

*Central files*

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

JUL 7 1975

Iowa Electric Light and Power Company  
ATTN: Mr. Charles W. Sandford  
Executive Vice President,  
Engineering  
Security Building  
P. O. Box 351  
Cedar Rapids, Iowa 52405

Docket No. 50-331

Gentlemen:

This refers to the inspection conducted by Messrs. Cook and Feierabend of this office on June 11-13, 1975, of activities at Duane Arnold Energy Center authorized by NRC License No. DPR-49 and to the discussion of our findings with Messrs. Hunt, Hammond and others of your staff at the conclusion of the inspection.

A copy of our report of this inspection is enclosed and identifies the areas examined during the inspection. Within these areas, the inspection consisted of a selective examination of procedures and representative records, interviews with plant personnel, and observations by the inspectors.

No items of noncompliance with NRC requirements were identified within the scope 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. If this report contains any information that you or your contractors believe to be proprietary, it is necessary that you make a written application to this office, within twenty days of your receipt of this letter, to withhold such information from public disclosure. Any such application must include a full statement of the reasons for which it is claimed that the information is proprietary, and should be prepared so the proprietary information identified in the application is contained in a separate part of the document. Unless we receive an application to withhold information or are otherwise contacted within the specified time period, the written material identified in this paragraph will be placed in the Public Document Room.



*RM*

Iowa Electric Light and  
Power Company

- 2 -

JUL 7 1975

No reply to this letter is necessary; however, should you have any questions concerning this inspection, we will be glad to discuss them with you.

Sincerely yours,

Gaston Fiorelli, Chief  
Reactor Operations Branch

Enclosure:  
IE Inspection Rpt No. 050-331/75-07

bcc: PDR  
Local PDR  
NSIC  
TIC

U. S. NUCLEAR REGULATORY COMMISSION  
OFFICE OF INSPECTION AND ENFORCEMENT

REGION III

Report of Operations Inspection

IE Inspection Report No. 050-331/75-07

Licensee: Iowa Electric Light and Power Company  
Security Building  
P. O. Box 351  
Cedar Rapids, Iowa 52405

Duane Arnold Energy Center  
Palo, Iowa

License No. DPR-49  
Category: C

Type of Licensee: BWR (GE) - 538 Mwe

Type of Inspection: Special, Announced

Dates of Inspection: June 11-13, 1975

Principal Inspector: *C. D. Feierabend*  
C. D. Feierabend

7/3/75  
(Date)

Accompanying Inspector: *R. J. Cook*  
R. J. Cook

7/3/75  
(Date)

Other Accompanying Personnel: None

Reviewed By: *RC Knop*  
R. C. Knop  
Senior Inspector  
Projects Unit 1  
Reactor Operations Branch

7/6/75  
(Date)

## SUMMARY OF FINDINGS

### Inspection Summary

Inspection on June 11-13: Review of videotapes of examinations of fuel channels and dropped fuel assembly; visual examination, by boroscope, of wear on fuel channels due to instrument tube vibration; investigation of the circumstances involving the dropping of a fuel assembly in the reactor vessel; examination of a relief valve blow-down pipe that had previously been damaged during valve operation.

### Enforcement Items

None.

### Licensee Action on Previously Identified Enforcement Items

None.

### Other Significant Items

#### A. Systems and Components

Examination of fuel channels verified wear caused by instrument tube vibration. The licensee is discussing resolution of the problem with Licensing. The discussions will include resolution of the problems arising from damage to fuel assemblies caused by dropping an assembly into the reactor vessel.

#### B. Facility Items (Plans and Procedures)

The licensee expects to complete interim modifications to the reactor that will allow operation at power levels up to 85% of rated power and return to power production in early July, 1975.

#### C. Managerial Items

None reviewed.

#### D. Noncompliance Identified and Corrected by Licensee

None reviewed.

E. Deviations

Procedure for operation of fuel handling equipment was not readily available on the fuel handling floor. (Paragraph 3)

F. Status of Previously Reported Unresolved Items

None reviewed.

Management Interview

A management interview was conducted with Messrs. Hunt, Hammond and member of the plant staff at the conclusion of the inspection.

The inspector stated that the purpose of the inspection was to observe the status of the licensee's activities in the area of correlating the data obtained by instrumentation with physical affect on the fuel channels and instrument tubes. The inspector stated that the inspection also included review of the occurrence of a dropped fuel assembly, the plans for recovery of the damaged assemblies and an examination of the relief valve blowdown piping that had been previously damaged by valve actuation. The inspector stated that the scope and timing of any subsequent inspection would be dependent on resolution of the scope of the recovery program and the affect of any changes to the operating license.

A. Fuel Channel Inspection

The inspector stated that personal examination of one fuel channel by boroscope verified the evidence of wear by the instrument tube vibration and showed that the videotapes prepared by the licensee accurately reproduced the condition of the channel damage.

B. Recovery of Damaged Fuel Assemblies

The inspector stated that he had discussed plans for recovery of the dropped fuel assembly and had viewed the videotape of recovery and preliminary inspection of the assembly.

The inspectors stated that they had participated in discussions of plans for recovery of the second damaged assembly and had confidence that appropriate precautions were being considered.

C. Relief Valve Blowdown Piping

The inspector stated that he had inspected the relief valve blowdown piping that had been previously damaged during valve actuation, and that the damage appeared to be less severe than he had expected from the sketches and description he had seen.

The licensee stated that a stress analysis is currently in progress to confirm the judgment made by the licensee's engineering staff that no significant damage had occurred.

The inspector stated that he would expect that the licensee analysis would resolve any questions concerning the current status of the piping, and that if there was any question of integrity it would be replaced prior to startup. The licensee acknowledged the comment.

## REPORT DETAILS

### 1. Persons Contacted

#### Iowa Electric Light and Power Company (IELP)

D. Arnold, President  
C. Sanford, Executive Vice President  
G. Hunt, DAEC Chief Engineer  
R. Surls, Administrative Supervisor  
B. York, Operations Supervisor  
D. Moen, Reactor and Plant Performance Engineer  
C. Vondra, Shift Supervising Engineer  
D. Kalavitinos, Shift Supervising Engineer  
D. Teply, Shift Supervising Engineer  
J. Gebert, Maintenance Supervisor  
R. Rockhill, Mechanical Maintenance Supervisor  
R. Rinderman, Quality Supervisor  
D. Wilson, Results Engineer

#### General Electric Company (GE)

S. Levy, General Manager, BWR Operations  
J. Zilinskas, Senior Engineer, Service Projects  
J. Hoffman, Manager, Reactor Refueling and Servicing  
W. Swanson, Fuel Operations Specialist

### 2. Inspection of Fuel Channels

The licensee had completed removal of the vessel upper internals and had started inspection of the fuel channels adjacent to the instrument tube with the noisiest instrument indications. Inspection was performed with a boroscope, with capabilities of recording the image on videotape. The inspector examined a fuel channel, using the boroscope, and viewed videotape records of inspection of a fuel channel, taken at different angles to show all available detail. The videotape records provided good detail of the wear, including the record of location by means of a tape measure mounted within the viewing range.

In the course of the inspection the inspectors attended meetings between licensee management, GE and NRR(L) held at the site to discuss the vibration problem. No decisions were made concerning the interim and/or final solution to the problem pending completion of inspection of all of the affected channels and instrument tubes.

### 3. Dropped Fuel Assembly

While enroute to the site the inspectors were informed by telephone that a fuel assembly had dropped from the grapple into the reactor vessel. Upon arrival at the site the inspectors discussed the occurrence with plant management personnel prior to inspecting on the refueling floor. The licensee had obtained videotape record of the location of the fuel assembly with closeup of the impact area showing that the nose of the dropped assembly had lodged into the top of one element, bending the lifting bail and depressing the upper tie plate. There was no apparent contact with any of the adjacent assemblies, although the element that had been struck appeared to be forced laterally against the adjacent element in the cell.

The inspectors visually inspected the fuel assembly from the refueling bridge and confirmed the attitude and accessibility were in agreement with the licensee's plan for recovery. Plans for recovery of the dropped assembly included precautions to assure that damage would not be aggravated. The fuel assembly recovery operation was accomplished without incident and was documented on videotape.

The inspector attended a planning session for recovery of the second damaged assembly. Recovery of this assembly was scheduled to be performed after all of the fuel assemblies had been transferred to the fuel pool for channel inspection. Plans for recovery included provisions for backup assurance of integrity of the assembly in case of failure of the lifting bail or the tie bolts.

The inspector discussed the occurrence with the senior reactor operator who was supervising fuel movement and with plant management personnel. The inspector determined that the operating crew performing the refueling operations met the license requirements of the Technical Specifications and that the operations were being performed in accordance with the licensee's procedures. The procedure was not specific in the method of verifying that the grapple had engaged the bail. Verbal discussions indicated that the visible portion of the grapple hook had been painted orange color to be visible from the refueling platform. The method of verifying that the grapple was closed was by watching the hook with binoculars. As the hook disappeared it was considered to be engaged. The next step was to raise the grapple and verify that the "hoist loaded" light turned on. Verification of the action of the grapple hook was verified by the licensed SRO and a licensed RO before the assembly was raised. All



indications were normal as the assembly was raised until the "grapple normal up" indicating light was lit. As the operator started to move the refueling bridge, the fuel assembly dropped from the grapple and lodged with the nose in a fuel assembly and the top against the side of the reactor vessel.

The inspector observed that the fuel assembly being moved, (serial No. AR-156) had been raised from location 38-09, which is a peripheral assembly and difficult to view because of the interference of the refueling bridge and vessel wall. This could have affected the visibility sufficiently to mask the fact that the hook had not fully engaged, however, both observers verified that the hook disappeared from view. The apparent cause of the occurrence was that the grapple hook engaged the bail in a manner to grip it sufficiently to raise the assembly, but was not fully engaged to capture the bail as designed.

Subsequent discussions with licensee personnel indicated that the possibility of this type of occurrence had been recognized through information supplied by GE concerning similar occurrences at other reactor facilities. The licensee stated that this was the reason that a requirement for verification by two individuals had been required. (This had also been the case for the initial fuel loading) Although cause of the occurrence may be directly attributed to operator error in incorrectly identifying the grapple hook to be engaged, the system design that allowed the error appears to be significant contributing factor.

In discussing the occurrence with the personnel involved, one apparent deficiency was identified in conjunction with the fuel handling operation. Although all of the fuel handling movements appear to have been conducted in accordance with approved procedure, the procedure for operating the grapple was not readily available on the refueling floor. The licensee indicated that this deficiency would be resolved.

#### 4. Fuel Handling Grapple Design

Review of records showed that an incorrectly latched grapple had released a partially withdrawn blade guide during preparation for initial fuel loading. In addition, similar occurrences at other facilities had prompted GE to modify the design of the grapple to add positive indication of full engagement of the bail and engagement of the grapple hook. This modification had been offered to licensee's via an information letter<sup>1/</sup> as a fuel grapple modification kit, which gives the grapple operator indication lights actuated by one microswitch and one proximity switch.

<sup>1/</sup> GE Operating Plant Services SIL No. 109, dtd 10/31/74.

The licensee had initiated a design change to implement the GE recommendations, however, the schedule was that the modification would be completed prior to the first refueling in February 1976.

Licensee engineering representative stated that an attempt was made to expedite delivery of the kit in April, when the decision to shutdown to examine fuel channels was being considered, but that the earliest delivery of the kit was estimated to be 6 months. A GE representative was onsite to obtain information concerning the grapple and to assist in resolving the problem. However, there was no assurance that the grapple modification would be completed prior to reloading the core, which was scheduled to be completed prior to July 1, 1975.

5. Interim Measures to Prevent Recurrence

The licensee has mounted an underwater TV camera on the refueling grapple, with the viewing head positioned so that the grapple hook is clearly visible. This arrangement provides good visibility for observing the hook position. Although fuel movements are slower, due to the need for manually handling the camera cable, this operation appears to be effective in providing assurance that the bail is captured and released as designed.

6. Relief Valve Blowdown Piping

As a result of relief valve operation in February 1975, the relief valve discharge piping downstream of the vacuum breaker was damaged by contact with building structure. The damage occurred as a result of water entering the blowdown line when the vacuum breaker failed to operate. The entire section was physically examined by the inspector to ascertain the amount of damage to the blowdown piping. The following paragraphs are a summary of the results of this examination.

The seismic restraints were examined and it appeared that neither the restraints attachments, snubbers or piping were damaged by the event.

A horizontal section of the discharge piping impacted a portion of the drywell structure, which left three relatively sharp longitudinal marks in the pipe. The marks made by the corner of the structure were 14 inches long. The affected portion of the pipe was flattened and had a resultant cross-sectional geometry with an approximate  $3\frac{1}{2}$  inch outside diameter chord length.

Structural steel plate motion restrictors are located around a vertical section of the pipe at a relatively low elevation in the drywell. The blowdown piping appeared to have made contact with both plates and became burnished on opposite sides of the pipe. The burnish marks are about  $2\frac{1}{2}$  inches long and  $1\frac{1}{2}$  inches wide. Several transversally oriented light gouge lines about one inch long were superimposed on one of the burnish marks.

The underside of the pipe was dented and burnished at the first pipe guide on the drywell side of the torus duct. Looking normal to the longitudinal axis of the pipe, the underside of the pipe was displaced upward about  $\frac{3}{8}$  inch with an approximate  $2\frac{1}{4}$  inch concave radius. The cross sectional geometry at the location of greatest displacement was flat on the underside with a resultant chord length of approximately  $2\frac{1}{2}$  inches.

The piping at the second pipe guide into the torus duct from the drywell side was examined. The blowdown pipe had a very small burnish mark on the underside.

The U-bolt portion of the first pipe guide into the torus duct was found tightened against the pipe. The second pipe guide had the U-bolt portion installed with a diametral clearance of greater than one inch between the pipe and the U-bolt. The licensee stated during a telecommunication subsequent to the inspection, that the pipe guides in the torus duct should have a diametral clearance of about one inch and that the guides were being adjusted to their original design.

The licensee stated, during the same telecommunication mentioned above, that the damaged portions of the pipe had undergone ultrasonic and liquid penetrant testing. The penetrant testing results showed no indications of surface cracking and the ultrasonic testing results were being reviewed by a consultant contracted to analytically evaluate the blowdown line event.