UNITED STATES
ATOMIC ENERGY COMMISSION
DIRECTORATE OF REGULATORY OPERATIONS
REGION III
799 ROOSEVELT ROAD
GLEN ELLYN, ILLINOIS 60137

TELEPHONE
(312) 858-2660

A. RO Inspection Report No. 050-331/74-14

Transmittal Date : September 9, 1974

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C. Incident Notification From: _____
(Licensee & Docket No. (or License No.)

Transmittal Date : _____

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SEP 9 1974

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

Docket No. 50-331

Gentlemen:

This refers to the inspection conducted by Messrs. Feierabend and Fisher of this office on August 1-2, 1974, of activities at Duane Arnold by AEC License No. DPR-49 and to the discussion of our findings with you and members of your plant 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.

During this inspection, it was found that certain of your activities appear to be in violation of AEC requirements. The item and reference to the pertinent requirements are listed under Enforcement Action in the Summary of Findings Section of the enclosed inspection report.

This notice is sent to you pursuant to the provisions of Section 2.201 of the AEC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations. Section 2.201 requires you to submit to this office within twenty days of your receipt of this notice, a written statement or explanation in reply, including: (1) corrective steps which have been taken by you, and the results achieved; (2) corrective steps which will be taken to avoid further violations; and (3) the date when full compliance will be achieved.

In accordance with Section 2.790 of the AEC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations, a copy of this notice, the enclosed inspection report, and your response to this notice will be placed in the AEC'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 notice, 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.

Should you have any questions concerning this inspection, we will be glad to discuss them with you.

Sincerely yours,

James G. Keppler
Regional Director

Enclosure:
RO Inspection Rpt No.
050-331/74-14

bcc: RO Chief, FS&EB
RO:HQ (4)
Licensing (4)
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U. S. ATOMIC ENERGY COMMISSION
DIRECTORATE OF REGULATORY OPERATIONS

REGION III

Report of Operations Inspection

RO Inspection Report No. 050-331/74-14

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: B

Type of Licensee: BWR, 538 Mwe

Type of Inspection: Special, announced

Dates of Inspection: August 1-2, 1974

Dates of Previous Inspection: July 5-6, 1974 (Operations)

Principal Inspector: C. D. Feierabend 9/5/74 (Date)

Accompanying Inspectors: W. L. Fisher 8/28/74 (Date)

Other Accompanying Personnel: None

Reviewed By: R. C. Knop RC Knop 9/6/74 (Date)
Senior Inspector
Projects Unit 1
Reactor Operations Branch

SUMMARY OF FINDINGS

Enforcement Actions

The following violation is considered to be of Category II severity:

An unplanned release of liquid radioactive effluent was not in accordance with the Technical Specifications nor with the requirements of Environmental Technical Specifications.

a. Technical Specification 6.8.1 states in part that ". . . All procedures shall be adhered to: . . . Actions to be taken to correct the specific and foreseen potential malfunctions of systems or components. . ."

b. Environmental Technical Specification Section 3.3.1B.2 states in part "Prior to release of each batch of liquid effluent, a sample shall be taken from the batch and analyzed for gross radioactivity (β, γ) . . ."

c. Environmental Technical Specification Section 2.3.1.B.3c states in part that "Liquid waste activity and flow rate shall be continuously monitored and recorded during release. . . ."

Contrary to the above, on July 31, 1974, licensee personnel failure to adhere to an administrative control procedure, which had been applied to control operation of the normal waste sump pumps, allowed the pumps to operate and release liquid radioactive waste from the plant without prior sampling and without continuous monitoring.

Licensee Action on Previously Identified Enforcement Matters:

Not inspected.

Unusual Occurrences:

Loss of Instrument Air. (Paragraph 4)

Other Significant Findings

A. Current Findings

Licensee estimate of the concentration of liquid release was evaluated and confirmed to be within 10 CFR 20, Appendix B, limits.

B. Unresolved Items

Design of the Normal Waste System. (Paragraph 6)

C. Status of Previously Reported Unresolved Items: None

Management Interview

An interview was conducted with Mr. Sandford and members of the plant staff at the conclusion of the inspection.

The inspector stated that the purpose of the inspection was to verify the licensee's tentative evaluation of the unplanned release.

The inspector stated that he had reviewed the occurrence, discussed operator actions with the personnel who were on duty, and reviewed available records. The inspector noted that the release had been terminated when discovered, and that there was no apparent problem with controlling the reactor, but that considerable cleanup was yet to be completed.

The inspector stated that the occurrence identified apparent violations of the Environmental Technical Specifications, which require that all liquid radioactive releases be sampled (Section 3.3.1.B.2) and be continuously monitored (Section 2.3.1.B.3.c). He also stated that the apparent cause of the violation was the failure of an administrative control, which had been applied to prevent an inadvertent release.

The licensee commented that the occurrence emphatically demonstrated the importance of adherence to all administrative controls.

The inspector stated that the occurrence identified two areas where design changes appear necessary. These were the design of the "normal waste" system, which is a potential path for unmonitored release, and the condensate resin trap backwash header, where inability to isolate the header from the condensate backwash receiving tank may require shutdown of the plant in the event of malfunction of any of several valves.

The licensee stated that the first area had previously been identified and was being studied. The licensee stated that the second problem could affect reliability, and that a design change would be initiated to resolve the problem.

The inspector stated that his preliminary estimate of maximum possible release volume of 6,000 gallon was based on the design data for the sump pumps, i.e. 50 gpm, pumping for one hour. The inspector stated that he had reviewed the preoperational test data for the pumps, and that the total flow of the two pumps tested separately was 64.5 gpm. Thus in one hour the discharge could not

have been more than 3870 gallons. The licensee stated that, based on pumping times for emptying a tank, he was convinced that the flow rate was much less, and that additional testing would be performed with both pumps operating.

The inspector stated that he had reviewed and evaluated the licensee's analysis of samples, and confirmed that the licensee had correctly applied the MPC of 3×10^{-6} uCi/ml, as allowed by Note 3c of 10 CFR 20, Appendix B.

The inspector stated he had observed that locks had been placed on the discharge valves of the four sump pumps that discharge to the storm sewer. The licensee stated that the administrative control had been supplemented to include locks, with strict control by the Shift Supervising Engineer, and committed that the sump pumps would not be allowed to discharge to the storm sewer until the problem of potential radioactive release via these paths has been resolved.

REPORT DETAILS

1. Persons Contacted

C. Sandford, Executive Vice President
E. Hammond, Assistant Chief Engineer
B. York, Operations Supervisor
D. Teply, Shift Supervising Engineer
R. Graybeal, Radiation Protection Engineer
R. Johnson, Chemist
D. Wilson, Results Engineer

2. Release Path

The flow of water was from overflow of the condensate backwash receiving tank to the turbine building equipment drain sump, which overflowed onto the turbine building basement floor, over the separating curbs, into "normal waste" floor drains to the normal waste sump, and was pumped to the storm drains by the normal waste sump pumps. The normal waste sump had been identified as a potential unmonitored release path.[1/]

3. Condensate Demineralizer System

The condensate full flow demineralizers have resin traps to prevent any resin dislodged from the filters from entering the reactor coolant system. Periodic backwash of the resin traps is necessary to prevent excessive pressure drop. Backwash operations direct condensate in reverse flow through the resin trap to a backwash receiving tank (Tank No. 1T6), approximately 8,000 gallon capacity.

The resin trap backwash valves are butterfly type, with air-to-open, spring-to-close operators. The system design does not provide for isolation of the backwash header. Any leakage through the valves is directed to tank 1T6. Excessive leakage, after 1T6 is full, overflows to the turbine building equipment drain sump, to be pumped to radwaste.

4. Sequence of Events

At 1800 on July 31, 1974, the plant was operating at approximately 455 Mwe. An operator was performing a normal operation of backwashing the condensate demineralizer resin traps. The backwash water was collected in the condensate backwash receiving tank (Tank No. 1T6) and was pumped to the radwaste system, when the radwaste operator saw an increase in the backwash receiving tank. These actions were coordinated so that the radwaste operator was expecting the backwash water.

1/ RO Inspection Rpt. No. 050-331/72-12

After the resin trap flushing was complete (approximately 20 minutes) the condensate demineralizer trouble alarm was activated and the control operator observed that the hotwell level and feedwater suction pressures were decreasing and the condensate makeup valve was full open.

The shift supervising engineer immediately dispatched the operator (already in the general area) to check the resin trap backwash valve to see if it had closed. About the same time the radwaste operator informed control that tank No. 1T-6 level was high and that the transfer pump was not lowering the tank level. The shift supervising engineer dispatched an auxiliary operator to the turbine building basement to determine the status of water overflowing from tank 1T-6, and notified the system control center of load reduction.

Load was reduced in an orderly manner, starting at about 1830. By 1905 the load was at $\sim$250 Mwe when the operator reported that the backwash valve for the "E" demineralizer had been open and was now closed, and apparently controlling the loss of condensate.

During this time the auxiliary operator reported that he had found the normal waste sump pumps running, and had shut them off. This was approximately one hour after start of backwashing operations. It was shortly apparent that tank 1T-6 was still over flowing and the water level on the basement floor was increasing, so load reduction for orderly shutdown was continued. Load reduction was delayed approximately one hour at $\sim$160 Mwe while investigating a rod withdrawal block. The Load was then reduced to $\sim$20 Mwe, and the generator was tripped off line.

The feedwater system was shut down and control rod insertion continued. The reactor was subcritical, with nearly all control rods inserted, when a failure of instrument air occurred due to water level in the basement contacting the air compressor flywheels. The emergency procedure for shutdown with loss of instrument air was implemented. All systems responded as expected, and the reactor was tripped manually in accordance with the procedure. No control problems were encountered.

5. Malfunction of Valves

Malfunction of the "E" resin trap backwash valve was recognized as the cause of loss of condensate, and action was taken to manually assist closing of the last backwash valve that was operated. It was determined that this reduced the loss of condensate but did not stop it, so orderly shutdown was completed. Subsequent testing of the condensate system determined that the "C" backwash valve had malfunctioned just prior to backwashing the "E" resin trap, and had gone undetected because an increase in level in tank 1T-6 had been expected. The trouble was identified when the transfer pump could not lower the level in tank 1T-6 although pumping at 450 gpm.

6. Turbine Building Sumps

The turbine building drain sump has two sump pumps, rated at 50 gpm each, pumping to the waste holdup tank. The sump quickly overflowed onto the turbine building floor. The turbine building floor drain pumps, two 50 gpm pumps, pumped to the floor drain collector tank; however, the level on the floor increased to ~8" in depth, flowing over the curbs to the "normal waste" floor drains and entered the normal waste sump. The normal waste sump pumps pumped to the storm sewer, which discharges into the discharge canal and subsequently to the Cedar River.

The licensee is evaluating the design of the turbine building sump arrangement, and has committed that the pumps will not again be allowed to discharge into the storm sewer until the potential for unmonitored release has been resolved.

A second waste sump that discharges to the storm sewer, located at the north end of the turbine basement, discharges the water that is segregated from the oil by the oil intercepter. The sump pump control switches were off and no water was discharged via this route; however, the sumps were flooded so the potential for inadvertent release existed.

The normal waste sump pumps had been placed under administrative control in accordance with the licensee administrative procedure No. 1404.5, "Hold Off Procedures". Warning tags were placed on the pump control switches cautioning that pumps were not to be operated without authorization of the Radiation Protection Supervisor. The licensee had not yet determined when the switches had been placed in the auto position, apparently in violation of the administrative control. This is considered to be a violation of 10 CFR 50, Appendix B.

7. Release Volume

The normal waste sump pumps are rated at 50 gpm. However, review of the preoperational test records verified that the pumps tested individually delivered 31.5 gpm and 33 gpm. The licensee conservatively set the duration of the release at 60 minutes. Thus the volume released could not have exceeded 3870 gallons (64.5 gpm x 60 min.). The licensee estimated that the actual pumping rate was much less than that indicated by the individual pump tests, based upon previously observed time required to pump out a tank, and estimated the amount of release of 3,000 gallons. The licensee intends to perform additional testing to verify the lower than design pump performance.

8. Release Concentrations

Gross beta analysis of a 200 milliliter liquid sample from the turbine building floor showed a concentration of 2×10^{-4} microcuries per milliliter (excluding tritium) at about 8:30 p.m. on July 31. A gamma isotopic analysis (decay corrected to 8:30 p.m.) identified fluorine 18, sodium 24, manganese 54, manganese 56, cobalt 58, cobalt 60, and copper 64 sufficient to account for about 40 percent of the beta activity. Strontium (total) was determined to be less than 1.3×10^{-8} microcuries per milliliter, and tritium was determined to be 2.3×10^{-4} microcuries per milliliter. No radioiodines were identified by the gamma scan. The 60 percent of the betas not identified were apparently short-lived, as indicated by a recount 22 hours later, which showed about a hundredfold decrease in the beta activity.

Having established the absence of radiostrontium and radioiodine in accordance with 10 CFR 20, Appendix B, Note 5, the licensee chose an MPC of 3×10^{-6} microcuries per milliliter, as permitted by Note 3.c, against which to compare the release. Assuming a release at 64.5 gpm into a 10,000 gpm (6,000 gpm dilution plus 4,000 gpm cooling tower blowdown) dischcarge canal flow rate, the concentration entering the Cedar River would have been about:

$$2 \times 10^{-4} \text{ } \mu\text{Ci/ml} \left(\frac{64.5}{10{,}000}\right) = 1 \times 10^{-6} \text{ } \mu\text{Ci/ml}.$$

This concentration is 40% of the chosen MPC.

9. Environmental Sampling

Despite the low concentration and the predominance of short-lived radionuclides, Cedar Rapids water supply samples were taken at two-hour intervals starting at 2:00 p.m. on August 1. The sampling period was selected after considering the plant-to-city and river-to-well transit times. Eleven influent samples ranged from 2×10^{-9} to 9×10^{-9} microcuries per milliliter, while eleven effluent (potable) samples ranged from 2×10^{-9} to 2×10^{-8} microcuries per milliliter. The latter concentration is factor of one hundred below the maximum permissible concentration.

The discharge canal composite sample was not removed for analysis after the release. When removed routinely on August 7, the composite sample gross beta concentration was found to be 1.3×10^{-8} microcuries per milliliter.

10. Personal Radiation Exposure

Air samples taken during recovery operations showed that no inhalation exposure resulted from this event. No external exposure or personal contamination problems were encountered.