

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-331/92010(DRSS)

Docket No. 50-331

License No. DPR-49

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

Facility Name: Duane Arnold Energy Center

Inspection At: Duane Arnold Site, Palo, Iowa

Inspection Conducted: April 20-24, 1992

Inspector: *T. J. Kozak*  
T. J. Kozak  
Radiation Specialist

*5/7/92*  
Date

Approved By: *William Snell*  
William Snell, Chief  
Radiological Controls Section

*5/7/92*  
Date

Inspection Summary:

Inspection on April 20-24, 1992 (Report No. 50-331/92010(DRSS))

Area Inspected: Routine unannounced inspection of the licensee's radiation protection program during a refueling outage, including: licensee action on previous inspection findings (IP 83750); organization and management controls (IP 83750); planning and preparation (IP 83750); external exposure controls (IP 83750); control of radioactive materials and contamination, surveys, and monitoring (IP 83750); and maintaining occupational exposure ALARA (IP 83728).

Results: The licensee's radiation protection program appears to be generally effective in controlling radiological work and in protecting the public health and safety. The licensee improved overall radiological performance during this refueling outage compared to past refueling outages as indicated by a significant reduction in dose expended and personal contamination events. The radiological condition of the plant was good but radioactive liquid spills which resulted in the spread of contamination continued. It appears that an expanded investigation by the licensee into this area is warranted. The licensee's source term reduction program continued to progress with a chemical decontamination of the recirculation system and the accelerated replacement of 18 high cobalt-containing control rods.

## DETAILS

### 1. Persons Contacted

#### Licensee Staff

- \*D. Boone, Supervisor, Health Physics
- \*P. Bessette, Regulatory Communications
- \*T. Browning, Supervisor, Regulatory Communications
- \*R. Hite, ALARA Coordinator
- \*P. Louis, Foreman, Health Physics
- \*L. Mattes, Management Support
- \*D. Robinson, Technical Support Specialist
- \*T. Sims, Licensing Specialist
- \*G. Van Middlesworth, Assistant Plant Superintendent,  
Operations and Maintenance
- \*T. Wilkerson, Manager, Radiation Protection
- \*D. Wilson, Plant Superintendent

#### Nuclear Regulatory Commission

- \*M. Parker, Senior Resident Inspector

The inspector also interviewed other licensee personnel in various departments during the course of the inspection.

\*Denotes those present at the exit meeting on April 24, 1992.

### 2. General

This inspection was conducted to review aspects of the licensee's radiation protection program during a refueling and maintenance outage. Included in this inspection was a follow-up of outstanding items in the radiation protection area. The inspection included tours of radiologically controlled areas, the reactor building, drywell and radwaste facilities, observations of licensee activities, a review of representative records and discussions with licensee personnel.

### 3. Licensee Action on Previous Inspection Findings (IP 83750)

(Open) Open Item (331/91021-01): Radiation levels exceeded design levels in some areas listed in the Updated Final Safety Analysis Report (USAR). The higher than anticipated radiation levels appeared to be mainly caused by hydrogen water chemistry. The licensee was in the final stages of preparing a change to the USAR requiring doses to be controlled below regulatory limits in areas which have radiation levels in excess of the design goals. This item

remains open and will be reviewed during a future inspection to ensure that the change is forwarded to the NRC.

(Open) Open Item (331/91021-02): In October 1991, three significant spills of radioactive liquid contaminated several corner rooms. Licensee identified corrective actions were not complete at the time of the inspection. (See Section 7). This item remains open and the corrective actions concerning the events will be reviewed during a future inspection.

4. Organization and Management Controls (IP 83750)

The inspector reviewed the licensee's organization and management controls for the radiation protection program including: organizational structure, staffing, delineation of authority and management techniques used to implement the program.

The licensee's staff remained relatively stable since the last inspection of the radiation protection program. One staff change occurred in which the Radioactive Waste Supervisor was reassigned to another position within the company. The new Radioactive Waste Supervisor was hired from the licensee's corporate staff. There were no other changes in the Radiation Protection Department staff or its management structure.

The radiation protection staff was augmented for the outage by hiring seventy contract radiation protection technicians (CRPTs). Approximately fifty percent of the technicians were returnees. The licensee required the contractor to provide the requested number of technicians and verify their qualifications. Upon arriving at the site, the CRPTs were required to take a theory exam. If the exam was not passed, the licensee provided counselling in needed areas. This was followed by a one week training class covering site procedures. CRPTs had to pass a test on the material upon completion of the class. No problems were noted in the licensee's process for hiring CRPTs. It appeared that the augmented staff was appropriately qualified and capable of implementing the requirements of the radiation protection program.

No violations or deviations were identified.

5. Planning and Preparation (IP 83750)

The inspector reviewed the affect that changes in the licensee's outage preparation activities had on outage performance. The new planning and preparation policy was described in Inspection Report No. 50-331/91021 (DRSS) and

basically consisted of assigning a project team leader and key individuals to jobs with significant radiological implications. These jobs included drywell shielding and work on motor operated valves, snubbers, hydraulic control units, control rod drives, and valve repacking. As can be expected when implementing a new program, the licensee identified areas where better preparations could have led to smoother job execution. However, overall performance in this area was much improved over previous outages. This effort appeared to be especially successful in the coordination of jobs occurring within close proximity to one another. Project teams coordinated their jobs with others in an effort to ensure insulation was removed and scaffolding and shielding was installed only once in areas where multiple jobs were occurring. There was very little rework identified in this potentially troublesome area.

Adherence to the planned schedule and sequence of work activities also played a significant role in the licensee's performance during the outage. The licensee had identified that in many cases during past outages, too many workers were assigned to jobs. This resulted in an unnecessary expenditure of dose to those workers that were in radiation areas but were not needed. The schedule for this outage was resource-based, meaning that the required number of workers for a particular job was listed on the schedule. Only the scheduled number of workers were dispatched to the job site resulting in a dose reduction in jobs when compared to previous performance. Work was sequenced such that only essential jobs were performed in the lower levels of the drywell prior to chemical decontamination (chem decon) of the recirculation system. A review of dose records indicated that the licensee was very successful in limiting work in the lower levels of the drywell prior to and during chem decon resulting in significant dose savings. The administrative overexposure described in the previous inspection report (No. 50-331/92007(DRSS)) occurred in an upper level of the drywell during the chem decon. Work in the upper levels of the drywell was generally sequenced to occur either before or after the chem decon. However, a slip in the inservice inspection schedule resulted in work being rescheduled during the chem decon. The licensee indicated that an investigation would be conducted into rescheduling methods so that similar situations to this one would be avoided during future outages.

No violations or deviations were identified.

6. External Exposure Control (IP 83750)

The inspector reviewed the licensee's external exposure control and personal dosimetry program, including: changes

in the program, use of dosimetry to determine whether requirements were met, and required records, reports and notifications.

There were no major changes in the personal dosimetry program. Total station dose as measured by thermoluminescent dosimeters was 193 person-rem in 1991. There were no major outages last year. Of the total, 95 person-rem was expended during the Torus decontamination project. The goal for 1992 was a total of 514 person-rem of which 414 was expected to be expended during the scheduled refueling outage. It appeared that the actual dose for the outage would be slightly under 400 person-rem. While this represents a significant performance improvement over that during the previous outage, it appeared that there were still areas where improvement could be made.

The inspector reviewed radiation protection technician coverage policies for jobs with significant radiological liability. The licensee was establishing stay times for all entries into the drywell and technicians were accompanying workers to their work site to verify dose rates. Electronic dosimeter alarms were being demonstrated to workers prior to entry into work areas. No problems were noted with coverage policies.

The inspector reviewed exposure records for 1991 and 1992 to date. It did not appear that there were any administrative overexposures, other than the one described earlier, and there were no exposures in excess of regulatory requirements.

No violations or deviations were identified.

7. Control of Radioactive Materials and Contamination, Surveys, and Monitoring (IP 83750)

The inspector reviewed the licensee's program for control of radioactive materials and contamination, including: maintenance and calibration of contamination survey and monitoring equipment; adequacy of review and dissemination of survey data; and effectiveness of radioactive and contaminated material controls.

The inspector verified by a review of records, discussions with licensee personnel, and tours of operational areas that the supply, maintenance, and performance checks of survey monitoring instruments were adequate. The alarm for the Eberline PCM-1Bs used for whole body frisking throughout the plant was set at 5,000 disintegrations per second over the 300 square centimeter area of the detectors.

The inspector reviewed selected routine surveys for proper documentation and supervisory review. All surveys reviewed appeared to adequately characterize radiological conditions in the surveyed area and had undergone appropriate reviews. Postings throughout the plant adequately represented radiological conditions. The licensee indicated that upon completion of the outage, surveys would be located in various areas inside the reactor building.

There were 82 Personnel Contamination Events (PCEs) recorded in 1991 which was a non-outage year. At the time of the inspection, there were 187 PCEs recorded for 1992, 181 of which occurred during the outage. This is a significant performance improvement over that during the last refueling outage and is attributable to increased investigative efforts by the licensee in this area. These efforts included dedicating one technician per shift solely to investigate causes of PCEs, including an interview of each contaminated individual, and to make recommendations on how to reduce their occurrences. A formal documenting and tracking system was set up which identified several problem areas. PCEs were discussed at the daily outage management meeting to raise awareness of them and discuss proposed corrective actions. The inspector indicated that while the licensee's effort resulted in improved performance, continued attention appeared warranted in this area to further reduce the number of PCEs.

The inspector accompanied representatives from the operations department on their daily round of the turbine and reactor buildings to ascertain the affect that radiological conditions in the plant had on their day-to-day work activities. In general, the plant was in very good radiological condition as operations personnel were required to don protective clothing only a few times for entry into contaminated areas. However, it appeared that the radiological condition in areas requiring daily entry was threatened by the possibility of being contaminated by the spread of contamination through liquid spills. As documented in previous Inspection Report No. 50-331/91021(DRSS), three significant spills occurred during the week of October 14, 1991, which contaminated several corner rooms. During the outage, there were several more significant spills which spread contamination to previously decontaminated areas, including corner rooms and the Torus. Significant efforts, including unnecessary dose expenditure, were required to reduce contamination levels in these areas such that entry could be made without the use of protective clothing. It was noted in Inspection Report No. 50-331/91021(DRSS) that several drain lines were in the form of plastic sleeving directed to floor drains. In at least two cases, the sleeving was taped to the floor drain in such a

manner that it appeared that in the case of an overflow, the sleeving would most likely fill with liquid, separate from the system and cause a spill. Tours during this inspection revealed that only one of these drain lines was modified in response to the inspector's comments. The licensee indicated that an investigation would be conducted into an alternate means for draining systems that are not hardpiped and that the investigation would be expanded to try to determine similarities in the causes of the spills and to determine corrective actions required to avoid them in the future. This issue is already being tracked as an open item and progress will be further reviewed during a future inspection.

No violations or deviations were identified.

8. Maintaining Occupational Exposures ALARA (IP 83728)

The inspector reviewed the licensee's program for maintaining occupational exposures ALARA, including: the source term reduction program; ALARA group staffing and qualification; changes in ALARA policy and procedures, and their implementation; ALARA considerations for planned, maintenance and refueling outages; and worker awareness and involvement in the ALARA program.

There were significant efforts expended in the source term reduction program during this outage. These efforts included a chemical decontamination of the recirculation system, the replacement of 32 high cobalt-containing control rod blades (18 were replaced on an accelerated schedule) with low cobalt-containing blades, replacement of the feed pump recirculation valve internals with stellite-free parts, and hydrolazing of tanks and pipes to reduce dose rates. Preliminary plans were to replace the seat and plug of the feedwater regulating valve with stellite-free parts and to replace the remaining thirty-six control rods with high cobalt parts during the next outage. The top out-of-core contributors of cobalt to the system have been identified and replacement of stellite-containing parts will be considered on a case-by-case basis.

The ALARA staff remained stable throughout the outage and appeared to be appropriately qualified to implement the program. The generation of radiation work permits (RWPs) and requirements for ALARA reviews were appropriately proceduralized. Job history files were in the initial stages of development and use. The files were kept and retrieved in hard copy form. Lessons learned from jobs were being incorporated into the files and will be used during future outages. The inspector reviewed the files and verified that a file for reactor vessel water level

inventory reduction was in existence. Appropriate surveys were incorporated into the file as were lessons learned from problems experienced during this outage. The licensee is considering computerizing the RWP generation and job history files. The inspector noted that manual retrieval of information may become cumbersome as the number and size of the files increases.

The inspector went over the ALARA reviews for several jobs including chemical decontamination, control rod drive removal and rebuild, motor operated valve work and main steam isolation valve work. There were many ALARA initiatives used in the performance of these and other jobs including the use of special tools, attempting new work in lower radiation fields if possible, and ensuring scheduling and sequence of work took into account the chem decon. Dose rates were reduced by a factor of two by the chem decon which resulted in a significant dose reduction for work in areas affected by the decon. The use of a hydraulic torque wrench in place of a slugging wrench resulted in a significant time and dose savings during several jobs. One area that was not developed very much was the use of mock ups for high dose jobs. The licensee indicated that this area will be among their priorities as they prepare for future outages.

No violations or deviations were identified.

9. Exit Meeting

The inspector met with licensee representatives (denoted in Section 1) at the conclusion of the inspection on April 24, 1992, to discuss the scope and findings of the inspection.

During the exit interview, the inspector discussed the likely informational content of the inspection report with regard to documents or processes reviewed by the inspector during the inspection. Licensee representatives did not identify any such documents or processes as proprietary. The inspector specifically discussed the following items:

- \* The completion of corrective actions to prevent recurrence of spills leading to the spread of radioactive contamination (Section 7).
- \* Positive developments with respect to dose expended and contamination events and the need to continue improvement in these areas.



## IFS Data Entry Form

Reviewed By: W. SmithDate: 5/7/92☒ Reactor/Vendor Inspection (IFS Option 1)☐ Docket Related/P21 Items (IFS Option 4)Items Opened (Y/N): N

Enter Log Number: \_\_\_\_\_

☐ Material Inspection (IFS Option 2)☐ LER Items (IFS Option 5)

S91 (Y/N): \_\_\_\_\_

Enter LER Number: \_\_\_\_\_

Letter (Y/N): \_\_\_\_\_

☐ Non-Docket Related Items (IFS Option 6)

Clear (Y/N): \_\_\_\_\_

Site/Name: Duane ArnoldReport Transmittal Date: 6/10/92Lead Inspector: TFKResponsible Org. Code: 3414Report End Date 4/24/92

## Report NBR

A 92010

## Docket NBR

05000331

B \_\_\_\_\_

C \_\_\_\_\_

## Materials Only

## License NBR

## \*Docket Name

Update? (Y/N): Y Opened VR: 91021 Is this an old OIL item? (Y/N) N\*\*Sequence NBR: 01 Item Type: IFI \*\*Severity: \_\_\_\_\_ \*\*Supplement: \_\_\_\_\_

Status \*UPD I/R \*Proj. Closeout \*Actual Closeout

A 0 92010 1/1 1/1B \_\_\_\_\_ 1/1 1/1C \_\_\_\_\_ 1/1 1/1

## 10 CFR

## Materials Only

## License Cond.

## Tie Down

Title: LICENSEE IS EXCEEDING USAR DESIGN GOAL RAD LEVELS (55 character width)

\*Closeout Org: \_\_\_\_\_ \*Closeout EMP: \_\_\_\_\_ \*Contact EMP: \_\_\_\_\_ \*Procedure: \_\_\_\_\_ \*Functl Area: \_\_\_\_\_

\*Cause CD: \_\_\_\_\_ \*\*EA Number: \_\_\_\_\_ \*\*NOV/NNC Issue Date: 1/1/

A CHANGE TO USAR IS IN FINAL CONCURRENCE STAGE PRIOR TO  
FORWARDING TO THE NRC FOR REVIEW. THIS ITEM WILL REMAIN OPEN  
UNTIL THE CHANGE IS FORWARDED TO THE NRC.

Update? (Y/N): Y Opened VR: 91021 Is this an old OIL item? (Y/N) NSequence NBR: 02 Item Type: IFI \*\*Severity: \_\_\_\_\_ \*\*Supplement: \_\_\_\_\_

Status \*UPD I/R \*Proj. Closeout \*Actual Closeout

A 0 92010 1/1 1/1B \_\_\_\_\_ 1/1 1/1C \_\_\_\_\_ 1/1 1/1

## 10 CFR

## Materials Only

## License Cond.

## Tie Down

Title: REVIEW COMPLETION OF CORRECTIVE ACTIONS REGARDING SPILLS (55 character width)

\*Closeout Org: \_\_\_\_\_ \*Closeout EMP: \_\_\_\_\_ \*Contact EMP: \_\_\_\_\_ \*Procedure: \_\_\_\_\_ \*Functl Area: \_\_\_\_\_

\*Cause CD: \_\_\_\_\_ \*\*EA Number: \_\_\_\_\_ \*\*NOV/NNC Issue Date: 1/1/

Text: Corrective actions were not timely concerning spills and the spread  
of contamination from them. A review of this area will be completed during  
a future inspection.

Sequence NRR is not applicable for docket related/P21, LER or non-docket related items

\*\* Severity, Supplement and NOV/NNC only applicable for Violations; EA Number only  
applicable for Apparent Violations

\* Optional FIELDS

Does this form contain old OIL items? (Y/N) N