Iowa Electric Light and Power Company

April 28, 1992
NG-92-2185

Mr. A. Bert Davis
Regional Administrator
Region III
U. S. Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, IL 60137

Subject: Duane Arnold Energy Center
Docket No: 50-331
Op. License DPR-49
Licensee Event Report #91-005,Rev.01

Gentlemen:

In accordance with 10 CFR 50.73 please find attached a supplemental update of the subject Licensee Event Report.

Very truly yours,

David L. Wilson

David L. Wilson
Plant Superintendent - Nuclear

DLW/RM/eah

cc: Director of Nuclear Reactor Regulation
Document Control Desk
U.S. Nuclear Regulatory Commission
Mail Station P1-137
Washington, D. C. 20555

NRC Resident Inspector - DAEC

IE22

NRC Form 366A (6-89) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

APPROVED OMB NO 3150-0104

EXPIRES 4/30/92

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)	DOCKET NUMBER (2)	PAGE (3)
Duane Arnold Energy Center	0 5 0 0 0 3 3 1	1 OF 0 5

TITLE (4) Automatic Reactor Scram Following Main Steam Isolation Valve (MSIV) Closure and Subsequent Residual Heat Removal (RHR) Shutdown Cooling Isolation

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 6	2 2	9 1	9 1	0 0 5	0 1				None	0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	1 0 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 Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	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	TELEPHONE NUMBER
	AREA CODE
Ron McGee, Technical Support Specialist	3 1 9 8 5 1 - 7 6 0 2

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	L K	I S V		Y							

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

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

On June 22, 1991 with the reactor at approximately 100% power, a single outboard Main Steam Isolation Valve (MSIV) closed, resulting in a high flux automatic reactor scram. The root cause for this event was poor workmanship during original construction of a soldered copper joint in the non-safety related nitrogen supply piping to the outboard MSIVs. Corrective actions include replacement of the MSIV copper piping with stainless steel tubing and evaluation of the long term suitability of existing copper piping in systems related to plant safety or availability.

While proceeding to cold shutdown, on June 23, 1991, a partial Primary Containment Isolation System (PCIS) Group IV actuation isolated the Residual Heat Removal (RHR) system suction piping. This occurred while aligning RHR to enter shutdown cooling. When the RHR pump was started, a pressure surge, cause unknown, resulted in the PCIS actuation. Corrective actions include installation of instrument line snubbers, and testing and analysis of the RHR shutdown cooling system.

This report is submitted as a supplemental update on corrective actions taken and testing performed.

I. DESCRIPTION OF EVENT:

On June 22, 1991 at 0214, a reactor scram occurred as a result of a Main Steam Isolation Valve (MSIV) closure. The reactor was operating at approximately 100% power prior to the event. The MSIV closure caused reactor pressure and power to rise, resulting in an Average Power Range Monitor (APRM) high flux reactor scram.

As expected following the scram reactor water level lowered due to void reduction. Primary Containment Isolation System (PCIS) Groups II through V isolated as designed due to low vessel level. Reactor water level was quickly restored with feedwater flow, and the plant was returned to a stable condition. Peak reactor pressure was 1028 psig.

While proceeding to cold shutdown, with reactor pressure at less than 80 psig, Operations personnel were in the process of establishing the shutdown cooling mode of the Residual Heat Removal (RHR) System. The RHR inboard and outboard suction line isolation valves were opened and the suction line flushed. When the 'D' RHR pump was started, the outboard suction line isolation valve auto-closed due to a partial PCIS Group IV logic actuation (actuates when sensed reactor pressure is greater than 135 psig). The isolation protects the RHR system piping from overpressure. No noticeable changes were observed in reactor pressure after the isolation; however, control room annunciators indicated that a momentary localized pressure surge had occurred in the RHR and reactor recirculation systems. Also, Reactor Vessel water level had decreased approximately 4.5 inches; however, level remained in the normal shutdown range.

This revision to the original report is being submitted as a supplemental update on corrective actions completed and testing results.

II. CAUSE OF EVENT

The cause of the MSIV closure was determined to be a non-safety related pipe joint failure. The two inch nitrogen supply pipe that supplies the outboard MSIVs' control accumulators separated sufficiently at a soldered coupling to reduce supply pressure. Although check valves are installed to maintain control pack accumulator pressure, two smaller fitting leaks on the control pack for the 'B' outboard MSIV slowly reduced the pressure to the nitrogen-operated MSIV position control valve. This caused the control valve to slowly change position, porting actuating nitrogen to close the MSIV.

The root cause of the pipe joint failure has been determined to be poor workmanship during original construction. Inspection of the copper pipe soldered joint revealed inadequate coupling. A two inch pipe should be inserted approximately 1-1/2 inches into the coupling, then soldered. This pipe was inserted approximately 3/4 inches when it was soldered. The pipes on both sides of the failed joint were structurally mounted in such a way that a small tensile stress was applied to the joint. Additionally, the solder used was 50-50 Sn-Pb, which is not an optimal solder for the higher temperature area (steam tunnel). The pulling action, in association with the inadequate joint construction, and the application of 50-50 Sn-Pb solder caused the joint to fail approximately seventeen years following installation.

The cause of the partial PCIS Group IV actuation is unknown. Prior to initiating the shutdown cooling mode of the RHR system, the suction piping is filled by opening the RHR outboard suction line isolation valve and manually filling with the condensate service water system. Once complete, the RHR inboard suction line isolation valve is opened and the suction piping is flushed to minimize thermal shock to the RHR system vessel inlet nozzles. Once complete, the RHR pump is started. When the RHR pump was started a momentary pressure surge occurred, sensed by the PCIS pressure switches. The pressure surge was sufficient to cause one pressure switch to trip, resulting in the automatic closure of the RHR shutdown cooling outboard suction line isolation valve.

III. ANALYSIS OF EVENT

A single MSIV closure transient is a non-limiting event. All automatic actions occurred as designed. Operator response was good, quickly restoring the plant to a stable condition.

The partial PCIS Group IV isolation and momentary loss of shutdown cooling is not a safety concern. All automatic actions for the isolation were verified to have occurred as designed. Shutdown cooling was initiated within six minutes following the isolation.

IV. CORRECTIVE ACTIONS

1. The fittings on the MSIV control pack were tightened to eliminate the leakage. Additionally, preventative maintenance actions have been initiated to inspect the MSIV nitrogen piping each outage.

2. The copper, non-safety related nitrogen supply header in the steam tunnel area (outboard MSIVs) was replaced with stainless steel tubing.

3. The remaining outboard MSIV copper tubing connections (safety related) were leak checked using a soap solution. One very minor fitting leak was found and corrected.

4. Solder materials are evaluated during rework or installation for use in high ambient temperature applications.

5. A review of plant documents to identify additional systems utilizing copper piping which could affect plant safety or availability was completed. Three areas were identified:

   a. Instrument air system: An inspection program of two (2) and three (3) inch solder joints was completed by September 16, 1991. Of the 318 joints inspected, 5 were rejected due to joint leakage and 56 joints were rejected for inadequate solder coupling as identified by ultrasonic examination. The rejected joints have been repaired, overlayed with a metallic bonding compound and /or physically restrained to prevent joint failure.

   b. Safety related copper tubing for the outboard MSIVs: This tubing was replaced with stainless steel tubing during the recent refueling outage as recommended by an engineering review completed July 16, 1991.

   c. Safety related instrument air supply for the control building ventilation system: A review of the long term suitability of this tubing was completed August 22, 1991. It was determined this tubing (nominal size one inch or less) is not likely to be susceptible to the failure mode associated with the larger soldered joints. Trending of leakage as determined by quarterly surveillance testing is adequate to identify increasing joint leakage.

6. Instrument line snubbers for the shutdown cooling PCIS pressure switches were installed November 27, 1991.

7. Additional RHR system testing was performed on February 28, 1992 when entering the shutdown cooling mode. This mode of operation was successfully entered without PCIS actuation. The testing revealed no system perturbations.

V. ADDITIONAL INFORMATION

1. Failed component identification: The failed joint was a two inch copper piping coupling connection at a 90 degree elbow bonded with 50-50 Sn-Pb solder.

2. Previous Similar Events:

   - A manual scram event occurred on September 13, 1990 (LER 90-015). This event was caused by a poorly soldered copper joint in the instrument air system. As part of the corrective actions for this event, an inspection program of soldered joints for the instrument air system was begun. The nitrogen supply system was not recognized at that time as being susceptible to a similar failure.

   - A RHR PCIS Group IV isolation event occurred on December 10, 1990 (LER 90-022). In that event, the isolation occurred when the inboard and outboard suction line isolation valves were opened. The corrective actions for that event included the procedural enhancement of filling the RHR system suction line. A review of this corrective action indicates that it was successful in reducing suction piping voids.

3. Applicable EIIS System/Component Codes:

System	System Code
Nitrogen Supply System	LK
Primary Containment Isolation System	JM
Reactor Protection System	JD
Residual Heat Removal System	BO
Reactor Recirculation System	AD
Condensate Service Water System	KA

Component	Component Code
Main Steam Isolation Valves	ISV
RHR Inboard and Outboard Isolation Valves	ISV
RHR Pumps	P
Pressure Switches	PS

These events were reported pursuant to 10CFR50.73(a)(2)(iv).