STATE OF MISSOURI
PUBLIC SERVICE COMMISSION
JEFFERSON CITY
July 12, 2001

CASE NO: ES-99-581

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Enclosed find certified copy of an ORDER in the above-numbered case(s).

Sincerely,

Dale Hardy Roberts

Dale Hardy Roberts
Secretary/Chief Regulatory Law Judge

STATE OF MISSOURI
PUBLIC SERVICE COMMISSION

At a session of the Public Service Commission held at its office in Jefferson City on the 12th day of July, 2001.

In the Matter of Kansas City Power & Light Company Regarding an Incident at the Hawthorn Station, Kansas City, Missouri, on February 17, 1999.	)))	**Case No. ES-99-581**

ORDER APPROVING STIPULATION AND AGREEMENT

Procedural History:

On June 1, 1999, the Staff of the Missouri Public Service Commission filed a Motion to Open Docket, stating that an explosion had occurred on February 17, 1999, at a generating plant operated by Kansas City Power & Light Company (KCPL), an electric corporation subject to Commission jurisdiction as a public utility. The explosion at Hawthorn Station's Boiler No. 5 occurred at approximately 12:30 a.m. Although the boiler was destroyed and other structures at the plant were damaged, no person was seriously injured as a result of the explosion. Staff stated that it had initiated a formal investigation into the incident and that, due to the quantity of debris, the investigation would likely require six or more months for completion. Staff requested that the Commission establish a case for the purpose of receiving information, including an incident report relating to the explosion at Hawthorn Station, and for the purpose of ordering an appropriate response to the information gathered by Staff. The Commission opened this case on June 4, 1999, and directed that Staff file its report in 120 days.

On October 8, 1999, Staff filed its Interim Report, noting that the investigation of the explosion was not yet complete and that the cause of the explosion had not yet been determined. The Commission directed that a report be filed within 120 days. On February 4, 2000, Staff filed its Second Interim Report, again noting that the investigation of the explosion was not yet complete and that the cause of the explosion had not yet been determined. The Commission again directed Staff to file another report within 120 days.

On June 6, 2000, Staff filed its Third Interim Report. Staff stated that the investigation of the explosion was still not yet complete and that the cause of the explosion had not yet been determined. Staff promised a formal incident report within 90 to 120 days of receiving the final investigation reports of KCPL and its contractor, Crawford Investigation Services (Crawford). Staff also promised another interim report within 120 days of the Third Interim Report, if the formal incident report was not yet ready at that time. Finally, Staff stated that KCPL expected to provide a report on their investigation to Staff on August 1, 2000. The Commission again directed Staff to file its report within 120 days and directed it to file any reports received from KCPL or Crawford when received.

On July 13, 2000, the Commission issued its Report and Order in Case No. EC-99-553, *GS Technology Operating Company, Inc., doing business as GST Steel Company, v. Kansas City Power & Light Company.* Ordered Paragraph No. 7 in that Report and Order stated:

> That the Staff of the Missouri Public Service Commission, in its investigation of the explosion that occurred at Hawthorn Station Unit No. 5 on February 17, 1999, in Case No. ES-99-581, shall investigate and report to the Commission as to whether or not the safety procedures prescribed by the management of Kansas City Power & Light Company were adequate and appropriate, whether or not Kansas City Power & Light Company employees followed those safety procedures, and whether Kansas City Power & Light Company has

provided adequate and appropriate training to its employees. Likewise, the Staff of the Commission shall investigate and report to the Commission in Case No. ES-99-581 as to whether or not the performance of Kansas City Power & Light Company's system has declined over the past decade and, if so, why.

On August 22, 2000, Staff filed its Notice to Commission, advising the Commission that the anticipated final investigation reports from KCPL and Crawford would be delayed. Staff further advised that it intended to file its final investigation report, together with the second report directed in Case No. EC-99-553, on or before January 25, 2001. The Commission directed Staff to implement the suggestions set out in its Notice to Commission.

On September 6, 2000, KCPL filed its motion for a protective order. KCPL asserted that its final investigation report in this matter would contain "Highly Confidential" information. KCPL further stated that the information in question was nowhere publicly available. Because the Commission ordinarily grants protective orders to protect sensitive company information and because no party objected to KCPL's request in this case, the Commission granted the protective order.

On January 23, 2001, Staff filed its Unopposed Motion for Extension of Time to File Report Concerning Kansas City Power & Light Company's Operations. Staff stated that, while its report concerning the Hawthorn Incident would be filed as expected on January 25, 2001, its accompanying report concerning KCPL's procedures, maintenance and performance would be delayed by 30 days, to February 26, 2001. The Commission granted the requested extension.

On January 25, Staff filed its Motion to File Staff Final Electric Incident Report accompanied by its *Staff Final Electric Incident Report* (*Incident Report*), in HC and

NP versions as required by the protective order.[1] On February 1, the Commission directed KCPL to respond to Staff's Incident Report within 30 days and to respond to Staff's report concerning maintenance and performance over the past ten years, due to be filed on or before February 26, 2001, within 30 days of the date that report was filed. The Commission also directed Staff to file a reply to each of KCPL's responses, within 30 days of the filing of the response.

On February 26, the Staff filed its Motion to File Staff Final Electric Incident Report[2] accompanied by its *Evaluation of Kansas City Power & Light Company's System Performance and Employee Safety and Training Programs* (*Performance Evaluation*), in HC and NP versions as required by the protective order. Also on February 26, KCPL filed its response, in HC and NP versions, to the *Incident Report.*

On March 9, Staff filed a Motion to Correct Record, stating that the official case file maintained by the Commission's Records Department did not include the correct version of the HC report entitled, *Hawthorn 5 February 17, 1999, Boiler Explosion Investigation Report*, prepared by KCPL. The Commission granted this motion on April 10.

On March 27, the parties filed their HC Stipulation and Agreement.

On March 28, Staff filed its reply to KCPL's response to Staff's *Incident Report.* Staff stated that all of its recommendations contained in the *Incident Report* were satisfactorily addressed in the Stipulation and Agreement filed on March 27 and that Staff

[1] "HC" is "Highly Confidential," that is, protected from further disclosure. "NP" is "Non-Proprietary," that is, public.

[2] Actually, this motion should have referred to Staff's Evaluation and not its Incident Report.

would file, within 30 days, a Memorandum urging the Commission to approve the Stipulation and Agreement. Also on March 28, KCPL filed its response to Staff's *Performance Evaluation.* KCPL stated that it concurred with Staff's conclusions as stated in the *Performance Evaluation.* Staff replied to KCPL's response on April 24, stating that no comment was necessary.

On April 5, Staff filed its Memorandum in Support of Stipulation and Agreement. Staff states that the Stipulation and Agreement addresses the way in which KCPL will review the fuel-trip-control logic of the burner management system of its boilers and the fuel management system of its combustion turbines. The Stipulation and Agreement details the information that KCPL is to submit in interim reports to Staff and in a final report to the Commission. A complete list of the units to be included in this review is attached to the Stipulation and Agreement. Also attached to the Stipulation and Agreement is the schedule for performing the reviews. Each unit will be reviewed when it is otherwise off-line for regular maintenance. Staff points out that the schedule can be changed if a more aggressive review is necessary to address specific problems. Additionally, KCPL has agreed in the Stipulation and Agreement to review its operating procedures to determine whether deficiencies exist in any of the manuals used by its employees. Finally, KCPL has agreed in the Stipulation and Agreement to shut off the fuel to any boiler or combustion turbine that is shut down for work on the burner management system or fuel management system.

On April 19, the Commission issued its Order Directing Filing. In this order, the Commission reviewed the course of this proceeding, noting particularly the many filings designated as "Highly Confidential" (HC) in whole or in part. The Commission directed the

parties to file their responses, justifying each HC designation and describing with particularity the harm likely to result from disclosure. Staff responded on April 30 and KCPL responded on May 1. In its response, Staff stated that it has no independent interest in maintaining the confidentiality of any of this material. KCPL, in turn, explained that it had liberally applied the HC designation in order to prevent premature disclosure of information concerning the Hawthorn explosion. KCPL asserted that such premature disclosure could well prejudice its efforts to recover damages from entities responsible to some degree for the incident. However, KCPL further explained, the filing on April 1 of several lawsuits obviated the need for further confidentiality of much of the information filed herein.

Findings of Fact:

Based on the record before it, the Commission makes these findings of fact:

KCPL is engaged in generating, transmitting and selling electrical energy at retail to customers in the state of Missouri.

What happened at Hawthorn Station?

An explosion occurred at 12:28 a.m. on February 17, 1999, at Hawthorn Station, a generating plant operated by KCPL. The explosion destroyed Boiler No. 5 and damaged other structures at the plant. No persons were seriously injured as a result of the explosion. The destroyed boiler was scrapped and the construction of a new boiler is expected to be completed in June 2001. KCPL incurred losses in excess of $450 million due to this explosion.

Why did the explosion occur?

The explosion occurred because natural gas entered the off-line boiler and was ignited. The boiler was taken off-line at 1:55 p.m. on February 16, 1999, in order to repair a leak on a line to a feedwater heater. Natural gas entered the off-line boiler because the boiler management system (BMS) sent an incorrect signal to the main gas trip valve and one of the main gas burner valves, opening them. The natural gas in the boiler was ignited by one of the boiler gas burner ignitors which the BMS incorrectly energized.

Why did the Burner Management System (BMS) fail?

At about 3:00 p.m. on February 16, 1999, the toilets in the control room area restroom overflowed into the control room. Wastewater flowed down through existing cable openings into the electronic cabinets of the BMS two floors below. KCPL personnel repaired the BMS by physically removing and drying components, and then reinstalling the dried components in the cabinets. During this process, two electronic addressing cards were incorrectly reinstalled. The result was that the BMS opened the main gas trip valve and one main gas burner valve and also energized two gas burner ignitors, thereby causing the explosion. The wastewater overflow into the BMS also caused a short circuit in a solenoid coil monitor device, SCM3. This in turn prevented the DC-HWT latching relay from re-latching and sending a signal to close the main gas trip valve when the master fuel trip relay was reset during repair of the BMS. Thus, the BMS's intrinsic fail-safe system also failed.

Background:

Hawthorn Station is located on the Missouri River in Kansas City, Missouri. It consists of two units, Nos. 5 and 6. Unit No. 6 is a Siemens 140 MW combustion turbine

which burns natural gas. Unit No. 6 entered commercial service in July 1999, some months after the explosion at Unit No. 5.

Unit No. 5 was a Combustion Engineering boiler which used natural gas to burn low sulfur, low BTU, western coal to produce high pressure steam to drive a 476 MW General Electric turbine generator. Unit No. 5 entered commercial service in May 1969. Boiler No. 5 was a drum-type boiler with tangential burners. Its walls consisted of vertical tubes welded side-by-side to form a rectangular box surrounding the boiler's furnace. The furnace was fired by gas burners in each corner. A large drum at the top of the boiler supplied water to the tubes and collected the steam.

Unit No. 5 was controlled by a BMS which was designed to shut down the boiler's fuel source whenever a trip occurred. The BMS consisted of a series of relays and latching relays interlocked with gas valves, ignitors, coal pulverizers, coal feeders, fans, and boiler control instrumentation. A relay is a device that acts like a switch. It consists of a solenoid coil and contacts. When the solenoid coil is energized, the contacts change position, either opening and breaking a circuit or closing and completing a circuit, depending on the type of relay.

The purpose of the BMS was to prevent the entry of either natural gas or an ignition spark into the boiler at inappropriate times. The BMS on Hawthorn Unit No. 5 was a Programmable Logic Controller (PLC) based system, installed in 1995. It consisted of a monitor screen in the third floor control room and cabinets containing electrical components on the first floor.

The events leading to the explosion:

On the afternoon of February 14, 1999, KCPL decided that Unit No. 5 could be placed back on-line, although repairs to the No. 4 feedwater heater were not yet completed. Standard startup procedures were initiated early on February 16 in order to return Unit No. 5 to service. However, by noon, it was apparent that air leakage from the still-unrepaired No. 4 feedwater heater was preventing the formation of a vacuum and thus the startup of the Unit No. 5 turbine. KCPL then initiated boiler shutdown procedures and, by 1:55 p.m., the Unit No. 5 boiler was again off-line.

Meanwhile, KCPL maintenance personnel had contacted Reddi-Rooter at 7:15 a.m. on February 16 concerning flushing problems with the toilet near the Hawthorn 5 control room. These problems were due to a collapsed wastewater pipe located in the plant yard near the No. 2 wastewater lift station. A Reddi-Rooter serviceman arrived at Hawthorn at about 9:37 a.m. to begin repair work. He first attempted to clear the line through the toilet itself; when this effort proved unsuccessful, he moved to the sewer line cleanout access. At about 1:00 p.m., the Reddi-Rooter serviceman's jetting tool became stuck in a check valve in the sewer line serving the Unit No. 5 control room restroom. The check valve is a device which permits water to flow in only one direction, away from the restroom. However, with the jetting tool stuck in it, the check valve did not function correctly. At 2:00 p.m., the Reddi-Rooter serviceman notified the control room of the jetting tool stuck in the sewer line check valve and requested drawings of the sewer line.

Despite notification of the jetting tool stuck in the sewer line check valve, the control room personnel permitted an automatic sump pump on the sewer line to continue to operate, with the result that wastewater was pumped out of the third floor toilet and into the

control room, damaging the BMS as already described. The pump in question was one of two located in the No. 1 waste water lift station; its operation was automatically controlled by a float in the sump. When the water in the sump reached the predetermined maximum level, the float caused a switch contact to close, starting the pump. The pressurized wastewater was able to escape past the check valve because it was jammed open by the stuck jetting tool. Some hundreds of gallons of wastewater were pumped through the restroom toilet and into the control room. The water then flowed down through cable openings and into the BMS two floors below.

The toilet overflow was not stopped until 3:00 p.m. The sump pump was not taken out of service until 4:00 p.m. Sometime after 5:00 p.m., the jetting tool was removed from the sewer line check valve. The Reddi-Rooter serviceman left the plant at 5:50 p.m.

The inundation of the BMS by the wastewater overflow caused numerous alarms to sound in the control room and caused the SCM3 to short circuit. KCPL operating and maintenance personnel then worked together to repair the BMS and to clear the various alarms. KCPL personnel repaired Rack No. 1 of the BMS as described previously between 4:00 and 4:30 p.m. They repaired Rack No. 2 between 9:00 and 9:25 p.m., inadvertently switching two addressing cards. As a result, the main gas trip valve opened, a corner gas valve opened and two ignitors were energized at 9:25 p.m. when Rack No. 2 was energized.

The Unit No. 5 boiler ignitors were alternately energized and de-energized as the cards were cleaned and Rack No. 2 was powered up and down. By 10:00 p.m., 145 MCF of natural gas had flowed into the boiler. At 10:08 p.m., a corner gas valve opened and one of three gas vent valves opened. Between 10:00 p.m. and 11:00 p.m., 263 MCF of natural

gas entered the boiler. By 11:30 p.m., Rack No. 2 was powered up with no faults showing. The corner gas valve was open and the ignitors were operating. Between 11:00 p.m. and midnight, 268 MCF of natural gas entered the boiler.

At 9:30 p.m., when KCPL's repair personnel took a dinner break, the BMS was still not working properly. By 11:30 p.m., Racks Nos. 1 and 2 of the BMS were powered up with no faults indicated. Repair work then proceeded on SMC3 until the explosion occurred at 12:28 a.m.

Following the explosion, KCPL personnel saw natural gas flames shooting up and one of them manually closed the main gas valve at the Williams Gas Company metering point.

Were KCPL's safety and operating procedures adequate?

Staff concludes that, at the time of the explosion, KCPL's safety and operating procedures were adequate and none of its employees deviated substantially from those procedures.

The Stipulation and Agreement:

In settlement of this matter, the parties have entered into a Stipulation and Agreement that they ask the Commission to approve. Initially, the Stipulation and Agreement was designated highly confidential; however, as previously noted, KCPL has now retracted that designation.[3] The Stipulation and Agreement includes 17 provisions, most of which are intended to reduce the possibility of a similar explosion in the future.

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[3] KCPL stated, in its pleading filed on May 1, 2001, that "KCPL respectfully requests that the Commission maintain the highly confidential designation with respect to the Testing Schedules that are attached to the Stipulation as Attachment A-1 and A-2. KCPL has no objections if the Commission elects to remove the highly confidential designation from the remaining documents."

The Stipulation and Agreement provides that KCPL will hire a qualified consultant to test the BMS and fuel control management system (FCMS) of each of its non-nuclear plants "to determine whether the failure of any one device of the control system could result in a condition that is likely to result in or lead to a catastrophic event, such as an explosion or fire." Likewise, a consultant will review any proposed modifications to a BMS or FCMS before they are made. If KCPL does modify any BMS or FCMS, KCPL will identify the control-logic-trip sequence. KCPL will test each BMS and FCMS and provide an individual test report for each of its plants no later than December 31, 2002. KCPL will also review its operating procedures, including its maintenance and troubleshooting guides, and determine whether any modifications are necessary. KCPL will submit a report regarding its review of its operating procedures; KCPL shall compile and submit a single final report from the BMS, FCMS and operating procedures reports referred to in the Stipulation and Agreement, on or before December 31, 2002. KCPL will manually isolate the fuel from the boiler in any plant that is shut down and undergoing work on the BMS, FCMS or fuel-trip relays. KCPL will advise Staff as to how it will accomplish this at each of its plants.

Conclusions of Law:

The Commission makes these conclusions of law:

Jurisdiction:

KCPL is an "electric corporation" and a "public utility" within the intendments of Section 386.020, (15) and (42), RSMo 2000, and is therefore subject to the jurisdiction of this Commission under Chapters 386 and 393, RSMo.

Public Safety:

The Commission is charged with the "general supervision" of all electrical corporations.[4] The Commission is authorized to investigate the facilities, methods and procedures used by electrical corporations and to "order such reasonable improvements as will best promote the public interest, preserve the public health and protect those using such . . . electricity . . . system, and those employed in the manufacture and distribution thereof[.]"[5] After notice and a hearing, the Commission may, "by general or special orders, by rules or regulations, or otherwise," require a public utility to maintain and operate its system "in such manner as to promote and safeguard the health and safety of its employees, . . . customers, and the public[.]"[6]

The requirement for a hearing is met when the opportunity for hearing has been provided and no proper party has requested the opportunity to present evidence. *State ex rel. Rex Deffenderfer Enterprises, Inc. v. Public Service Commission,* 776 S.W.2d 494, 496 (Mo. App., W.D. 1989). Since no one has requested a hearing in this matter, the Commission may resolve this case based on the pleadings and on the parties' Stipulation and Agreement.

The Commission has considered the record, the proposed Stipulation and Agreement, and Staff's Suggestions in Support of the Stipulation and Agreement. The Commission concludes that the chain of events resulting in the explosion at Hawthorn No. 5 has been identified and that the weaknesses in KCPL's control systems and

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[4] Section 393.140(1), RSMo 2000.

[5] Section 393.140(2), RSMo 2000.

[6] Section 386.310.1, RSMo 2000.

procedures that permitted the explosion to occur have also been identified. The provisions contained in the Stipulation and Agreement are reasonable and are designed to reduce or prevent the possibility of another, similar explosion. The Commission will approve the Stipulation and Agreement and direct KCPL to comply with its provisions.

IT IS THEREFORE ORDERED:

1. That the Stipulation and Agreement filed on March 27, 2001, is approved.

2. That Kansas City Power & Light Company shall comply with the provisions of the Stipulation and Agreement herein approved.

3. That this order shall become effective on July 22, 2001.

BY THE COMMISSION

Dale Hardy Roberts

Dale Hardy Roberts
Secretary/Chief Regulatory Law Judge

(S E A L)

Simmons, Ch., Lumpe, and Gaw, CC.,
Concur.
Murray, C., absent.

Thompson, Deputy Chief Regulatory Law Judge

ALJ/Secretary: Thompson / Pape

7-9 — Date Circulated

ES-99-581 — CASE NO.

KS

~~Lumpe~~, Chair
Simmons

~~Drainer, Vice Chair~~

absent
Murray, Commissioner

SL p 3, 5, 7
~~Simmons~~, Commissioner

Lumpe
Gaw, Commissioner

p. 14

7-12
Agenda Date

Action taken: 3-0 AA

Must Vote Not Later Than _____

STATE OF MISSOURI

OFFICE OF THE PUBLIC SERVICE COMMISSION

I have compared the preceding copy with the original on file in this office and I do hereby certify the same to be a true copy therefrom and the whole thereof.

WITNESS my hand and seal of the Public Service Commission, at Jefferson City, Missouri, this 12th day of July 2001.

Dale Hardy Roberts

Dale Hardy Roberts
Secretary/Chief Regulatory Law Judge