

APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report: 50-267/91-10

Operating License: DPR-34

Docket: 50-267

Licensee: Public Service Company of Colorado (PSC)
P.O. Box 840
Denver, Colorado 80201-0840

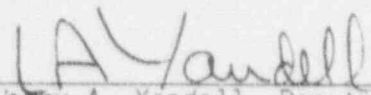
Facility Name: Fort St. Vrain Nuclear Generating Station (FSV)

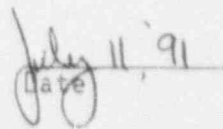
Inspection At: FSV Site, Weld County, Platteville, Colorado

Inspection Conducted: June 21, 1991

Inspectors: Roger L. Pedersen, Acting Chief, Radiological Protection and
Emergency Preparedness Section
J. Blair Nicholas, Senior Radiation Specialist

Approved:


Larry A. Yandell, Deputy Director, Division of
Radiation Safety and Safeguards


Date July 11, 91

Inspection Summary

Inspection Conducted June 21, 1991 (Report 50-267/91-10)

Areas Inspected: Special, reactive, announced inspection of the radiological control issues regarding the decontamination of the shielded cask in the hot service facility (HSF).

Results: Four apparent violations (failure to perform surveys - paragraph 3, failure to follow procedures - paragraph 5, failure to provide instructions - paragraph 6, and failure to provide personnel monitoring - paragraph - 8) were identified.

These apparent violations were associated with activities performed in the HSF that resulted in uncontrolled extremity exposures to two licensee staff members. These four apparent violations were similar to violations identified in NRC Inspection Report 50-267/90-16 concerning a similar event that occurred on September 19, 1990. The licensee's corrective actions taken in response to the September 1990 event were found to be consistent with the commitments in their November 29, 1990, letter. However, these corrective actions were ineffective in preventing a recurrence of these violations.

9107170070 910711
PDR ADUCK 05000267
Q PDR

DETAILS

1. Persons Contacted

PSC

- *C. H. Fuller, Manager, Nuclear Production
- *F. J. Borst, Manager, Nuclear Training and Support
- *P. F. Tomlinson, Manager, Quality Assurance (QA)
- *P. Moore, Supervisor, QA Technical Support
- D. G. Seymour, QA Engineer
- *B. Matherney, QA Engineer
- *M. Block, Manager, System Engineering
- *J. M. Gramling, Supervisor, Nuclear Licensing-Operations
- *M. H. Holmes, Manager, Nuclear Licensing
- *S. W. Chesnutt, Nuclear Licensing Engineer
- *S. M. Goebel, Supervisor, Nuclear Computer Services
- *B. Woodard, Supervisor, Health Physics
- *K. R. Barr, Health Physicist
- H. O'Hagan, Project Manager, Program Office
- D. L. Blain, Health Physicist
- R. Rowell, Mechanic
- G. Tillman, Health Physics Technician

NRC

- *J. B. Baird, Senior Resident Inspector

*Denotes individuals in attendance at the exit interview on June 21, 1991.

2. Background Information

On June 12, 1991, the licensee informed the resident inspector of an event where a mechanic and a health physics technician received unplanned exposures to their hands from unknowingly handling activated components while decontaminating the shielded Hot Service Facility (HSF) cask in preparation for installing a clean shipping liner. Based on this preliminary information, Region IV management decided to dispatch two inspectors to the plant on June 21, 1991, to conduct a special, reactive inspection.

In support of decommissioning the FSV facility, the licensee commenced cutting up the reactor control rod assemblies in February 1991 for shipment to a low-level waste burial facility. Each control rod assembly consists of 22 segments of neutron absorber material. The segments are hollow cylindrical canisters approximately 17-inches long and 3.5-inches outside diameter (OD) and 1.9 inches inside diameter (ID).

In order to package the control rods for transportation, a shielded cask with a shipping liner (approximately 8 feet in ID and 7-feet deep) was

placed in the HSF pit such that the top of the cask was at about the HSF floor level. A special arm was fitted with an enclosure housing that could be positioned over the center of the liner. The control rods were cut up remotely by lowering each control rod string (CRS) into the housing where the center spline and compression sleeve between the canisters were cut, dropping each canister into the liner. The first CRS was cut up in this way during February 9-12, 1991, using a grinding wheel type cutter. Although the cutting enclosure was fitted with a filtered ventilation exhaust, significant contamination of the HSF resulted. Subsequently, during March 1991, the decision was made to use hydraulic clippers, similar to the jaws-of-life used by rescue squads, for cutting. Following a decontamination of the HSF, cutting operations were resumed on April 4, 1991, and the first liner was filled by May 31.

During control rod cutting operations, the operators noticed that some pieces of the compression sleeve were on the closed clipper jaws when they were retracted from the cutting housing. This may have allowed pieces of activated material to fall down between the liner and the cask. The procedure was then changed to open the clippers before retracting them so that all components fell directly from the housing into the shipping liner. The cutting operation was interrupted several times when the liner was lifted out of the cask so that radiation and contamination levels on the outside of the liner could be measured to ensure they were within the Department of Transportation (DOT) and burial facility requirements.

On June 11, 1991, the liner was removed from the HSF. This job required that the liner be transferred to a shipping cask that was lowered into the HSF. Before lifting the shipping cask and liner to the refueling floor above, an entry was made to the HSF to bolt down the cask lid. Once the cask was on the refueling floor, additional surveys and torquing of the lid bolts were performed prior to loading the cask on the truck.

On June 7, 1991, the licensee had issued Radiation Work Permit (RWP) 11663 for the HSF and refueling floor to cover survey and preparation of the liner for transfer to the shipping cask. RWP 11663 was reviewed and approved by the facility health physicist (HP) who was the acting HP supervisor, as required by procedure. Also, as required by procedure, a prejob briefing was conducted and documented on June 6, 1991.

During a plan-of-the-day meeting at about 7:10 a.m. on June 11, 1991, the fuel deck superintendent discussed the work planned for shipping the loaded cask with his crew (including the fuel deck HP technician). The intent to install a new liner in the HSF cask and the need to decontaminate this cask prior to liner installation was also discussed. Since the fuel deck HP technician was to cover loading the shipping cask on the truck, additional HP support for the work in the HSF was requested from the acting HP Supervisor.

The fuel deck HP technician, the support HP technician, and the assigned mechanic met to discuss the scope of the task which included general housekeeping of the HSF, the taping of some loose electrical insulation,

and the decontamination of the cask. The decontamination of the cask was to be accomplished by leaning over the cask lip from a position on the HSF floor and wiping down the liner walls of the cask with a long-handled masslin mop.

At approximately 12:55 p.m. that same day, the HP technician entered the HSF through the personnel access door on Level 8 and performed a survey of the HSF before signaling to the crane operator to lower the mechanic into the HSF via the man-basket. Both individuals entered the HSF under RWP 11663 and were wearing double anti-Cs with a full-face respirator. During the initial attempt to decontaminate the cask, it became apparent that the proposed method for decontaminating the cask was awkward and presented a risk of the mechanic falling into the cask. Therefore, the mechanic and the HP technician decided to place a ladder diagonally into the cask from which the mechanic could more easily mop the cask walls. The HP technician instructed the mechanic to stay on the ladder above the second rung. The mechanic entered the cask via the ladder and proceeded to mop the walls down in horizontal passes around the circular cask wall, starting at the top and working to the bottom. Following each pass, the HP technician would survey the mop head and replace the masslin. The HP technician did not perform a survey of the inside of the cask before allowing the mechanic to enter.

On completion of mopping the cask walls, the mechanic noted some debris where the wall meets the floor of the cask that the masslin would not pick up. At the suggestion of the crane operator watching from the refueling deck above, the mechanic and HP technician decided to use the installed HSF vacuum system to pick up the debris. The HP technician surveyed the vacuum, then passed the hose to the mechanic instructing him to hold it back 2 feet from the end, since the nozzle was reading 25 millirem per hour (mrem/hr).

Following the vacuum operation, the mechanic handed the vacuum hose back to the HP technician who surveyed and replaced it. While the HP technician was involved with securing the vacuum system, the mechanic noticed two metal objects in the cask that the vacuum had not picked up. The mechanic thought he recognized the objects as fittings used to splice metal cable such as that used with the crane lifting rig. The objects actually were two pieces of the sleeve that attach the neutron absorber canisters to the spline of a control rod string. The mechanic reached over, picked up the two pieces, and proceeded up the ladder.

At the top of the ladder, the mechanic passed the two objects to the HP technician and asked him to survey them. The technician held the pieces while surveying them with the Eberline R02 survey meter, and when he observed the meter deflect off-scale high (on the 0-50 mrem/hr scale), he immediately tossed the sleeve pieces to the far wall.

After checking their self-reading dosimeters (the mechanic's read 12 mrem, and the HP technician's read 8 mrem), the technician attempted to survey the pieces. Unshielded readings on the two pieces exceeded the highest

scale (5000 mrem/hr) on the HP technician's meter measured at approximately 8 inches from the fragments. The HP technician placed lead bricks over the two sources to get general area dose rates down to about 25 mrem/hr. With the situation stabilized, the mechanic and HP technician proceeded to complete their tasks (about 15 minutes work) before exiting the area.

They exited the HSF at approximately 1:35 p.m. through the personnel access door on Level 8 where they again read their pocket dosimeters. The mechanic's read 16 mrem and the HP technicians read 10 mrem. The HP technician informed the facility HP, who stopped work in the HSF at about 2 p.m.

On June 12, 1991, at approximately 8 a.m., the licensee removed the lead bricks from the sleeve pieces remotely using the HSF manipulator and camera. A survey of the two pieces together with the high-range survey meter (R07) installed in the HSF indicated 10 R/hr. The pieces were picked up with the manipulator and dropped into the new cask liner. The first rolled to the north edge, and the second rolled to the west edge. A subsequent inspection of the HSF with the camera identified a third sleeve piece in one of the bolt holes in the cask lip. This third piece was extracted from the bolt hole and dropped in the cask. It rolled to the north edge adjacent to the first fragment. At 10 a.m., a survey of the three pieces was made with a teletector (high-range GM detector). The survey indicated that the west piece was reading 12 R/hr (contact), and the two north pieces were reading 10 R/hr (contact) and 2 R/hr (contact).

3. Surveys

The inspector reviewed the radiological survey performed in conjunction with the entry into the HSF on June 11, 1991, and interviewed the HP technician involved. The HP technician had performed a comprehensive contamination and radiation survey of the known hot spots on the HSF floor prior to allowing the mechanic entrance to the HSF. Since no entry into the cask was anticipated, the HP technician did not survey the inside of the cask. A radiation measurement was obtained above the cask in the area where the work was to be performed per the discussion that morning. However, the mechanic was subsequently allowed to enter the cask to complete the decontamination without a survey being performed. 10 CFR 20.201(b) requires that each licensee shall make or cause to be made such surveys as may be necessary to evaluate the extent of radiation hazards that may be present. The failure to conduct direct radiation and contamination surveys of the HSF cask before allowing work within the cask is an apparent violation of 10 CFR 20.201(b) (267/9110-01).

Conclusion

One apparent violation was identified concerning the failure of the licensee to perform radiation surveys in the HSF cask before allowing entry by a worker. This is similar to Violation 267/9016-01 when a Special Services licensed operator was allowed to work in the HSF without

a proper radiation survey being performed. The licensee's corrective actions for the 1990 event were ineffective at preventing a recurrence of this violation.

4. Personnel Exposure

The inspectors reviewed the personnel monitoring records and dose calculations for the mechanic and HP technician involved in this event. Based on the 10 R/hr results of the initial survey of the two sleeve pieces and FSV's experience with the relative response of pocket dosimeters versus film badge, the licensee determined that the pocket dosimeter readings of 16 mrem and 10 mrem for the mechanic and HP technician were representative of their whole body exposure. Therefore, they did not have the individuals' film badges developed.

The inspectors reviewed the licensee's calculations of the exposure to the mechanic's right hand, and the HP technician's left hand. In both cases, the duration of the exposure was estimated to be 15 seconds. Based on a 14 R/hr contact reading (the 12 R/hr + 2 R/hr pieces), an extremity dose of 58 mrem was assigned to each individual. The inspectors noted that this calculation was based on teletector contact readings with the pieces which is not accurate enough for determining an actual dose of record. In addition, during interviews with the licensee, there was some confusion over which of the north pieces was the one handled by these individuals. The licensee subsequently determined the contact dose rate using an extremity thermoluminescent dosimeter (TLD) placed in contact with the two highest reading pieces. The TLD indicated a contact dose rate of 1.2 rad/min. Therefore, the licensee updated the dose records for the mechanic and HP technician to indicate an extremity dose of 300 mrem from this event.

Conclusion

Calculations of the extremity exposure indicated that neither individual received an extremity dose in excess of the limit in 10 CFR Part 20.

5. Radiation Work Permit (RWP)

The inspectors reviewed the RWP used for entry into the HSF to decontaminate the cask (RWP 11663). The inspectors noted that the task of decontaminating the HSF cask was outside the scope of this RWP. RWP 11663 was written for the HSF and refueling floor to survey and prepare for transfer of the liner to the new cask. RWP 11663 did not address decontaminating the HSF cask. No survey results, protective clothing requirements, or special instructions were provided for this task.

The inspector reviewed Licensee Procedures HPP-125, "Establishing and Posting Controlled Areas," and NPAP-10, "Radiation Work Permit Program," and noted the following examples where procedures were not followed as they pertain to this event:

- ° Procedure HPP-125, Section 4.3, titled, "Hot Service Facility Control," Subsection 4.35, states, "Write a Radiation Work Permit (RWP) for the job to be performed in the HSF."
- ° Procedure NPAP-10, Section 4.2.3, states, "During work in an area controlled by an RWP, health physics personnel shall: (b) conduct radiation, contamination, and airborne radioactivity surveys as necessary to determine changing radiological conditions."

Technical Specification (TS) 7.4.d. states, "Procedures for personnel radiation protection shall be prepared consistent with the requirements of 10 CFR Part 20, and shall be approved, maintained, and adhered to for all operations involving personnel radiation exposure." The failure to adhere to Procedures HPP-125 and NPAP-10 is considered an apparent violation of TS 7.4.d. (267/9110-02).

Conclusion

One apparent violation was identified concerning the failure to follow procedures with regard to the preparation and use of RWPs. The change to the scope of work fell outside the bounds of RWP 11663, and it was not updated nor was a new RWP issued to cover personnel entry into the cask. This is similar to Violation 267/9016-02. The licensee's corrective actions for that violation included revising the facility RWP procedures, requiring all RWPs to be reviewed by RP management prior to being issued, and reviewing the event with station personnel. However, these corrective actions were ineffective in preventing a recurrence of this violation.

6. Planning, Training, and Instructions

The inspector reviewed the planning, training, and instructions associated with the decontamination of the HSF cask. The inspector determined that a formal prejob briefing for RWP 11663 was performed and documented on June 6, 1991. Interviews with the personnel involved, however, indicated that the decontamination of HSF cask was not anticipated; therefore, no hazards associated with that work were discussed.

The interviews with the personnel involved did indicate that prejob discussions between the acting radiation protection (RP) supervisor the refueling floor HP technician, the support HP technician, and the mechanic did take place prior to the support HP technician and the mechanic entering the HSF. However, during the discussion, the risk of encountering pieces of the cut up control rods was not addressed.

The inspector noted that the June 11, 1991, unplanned exposures at FSV were similar to an event discussed in NRC Information Notice (IN) 90-47, "Unplanned Radiation Exposures to Personnel Extremities Due to Improper Handling of Potentially Highly Radioactive Sources." The IN discusses, in part, an event in which an HP technician received an unplanned extremity dose from picking up parts of control rod drive mechanisms, by hand, to survey them. Documentation of the licensee's review of IN-90-47 includes

a memo from the HP who was the acting HP supervisor on June 11, 1991, for distribution to the RP staff addressing the information in the IN.

10 CFR 19.12 requires that all individuals working in a restricted area shall be instructed in precautions or procedures to minimize exposure. The extent of these instructions shall be commensurate with potential radiological health problems in the restricted area. The failure to provide proper instructions to the mechanic and the HP technician concerning handling pieces of the cut up control rod are considered an apparent violation of 10 CFR 19.12 (267/9110-03).

Conclusion

One apparent violation was identified concerning the failure to instruct the individuals involved in this event of the precautions required to minimize their exposure from the activated pieces of control rod. The acting HP supervisor should reasonably have been aware of the potential for encountering pieces of control rod in the HSF. This is similar to Violation 267/9016-03. The licensee's corrective actions for that violation included revising the facility RWP procedures, requiring all RWPs to be reviewed by RP management prior to being issued, and reviewing the event with station personnel. However, these corrective actions were ineffective in preventing a recurrence of this violation.

7. Personnel Monitoring

The inspector determined that extremity monitoring had not been provided to the mechanic that decontaminated the HSF cask even though the potential existed for handling highly activated or contaminated materials.

10 CFR 20.202 requires that each licensee shall supply appropriate personnel monitoring equipment to each individual who enters a restricted area under such circumstances that he receives, or is likely to receive, a dose in any calendar quarter in excess of 25 percent of the applicable value specified in paragraph (a) of 10 CFR 20.101. The failure to provide extremity monitoring to the mechanic decontaminating the HSF cask on June 11, 1991, is considered a violation of 10 CFR 20.202(a)(1) (267/9110-04).

The inspector noted that from the time of the exposure, about 1:20 on June 11, 1991, until the radiation survey of the pieces at about 8 a.m. on June 12, 1991, the licensee had no knowledge of the severity of these extremity exposures. Interviews with the individuals involved indicated that based on the low whole body dose determinations, the mechanic and HP technician were allowed to leave the site without a medical examination or with any instructions to be watchful for erythema effects so that prompt medical attention could be obtained.

Conclusion

One apparent violation was identified concerning the failure to provide extremity monitoring to the individuals working in the HSF. The potential for inadvertently handling highly activated or contaminated materials should reasonably have been anticipated. This is similar to Violation 267/9016-05. The licensee's corrective action for this violation included requiring all RWPs to be reviewed by RP management to assure that adequate dosimetry is provided for the work to be performed. However, the corrective actions were ineffective in preventing a recurrence of this violation.

8. Supervisory Oversight

The inspector reviewed the amount of HP supervisory oversight that the decontamination of the HSF cask received. On June 11, 1991, the HP supervisor was not on site. The HP, who is normally assigned to cover the refueling floor and HSF work, was acting for the HP supervisor. The preparing and shipping of the transportation cask containing the cut-up control assemblies was being worked at the same time as the decontamination effort. As noted in paragraphs 6 and 7 above, significant failings to recognize the radiation hazards to workers were identified. It appears that the acting HP supervisor's attention was focused on the need to ensure that the transfer of the cut-up control assemblies to the burial facility met all NRC, DOT, and state requirements and was unable to provide necessary supervision of radiation protection work activities in the HSF.

9. Exit Interview

The inspector met with the resident inspector and the licensee representatives denoted in paragraph 1 at the conclusion of the inspection on June 21, 1991, and summarized the scope and findings as presented in this report. The licensee did not identify as proprietary any of the materials provided to, or reviewed by, the inspector during the inspection.

Enclosure 2

PROPOSED ENFORCEMENT CONFERENCE AGENDA

Public Service Company of Colorado Meeting with NRC

July 19, 1991, at 9 a.m.

- | | |
|--|-------------------|
| I. INTRODUCTION AND PURPOSE OF MEETING | A. Bill Beach |
| II. APPARENT VIOLATIONS | Blaine Murray |
| III. DISCUSSION | PSC Staff |
| IV. ENFORCEMENT POLICY | Gary F. Sanborn |
| V. LICENSEE COMMENTS | A. Clegg Crawford |
| VI. CLOSING COMMENTS | A. Bill Beach |