COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

BIG RIVERS ELECTRIC CORPORATION	)	
	)	
	)	CASE NO. 91-444
	)	
ALLEGED FAILURE TO COMPLY WITH COMMISSION REGULATIONS	)	

STIPULATION OF PROCEDURE

By order dated December 6, 1991, the Commission initiated this investigation to determine whether Big Rivers Electric Corporation (Big Rivers) should be subject to the penalties prescribed in KRS 278.990 for the probable violations of 807 KAR 5:006, Section 22, and 807 KAR 5:041, Section 3. The order arose from an accident which occurred on August 12, 1991, at Big Rivers' Coleman Plant in Hancock County, Kentucky, when a sulfuric acid storage tank exploded, causing the death of one employee and serious injuries to another employee.

On December 16, 1991, Big Rivers requested the Commission to hold in abeyance that portion of its December 6, 1991, order requiring Big Rivers to file a written response to the probable violations noted in the order. Big Rivers stated that it did not intend to contest any Commission findings which are parallel to those of the Kentucky Labor Department, Occupational Safety & Health Program, and wished to avoid the expense of preparation of formal responses and participating at a hearing on the show cause order.

By order dated December 19, 1991, Big Rivers' motion was sustained and an informal conference was held at the Commission's offices on January 14, 1992, at which the findings of the Commission and the position of Big Rivers were considered.

At that conference Big Rivers agreed that if it and Commission staff could agree on a stipulation of facts, Big Rivers would waive a hearing on the Show Cause order, with the Commission to decide the case on the stipulation and on any brief that might be filed. The following stipulation has been reached.

STIPULATION OF FACTS

1. On August 12, 1991, an explosion occurred in a sulfuric acid tank located in the basement of Big Rivers' Coleman Electric Generating Plant at Hawesville, Kentucky, resulting in the death of Big Rivers' employee Melvin Hagan, and the serious injury of a second employee, James Boarman. The explosion occurred while the two employees were using an oxygen and acetylene torch to cut sections from a condensate line, six inches in diameter, located close to the ceiling of the basement above, parallel to, and at the side of the tank. Exhibit 1 hereto shows the side of the tank, the condensate pipe from which the employees cut one segment and the stepladder on which Boarman was standing while cutting on the stub of pipe protruding from the wall.

2. The tank was 14 feet 7 inches in length and 8 feet in diameter. It and the condensate line ran from south towards the north wall of the basement, where the condensate line exited. The tank had a capacity of 5,000 gallons of sulfuric acid, but

contained only an estimated 2,000 gallons at the time of the explosion. It was not pressurized. The tank, and the sulfuric acid in it, were reserve elements in the Coleman Generating Station's boiler water treatment facilities, and were used only occasionally following installation of new equipment in 1984. The north end of the tank was 5-1/2 inches from the north wall of the basement. The tank was equipped with a two-inch overflow pipe which came out of the top of the tank turned down the west side of the tank, the side on which the pipe cutting was done, and terminated at the floor level of the tank. It remained open and unshielded during the pipe cutting. This overflow line was 48 inches south of the basement north wall. The tank was prominently labeled "DANGER: ACID". The area of the tank was labeled "DANGER: NO SMOKING" and "CAUTION: CUTTING AND WELDING PERMIT REQUIRED IN THIS AREA".

3. Prior to the explosion Big Rivers' maintenance supervisor, John Sosh, requested a cutting and welding clearance from Big Rivers' operation department to comply with Big Rivers' published Employee Protective Program, Manual for Accident Prevention and Safety Cutting and Welding Procedure governing hazardous or dangerous areas.

4. Gene Burlingame, Big Rivers' shift supervisor then on duty, took an oxygen and explosive gas detector (MSA-360)[1] to the work location at approximately 8:15 a.m. on August 12 to test the

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[1]This detector was tested and calibrated monthly. It was calibrated and tested on the day following the explosion and found to be within acceptable tolerances.

atmosphere in the work area. He tested two areas, (1) the area near the basement ceiling where the pipe was to be cut, and (2) the area between the top of the tank and the basement ceiling at the north end of the tank, the end closest to the proposed pipe cut. He used the twelve-foot stepladder in making these tests near the ceiling. He tested the area of the pipe cut for eight to ten minutes and the area over the tank for about five minutes. Hagan accompanied Burlingame during this testing.

5. Burlingame's testing having disclosed no gas or abnormal conditions, he had the control operator issue a cutting and welding clearance. Clearance C02771 was issued to Burlingame at 8:47 a.m. It was signed by John Sosh and Hagan accepted the clearance at 9:33 a.m. Hagan and Boarman discussed the job, got their tools and began cutting and removing the segments of the condensate pipe. The objective was to remove the old pipe through the north wall of the basement and replace it with new pipe.

6. At approximately 10:35 a.m. plant employees heard an explosion. They rushed to the close proximity of the area of the pipe cutting, where they implemented emergency rescue operations for Hagan and Boarman, both of whom had been sprayed with sulfuric acid which caused Hagan's death and Boarman's injury. The explosion ripped off about three-fourths of the south end of the acid tank (Exhibit 2), spilling an estimated 1,000 gallons of acid in the area.

7. The two-foot section of the six-inch condensate line was on the floor near the north basement wall, and almost directly

below the line from which it had been cut. A four-inch horizontal cut on the short stub of the condensate pipe left protruding from the north wall of the basement after removal of the two-foot segment indicated that the explosion occurred while the cutting of this stub was underway.

8. The acid tank was manufactured by Hungerford & Terry, Inc., and installed pursuant to drawings prepared by Hungerford & Terry and approved by Parsons-Jurden, consulting engineers employed by Big Rivers for the design and construction of the Coleman Station. It sat over a grate and a four-foot deep sump. When installed in 1967, the tank was manufactured to ASTM-A-263 Grade C steel with a maximum carbon content of 0.12 percent, and a thickness of 0.375 inch. Following the explosion, the overflow line was found broken from the top of the tank. Examination of the overflow line at the break indicated that the threads at the fitting where the break occurred were very thin. The cause of the break is unknown; whether it was a result of an internal or external force cannot be determined.

9. Technical information published by Stauffer Chemical Company and provided to the Commission by Big Rivers reveals that when sulfuric acid contacts freshly cleaned carbon steel, a reaction takes place which produces iron sulfate and explosive gaseous hydrogen. Typically, the corrosion reaction slows and eventually become insignificant as the iron sulfate forms a protective coating on the steel. However, the record in this case shows that the corrosion rate for this acid tank was significant

between 1967 and 1985. Only small amounts of hydrogen are required to present the danger of fire and explosion. The explosive range for a hydrogen-air mixture is four percent to 74.2 percent hydrogen volume. Hydrogen is lighter than air.

10. The tank leaked at the bottom on July 9, 1985. In testing the thickness of the tank at that time, the thickness of the tank wall in the bottom half of the tank ran from zero at the leak to .262 of an inch at the mid-point of the tank. Big Rivers' personnel repaired the leak without consulting the tank manufacturer. The tank was rotated 180° and continued in service, even though the thickness of the top of the tank was far below its original thickness. The tank was again examined for wall thickness on May 19, 1989, and the bottom half of the tank wall revealed thicknesses running from .200 to .300 of an inch. After the explosion the tank wall at the tank end measured from .193 to .220 of an inch.

11. An emergency water shower was located a few feet from the acid tank. Boarman was able to reach this shower following the explosion, but Hagan was unable to do so and was placed in a shower by the rescue team before being taken to the hospital.

12. Lockers in the basement near the acid tank contained rubber boots and other rubber protective clothing which Big Rivers' personnel used when working on the acid tank. Neither Hagan nor Boarman was instructed to use this equipment while cutting the condensate pipe. Hard hats equipped with ear muffs and welder's goggles were found at the scene of the explosion.

13. Hagan and Boarman used the 12-foot fiberglass stepladder shown in Exhibit 1 in cutting the condensate pipe and in lowering the two-foot segment. The stepladder would only accommodate one worker at a time. Steps of the ladder were 12 inches apart. The top of the ladder extended to within 21 inches of the condensate pipe. Boarman was standing on the third step from the top of the ladder using the cutting torch at the time of the explosion. He was cutting downward at between the 4:30 and 5:00 o'clock position on the stub of the condensate pipe which was sticking out through the north wall of the basement, and which remained after the two-foot section of the condensate pipe had been cut and laid on the floor of the basement. The splatter from this cutting would fall downward. See Boarman statement, Exhibit 3 hereto.

14. Prior to the explosion, Big Rivers published and made available to its employees various booklets including "Big Rivers' Employee Protection Program", "Manual for Accident Prevention", and "Safety Cutting and Welding Procedure". These publications were used in regularly scheduled training programs for Big Rivers' employees, and which covered tagging and operation procedures in hazardous areas. Big Rivers conducts a monthly safety training program for its production employees, weekly programs by first line supervisors and daily programs for job assignments. However, Big Rivers failed to give its employees written instructions to follow the established safety procedures for working in a hazardous area.

15. Teams from Big Rivers, the Public Service Commission, and OSHA made post-explosion inspections of the scene of the explosion.

Big Rivers' inspection report is attached as Exhibit 4. OSHA's report and six penalties against Big Rivers, ranging from $540.00 to $720.00, totalling $3,960.00, is attached as Exhibit 5. The Commission's findings are shown in its Show Cause order and attachments thereto.

16. The explosion occurred on the inside of the acid tank. The precise source of ignition cannot be determined. The consensus of Big Rivers' investigating team was that the most probable source of ignition was a piece of hot slag from the cutting of the condensate pipe stub falling to the basement floor and bouncing across the mouth of the open vent line near the basement floor and 48 inches from the north wall.

17. The Coleman Plant is the only one of the four generation stations operated by Big Rivers which has sulfuric acid stored inside the plant. Big Rivers has dismantled and removed the water treatment system, the sulfuric acid tank and the caustic soda tank (containing 50% sodium hydroxide) from the Coleman Plant basement. These tanks were reserves for service to the Generating Units at Coleman. Big Rivers now uses a reverse osmosis system of boiler water treatment for all three Coleman Units. This reverse osmosis system utilizes the sulfuric acid and caustic soda tanks located on the mezzanine floor in the Unit 3 area of Coleman Station. These tanks are vented outside the building. Big Rivers has also asked OSHA to make a safety inspection of all generating plants operated by Big Rivers. Big Rivers has and will heed the recommendations

contained in pages 11 and 12 of Attachment 1 to the Commission's Show Cause order by:

a. As stated, the sulfuric acid tank and the caustic soda tank and the water system they served have all been dismantled and removed from the basement of the Coleman Station. The sulfuric acid tank located on the mezzanine floor of the Coleman Station will be removed and replaced outside the building with a baked phenolic-lined tank. Tank wall thickness will be tested periodically by UT and if corrosion is observed and material thickness becomes below the recommended level, the tank will be promptly repaired or replaced.

b. As stated, the sulfuric acid tank on the mezzanine floor in the Coleman building is already vented outside the building and in a safe area. Any replacement tank will likewise be vented in a safe area.

c. All cutting or welding within 25 feet of the tank will be forbidden until the contents of the tank have been removed and neutralized and the area has been tested and found to be explosive-free. Proper written safety instructions will be given to any employees assigned to this task.

d. Any tank area inside the building will be well illuminated and well ventilated during operation or maintenance.

e. Employees will be instructed to use personal protective equipment while performing maintenance in the hazardous area of the sulfuric acid tank.

f. The corrective steps and actions outlined in the three memos each dated February 10, 1992, one from Rich Greenwell, Vice General Manager of Production, and two from J. V. Haner, Manager of Insurance and Loss Control, addressed to Mr. Morton Holbrook, and filed herewith as Exhibits 6, 7, and 8, will be followed.

18. This Stipulation is for use in PSC Case No. 91-444 only, and neither party hereto shall be bound by any part of the Stipulation in any other proceeding, except that this Stipulation may be used in any proceeding between the Public Service Commission and Big Rivers.

19. Big Rivers will not contest the Commission's Show Cause Order of December 6, 1991, herein, if the Commission approves this stipulation and the agreement reached between the Commission's staff and Big Rivers, that Big Rivers will pay a civil penalty of $2,000 on each of the five probable violations alleged at page 2 of Attachment A to the Show Cause Order herein, without admitting, or denying any one or more of such allegations.

Agreed to as of this 31 day of March, 1992.

BIG RIVERS ELECTRIC CORPORATION

BY: Morton Holbrook
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Its Counsel

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