

NRC Form 366
(9-83)

U.S. Nuclear Regulatory Commission
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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Arkansas Nuclear One, Unit One (ANO-1)										DOCKET NUMBER (2) PAGE (3)					
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TITLE (4) Reactor Building Hydrogen Concentration Instrument Inoperable Due to Inadequate Post-Modification Testing															
EVENT DATE (5)				LER NUMBER (6)				REPORT DATE (7)				OTHER FACILITIES INVOLVED (8)			
Month	Day	Year	Year	Sequential Number	Revision Number	Month	Day	Year	Facility Names				Docket Number(s)		
01	21	08	08	004	01	01	04	08	N/A				0150000		
OPERATING MODE (9) THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)															
POWER LEVEL (10) 0 8 0															
20.402(b)				20.405(c)				50.73(a)(2)(iv)				73.71(b)			
20.405(a)(1)(i)				50.36(c)(1)				50.73(a)(2)(v)				73.71(c)			
20.405(a)(1)(ii)				50.36(c)(2)				50.73(a)(2)(vii)				Other (Specify in			
20.405(a)(1)(iii)				50.73(a)(2)(i)				50.73(a)(2)(viii)(A)				Abstract below and			
20.405(a)(1)(iv)				50.73(a)(2)(ii)				50.73(a)(2)(viii)(B)				in Text, NRC Form			
20.405(a)(1)(v)				50.73(a)(2)(iii)				50.73(a)(2)(x)				366A			
LICENSEE CONTACT FOR THIS LER (12)															
Name										Telephone Number					
Patrick C. Rogers, Nuclear Safety and Licensing Specialist										Area Code 5101191641-1311010					
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)															
Cause	System	Component	Manufacturer	Reportable to NPRDS	Cause	System	Component	Manufacturer	Reportable to NPRDS						
B	I	K	A	C	5	3	9	Y							
SUPPLEMENT REPORT EXPECTED (14)															
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 2/10/88, while performing an operability verification test on the lead hydrogen analyzer, the remote control room hydrogen concentration indication was observed to read zero when a hydrogen test gas was applied to the analyzer. Troubleshooting by maintenance and engineering personnel revealed that two wires located in the lead hydrogen analyzer panel were not terminated on correct terminal block locations. The wiring discrepancy was corrected and the as-built wiring configuration was determined. The lead hydrogen analyzer was calibrated and returned to service on 2/14/88. The redundant standby hydrogen analyzer was removed from service to determine if a similar problem existed. A hydrogen test gas was applied to the standby analyzer and proper indications were observed. The standby analyzer was returned to service on 2/15/88. The causes were (1) a failure to reflect as-built configuration of the panel wiring in the design drawings after installation of the remote indication to meet NUREG-0737 requirements and (2) a failure to provide adequate guidance for post-modification testing after a December 1986 design modification. Current design modification procedures contain adequate guidance for post-modification testing and as-built verifications. Future action will be to update the hydrogen analyzer panels design drawings to reflect as-built configurations. This event was considered to be reportable per 10CFR50.73(a)(2)(i).

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		Year	Sequential Number	Revision Number	
Arkansas Nuclear One, Unit One	0151010103113	88	004	0	0102101015

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

I. Description of Event

A. Plant Status

At the time of discovery of this event on 2/10/83, ANO-1 was operating at 80 percent reactor power with a reactor coolant system (RCS) temperature of 579 degrees Fahrenheit and an RCS pressure of 2155 psig.

B. Component Identification

The component involved in this event is the lead hydrogen analyzer panel (C178) which was supplied by Comsip Delphi Incorporated. The EIIS identifier is IK-AI and the manufacturer code is C539.

C. Sequence of Events

On 2/10/88 while performing an operability verification test on the lead hydrogen analyzer, the control room hydrogen concentration indication was observed to read zero when a hydrogen test gas was applied to the analyzer. Troubleshooting by maintenance and engineering personnel revealed that two wires located in panel C178 were not terminated on correct terminal block locations. The wiring discrepancy was corrected and the as-built wiring configuration of C178 was determined. The hydrogen analyzer was calibrated and returned to an operable status on 2/14/88. After the lead hydrogen analyzer was returned to an operable status, the redundant standby hydrogen analyzer was removed from service to determine if a similar problem existed. A hydrogen test gas was applied to the standby analyzer and proper indications were observed. The standby analyzer was returned to service on 2/15/88.

II. Event Cause

A. Event Analysis

Two redundant hydrogen analyzer systems are installed to provide indication of hydrogen concentration in the reactor building following an accident in order to determine when hydrogen control equipment needs to be placed in service. A sample of reactor building atmosphere is provided to the hydrogen analyzers by sample pumps through sample piping and valving. The hydrogen analyzer measures the hydrogen concentration and converts the measurements to signals which feed both local instruments and remote instruments located in the control room. Additionally, a control room alarm will be generated if the measured hydrogen concentration reaches approximately 2 percent. This alarm is generated from a portion of the analyzer circuitry which is independent of the concentration indication circuitry. When the hydrogen analyzers were initially installed, only local instrumentation at the hydrogen analyzer panels was provided. NUREG-0578, "TMI Lessons Learned Task Force Status Report and Short-Term Recommendations", and NUREG-0737, "Clarification of TMI Action Plan Requirements", required that the range of the hydrogen concentration instruments be increased and that remote readout and alarms be provided in the control room.

This event was discovered as a result of post modification testing related to SV-7467, one of the containment isolation valves for the lead hydrogen analyzer system. SV-7457 had been discovered in an incorrect configuration for proper functioning as a containment isolation valve (Reference LER 50-313/88-001). SV-7467 was removed and re-installed in the correct configuration and leak rate testing was required to verify operability. Leak rate testing of the valve required disconnecting piping fittings within the lead hydrogen analyzer panel (C178) in order to provide venting required by the leak rate test procedure. Since work had been performed in the cabinet, it was decided to verify calibration of the hydrogen analyzer system as well as check for leakage after reconnecting the piping fittings within C178.

While verifying the calibration of the hydrogen analyzer system, a hydrogen test gas of 8 percent hydrogen concentration was applied to the hydrogen analyzer. The control room hydrogen concentration instrument indicated zero percent hydrogen concentration instead of 8 percent as expected and required for proper calibration. Further investigation and

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troubleshooting by maintenance and engineering personnel revealed that two wires in panel C178 were not terminated on correct terminal block locations. This error caused a reverse polarity to the control room hydrogen concentration indication causing the indicator to read zero, even when the analyzer was exposed to a hydrogen test gas.

The surveillance history for C178 was examined to determine when the wiring error could have occurred. The hydrogen concentration instrumentation calibration surveillance is required on an 18 month frequency. The last calibration performed on the C178 instrumentation prior to the discovery of the wiring discrepancy was completed on 10/27/86 with satisfactory results. Therefore, it was concluded that the error must have occurred after this date. The activities associated with C178 after the 10/27/86 calibration were examined.

These investigations revealed that a design modification was performed on both the lead and standby hydrogen analyzer systems in December 1986. The modification was performed to reduce the sample transport time of the sample from the reactor building to the hydrogen analyzer. Modifications included installation of new sample pumps and associated control circuitry and modification of the sample flow alarm circuitry. The scope of the original design modification did not include any work associated with the hydrogen analyzer circuitry.

At the time the modification was implemented in December 1986, procedural guidance related to design change packages (DCP) required identification of necessary installation inspections, installation tests and post-installation checkouts. Revisions to a DCP could be made by an amendment to the DCP if major modifications or scope changes were needed or by a field change notice (FCN) if minor revisions were needed. Either revision method required that the revised portion of the design change be in accordance with original DCP requirement, e.g., identification of any necessary post-installation checkouts.

Since the hydrogen analyzer circuitry was not affected by the scope of the original DCP, operational checks or calibrations of the hydrogen analyzers were not considered necessary and were not included in the original DCP. However, during implementation of the DCP it was necessary to replace the terminal blocks in the lead hydrogen analyzer panel (C178) and the standby hydrogen analyzer panel (C179) because of space limitations encountered. An FCN was written to address this additional work. The FCN that implemented the terminal block change-out did not require additional testing requirements even though the wiring for the terminal blocks had to be de-terminated and then re-terminated in order to install the new terminal blocks. Electrical drawings for the analyzer panels in effect at the time of the DCP were used as guidance for re-terminating the wiring in C178 and C179. It is believed that a wiring change was made to obtain proper indication during installation of remote instrumentation to meet NUREG-0737 requirements. After this installation the electrical drawings apparently were not updated to reflect as-built configurations. When the wires were re-terminated per the drawings while implementing the December 1986 DCP, two wires were terminated in incorrect locations for proper operation of the C178 remote hydrogen concentration instrument. As a result of the termination made from incorrect electrical drawings, the polarity was reversed for the output of the hydrogen analyzer to the remote instrument.

The surveillance history of the standby hydrogen analyzer (C179) instrumentation was also examined. The last calibration of C179 was completed on 12/17/86, one day after the completion of the DCP. The results of the calibration were satisfactory with proper remote indication when a hydrogen test gas was applied to the hydrogen analyzer. This indicated that there was no problem with the remote hydrogen concentration indication associated with this analyzer.

The absence of control room indication of reactor building hydrogen concentration from C178 resulted in minimum safety significance. The wiring discrepancy did not affect the local indication of hydrogen concentration or the control room alarm functions from C178. The hydrogen concentration alarm would have alerted the operators in the event of high reactor building hydrogen concentration and the local indicator could have been observed to determine actual hydrogen concentration. Also, the redundant hydrogen analyzer system was operable and could have provided indication of reactor building hydrogen concentration in the control room

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in the event of an accident. Additionally, both redundant hydrogen recombiners were operable to control reactor building hydrogen concentration if necessary.

B. Root Cause

The root causes of this event are believed to be: 1) a failure to ensure the design drawings for panel C178 reflected the as-built configuration of the panel after installation of the remote indication to meet NUREG-0737 requirements and 2) failure to perform adequate post-modification testing after the scope of work changed during the December 1986 design modification on the system.

C. Reportability

ANO-1 Technical Specifications (TS) 3.14.3 requires that both hydrogen analyzers be operable whenever reactor building integrity is required. With only one analyzer operable TS 3.14.4 allows operation to continue for 30 days, then a plant shutdown to hot shutdown condition is required.

Initially, upon discovery of the event on 2/10/88, it was believed that the local indication satisfied the requirements of TS 3.14.3 and that the event was not reportable. However further research determined that the control room indication was required to satisfy the technical specifications. This delay in reportability determination resulted in the difference between discovery date and the report date exceeding 30 days.

The requirement for hydrogen analyzers and instrumentation for readout of hydrogen concentration was initially added to the ANO-1 TS by Amendment 10 dated 2/18/76. At this time, the system design did not include remote control room indication of hydrogen concentration. The requirement for control room indication of hydrogen concentration in the control room came about as a result of NUREG-0578 and NUREG-0737. The installation of this instrumentation was completed on 11/30/81. In December, 1983, Generic Letter 83-37 provided guidance on TS for NUREG-0737 items and requested appropriate TS changes be submitted. In response to the request relating to control room indication of reactor building hydrogen concentration, Arkansas Power & Light stated that the existing ANO-1 TS were considered adequate to meet the NUREG-0737 requirement and no additional TS were necessary. Therefore, it was concluded that the control room indication of reactor building hydrogen concentration was necessary for compliance with TS 3.14.3.

Since it was determined that the control room indication of hydrogen concentration from C178 was inoperable in excess of the 30 days allowed by TS 3.14.4, this event is considered reportable per 50.73(a)(2)(i)(B) as operation prohibited by Technical Specifications.

III. Corrective Actions

A. Immediate

Since C178 had been removed from service as a result of modification of SV-7467, the only immediate action was to initiate an investigation into the cause of the anomaly.

B. Subsequent

Engineering and maintenance personnel determined the as-built configuration of panel C178, and the wiring discrepancy was corrected in accordance with engineering guidance. The lead hydrogen analyzer and the hydrogen concentration instruments were calibrated after correcting the wiring error. Calibration was completed and the lead hydrogen analyzer was returned to service on 2/14/88.

After panel C178 was returned to service, a hydrogen test gas was applied to the standby hydrogen analyzer (C179) to ensure that a similar error did not exist in C179. Proper analyzer response and proper remote indications were observed. The standby hydrogen analyzer system was returned to service on 2/15/88.

The current design modification procedures permit changes to be made to a DCP issued for implementation by means of a design change package revision (DCPR) or a field change request (FCR). An FCR may be used during installation of a DCP to make minor changes in order to facilitate the installation of the DCP or to correct minor errors in the DCP. Specific guidelines and limitations are procedurally identified for use of an FCR.

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Due to the additional guidance contained in the current design modification procedures versus the procedures in effect in December 1986, the current procedures are considered adequate to prevent recurrence of a similar event. Additionally, the installation and close-out requirements in the current procedures require as-built verifications and walkdowns to ensure that the requirements of the DCP are met and that the as-built configurations are identified. Consequently, it was determined that revisions to the current design modification procedures were not necessary.

C. Future

The design drawings for the reactor building hydrogen analyzer panels C178 and C179 will be updated to reflect the as-built configurations of the panels.



ARKANSAS POWER & LIGHT COMPANY

April 5, 1988

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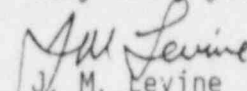
U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

SUBJECT: Arkansas Nuclear One - Unit 1
Docket No. 50-313
License No. DPR-51
Licensee Event Report 50-313/88-004-00

Gentlemen:

In accordance with 10CFR50.73(a)(2)(i), attached is the subject report concerning reactor building hydrogen concentration instrument inoperable due to inadequate post-modification testing.

Very truly yours,


J. M. Levine
Executive Director
Nuclear Operations

JML:PCR:djm
attachment

cc w/att: Regional Administrator
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