



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

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Report No.: 50-416/90-21

Licensee: System Energy Resources, Inc.
Jackson, MS 39205

Docket No.: 50-416

License No.: NPF-29

Facility Name: Grand Gulf

Inspection Conducted: October 15-19, 1990

Inspector:

Charles A. Hughey
C. A. Hughey

11/1/90
Date Signed

Accompanying Personnel: E. B. Pharr

Approved by:

J. P. Potter
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Facilities Radiation Protection Section
Radiological Protection and Emergency
Preparedness Branch
Division of Radiation Safety and Safeguards

11/1/90
Date Signed

SUMMARY

Scope:

This was a routine unannounced inspection of the radiation protection program in the areas of internal and external exposure control, outage coverage, control of radioactive materials and dose reduction techniques.

Results:

In the areas inspected, no violations or deviations were identified.

The original collective exposure goals for 1990 and the outage had been revised downward because of the elimination of previously planned outage work. Collective exposures were trending along with these revised estimates. Personnel contamination events were trending below established 1990 goals (Paragraph 2).

Contract senior health physics technicians hired to supplement permanent plant staff during the outage met the qualification requirements of the Technical Specifications (Paragraph 3).

No significant internal exposures had been noted so far in calendar year 1990 (Paragraph 4).

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A new electronic dosimetry system had been implemented and appeared to be operating smoothly (Paragraph 5).

Controlled reactor shutdowns, reactor pressure vessel nozzle flushes and good water chemistry control had been instrumental in reducing dose rates around the drywell and containment during the outage (Paragraph 7).

REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *W. Cottle, Vice President, Nuclear Operations
- *J. Cotton, Health Physics Supervisor
- S. Cotton, Technical Assistant
- *T. Hildebrandt, Radiation Control Superintendent
- J. Hurst, Radiation Control Supervisor
- *C. Hutchinson, General Manager
- G. Smith, Outage Drywell Coordinator
- *J. Summers, Compliance Coordinator
- *T. Wilkerson, Radiation Control Supervisor

Other licensee employees contacted included technicians, security officers and administrative personnel.

Nuclear Regulatory Commission

- *F. Cantrell, Section Chief, Region II
- *H. Christensen, Senior Resident Inspector
- *J. Mathis, Senior Resident Inspector

*Attended exit interview.

2. Person-Rem and Personnel Contaminations Status (83750, 83729)

10 CFR20.1(c) states that persons engaged in activities under licenses issued by the NRC should make every reasonable effort to maintain radiation exposure ALARA.

a. Person-Rem Status

The inspector reviewed site collective doses and discussed current trends and future goals with cognizant plant personnel.

The original site 1990 collective exposure goal had been reduced from 475 person-rem to 400 person-rem since the last inspection in this area. The main reason for this reduction, as indicated by the licensee, was the elimination of reactor coolant pump shaft replacement work scheduled for the current outage. The original outage goal of 410 person-rem had been subsequently reduced to 300 person-rem.

As of October 16, 1990 (day 17 of a planned 46 day refueling outage, RF04) collective exposure was 188 person-rem year-to-date and 119 person-rem for RF04. Exposures for the year and the outage appeared to trending along with the estimates discussed above.

Collective dose estimates for 1991 had also been revised downward since the last inspection (90-13) from 144 person-rem to 95 person-rem. The significant difference from 1990 goals was due to the fact that no outages were scheduled for 1991. The licensee had also estimated collective exposures through 1995 and are summarized below. It must be emphasized; however, that estimates that far in the future could change significantly as work scope changes.

YEAR	GOAL (person-rem)
1991	95
1992	450
1993	400
1994	90
1995	440

b. Personnel Contamination Reports (PCRs)

The inspector reviewed a summary of PCRs that had occurred so far during 1990. The criteria for tracking a PCR was greater than 100 disintegrations per minute (DPM) above background readings not including noble gas and radon contaminations.

As of October 17, 1990, there had been 83 PCRs recorded for all of 1990, of which, 50 had occurred since the beginning of the outage. This translated into about 0.33 PCRs per 2,000 radiation work permit (RWP)-hours which was well below the site's established goal of less than 2 PCRs/2000 RWP-hours.

No violations or deviations were identified.

3. Contract Health Physics Technicians (83750, 83729)

10 CFR 19.12 in part requires the licensee to instruct all individuals working or frequenting any portion of the restricted areas in health protection aspects associated with exposure to radioactive material or radiation and in precautions and procedures to minimize exposure.

Technical Specification (TS) 6.3, Unit Staff Qualifications, states that each member of the unit staff shall meet or exceed the minimum qualifications of ANSI N18.1-1971 for comparable positions. Section 4.5.2 of ANSI N18.1 states that technicians in responsible positions shall have a minimum of two years of working experience in their specialty and should have a minimum of one year of related technical training in addition to their experience.

To supplement the permanent health physics staff during the outage, the licensee had temporarily hired over 70 contract technicians. Over 40 of these technicians were used as senior technicians. The inspectors reviewed selected resumes of these technicians to verify their pertinent experience and found that all exceeded the requirements of ANSI N18.1.

Prior to being assigned duties as senior health physics technicians, the licensee administered an examination in the areas of basic health physics fundamentals and survey techniques. A passing grade of greater than 70 percent was required. If a person scored between 60 and 70 percent, a retest and subsequent oral interview was allowed at the option of the health physics supervisor. If a person scored less than 60 percent, a retest was not allowed and that person was not offered a position as a senior technician. Passing of this examination at the Grand Gulf facility also met the testing requirements of other system nuclear facilities (Waterford 3 and Arkansas Nuclear One). Persons who met the minimum experience qualifications and passed the examination were also required to complete a qualification card on plant specific procedural requirements.

No violations or deviations were identified.

4. Internal Exposure Control (83750)

10 CFR 20.103(a)(3) requires, in part, that the licensee, as appropriate, use measurements of radioactivity in the body, measurements of radioactivity excreted from the body, or any combination of such measurements as may be necessary for timely detection and assessment of individual intakes of radioactivity by exposed individuals.

Procedure 08-S-02-32, Evaluation of In Vivo Bioassay Results, Revision 4, dated September 13, 1988, states that maximum permissible concentration (MPC)-hour calculations shall be performed for all positive whole body counting results greater than one percent maximum permissible body burden (MPOB).

As of the beginning of the outage there had been no uptakes greater than one percent MPOB for calendar year 1990. During the beginning of the current outage; however, on October 3, 1990, seven people were internally contaminated with low levels of cobalt-60 and manganese-54 during maintenance activities on a residual heat removal system valve. MPC-hour calculations were performed based on whole body counting results. The most exposed individual had been exposed to concentrations of radioactive materials in air equivalent to 4.59 MPC-hours. No regulatory limits were exceeded by any of the workers. Immediate corrective actions were initiated by the licensee to determine the cause of the internal contaminations and to attempt to prevent further recurrences.

No violations or deviations were identified.

5. External Exposure Control and Personnel Dosimetry (83750)

10 CFR 20.202 requires each licensee to supply appropriate monitoring equipment to specific individuals and requires the use of such equipment.

Prior to the beginning of the outage the licensee had started using an electronic dosimetry system. As discussed in the previous report in this area (90-13) this system would take the place of the self reading pocket dosimeters and would indicate not only integrated dose rate but also

instantaneous dose rate. Prior to entering the radiologically controlled area (RCA), the worker would enter his or her RWP number into a computer keyboard. After placing the individual electronic dosimeter in a special receptacle, appropriate radiation alarm limits associated with the RWP were automatically set into the dosimeter. When the worker logged out of the system upon exiting the RCA, the total dose for the entry was automatically recorded by the system. The dosimeter could also be used as an alarming device as required during entries in high radiation areas. The system had many other useful functions. Self-reading pocket dosimeters could also be used with the system in case of unexpected electronic dosimeter problems or shortages. The licensee indicated that after some computer problems during the beginning of the outage the system was performing smoothly with no significant problems. After some initial intimidation of some individuals not familiar with computer terminals, workers were quickly becoming comfortable with its use. The inspectors verified this by directly observing and quizzing several plant workers using the system.

During tours of the RCA, the inspector observed the proper use and placement of self-reading pocket dosimeters and the new electronic dosimeters by plant personnel. Also observed was proper techniques by plant personnel for donning and removing anti-contamination clothing.

No violations or deviations were identified.

6. Surveys, Monitoring, and Control of Radioactive Materials (83750, 83729)

10 CFR 20.201(b) requires each licensee to make or cause to be made such surveys as (1) may be necessary for the licensee to comply with the regulations and (2) are reasonable under the circumstances to evaluate the extent of radioactive hazards that may be present.

During several tours of the drywell, containment, auxiliary building and radwaste facility, the inspector observed proper posting and control of radiation and contamination areas. Independent radiation surveys conducted by the inspectors were comparable with licensee results. Selected radiation protection instrumentation was also verified to be within current calibration requirements.

General area dose rates during this outage (RFC1) were generally low and are summarized as follows:

Containment - 5 millirem per hour (mR/Hr)

Drywell-

lower	20-30 mR/hr
upper	5-10 mR/hr

The licensee attributed the low dose rates to controlled shutdown techniques, nozzle lancing, good water chemistry and good fuel integrity. These items are discussed in more detail in Paragraph 7 of this report.

No violations or deviations were identified.

7. Dose Reduction Techniques (83750, 83729)

10 CFR 20.1(c) states, in part, that licensees should make every reasonable effort to maintain radiation exposures as far below the limits specified in 10 CFR 20 as is reasonably achievable.

Discussions with the licensee indicated that generally low collective doses during the outage and the year were the result of a combination of techniques for source term reduction and dose reduction. Some of the more important ones are discussed below:

a. Reactor pressure vessel (RPV) nozzle flushes

During the outage, the licensee was planning to conduct an induction heat stress inspection (IHSI) and in-service inspection (ISI) of the reactor feedwater inlets and jet pump instrumentation nozzle welds along with other selected RPV nozzles. To reduce exposures associated with this job, a low and high pressure water flush of the crevices in the nozzles thermal sleeves was completed. These flushes resulted in significant dose reductions around the nozzles. Dose rates around the upper feedwater inlet nozzles (N4) ranged between 7.5 and 12.5 rem per hour (R/hr) before the flush and were reduced to between 4.5 and 6.5 R/hr after the flush. Shielding placed around the nozzles further reduced contact dose rates to between 1.1 and 1.5 R/hr. Flushing of the lower jet pump instrumentation nozzles (W9A and W9B) reduced dose rates from between 10.5 and 9.5 R/hr to 800 and 650 millirem per hour (mR/hr). Shielding cut the dose rates even further by a factor of 2.

b. Controlled Reactor Shutdown

Prior to beginning of the current outage (RF04), the licensee completed a controlled shutdown of the reactor. The purpose of this procedure was to minimize the scrubbing action on the fuel cladding during cooldown by maintaining system pressure as cooldown occurred, thereby mitigating the usual crud burst and containing activated crud in the core. This allowed the reactor water cleanup system to more effectively reduce crud levels in the core and therefore reduce source term.

This procedure was also completed prior to RF03 and very promising results were noted then in that no significant increases in drywell dose rates were noted between RF02 and RF03. The results from RF04 were even more promising in that drywell dose rates were generally less than those noted during RF02. Radwaste personnel also indicated to the inspectors that there had been a significant increase in spent reactor water cleanup resins curie content indicating that crud was being more effectively removed from the reactor coolant system.

c. Water chemistry

Fuel cladding leakage had been low during the previous fuel cycle resulting in low reactor coolant fission product activity. Airborne

radioactive iodine activity in the drywell and containment immediately after the shutdown had been insignificant.

Radioactive crud levels in the core were also helped by routing heater drains to the condenser during unit startup until iron levels were significantly reduced. Heater drains were then pumped forward thereby reducing the level of insoluble corrosion products in the coolant. Additional crud reduction was realized by extending the useful life of reactor water cleanup and condensate polisher resins thereby increasing their filtering efficiency. The effectiveness of these techniques were evidenced by relatively low dose rates on control rod drives (CRDs) that were changed out during the outage. The 18 CRDs that were replaced averaged 1 R/hr on contact with the highest reading 3 R/hr.

No violations or deviations were identified.

8. Exit Interview

The inspection scope and results were summarized on October 19, 1990, with those persons indicated in Paragraph 1. The inspector described the areas inspected and discussed the inspection findings. Proprietary information is not contained in this report. No violations or deviations were identified.