



UNITED STATES
NUCLEAR REGULATORY COMMISSION

REGION II
101 MARIETTA ST., N.W., SUITE 3100
ATLANTA, GEORGIA 30303

Report No. 50-261/81-17

Licensee: Carolina Power and Light Company
411 Fayetteville Street
Raleigh, NC 27602

Facility Name: H. B. Robinson

Docket No. 50-261

License No. DPR-23

Inspection at H. B. Robinson Site near Hartsville, South Carolina

Inspector:

John R. Wray
J. R. Wray

7/6/81
Date Signed

Approved by:

C. M. Hosey
C. M. Hosey, Acting Section Chief
Technical Inspection Branch
Engineering and Technical Inspection Division

7/9/81
Date Signed

SUMMARY

Inspection on June 8-9, 1981

Areas Inspected

This special, unannounced inspection involved 12 inspector-hours on site reviewing the events surrounding an overexposure of a contract worker.

Results

In the areas inspected, two violations were identified (exceeding quarterly whole body dose limit, paragraph 5.e; failure to follow procedures, paragraphs 5.a, 5.c, and 5.d). Both violations relate to an overexposure event which was reported by the licensee in a letter to the Director, Office of Inspection and Enforcement, dated June 9, 1981. The event is an additional example of the inadequate external exposure control program identified in IE Report 50-261/81-10. Therefore, no Notice of Violation is enclosed herewith.

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REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *R. B. Starkey, Jr., General Manager
- *D. S. Crocker, Manager-Environmental and Radiation Control
- *B. MacCready, E&RC Supervisor
- J. Pettigout, Senior ALARA Specialist
- W. Ritchie, RC&T Foreman

Other licensee employees contacted included four technicians.

Other Organizations

- V. Burke, Senior Engineer - Westinghouse
- E. Boyce, Site Coordinator - Institute for Resource Management, Inc.

NRC Resident Inspector

- *S. Weise, Resident Inspector

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on June 9, 1981, with those persons indicated in paragraph 1 above. The General Manager informed the inspector that the response to the overexposure event will be included in the response to NRC's letter of May 12, 1981. The inspector agreed that no further written action would be required if the response is determined to be adequate. The inspector also discussed the factors listed in paragraph 9 which are believed to have contributed to the overexposure.

3. Licensee Action on Previous Inspection Findings

Not inspected.

4. Unresolved Items

Unresolved items were not identified during this inspection.

5. Overexposure Incident

- a. On May 30, 1981, a contract worker notified the Health Physics Department that he would be entering the containment building and performing platform work on steam generator B. The individual was

issued a full-face respirator and multiple thermoluminescent dosimeters (TLDs) for his head, chest and gonad areas as required for platform work by health physics procedure HP-12, Steam Generator Inspection and Maintenance. An air supplied suit is required for entries into the steam generator while only a full-face respirator is required for platform work. Dose control restricted his allowable exposure to 400 mrem, the normal limit assigned for work not involving entry into the steam generator. The health physics control point at the containment building entrance verified that the individual was wearing the proper protective clothing and personnel monitoring devices prior to entering containment. They also verified that sufficient health physics personnel were inside the containment building to provide job coverage as required by procedures. At approximately 8:45 a.m., the contract worker entered the containment building on Special Radiation Work Permit (SRWP) 530-9 to mark tubes in steam generator B for eddy current testing. SRWP 530-9 was written for steam generator C with the appropriate radiological survey information for that steam generator. The worker should have been listed on SRWP 530-8 which was written for work on B steam generator. Health physics procedure HP-7, Special Radiation Work Permits, states that only workers listed on the SRWP are authorized to perform work under that SRWP. Technical Specification 6.11 states that procedures involving personnel radiation exposure shall be adhered to for all operations. The inspector stated that an individual listed on and performing work under the wrong SRWP was failure to follow procedure HP-7 in violation of Technical Specification 6.11 (81-10-03).

- b. There were approximately five individuals, in addition to two health physics technicians, in containment at this time. The two HP technicians were providing coverage of an entry by one individual into steam generator C. The remaining four individuals did not require continuous health physics coverage. One of the HP technicians was assigned by the licensee to act as rover, covering jobs requiring intermittent HP coverage and assisting, as was the situation at C steam generator, special jobs when appropriate. The technician responsible for providing roving health physics coverage informed the inspector that he was not aware that work was planned for B steam generator nor that a worker had entered the building in order to work on B steam generator. The inspector reviewed the minutes of the daily plan-of-the-day meeting which indicated that site management was aware that marking tubes in B steam generator was scheduled for May 30. In addition, health physics personnel in dose control, respiratory protection and at the containment building access control point were aware that a worker was entering the containment to work on B steam generator. The inspector stated that a system should be devised to ensure that the health physics technician in the containment building responsible for ensuring each worker is provided health physics coverage is aware of all work performed in the building.

- c. The entrance to the B steam generator area was posted with a sign which read "contact HP prior to entry." SRWPs 530-8 and 530-9 emphasized the requirement to obey all postings and to contact HP prior to starting work at the steam generators. Technical Specification 6.13 states that each individual or group of individuals entering a high radiation area shall be provided with a dose rate survey instrument. Health physics procedure HP-7 states that during outages continuous health physics coverage can be substituted for the requirement specified in Technical Specification 6.13. The worker admitted to entering the B steam generator platform area without contacting health physics and without a survey instrument. The inspector stated that not following the requirements of the SRWP was another example of failure to follow procedure HP-7 in violation of Technical Specification 6.11 (81-10-03).
- d. At approximately 9:30 a.m., the roving HP technician was relieved and a turnover of activities in the containment building was conducted with his relief. No mention of work in B steam generator was made. Upon assuming the watch, the HP technician toured the building and discovered the worker marking tubes in B steam generator. The technician stopped work, read the worker's pocket dosimeter on his chest which indicated 260 mrem and observed that his exposure limit was 400 mrem. The worker stated that he had only one more tube to mark. The technician left the area to continue the tour and permitted the worker to complete his work without ensuring that health physics coverage was provided. The inspector stated that not providing health physics coverage for work on B steam generator after becoming aware that work was being performed on the platform in a high radiation area without a survey instrument was another example of failure to follow procedure HP-7 in violation of Technical Specification 6.11 (81-10-03).
- e. Within approximately 15 minutes, the HP technician confronted the worker a second time and read his pocket dosimeter. It indicated 370 mrem. Because this value was near the worker's limit of 400 mrem, the technician instructed the worker to leave the building. Subsequent processing of the worker's head, chest and gonad TLDs indicated doses of 2807 mrem, 1092 mrem and 163 mrem, respectively. Based upon a previous quarterly whole body exposure of 302 mrem, the individual was assigned a whole body dose of 3.109 rem for the second calendar quarter of 1981. 10 CFR 20.101(b) requires licensees to restrict the total occupational dose to the whole body of each individual in a restricted area to 3 rems during any calendar quarter. The inspector stated that an individual receiving a whole body dose of 3.109 rems in the second calendar quarter of 1981 was in violation of 10 CFR 20.101(b) (81-10-03).

6. Coincidental Circumstances

As previously stated, there were approximately five workers, in addition to two health physics technicians between 8:45 a.m. and 9:30 a.m. on May 30. Two HP technicians were providing health physics coverage to a worker making an entry into C steam generator. Three workers were painters not working in a high radiation area and, therefore, did not require continuous health physics coverage. The last worker was an engineering technician inspecting the portable 1000 cfm HEPA filter units used on each steam generator. This technician informed the inspector that he had encountered a worker in the B steam generator bay twice during his tours. At both times, health physics coverage was not being provided. The engineering technician stated that he had observed the worker with his head inside the steam generator channel head marking tubes, but acknowledged not comprehending the significance of this activity nor the absence of a qualified HP technician. However, he did instruct the worker that when idle, to wait in a low dose rate area. Subsequent interviews with the worker indicated that he mistook the engineering technician as a HP technician. Although he admitted not contacting HP prior to his initial entry into the B steam generator platform area, the worker assumed that a health physics technician had arrived to cover his job. The licensee has modified its containment building health physics coverage program to require HP technicians to wear red arm bands as a visual aid in identifying members of the Health Physics Department.

The inspector reviewed the licensee's program for computing stay times inside steam generator channel heads. A licensee representative stated that prior to steam generator entry, the HP technician covering the job is required to phone dose control outside containment where the worker's exposure history is reviewed and a stay time is calculated using the formula specified in HP-12. For platform work, dose control reviews a worker's exposure history and assigns a dose limit of 400 mrem which is written on the worker's protective clothing prior to containment building entry. When health physics became aware that this worker was at B steam generator, it appeared, based on the issuance of a full-face respirator, an exposure limit of 400 mrem written on his protective clothing and discussions with the worker, that only platform work was being performed. Health physics had no reason to expect an overexposure since the worker's chest worn pocket dosimeter did not exceed 400 mrem. (The pocket dosimeter is worn on the chest during platform work because this is the area of the body which would appear to receive the maximum dose if the individual does not enter the generator.) Based on reenactment of the worker's activities on the mock-up and comparison of exposure results and survey data, it was concluded that multiple channel head entries were made. The licensee estimated that the worker had to have been inside the generator approximately 15 minutes to receive a dose to the head of 2807 mrems based on survey data. Interviews with the contractor responsible for the steam generator work revealed a misinterpretation of what constitutes a steam generator entry. The licensee

maintains that any part of the body breaking the imaginary plane of the steam generator channel head manway is considered an entry. The contractor stated that he considered an entry that which involves the entire body entering the channel head area. It appeared that for this reason, the worker informed health physics that he would be performing platform work and not making any entries. The inspector reviewed records subsequent to this event that indicated personnel on site had been reinstructed in what constitutes a steam generator entry and how tube marking can result in steam generator entries.

7. Pre-incident Activities

The inspector reviewed records of training given to the overexposed individual. The worker required a second test before successfully passing the requirements for unescorted access throughout the plant. The individual had previously worked for the contractor as a steam generator jumper and had worked three or four times before at the Robinson facility. The inspector was informed by contractor and licensee representatives that they had no previous radiological concerns with regard to this worker.

The inspector reviewed the worker's NRC Form 4. It indicated an exposure of 85 mrem received between April 1 and May 15, 1981. Licensee dosimetry records indicate that the worker received 231 mrem since arrival onsite May 14, 1981 and prior to entering containment at approximately 8:45 a.m. on May 30, 1981. His combined previous quarterly whole body exposure of 316 mrem when combined with 2807 mrem received the morning of May 30 exceeds the quarterly dose limit of three rems specified in 10 CFR 10.101(b).

Records indicated that the worker was given special training on the steam generator mock-up by an experienced contractor senior engineer. This training consisted of proper dress requirements, nozzle cover installation, eddy current fixture, mechanical plugging operation and tube sheet marking. The inspector had no further questions concerning worker training.

8. Post-incident Activities

Upon recognition that a worker had been overexposed during steam generator work, the licensee restricted the individual from further work at the plant. In addition, the licensee stopped all work in the containment building and began training site personnel on the contributing factors of this event and actions each worker needed to take to prevent recurrence. Modifications to the health physics containment building coverage program were made. Health physics technicians in containment began wearing red arm bands to facilitate recognition by workers so that the worker can procure health physics coverage prior to starting work. Training sessions were also conducted to clarify that an entry into a steam generator means any part of the body breaking the imaginary plane of the manway opening. In addition, an individual was assigned to the steam generator contractor to ensure that a

health physics technician accompanies workers into high radiation areas inside the containment building requiring continuous health physics coverage. The inspector had no further comments.

9. Conclusions

The inspector concluded that the major contributing factor to the over-exposure of the contract worker marking the B steam generator tube sheet was the worker's disregard for the requirements of the appropriate SRWP. In addition, the following concerns were expressed to licensee management:

- a. lack of knowledge by responsible HP technician in the containment building of all activity under his purview;
- b. permission by health physics technician to perform work on steam generator platform without HP coverage;
- c. apparently no requirement for workers to read, initial and comply with all requirements of SRWP or RWP;
- d. lack of knowledge of HP personnel on tube sheet marking activities and the possibility that such activities could involve steam generator entries;
- e. misunderstandings of definition of steam generator entry;
- f. consideration that posting is adequate personnel access control to high radiation areas within the containment building; and
- g. placement of pocket dosimeter on chest during marking operations.