

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION III  
799 ROOSEVELT ROAD  
GLEN ELLYN, ILLINOIS 60137

MAR 02 1977

Iowa Electric Light and  
Power Company  
ATTN: Mr. Duane Arnold  
President

Docket No. 50-331

IE Towers  
P.O. Box 351  
Cedar Rapids, Iowa 52406

Gentlemen:

This refers to the inspection conducted by Messrs. E. W. K. Lee and E. L. Jordan of this office on February 16, 1977, of activities at the Duane Arnold Energy Center authorized by License No. DPR-49 and to the discussion of our findings with Messrs. E. Hammond and K. V. Harrington and other members of your staff at the conclusion of the inspection.

The enclosed copy of our inspection report identifies areas examined during the inspection. Within these areas, the inspection consisted of a selective examination of procedures and representative records, observations, and interviews with personnel.

No items of noncompliance with NRC requirements were identified during the course of this inspection.

In accordance with Section 2.790 of the NRC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations, a copy of this letter and the enclosed inspection report will be placed in the NRC's Public Document Room, except as follows. If this report contains information that you or your contractors believe to be proprietary, you must apply in writing to this office, within twenty days of your receipt of this letter, to withhold such information from public disclosure. The application must include a full statement of the reasons for which the information is considered proprietary, and should be prepared so that proprietary information identified in the application is contained in an enclosure to the application.



Iowa Electric Light  
and Power Company

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We will gladly discuss any questions you have concerning this inspection.

Sincerely,

R. F. Heishman, Chief  
Reactor Construction and  
Engineering Support Branch

Enclosure: IE Inspection Rpt.  
No. 050-331/77-04

cc w/encl:  
E. L. Hammond, Chief  
Engineer  
Central Files  
Reproduction Unit NRC 20b  
PDR  
Local PDR  
NSIC  
TIC

OFFICE	RIII	RIII	RIII	RIII		
SURNAME	Lee/lb <i>EL</i>	<i>EL</i> Jordan	<i>EL</i> Heishman	<i>EL</i> Kister		
DATE	3/1/77					

UNITED STATES NUCLEAR REGULATORY COMMISSION  
OFFICE OF INSPECTION AND ENFORCEMENT

REGION III

Report of Construction Inspection

IE Inspection Report No. 050-331/77-04

Licensee: Iowa Electric Light and Power Company  
IE Towers  
P. O. Box 351  
Cedar Rapids, Iowa 52406

Duane Arnold Energy Center  
Palo, Iowa

License No. DPR-49  
Category: C

Type of Licensee: BWR 538 MWe

Type of Inspection: Special, Announced

Date of Inspection: February 16, 1977

Principal Inspector: E. W. K. Lee *E. W. K. Lee*

3/1/77  
(Date)

Accompanying Inspectors: None

Other Accompanying Personnel: E. L. Jordan

Reviewed By: *E. L. Jordan*  
E. L. Jordan, Chief  
Engineering Support Section

3/2/77  
(Date)

SUMMARY OF FINDINGS

Inspection Summary

Inspection on February 16, (77-04): Reviewed the cause, damages and corrective actions taken by the licensee relative to the core spray line (loop A) water hammer which occurred on February 11, 1977.

Enforcement Items

None.

Licensee Action on Previously Identified Enforcement Items

Not applicable.

Other Significant Items

A. Systems and Components

The licensee reported a water hammer occurred to the loop A of the core spray line on February 11, 1977, during a semiannual surveillance test of the system. (Paragraph 1, Report Details)

B. Facility Items (Plans and Procedures)

None.

C. Managerial Items

None.

D. Deviations

None.

E. Status of Previously Reported Unresolved Items

None.

Management Interview

- A. The following persons attended a management interview held at the conclusion of the inspection.

Iowa Electric Light and Power Company (IEL&P)

E. Hammond, Chief Engineer  
K. Harrington, Supervising Engineer - Construction  
L. Nelson, Reactor Engineering Department  
R. Rinderman, Site Quality Supervisor  
P. Ward, Mechanical Design Engineer  
D. Wilson, Technical Engineer

Bechtel Power Corporation

J. Ogawa, Mechanical Engineer

- B. Matters discussed and comments on the part of management, were as follows:

The inspectors discussed the findings as documented in the Report Details section of this report. The inspectors stated that they agreed with the licensee's findings regarding probable cause and immediate corrective actions and no significant deficiencies had been identified by the NRC inspectors.

The inspectors stated that they understood that the cast iron motor clutch housing was being replaced with an identical component until a malleable iron replacement can be obtained for both core spray loop valve operators. The inspectors also stated that they understood that the Operations Review Committee planned to review the occurrence prior to declaring the loop operable.

Licensee representatives acknowledged the inspector's understandings.

Licensee representatives described a previous failure of the same motor clutch housing which had occurred in 1974. During a discussion of generic aspects of the failure, licensee representatives stated that the Occurrence Report would contain the full description of the component which had failed.

## REPORT DETAILS

### Persons Contacted

The following persons in addition to individuals listed under the Management Interview section of this report, were contacted during the inspection.

#### Iowa Electric Light and Power Company (IEL&P)

R. Zooke, Shift Supervisor  
G. Stratton, Equipment Operator  
J. Vinqvist, Electrical Maintenance Supervisor

### Results of Inspection

#### 1. Initial Identification by Licensee

The water hammer was heard and reported to the control room by two plant personnel who were in the Reactor Building at the time of the occurrence. The Core Spray Test was at step 4.4.3 when the water hammer was reported. Licensee representatives have postulated errors which could have resulted in an inadvertent core spray system initiation. Although the procedure was revised since the previous test in August 1976, the revision did not affect the steps at which the water hammer apparently was initiated. Subsequent to the occurrence, the licensee performed an inspection on the system to assess the damages. It was found that the only damage was to the valve (MO-2115) cast iron motor clutch housing. The licensee's contractor also performed a calculation to estimate the stresses in the pipe during the water hammer. It was determined that the highest stress of 22,000 psi occurred at the elevation 786'-0" anchor point. The calculation was based on a displacement of 1" at valve MO-2115.

The licensee presently plans to retest loop A from about procedure step 4.30 under additional supervision.

#### 2. Inspection and Surveillance Testing

The inspectors examined the accessible portions of loop A core spray system. The inspectors determined that: (1) there was no

apparent damage to hangers, snubbers and etc., other than the cracked clutch housing; (2) displacement of 1" at valve I.D. No. MO-2115 appears to be unlikely; (3) portions of the grout at elevation 786'-0" anchor point was broken and (4) the water hammer impact appears to have been absorbed by the anchor at elevation 786'-0". The core spray system loop A remained out of service following the occurrence pending replacement of the motor clutch housing and completion of review of the occurrence by the licensee. Surveillance of the operable B loop was initiated and has been performed daily in accordance with T.S. 3.5.A.2. The inspectors also examined loop B core spray system which was fully accessible up to the dry-well penetration. No significant deficiencies were found.

3. Cause of Event

Based upon review of records, examination of equipment and discussion with personnel, the inspectors determined that the event probably resulted from a combination of an error by personnel performing the Core Spray System Semiannual Surveillance Test No. 42B010, plus a partial drainage of the core spray line via the test bypass line to the torus. The core spray pump had been operated immediately prior to the inadvertent initiation. Therefore, if the line had partially drained, insufficient time had elapsed to replenish the line via the line fill system.

4. Records Reviewed

The following documentation was reviewed:

Core Spray Semiannual Logic Test  
Procedure STP 42B010

Shift Supervisor's Log for February 11, 1977

Reactor Operations Log for February 11, 1977

Alternate Core Spray Subsystem B  
Surveillance Testing Procedure 45A005 and Surveillance Records

Operations Review Committee Minutes for February 11, 1977 (Draft)

No significant deficiencies were identified.