CATEGORY 1

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:9605300017 DOC.DATE: 96/05/21 NOTARIZED: NO DOCKET #
FACIL:50-269 Oconee Nuclear Station, Unit 1, Duke Power Co. 05000269
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RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 96-07-00:on 960421,containment hydrogen recombiner sys decalred inoperable due to deficient design analysis.Caused by failure of drain pumps to operate due to corrosion.Pumps repaired & tested satisfactorily.W/960521 ltr.

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TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

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May 21, 1996

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

Subject: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287
Licensee Event Report 269/96-07

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a) (1) and (d), attached is Licensee Event Report, 269/96-07, concerning the inoperability of the Containment Hydrogen Recombiner System.

This report is being submitted in accordance with 10 CFR 50.73 (a)(2)(v)(D). This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

J. W. Hampton, Vice President
Oconee Nuclear Site

/fts

Attachment

280027

Document Control Desk
May 21, 1996

xc: Mr. D. E. LaBarge, Project Manager
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Washington, D.C. 20555

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NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 04/30/98

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Oconee Nuclear Station, Unit One	05000 269	1 OF 8

TITLE (4) The Containment Hydrogen Recombiner System Was Inoperable Due To A Deficient Design Analysis

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 NAME	DOCKET NUMBER
									Oconee, Unit Two	05000 270
04	21	96	96	-- 07 --	00	05	21	96	Oconee, Unit Three	05000 287

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)			
POWER LEVEL (10)	100	20.2201(b)	20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(viii)
		20.2203(a)(1)	20.2203(a)(3)(i)	50.73(a)(2)(ii)	50.73(a)(2)(x)
		20.2203(a)(2)(i)	20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.71
		20.2203(a)(2)(ii)	20.2203(a)(4)	50.73(a)(2)(iv)	OTHER
		20.2203(a)(2)(iii)	50.36(c)(1)	X 50.73(a)(2)(v) (D)	Specify in Abstract below or in NRC Form 366A
		20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
L. V. Wilkie, Safety Review Manager	(864) 885-3518

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

SUPPLEMENTAL REPORT EXPECTED (14)

			EXPECTED SUBMISSION	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).		X NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On April 20, 1996, with Units 1 and 3 at 100 % full power and Unit 2 in a refueling outage, a surveillance test (Hydrogen Recombiner Leak Test and Drain Test) was performed on the Unit 2 Containment Hydrogen Recombiner System. During the test, the condensate drain pump on the "2A" drain skid failed to operate. An investigation indicated that the drain pumps on all three Oconee units failed to operate due to corrosion between the pump casing and the impeller. These pumps had been in service since February 10, 1996. On May 16, 1996, Management and Engineering completed a past operability evaluation. They concluded that even though the system would have been repaired in time to perform its intended function, the pumps would not have started as originally intended. Therefore, the Containment Hydrogen Recombiner System was declared past inoperable. The root cause of this event is determined to be a Deficient Design Analysis, Improper component selection. Corrective actions included increasing the test frequency on the pumps and machining and coating the inside of the pump casing with epoxy.

BACKGROUND

The Containment Hydrogen Recombiner System (CHRS) [EIIS:BB] includes a portable hydrogen recombiner, control panel, and a piping flow path designated as part of the Purge System (PR) [EIIS:VA]. The system is only used in the event of a Loss of Coolant Accident (LOCA) and is not utilized during normal operation. If needed during a LOCA scenario, the recombiner will be moved to the affected unit and anchored to an existing foundation. It will then be connected by flexible piping to the PR piping. Once connected to the PR piping, the CHRS draws gases containing hydrogen from the reactor building into a heater in the recombiner. As the air temperature increases in the recombiner, the hydrogen combines with oxygen to form water vapor which is then returned to the reactor building.

Due to the accessibility of support equipment and the time available to place the CHRS in service (approximately 7 days), the CHRS does not have to meet single failure criteria. Therefore, the design basis of the CHRS includes the assumption that components outside containment are not redundant and credit is taken for repair/replacement of failed components.

Technical Specification 3.16.3 requires components in the Containment Hydrogen Control System flow path to be operable. If the flow path is inoperable, it shall be restored to operable status within 7 days.

EVENT DESCRIPTION

On January 30, 1996, while performing an engineering review of the Containment Hydrogen Recombiner System (CHRS), it was recognized that the post accident Reactor Building (RB) [EIIS:NH] environmental conditions could allow condensation to accumulate in the system flow path. As a result, a Problem Investigation

Process report was generated and an engineering evaluation was initiated.

On February 1, 1996, at 1330 hours, Engineering completed a preliminary analysis. The analysis indicated that post accident RB temperature and humidity at the time the CHRS is expected to be placed in service would create a potential for water to condense and accumulate in the suction or discharge piping to the Hydrogen Recombiner. This water accumulation may be sufficient to block flow and may prevent the CHRS from limiting the Reactor Building hydrogen concentration to less than 4 percent by volume. This condition was reported by LER 269/96-02. Preparations began immediately to determine what modifications would be required to ensure the system would perform its intended function.

Design work began on Temporary Modifications (TM) to make the system operable on each Unit. The TMs were to install a workable drainage arrangement to remove moisture from the CHRS piping low points. The drainage portion includes high pressure hoses that direct condensate to collection tanks. Each collection tank has a pump that returns condensate to the RB.

An extension of the seven day Limiting Condition for Operation was asked for and granted by the NRC on February 7, 1996.

On February 10, 1996, the TMs and testing for all three units were completed. As a result, the CHRS was operable, but degraded on all three Units. The system is considered degraded because all the equipment utilized does not satisfy the criteria of QA Condition 1 designation, mostly in the area of material procurement and traceability.

On April 20, 1996, with Unit 2 in a refueling outage, a surveillance test (Hydrogen Recombiner Leak Test and Drain Test) was performed on the CHRS. During the test, it was discovered that the condensate drain pump on the "2A" drain skid failed to operate. As a result, the pump and motor were replaced. Upon

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
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TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

starting the new pump and motor, it also did not operate. After adjusting the motor mounting bolts which attach the motor to the pump casing, the pump and motor operated correctly. The surveillance test was completed with satisfactory results.

On April 21, 1996, the surveillance test was performed on the "2B" drain skid. During the test, it was discovered that the condensate drain pump on the "2B" drain skid failed to operate. Another investigation indicated that the "2B" drain skid pump had the same problem. After adjusting the motor mounting bolts, the pump and motor operated correctly. The surveillance test was completed with satisfactory results.

As a result of these failures, a Problem Investigation Process report was initiated. Also, the pumps and motors on Units 1 and 3 were inspected and the same type failure occurred. The six spare pumps in the warehouse were inspected and two of the six pumps were discovered to have the same type failure. Following this discovery, engineering notified the Operation Shift Manager that all three units had inoperable CHRS flow paths due to the apparent common mode failure of the pumps. On April 21, 1996, at 1720 hours, a seven day Limiting Condition for Operation (LCO) was entered. At 1848 hours, a four hour NRC Emergency Notification System call was made. Engineering began an operability evaluation, and an investigation began immediately to determine the cause of the failure of the pumps.

The investigation revealed that corrosion builds between the pump casing and the impeller, preventing the pump from rotating. The pump casing is Cast Iron and the impeller is a plastic material.

Between April 22 and April 24, 1996, Unit 1 and 3 CHRS pumps were repaired and tested with acceptable results. A corrective action has been implemented which requires the pumps to be run and checked for rotation at least every seven days. On April 24, 1996, at 1630 hours, the seven day LCO was exited.

On May 8, 1996, Engineering completed the past operability. The evaluation concluded that the CHRS system would have maintained containment hydrogen concentrations below the lower flammability limit of four percent by volume even with the failure of the condensate skid pumps. Actions to diagnose and correct the problem would have returned the system to service in a timely manner and allowed the system to still maintain its intended function.

On May 16, 1996, a management meeting was held to discuss the operability evaluation for this event. Although the design basis of the system takes credit for the ability to repair failed components, management considered that the actual common mode failure on all three units exceeds the intent of the design basis and declared the CHRS past inoperable.

CONCLUSIONS

The root cause of this event is determined to be a deficient Design Analysis, Improper component selection. During the design process of the temporary modification in February 1996, it was not recognized that the condensate pumps would be susceptible to excessive corrosion in this application. Operating experience with this type pump in other applications has been successful. If the correct component had been selected for this application or the selected component had been coated during the modification process to prevent the corrosion buildup, this event could have been prevented.

A review of LERs written within the last two years revealed that four events (269-94-01, 269/94-04, 269/95-03 and 269/96-02) involved Design Analysis, Unanticipated interaction of systems or components. LER 269/94-01 involved a potential seismic interaction that could have resulted in the loss of Emergency Condenser Circulating Water. LER 269/94-04 involved a postulated event that may have rendered the Post Accident Core Cooling

system inoperable. LER 269/95-03 involved a postulated single failure of a Low Pressure Injection pump during Emergency Core Cooling System operation which could have resulted in exceeding the Reactor Building pressure/temperature profile required in the Equipment Qualifications analysis. LER 269/96-02 involved a potential event where condensation could have prevented the Containment Hydrogen Recombiner System from removing hydrogen from containment following a Loss of Coolant Accident. All four of the events identified above involved design deficiencies; therefore, the event is considered to be recurring. The corrective actions for the events identified above included modifications, completion of single failure analysis and Design Basis Documents. All of the design deficiencies above actually occurred prior to the 1991 Design Engineering re-organization. The corrective actions in those events did not require any programmatic or personnel actions. Thus, no corrective actions were taken that should have prevented this event.

This event did not result in the release of any radioactive material, radiation overexposures or personnel injuries. There was no NPRDS reportable equipment failure associated with this event.

CORRECTIVE ACTIONS

Immediate

1. The pumps were repaired and tested satisfactorily.

Subsequent

1. A requirement to run and check pumps rotation at least every seven days was implemented. This will be continued until the effectiveness of other corrective actions has been demonstrated.

Planned

1. The inside of the pump casings will be machined and then coated with an epoxy material.

2. A permanent modification will be implemented to remove the accumulation of moisture in the suction and discharge piping such that the Temporary Modification, including the pumps, will no longer be needed.

3. Strengthen the Temporary Modification process to include a technical issues checklist as described in Appendix A of NSD 301 and add the materials compatibility issues of this LER.

SAFETY ANALYSIS

The Containment Hydrogen Recombiner System (CHRS) controls hydrogen in the Reactor Building (RB) following a Design Basis Loss of Coolant Accident (LOCA). The Emergency Operating Procedure requires the Operator to monitor RB hydrogen concentrations following a LOCA. If concentrations are greater than or equal to .5%, the CHRS is placed in operation per an Operations Procedure. In the event that the condensate pumps failed to operate, moisture would have accumulated in the collection tank and then backed up eventually into the hydrogen recombiner piping. This would have resulted in the hydrogen recombiner tripping on a low flow trip signal. Operators would have recognized the recombiner trip status lights or the increasing concentration of hydrogen in containment by control room indications. Troubleshooting efforts would have been initiated by the Technical Support Center/Operational Support Center to determine the cause of the trip. Recombiner operation is begun after seven days when hydrogen concentration exceeds .5%. Per calculations, under the worst case conditions, 3 % by volume will not be reached for approximately 6.5 days and the

lower flammability limit for hydrogen (4 % by volume) will not be reached for approximately 15 days. About 8.5 days was available to detect and correct the corrosion problem identified by this LER.

Removal and reinstallation of the pumping skids from a penetration room or cask decon room, post accident, requires individuals to enter high radiation areas with the higher radiation area being the penetration room. Calculated stay times following an accident for areas within the penetration room indicate that sufficient time would have been available for individuals to enter and replace the pumping skids maintaining dose to each individual affected below 10CFR20 exposure limits.

Large dry containment designs like Oconee's have been shown during Individual Plant Evaluation studies to have low probability of failure as a result of hydrogen combustion. This is especially true when hydrogen concentration is only slightly above the lower flammability limit. Hydrogen generation calculations for Oconee predict a concentration of about 5.5% by volume thirty days following a design basis accident. The containment temperature and pressure response to hydrogen ignition in this range is very mild and will not expect to impact the operability of containment equipment.

During the period of time that the Containment Hydrogen Recombiner System was inoperable, no event occurred which required the recombiner to be utilized. Therefore, the health and safety of the public were not affected by this event.