



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2900
ATLANTA, GEORGIA 30323

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Report Nos.: 50-259/86-41, 50-260/86-41, and 50-296/86-41

Licensee: Tennessee Valley Authority
6N38 A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Docket Nos.: 50-259, 50-260 and 50-296

License Nos.: DPR-33, DPR-52,
and DPR-68

Facility Name: Browns Ferry 1, 2, and 3

Inspection Conducted: December 8-12, 1986

Inspectors: Roy C. Weddington

12/30/86

C. H. Bassett

Date Signed

Roy C. Weddington

12/30/86

R. E. Weddington

Date Signed

Approved by: C. M. Hosey

12/31/86

C. M. Hosey, Section Chief

Date Signed

Division of Radiation Safety and Safeguards

SUMMARY

Scope: This was a special unannounced inspection to review the health physics aspects of the Unit 2 Recirculation Inlet Safe-end Replacement project. The inspection included observation and review of the mock-up training and training facility, review of dosimetry records and selected contractor records including Form NRC 4's, review of survey records and air sampling data, interviews with health physics and other personnel involved in the project and observation of the work being performed in the Unit 2 drywell.

Results: No violations or deviations were identified.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*R. L. Lewis, Plant Manager
*A. W. Sorrell, Site Radiological Control Supervisor
*R. D. Shulz, Compliance Supervisor
*H. M. Crowson, Radiological Control Supervisor
*J. M. Corey, Radiological Control Supervisor
R. H. Albright, Radiological Control Supervisor
*S. Howard, ALARA Supervisor

Other licensee employees contacted included construction craftsmen, technicians, security force members, and office personnel.

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*G. L. Pault, Senior Resident Inspector
*C. Brooks, Resident Inspector

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on December 12, 1986, with those persons indicated in Paragraph 1 above. The licensee acknowledged the inspection findings and took no exceptions. The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspectors during this inspection.

3. Licensee Action on Previous Enforcement Matters

This subject was not addressed in the inspection.

4. Unit 2 Recirculation Inlet Safe End Replacement Project (83729)

a. Planning and Preparation

When it was decided to replace the ten N2 safe-end risers on Browns Ferry Nuclear Plant Unit 2, much of the planning effort had already been completed due to previously anticipated recirculatory piping replacement work. Also, some preparations, such as extensive shielding in the Unit 2 drywell, had been completed in support of other work in that area. In an NRC Region II management briefing on November 4, 1986, the licensee indicated that the Unit 2 replacement project was scheduled such that cutting of the piping was to begin on December 8, 1986, and welding of the replacement piping was to be completed by

February 6, 1987. Subsequent to that presentation, TVA issued a letter, Browns Ferry Nuclear Plant (BFN) - Response to NRC's Generic Letter 84-07 - Unit 2 Recirculation Inlet Safe-end Replacement, dated November 20, 1986, which detailed the actions planned to maintain exposure as low as reasonably achievable (ALARA) during the project. The inspector reviewed the ALARA plans for the project and the notes from the briefing. The planning and preparations appeared to be adequate for the project.

b. Training

The licensee determined that all personnel involved in the safe end replacement work would be required to receive training prior to participation in the project. General Employee Training (GET) was provided for all personnel and specific job training was provided to those involved in specific tasks. This training was given in a mock-up training facility set up for the project. The training was made as realistic as possible by establishing full radiological controls for the mock-up area and requiring all personnel to participate in mock-up training of their specific task. The scope of the training involved set-up, use and removal of the cutting machine, shielding installation, use of the containment system and set-up and use of the welding machine.

The inspector toured the mock-up training facility and observed training in progress. Training records of individuals involved in the project were also reviewed. Observations were made of workers as they applied the training in the actual working environment. The mock-up facility appeared to provide an adequate environment in which to familiarize the workers with the actual work to be performed. The training also appeared to be adequate.

c. Maintaining Exposure ALARA

The licensee's letter to the NRC in response to Generic Letter 84-07 described measures that would be taken to maintain exposure ALARA during the replacement project. The measures included:

- hydrolasing the back side of the N2 safe-ends from the drywell side to remove crud build up.
- using shielding to the extent possible on hot spots in the drywell, around N2 safe-end nozzles and inside the nozzles after the piping was removed.
- using high efficiency particulate air (HEPA) filtered ventilation units and total containment tents around the area where the piping was removed to limit airborne contamination during welding.
- using video monitoring and radio communications equipment to monitor and direct the work effort.

- reviewing and applying experience information from other utilities that had performed similar work.

The inspector verified that the ALARA measures described in the licensee's response to Generic Letter 84-07 had been taken and were apparently effective in minimizing worker exposures.

c. External Exposure Control and Dosimetry

The inspector reviewed selected records of radiological surveys performed to support the replacement project. Radiation surveys taken before the N2 safe-ends were hydrolased indicated contact readings from 1000 to 5500 millirem per hour (mr/hr) on the riser piping and from 160 to 300 mr/hr in the general work area. Surveys following the hydrolasing indicated radiation levels had been reduced to 300-500 mr/hr on contact with the risers and 100-200 mr/hr general area. After the risers were cut out and removed, radiation surveys were taken at the open end of the pipe and at one foot increments inside the opening. This was done to determine exposure rates for subsequent welding operations that would be required inside the pipe once the replacement piping was in place. Total beta-gamma radiation levels at the pipe openings varied from 8 rem per hour (R/hr) to 11 R/hr, while levels three feet inside the pipe varied from 143 R/hr to 789 R/hr. The beta radiation levels measured at the pipe opening varied from 3-6 R/hr and levels three feet inside the pipe varied from 107 to 704 R/hr. The inspector also noted that contamination surveys in the work area indicated contamination levels of 6,000-10,000 disintegrations per minute per one hundred square centimeters (dpm/100cm²) while the cutting machine was contaminated from 80,000 to 120,000 dpm/100cm².

In order to assess the exposure each person received, workers were required to wear low and high range direct reading dosimeters, accumulative digital or alarming dosimeters and thermoluminescent dosimeters (TLDs). Extremity and multibadge monitoring was required in certain instances. The placement of the extremity monitoring TLDs and multibadging was discussed with licensee representatives. It was noted that placement of the TLD on the head needed to be more standardized in order to achieve consistent results, especially in determining dose to the lens of the eye. The licensee acknowledged the observation and issued instructions to health physics personnel concerning standard placement of the head multibadge TLD.

The inspector reviewed daily dose records of contractor personnel working under the replacement project radiation work permits (RWPs) and determined that the average dose received per worker each shift was approximately 200 mr. All cumulative exposures were well below licensee administrative quarterly exposure limits.

Form NRC 4's of selected individuals and multiple TLD issuance records and TLD processing reports of personnel involved with the replacement

project were also reviewed. The records appeared to be complete and contained the proper supporting documentation.

The inspector reviewed the licensee's administrative exposure controls and determined that the administrative controls were designed to maintain exposures ALARA. The licensee required consecutively higher tiers of supervision to approve dose extensions with the plant manager having approval authority for whole body exposures in excess of 3 rems during the calendar year. The administrative limits appeared to be adequate.

d. Internal Exposure Control

Personnel working on the safe-ends replacement project were required to wear respiratory protection equipment during certain job evolutions. As work progressed, the health physics staff monitored the airborne radioactivity in the work areas using both high and low volume air samplers. The air sampling data was reviewed by the inspector and it was determined that the highest airborne concentration was twenty-three percent (23%) of the maximum permissible concentration (MPC) listed in 10 CFR 20, Appendix B, Table 1, Column 1. However, the majority of air sample results indicated airborne radioactivity was being maintained below ten percent of MPC.

e. Control of Radioactive Materials and Contamination, Surveys and Monitoring

After the piping sections were removed from the recirculation system, the ends of the pipes were bagged and the sections were removed from the drywell. Two sections were then placed in a lead lined metal shipping container which was subsequently removed from the area and placed in storage. The inspector observed this evolution and made independent radiation measurements using NRC equipment. The inspector's measurements agreed with those of the licensee.

While touring other plant areas, the inspector observed the movement of material from controlled areas to uncontrolled areas to determine if proper direct and removable contamination surveys were being performed. It was noted that surveys were being performed in a satisfactory manner, however some improvements in survey techniques for inside of pipes and for electrical cords were discussed with licensee health physics management. The licensee stated that these survey techniques would be incorporated into their survey program.

The inspector also observed personnel exiting the contamination control zone and performing whole body personal contamination surveys. All personnel surveys appeared to be adequate.

e. Control of the Project

In order to control and direct the work, the licensee established a "command center" which consisted of a room containing four video monitors, four video recorders and two sets of radio headphones. All these were connected to video cameras and communication gear set up in the drywell work area. The inspector determined that this facility allowed the licensee to maintain good control and closely follow the work inside the drywell.

While observing the work by means of the video monitors, the inspector noted that, on one occasion, all the personnel required to support a specific task were not readily available. This apparent breakdown in coordination of workers resulted in some individuals remaining in radiation areas longer than necessary. When the licensee was informed of this situation, steps were taken to ensure better work follow and closer worker coordination. This appeared to be an isolated occurrence and no similar coordination problems were noted during the inspection.

As an additional control measure, a meeting was held twice a day which involved all groups working on the project. The meeting was used to discuss the next work evolutions to be attempted as well as the problems that were encountered on previous shifts. The meetings appeared to be an effective means of controlling the work effort and resolving problems.

RWPs and a Pre-Job ALARA Planning Report were also used to control the work. The inspector reviewed the RWPs governing the replacement work and the Pre-Job ALARA Planning Report for the project, BF RCI-IS Attachment 1, Rev. 0, October 15, 1985, No. 02-5R-64. The RWP process and ALARA planning appeared to be adequate to ensure that ALARA considerations and proper health physics requirements were addressed.

f. Conclusion

The inspector reviewed the licensee's various plans and preparations for the safe-ends replacement project. It appeared that the ALARA pre-planing was effective in focusing the proper attention on personnel exposure and methods to control it. The licensee had reviewed work experience and project data obtained from other plants where replacement work had been done and had incorporated this knowledge into plans for BFN. Through observation of the work in progress, the inspector noted that the work schedule was being followed closely and was proceeding properly. It was determined that the work was conducted in accordance with the licensee's letter in response to the NRC's generic letter 84-07 and in conformance with regulatory requirements.

No violations or deviations were identified.

5. Allegation Followup (99014)

The inspector was contacted by two concerned employees during the inspection. Their concerns and findings are discussed below.

a. Allegation (RII 86A0329)

Contractor personnel working on the safe-end replacement project inside the Unit 2 drywell are not complying with the radiation work permit (RWP) prohibition against wearing personal clothing under their protective clothing.

Discussion

The RWP for the safe end work did specify that personal outer clothing was not to be worn and some contractor personnel were observed exiting the Unit 2 drywell wearing their personal clothing under their protective clothing. The inspector determined, however, that there was no safety issue associated with this requirement. The statement on the RWP was intended to preclude the licensee from becoming liable for replacement of personal clothing worn in contaminated areas. Workers were permitted to wear their clothing under the protective clothing if they understood they were doing so at their own risk. This was explained to the concerned employee, who acknowledged that he understood, but was still concerned that technically the RWP requirement was being violated.

This issue was discussed with licensee health physics management. They stated that they would evaluate means of clarifying the wording on the RWP so that it was consistent with actual practice.

Finding

The allegation was substantiated in that the RWP stated that no personal outer clothing was to be worn under the protective clothing. However, no violation or deviation was identified since the procedure governing RWPs stated that personal clothing could be worn at the worker's own risk. Therefore, there was an interpretation problem with the RWP but no safety issue was involved.

b. Allegation (RII 86A0330)

On December 6, 1986, the concerned employee was working outside the Unit 2 drywell in an area not being controlled for contamination. Workers above him wearing protective clothing were grinding and some of the grindings were falling on him. A licensee health physics technician was notified and he stopped the work until a herculite floor could be installed to protect the workers below. When the work group general foreman became aware of the situation, he directed that everyone go back to work before the unsafe work condition had been corrected.

Discussion

The inspector determined through interviews and discussions with licensee management that the event had occurred essentially as described by the concerned employee. It was further determined that the workers in the overhead were dressed in protective clothing because they had to climb through potentially contaminated areas to access the work area, but the actual items being ground had been determined by health physics survey to be uncontaminated. Therefore the health physics technician actions had been motivated by industrial safety rather than radiological concerns.

Finding

The allegation was substantiated, however no violation or deviation was identified since the matter was an industrial safety issue. However, licensee management stated that they were committed to providing safe working conditions and that action would be taken to ensure that similar problems are avoided in the future.