not due to replacement/protection required by the Commission regulations. The "PROTECTION-WITH SLRP" category does make economical sense, but this cathodic protection should not detract from high priority area compliance.

There are safety reasons for concentrating on high priority cast iron mains instead of unprotected steel mains. These stem from the mode of failure. The failure mode for unprotected steel mains is corrosion pitting, which is a relatively slow process beginning with a pinhole that gradually expands. The failure mode for cast iron mains is a sudden fracture that releases large volumes of natural gas, and can quickly create a hazard. If venting is not restricted by pavement, a corrosion pit leak, due to its gradual nature and initial small amount of volumes released, takes a much longer time to become hazardous. The required annual leak surveys of unprotected steel mains are likely to detect corrosion pit leaks prior to leakage posing a hazard. KPL and its predecessor had 13 incidents caused by cast iron main failures during the past 30 years and no incidents caused by unprotected steel main failures. Cast iron main replacement is the subject of Federal legislation recently proposed and sponsored by both Senators from Missouri, and an Alert Notice which was issued by the Federal Office of Pipeline Safety alerting operators of the NTSB recommendation to institute a planned replacement of cast iron piping.

The Staff is concerned about the ratio of replacement to cathodic protection in the unprotected steel main program. Cathodic protection is an acceptable method under the rule; however, replacement is preferable when the main is deteriorated, especially when located in a high priority area. For instance, unprotected steel mains with a history of corrosion leaks should probably be replaced rather than cathodically protected. If the life of a main can be economically and safely extended by cathodic protection, then that would be acceptable. However, the Staff would prefer to see fewer total miles eliminated, than to have the Company cathodically protect marginal or deteriorated pipe.

6. Staff Response to the Cast Iron Program

First, the KPL filing (Attachment 3) is a schedule and not an explained program as required by the rule. As detailed in the Staff's response to the Unprotected Steel Main Program, investment should be switched to the required replacement of high priority cast iron mains from unprotected steel main action that is not specifically required. The shift by KPL from required cast iron main replacements to cathodic protection of unprotected steel mains, which are not required to be addressed by the regulations, is unacceptable to the Staff.

Rule 4 CSR 240-40.030(15)(D)1., requires KPL to have a prioritized program to replace high priority cast iron mains in an expedited manner and must include the areas described in subparagraphs (15)(D)1.A. through (15)(D)1.G. Using four-inch and smaller as small diameter, KPL has identified the miles of main in (15)(D)1.A., B., and C. as shown in the DR response and the filed schedule (Attachments 2 and 3). The filed schedule indicates a total of 366 miles in the "4 INCH AND SMALLER - OTHER" category, but the Staff believes this may be a typographical error and the correct number should be 253 miles.

The schedule filed by KPL has a "PUBLIC WORKS PROJECTS" category for high priority areas (15)(D)1.D., E., and F. The Staff would assume that these miles are based upon future work projects and could require up to 3 miles of cast iron replacement per year. In addition to future public work projects, a review for past excavations in proximity to cast iron mains must be conducted for high priority areas (15)(D)1.D. and E. The Staff has no knowledge of such a study by KPL, and the 0.0 miles filed for 1992 indicates none were identified. KPL should conduct such a review of its past records.

The other high priority areas that require expedited action are "sections of cast iron main that exhibit a history of leakage or graphitization" in accordance with (15)(D)1.G. To the Staff's knowledge, KPL has not conducted a complete evaluation of historical records to identify the cast iron main segments with fracture or graphitization history. Based on KPL's initial program filing dated April 30, 1990, an existing KPL procedure requires that "In-block mains must be scheduled for replacement in the area of breakage when records indicate three or more breaks (include current break) have occurred within the previous five years". This procedure is not reflected in the filed schedule. The filed program schedule indicates that 0.3 and 0.8 miles in 1992 and 1993, respectively, and then 1.0 mile thereafter will be identified using FPI. The FPI process is not explained. As noted on page 5, the Staff and KPL personnel met on December 6, 1991, to discuss the CPI, so the Staff could better understand what drives CPI. FPI is one of the methods used to identify main segments to be prioritized by CPI. Another identification method is cast iron coupon sampling (removing a sample of the wall of the cast iron pipe for analysis) where the coupon is examined for the extent of graphitization.

The Staff's understanding of the program schedule filed by KPL is that FPI would identify the 1.0 mile or less that a theoretical model predicts has experienced the most graphitization. Although cast iron mains identified by the existing procedure on breaks per block and by coupon sampling are not included in the filed schedule, the Staff's understanding is that these mains would be placed in the pool of main segments to be prioritized by CPI. Based on the CPI priority, they would be replaced at some point in the future. These methods fail to meet the rule requirement. The rule requires KPL to identify the cast iron mains that have exhibited a history of fractures and/or graphitization, to prioritize the identified main sections, and to replace them in an expedited manner.

Even though the Staff does not believe that these methods are adequate for complete identification, the Staff believes that FPI, breaks per block, and coupon sampling may be appropriate tools to prioritize the cast iron main replacements that must be identified by a complete review. From the leak records and fracture maps that have been observed by the Staff, this could be a substantial number of miles that should be identified by a complete review. However, these main sections will be mostly limited to diameters of less than eight-inch. These main sections will largely overlap with the other high priority cast iron mains that KPL has already identified and placed in the schedule. The Staff believes the overlap miles should be given higher priority, and that there are probably a few miles of six-inch diameter cast iron mains with fracture history that do not overlap and should be placed in the program. KPL needs to conduct the identification process as soon as possible, if this has not yet been done.

Paragraph (15)(D)2. requires that a long-term organized replacement program and schedule shall also be established for cast iron mains that are not identified as high priority. KPL has not provided a specific long-term program and schedule other than 1.0 mile per year under "SYSTEM IMPROVEMENT". The Staff would assume that the "PUBLIC WORKS PROJECTS", the "FPI", and "SYSTEM IMPROVEMENT" categories would continue into the future. Replacements required by rule subsection (13)(Z) would continue when excavations are in proximity to cast iron, resulting in additional replacements under (15)(D)1.E. The Staff believes a long-term program must be addressed as required, and should concentrate on the remaining 6-inch pipe, public works requirements, FPI, and system improvements.

7. Staff Recommendations

As detailed in the Staff response, the cast iron main program schedule filed by KPL (Attachment 3) does not meet the rule requirements regarding explanation, identification, prioritization, or replacement of high priority areas in an expedited manner. No explanation is provided for the unprotected steel main program. The Staff recommends that KPL file detailed program explanations as required.

The Staff recommends that the Commission not approve the cast iron main replacement schedule submitted by KPL. The Staff recommends that the Commission approve a modified schedule for cast iron and unprotected steel mains as proposed by the Staff and shown in Attachment 4. As noted above, a detailed program explanation must be submitted by KPL. The Staff has explained the deficiencies in the Company's schedule and provided justification for the modified schedule in this memorandum. The schedule proposed by the Staff provides for added prioritization of the high priority cast iron mains that have been identified. The high priority cast iron mains are scheduled for more expedited replacement than proposed by KPL by removing non-required miles from the unprotected steel main schedule. Even though the six-year schedule for all unprotected steel mains exceeds the rule requirements, the Staff recommends that it be modified as explained in this memorandum and as shown in Attachment 4. KPL's filed schedule commits resources to unprotected steel mains in excess of the rule requirements and results in high priority cast iron main replacement being less expedited. In addition to rule compliance, the Staff believes there are safety reasons for switching resources from low-priority unprotected steel mains to high-priority cast iron mains. These safety reasons relate to the difference in the failure mode, which is detailed in Section 5. The Staff's proposal includes a statement for the required long-term program. Because the actual status of the remaining cast iron piping in ten years is unknown, the statement addresses priorities rather than specific mileage.

As shown on Attachment 4, there are still some high priority mains that were not identified in the filed schedule and other information provided by KPL. The Staff recommends that the Commission order KPL to identify these other high priority areas, provide the data to the Commission, and place these mains into the schedule proposed by the Staff. The high priority areas which need to be identified are as follows:

(15)(D)1.D. and E. - Cast iron mains that were in close proximity to extensive excavation, blasting, or construction activities in the past, and especially cast iron mains that had sections replaced as required by 49 CFR 192.755.

(15)(D)1.G. - Cast iron mains that fractured or exhibited graphitization in the past.

(15)(E)5. - Unprotected steel mains that had corrosion leaks or exhibited corrosion in the past.

Specifically to KPL, the Staff recommends that precautions be taken when choosing to cathodically protect the high priority unprotected steel mains instead of replacing them. These precautions should attempt to determine when the main condition has deteriorated to a point where replacement is necessary.

The Staff recommends that KPL should be given adequate time to respond to this memorandum and present additional information to the docket. However, this response time should allow the approval process to proceed in a timely manner. The Staff believes that 30 days should give KPL ample opportunity to submit a response. Therefore, in conjunction with this memorandum, the Staff will file a motion with the Commission requesting that KPL be ordered to file a response to this memorandum within 30 days.

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attachments 1-4

ATTACHMENT 1-1

property line, approximately one hundred feet (100') from the structure, or at the service tap at the main, whichever is closest to the structure. In lieu of conducting the tests of the subsurface atmosphere, the operator may conduct a leak survey of this pipe with gas detection equipment capable of detecting gas concentrations of one hundred (100) parts per million, gas-in-air. These tests are required when working any type of customer gas service order or call, with the exception of collections, meter readings and cathodic protection work.

7. A repeat leak investigation shall be conducted within three (3) calendar days of any leak or odor notice from the general public where, during the initial leak investigation, no leak was found or no explanation of the odor was determined. When access to the premise is limited, outside leak investigations are sufficient.

(C) Leak Classifications.

1. Class 1 leak is a gas leak which, due to its location and/or magnitude, constitutes an immediate hazard to a building and/or the general public. It shall require immediate corrective action which shall provide for public safety and protect property. Examples of Class 1 leaks are: a gas fire, flash or explosion; broken gas facilities such as contractor damage, main failures or blowing gas in a populated area; an indication of gas present in a building emanating from company-owned facilities; a gas reading equal to or above the lower explosive limit in a tunnel, sanitary sewer or confined area; gas entering a building or in imminent danger of doing so; and any leak which, in the judgment of the supervisor at the scene, is regarded as immediately hazardous to the public and/or property. When venting of the leak is the immediate corrective action taken for Class 1 leaks where gas is detected entering a building, the leak may be reclassified to a Class 2 leak. However, the leak shall be repaired within fifteen (15) days and rechecked daily until repairs are completed. Leaks of this nature, if not repaired within five (5) days, may need to be reported as a safety-related condition required by 4 CSR 240-40.020(12) and (13). (191.23 and 191.25)

2. Class 2 leak is a leak that does not constitute an immediate hazard to a building or to the general public but is of a nature requiring action as soon as possible. A leak of this classification shall be repaired or properly reclassified to a lower leak classification within fifteen (15) days after the initial investigation unless it is definitely included and scheduled in a rehabilitation or replacement program to be completed within a period of one (1) year, in which case the leak must be rechecked every fifteen (15)

days to determine that no immediate hazard exists. Examples of Class 2 leaks are: a leak from a transmission line discernible twenty-five feet (25') or more from the line and within one hundred feet (100') of a building; any reading outside a building at the foundation or within five feet (5') of the foundation; any reading greater than fifty percent (50%) gas-in-air located five to one hundred fifty-one feet (5'—151') from a building; any reading below the lower explosive limit in a tunnel, sanitary sewer or confined area; any reading equal to or above the lower explosive limit in a vault, catch basin or manhole other than a sanitary sewer; or any leak, other than a Class 1, which in the judgment of the supervisor at the scene, is regarded as requiring Class 2 priority.

3. Class 3 leak is a leak that does not constitute a hazard to property or to the general public but is of a nature requiring routine action. These leaks must be repaired within five (5) years and be rechecked twice per calendar year, not to exceed six and one-half (6 1/2) months, until repaired or the facility is replaced. Examples of Class 3 leaks are: any reading of fifty percent (50%) or less gas-in-air located between five and fifteen feet (5'—15') from a building; any reading located between fifteen and fifty feet (15'—50') from a building, except those defined in Class 4; a reading less than the lower explosive limit in a vault, catch basin or manhole other than a sanitary sewer; or any leak, other than a Class 1 or Class 2 which, in the judgment of the supervisor at the scene, is regarded as requiring Class 3 priority.

4. Class 4 leak is a confined or localized leak which is completely non-hazardous. No further action is required.

(15) Replacement Programs.

(A) Scope. This section prescribes minimum requirements for the establishment of replacement programs for certain pipelines.

(B) Replacement Programs—General Requirements. Each operator shall establish written programs to implement the requirements of this section. The requirements of this section apply to pipelines as they exist on the effective date of this rule. These programs shall be filed with designated commission personnel in accordance with subsection (1)(J) by May 1, 1990.

(C) Replacement Program—Unprotected Steel Service Lines and Yard Lines. At a minimum, each investor-owned, municipal or master meter operator shall establish instrument leak detection survey and replacement programs for unprotected company and customer-owned steel service lines and yard lines. The operator shall choose

from the following options, unless otherwise ordered by the commission, and shall notify the commission by May 1, 1990 of which option or combination of options the operator will implement:

1. Conduct annual instrument leak detection surveys on all unprotected steel service lines and yard lines and implement a replacement program where all unprotected steel service lines and yard lines will be replaced by May 1, 1994;

2. Conduct of annual instrument leak detection surveys on all unprotected steel service lines and yard lines. The operator shall compile a historical summary listing the cumulative number of unprotected steel service lines and yard lines installed, replaced or repaired due to underground leakage and with active underground leaks in a defined area. Based on the results of the summary, the operator shall initiate replacement, to be completed within eighteen (18) months, of all unprotected steel service lines and yard lines in a defined area once twenty-five percent (25%) or more meet the previously mentioned repair, replacement and leakage conditions. At a minimum, ten percent (10%) of the unprotected steel service lines and yard lines in the system as of the effective date of this rule must be replaced annually; and

3. Conduct annual instrument leak detection surveys on all unprotected steel service lines and yard lines and implement a replacement program. The program must have prioritized and replacements based on the greatest potential for hazards. At a minimum, ten percent (10%) of the unprotected steel service lines and yard lines in the system as of the effective date of this rule must be replaced annually.

(D) Replacement Program—Cast Iron.

1. Operators who have cast iron transmission lines, feeder lines or mains shall develop a replacement program to be submitted with an explanation to the commission by May 1, 1990 for commission review and approval. This systematic replacement program shall be prioritized to identify and eliminate pipelines in those areas that present the greatest potential for hazard in an expedited manner. These high priority replacement areas would include, but not be limited to:

A. High-pressure cast iron pipelines located beneath pavement which is continuous to building walls;

B. High-pressure cast iron pipelines located near concentrations of the general public such as Class 4 locations, business districts and schools;

C. Small diameter cast iron pipelines;

ATTACHMENT 1-2

D. Areas where extensive excavation, blasting or construction activities have occurred in close proximity to cast iron pipelines;

E. Sections of cast iron pipeline that have had sections replaced as a result of requirements in subsection (13)(Z) (192.755);

F. Sections of cast iron pipeline that lie in areas of planned future development projects, such as city, county or state highway construction/relocations, urban renewal, etc.; and

G. Sections of cast iron pipeline that exhibit a history of leakage or graphitization.

2. A long-term, organized replacement program and schedule shall also be established for cast iron pipelines not identified by the operator as being high priority.

3. Operators who have cast iron service lines shall replace them by December 31, 1991.

(E) Replacement/Cathodic Protection Program—Unprotected Steel Transmission Lines, Feeder Lines and Mains. Operators who have unprotected steel transmission lines, feeder lines or mains shall develop a program to be submitted with an explanation to the commission by May 1, 1990 for commission review and approval. This program shall be prioritized to identify and cathodically protect or replace pipelines in those areas that present the greatest potential for hazard in an expedited manner. These high priority areas should include, but not be limited to:

1. High-pressure unprotected steel pipelines located beneath pavement which is continuous to building walls;

2. High-pressure unprotected steel pipelines near concentrations of the general public such as Class 4 locations, business districts and schools;

3. Areas where extensive excavation, blasting or construction activities have occurred in close proximity to unprotected steel pipelines;

4. Sections of unprotected steel pipeline that lie in areas of planned future development projects, such as city, county or state highway construction/relocations, urban renewal, etc.;

5. Sections of unprotected steel pipeline that exhibit a history of leakage or corrosion; and

6. Sections of unprotected steel pipeline subject to stray current.

(16) Waivers of Compliance. Upon written request to the secretary of the commission, the commission, by authority order, and under such terms and conditions as the commission deems appropriate, may waive

in whole or part compliance with any of the rules and requirements contained in the rule which are more stringent than minimum federal requirements. Waivers will be granted only on a showing that gas safety is not compromised. If any such request is denied, the denial will be in writing and state the reason(s) therefor.

Auth: section 393.140, RSMo (1986). Original rule filed Feb. 23, 1968, effective March 14, 1968. Amended: Filed Dec. 28, 1970, effective Jan. 6, 1971. Amended: Filed Dec. 29, 1971, effective Jan. 7, 1972. Amended: Filed Feb. 16, 1973, effective Feb. 26, 1973. Amended: Filed Feb. 1, 1974, effective Feb. 11, 1974. Amended: Filed Dec. 19, 1975, effective Dec. 29, 1975. Emergency amendment filed Jan. 17, 1977, effective Jan. 27, 1977, expired May 27, 1977. Amended: Filed Jan. 17, 1977, effective June 1, 1977. Emergency amendment filed March 15, 1978, effective March 25, 1978, expired July 23, 1978. Amended: Filed March 15, 1978, effective July 13, 1978. Amended: Filed July 5, 1978, effective Oct. 12, 1978. Amended: Filed July 13, 1978, effective Oct. 12, 1978. Amended: Filed Jan. 12, 1979, effective April 12, 1979. Amended: Filed May 27, 1981, effective Nov. 15, 1981. Amended: Filed Dec. 28, 1981, effective July 15, 1982. Amended: Filed Jan. 25, 1983, effective June 16, 1983. Amended: Filed Jan. 17, 1984, effective June 15, 1984. Amended: Filed Nov. 16, 1984, effective April 15, 1985. Amended: Filed Jan. 22, 1986, effective July 18, 1986. Amended: Filed May 4, 1987, effective July 24, 1987. Amended: Filed Feb. 2, 1988, effective April 28, 1988. Rescinded and readopted: Filed May 17, 1989, effective Dec. 15, 1989.

ATTACHMENT 2-1

2460 Pershing Road
Kansas City, Missouri 64108
Phone (816) 346-5575

Hans E. Mertens
Vice President, Engineering
Gas Service Division

May 16, 1991

Mr. Bob Leonberger
Assistant Manager-Engineering
Missouri Public Service Commission
P.O. Box 360
Jefferson City, Missouri 65102

RECEIVED

MAY 22 1991

**UTILITY DIVISION
P. S. C. MO.**

RE: Case No. GO-91-277

Mr. Leonberger;

In response to your inquiry of April 18, 1991, relative to the informational update for the Cast Iron Main and Unprotected Bare Steel Main Programs, the following additional information is offered.

CAST IRON MAIN

A preliminary review of the system has been made with a breakdown of the piping by code subsection as follows.

Section 15-D-1-A

It is estimated that 96 miles fall into the classification as being high pressure (operating above 14" w.c.) and located beneath pavement which is continuous to building walls.

Section 15-D-1-B

It is estimated that 96 miles fall into the classification as being high pressure (operating above 14" w.c.) and located near concentrations of the general public.

Section 15-D-1-C

The total mileage of small diameter, (4" and less), cast iron piping is estimated at 276 miles.

Section 15-D-1-D

In areas where extensive excavation, blasting, or construction activities have occurred in close proximity to the pipeline, the main has routinely been replaced in the past. This program will be continued in the future.

Section 15-D-1-E

Five sections of cast iron main, representing .99 miles of piping, have been replaced as a result of requirements outlined in section 192.755.

Section 15-D-1-F

In areas planned for future development projects, such as city, county or highway construction/relocation projects, the pipeline has routinely been replaced in the past. This program will be continued in the future.

Section 15-D-1-G

The leakage history and graphitization are currently being analyzed by outside consultants to evaluate and determine what type of strategic prioritization schedule should be developed.

Additional Questions

1. Miles of piping that overlap between categories.
 - A. Overlap between continuous pavement and concentrations of the general public - 92 miles.
 - B. Overlap between continuous pavement and small diameter piping - 22 miles.
 - C. Overlap between concentrations of the general public and small piping - 23 miles.

- D. Overlap between continuous pavement, concentrations of the general public and small piping - 22 miles.
2. Miles of high-pressure cast iron main for sizes 6" and smaller that is under continuous pavement.

2"	2½"	3"	4"	6"
0.31	0.0	0.73	21.25	19.15

3. Below is an estimated breakdown of the miles of cast iron replacement through the year 1995. This program is only intended to be an interim program for the replacement of cast iron main, and therefore not projected thru the year 2000 as requested. Once the FPI study more formally quantifies and further identifies the specific segments and their replacement schedule, it is proposed that this interim plan be further modified.

Year	Total (Miles)	Under Paving	Class 4 Location	Small Diameter	Other Piping	Overlap Piping
1991	4	1.0	0.0	3.5	.5	1.0
1992	4	2.5	2.5	3.5	0.5	5.0
1993	4	2.5	2.5	3.5	0.5	5.0
1994	4	2.5	2.5	3.5	0.5	5.0
1995	4	2.5	2.5	3.5	0.5	5.0

UNPROTECTED BARE STEEL MAIN

At the end of 1990 there were approximately 802 miles of unprotected bare steel piping operating within the system. A preliminary review of the system has been made with a breakdown of the piping by code subsection as follows.

Section 15-E-1

It is estimated that 29.6 miles fall into the classification as being high pressure (operating above 14" w.c.) and located beneath pavement which is continuous to building walls.

Section 15-E-2

It is estimated that 13.5 miles fall into the classification as being high pressure (operating above 14" w.c.) and located near concentrations of the general public.

Section 15-E-3

In areas where extensive excavation, blasting, or construction activities have occurred in close proximity to the pipeline, the main has been reviewed for leakage and conflict with construction and replaced where necessary. Those lines not being replaced were leak surveyed. This program will be continued in the future.

Section 15-E-4

In areas planned for future development projects, such as city, county or highway construction/relocation projects, the pipeline has routinely been replaced in the past. This program will be continued in the future.

Section 15-E-5

When sections of unprotected steel mains have developed a history of leakage, they have been replaced based on a repair/replacement criteria evaluation. This is being taken a step further with the development of the Leak Data System (LDS) and the adoption of the 5/5/3 review (5 Leaks within a city block, 500 feet, over the past 3 years) as recommended by the Stone & Webster Safety Audit.

Section 15-E-6

We are not aware of any unprotected steel mains are subject to stray currents. However, mains in this category will exhibit a leak history and therefore be replaced as required under Section 15-E-5.

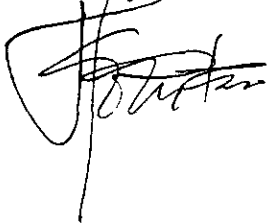
Additional Questions

1. Miles of piping that overlap between categories.
 - A. Overlap between continuous pavement and business districts - 10.7 miles.

2. Miles of high-pressure unprotected bare steel main that are under continuous pavement with a history of corrosion leaks have and continue to be repaired or replaced based on the current repair/replacement criteria and evaluation. Note response under Section 15-E-5.
3. The following is an estimated breakdown for an interim program for system protection or replacement. This program is only intended to be an interim program, and therefore not projected thru the year 2000 as requested. Once the FPI study more formally quantifies and further identifies the specific segments and their protection or replacement schedule, it is proposed that this interim plan be reviewed and modified where appropriate.

Year	Total (Miles)	Under Paving	Class 4 Locations	Other Piping	Overlap Piping
1991	30.0	0	0	30.0	0
1992	30.0	0	0	30.0	0
1993	30.0	0	0	30.0	0
1994	30.0	0	0	30.0	0
1995	30.0	0	0	30.0	0

Sincerely,



AKRE, WENDT & FISCHER

ATTORNEYS AT LAW

LOHMAN OPERA HOUSE

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ATTACHMENT 3-1

BAILEY COURT

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REPLY TO JEFFERSON CITY

STEVEN H. AKRE
JAMES M. FISCHER
DAVID H. WENDT*

*ALSO LICENSED TO
PRACTICE IN ILLINOIS

September 27, 1991

FILED

SEP 27 1991

PUBLIC SERVICE COMMISSION

Mr. C. Brent Stewart
Executive Secretary
Missouri Public Service Commission
Post Office Box 360
Jefferson City, Missouri 65102

RE: Review and Approval of Cast Iron Main and Unprotected
Steel Main Programs for The Kansas Power and Light
Company, Case No. GO-91-277

Dear Mr. Stewart:

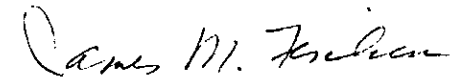
Enclosed for filing in the above-referenced proceeding are the original and fourteen (14) copies of schedules summarizing the present replacement plans of The Kansas Power and Light Company pursuant to 4 CSR 240-40.030. This docket has been established for the receipt of the cast iron main and unprotected steel main programs of the Company. The attached schedules identify the Company's replacement program for cast iron main and unprotected steel mains as well as service line replacement for the years 1992-2000, inclusive.

While we believe these plans meet the requirements of 4 CSR 240-40.030, these plans are subject to discussion and review in the context of Re Kansas Power & Light Company, Case No. GR-91-291.

If the Commission has any questions regarding the attached replacement program, we would appreciate the opportunity to answer them at the convenience of the Commission.

Very truly yours,

AKRE, WENDT & FISCHER



James M. Fischer

JMF/jr
Enclosures

cc: All Parties of Record

MISSOURI SAFETY DOCKET
(SERVICE LINES, CAST IRON, AND BARE STEEL MAINS)

SERVICE LINE REPLACEMENT	CODE SECTION	1992	1993	1994	1995	1996	1997	1998	1999	2000
TOTAL SERVICES *	SEC 15-C-3	28,845	28,845	28,845	28,845	28,845	28,845	28,845	9,322	0
CAST IRON MAIN - MILES										
4 INCH AND SMALLER - P & P **	SEC 15-D-1-A,B,C	9.4	8.6	5.4	0.0	0.0	0.0	0.0	0.0	0.0
OVER 4 INCH - P & P **	SEC 15-D-1-A,B	0.0	0.0	3.7	11.0	19.0	32.0	7.3	0.0	0.0
4 INCH AND SMALLER & OTHER	SEC 15-D-1-C	2.1	12.4	18.0	32.1	40.0	40.0	72.7	80.0	68.9
PUBLIC WORKS PROJECTS	SEC 15-D-1-D,E,F	0.0	1.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0
FPI	SEC 15-D-1-G	0.3	0.8	1.0	*** 1.0	*** 1.0	*** 1.0	*** 1.0	*** 1.0	*** 1.0
SYSTEM IMPROVEMENT		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
TOTAL CAST IRON MILES		12.8	24.3	32.1	48.1	64.0	77.0	85.0	85.0	73.9
BARE STEEL MAIN - MILES										
ALL SIZES - PROTECT - P & P **	SEC 15-E-1,2	2.2	11.8	16.1	0.0	0.0	0.0	0.0	0.0	0.0
ALL SIZES - REPLACE - P & P **	SEC 15-E-1,2	0.0	1.3	1.3	0.0	0.0	0.0	0.0	0.0	0.0
PROTECTION - WITH SLRP		102.0	100.0	100.0	90.0	75.0	44.5	0.0	0.0	0.0
PROTECTION - INDEPENDENT		22.0	15.0	15.0	15.0	16.0	24.0	0.0	0.0	0.0
PUBLIC WORKS PROJECTS	SEC 15-E-3,4	1.0	1.0	1.0	4.0	4.0	4.0	0.0	0.0	0.0
FPI	SEC 15-E-5	7.3	7.3	7.3	*** 7.2	*** 7.2	*** 7.2	0.0	0.0	0.0
SYSTEM IMPROVEMENTS		1.0	1.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0
TOTAL BARE STEEL MILES		135.5	137.4	141.7	117.2	103.2	80.7	0.0	0.0	0.0
TOTAL MILES		148.3	161.7	173.8	165.3	167.2	157.7	85.0	85.0	73.9

* BASED ON INITIAL UNPROTECTED BARE STEEL SERVICE INVENTORY OF 284,365

** IN AREAS OF CONTINUOUS PAVEMENT AND NEAR CONCENTRATIONS OF THE GENERAL PUBLIC

*** FPI REPLACEMENT MILES WILL VARY AS SEGMENTS OF MAIN ARE IDENTIFIED FOR REPLACEMENT

PSC Staff Proposal for KPL Main Programs Required By Subsections (15)(D) & (15)(E)

Cast Iron Main Replacement Program – Subsection (15)(D) – Miles

High Priority Category	Code Requirement	Total	1992	1993	1994	1995	1996	1997	1998	1999	2000
2" and 3" – P&P	(15)(D)1.A.,B.,&C.	1	1								
4" – P&P	(15)(D)1.A.,B.,&C.	22	4*	12	6						
6" – Paved	(15)(D)1.A.	19		2*	11	6					
6" – Public; >6" – P&P	(15)(D)1.A.&B.	54				4*	10	10	10	10	10
2" and 2½" – Other	(15)(D)1.C.	20	10*	10							
3" and 4" – Other	(15)(D)1.C.	233		3*	18*	32*	36	36	36	36	36
Public Works Projects	(15)(D)1.D.,E.,&F.	NA	3	3	3	3	3	3	3	3	3
Past Excavations	(15)(D)1.D.&E.	"E"	E/6	E/6	E/3	E/3					
Break/Graph. – >4"	(15)(D)1.G.	"B"					B/5	B/5	B/5	B/5	B/5

Unprotected Steel Main Program – Subsection (15)(E) – Miles

High Priority Category	Code Requirement	Total	1992	1993	1994	1995	1996	1997	1998	1999	2000
P&P – Protect	(15)(E)1.&2.	P&P = 33	10	10	10						
P&P – Replace	(15)(E)1.,2.,&5.		1#	1#	1#						
Public Works Projects	(15)(E)3.&4.	NA	4	4	4	4	4	4	4	4	4
Past Corrosion	(15)(E)5.	"C"	C/6	C/6	C/6	C/4	C/4	1	1	1	1
FPI	(15)(E)5.	NA				2	4	6	6	6	6

P&P – Areas of Continuous Pavement or General Public Concentrations

* – Emphasis on Main Segments with Fracture or Graphitization History

– Past and/or Current Corrosion Leak History; Miles should be Raised if Necessary

Long-Term Cast Iron Main Program – Paragraph (15)(D)2.

Beyond the year 2000, replacements will concentrate on the remaining 6", public works, FPI, and system improvements.
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