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145-93(04-12)-LP
2C.220
Illinois Power Company
Clinton Power Station
P.O. Box 678
Clinton, IL 61727
Tel 217 935-8881

10CFR50.73

Docket No. 50-461

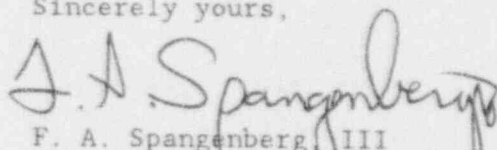
Document Control Desk
Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Clinton Power Station - Unit 1
Licensee Event Report No. 93-001-00

Dear Sir:

Please find enclosed Licensee Event Report No. 93-001-00: Vendor Failure to Design Flywheel and Unexplained Capped Constant Bleed Drain on Air Tank Result in High Compressor Motor Current and Inoperable H₂O₂ Analyzers. This report is being submitted in accordance with the requirements of 10CFR50.73.

Sincerely yours,


F. A. Spangenberg, III
Manager, Licensing and Safety

RSF/nls

Enclosure

cc: NRC Clinton Licensing Project Manager
NRC Resident Office, V-690
Regional Administrator, Region III, USNRC
Illinois Department of Nuclear Safety
INPO Records Center

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LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) Clinton Power Station										DOCKET NUMBER (2) 0 5 0 0 0 4 6 1 1										PAGE (3) 1 OF 0 0																																
TITLE (4) Vendor Failure to Design Flywheel and Unexplained Capped Constant Bleed Drain On Air Tank Result in High Compressor Motor Current and Inoperable H ₂ O ₂ Analyzers																																																				
EVENT DATE (5)									LER NUMBER (6)									REPORT DATE (7)									OTHER FACILITIES INVOLVED (8)																									
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OPERATING MODE (9) 2										THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more of the following) (11)																																										
POWER LEVEL (10) 0 0 0										20.402(b)										20.406(c)										50.73(a)(2)(iv)										73.71(b)												
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NAME W. R. Hogenson, System Engineer, extension 4054																				TELEPHONE NUMBER AREA CODE 2 1 7 9 3 5 - 8 1 8 1 1																																
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																																																				
CAUSE		SYSTEM		COMPONENT		MANUFACTURER		REPORTABLE TO NPD		CAUSE		SYSTEM		COMPONENT		MANUFACTURER		REPORTABLE TO NPD		CAUSE		SYSTEM		COMPONENT		MANUFACTURER		REPORTABLE TO NPD																								
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YES (If yes, complete EXPECTED SUBMISSION DATE)																				X NO										EXPECTED SUBMISSION DATE (15)																						
ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)																																																				

On March 16, 1993, Illinois Power (IP) concluded that both divisions of hydrogen and oxygen analyzers had not been operable because their backup air supply systems were not capable of running for the period necessary to support operation of the analyzers following an accident and loss of plant Instrument Air. Therefore the requirements of Technical Specification 3.3.7.5 were not met. The cause of the event is attributed to the vendor's failure to include a flywheel in the design of the backup air supply compressor motor. In addition, unauthorized caps were found to be blocking the air tank constant bleed orifices. These conditions resulted in high motor current readings in excess of the motor nameplate and an overload trip of the division 1 analyzer. IP believes the caps were installed after initial operations but has been unsuccessful in identifying an installing work document. Corrective actions include installing flywheels, removing caps, determining if other positive displacement equipment may have similar problems, and installing labels identifying the orifices are not to be blocked.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMB NO. 3150-0104

EXPIRES: 8/31/88

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

DESCRIPTION OF EVENT

On March 16, 1993, Illinois Power (IP) concluded that both divisions of hydrogen and oxygen analyzers [MON] in the containment monitoring system [IK] had not been operable because their backup air supply systems could not have performed their function during an accident and a loss of plant instrument air [LD]. Technical Specification 3.3.7.5 requires both hydrogen and oxygen analyzers to be operable in Modes 1 (POWER OPERATION), 2 (STARTUP) and 3 (HOT SHUTDOWN). IP concluded that the analyzers had not been operable since the plant first entered mode 2 on February 26, 1987. The plant has been at various power levels up to 100 percent reactor [RCT] power and in all modes since first entering Mode 2.

The Containment Monitoring system has two divisionally separate, redundant hydrogen and oxygen analyzer subsystems, each consisting of two separate modules: the analysis sample conditioning module located in the Fuel Building and the Electronic Control Module (ECM) located in the Main Control Room. The sample conditioning module contains a Gas Chromatograph (GC) and the ECM contains a Central Processing Unit (CPU) with a microprocessor which is programmed to control sampling and analysis of the Containment and Drywell atmospheres. The system is manually initiated under post-accident conditions.

The plant instrument air system normally provides air to operate the GC sample valves [SMV] (pneumatically actuated slide valves) and the GC column oven air heater [EHTR]. A two-stage air compressor [CMP] and a compressed air tank [TK] provide backup to the plant instrument air system to ensure a continuous air supply. In the event instrument air pressure falls below a predetermined setpoint the air compressor will automatically start and run continuously until the instrument air system pressure is restored. The tank constantly bleeds off excess air and moisture through an orifice [OR] drain [DRN].

On August 6, 1992, during performance of surveillance 9437.17, "Containment/Drywell Atmosphere H₂/O₂ Monitoring System Channel Calibration," the division 1 hydrogen and oxygen analyzer backup air compressor motor [MO] tripped due to current overload. The overload trip was reset and the air compressor was run for an indeterminate time with no further trips. The surveillance test was considered acceptable and the analyzer was considered operable.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMB NO. 3150-0104

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TEXT (If more space is required, use additional NRC Form 368A's) (17)

Maintenance Work Request (MWR) D30201 was initiated to investigate the overload tripping.

On February 4, 1993, work began on MWR D30201. The air compressor motor starting and running currents were measured to be approximately 15 amps and 3.4 amps, respectively, with the compressor and motor coupled. The nameplate current rating for the motor is 2.5 amps. The motor currents were normal with the motor uncoupled from the compressor. As a result, the compressor was considered to be the apparent problem and was replaced. (The original compressor was later reinstalled when it was determined not to be causing the high current condition.)

Further troubleshooting of the backup air supply system between February 5 and February 12, 1993, identified that an unauthorized cap had been installed on the air tank constant bleed orifice drain. Prior to removal of the cap, tank air pressure was about 60 pounds per square inch gauge (psig), well below the relief valve [RV] setting of 80 psig. Following removal of the cap, air pressure dropped to the normal range of 40 to 45 psig; however, the air compressor motor current only dropped to about 2.8 amps.

Discussions between the system engineer and the Sentry Equipment Corporation (the vendor) representative revealed that these particular air compressors, manufactured by Metal Bellows Corporation, have on occasion experienced overload tripping problems when 480 volt motors were used as drivers. The tripping problems were a result of the relatively small rotor mass which is not always large enough to overcome fluctuations in torque, especially at the "top dead center" position of the cycle. To resolve this problem the Sentry representative recommended installing a flywheel on the air compressor motor. On February 12, 1993, IP fabricated a flywheel and installed it on the air compressor motor in accordance with plant modification CM-034. After installation of the flywheel the motor current was found to be below the motor nameplate rating and air pressure was in the normal range.

On February 16, 1993, the Sentry representative informed the system engineer that the air compressor motor assemblies were probably originally tested by Metal Bellows with a flywheel installed and therefore the current problem was not identified during vendor testing.

Based on the troubleshooting of the backup air supply and evaluating the need for a flywheel, IP concluded that the compressor motor assembly design was inadequate. Therefore, on February 17, 1993, the system engineer initiated Condition Report (CR) 1-93-02-021 to document the anomalies found during the investigation and initiated MWR D25229 to inspect the division 2 hydrogen and oxygen analyzer for similar deficiencies. MWR D25229 was scheduled to be worked on March 16, 1993, based on the division 2 analyzer not exhibiting the symptoms that the division 1 analyzer had exhibited.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

On March 16, 1993, the division 2 analyzer was inspected and the conditions found were similar to those found on the division 1 analyzer. Motor current was approximately 3.4 amps, and a cap was found on the air tank constant bleed orifice drain. After removing the cap, motor current reduced to approximately 2.9 amps. In accordance with plant modification CM-034 a flywheel was installed which further reduced motor current to the proper value.

On March 16, 1993, a review of this issue concluded that the air compressors would not have been capable of running for the extended period necessary to support operation of the hydrogen and oxygen analyzers following an accident and loss of plant instrument air. As a result of this condition, the hydrogen and oxygen analyzers were considered to have been inoperable since the plant initially entered Mode 2 on February 26, 1987.

No automatic or manually initiated safety system responses were necessary to place the plant in a safe and stable condition. No other equipment or components were inoperable at the start of this event to the extent that their inoperable condition contributed to this event.

CAUSE OF EVENT

The cause of this event is attributed to a vendor design deficiency in the failure to provide a flywheel on the air compressor motor assembly. This deficiency caused the high current condition. In addition, the unauthorized installation of caps blocking the constant bleed orifice drains raised both system pressure and motor current and further contributed to the high current condition.

Discussions with the Sentry representative identified that the air compressor motor assemblies were probably tested using motors with flywheels. However, the vendor design did not require flywheels and none were supplied with the assemblies installed at Clinton Power Station. Clinton Power Station startup testing of the hydrogen and oxygen analyzers determined that motor current was acceptable; however, the motor run time was not specified by the test and the orifice drains were probably not capped at that time. IP has been unsuccessful in determining any information about the date or circumstances of the unauthorized orifice drain capping.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

CORRECTIVE ACTION

As described in the DESCRIPTION OF EVENT section of this report, both divisions of the hydrogen and oxygen analyzers were investigated and corrected. Flywheels were installed on the air compressor motors of both divisions in accordance with plant modification CM-034. The caps blocking the air tank constant bleed orifice drains were removed from both divisions. Following the flywheel installation and removal of caps, the air compressor and motor assemblies were run and motor current readings for both divisions were measured and found to be normal (2.5 amps or less).

IP will determine if other positive displacement equipment at Clinton Power Station may be subject to similar motor current problems.

IP will install labels near the orifice drains identifying they are not to be blocked.

ANALYSIS OF EVENT

This event is reportable under the provisions of 10CFR50.73(a)(2)(i)(B) due to the failure to have both divisions of hydrogen and oxygen analyzers operable as required by Technical Specification 3.3.7.5. Analysis of this event identified that this event was not nuclear safety significant. The hydrogen and oxygen analyzers only perform a post-accident function. In the event of an accident combined with a loss of plant instrument air and a current trip of both hydrogen and oxygen analyzers, operators would observe obvious erroneous information at the Main Control Room panel [PL]. In response, operators would determine the system was inoperable and would require manual sampling and analysis of the drywell and containment atmospheres for hydrogen in accordance with Emergency Operating Procedure (EOP)-7 Hydrogen Control and off-normal procedure 4412.00C001, "Sampling Containment and Drywell for Hydrogen Checklist." The manual sampling and analysis would provide sufficient data to operators about hydrogen concentration.

IP considers the divisions 1 and 2 hydrogen and oxygen analyzers to have been inoperable since the plant initially entered Mode 2 on February 26, 1987, until they were restored at 1010 hours on February 13, 1993, and at 1100 hours on March 21, 1993.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104

EXPIRES: 8/31/88

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TEXT (If more space is required, use additional NRC Form 365A's) (17)

ADDITIONAL INFORMATION

The divisions 1 and 2 containment atmosphere hydrogen and oxygen analyzers are equipment identification numbers 1CM01SA and 1CM01SB respectively. The analyzers were manufactured by Sentry Equipment Corporation. The air compressors discussed in this report are positive displacement pumps, Part Number MB-601 H.P., model number 41169, manufactured by Metal Bellows Corporation. The air compressor motors discussed in this report are 1.5 horsepower, 480 volt, three phase, model TBFC, manufactured by Westinghouse.

A review of CPS LERs identified no previous similar events.

For further information regarding this event, contact W. R. Hogenson, system engineer, at (217) 935-8881, extension 4054.