

**ENCLOSURE**

U.S. NUCLEAR REGULATORY COMMISSION  
REGION IV

Docket No.: 50-416  
License No.: NPF-29  
Report No.: 50-416/99-13  
Licensee: Entergy Operations, Inc.  
Facility: Grand Gulf Nuclear Station  
Location: Waterloo Road  
Port Gibson, Mississippi  
Dates: November 1-5, 1999  
Inspectors: Michael P. Shannon, Senior Radiation Specialist  
Michael C. Hay, Resident Inspector, Cooper Nuclear Station  
Approved By: Gail M. Good, Chief, Plant Support Branch  
Attachment : Supplemental Information

## EXECUTIVE SUMMARY

### Grand Gulf Nuclear Station NRC Inspection Report No. 50-416/99-13

#### Plant Support

- Overall, the external and internal exposure control programs were effectively implemented. In general, high radiation areas were properly controlled and posted in accordance with station procedures and regulatory requirements. Radiation workers were knowledgeable of the radiation levels in assigned work locations, knew the proper response to electronic dosimeter alarms, and wore dosimetry properly. In general, portable air samplers and high efficiency particulate air filter ventilation units were appropriately used to evaluate radiological conditions and limit airborne exposures during work evolutions. No problems were identified with the whole-body counting and internal dose assessment programs (Sections R1.1 and R1.2).
- On October 26, 1999, the licensee identified a violation of Technical Specification 5.7.1. for the failure to barricade the reactor cavity area to prevent inadvertent access. This Severity Level IV violation is being treated as a noncited violation, consistent with Section VII.B.1.a. of the NRC Enforcement Policy. The licensee documented this issue in Condition Report 99-1375 (Section R1.1).
- On November 1, 1999, the licensee identified a violation of 10 CFR 20.1501(a) for the failure to perform an airborne radiological survey during the "Traversing Incore Probe" tubing removal work to evaluate the concentrations or quantities of radioactive material and the potential radiological hazards. This Severity Level IV violation is being treated as a noncited violation, consistent with Section VII.B.1.a. of the NRC Enforcement Policy. The licensee documented the above issue in Condition Report 99-1477 (Section R1.2).
- Radiological outage work planning was good. In general, radiological work tasks were well planned, and ALARA personnel were appropriately involved during the outage planning stage (Section R1.3).
- Radiation workers properly used contamination monitoring equipment. All radioactive material containers were properly labeled, posted, and controlled. Contamination boundaries were clearly identified and properly posted. Radiological postings were conspicuous and clear (Section R1.4).
- On November 3, 1999, the inspectors identified a violation of 10 CFR 20.1201(c) for the failure to assess the part of the whole-body receiving the highest dose for work under the reactor vessel. General area head level dose rates were a factor of about 1.7 higher than the chest level dose rates in the work area. No over exposures occurred due to this event. This Severity Level IV violation is being treated as a noncited violation, consistent with Section VII.B.1.a. of the NRC Enforcement Policy. The licensee wrote Condition Report 99-1511 documenting this issue (Section R1.4).

- Overall, a good ALARA program was implemented. The 1999 refueling outage dose goal of 200 person-rem was established using past best performance and industry experience for similar work. Department ALARA coordinators and the ALARA committee were appropriately involved in establishing and monitoring outage exposure goals. A good temporary shielding program which reduced general dose rates by approximately 40 percent was in place (Section R1.5).
- A good contractor radiation protection technician qualification program was maintained. Radiation protection management was appropriately involved in the contractor radiation protection program. Qualification cards included all the tasks assigned to contractor radiation protection technicians (Section R5.1).
- Quality program audit and surveillances provided management with a good overview of the radiation protection program. No negative trends were identified during the review of radiological condition reports (Section R7.1).

## **Report Details**

### **Summary of Plant Status**

During this inspection the station was in days 9 through 13 of a planned 33-day refueling outage.

## **IV. Plant Support**

### **R1 Radiological Protection and Chemistry Controls**

#### **R1.1 External Exposure Controls**

##### **a. Inspection Scope (83750)**

Selected radiation workers and radiation protection personnel involved in the external exposure control program were interviewed. A number of tours of the radiological controlled access area, including the reactor containment and drywell buildings were performed. The following items were reviewed:

- Control of high radiation areas
- Personnel dosimetry use
- Job coverage by radiation protection personnel
- Housekeeping in the radiological controlled area

##### **b. Observations and Findings**

In general, high radiation areas were properly controlled and posted in accordance with regulatory requirements. All Technical Specification required doors were properly locked, and flashing lights were working and appropriately used in accordance with regulatory requirements. Observed radiological postings were clearly and consistently posted.

Technical Specification 5.7.1 states, in part, each high radiation area, as defined in 10 CFR Part 20, in which the intensity of radiation is greater than 100 mrem per hour but less than 1000 mrem per hour, shall be barricaded. During the review of condition reports, the inspectors noted that on October 24, 1999, a ladder was installed to gain access to the reactor cavity. General radiation levels in the reactor cavity area were as high as 420 mrem per hour. The area was properly posted by the licensee; however, it was not barricaded to prevent inadvertent access until 2 ½ days later. The failure to barricade the reactor cavity area to prevent inadvertent access is a violation of Technical Specification 5.7.1. This Severity Level IV violation is being treated as a noncited violation, consistent with Section VII.B.1.a. of the NRC Enforcement Policy. On October 26, 1999, the licensee identified this issue and documented it in Condition Report 99-1375 (50-416/9913-01).

Field interviews with radiation workers revealed that, in general, workers were knowledgeable of the radiation levels and low dose waiting areas in assigned work

locations and knew the proper response to electronic dosimeter alarms. All workers observed wore dosimetry properly.

During tours of the controlled access area, the inspectors observed a number of radiological work activities. In general, workers followed good health physics practices. Radiation protection job coverage was appropriate for radiological work observed. Field radiological briefings provided by radiation protection technicians provided workers with current radiation levels in their work area and proper radiological controls to perform their work radiologically safe.

Housekeeping throughout the controlled access area was good. In general, areas were free of debris. Tools and equipment staged for radiological work activities were properly controlled.

c. Conclusions

Overall, a good external exposure control program was implemented. In general, high radiation areas were properly controlled and posted in accordance with station procedures and regulatory requirements. A violation of Technical Specification 5.7.1. was identified for the failure to barricade the reactor cavity area to prevent inadvertent access. This Severity Level IV violation is being treated as a noncited violation, consistent with Section VII.B.1.a. of the NRC Enforcement Policy. On October 26, 1999, the licensee identified this issue and documented it in Condition Report 99-1375. Radiation workers were knowledgeable of the radiation levels in assigned work locations, knew the proper response to electronic dosimeter alarms, and wore dosimetry properly. Radiation protection job coverage was appropriate for radiological work observed. Housekeeping throughout the radiological controlled area was good. In general, areas were free of debris. Tools and equipment staged for work activities were properly controlled.

R1.2 Internal Exposure Controls

a. Inspection Scope (83750)

Selected radiation protection personnel involved with the internal exposure control program were interviewed. The following items were reviewed:

- Air sampling, including the use of filtration units
- Respiratory protection
- Whole-body counting
- The internal dose assessment

b. Observations and Findings

With one exception, portable air samplers and high efficiency particulate air filter ventilation units were appropriately used to evaluate radiological conditions and limit airborne exposures during work evolutions.

10 CFR 20.1501(a) states, in part, each licensee shall make or cause to be made, surveys that are reasonable under the circumstances to evaluate the concentrations or quantities of radioactive material and the potential radiological hazards. During the review of selected condition reports, the inspectors noted that on October 27, 1999, work to remove the "Traversing Incore Probe" tubing was performed under the reactor vessel area, without performing an airborne survey. General contamination levels in the work area were as high as 500,000 disintegrations per minute per 100 centimeters squared. Both workers were contaminated during this work. One of the workers received an internal uptake of radioactive material, resulting in 12 mrems of radiation exposure. The failure to perform an airborne radiological survey during the "Traversing Incore Probe" tubing removal work to evaluate the concentrations or quantities of radioactive material and the potential radiological hazards is a violation of 10 CFR 20.1501(a). This Severity Level IV violation is being treated as a noncited violation, consistent with Section VII.B.1.a. of the NRC Enforcement Policy. On November 1, 1999, the licensee identified the above issue and documented it in Condition Report 99-1477 (50-416/9913-02).

As of November 4, 1999, there had been no respiratory equipment issued for radiological reasons during Refueling Outage Cycle 10. There had been one positive whole-body count which occurred during this refueling outage. From a review of the licensee supplied data, the inspectors noted that the licensee's calculated internal dose was approximately 12 mrem. The inspectors performed an independent internal dose assessment of the above positive whole-body count and concurred with the licensee's results. No problems were identified with the whole-body counting and internal dose assessment programs.

c. Conclusions

A good internal exposure control program was in place. In general, portable air samplers and high efficiency particulate air filter ventilation units were appropriately used to evaluate radiological conditions and limit airborne exposures during work evolutions. A violation of 10 CFR 20.1501(a) was identified for the failure to perform an airborne radiological survey during the "Traversing Incore Probe" tubing removal work to evaluate the concentrations or quantities of radioactive material and the potential radiological hazards. This Severity Level IV violation is being treated as a noncited violation, consistent with Section VII.B.1.a. of the NRC Enforcement Policy. On November 1, 1999, the licensee identified the above issue and documented it in Condition Report 99-1477. No problems were identified with the whole-body counting and internal dose assessment programs.

R1.3 Planning and Preparation

a. Inspection Scope (83750)

Radiation protection department personnel involved with radiation protection planning and preparation were interviewed. The following items were reviewed.

- ALARA job planning

- ALARA work packages
- Incorporation of lessons learned from similar work
- Supplies of radiation protection instrumentation, protective clothing, and consumable items

b. Observations and Findings

In general, radiological work tasks were well planned, and ALARA personnel were appropriately involved during the outage planning stage. At the completion of radiological work tasks, job history comments were gathered by ALARA personnel for evaluation and incorporation into radiological work history packages for future similar work.

From field observations and interviews with radiation workers, the inspectors determined that there were no problems with the radiation protection support, instrumentation, protective clothing, and consumable supplies needed to support outage radiological work.

c. Conclusions

Radiological outage work planning was good. In general, radiological work tasks were well planned, and ALARA personnel were appropriately involved during the outage planning stage. No problems were noted with the radiation protection support, instrumentation, protective clothing, and consumable supplies needed to support outage radiological work.

R1.4 Control of Radioactive Materials and Contamination; Surveying and Monitoring

a. Inspection Scope (83750)

Areas reviewed included:

- Contamination monitor use and response to alarms
- Control of radioactive material
- Portable instrumentation calibration and performance checking programs
- Adequacy of the surveys necessary to assess personnel exposure

b. Observations and Findings

Workers exiting the controlled access area used the contamination monitoring equipment in accordance to station procedures and management's expectations. However, one individual assigned to assist workers and monitor alarms was not attentive to personnel who alarmed the personnel contamination monitors. When this observation was discussed with radiation protection supervision, the individual was immediately counseled and corrected. The inspectors did not observe any additional similar occurrences. While exiting contaminated areas, the inspectors observed

radiation worker activities and noted use of good health physics practices during the removal of potentially contaminated protective clothing.

Independent radiological measurements performed by the inspectors during tours of the controlled access area confirmed that radiological postings reflected general radiological conditions within the rooms. Radioactive material containers observed were properly labeled, posted, and controlled. All radiological postings were conspicuously and clearly posted in accordance with station procedures and regulatory requirements.

Contamination boundaries were clearly marked and posted. Trash and laundry containers were properly maintained to prevent the spread of radioactive contamination to clean areas.

10 CFR 20.1003 defines the whole-body, for purposes of external exposure, as the head, trunk (including male gonads), arms above the elbow, or legs above the knee. 10 CFR 20.1201(c) requires, in part, that the assigned deep dose equivalent must be for the part of the body receiving the highest exposure. The deep-dose equivalent may be assessed from surveys or other radiation measurements for the purpose of demonstrating compliance with the occupational dose limits, if the individual monitoring device was not in the region of highest potential exposure, or the results of individual monitoring are unavailable. 10 CFR 20.1502(a) requires, in part, that each licensee shall monitor occupational exposure to radiation and shall supply and require the use of individual monitoring devices by . . . individuals entering a high or very high radiation area.

During the review of the "Traversing Incore Probe" tubing removal work performed under the reactor vessel, which included a review of the radiological survey information and an interview with the radiation protection technician who provided job coverage, the inspectors determined that the workers' dosimetry was placed on the chest and not the head. Additionally, the inspectors determined that the deep-dose equivalent for the head was not assessed from surveys or other radiation measurements conducted prior to or during the "Traversing Incore Probe" tubing removal task. From a review of the radiological survey information for work under the reactor vessel, the inspectors noted that general chest radiation levels ranged from 70 to 80 mrems per hour, while general head radiation levels ranged from 100 to 140 mrems per hour. On November 7, 1999, using a multiplication factor of 1.7, which was the derived from the difference between the chest and head radiation dose rates, the licensee corrected the workers dosimetry records. No over exposures occurred due to this event.

The failure to assess the part of the whole-body receiving the highest deep-dose is a violation of 10 CFR 20.1201(c). This Severity Level IV violation is being treated as a noncited violation, consistent with Section VII.B.1.a. of the NRC Enforcement Policy. On November 3, 1999, the licensee wrote Condition Report 99-1511 documenting this issue (50-416/9913-03).

c. Conclusions

Radiation workers properly used contamination monitoring equipment. All radioactive material containers were properly labeled, posted, and controlled. Contamination boundaries were clearly identified and properly posted. Portable radiation detection

instrumentation was properly calibrated and source response checked. Radiological postings were conspicuous and clear. On November 3, 1999, the inspectors identified a violation of 10 CFR 20.1201(c) for the failure to assess the part of the whole-body receiving the highest dose for work under the reactor vessel. General area head level dose rates were a factor of about 1.7 higher than the chest level dose rates in the work area. No over exposures occurred due to this event. This Severity Level IV violation is being treated as a noncited violation, consistent with Section VII.B.1.a. of the NRC Enforcement Policy. The licensee wrote Condition Report 99-1511 documenting this issue.

R1.5 Maintaining Occupational Exposure As Low As is Reasonably Achievable (ALARA)

a. Inspection Scope (83750)

Radiation protection personnel involved with the ALARA program were interviewed. The following areas were reviewed:

- ALARA committee support
- Outage exposure goal establishment and status
- Temporary shielding program

b. Observations and Findings

From a review of the four ALARA committee meeting minutes held since February 1999, the inspectors determined that the committee was fully supported by all major station departments, and was aggressively involved in outage ALARA planning, monitoring, and soliciting of ideas, solutions and suggestions from station workers to help reduce station dose.

The outage exposure goal of 200 person-rem for planned work was aggressive and developed using historical dose information, past actual task exposure and industry related information. Department ALARA coordinators and the ALARA committee were appropriately involved in the development of these goals. ALARA personnel properly tracked, trended, and distributed exposure information and goals to maintain station awareness. As of November 2, 1999, the station's actual exposure of 43 person-rem was approximately 32 person-rem less than the projected exposure goal of 75 person-rem. ALARA personnel informed the inspectors that the majority of the difference between the projected and actual exposure was due to the fact that some scheduled work had slipped because of polar crane and refueling problems. However, from a review of the remaining projected work schedule, the inspectors determined that the licensee's goal of 200 person-rem was attainable.

No problems were identified with the temporary shielding program. There were 18 temporary shielding packages installed during Refueling Outage Cycle 10. All shielding installations observed were properly installed in accordance with station procedure requirements and engineering specifications. From information supplied by the licensee, the inspectors determined that the average dose reduction factor was approximately 40 percent. The inspectors randomly selected 2 of the 18 temporary shielding packages for review. Both shielding packages contained proper engineering

evaluations, dose saving estimates, pre- and post-shielding surveys, and drawings/pictures of the shielding installation. Overall, the inspectors determined that the station had a good temporary shielding program in place.

c. Conclusions

Overall, a good ALARA program was implemented. The 1999 refueling outage dose goal of 200 person-rem was established using past best performance and industry experience for similar work. Department ALARA coordinators and the ALARA committee were appropriately involved in establishing and monitoring outage exposure goals. ALARA personnel properly tracked, trended, and distributed outage exposure status to maintain station awareness. A good temporary shielding program which reduced general dose rates by approximately 40 percent was in place.

**R5 Staff Training and Qualification in Radiological Protection and Chemistry**

**R5.1 Radiation Protection Staff Training**

a. Inspection Scope (83750)

The inspectors interviewed personnel involved with contractor radiation protection technician training and resume evaluation. The following items were reviewed:

- Contractor radiation protection technician qualification program
- Resumes of selected contractor radiation protection technicians
- Radiation protection management over sight of the contractor radiation protection training/qualification program

b. Observations and Findings

Thirty nine senior contractor radiation protection technicians were hired to support outage radiological work activities. From a review of the resumes, the inspectors determined that all senior contractor radiation protection technicians met or exceeded ANSI 18.1 requirements (2 years radiation protection experience).

Radiation protection management was involved in developing the qualification task topics. All contractor radiation protection technicians were required to pass the Northeast Utilities examination within the past 5 years before being approved to work at the station. The Northeast Utilities examination was used to assess the basic radiation protection technical knowledge of the contractor radiation protection technicians. Additionally, all contractor radiation protection technicians were tested on site-specific information and station radiation protection procedures.

On-the-job training and evaluations were given before contractor radiation protection technicians were assigned independent tasks. Based on a review of contractor radiation protection technician qualification cards, the inspectors determined that the qualification

cards were well developed and included all the tasks assigned to contractor radiation protection technicians.

No problems were noted with the radiation protection contractor qualification program.

c. Conclusions

A good contractor radiation protection technician qualification program was maintained. Radiation protection management was appropriately involved in the contractor radiation protection program. Qualification cards included all the tasks assigned to contractor radiation protection technicians.

**R7 Quality Assurance in Radiological Protection and Chemistry Activities**

**R7.1 Quality Assurance Audits and Surveillances, and Radiation Department Self-Assessments and Radiological Condition Reports**

a. Inspection Scope (83750)

Selected personnel involved with the performance of quality program audits and surveillances, and radiation department self-assessments were interviewed. The following items were reviewed:

- Quality program audits performed since February 1999
- Quality program surveillances performed since February 1999
- Radiation protection department self-assessments performed since February 1999
- Radiological condition reports written since February 1999

b. Observations and Findings

No problems were identified during the review of the one quality programs radiation protection audit and two quality programs radiation protection surveillances performed since the last NRC inspection in February 1999. The audit and suveillances provided management with a good overview of the radiation protection program. All recommendations were properly tracked in the management open items system and closed in a timely manner.

There was one radiation protection department self-assessment performed since February 1999; however, it was in the draft stage and not ready for review during this inspection.

The inspectors reviewed a summary of condition reports written since February 1, 1999, and randomly selected eight of these condition reports for a more in-depth review. No negative trends were identified. The station identified radiological concerns at the

proper threshold providing management with a good prospective of the radiation protection program. In general, condition reports were closed in a timely manner.

c. Conclusions

Quality program audit and suveillances provided management with a good overview of the radiation protection program. No negative trends were identified during the review of radiological condition reports.

**R8 Miscellaneous Radiological Protection and Chemistry Issues**

**R8.1 (Closed) Violation 50-416/9901-01: Failure to control a locked high radiation area**

The inspectors verified that the corrective actions documented in Condition Report 1999-0162 were implemented. No similar locked high radiation area control problems were identified.

**V. Management Meetings**

**X1 Exit Meeting Summary**

The inspectors presented the inspection results to members of licensee management at an exit meeting on November 5, 1999. The licensee acknowledged the findings presented. No proprietary information was identified.

**ATTACHMENT**

**SUPPLEMENTAL INFORMATION**

**PARTIAL LIST OF PERSONS CONTACTED**

**Licensee**

C. Abbott, Quality Assurance Supervisor  
A. Burks, Health Physics Specialist  
D. Coulter, Senior Quality Programs Specialist  
W. Deck, Security Superintendent  
W. Eaton, Vice President  
N. Edney, Health Physics Supervisor  
M. Larson, Senior Licensing Specialist  
J. Robertson, Quality Assurance Manager  
W. Shelly, Training and EP Manager  
C. Stafford, Operations Manager  
W. Trichell, Health Physics Supervisor  
J. Venable, Site General Manager  
R. Wilson, Radiation Control Superintendent

**NRC**

P. Alter, Resident Inspector  
J. Dixon-Herrity, Senior Resident Inspector  
G. Good, Chief, Plant Support Branch, Region IV

**INSPECTION PROCEDURE USED**

83750 Occupational Radiation Exposure

**LIST OF ITEMS OPENED, CLOSED, and DISCUSSED**

**Opened and Closed**

50-416/9913-01	NCV	Failure to barricade a high radiation area (Section R1.1)
50-416/9913-02	NCV	Failure to perform an airborne radiological survey (Section R1.2)
50-416/9913-03	NCV	Failure to assess the part of the whole-body receiving the highest exposure (Section R1.4)

Closed

50-416/9901-01      VIO      Failure to control a locked high radiation area

Discussed

None

LIST OF DOCUMENTS REVIEWED

A summary of radiological condition reports written since February 1999

Quality Program Documentation

Audit Report QPA 37.01-99, "Health Physics Program," dated March 31, 1999

Surveillance Report 99/00131, "Tour of Selected Plant Areas," dated January 26, 1999

Surveillance Report 99/01337, "Evaluation of Plant Access and Radiation Worker Requalification Training," dated May 28, 1999

Procedures

01-S-08-1	Administration of the GGNS Health Physics Program, Revision 101
01-S-08-2	Exposure and Contamination Control, Revision 108
01-S-08-6	Radioactive Material Control, Revision 104
01-S-08-8	ALARA Program, Revision 16
01-S-08-27	Radiological Practices for Controlled Areas, Revision 5
01-S-08-34	Radiological Work Planning, Performance, and Reviews, Revision 0
08-S-01-28	Use and Control of Temporary Shielding, Revision 10
08-S-02-20	Establishing and Posting Controlled Areas, Revision 17
08-S-02-32	Evaluation of In Vivo Bioassay Results, Revision 7
08-S-02-33	TLD Issue for Personnel Working in Non-Uniform Radiation Fields, Revision 5
08-S-02-50	Radiological Surveys and Surveillances, Revision 105