



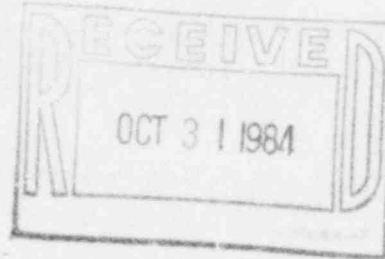
LOUISIANA
POWER & LIGHT

142 DELARONDE STREET • P.O. BOX 6008
NEW ORLEANS, LOUISIANA 70174-6008 • (504) 366-2345

October 26, 1984

W3P84-2678
Q-3-A35.07.114
3-A1.01.04

Mr. John T. Collins
Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 76012



Dear Mr. Collins:

Subject: Waterford 3 SES
Docket No. 50-382
SIGNIFICANT CONSTRUCTION DEFICIENCY NO. 114
"Damage to Safety Related Equipment Due to Waterhammers"
Final Report

Reference: LP&L letter W3P84-2697 dated September 24, 1984

The referenced letter was an interim report on SCD-114. In accordance with the requirements of 10CFR50.55(e), enclosed are two copies of the Final Report of Significant Construction Deficiency No. 114, "Damage to Safety Related Equipment Due to Waterhammers".

Very truly yours,

K.W. Cook
Nuclear Support & Licensing Manager

KWC:RJB:GEW:sms

Enclosure

cc: NRC, Director, Office of I&E
NRC, Director, Office of Management
E.L. Blake
W.M. Stevenson
W.A. Cross
INPO Records Center (D.L. Gillispie)

8411130697 841026
PDR ADOCK 05000382
S PDR

11 15-27

FINAL REPORT OF
SIGNIFICANT CONSTRUCTION DEFICIENCY NO. 114
"DAMAGE TO SAFETY RELATED EQUIPMENT DUE TO WATERHAMMERS"

INTRODUCTION

This report is submitted pursuant to 10CFR50.55(e). It describes the waterhammer events which occurred on 5/10/84 and 5/17/84. It also describes the system/components affected, subsequent corrective action, and actions taken to minimize the potential of recurrence.

The deficiency has not been reported to the USNRC pursuant to 10CFR21.

DESCRIPTION

On May 9, 1984, at approximately 14:45, with Safety Injection System (SIS) train "A" aligned in the shutdown cooling (SDC) mode, the annunciator for "Loop 2 Shutdown Cooling System Hydraulic Isolation Valve Trouble" began to alarm intermittently. In accordance with annunciator response procedure OP-500-011, the motor breaker to the hydraulic actuator was opened for SIS Isolation Valve SI405A. On May 10, 1984, at about 06:48, a loss of shutdown cooling flow was observed and SI405A was indicated closed with LPSI "A" pump still running. LPSI "A" pump was immediately secured. The operators were not aware that a negative pressure existed in the Emergency Core Cooling System (ECCS). The waterhammer occurred when the Refueling Water Storage Pool (RWSP) quick opening butterfly outlet valve SI106A was opened.

On May 17, 1984, at 00:50, while conducting an operability check of Containment Spray Pump (CSP) "A", personnel observed a drop in suction and discharge pressure and saw recirculation flow drop to zero. The pump was secured and valve SI106A was found closed. Due to improper verification of valve alignment prior to starting LPSI "A" and compounded by misinterpretation of communications, SI106A was opened resulting in the second waterhammer event.

Subsequent walkdowns were performed to evaluate potential damage that may have been sustained in both events. Scope of inspections and findings were as follows:

1. One hundred twenty nine (129) supports associated with train "A" of the ECCS were evaluated. Twenty (20) restraints required further evaluation, rework, or replacement.
2. Ultrasonic (UT) and dye penetrant testing (PT) consistent with the LP&L In-Service Inspection (ISI) program were performed on affected piping. Six (6) PT's and five (5) UT's were performed in areas where piping was postulated to have received the highest stresses.
3. All affected pumps (High Pressure Safety (HPSI) "A", HPSI "A/B", Low Pressure Safety Injection (LPSI) "A", and Containment Spray (CS) "A") were tested with satisfactory results in accordance with ISI surveillance procedures. X-Y vibration

DESCRIPTION (cont'd)

plots were performed on all the above pumps and maintenance was performed where necessary to assure minimum vibration regardless of the cause or reason for vibration.

- 4) A defective check valve within the hydraulic operator for SI405A caused the valve to close thereby interrupting SDC flow.

SAFETY IMPLICATION

For conservatism, it is assumed for this safety evaluation that the twenty (20) supports/restraints were removed. Under these assumptions, if left uncorrected, the capability for Train "A" of the ECCS system to sustain the design basis earthquake loads is rendered indeterminate. This could potentially render a single train inoperable for the removal of residual heat and its ability to mitigate the consequences of a Loss of Coolant Accident (LOCA). Corrective actions have been completed on all questionable/damaged restraints.

CORRECTIVE ACTION

The following corrective actions were taken to assure hardware integrity:

- 1) The 20 questionable or damaged seismic restraints were reworked or replaced to original specifications in accordance with approved procedures.
- 2) All pumps passed the ISI surveillance requirements as a result of the analysis of pump vibration data.
- 3) The defective check valve within the hydraulic operator for SI405A was repaired and satisfactory tested.
- 4) No anomalies were observed (visually or through evaluation) on those portions of piping systems which had undergone Nondestructive Examination (NDE). Therefore, no further NDE was performed.

The following actions have been taken by the Operations Department to prevent system waterhammer events:

- 1) Operating Procedures OP-500-011 and 12 have been revised to assure that respective trains are declared inoperable when power cannot be restored to the hydraulic pump motor.

CORRECTIVE ACTION (cont'd)

- 2) The Operations Supervisors have been cautioned and instructed to caution their personnel concerning the waterhammer events to date. Additionally, the Potential Reportable Events (PRE) reports concerning waterhammer events to date have been added to the required reading list for operators.
- 3) Daily instructions were prepared which cautioned Operations personnel concerning proper valve alignments and venting of systems prior to operation to prevent waterhammer events.
- 4) Departmental instructions (OI-01-000) addressing sound operating practices and guidelines have been developed which address such things as waterhammer. Implementing these practices should reduce the probability for future operational events.

This report is submitted as the final response to SCD 114.