Exhibit No.:
Issue: Hawthorn 5 Generating Station Explosion
Witness: Jerry N. Ward
Sponsoring Party: GST Steel, Inc.
Type of Exhibit: Direct Testimony
Case No.: EC-99-53



Before the

Public Service Commission of the State of Missouri

Case No. EC-99-553

# HAWTHORN 5 GENERATING STATION EXPLOSION FEBRUARY 17, 1999

Direct Testimony of

Jerry N. Ward

On Behalf of

GST STEEL COMPANY

Prepared by

GDS Associates, Inc.
1850 Parkway Place, Suite 720
Marietta, Georgia 30067

November 17, 1999

**Q. PLEASE STATE YOUR NAME, TITLE AND BUSINESS ADDRESS**

A. My name is Jerry N. Ward. I am a consultant to GDS Associates, Inc., and in this capacity my business address is 1850 Parkway Place, Suite 720, Marietta, Georgia, 30067.

**Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY**

A. GST Steel experienced repeated service disruptions and increased electricity costs in 1998 and 1999 as a result of a series of KCPL distribution and generation problems. My testimony presents the results of my review and analysis of these problems, and particularly the events that led up to the boiler explosion at Kansas City Power and Light's (KCPL) Hawthorn 5 Generating Station.

**Q. PLEASE SUMMARIZE YOUR FINDINGS AND RECOMMENDATIONS.**

A. Overall, KCPL for some years has been reducing the costs associated with operations, maintenance and capital replacements. KCPL's actions have resulted in a lack of management attention to the actual operation of the power plants, with a resultant significant increase in the unavailability of their units. The atmosphere thus created is typified by the reliability problems GST has experienced and the boiler explosion at Hawthorn 5 in February of 1999. The boiler explosion occurred because KCPL failed to exercise reasonable care. The company failed to take the steps necessary to ensure plant safety that prudent managers would have employed under the circumstances that prevailed at the time.

**Q. WHAT EXPERIENCE DO YOU HAVE RELATING TO THE OPERATION OF GENERATING PLANTS?**

A. Since graduating from Iowa State University in 1962, I have been involved in all aspects of electrical generation. Since beginning with the nuclear Navy, I have been involved with engineering, construction, operation and/or financing of essentially every major type of power plant, including coal, gas, nuclear and waste fuels. I have been employed by a National Laboratory, an investor-owned utility, a generation and transmission cooperative, a federally owned utility and a major engineer/constructor. In addition, I have several years of consulting experience in the industry (Shown in Exhibit 1).

**Q. PLEASE DISCUSS SIGNIFICANT FACTORS THAT HAVE INFLUENCED POWER PLANT PRODUCTION IN RECENT YEARS.**

A. In a nutshell, every utility and non-utility power producer is, or should be, preparing for a competitive power market place. Regardless of the production costs allowed in rates today, every power plant operator knows that its cost structure must be competitive with other suppliers in the region. More important, a utility like KCPL must maximize utilization of its generating resources. This point was described in the most recent edition of "Utility Business",

> Utility managers construe the term productivity to mean something different today than before deregulation began. Eight years ago, their understanding had led them to provide safe, reliable energy at the lowest reasonable cost. Now, those managers know they must increase output and reduce costs if they want to keep their jobs.[1]

[1] *Utility Business*, October 1999 at 31.

The astronomical energy price spikes experienced in the Midwest in June and September of 1998 provided an object lesson for the entire industry: the cost of poor generating unit availability and performance, particularly during peak load periods, is prohibitive. Utilities that have gambled by going into the summer season with insufficient resources have paid a significant price, as have utilities that have poor unit availability.

**Q. CAN YOU DESCRIBE THE TREND IN KCPL's PRODUCTION EXPENDITURES?**

A. Yes. KCPL operates generation resources that are primarily coal-fueled. For a number of years it has been attempting to prepare for deregulation of the electric utility industry. KCPL has also been intensely involved in at least two attempts to merge with other utility systems. It currently plans to merge with Western Resources. As will be detailed later in this testimony, KCPL has been engaged in a systematic program of reducing costs. The company also claims that improving plant availability is its highest priority. In KCPL's case, however, the company has cut costs but has not become more productive. In fact, production performance, particularly in terms of plant availability, has declined steadily. KCPL's reduced corporate attention to the details of power plant management has shown up in a series of glitches, mistakes and oversights. Collectively, they are reflected in the trend of declining equivalent availability and increasing forced outage rates. Individually, they are represented in the chronic reliability problems GST experienced in 1998 and in more spectacular fashion by the August 1998 steam pipe rupture and the February 1999 boiler explosion that virtually destroyed Hawthorn Unit 5.

**Q. PLEASE DESCRIBE KCPL's COST CUTTING EFFORTS IN THE PRODUCTION AREA.**

A. KCPL has been cutting production costs across the board for some time. The total number of employees had been reduced from over 3,130 in 1993 to 2,550 in 1998, a 19% reduction (FERC Form 1, 1989-98, page 323, Shown in Exhibit 2). This manpower reduction led directly to a reduction in operations costs of $138.3 MM in 1993 to $126.4 MM in 1998 – an 8.6 % reduction. In this same period, the maintenance expenses were reduced from $39.5 MM to $32.6 MM – a 17.4 % reduction (FERC Form 1, 1989-93, page 320, Shown in Exhibit 3).

**Q. ARE OTHER UTILITIES DOING SIMILAR THINGS?**

A. Yes. There is a general understanding that when real competition between generation sources begins at the retail level, the cost of electricity will be a prime factor in determining who sells their power. Lowering the costs needed to produce the electricity should reduce the unit price of production as long as performance levels are sustained. KCPL has cut its production costs but has seen reliability and production performance decline as well. It has become less competitive as a result.

**Q. ARE THERE ANY OTHER EXAMPLES OF KCPL'S COST CUTTING IN PRODUCTION?**

A. Yes. KCPL has consistently reduced the amount of capital expenditures forecasted to be spent on existing generating stations in each successive 5-year period. In 1994, KCPL predicted expenditures, over the next five years, of $191.6 MM for capital improvements on their existing generating stations. This amount was reduced to $155.3 MM in the

1995 projection; to $114.7 MM in their 1996 projection; and to $70.7 MM in their 1997 projection. Their 1998 projection increased to $113.1 MM, but the forecast was immediately reduced again in their 1999 projection to $81.2 MM . By comparing 5-year forecasts, the effect of a single large expenditure can be minimized, and general trends can be observed. (Construction Forecasts – Summary by Group, KCPL Budgets, Shown in Exhibit 4).

**Q. HOW HAS THE PLANT STAFF AT HAWTHORN 5 BEEN AFFECTED BY THESE REDUCTIONS?**

A. According to the Plant Manager, James Teaney, the staff has been reduced from 115 people to 102, from 1995 to 1999 – an 11% reduction.[2] Another example of impact on the staff is the number of training hours spent in a classroom for instruction other than required by OSHA. This had declined from a high of 8,318 hours in 1996 to 1,234 hours in 1998, a precipitous drop of 85% from 1996 and a 70% reduction from 1995 levels (Response to GST 3.48).[3]

**Q. WHAT DOES KCPL CLAIM IS THE NUMBER ONE GOAL OF THE PRODUCTION DEPARTMENT?**

A. Both the Vice President of Generation Services, Mr. Branca,[4] and the Hawthorn Plant Manager, Mr. Teaney,[5] stated that the top priority on their lists of power plant production goals was unit availability.

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2 Deposition of James Teaney, page 36, lines 23-25.
3 KCPL response to Data Request GST 3.48.
4 Deposition of Frank L. Brance, page 2o, lines 18-19.
5 Deposition of James Teaney, page 14, lines 20-24.

**Q. HOW HAS KCPL PERFORMED WITH REGARD TO ITS TOP PRODUCTION GOAL?**

A. By all accounts, performance relative to unit availability is abysmal. Based on data reported to the Federal Energy Regulatory Commission (FERC), between 1994 and 1998, KCPL's total system unavailable capacity due to unplanned outages and derates, at the time of the monthly peak demand, increased from 2,064 MWs to 4,608 MWs, or it more that doubled (Shown in Exhibit 5 and Exhibit 5A). This is a clear indication of declining performance. Outages and derates occur when equipment breaks down or operators and/or maintainers make mistakes. During this period, while most utilities were reducing their costs and increasing unit availability, availability at KCPL's plants has been going in the exact opposite direction.

**Q. HOW DOES KCPL RANK IN RELATION TO OTHER UTILITIES REGARDING PRODUCTION COSTS?**

A. In the October 1999 issue of Electric Light & Power, industry statistics for the year 1998 are presented (Shown in Exhibit 6). In Table 5, page 21, utilities are listed, in descending order according to their Total Cost for generating electricity, expressed in $/MWh. KCPL is ranked 87th of the 100 companies listed. In table 6, which ranks utilities by distribution costs, KCPL does not even make the list of the top (lowest cost) 100 companies.

**Q. HOW DID HAWTHORN 5 PERFORM DURING THIS PERIOD?**

A. Hawthorn 5's equivalent forced outage rate (EFOR) was 7.1% in 1994 and 5.36 % in 1995. From that point, it began to rise – reaching 11.8% in 1996; 13.59 % in 1997, and soaring to 33.52 % in 1998.[6]

**Q. HOW IS THE EQUIVALENT FORCED OUTAGE RATE CALCULATED?**

A. It is calculated according to the formula:

$$\text{NERC EFOR} = \frac{\text{Forced Outage Hours (FOH)} + \text{Eq.Forced Derated Hours (EFDH)}}{\text{FOH} + \text{Service Hours (SH)} + \text{Eq. Forced Derated Hours During Reserve Shutdowns (EFDHRS)}} \times 100\%$$

Forced Outage Hours FOH) Sum of all hours experienced during Forced Outages.

Equivalent Forced Derated Hours (EFDH)– The product of Forced Derated Hours (FDH) and size of reduction, divided by Net Maximum Capacity (NMC)
Service Hours (SH) – The total number of hours a unit was electrically connected to the transmission system.
Equivalent Forced Derated Hours During Reserve Shutdowns (EFDHRS) – The product of Forced Derated Hours (FDH) (during reserve shutdowns {RS} only) and Size of Reduction, divided by Net Maximum Capacity (NMC).
NERC – North American Electric Reliability Council.

EFOR is a commonly employed and standardized measure of the effectiveness of a plant's operation. The higher the number, the more hours the plant was not operating at the production levels expected of it. Thus, the higher the EFOR, the more expensive is the unit cost of the electricity produced by the plant. Also, poor unit availability for a utility like KCPL means that it is relying more than it should on energy purchases and more expensive resources to meet its load requirements. Given the volatility of wholesale energy in today's immature competitive markets, poor unit availability can

[6] KCPL Response to Data Request GST 2.1.

unnecessarily expose the utility, and its ratepayers, to excessive spot energy prices. In short, in today's environment, high unit availability has gone from being a desirable utility management goal to an absolute necessity. KCPL's management clearly was aware of this change in the wholesale energy market, but it did not improve the performance of KCPL's plants. To the contrary, as described above, performance steadily declined.

**Q. IS IT UNUSUAL FOR A PLANT TO HAVE A LONG PERIOD OF DECLINING AVAILABILITY?**

A. Yes. It is very unusual for a plant to demonstrate such a long period of escalating equivalent forced outage rates. Sometimes a plant will have a bad year, due to some difficult situation or major breakdown, but to see such a sustained period of increasingly poor performance is unusual, and is an indication that management is not placing the proper emphasis on plant operation. Good utility management practices would have realized and reacted to the declining availability much more quickly.

**Q. ARE YOU AWARE OF OTHER PROBLEMS RELATING TO THE RELIABILITY OF KCPL'S SERVICE TO GST?**

A. Yes. I have reviewed the Affidavit of Ronald F. Lewonski, filed on behalf of GST in the original filing with the Public Service Commission of the State of Missouri. GST experienced repeated power outages in 1998 due to recurring KCPL equipment failures. As relayed in the affidavit of Mr. Lewonski, GST's Central Maintenance Manager, chronic failures by KCPL's transformer #12 cut power to GST's mill on January 20, 1998 and repeatedly during the period July-October 1998. Transformer #12 was used equipment that was ineffectively rebuilt. KCPL eventually acknowledged that the transformer was unreliable and replaced it. Mr. Lewonski also relayed that:

- From mid-September 1998 through the beginning of November 1998 there were numerous problems with KCPL's transformer #1A. During this time period, the transformer #1A assembly experienced numerous voltage spikes. GST reported these problems to KCPL, but to my knowledge, no action was taken by KCPL to address the voltage spikes. The neglected voltage spikes culminated in a tap changer failure of transformer #1A. A root cause analysis indicated that internal spring fatigue caused the failure of the tap changer. The ineffective spring likely had been the cause of the voltage spikes. As a result of the tap changer failure, GST's Melt Shop Complex was shut down for several hours. By the time the tap changer repairs were fully completed and transformer #1A went back on line, GST had suffered production delays of 545 minutes.

- November 13, 1998, a power fluctuation attributable to KCPL occurred with the failure of their underground cable #5316-1 (likely due to deterioration of the cable associated with its age), which caused GST's Rod Mill to scrap 15 tons of steel and shut down for 170 minutes.

- On November 17, 1998 feeder #5314 was grounded while KCPL was repairing its feeder #5316 causing injuries to KCPL personnel. As a result, GST scrapped 19 tons of steel, its Rod Mill was shut down for 180 minutes, and its South Plant was shut down for 300 minutes. In addition, service to the GST Administration building was also disrupted.

KCPL eventually acknowledged that the reliability and quality of service provided to GST was "poor" (December 15, 1998 letter from G.W. Burrows to F. Branca, Shown in Exhibit 7). The utility's slow response to these circumstances and continued use of defective equipment like the #12 transformer caused nearly 50 hours of lost production time at GST's facilities and one "breakout" of liquid metal which created serious safety as well as production concerns.

In August 1998, a main high pressure steam pipe ruptured at Hawthorn 5. The pipe explosion spewed asbestos piping insulation throughout the boiler building. The potential for longitudinal ruptures of welded pipe used in such steam lines had been an industry-wide concern since a similar explosion occurred at the Mohave plant in Arizona in 1985. In KCPL's case, the company had a piping inspection program, but failed to realize that the pipe that failed was in fact welded pipe. Apparently, the plant drawings indicated that it was seamless pipe and, either the piping installed did not conform to specifications or the plant drawings were incorrect. In either case, the event caused Hawthorn 5 to be out of service for nearly three months (From August -- to November 11). This extended outage adversely affected the electricity costs charged to GST, particularly during the very high peak periods that occurred in September. Also, at some time in September 1998, all of KCPL's plants were out of service for one reason or other, except the Wolf Creek nuclear unit, which KCPL does not operate. Taken in conjunction with the increasingly poor performance of the KCPL generating stations, the overall record of KCPL's service to GST is very poor.

**Q. HAVE YOU IDENTIFIED ANY EXAMPLES OF POOR PRACTICES ON THE PART OF THE PLANT STAFF?**

A. Yes. In his deposition, the Hawthorn Plant Manager indicated that there were no written checklists to ensure a safe shutdown of plant equipment.[7] Further, while indicating he thought there was a written procedure for shutting down the facility, the operators didn't "necessarily follow it".[8] The absence of evidence that the operators followed such procedures contributed to the boiler explosion in February 1999 that destroyed most of the Hawthorn plant. Another example he offered was that in his nine years as the Plant Manager, he had never been involved with a work order problem.[9] These examples indicate a casual, informal approach toward operations and maintenance of a major utility power plant. Informality in any control room leads to errors, and can ultimately lead to serious consequences to the plant and its personnel.

**Q. PLEASE DESCRIBE THE SEQUENCE OF EVENTS LEADING UP TO THE FEBRUARY 1999 HAWTHORN 5 BOILER EXPLOSION?**

A. KCPL brought Hawthorn 5 down for a forced outage on February 12, 1999. The company's control room records indicate that plant heat-up was initiated by KCPL employees during the early hours of February 16, 1999. This means in part that the boiler

[7] Deposition of James Teaney, page 51, lines 7-10.

[8] Deposition of James Teaney, page 50, line 25 and page 51, lines 1-3.

[9] Deposition of James Teaney, page 53, lines 21-22.

was sealed, a vacuum was established, KCPL operators opened gas valves to introduce gas to the igniters, and that flames from the burners began to heat the boiler. This process is controlled by Hawthorn's operators using a computerized Burner Management System.

**Q. PLEASE DESCRIBE THE GAS LINE SYSTEM THAT FEEDS THE HAWTHORN 5 BOILER.**

A. The main gas line is 24 inches in diameter and carries gas to the main gas control valves under a nominal pressure of 380 psig. Sensors in the pipes record the volume of gas going into the boiler.

**Q. PLEASE CONTINUE DESCRIBING THE BOILER EXPLOSION.**

A. At the time of this start-up activity, two contractor employees were attempting a weld repair of a feed water heater. In attempting to draw a vacuum on the main condenser, KCPL discovered that the weld repair was not complete, and in fact, could not be completed while the line was under vacuum. Welding cannot be satisfactorily accomplished when it is attempted with a pressure differential across the area being welded. There was a lack of coordination between the operators and the contractors, and upon discovering the repair would take at least another twelve hours beyond what had been expected, the shift supervisor decided to stop the heat up.

**Q. WHAT INSTRUCTION DID THE SHIFT SUPERVISOR GIVE TO THE CONTROL OPERATOR?**

A. At approximately 1330 hours, he instructed the control operator to "take all the fuel out of the boiler;". When the Shift Supervisor returned to the control room about 45 minutes later, he instructed the control operator to remove the fans from service, and it was accomplished by 1430 (Shown in Exhibit 8). This was apparently done to minimize the loss of boiler heat during the interim period.

**Q. PLEASE CONTINUE.**

A. Just before three o'clock that afternoon, the toilets in the control room began overflowing. They had been inoperative since the previous day (Shown in Exhibit 8). The cause of this immediate problem was due to the wastewater sump pumps operating while the main sewer line was plugged. A local contractor was on site attempting to clear the line, and had removed the toilet from the control room rest room.

As described by the Hawthorn 5 Control Operator:

> The waste water sump operated. The pumps pumped water into the control room. The water was an inch to one and a half inches on the floor. It is known that circuit boards had shorted out and had to be replaced. The fuel safety system was entrained in water. Daryl Helsley (sic) the maintenance foreman was supervising a crew of technicians on the sixteenth on replacing and drying out the equipment on the fuel safety cabinet in the computer room which is three levels below the control room. They had completed their work by 22:00. (Statement of McLin, Control Operator) (Shown in Exhibit 9).

**Q. WAS THIS WASTE WATER PROBLEM AVOIDABLE?**

A. Yes. With the sewer pipe clogged and under repair, plant staff should have placed a hold on the waste water sump pumps.

**Q. PLEASE CONTINUE YOUR DESCRIPTION OF THE INCIDENT.**

A. Water from the overflow traveled down drains, electrical conduits and other openings in the control room floor to the computer room located several floors down. The water caused electrical shorts to occur in the Burner Management System (BMS), including the fuel safety subsystem. An additional technician was called in to assist in replacing a relay that had failed in the BMS system from the water intrusion. Work was just beginning on the relay replacement when the explosion occurred, just after midnight, early on February 17, 1999. (Statement of: Boylan) (Shown in Exhibit 10).

**Q. WITH THE BURNER MANAGEMENT SYSTEM OUT OF SERVICE, WHAT DID KCPL DO TO ENSURE THAT UNSAFE CONDITIONS DID NOT DEVELOP?**

A. Apparently, insufficient protective measures were taken. The BMS would automatically close all gas valves if the flame went out or any of a dozen potentially explosive or unsafe conditions developed. With BMS under repair for more than 8 hours, that fail safe system was not functioning, but the potential for unsafe and dangerous conditions to develop still existed. Also, the potential for further short circuits, erroneous readings and other difficulties with the BMS and the fuel safety subsystem due to water damage was obvious. Prudent and safe operating procedures under these circumstances required closing the manual gas supply valves and placing hold tags on them to ensure they remained in the closed position. KCPL did not take this step.

**Q. CAN YOU CONFIRM THE PRESENCE OF GAS IN THE BOILER?**

A. Yes, I have reviewed hourly readings of gas flow and pressure entering the Hawthorn site. This data for February 16 and 17 indicates the gas being used for the plant heatup beginning in the early morning of the $16^{th}$, and returning to a very low level in the early afternoon (Shown in Exhibit 11). This coincides with the statement of the Shift Foreman Lunsford – "I ordered the control operator to take all fuel out of the boiler at 1330".

**Q. DO THE HOURLY READINGS INCREASE AT A LATER TIME?**

A. Yes, beginning with the 2100 hours reading, when it had increased to 145 MCF.

**Q. DID THE READING SHOW ADDITIONAL GAS FLOW?**

A. The 2200 hour reading shows the flow had increased to 263 MCF.

**Q. PLEASE CONTINUE.**

A. The 2300 reading showed the flow continuing to increase, to 268 MCF in that hour.

**Q. AND DID THE GAS CONTIUE TO FLOW?**

A. The final reading available is for 2400, or midnight, and it shows a flow of 314 MCF. This level of gas flow is higher than any hourly reading during the earlier heatup of the boiler. (Shown in Exhibit 12).

**Q. DID THE PLANT STAFF NOTICE THE BUILDING OF GAS IN THE BOILER?**

A. Apparently not, as no action was taken to stop the flow of gas into the boiler. Introducing gas into the boiler during a shut down creates a known and unacceptable safety hazard.

**Q. WITH WATER AND SEWAGE INDUCED SHORTS TO THE BURNER MANAGEMENT SYSTEM, SHOULD KCPL HAVE TAKEN ACTIONS TO ENSURE THAT THE GAS SYSTEM REMAINED PROPERLY SECURED WHILE REPAIRS WERE MADE?**

A. Yes. If the gas system had been secured properly during the highly unusual situation of a flooded BMS and Fuel Safety System, no gas flow would have been possible. In such circumstances, the extent of damage to electrical components is difficult to assess, but the explosive risks of gas flow to the boiler is known and should have been addressed.

**Q. WHAT CAN YOU CONCLUDE WITH RESPECT TO THE BOILER EXPLOSION?**

A. Hawthorn 5 was under the control of KCPL employees at all times on February 16 and 17. At some point on February 16, apparently around 9:00 p.m. (2100 hours), it appears that a KCPL employee inadvertently opened the gas valves to the boiler, or a short in the BMS had the same effect. KCPL's control room operators did not notice the open gas valve(s) or the flow of gas into the boiler, apparently because the BMS System was under repair. Given the volume of gas in the boiler and the magnitude of the resulting explosion, KCPL was very fortunate to have avoided any injuries or fatalities. In fact, several KCPL employees were scheduled to perform some work in the boiler building a few minutes after the explosion occurred. KCPL thus avoided fatalities in this incident by the narrowest of margins. I do not know if KCPL or the Crawford Investigators have pin-pointed the exact chain of events, but the incident definitely was avoidable, and would have been avoided if KCPL had taken reasonably prudent precautions to secure the gas system while the control room, Burner Management and Fuel Safety System were under repairs.

**Q. DO YOU HAVE ANY OTHER COMMENTS?**

A. Yes. After the explosion, a technician observed a fireball in the lower level of the boiler rubble that went out, apparently after someone had the presence of mind to close the Williams main gas valve to the boiler. This observation confirmed the continuing flow of gas to the boiler and the fact that the manual isolation valves that should have been closed were actually in the open position (Shown in Exhibit 13).

**Q. DID THE PLANT STAFF HAVE ANY OPPORTUNITIES TO PREVENT THE EXPLOSION FROM OCCURING?**

A. Yes. In reviewing the statements by the plant staff who were present just before and during the explosion, there are glaring examples of poor practice. In fact, they show that the plant staff had two distinct chances to prevent the explosion. Unfortunately, those opportunities were missed.

**Q. PLEASE EXPLAIN.**

A. It is a basic electric industry practice, while working on control devices, to take steps to prevent the movement of things they control, like gas valves. Additionally, it is common practice, and good sense, to "tag out" devices (*i.e.*, place a hold on the use of such equipment) that could inadvertently operate in a system that is degraded. For example, if the wastewater sump pumps had been red tagged out while the main sewer line was plugged, it is improbable there would have been a flood of wastewater to the control room and computer room. Second, during the "drying out" process for the BMS computer, it is apparent that somehow the gas valve to the boiler was opened. To preclude the admittance of gas to the boiler due to the inadvertent opening of the gas valve, the manual valve should have been red-tagged closed. Based on the statements of the plant staff, it was not.

**Q. DOES KCPL HAVE PROCEDURES FOR TAGGING OUT EQUIPMENT?**

A. The Plant Manager stated that they do have a Hold procedure, and that:

> A worker will place that on a piece of equipment for safety reasons, personnel safety, to prevent it operating inadvertently and endangering himself. [10]

**Q. IS THERE A KCPL CORPORATE PROCEDURE REQUIRING HOLD TAGS BE USED?**

A. Yes. Section 4 of the Production Safety Rules and Procedures in entitled "Hold Procedure". Paragraph 4.06, under the general heading of "Conditions under which a hold is required" states, in part:

> ....however, if such circuit or equipment can become "live" accidentally by fallen wires or induced voltages, protection SHALL be provided...

Further, the same procedure, in section 4.15 (c) (i) states:

> The Control Authority SHALL have all switches or valves necessary to secure the equipment or section of equipment isolated from all known sources of energy by properly placing these switches and valves in the protective position and tagged by the Switch Person. (Capitals in original).

If these procedural steps been taken, as they were required to be by the Safety Rules and Procedures Manual, no gas would have been able to enter the boiler, even if the valve(s) controlled by the BMS had inadvertently opened. Remember, at the time of the explosion, the BMS was still out of service, because the relay that was known to have failed during the water incident had not yet been replaced.

[10] Deposition of James Teaney, page 47, lines 13-16.

**Q DO YOU BELIEVE THESE SITUATIONS AND THE OVERALL CLIMATE AT KCPL CONTRIBUTED TO THE HAWTHORN 5 EXPLOSION?**

A. Yes. I believe there is ample evidence of deteriorating conditions at Hawthorn 5. The declining performance of the unit over an extended period confirms there were problems. In effect, Hawthorn 5 was an accident waiting to happen – and in fact there had been several, as indicated by the extremely high Equivalent Forced Outage Rate during 1998.

**Q. WHAT IS YOUR CONCLUSION REGARDING THIS INCIDENT?**

A. KCPL was cutting production-related costs without the necessary equivalent concentration on the results of its actions. By reducing manpower, expenses, and capital investment, KCPL allowed the performance of its plants to deteriorate, and the company failed to act appropriately. By so doing, KCPL created an atmosphere regarding plant operations and maintenance that was conducive for major problems. The boiler explosion was an unfortunate but not isolated incident. It was symptomatic of the basic problems at the plant and it would have been prevented by attention to detail and by adhering to safe operating practices by the plant staff. The company failed to exercise the diligence and care expected of prudent management under the circumstances.

**Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

A. Yes, it does.

# *Exhibit 1*

**Resume**

**EDUCATION:** MS, US Navy Nuclear Power Program, 1964
BS, Iowa State University, 1962

**EXPERIENCE:**

1998 – Present Energy and Deregulation Consulting

Mr. Ward has applied his thirty-seven years of management and technical experience in the energy industry. He assists companies in reducing costs, and in developing and directing cogeneration projects. Advice is provided to the industry regarding deregulation, and customers are counseled as they begin choosing their energy supplier. Litigation support is also provided.

**Tennessee Valley Authority**

1994-1998 Tennessee Valley Authority

As Manager, Non-Utility Generation/Competition, Mr. Ward directed the group responsible for interfacing with Independent Power Producers who desired to sell electrical capacity and energy to TVA. This group also administered all contracts under which existing PURPA- qualified facilities sold electricity to TVA.

Until the responsibility was transferred to another TVA group in 1997, Valley industries were assisted in obtaining reliable, low-cost steam as well as electricity (and chilled water, brine, air, etc., as needed).

- Developed new cogeneration projects sized for the particular industrial facility.
- Included off-balance sheet financing where appropriate.

Mr. Ward served as a member of the Administration's Interagency Review Group developing its principles for restructuring the electric utility industry and creating retail open access. Mr. Ward also served as a member of TVA's Deregulation Task Force.

1992-1994 Tennessee Valley Authority

As Manager of Engineering and Modifications at the Sequoyah Nuclear Plant, Mr. Ward was responsible for all design engineering and project management activities for this two-unit facility, directing a force of 350 employees and contractors (with an annual budget of over $75 million) who provided the technical details for all design changes necessary for upgrading plant operation. In addition, the following organizations also reported to Mr. Ward:

- The **Modifications Group**, consisting of supervision, field engineers and contractor craft forces (up to a maximum of 1200 persons), performed the actual installation of the changes.

- The **Technical Programs Group** directed the performance of such diverse programs as ASME Section XI compliance, erosion-corrosion prevention and all in-service inspection activities.
- The **Stores Group** directed the purchase, receipt, storage and issuance of all materials used at the plant.

1989-1991 Jeran, Incorporated

As Energy and Management Consultant, Mr. Ward was founder and sole employee of this independent consulting firm, concentrating on the cogeneration sector. He built the company into a multi-client business, grossing $200,000 in its second year.

- Negotiated a contract for engineering and construction services for a $70 million power plant.
- Negotiated the purchase of two 400,000 #/hr circulating fluidized bed boilers, allowing a utility cogeneration subsidiary to successfully close its project financing for the facility.
- Provided capital cost and operations and maintenance costs to a large coal company for a feasibility study, allowing it to enter the lowest bid in a power purchase solicitation.
- Negotiated a wheeling contract and a power purchase contract for a unique combined-cycle cogeneration facility, allowing the project to become a reality.

Mr. Ward was retained as an expert witness by a nuclear utility. He performed research, analysis and testimony preparation for an engineering and construction mismanagement litigation.

- From a database covering 17 years of activity, which included over 45,000 drawings and 2.5 million pages of documentation, theories of mismanagement were researched, analyzed and documented.
- This was accomplished within court-imposed deadlines, and resulted in a substantial settlement for his client.

1977-1989 Bechtel Power Corporation

As Vice President, Manager of Marketing and Business Development, Mr. Ward was responsible for directing all activities related to obtaining new business for the fossil business line, world-wide, and for guiding all marketing functions.

As Vice President, Manager of Plant Operations, Mr. Ward headed the Industrial Business Development Group. He directed a new business activity for the Company. He formed and was Managing Director of a joint venture – selecting and training personnel to operate an 80-megawatt solid fuel cogeneration facility.

- Created employee compensation schedules, personnel policies and benefits programs.
- Successfully performed under a fixed-price contract.

As Vice President, Manager of Industrial Business Development, Mr. Ward was the first manager of this newly formed department. He led a group of project developers (initially two persons and growing to eight) that sought opportunities first in the Eastern region of the United States, and then throughout the country. After screening many opportunities, our targets were selected and pursued, often for several years.

- Successfully achieved financial closing on our prospects, while maintaining adequate margins, under strict budgetary controls.
- Achieved the company's first ever design, build, own and operate project.
- These projects typically required \$80-\$100 million firm price contracts, with liabilities of up to 30% of the contract price.

As Business Development Manager, Mr. Ward represented the company to utility customers in four Midwestern states and in Scandinavia. During 1983-84, the bottom fell out of the nuclear business in the Midwest, and the Company regrouped by downsizing the office, and transferring several of the management team back to the East Coast. However, several successful operating support contracts were continued during this time.

- Although Bechtel had not previously pursued work in Scandinavia, a protocol was signed with the Finnish utility, Imatron Voima Oy, which provided for our assisting them in nuclear containment design and our use of their expertise in district heating.
- A steam generator replacement study was received for Vattenfall, the Swedish state utility.

As Project Manager for five years on a two-unit, 1300-megawatt nuclear generating station in Grand Gulf, MS, Mr. Ward took over management of the project while Unit One was in early construction. This unit was a prototype, but even with the additional requirements this imposed, PLUS the problems resulting from a tornado striking the site, it was completed and turned over to the client for fuel load in just 90 months.

- Cash flow averaged \$20 million/month, with 5000 people involved on site, and an additional 600 engineering and support personnel in the home office.
- Supervised \$250 million of other contractors providing specialty services on site.

Unit Two design was completed and construction commenced while Mr. Ward was in charge.

1975-1977 Central Iowa Power Cooperative

As Manager of Power Supply for this Generating and Transmission Cooperative Mr. Ward was responsible for 300 megawatts of electric generating capacity, which included a gas-fired combined cycle facility, a coal-fired generating facility, and minority ownership of a nuclear plant.

- Represented the cooperative on the owners' committee of a 600-megawatt coal plant under construction.
- As part of a three-utility group attempting to bring the second nuclear plant to Iowa, negotiated ownership agreements and the purchase of the nuclear steam supply system.

1970-1975 Iowa Electric Light and Power Company

As Nuclear Group Leader Mr. Ward was the first person hired with previous nuclear experience. Mr. Ward was initially responsible for all mechanical systems during the period in the design when the major procurements were made. Later, while maintaining design responsibility for the radioactive waste systems, he directed regulatory agency affairs at all levels - county, state and federal. He also acted as a principal spokesman for an extensive public information program.

1968-1970 Argonne National Laboratory

As Construction Manger, the CP-5 research reactor was completely dismantled and re-built under Mr. Ward's supervision. He directed the Lab's first Quality Assurance Program providing guidance for the conduct of the work.

1962-1968 U. S. Navy Nuclear Power Program

Following graduation from Iowa State University as a Regular in the Navy NROTC program, Mr. Ward was a direct input into the Nuclear Power Program. After receiving the equivalent of a Masters Degree in Nuclear Engineering, and completing Submarine School, he served on the USS Plunger and the USS Enterprise. His responsibilities included operating the reactor plants and serving as the Electrical Division Officer. Teaching at the NROTC Unit at the Illinois Institute of Technology completed his Navy career.

# *Exhibit 2*

## KCPL FERC Form 1, 1989-98, p. 323

Brickfield, Burchette & Ritts, P.C.
July 26, 1999

**KANSAS CITY POWER & LIGHT COMPANY NUMBER OF EMPLOYEES**

| | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Full Time** | | | | | | | | | | |
| Number | 3,191 | 3,196 | 3,233 | 3,149 | 3,092 | 2,711 | 2,616 | 2,573 | 2,535 | 2,493 |
| Annual Change | | 0 | 37 | -84 | -57 | -381 | -95 | -43 | -38 | -42 |
| Percentage change | | 0% | 1% | -3% | -2% | -12% | -4% | -2% | -1% | -2% |
| Change from 1993 | | | | | | -381 | -476 | -519 | -557 | -599 |
| Percentage change from 1993 | | | | | | -12% | -15% | -17% | -18% | -19% |
| **Part Time** | | | | | | | | | | |
| Number | 25 | 47 | 43 | 32 | 38 | 27 | 27 | 29 | 59 | 57 |
| Annual Change | | 22 | -4 | -11 | 6 | -11 | 0 | 2 | 30 | -2 |
| Percentage change | | 88% | -9% | -26% | 19% | -29% | 0% | 7% | 103% | -3% |
| Change from 1993 | | | | | | -11 | -11 | -9 | 21 | 19 |
| Percentage change from 1993 | | | | | | -29% | -29% | -24% | 55% | 50% |
| **Total** | | | | | | | | | | |
| Number | 3,216 | 3,243 | 3,276 | 3,181 | 3,130 | 2,738 | 2,643 | 2,602 | 2,594 | 2,550 |
| Annual change | | 27 | 33 | -95 | -51 | -392 | -95 | -41 | -8 | -44 |
| Percentage change | | 1% | 1% | -3% | -2% | -13% | -3% | -2% | 0% | -2% |
| Change from 1993 | | | | | | -392 | -487 | -528 | -536 | -580 |
| Percentage change from 1993 | | | | | | -13% | -16% | -17% | -17% | -19% |

Appendix 5

Source: KCPL FERC Form 1, 1989-98, p. 323.

N:\GST\powercost

# *Exhibit 3*

**KCPL FERC Form 1, 1989-98, p. 320**

Brickfield, Burchette & Ritts, P.C.
July 26, 1999

| (dollars) | KANSAS CITY POWER & LIGHT COMPANY POWER PRODUCTION EXPENSES | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
| **Steam** | | | | | | | | | | |
| | | | | | | | | | | |
| Operation Cost | 130,601,048 | 141,975,961 | 142,414,876 | 136,641,444 | 138,291,517 | 141,538,899 | 139,464,549 | 140,582,906 | 131,573,392 | 126,408,970 |
| Annual change | | 11,374,913 | 438,915 | -5,773,432 | 1,650,073 | 3,247,382 | -2,074,350 | 1,118,357 | -9,009,514 | -5,164,422 |
| Percentage change | | 9% | 0% | -4% | 1% | 2% | -1% | 1% | -6% | -4% |
| Change from 1993 | | | | | | 3,247,382 | 1,173,032 | 2,291,389 | -6,718,125 | -11,882,547 |
| Percentage change from 1993 | | | | | | 2% | 1% | 2% | -5% | -9% |
| | | | | | | | | | | |
| Maintenance Cost | 34,374,661 | 38,009,291 | 39,732,010 | 42,999,117 | 39,497,412 | 34,631,107 | 40,225,808 | 32,420,969 | 31,384,384 | 32,623,497 |
| Annual change | | 3,634,630 | 1,722,719 | 3,267,107 | -3,501,705 | -4,866,305 | 5,594,701 | -7,804,839 | -1,036,585 | 1,239,113 |
| Percentage change | | 11% | 5% | 8% | -8% | -12% | 16% | -19% | -3% | 4% |
| Change from 1993 | | | | | | -4,866,305 | 728,396 | -7,076,443 | -8,113,028 | -6,873,915 |
| Percentage change from 1993 | | | | | | -4% | 2% | -18% | -21% | -17% |
| | | | | | | | | | | |
| **Nuclear** | | | | | | | | | | |
| | | | | | | | | | | |
| Operation Cost | 33,576,420 | 33,236,455 | 35,309,972 | 42,225,599 | 43,511,242 | 44,745,303 | 49,357,450 | 48,061,195 | 53,292,621 | 57,084,313 |
| Annual change | | -339,965 | 2,073,517 | 6,915,627 | 1,285,643 | 1,234,061 | 4,612,147 | -1,296,255 | 5,231,426 | 3,791,692 |
| Percentage change | | -1% | 6% | 20% | 3% | 3% | 10% | -3% | 11% | 7% |
| Change from 1993 | | | | | | 1,234,061 | 5,846,208 | 4,549,953 | 9,781,379 | 13,573,071 |
| Percentage change from 1993 | | | | | | 3% | 13% | 10% | 22% | 31% |
| | | | | | | | | | | |
| Maintenance Cost | 8,882,298 | 15,066,631 | 15,971,585 | 14,640,960 | 14,548,097 | 14,897,957 | 15,336,894 | 17,940,062 | 17,316,483 | 16,467,606 |
| Annual change | | 6,184,333 | 904,954 | -1,330,625 | -92,863 | 349,860 | 438,937 | 2,603,168 | -623,579 | -848,877 |
| Percentage change | | 70% | 6% | -8% | -1% | 2% | 3% | 17% | -3% | -5% |
| Change from 1993 | | | | | | 349,860 | 788,797 | 3,391,965 | 2,768,386 | 1,919,509 |
| Percentage change from 1993 | | | | | | 2% | 5% | 23% | 19% | 13% |

Appendix 1

Source: KCPL FERC Form 1, 1989-98, p. 320.

N:\GST\powercost

# *Exhibit 4*

## Summary of KCPL 5-Year Construction Forecasts

# SUMMARY OF
# KCPL CONSTRUCTION FORECASTS

## 5-YEAR PROJECTIONS

## EXISTING GENERATING STATIONS ONLY

YEARS PROJECTIONS WERE MADE-MILLIONS OF DOLLARS

| YEAR | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|---|
| 1994 | 32.7 | | | | | |
| 1995 | 61.9 | 27.9 | | | | |
| 1996 | 51.0 | 34.5 | 27.4 | | | |
| 1997 | 23.8 | 24.9 | 25.8 | 24.5 | | |
| 1998 | 17.2 | 34.9 | 23.5 | 11.2 | 17.1 | |
| 1999 | | 33.1 | 21.9 | 11.3 | 26.3 | 17.4 |
| 2000 | | | 16.1 | 9.6 | 26.5 | 9.4 |
| 2001 | | | | 14.1 | 8.5 | 10.1 |
| 2002 | | | | | 34.7 | 23.9 |
| 2003 | | | | | | 20.4 |
| | | | | | | |
| 5 YEAR TOTAL | 191.6 | 155.3 | 114.7 | 70.7 | 113.1 | 81.2 |

Source – KCPL Construction Forecasts – Summary by Group – Various Budget Periods, 1994-2003

# *Exhibit 5*

## Unavailable Capability
## Table From KCP&L FERC Form 714

## Kansas City Power & Light

**Unavailable Capability Due to Unplanned Outage and Derating at Time of Monthly Peak Demand**

| | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|
| Jan | 274 | 14 | 623 | 555 | 107 |
| Feb | 59 | 54 | 387 | 41 | 374 |
| Mar | 137 | 37 | 403 | 254 | 220 |
| April | 61 | 28 | 54 | 161 | 89 |
| May | 131 | - | 5 | 442 | 751 |
| June | 87 | 304 | 25 | 727 | 382 |
| July | 22 | 472 | 100 | 133 | 533 |
| Aug | 135 | 373 | 39 | 107 | 246 |
| Sept | 63 | 347 | 29 | 203 | 761 |
| Oct | 272 | - | 409 | 525 | 480 |
| Nov | 343 | 345 | 72 | 170 | 303 |
| Dec | 480 | 35 | 179 | 605 | 362 |
| Total | 2,064 | 2,009 | 2,325 | 3,923 | 4,608 |

| | Total | Incr. from 1994 | % Increase |
|---|---|---|---|
| 1994 | 2,064 | | |
| 1995 | 2,009 | -55 | -3% |
| 1996 | 2,325 | 261 | 13% |
| 1997 | 3,923 | 1859 | 90% |
| 1998 | 4,608 | 2544 | 123% |

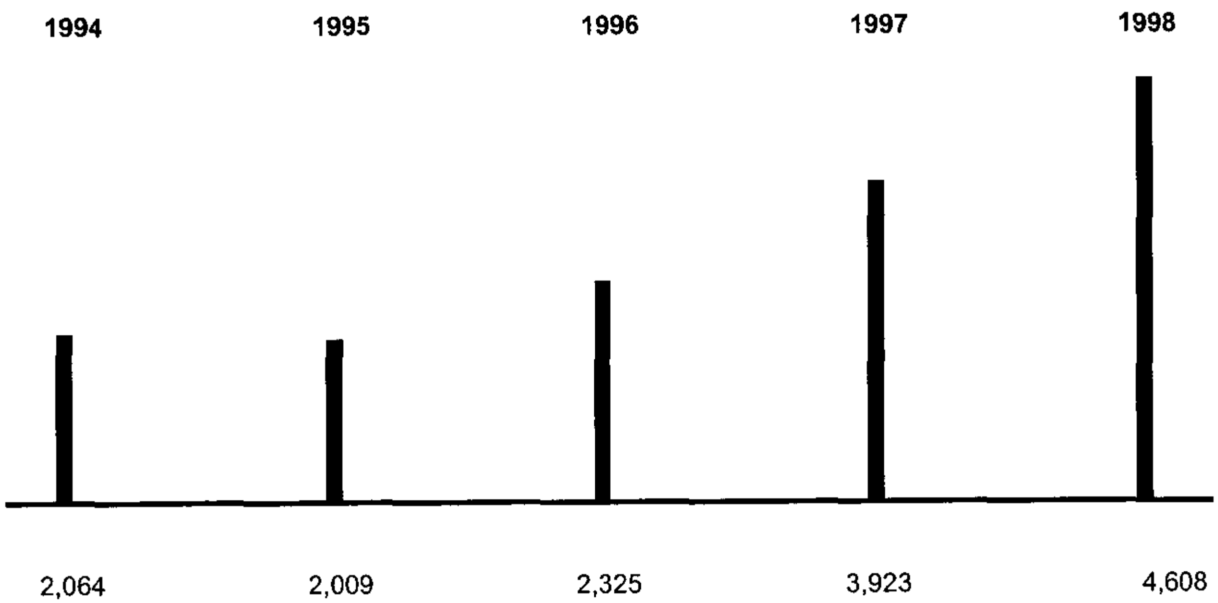
# *Exhibit 5A*

**Graph of**
**KCP&L Unavailable Capability Due to**
**Unplanned Outage & Derating at Time**
**of Monthly Peak Demand**

**KANSAS CITY POWER AND LIGHT**

**UNAVAILABLE CAPABILITY DUE TO UNPLANNED**

**OUTAGE AND DERATING AT TIME OF MONTHLY PEAK DEMAND**




**Source - KCPL FERC Form 714**

# *Exhibit 6*

**Electric Light & Power October 1999 Article**

**"Industry Report**
**On Top 100 Operating Performance"**

## Table 5. Generating costs—best 100 companies

| Rank | Company | Fossil ($/MWh) | Nuclear ($/MWh) | Hydro ($/MWh) | Other ($/MWh) | Total cost ($/MWh) |
|---|---|---|---|---|---|---|
| 1 | Black Creek Hydro, Inc. | 0.00 | 0.00 | 0.68 | 0.00 | 0.68 |
| 2 | Long Island Lighting Co. | 0.00 | 0.00 | 0.00 | 0.93 | 0.93 |
| 3 | Nebraska Public Power District (NE) *1997 | 1.09 | 0.84 | 0.06 | 0.64 | 2.63 |
| 4 | Tapoco, Inc. | 0.00 | 0.00 | 2.97 | 0.00 | 2.97 |
| 5 | Seattle City of (WA) *1997 | 1.24 | 0.00 | 1.90 | 0.00 | 3.14 |
| 6 | Yadkin, Inc. | 0.00 | 0.00 | 3.58 | 0.00 | 3.58 |
| 7 | Beebee Island Corp. | 0.00 | 0.00 | 4.19 | 0.00 | 4.19 |
| 8 | Safe Harbor Water Power Corp. | 0.00 | 0.00 | 4.55 | 0.00 | 4.55 |
| 9 | Sacramento Municipal Util Dist (CA) *1997 | 1.84 | 0.00 | 0.98 | 3.01 | 5.82 |
| 10 | Catalyst Old River Hydro Ltd Part | 0.00 | 0.00 | 6.64 | 0.12 | 6.76 |
| 11 | Lockhart Power Co. | 0.00 | 0.00 | 7.08 | 0.00 | 7.08 |
| 12 | Central Vermont Public Service Corp. | 0.00 | 0.00 | 7.29 | 0.05 | 7.34 |
| 13 | Newport Electric | 7.86 | 0.00 | 0.00 | 0.17 | 8.03 |
| 14 | Edison Sault Electric Co. | 0.00 | 0.00 | 8.16 | 0.00 | 8.16 |
| 15 | Imperial Irrigation District (CA) *1997 | 5.92 | 0.00 | 2.00 | 0.29 | 8.20 |
| 16 | Moreau Manufacturing Corp. | 0.00 | 0.00 | 10.18 | 0.00 | 10.18 |
| 17 | Blackstone Valley Electric | 0.00 | 0.00 | 10.20 | 0.00 | 10.20 |
| 18 | Northern States Power Co.- Wisc | 0.00 | 0.00 | 9.22 | 1.16 | 10.38 |
| 19 | Los Angeles City of (CA) *1997 | 9.73 | 1.04 | 0.94 | 0.01 | 11.72 |
| 20 | Electric Energy Inc. | 12.08 | 0.00 | 0.00 | 0.00 | 12.08 |
| 21 | Power Authority of State of NY (NY) *1997 | 3.38 | 8.02 | 1.05 | 0.10 | 12.56 |
| 22 | Black Hills Corp. | 11.88 | 0.00 | 0.00 | 0.74 | 12.62 |
| 23 | Consolidated Water Power Co. | 0.00 | 0.00 | 12.87 | 0.00 | 12.87 |
| 24 | Northwestern Public Service Co. | 12.39 | 0.00 | 0.00 | 0.81 | 13.20 |
| 25 | Kentucky Power Co. | 13.23 | 0.00 | 0.00 | 0.00 | 13.23 |
| 26 | Northwestern Wisconsin Electric Co. | 0.00 | 0.00 | 11.97 | 1.54 | 13.51 |
| 27 | Upper Peninsula Power Co. | 0.00 | 0.00 | 13.08 | 0.49 | 13.57 |
| 28 | Tennessee Valley Authority (TN) *1997 | 10.08 | 4.18 | 0.28 | 0.16 | 14.69 |
| 29 | Indiana-Kentucky Electric Corp. | 15.03 | 0.00 | 0.00 | 0.00 | 15.03 |
| 30 | Indianapolis Power & Light Co. | 14.87 | 0.00 | 0.00 | 0.19 | 15.06 |
| 31 | Alcoa Generating Corp. | 15.20 | 0.00 | 0.00 | 0.00 | 15.20 |
| 32 | East Texas Electric Coop, Inc. | 15.30 | 0.00 | 0.00 | 0.00 | 15.30 |
| 33 | Ohio Valley Electric | 15.45 | 0.00 | 0.00 | 0.00 | 15.45 |
| 34 | System Energy Resources, Inc. | 0.00 | 15.54 | 0.00 | 0.00 | 15.54 |
| 35 | Susquehanna Electric Co. | 0.00 | 0.00 | 15.56 | 0.00 | 15.56 |
| 36 | Dayton Power and Light Co. | 15.75 | 0.00 | 0.00 | 0.33 | 16.08 |
| 37 | MDU Resources Group, Inc. | 16.24 | 0.00 | 0.00 | 0.35 | 16.59 |
| 38 | Monongahela Power Co. | 16.64 | 0.00 | 0.00 | 0.00 | 16.64 |
| 39 | Omaha Public Power District (NE) *1997 | 7.01 | 9.43 | 0.00 | 0.26 | 16.70 |
| 40 | Cincinnati Gas & Electric Co. | 16.30 | 0.00 | 0.00 | 0.55 | 16.85 |
| 41 | Salt River Proj Ag I & P Dist (AZ) *1997 | 13.10 | 2.94 | 0.25 | 0.57 | 16.86 |
| 42 | Alaska Electric Light and Power Co. | 0.00 | 0.00 | 15.69 | 1.33 | 17.02 |
| 43 | South Beloit Water, Gas & Electric | 0.00 | 0.00 | 16.61 | 0.47 | 17.08 |
| 44 | South Carolina Pub Serv Auth (SC) *1997 | 14.83 | 1.95 | 0.26 | 0.05 | 17.08 |
| 45 | Puget Sound Energy, Inc. | 9.32 | 0.00 | 6.87 | 0.91 | 17.10 |
| 46 | Avista Corp. | 14.66 | 0.00 | 1.96 | 0.51 | 17.13 |
| 47 | Big Rivers Electric Corp. | 17.13 | 0.00 | 0.00 | 0.03 | 17.16 |
| 48 | San Antonio City of (TX) *1997 | 12.23 | 5.09 | 0.00 | 0.00 | 17.32 |
| 49 | New Hampshire Elec Coop | 0.00 | 17.41 | 0.00 | 0.00 | 17.41 |
| 50 | North Atlantic Energy Corp. | 0.00 | 17.42 | 0.00 | 0.00 | 17.42 |
| 51 | Southern Indiana Gas and Electric | 17.12 | 0.00 | 0.00 | 0.61 | 17.73 |
| 52 | St. Joseph Light & Power Co. | 16.64 | 0.00 | 0.00 | 1.10 | 17.74 |
| 53 | Illinois Power Co. | 17.77 | 0.00 | 0.00 | 0.08 | 17.85 |
| 54 | Columbus Southern Power Co. | 18.42 | 0.00 | 0.00 | 0.00 | 18.42 |
| 55 | South Carolina Generating Co. | 18.57 | 0.00 | 0.00 | 0.00 | 18.57 |
| 56 | Austin City of (TX) *1997 | 13.56 | 5.52 | 0.00 | 0.00 | 19.08 |
| 57 | Otter Tail Power Co. | 14.36 | 0.00 | 5.22 | 0.10 | 19.68 |
| 58 | Montana Power Co. | 17.29 | 0.00 | 2.75 | 0.01 | 20.05 |
| 59 | Jacksonville Electric Auth (FL) *1997 | 20.27 | 0.00 | 0.00 | 0.06 | 20.33 |
| 60 | Idaho Power Co. | 16.81 | 0.00 | 3.56 | 0.00 | 20.37 |
| 61 | AEP Generating Co. | 20.96 | 0.00 | 0.00 | 0.00 | 20.96 |
| 62 | Central Illinois Light Co. | 20.93 | 0.00 | 0.00 | 0.05 | 20.98 |
| 63 | Southern Elec Gen Co. | 21.28 | 0.00 | 0.00 | 0.08 | 21.36 |
| 64 | PSI Energy, Inc. | 17.29 | 0.00 | 2.86 | 1.51 | 21.66 |
| 65 | Appalachian Power Co. | 16.25 | 0.00 | 5.83 | 0.00 | 22.08 |
| 66 | Great Bay Power Corp. | 0.00 | 22.37 | 0.00 | 0.00 | 22.37 |
| 67 | Minnesota Power | 16.89 | 0.00 | 5.63 | 0.00 | 22.52 |
| 68 | York Haven Power Co. | 0.00 | 0.00 | 22.62 | 0.00 | 22.62 |
| 69 | Ocean State Power | 22.80 | 0.00 | 0.00 | 0.00 | 22.80 |
| 70 | Texas-New Mexico Power Co. | 23.48 | 0.00 | 0.00 | 0.00 | 23.48 |
| 71 | Boston Edison Co. | 0.00 | 23.45 | 0.00 | 0.05 | 23.50 |
| 72 | Central Illinois Public Service Co. | 23.92 | 0.00 | 0.00 | 0.00 | 23.92 |
| 73 | Entergy New Orleans, Inc. | 24.02 | 0.00 | 0.00 | 0.02 | 24.04 |
| 74 | Morrisville Water and Light Dept. | 0.00 | 0.00 | 24.47 | 0.00 | 24.47 |
| 75 | Orlando Utilities Comm (FL) *1997 | 22.32 | 1.38 | 0.00 | 0.88 | 24.58 |
| 76 | Louisville Gas and Electric Co. | 16.96 | 0.00 | 7.89 | 0.10 | 24.95 |
| 77 | Ocean State Power II | 24.99 | 0.00 | 0.00 | 0.00 | 24.99 |
| 78 | West Penn Power Co. | 16.35 | 0.00 | 8.87 | 0.00 | 25.22 |
| 79 | Commonwealth Electric Co. | 25.24 | 0.00 | 0.00 | 0.02 | 25.26 |
| 80 | Northern Indiana Public Service Co. | 20.50 | 0.00 | 4.81 | 0.20 | 25.51 |
| 81 | KeySpan Generation LLC | 25.81 | 0.00 | 0.00 | 0.69 | 26.50 |
| 82 | Kentucky Utilities Co. | 15.05 | 0.00 | 11.16 | 0.41 | 26.62 |
| 83 | Old Dominion Electric Cooperative | 15.23 | 11.58 | 0.00 | 0.00 | 26.81 |
| 84 | Ohio Power Co. | 20.70 | 0.00 | 6.32 | 0.00 | 27.02 |
| 85 | Empire District Electric Co. | 16.43 | 0.00 | 7.03 | 4.02 | 27.48 |
| 86 | Tucson Electric Power Co. | 28.40 | 0.00 | 0.00 | 0.10 | 28.50 |
| ~~87~~ | ~~Kansas City Power & Light Co.~~ | ~~13.57~~ | ~~15.62~~ | ~~0.00~~ | ~~0.71~~ | ~~29.90~~ |
| 88 | Narragansett Electric Co. | 28.71 | 0.00 | 0.00 | 1.55 | 30.26 |
| 89 | Vermont Yankee Nuclear Pwr. Corp. | 0.00 | 34.79 | 0.00 | 0.00 | 34.79 |
| 90 | Potomac Edison Co. | 16.17 | 0.00 | 19.34 | 0.00 | 35.51 |
| 91 | Hawaiian Electric Company, Inc. | 35.91 | 0.00 | 0.00 | 0.07 | 35.98 |
| 92 | Northern States Power Co. | 9.67 | 16.94 | 9.46 | 0.29 | 36.36 |
| 93 | Gulf Power Co. | 36.64 | 0.00 | 0.00 | 0.18 | 36.82 |
| 94 | Metropolitan Edison Co. | 19.25 | 17.38 | 0.00 | 0.68 | 37.31 |
| 95 | Duke Energy Corp. | 16.25 | 15.09 | 6.50 | 0.43 | 38.27 |
| 96 | Public Service Co. of Oklahoma | 38.22 | 0.00 | 0.00 | 0.13 | 38.35 |
| 97 | Indiana Michigan Power Co. | 20.89 | 0.00 | 17.90 | 0.02 | 38.81 |
| 98 | Chugach Electric Association, Inc. | 18.91 | 0.00 | 0.00 | 20.52 | 39.43 |
| 99 | PacifiCorp | 34.33 | 0.00 | 4.87 | 0.40 | 39.60 |
| 100 | Portland General Electric Co. | 31.32 | 0.00 | 6.25 | 2.70 | 40.27 |
| **Average** | | **12.68** | **2.48** | **3.60** | **0.54** | **19.28** |

Source: Navigant Consulting

## Table 6. Distribution costs—best 100 companies

| Rank | Company | Dist Total Exp | Customer accts exp | Sales total exp | Average customers | Distribution ($/customer) |
|---|---|---|---|---|---|---|
| 1 | Exeter & Hampton Electric Co. | 1,054,388 | 1,046,856 | 0 | 39,486 | 53.21 |
| 2 | Central Power and Light Co. | 27,113,711 | 15,876,326 | 0 | 642,022 | 66.96 |
| 3 | South Beloit Water, Gas & Electric | 238,236 | 301,326 | 0 | 7,432 | 72.60 |
| 4 | San Antonio City of (TX) *1997 | 31,167,074 | 8,264,841 | 37,560 | 535,998 | 73.64 |
| 5 | El Paso Electric Company | 13,064,870 | 8,112,516 | 105,604 | 287,911 | 73.92 |
| 6 | Public Service Co. of Colorado | 50,939,445 | 30,094,369 | 5,047,718 | 1,163,468 | 73.99 |
| 7 | Concord Electric Co. | 1,161,624 | 874,836 | 0 | 27,125 | 75.08 |
| 8 | Green Mountain Power Corp. | 4,015,257 | 2,278,598 | 468 | 83,549 | 75.34 |
| 9 | Puget Sound Energy, Inc. | 45,078,232 | 20,870,573 | 531,142 | 881,834 | 75.39 |
| 10 | Public Service Co. of Oklahoma | 25,952,013 | 12,037,565 | 0 | 485,927 | 78.18 |
| 11 | Tucson Electric Power Co. | 12,075,023 | 11,668,572 | 1,589,701 | 320,744 | 78.98 |
| 12 | Florida Power & Light Co. *1997 | 187,778,891 | 102,505,224 | 52,984 | 3,615,493 | 80.30 |
| 13 | Nevada Power Co. | 21,114,418 | 21,427,842 | 764,854 | 534,875 | 80.97 |
| 14 | Southwestern Electric Power Co. | 24,039,634 | 10,144,763 | 0 | 419,019 | 81.58 |
| 15 | Wisconsin Power and Light Co. | 21,048,529 | 10,746,673 | 94,023 | 388,721 | 82.04 |
| 16 | Entergy New Orleans, Inc. | 7,407,362 | 4,811,615 | 3,626,401 | 189,317 | 83.70 |
| 17 | Fitchburg Gas & Electric Light Co. | 1,284,852 | 1,117,053 | 31,577 | 28,936 | 84.10 |
| 18 | Morenci Water & Electric Co. | 138,560 | 40,090 | 211 | 2,125 | 84.17 |
| 19 | Citizens Utilities Co. | 4,951,451 | 4,474,753 | 138,652 | 112,884 | 84.73 |
| 20 | Southwestern Public Service Co. | 18,345,581 | 11,473,820 | 2,612,449 | 381,684 | 84.97 |
| 21 | Superior Water, Light & Power Co. | 802,510 | 396,274 | 0 | 14,029 | 85.45 |
| 22 | Virginia Electric and Power Co. *1997 | 110,233,126 | 54,544,163 | 5,587,414 | 1,975,924 | 86.22 |
| 23 | West Texas Utilities Co. | 10,458,171 | 5,848,442 | 0 | 188,103 | 86.69 |
| 24 | Public Service Electric and Gas Co. | 102,816,341 | 63,080,344 | 1,178,945 | 1,910,967 | 87.43 |
| 25 | Maine Public Service Co. | 1,981,007 | 1,096,387 | 40,336 | 35,373 | 88.14 |
| 26 | Oklahoma Gas and Electric Co. | 39,243,365 | 19,497,748 | 2,437,997 | 693,659 | 88.20 |
| 27 | Sierra Pacific Power Co. | 16,141,845 | 9,659,611 | 0 | 290,485 | 88.82 |
| 28 | Consumers Energy Co. | 91,682,218 | 52,811,890 | 1,242,080 | 1,627,792 | 89.53 |
| 29 | Entergy Louisiana, Inc. | 32,657,238 | 15,419,743 | 8,587,666 | 628,814 | 90.11 |
| 30 | Florida Power Corp. *1997 | 60,430,976 | 50,165,972 | 9,697,077 | 1,314,491 | 91.51 |
| 31 | Union Light, Heat and Power Co. | 4,737,943 | 4,541,746 | 1,622,661 | 119,046 | 91.58 |
| 32 | Avista Corp. | 16,139,219 | 10,908,675 | 602,539 | 301,905 | 91.59 |
| 33 | Jacksonville Electric Auth (FL) *1997 | 20,660,627 | 10,914,023 | 0 | 337,420 | 93.58 |
| 34 | South Carolina Pub Serv Auth. (SC) *1997 | 6,163,000 | 2,875,000 | 1,707,000 | 114,322 | 93.99 |
| 35 | Upper Peninsula Power Co. | 4,495,390 | 1,413,314 | 4,561 | 62,384 | 94.79 |
| 36 | MDU Resources Group, Inc. | 7,075,218 | 3,417,661 | 345,751 | 114,111 | 94.98 |
| 37 | Public Service Co. - New Mexico | 18,094,078 | 11,707,707 | 4,020,469 | 353,576 | 95.66 |
| 38 | Tampa Electric Co. | 27,510,072 | 20,854,984 | 2,685,877 | 530,252 | 96.28 |
| 39 | Madison Gas and Electric Co. | 7,482,610 | 4,226,263 | 174,549 | 123,264 | 96.41 |
| 40 | Carolina Power & Light Co. | 61,128,377 | 43,848,503 | 7,713,917 | 1,168,550 | 96.44 |
| 41 | Entergy Gulf States, Inc. | 33,171,081 | 19,464,872 | 10,495,127 | 649,934 | 97.13 |
| 42 | San Diego Gas & Electric Co. | 68,735,847 | 47,307,550 | 32,884 | 1,189,545 | 97.58 |
| 43 | Wisconsin Electric Power Co. | 64,031,114 | 32,405,422 | 348,722 | 983,817 | 98.38 |
| 44 | Northwestern Public Service Co. | 4,253,045 | 1,314,968 | -11,786 | 55,957 | 99.29 |
| 45 | Northern Indiana Public Service Co. | 22,620,788 | 15,361,228 | 3,945,813 | 418,356 | 100.22 |
| 46 | Louisville Gas and Electric Co. | 26,630,059 | 8,263,893 | 1,292,814 | 359,291 | 100.72 |
| 47 | Orlando Utilities Comm (FL) *1997 | 5,941,814 | 6,438,281 | 1,290,144 | 134,672 | 101.51 |
| 48 | Citizens Electric Co. | 404,428 | 239,364 | 0 | 6,308 | 102.06 |
| 49 | Western Resources, Inc. | 22,823,790 | 10,992,025 | 639,340 | 336,864 | 102.28 |
| 50 | St. Joseph Light & Power Co. | 4,182,137 | 1,568,576 | 645,167 | 61,988 | 103.18 |
| 51 | South Carolina Electric & Gas Co. | 30,427,568 | 20,685,342 | 1,887,392 | 510,471 | 103.83 |
| 52 | Kansas Gas and Electric Co. | 19,035,520 | 9,982,654 | 407,487 | 283,319 | 103.86 |
| 53 | Portland General Electric Co. | 45,027,300 | 26,842,958 | 913,538 | 691,061 | 105.32 |
| 54 | Atlantic City Electric Co. | 33,982,964 | 17,163,574 | 117,922 | 486,521 | 105.37 |
| 55 | Duke Energy Corp. | 128,499,495 | 78,078,272 | 836,743 | 1,968,201 | 105.38 |
| 56 | Potomac Edison Co. | 25,812,795 | 13,820,401 | 1,117,084 | 386,064 | 105.55 |
| 57 | Black Hills Corp. | 3,016,814 | 2,974,695 | 0 | 56,665 | 105.74 |
| 58 | Southern California Edison Co. | 203,753,593 | 241,385,187 | 7,976,998 | 4,283,996 | 105.77 |
| 59 | West Penn Power Co. | 43,307,970 | 24,973,167 | 2,811,970 | 669,319 | 106.22 |
| 60 | Bangor Hydro-Electric Co. | 7,980,038 | 4,529,670 | 394,242 | 120,558 | 107.04 |
| 61 | Lockhart Power Co. | 379,767 | 261,506 | 614 | 5,988 | 107.20 |
| 62 | IES Utilities Inc. | 23,915,030 | 12,738,802 | 51,439 | 339,823 | 108.01 |
| 63 | Maui Electric Co. | 3,759,558 | 2,107,490 | 99,291 | 54,871 | 108.73 |
| 64 | Morrisville Water and Light Dept. | 259,696 | 105,337 | 0 | 3,353 | 108.87 |
| 65 | Narragansett Electric Co. | 23,079,983 | 13,298,552 | 0 | 332,828 | 109.30 |
| 66 | Entergy Arkansas, Inc. | 37,398,076 | 22,414,788 | 8,999,787 | 627,824 | 109.61 |
| 67 | Wisconsin Public Service Corp. | 29,270,554 | 12,221,292 | 133,921 | 377,491 | 110.27 |
| 68 | Northern States Power Co.- Wisc | 19,118,853 | 5,814,521 | 314,444 | 228,540 | 110.47 |
| 69 | Eastern Edison Co. | 14,329,450 | 7,054,414 | 106,380 | 193,658 | 110.97 |
| 70 | Blackstone Valley Electric | 6,462,847 | 3,736,009 | 84,331 | 91,307 | 112.62 |
| 71 | Columbus Southern Power Co. | 39,193,908 | 29,246,616 | 2,725,127 | 629,758 | 113.00 |
| 72 | Interstate Power Co. | 13,208,680 | 5,549,340 | 4,546 | 165,725 | 113.22 |
| 73 | UtiliCorp United Inc. | 28,559,758 | 11,629,036 | 1,804,838 | 370,468 | 113.35 |
| 74 | Central Illinois Light Co. | 13,254,639 | 7,524,569 | 1,599,193 | 195,228 | 114.63 |
| 75 | Pennsylvania Power Co. | 11,015,336 | 5,650,156 | 116,499 | 146,326 | 114.69 |
| 76 | Reliant Energy HL&P | 91,184,422 | 91,112,591 | 1,006,367 | 1,596,339 | 114.83 |
| 77 | Northern States Power Co. | 97,511,886 | 48,080,437 | 6,759,173 | 1,318,195 | 115.58 |
| 78 | Delmarva Power & Light Co. | 36,982,930 | 14,693,197 | 1,064,138 | 452,126 | 116.65 |
| 79 | Texas-New Mexico Power Co. | 17,831,110 | 8,459,721 | 157,151 | 226,287 | 116.88 |
| 80 | Jersey Central Power & Light Co. | 79,516,672 | 33,595,679 | 1,578,565 | 976,604 | 117.44 |
| 81 | Southern Indiana Gas and Electric | 7,939,005 | 4,825,703 | 1,762,705 | 123,346 | 117.78 |
| 82 | Montana Power Co. | 24,832,001 | 7,160,662 | 1,482,647 | 283,760 | 117.97 |
| 83 | New Hampshire Elec Coop | 6,229,387 | 2,057,599 | 0 | 70,094 | 118.23 |
| 84 | Massachusetts Electric Co. | 71,519,791 | 43,591,984 | 0 | 972,056 | 118.42 |
| 85 | Kentucky Utilities Co. | 29,827,916 | 19,802,032 | 6,553,669 | 472,458 | 118.92 |
| 86 | Granite State Electric Co. | 2,996,878 | 1,345,750 | 0 | 36,501 | 118.97 |
| ~~87~~ | ~~Baltimore Gas and Electric Co.~~ | ~~86,965,709~~ | ~~46,012,150~~ | ~~0~~ | ~~1,116,652~~ | ~~119.09~~ |
| 88 | Empire District Electric Co. | 10,500,343 | 5,758,090 | 806,000 | 143,142 | 119.21 |
| 89 | Indianapolis Power & Light Co. | 29,595,870 | 15,642,052 | 5,252,299 | 423,397 | 119.25 |
| 90 | Anoka Electric Cooperative | 6,803,103 | 3,915,167 | 0 | 89,780 | 119.38 |
| 91 | Salt River Proj Ag I & P Dist (AZ) *1997 | 47,360,304 | 26,405,513 | 4,086,913 | 650,941 | 119.60 |
| 92 | Indiana Michigan Power Co. | 45,114,455 | 20,517,870 | 332,930 | 551,215 | 119.67 |
| 93 | Commonwealth Electric Co. | 20,041,517 | 18,600,364 | 755,624 | 327,033 | 120.47 |
| 94 | Dayton Power and Light Co. | 32,365,586 | 26,484,071 | 0 | 487,560 | 120.70 |
| 95 | Austin City of (TX) *1997 | 28,791,759 | 11,732,087 | 0 | 333,752 | 121.42 |
| 96 | Cincinnati Gas & Electric Co. | 32,039,831 | 33,904,473 | 9,723,153 | 622,803 | 121.50 |
| 97 | Toledo Edison Co. | 19,463,512 | 12,610,077 | 4,011,536 | 296,458 | 121.72 |
| 98 | Cleveland Electric Illuminating | 57,072,505 | 26,251,752 | 7,600,406 | 746,893 | 121.74 |
| 99 | Connecticut Light and Power Co. | 85,140,344 | 46,813,832 | 3,596,296 | 1,111,340 | 121.97 |
| 100 | PacifiCorp | 97,117,213 | 72,030,470 | 9,225,706 | 1,454,161 | 122.66 |
| **Average** | | **32,594,908** | **20,299,445** | **1,792,195** | **543,520** | **100.73** |

Source: Navigant Consulting

# *Exhibit 7*

**Letter From**
**G.W. Burrows to Frank Branca**

December 15, 1998

Mr. Frank Branca

Re: GST Outages

GST has experienced thirteen outages this year resulting from a combination of substation equipment failures at Blue Valley Sub and distribution equipment on circuits feed from Blue Valley Sub. This level of reliability is poor, and we have taken actions to improve it. Eight of the outages were due to cable faults, four were due to #12 transformer, and one was due to a failure of a new 161 kV breaker.

First, we have moved the normal feed to all other customers off #1 and #2 buses. GST will be the only customer normally fed from these buses. There were four faults this year on cables feeding PraxAir, which also caused outages to GST since PraxAir was being fed from #1 bus. During normal operation this action will eliminate the effects on GST caused by other customers. Second, eight of the GST outages were due to cable faults. Two of the faults were on cables owned by GST. There are a couple of thoughts on the reasons for the increased number of cable faults we have experienced. One is that we may have increased cable duct heating when the new PraxAir cable and load were added. This has been addressed and field changes made to reduce the cable duct temperatures. With these changes, we now feel this possible condition has been alleviated. A couple of the cable failures and one averted failure may have been caused by mechanical fatigue of the lead sheath on the cable due to movement of the Blue River bridge. Underground will visually inspect all of the cables in the four manholes on the bridge and repair or replace any cable with a problem.

Third, we are installing an additional transformer to normally supply the 16,000-hp motor at PraxAir. With this transformer in service, we will not have to isolate the bus before PraxAir can start this motor. Likewise, GST will not be asked to hold up production while PraxAir is starting this motor. We expect to have this transformer in service by June of next year.

One outage was caused by a failure of a new 161 kV breaker at Blue Valley. The breaker was replaced. This breaker was installed as part of a program to upgrade the 161 kV breakers.

Four of the outages were due to the problems we had with #12 transformer supplying #1 and #2 buses. We had two transformers fail in the #12 transformer position. We believe the failures of these two transformers were not related but due to the specific transformer problems. Our monitoring equipment of #1 bus power quality has indicated 30 amps of DC offset in the neutral current. This was just a snapshot, and we are investigating this further.

We believe with the actions taken, the reliability of GST load fed from Blue Valley should improve significantly.

G. W. Burrows

cc: Mr. V. J. Skripsky
Mr. M. E. Bier

GWB:lsc

# *Exhibit 8*

**Statement of Mike Lunsford**
**Dated 2/22/99**

KCPL#6

## Lunsford Mike

**From:** Lunsford Mike
**Sent:** Monday, February 22, 1999 3:43 PM
**To:** Smith Bob
**Subject:** Incident report

Bob Smith
Hawthorn Station
Incident Report for 2-17-99

2-22-99

Upon arrival at work that morning (16th), I relieved T. Stowers, who had worked the 11-7 shift. There was a fire (1 level warm-ups) in the unit at that time. Pressure was around 30 lbs. The fire had been in since 03:38 am. Before leaving for the morning meeting (07:15) I told the operator to go ahead and put another level of gas in. Dispatching had been told that Hawthorn would be on around 10:30 am.

At the morning meeting, I brought up the subject of the control room urinal's. They had not been functioning since early monday morning. The decision was made to have a contractor come in and repair.

We started to pull vacuum around 10:00 or 10:30. We were only able to sustain about 11 inches of vacuum. Operator's and myself started checking area's for reasons. It was found that the #4 L.P. Heater shell repair was causing the low vacuum. I had been told, the previous night, that the heater work would be done by noon tuesday. I contacted Steve Cox and relayed the problem we were having. He checked with the contractor's working on the heater and was told that it would be tuesday before they are done. He told me that they were going to see about getting a different contractor in to finish the work. This was around noon to 13:00 hrs.

I attended a training committee meeting at 13:00 hrs. At 13:30 hrs, Steve called me and told me that it was going to be at least 12 hrs before the heaters would be done. I called the control operator and told him to take all the fuel out of the boiler. This was done, however, the fans were left on at this time.

Upon returning from the training meeting at 14:15 hrs, I noticed the fans still on. I had the operator take the fans off in an effort to keep as much pressure bottled up as possible. The fans were removed from service around 14:30 hrs.

At approximately 14:45 hrs, the control room toilets started to overflow, like someone was backflushing the line and it was coming up here instead of going out the discharge. I called for Steve Cox and J. Martin in an effort to get someone that knew where the contractor, who was working on the toilets, was at this time so he could be told to stop what he was doing. The toilets overflowed for several minutes before stopping. There was raw sewage and water over half of the control room floor and water was running down the holes in the floor for cable routing. Maint. was surveying the damage and cleaning up as much as possible after the water stopped. There was no apparent problems showing up on the BTG board when I left at 15:30 hrs.

M. Lunsford
2 23 99

# *Exhibit 9*

**Statement of Melford H. McLin**
**Dated 2/18/99**

KCPLH~

Incident Report
Explosion, February 17, 1999
Approximately 00:25

I relieved Kirkwood at 23:00. I normally arrive at 22:00 but had a rest period. I had worked sixteen hours the previous day. I read the log book and walked the control panel down.

Roto Rooter a sewer maintenance company, cleaned the sewer lines in the control room during the day and afternoon shifts. The waste water sump operated. The pumps pumped water into the control room. The water was an inch to one and a half inches on the floor. It is known that circuit boards had shorted out and had to be replaced. The fuel safety system was entrained in water. Daryl Helsley the maintenance foreman was supervising a crew of technicians on the sixteenth on replacing and drying out the equipment on the fuel safety cabinet in the computer room which is three levels below the control room. They had completed their work by 22:00. This was before I arrived on the seventeenth

We did not have a fire in the boiler. The fans were off. The drum level was normal. We were waiting for the Fischbach welders to finish their work on number four low pressure heater.

While doing the midnight readings, the boiler exploded. I put my hands over my eyes and waited until the noise stopped.

I called Doug at dispatching . I notified him that we needed to call emergency people in because of the explosion.

I surveyed the control room;

Everything was covered with ash and broken glass. The patio doors had exploded inward. The Aux Buss OCBs had opened. The emergency lighting was on. I noticed a bright light outside. I went outside to see what was going on. The boiler was gone. I told Kirkwood to shut the gas off to the unit. He shut all the gas off. The fire went out. We continued to survey the damage. I Checked the D.C. Emergency power on the turbine lubrication pumps. It was OK. More damage reports came in, Jim Martin had lost his eyeglasses because of being knocked down during the explosion. He was not injured. I made a list of all personnel and their current whereabouts. Worked with the fire department on this list to verify it. Call the appropriate management people. The fire department had requested a structural engineer. Mike Schockey was contacted by some else. Had to make a list of V.I P. people to let them into the plant. The police would not allow anyone access to the plant.

Kirkwood informed me that water was raining down of the power centers and the 4160 buss. We decided to shut off the fire protection system main isolation valve.

Our next concern was the explosive status of the generator. It was decided to vent all the Hydrogen gas from the generator. We informed the fire department that we need to purge the generator with $CO^{-}$
The Generator was purged. We were giver direct orders by Jim Martin to evacuate the area. We evacuated the unit.

It is abnormal for the gas valves or any fuel to enter the boiler without all permits being met. If this has occurred, then the cause of operation is an abnormal circuit failure. Failure would be caused by a short circuit. I believe this is the case.

February 18, 1999

Melford H. McLin

By: Melford H. McLin

# *Exhibit 10*

**Statement of Ray Boylan**
**Dated 2/18/99**

KCPL #6

RB
2-17-99 I arrived on site at about 11:10 PM for a call-in from D. Sansley which I recieved at home at about 4:00 P.M. 2-17-

After arriving on site, I went to the elect. shop and got my work clothes on and picked up my handtools. I then went to the #5 control room and talked to the control operators about the reason for my call in. I was told to find Darrel Hensley about work to be done in the computer room.

I found D. Hensley in the tech. shop and talked briefly to Ed Long about what I was needed for on the shift. I was to assist the tech, coming on shift in the replacement of a relay before start-up of the unit.

D. Hensley, the tech (Bill Human), I myself then went to the computer room and looked at the job to be done and ~~the~~ a discussion of what the best ~~way~~ was to change out the relay.

We got the tools and equipment we thought would be needed and were just setting down at the job when the unit exploded.

Ray D. Boylan BOYLAN
2-18-99

# *Exhibit 11*

**Hawthorn 5 Gas Flow**
**Hourly Readings**

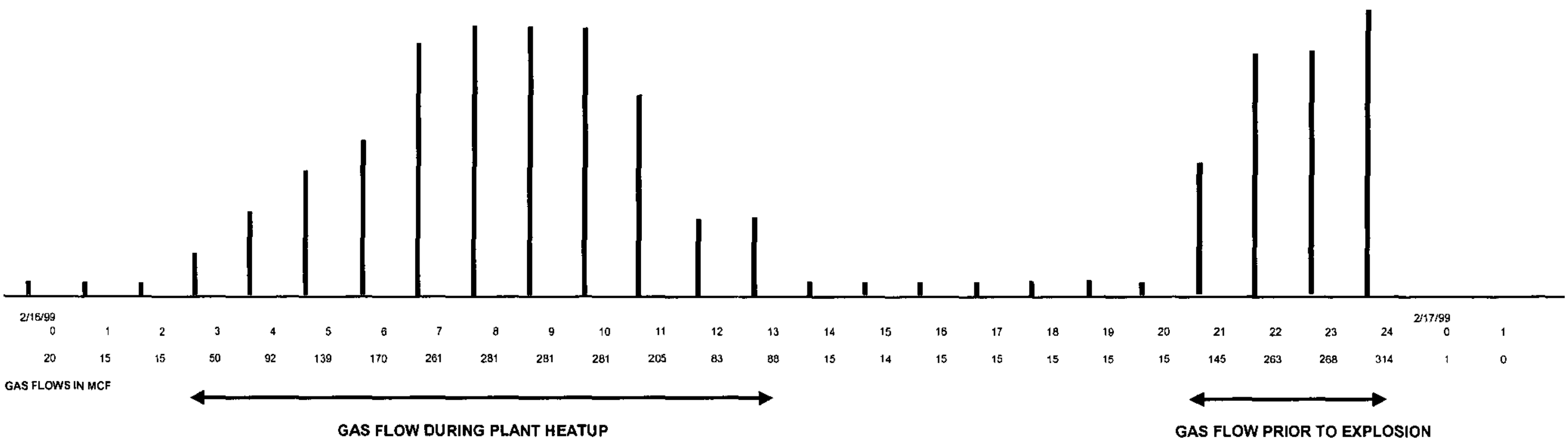
| | | | | | | |
|---|---|---|---|---|---|---|
| 02/15/99 | 19:00 | 016531 | 14 | 1000.0 | 14 | 374 |
| 02/15/99 | 20:00 | 016530 | 0 | 0.0 | 0 | 374 |
| 02/15/99 | 20:00 | 016531 | 14 | 1000.0 | 14 | 374 |
| 02/15/99 | 21:00 | 016530 | 0 | 0.0 | 0 | 374 |
| 02/15/99 | 21:00 | 016531 | 14 | 1000.0 | 14 | 374 |
| 02/15/99 | 22:00 | 016530 | 0 | 0.0 | 0 | 373 |
| 02/15/99 | 22:00 | 016531 | 14 | 1000.0 | 14 | 374 |
| 02/15/99 | 23:00 | 016530 | 0 | 0.0 | 0 | 374 |
| 02/15/99 | 23:00 | 016531 | 14 | 1000.0 | 14 | 374 |
| 02/16/99 | 00:00 | 016530 | 1 | 1022.5 | 1 | 381 |
| 02/16/99 | 00:00 | 016531 | 20 | 1000.0 | 20 | 375 |
| 02/16/99 | 01:00 | 016530 | 0 | 0.0 | 0 | 383 |
| 02/16/99 | 01:00 | 016531 | 15 | 1000.0 | 15 | 375 |
| 02/16/99 | 02:00 | 016530 | 0 | 0.0 | 0 | 381 |
| 02/16/99 | 02:00 | 016531 | 15 | 1000.0 | 15 | 375 |
| 02/16/99 | 03:00 | 016530 | 0 | 0.0 | 0 | 379 |
| 02/16/99 | 03:00 | 016531 | 50 | 1000.0 | 50 | 373 |
| 02/16/99 | 04:00 | 016530 | 0 | 0.0 | 0 | 376 |
| 02/16/99 | 04:00 | 016531 | 92 | 1000.0 | 92 | 370 |
| 02/16/99 | 05:00 | 016530 | 0 | 0.0 | 0 | 374 |
| 02/16/99 | 05:00 | 016531 | 139 | 1000.0 | 139 | 368 |
| 02/16/99 | 06:00 | 016530 | 0 | 0.0 | 0 | 375 |
| 02/16/99 | 06:00 | 016531 | 170 | 1000.0 | 170 | 368 |
| 02/16/99 | 07:00 | 016530 | 0 | 0.0 | 0 | 374 |
| 02/16/99 | 07:00 | 016531 | 261 | 1000.0 | 261 | 364 |
| 02/16/99 | 08:00 | 016530 | 0 | 0.0 | 0 | 372 |
| 02/16/99 | 08:00 | 016531 | 281 | 1000.0 | 281 | 364 |
| 02/16/99 | 09:00 | 016530 | 0 | 0.0 | 0 | 370 |
| 02/16/99 | 09:00 | 016531 | 281 | 1000.0 | 281 | 365 |
| 02/16/99 | 10:00 | 016530 | 0 | 0.0 | 0 | 369 |
| 02/16/99 | 10:00 | 016531 | 281 | 1000.0 | 281 | 365 |
| 02/16/99 | 11:00 | 016530 | 0 | 0.0 | 0 | 368 |
| 02/16/99 | 11:00 | 016531 | 205 | 1000.0 | 205 | 368 |
| 02/16/99 | 12:00 | 016530 | 0 | 0.0 | 0 | 373 |
| 02/16/99 | 12:00 | 016531 | 83 | 1000.0 | 83 | 373 |
| 02/16/99 | 13:00 | 016530 | 0 | 0.0 | 0 | 372 |
| 02/16/99 | 13:00 | 016531 | 88 | 1000.0 | 88 | 372 |
| 02/16/99 | 14:00 | 016530 | 0 | 0.0 | 0 | 377 |
| 02/16/99 | 14:00 | 016531 | 15 | 1000.0 | 15 | 378 |
| 02/16/99 | 15:00 | 016530 | 0 | 0.0 | 0 | 376 |
| 02/16/99 | 15:00 | 016531 | 14 | 1000.0 | 14 | 377 |
| 02/16/99 | 16:00 | 016530 | 0 | 0.0 | 0 | 375 |
| 02/16/99 | 16:00 | 016531 | 15 | 1000.0 | 15 | 376 |
| 02/16/99 | 17:00 | 016530 | 0 | 0.0 | 0 | 375 |
| 02/16/99 | 17:00 | 016531 | 15 | 1000.0 | 15 | 375 |
| 02/16/99 | 18:00 | 016530 | 0 | 0.0 | 0 | 375 |
| 02/16/99 | 18:00 | 016531 | 15 | 1000.0 | 15 | 375 |
| 02/16/99 | 19:00 | 016530 | 0 | 0.0 | 0 | 375 |
| 02/16/99 | 19:00 | 016531 | 15 | 1000.0 | 15 | 375 |
| 02/16/99 | 20:00 | 016530 | 0 | 0.0 | 0 | 375 |
| 02/16/99 | 20:00 | 016531 | 15 | 1000.0 | 15 | 375 |
| 02/16/99 | 21:00 | 016530 | 0 | 0.0 | 0 | 374 |
| 02/16/99 | 21:00 | 016531 | 145 | 1000.0 | 145 | 371 |
| 02/16/99 | 22:00 | 016530 | 0 | 0.0 | 0 | 372 |
| 02/16/99 | 22:00 | 016531 | 263 | 1000.0 | 263 | 368 |
| 02/16/99 | 23:00 | 016530 | 0 | 0.0 | 0 | 370 |
| 02/16/99 | 23:00 | 016531 | 268 | 1000.0 | 268 | 368 |
| 02/17/99 | 00:00 | 016530 | 1 | 1019.7 | 1 | 383 |
| 02/17/99 | 00:00 | 016531 | 314 | 1000.0 | 314 | 370 |
| 02/17/99 | 01:00 | 016530 | 0 | 0.0 | 0 | 388 |
| 02/17/99 | 01:00 | 016531 | 1 | 1000.0 | 1 | 382 |
| 02/17/99 | 02:00 | 016530 | 0 | 0.0 | 0 | 385 |
| 02/17/99 | 02:00 | 016531 | 0 | 0.0 | 0 | 383 |
| 02/17/99 | 03:00 | 016530 | 0 | 0.0 | 0 | 384 |

# *Exhibit 12*

## Graph of Hawthorn 5
## Hourly Readings Gas Flow

# HAWTHORN 5 GAS FLOW

*FEBRUARY 16, 17 1999*



# *Exhibit 13*

**Memo from Stack Don**
**Dated 2/22/99**

KCPL #6

**Smith Bob**

| | |
|---|---|
| **From:** | Stack Don |
| **Sent:** | Monday, February 22, 1999 1:58 PM |
| **To:** | Smith Bob |
| **Subject:** | Report On 2/17/99 |

Statement about explosion of 2/17/99:

Some time after 12:00 AM I was sitting at computer in the H-5 laboratory getting ready to check my email. In quick sucession, like a split second apart, the electricity went out, there was a tremendous explosion, there was a huge shock wave and flying debris and dust. My immediate instinct was to dive for the floor and cover up which is what I did and I think that the shock wave helped me to the floor. As I was going down I could see debris flying everywhere both inside and outside the lab. The building moved and shook from the explosion and shock wave. When I hit the floor I could feel stuff falling on me so I pulled out a lab drawer over my head. It was over in seconds and I got to my feet to evacuate. There was a cloud of dust in the air getting into my mouth, eyes, and nose. There are 2 doors to the lab. I tried to excape to the plant door but there was debris everywhere and there looked like a glow in the plant direction. I tried the fire excape door but the was large sheetmetal and duct work hanging over the door when I opened it. I got a flashlight (room had some emergency light on by this time). I headed outside exiting by way of stairs next to control room. I went to road by store room and turned around to see the destruction done. In what seemed like a few minutes, the structure housing the boiler had been reduced to rubble and there was a huge ball of fire burning in the middle of it. The ball of fire gradually got smaller as the main gas valve was closed. I went to control room for the next 15 to 30 minutes. McClin was calling supervisory personal. Debris all over control room and broken windows. All personal were told to get out of area and go to fuel foreman's office. I was there the rest of the night.

Don Stack
#2302
Don Stack