

LICENSEE EVENT REPORT (LER)

Facility Name (1) QUAD-CITIES NUCLEAR POWER STATION, UNIT ONE
 Docket Number (2) 0 | 5 | 0 | 0 | 0 | 2 | 5 | 4 | 1 | of | 0 | 5
 Page (3) 1 of 0 5
 Title (4) UPDATE ON 1C RESIDUAL HEAT REMOVAL SERVICE WATER PUMP PIPING IN EXCESS OF ALLOWABLE STRESS/IMPROPER ANCHOR BOLT TORQUING

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)
0 5	0 8	8 7	8 7	0 0 8	0 1	0 8	2 9	8 8		0 5 0 0 0 1 1 0 5 0 0 0 1 1

OPERATING MODE (9) 4
 THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)

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 Abstract below and in Text)
20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
20.405(a)(1)(iv)	X 50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

Name: Kevin B. Cravens, Technical Staff Engineer
 Ext. 2173
 TELEPHONE NUMBER: AREA CODE 3 | 0 | 9 | 6 | 5 | 4 | - | 2 | 2 | 4 | 1

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS	
X	B Q	S P T	H I 9 6	Y							

SUPPLEMENTAL REPORT EXPECTED (14)

Expected Submission Date (15) _____
 [Yes (If yes, complete EXPECTED SUBMISSION DATE)] X | NO

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

On May 8, 1987, Quad Cities Unit One was in the RUN mode at 96 percent of rated thermal power. At 1645 hours, the Station was notified that the Unit One Residual Heat Removal Service Water (RHRSW) system was operable but outside of the plant design specifications. This was the result of an analysis performed by Impell Corporation. The analysis was initiated based on the March 9, 1987 discovery that two of four bolts on a Concrete Expansion Anchor (CEA) plate were sheared off. Pipe hanger M-994D-107, which provides vertical support for the 1C RHRSW pump discharge line, is attached to this plate. NRC notification per 10 CFR 50.72 was completed at 1716 hours on May 8, 1987.

The cause was determined to be due to anchor bolt nuts loosening in service while being subjected to operational vibration. A replacement plate and bolts were installed and completed on June 16, 1987. The Station is inspecting all anchor bolts on CEA plates with RHRSW suction or discharge pipe support attachments in the RHRSW vaults. This report is provided per 10CFR50.73(a)(2)(ii).

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C. APPARENT CAUSE OF EVENT:

This report is submitted to comply with 10 CFR 50.73(a)(2)(ii) which requires the reporting of any condition that is outside the design basis of the plant. Although the RHRSW system was operable, the hanger was not performing its intended function as required by design.

Based on a study performed by Impell Corporation, aided by information from the corporate System Material Analysis Department (SMAD) and station vibrational testing personnel, the cause of the anchor bolt failure on support M-994D-107 was determined to be due to anchor bolt nuts loosening in service while being subjected to operational vibration. The operational vibration at the anchor bolts was due to flow induced vibration near the support. Details of the bolt analysis are provided in Section E below.

D. SAFETY ANALYSIS OF EVENT:

An operability analysis was performed by Impell Corporation to determine the impact of this event on the system operation and plant safety. The line was analyzed under the assumption that the failed hanger was not supporting any load. This implies that the load previously carried by failed support M-994D-107 is now distributed to the other supports on that line. The individual support load analysis showed each support on line 1-1004-12" to be both operable and within FSAR design limitations (Sections 12.1 and 12.2). However, the pipe stress analysis, including both gravity and seismic considerations, showed the pipe stress to be beyond FSAR design requirements, although it was still within operability limits.

The safety implications of this event were, therefore, minimal because at no time was the RHRSW system, or any component thereof, inoperable. The operability of the RHRSW pumps was demonstrated by the satisfactory performance of surveillance procedure QOS 1000-4, "RHR Service Water Pump Flow Rate Testing Operations - Every 90 Days" on March 23, 1987 and QOS 1000-S2, "RHR and RHRSW Pump Operability Data Sheet" on April 2, 1987 and May 1, 1987. Technical Specification 3.5.B.2, which permits reactor operation only during the succeeding 30 days after a RHRSW pump is found to be inoperable, is therefore, not applicable to this event.

E. CORRECTIVE ACTIONS:

The initial corrective action was to replace the existing expansion bolts and CEA plate with heavy duty bolts and plate. The previous plate was 8 inch by 8 inch by 1/2 inch thick with 1/2 inch by 7 inch bolts. The replacement plate is 9 inch by 9 inch by 3/4 inch thick with 3/4 inch by 8 1/2 inch bolts. The new plate was mounted in the same location as the old plate using the same strut and clamp on the pipe. This work was completed on June 26, 1987, under work request Q55793.

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The supports for the other RHRSW pump discharge lines were also visually examined by a Technical Staff Engineer at this time. The integrity of the supports and plates was observed to be satisfactory.

A followup analysis was performed on the deformed anchor bolts by Impell Corporation. Their investigation consisted of four tasks: 1) Metallurgical Testing and Evaluation; which consisted of a hardness test, chemical analysis, microstructure evaluation, and optical and scanning electron microscope fractography, 2) System Evaluation; i.e., the examination of the amplitude and frequency of the fatigue load, 3) Fatigue/Fracture Mechanics Analysis, and 4) Recommendations. Based on the results of the anchor bolt analysis, Impell concluded that the failure was not caused by poor quality of the bolt material. Instead, operational vibration in the pipe due to pump vibration caused the nuts to loosen and resulted in the fatigue failure of the bolts.

Expanding upon the recommendation by Impell, the station is inspecting all anchor bolts on CEA plates with RHRSW suction or discharge pipe support attachments in the RHRSW pump vaults for the proper torque. This work was completed on Unit Two under work request Q65667. During the inspection, three nuts on two different supports were found to be slightly loose and needed to be tightened approximately 1/16 inch rotationally before they held torque. Work request Q67523 was written to retorque the nuts and reinspect. This was completed on June 20, 1988. Impell found the supports and the system piping to be operable and within FSA design requirements during the time the nuts were loose. Work request Q68258 has been written to inspect the CEA plates on Unit One and is presently in progress. This will be tracked with NTS 2542008704000R1.1. Any loose nuts resulting in the associated support beyond FSAR or operability requirements, as determined by appropriate engineering calculations, will be addressed in a supplement. A review of the documentation for the supports with failed nuts indicated that the original installation (torquing) was performed correctly, as required by procedure QMP 800-12.

The three supports which had either failed anchor bolts (M-994D-107) or loose anchor bolt nuts (M-1026D-137, 142) have been identified as either the first or second support on the discharge side of the RHRSW pump. Corporate engineering and the station technical staff agree that a preventive maintenance program needs to be implemented to prevent any future failures resulting from the CEA plate nuts loosening in service. The program will be initiated once the final scope and frequency of inspection have been decided upon. This program will be tracked with NTS 2542008704000R1.2.

In addition, a modification (M-4-1(2)-87-002A,B,C,D) to the RHRSW pump impellers is in progress which will greatly reduce the pump vibration (NTS 2542008704000R1.3). Initial test results are documented in Special Test 1-109. Among other advantages, this modification will reduce the vibration experienced by the pipe supports and, therefore, the CEA plate bolts.

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The second issue to be addressed with regard to this event is the manner in which it was initially handled. A deficiency in the review process of this particular work request by the Operating Engineer has been noted and corrective actions initiated. In administrative procedure QAP 1500-2, Work Request Procedure for Station Maintenance, a note was added to the responsibilities assigned to the Operating Engineer or Assistant Superintendent of Operating when reviewing a work request. The note states that for items involving questionable FSAR compliance, such as degraded pipe supports, a Deviation Report should be initiated and the item evaluated for operability. A review process has also been created for use in the evaluation of component operability, unreviewed safety questions, or any potential deficiency. This review process will be included in procedure QAP 1100-12, Conduct of Safety Evaluations, and 10CFR50.59 Review (NTS 2542008704000R1.4).

F. PREVIOUS EVENTS:

There have been no previous similar failures of CEA plates documented as a Licensee Event Report (LER) at Quad Cities Station.

G. COMPONENT FAILURE DATA:

<u>Manufacturer</u>	<u>Nomenclature</u>	<u>Type</u>
Hilti Corporation	Hilti Kwik Bolts	½ inch x 7 inch

Due to the previous satisfactory performance of other Hilti bolts, it was determined that a larger sized Hilti expansion bolt would be an adequate repair and would prevent recurrence of the event.



Commonwealth Edison

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RLB-88-195

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

Reference: Quad-Cities Nuclear Power Station
Docket Number 50-254, DPR-29, Unit One

Enclosed is Licensee Event Report (LER) 87-008, Revision 01, for
Quad-Cities Nuclear Power Station.

This report is submitted in accordance with the requirements of the Code
of Federal Regulations, Title 10, Part 50.73(a)(2)(ii): the licensee shall
report any event or condition that resulted in the nuclear power plant being
in a condition that was outside the design basis of the plant.

Respectfully,

COMMONWEALTH EDISON COMPANY
QUAD-CITIES NUCLEAR POWER STATION

R. A. Ralston for
R. L. Bax
Station Manager

RLB/DH/ad

Enclosure

cc: I. Johnson
R. Higgins
INPO Records Center
NRC Region III

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