

ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION  
REGION IV

Inspection Report: 50-313/95-21  
50-368/95-21

Licenses: DPR-51  
NPF-6

Licensee: Entergy Operations, Inc.  
1448 S.R. 333  
Russellville, Arkansas

Facility Name: Arkansas Nuclear One, Units 1 and 2

Inspection At: Russellville, Arkansas

Inspection Conducted: September 11-14, 1995

Inspector: Thomas H. Andrews Jr., Radiation Specialist  
Facility Inspection Programs Branch

Approved: \_\_\_\_\_

*Blaine Murray*  
Blaine Murray, Chief  
Facility Inspection Programs Branch

10/2/95  
Date

Inspection Summary

Areas Inspected (Units 1 and 2): Routine, announced inspection of the radiation protection program including: audits and appraisals; changes; planning and preparation; external exposure control; internal exposure control; dose to the embryo/fetus and exposures of declared pregnant women; control of radioactive materials and contamination, surveys and monitoring; and maintaining occupational exposure as low as is reasonably achievable (ALARA).

Results (Units 1 and 2):

- The licensee's self assessment and corrective action programs provided a good tool for management to evaluate the radiation protection program performance (Section 2.1).
- Changes to the Radiation Protection Department organization were made in accordance with procedures. While the manager of the Radiation Protection Department did not meet the criteria of Regulatory Guide 1.8 to perform the function of radiation protection manager, qualified alternates were designated to perform these duties (Section 2.2).

- The licensee planned to use "task qualified" personnel to supplement Radiation Protection Department personnel for the Unit 2 outage. This allowed the licensee to reduce the number of contractors required to support outage activities and build an in-house supply of personnel for support purposes. General Employee Training was enhanced to provide a guided tour of the radiologically controlled area (Section 2.3).
- The licensee had changed guidance regarding the reading of pocket dosimeters that resulted in a non-conservative comparison of the day-to-day worker dose that was tracked versus the "dose of record" obtained from the thermoluminescent dosimeters (TLDs). Because the licensee is now using electronic dosimeters in lieu of pocket dosimeters, this concern is no longer an issue (Section 2.4).
- The licensee had an effective program for assessing the need for respiratory protection (Section 2.5).
- The licensee's recovery process for the Unit 1 service air contamination event was aggressive and appeared to be well planned with adequate management attention and oversight (Section 2.6).

Summary of Inspection Findings:

- Violation 313/9415-01; 368/9415-01 was closed (Section 3.1).
- Violation 313/9512-01013; 368/9512-01013 was closed (Section 3.2).
- Violation 313/9512-01023; 368/9512-01023 was closed (Section 3.2).

Attachments:

- Attachment - Persons Contacted and Exit Meeting

DETAILS

**1 PLANT STATUS**

Unit 1 operated at 100 percent and Unit 2 operated at 98 percent of rated thermal power throughout the inspection period. On Monday evening, September 11, 1995, there was an incident that resulted in the Unit 1 service air system being radioactively contaminated. The event and the licensee's recovery activities are documented in Section 2.6.

**2 OCCUPATIONAL RADIATION EXPOSURE (83750)**

**2.1 Audits and Appraisals**

Audits, assessments, and surveillances were performed on a regular basis as described in the licensee's procedures. The reports reviewed by the inspector indicated a probing of numerous areas within the radiation protection program that identified areas where additional attention was needed. This was associated with the close working relationship between the Quality Assurance Department and the Radiation Protection Department.

When items were identified as needing corrective actions, the licensee demonstrated an aggressive attitude towards responding to the audit identified deficiencies. The inspector reviewed several packages and determined that actions taken in response to the concerns identified by the Quality Assurance audits and surveillances were appropriate and timely.

In one instance, the inspector noted that the quality assurance surveillance determined that commitments were not properly tracked and controlled in the licensee's radiation protection procedures. The Quality Assurance Department determined that there might be a generic problem plant wide, and a subsequent quality assurance surveillance of other departments proved this to be true. This demonstrated that the Quality Assurance Department was reviewing radiation protection activities to ensure that compliance with regulations and commitments were being met and issues identified were looked at for generic implications.

There appeared to be a good working relationship between the Quality Assurance Department and the Radiation Protection Department. The licensee attributed this to the routine rotation of personnel from the Radiation Protection Department to the Quality Assurance Department to support radiation protection related activities. By having personnel who were familiar with the day-to-day operations in the Radiation Protection Department, the Quality Assurance Department was able to continually probe for areas of weakness. Quality assurance was also used as a separate assessment tool to help identify potential problem areas or to confirm that performance meets management's expectations.

Quality Assurance Department personnel who performed audits, surveillances, and assessments in the radiation protection area were familiar with radiation protection practices and had experience in the performance of radiation protection activities.

## Conclusions

The licensee's self assessment and corrective action programs provided a good tool for management to evaluate the radiation protection program performance.

### 2.2 Changes to the Radiation Protection Program

The inspector reviewed the changes made to the radiation protection organization since the last inspection. These changes included appointing a new manager of the Radiation Protection Department and moving the Chemistry Department under the Radiation Protection Department Manager. The licensee had processed a 10 CFR 50.59 evaluation of the changes as required.

The manager of the Radiation Protection Department pointed out that he did not meet the requirements of Regulatory Guide 1.8, "Personnel Selection and Training." The licensee committed to Regulatory Guide 1.8-1975 for the selection and training of the radiation protection manager. The manager presented a memo where a primary and alternate individual were designated to "review the decisions that are made that require the training and experience as laid out in Reg Guide 1.8." The inspector reviewed the qualifications of the personnel designated to perform the role of radiation protection manager and determined that they met the criteria in Regulatory Guide 1.8.

Plant personnel were cognizant of the changes, and these changes did not appear to impact the performance of personnel.

## Conclusions

Changes to the Radiation Protection Department organization were made in accordance with procedures. While the manager of the Radiation Protection Department did not meet the criteria of Regulatory Guide 1.8 to perform the function of the radiation protection manager, qualified alternates were designated to perform these duties.

### 2.3 Planning and Preparation

At the time of the inspection, the licensee was in the final stages of preparing for the upcoming outage for Unit 2. The licensee had approximately 100 work packages that were not completed out of an estimated 1,950 that were to be performed during the outage. A package was considered to be completed (ready for issue and work) if the procedures, the work instructions, and the radiation work permit were approved and ready for issue.

The licensee had significantly changed the ALARA review process as a result of the Core Support Assembly event that occurred during the Unit 1 outage in March 1995. The form that was routed to the craft to solicit input regarding the tasks to be performed had specific questions regarding ways to reduce dose and potential problems that may arise during the work. The licensee combined this input along with historical information from previous outages to develop an ALARA checklist for the task. Beside each item, the licensee identified if the item was covered in the procedure, work package, or the radiation work permit. The inspector reviewed several packages to ensure that ALARA

checklist items were covered as specified on the checklist. No problems were identified.

The licensee estimated that they would be using 35 senior radiation protection contractor technicians for the outage. Approximately 32 of these had previous experience at the licensee's facility. Qualification and processing of personnel was expected to be completed prior to the start of the outage.

The licensee indicated that they would not be using any contractor junior technician. In lieu of contractor junior technicians, the licensee was qualifying personnel to perform "task specific" duties to support the Radiation Protection Department. The personnel were selected from the Training and Operations Departments and had familiarity with the plant and plant procedures. These individuals were being trained to ensure that they were familiar with the tasks they would be assigned.

As part of preparations for the outage, the inspector reviewed the training process for additional workers to support the outage. The inspector observed that the licensee had modified the General Employee Training process to include a guided tour of the radiologically controlled area. This was viewed as a very positive improvement since it provided workers with a "hands-on" demonstration for actual access and egress of the radiologically controlled area. It also provided a good opportunity for students to ask for clarifications regarding access practices that might not be clear or overlooked during classroom training.

### Conclusions

The licensee planned to use "task qualified" personnel to supplement Radiation Protection Department personnel for the Unit 2 outage. This allowed the licensee to reduce the number of contractors required to support outage activities and build an in-house supply of personnel for support purposes. General Employee Training was enhanced to provide a guided tour of the radiologically controlled area.

### 2.4 External Exposure Control

During a review of the Unit 1 outage report, the inspector noted that unlike prior industry trends, cumulative pocket dosimeter results were lower than the doses recorded on TLDs. The difference was on the order of 5 to 10 percent. The inspector was concerned by this since the pocket dosimeter results were used for day-to-day tracking of worker dose while the TLD dose was the "dose of record." This was viewed as a nonconservative trend.

The inspector discussed this observation with the licensee and learned that the licensee had changed the guidance given to employees regarding the reading of pocket dosimeters. In the past, there was always an "over-estimating" effect, because workers that observed a displacement of the hairline in the dosimeter were instructed to "round up" the dose to the nearest 5 millirem. The new guidance from the licensee instructed workers to estimate dose to the nearest millirem.

The inspector questioned the accuracy of this approach since the dosimeters were only incremented in 10 millirem increments. A review of dosimetry records indicated that personnel had recorded doses as low as 1 millirem and were complying with the licensee's guidance. Based on a review of dosimetry records, there were no administrative or regulatory dose limits exceeded during 1994 and up until the time of this inspection.

The licensee indicated that they had observed the same trend regarding pocket dosimeters versus TLD results. The change in guidance was intended to allow a better day-to-day estimate of actual exposures to allow tracking of cumulative doses to compare with outage goals. Because of the recent change to the use of electronic dosimeters, the licensee believed that this issue was no longer a concern.

Because the electronic dosimeter results were displayed to the nearest millirem and were automatically transcribed into the licensee's database without worker input upon logging out of the radiologically controlled area, the inspector's concerns were addressed regarding the day-to-day tracking of worker dose versus the "dose of record" from the TLDs.

#### Conclusions

The licensee had changed guidance regarding the reading of pocket dosimeters that resulted in a nonconservative comparison of the day-to-day worker dose that was tracked versus the "dose of record" obtained from the TLDs. Because the licensee is now using electronic dosimeters in lieu of pocket dosimeters, this concern is no longer an issue.

#### 2.5 Internal Exposure Control

The inspector reviewed evaluations related to respirator usage. The licensee had issued only one respirator for radiological purposes in 1995. The licensee had not had any recorded dose associated with internal contamination where a dose assignment was necessary. This indicated that the assessment process for the reduced usage of respirators was effective.

#### Conclusions

The licensee had an effective program for assessing the need for respiratory protection.

#### 2.6 Control of Radioactive Materials and Contamination, Surveys, and Monitoring

The inspector toured the radiologically controlled area and observed postings and conditions throughout the plant. There was a lot of "pre-staging" activity evident by materials stored in hallways and near work locations. The inspector noted some minor housekeeping items and identified them to the radiation protection staff so additional attention could be given in these areas.

On Monday, September 11, 1995, the licensee discovered that the service air system became contaminated during the transfer of demineralizer resins to a cask located in the train bay. The following was a preliminary statement provided by the licensee describing the event.

During a resin transfer from the 2T-13 tank to a cask located in the train bay, the transfer line clogged, causing the resin transfer to stop. The procedure for this evolution has a supplement for backflushing to unclog the transfer line. This was attempted but was unsuccessful in clearing the line. An operator then lined up to flush the transfer line to the cask in accordance with the resin transfer procedure and also aligned Unit 1 service air to the transfer line. The operator then alternated between using the flush procedure (with water as the motive force), and using the service air to unclog the transfer line. This was eventually successful at unclogging the transfer line but it also caused contaminated water to backflow into the Unit 1 service air system.

The entire Unit 1 service air system was isolated and depressurized due to the widespread contamination. The contaminated water that has been drained from the system has been collected and discharged as monitored releases. The service air system is being sampled at all locations and plans are being made to flush the system and restore it to service. Other systems that interface with the Unit 1 service air system have also been sampled. No other contamination has been found.

The inspector met with the resident inspector to discuss this event. The resident inspector agreed to follow up on the operational conditions that led up to the event, including operator actions, procedure adequacy, etc. The inspector agreed to review the recovery actions taken by the licensee to ensure that they were adequate.

The inspector toured the plant on several occasions to observe postings and controls placed on the service air system outside of the normal radiologically controlled area. Hold tags were placed to restrict operation of valves in the service air system. A survey of the work area was performed and no abnormal radiation levels were observed.

The licensee discussed the recovery plans with the inspector and the resident inspector on September 12, 1995. The recovery plan essentially consisted of flushing the system with water, sampling the flush water for contamination, then if it was below the minimum detectable activities for their counting system, they would then proceed to drying out the system then taking air samples.

The inspector reviewed the counting system capabilities and observed that the minimum detectable activities were typically in the  $10^{-7}$  microcuries/milliliter range. This was deemed as an acceptable cutoff point.

At the end of the inspection period, the licensee was still flushing the service air system using water. They were developing plans to dry the system and sample the air throughout the system. The licensee had not made any assessment on future sampling frequency for the service air system.

At one point during the flushing, the radiation level in the service air receiver area increased to about 5 millirem per hour. The licensee posted the area as a temporary radiologically controlled area as required by their procedures. The increase in radiation levels was attributed to resin beads and fines being flushed into the receiver. The licensee was investigating actions necessary to address this new problem.

Overall, the licensee's recovery process was aggressive and appeared to be well planned with adequate management attention and oversight.

### Conclusions

The licensee's recovery process for the Unit 1 service air contamination event was aggressive and appeared to be well planned with adequate management attention and oversight.

### 3 FOLLOWUP - PLANT SUPPORT (92904)

#### 3.1 (Closed) Violation 313/9415-01; 368/9415-01; Repeated Failure of a Worker to Log in on Radiation Work Permit

NRC Inspection Report 50-313/94-15; 50-368/94-15 identified a violation where a worker repeatedly entered the radiologically controlled area without logging in on a radiation work permit. The subsequent investigation revealed that the worker had a learning disorder that was demonstrated by the need to repeatedly take the test to qualify as a radiation worker until a satisfactory grade was obtained. The licensee modified the criteria for General Employee Training to require a score of 80 percent to pass and limits the number of times the test can be retaken. Based on a review of these actions as well as incident reports related to access to the radiologically controlled area, the inspector determined that the licensee had addressed the concerns raised in this violation.

#### 3.2 (Closed) Violation 313/9512-01013; 368/9512-01013; Failure to Route ALARA Worksheet to Craft

During the investigation following the Core Support Assembly event that occurred during the Unit 1 refueling outage in March 1995, inspectors identified that the ALARA worksheet used to solicit information regarding ways to reduce doses during the performance of a task was not routed to the craft as required by procedure. In this particular instance, the craft was a contractor who had an established ALARA plan and this plan was simply attached to the worksheet. This provided for a missed opportunity to identify a critical parameter that contributed to the increased radiation doses obtained during the event.



The licensee reworked this form to make the questions more direct and implemented a change where they now forward the form to craft personnel, including contractors to solicit comments and suggestions on ways to reduce dose. The form also allows for identification of critical steps in the process. As discussed in Section 2.3, the inspector observed how this information was used to identify steps that could be taken to reduce dose.

Because the actions taken by the licensee have dramatically improved this process, and the concerns identified in the inspection report associated with this violation were addressed, this portion of the violation was closed.

3.3 (Closed) Violation 313/9512-01023; 368/9512-01023; Failure to Determine Adequate Termination Criteria for Radiation Work Permit

One of the contributing factors to the increased radiation exposures received during the Core Support Assembly event during the Unit 1 refueling outage in March 1995 was the failure to clearly identify and communicate termination criteria in the radiation work permit.

As part of the corrective actions, the licensee modified the process where there is more emphasis on activities that are considered "Infrequently Performed Tests or Evolutions" and on prejob briefings. As part of the prejob briefing process, one of the topics discussed is termination criteria. This allows workers to state their understanding of the criteria so that a common interpretation can be obtained before starting the work.

Because the actions taken by the licensee addressed the concerns identified in the inspection report associated with this violation, this portion of the violation was closed.

## ATTACHMENT

### 1 PERSONNEL CONTACTED

#### 1.1 Licensee Personnel

C. Anderson, Unit 2 Operations Manger  
R. Bement, Manager, Radiation Protection and Chemistry  
M. Bourguois, Unit 2 Outage Manger  
D. Deal, ALARA Supervisor  
D. Denton, Vice President, Operations (Acting)  
R. Espolt, Manager, Events Assessment and Analysis  
D. Fowler, Supervisor, Quality Assurance  
G. King, Supervisor, Technical Training  
W. McKelvy, Chemistry Superintendent  
D. Mims, Licensing Director  
T. Mitchell, Unit 2 Senior Manager  
M. Ruder, Assessment Specialist  
B. Short, Licensing Specialist  
J. Smith, Health Physics Superintendent  
M. Smith, Licensing Supervisor  
D. Snellings, Superintendent, Radiation Protection Technical Support  
L. Taylor, Assessment Specialist  
D. Wagner, Supervisor, Quality Assurance  
A. Wrape, System Engineering Manager  
C. Zimmerman, Plant Manger (Acting)

#### 1.2 NRC Personnel

S. Campbell, Resident Inspector - ANO  
K. Kennedy, Senior Resident Inspector - ANO

The personnel listed above attended the exit meeting. In addition to the personnel listed above, the inspector contacted other personnel during this inspection period.

### 2 EXIT MEETING

An exit meeting was conducted on September 14, 1995. During this meeting, the inspector reviewed the scope and findings of the report. The licensee did not express a position on the inspection findings documented in this report. The licensee did not identify as proprietary any information provided to, or reviewed by, the inspector.