

ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket No.: 50-267
License No.: DPR-34
Report No.: 50-267/96-05
Licensee: Public Service Company of Colorado (PSCo)
Facility: Fort St. Vrain Nuclear Generating Station
Location: Platteville, Colorado
Dates: December 3 through 5, 1996
Inspector: L. C. Carson II, Health Physicist
Approved by: D. Blair Spitzberg, Ph.D., Chief
Nuclear Materials Licensing Branch
Division of Nuclear Materials Safety
Attachment: Supplemental Inspection Information

EXECUTIVE SUMMARY

**Fort St. Vrain Nuclear Generating Station
NRC Inspection Report 50-267/96-05**

This announced inspection was conducted to assess the licensee's implementation of the radiation protection program and Decommissioning Plan. This inspection included reviews of the status of the radiation protection and radwaste management programs.

The following is a summary of the findings of the inspection:

- The inspector determined that licensee investigations of contamination in embedded piping were well documented and provided confidence that decontamination, grouting, and preparation for release of embedded piping had been conducted in accordance with license requirements and licensee commitments (Section 2).
- The licensee's radiation protection program met the requirements of the Decommissioning Technical Specifications (DTSS), 10 CFR Part 19, and 10 CFR Part 20 (Section 3).
- The licensee met the requirements of the radwaste management program (Section 4).

Report Details

1 **Plant Status**

On November 23, 1992, the NRC issued the Order which authorized the decommissioning of FSV. As of November 1, 1996, decontamination and decommissioning at FSV were complete. On November 7, 1996, PSCo submitted to the NRC a "Request to Terminate the FSV Facility Operating License," which is a 10 CFR Part 50 possession-only license. Most of the licensee contractors from the Westinghouse Team that included personnel from Westinghouse Electric, Scientific Ecology Group (SEG), and Morrison Knudsen-Ferguson had left the FSV site.

PSCo's objective was to dismantle, decommission, and release the FSV site for unrestricted use; however, the FSV facility will be largely left intact following decommissioning. The Prestressed Concrete Reactor Vessel (PCRv), reactor building, turbine building, liquid waste system, and the radioactive balance-of-plant equipment were dismantled or decontaminated as described in the FSV Decommissioning Plan.

During this inspection, the primary activities in progress at FSV consisted of terminating and phasing out 10 CFR Part 50 license radiation protection and decommissioning activities.

2 **Closeout and Inspection Survey (83890)**

a. Inspection Scope

This inspection activity involved a review of the embedded piping final survey packages and reactor building tours. The purpose of this inspection activity was to determine if contamination levels which remained in embedded piping in the reactor building and the concrete associated with the PCRv were below established limits.

b. Observations and Findings

The inspector compared final survey release records that were submitted to the NRC to the details contained in the licensee's final survey unit packages. Embedded piping included 30,000 feet of contaminated piping of which 22,000 feet was 1-inch diameter piping with bends. Several different radiation surveying and decontaminating methods were approved by the NRC for embedded piping remediation. Hydrolazing and beadblasting were some of the approved decontamination methods being used. Specially designed Geiger-Mueller detectors, cylinder gas flow detectors, and thermoluminescent detector strings were used to measure contamination contained within embedded piping. The licensee had established an NRC approved limit of 100,000 disintegrations per minute/100 centimeters squared (dpm/100 cm²) as the maximum contamination which could remain in embedded piping after decontamination and grouting. Grouting of pipes

below this level of residual contamination, under specified conditions, was approved by the NRC.

Tours of the reactor building were conducted to observe the location of grouted embedded piping. Embedded piping decontamination, survey methods, and residual radioactive material issues were discussed with licensee staff. Several documents were reviewed by the inspector which pertained to the disposition of embedded piping including:

- "Fort St. Vrain Final Survey Plan for Site Release, Proposed Revisions for Piping Systems and Suspect Affected Survey Units" - October 12, 1995
- Technical Basis Document, FSV-FRS-TBD-204, Revision 0, "Methods to Evaluate the Final Condition of Plant System Piping Internal Surfaces" - October 24, 1995
- "Response to NRC Questions Regarding PSCo's Proposed Revisions to the Final Survey Plan, Involving Survey of Piping Systems and Suspect Affected Survey Units" - January 18, 1996
- FSV Final Survey Plan - Aggressive Decontamination Methods - April 12, 1996
- "Final Survey Plan, Extension of Proposed Embedded Pipe Treatment to Include Large Diameter Pipes, and Proposal to Grout Diamond Wire Saw Kerfs" - May 13, 1996
- "Approval of the Fort St. Vrain Final Survey Plan for Site Release, Proposed Revisions for Survey of Piping Systems and Suspect Affected Survey Units" - June 18, 1996

According to NRC correspondence dated June 18, 1996, the licensee will mount warning plaques around the reactor building and PCRV. The plaques will read as follows:

"Caution: Grout-filled pipes embedded in concrete contain fixed radioactive contamination on inner surfaces as follows:

- Typical radionuclides include cobalt-60, cesium-137, tritium, iron-55, and europium-152, -154, and -155
- Contamination levels are 2,800 dpm/100 cm² (average), 87,000 dpm/100 cm² (maximum), as of September 1996.

These levels of radioactive contamination have been accepted by the U. S. Nuclear Regulatory Commission for building occupancy and dismantlement."

The licensee had ordered the caution plaques and planned to mount them before license termination. The inspector observed the proposed locations for the plaques. Until the plaques are mounted, no conclusions could be drawn as to the conspicuousness of the locations.

The inspector reviewed a summary report for final survey areas in Group G (contaminated plant systems located external to the PCRV) and Group H (PCRV inside surfaces and embedded piping). Features of the summary report included the identification of the survey unit, a description of the unit, whether the unit was grouted or not, and the maximum radioactivity remaining. Of the survey records reviewed, the inspector noted that the maximum fixed radioactivity remaining in a grouted pipe was 86,714 dpm/100 cm², which was found in Survey Unit H0401 (Core Support Floor [CSF] Column Embedded Piping). This was below the licensee's limit for contamination on grouted embedded piping of 100,000 dpm/100 cm². Twelve survey units had embedded piping grouted. Survey Unit H0304 had grouted embedded piping with the lowest amount of radioactivity, which measured 34,055 dpm/100 cm².

The inspector examined the following three final survey packages:

- G7202: Reactor Building Level 1 Drain Lines
- H0303: Vertical Tendon Tubes
- H0401: CSF Column Embedded Piping

The packages were evaluated to determine compliance with the administrative action levels listed in Procedure FSV-SC-FRS-I-115, "Final Survey Data Analysis for Plant Systems and Penetration," and in embedded piping reference documents previously listed. Final survey results above action levels were required to be investigated to determine whether additional survey unit measurements and remediation of embedded piping were required. In addition, the details of the investigations were evaluated to determine if the licensee's decisions were based on sound engineering judgement. Instructions for preparing replacement survey packages and documenting investigations were found in Implementing Procedure FSV-SC-FRS-I-102, "Survey Design and Package Preparation," Section 5.11. For final survey package investigations, Implementing Procedure FSV-SC-FRS-I-115, Sections 5.8 - 5.12, contained survey package investigation criteria for embedded pipe survey unit measurements.

Each final survey investigation contained a description of the problem which instigated investigation followup actions such as remediation surveys, decontamination actions, and the final disposition. The investigation final disposition contained information on the results of followup actions and the final survey results which lead to the licensee's decision to grout or not grout embedded piping.

The inspector found that Final Survey Package G7202 had four investigations conducted regarding elevated final survey measurements. One investigation involved a spill of contaminated oil into the floor drain. This spill was also documented under Radiological Occurrence Report (ROR) 96-035. The inspector noted that the licensee's use of the ROR was consistent with the Final Survey Plan commitments to document incidents involving radioactive material in areas released for final surveys. Investigation No. 2 involved the finding of an elevated measurement of 126,000 dpm/100 cm². Characterization and remediation history of the G7202 survey unit suggested that 91,600 dpm/100 cm² was the highest contamination level detected. Pre-final survey remediation efforts were conducted using a Work Package 2.4.2.11 and aggressive decontamination instructions (DIs) - 096, -121, and -124. According to the final survey investigation, aggressive decontamination included grit blasting and vacuuming operations that resulted in reducing contamination levels below 100,000 dpm/100 cm². The embedded piping was grouted consistent with the licensee's approved program for embedded piping.

Final Survey Package H0401 consisted of 262 CSF embedded pipes. The inspector's review of this package revealed that 10 final survey investigations were conducted. All of the final survey investigations were reviewed by the inspector. Final survey data in three of the investigations found that contamination had existed in embedded pipes in excess of 100,000 dpm/100 cm²; even though, historical remediation and characterization data had not detected this level of contamination. The inspector reviewed Decontamination Instruction (DI)-99 and Work Package 2.3.5.5-2, which described the history of remediation activities conducted on the CSF column embedded piping before the final survey. Before the performance of final survey package H0401, characterization surveys found that the average contamination in some pipes was 18,000 dpm/100 cm², and the maximum contamination was 41,590 dpm/100 cm². Pre-final survey records showed that the pipes were aggressively decontaminated using hydrolazing and scrubbing techniques before the pipes were released for final surveys. After the licensee identified the elevated measurements exceeding 100,000 dpm/100 cm² during final surveys, CSF pipes were again aggressively decontaminated below the 100,000 dpm/100 cm² limit. Survey point No. 125 remained at 86,714 dpm/100 cm², and consequently, the embedded piping was grouted consistent with the licensee's approved program for embedded pipe.

The inspector's review of final survey package H0303 revealed that two survey unit investigations were conducted. One investigation detected contamination in an embedded pipe that measured 2,800,000 dpm/100 cm². According to the investigation record, the licensee interviewed the technicians who had surveyed the piping and attempted to confirm the levels by remeasurement. Because, the licensee could not duplicate the elevated measurement, they determined the measurement to be erroneous. Therefore, the elevated measurement was invalidated and the basis documented. According to the remediation and characterization history recorded on Attachment 6.11 of the final survey package, "Plant System Unit History File," the highest individual contamination measurement

found was 54,688 dpm/100 cm². Consistent with licensee commitments, all the vertical tendon tubes represented by this survey package were remediated using the Final Survey Plan's aggressive decontamination methods. Based on the inspector's review of investigation documentation in the final survey package and discussions with the licensee, adequate measurements were clearly made at the same location where the initial survey identified contamination. The inspector determined that the licensee's investigations, as documented, were adequately justified and supported invalidating the original survey results under investigation.

c. Conclusion

For the three survey packages reviewed, all of the results above the prescribed action levels were investigated. The inspector determined that licensee investigations were well documented in the packages and provided additional confidence that the decontamination, grouting, and preparation for release of embedded piping had been conducted in accordance with license requirements and licensee commitments. A final, comprehensive review of the licensee's survey packages will be conducted prior to license termination.

3 Occupational Exposure During Safstor and Decon (83100)

a. Inspection Scope

The purpose of this inspection activity was to review FSV's radiation protection program through the completion of the decommissioning project. The inspector reviewed the licensee's ALARA program, personnel exposures and records, and radioactive material controls.

b. Observations and Findings

Occupational Exposures

The FSV Decommissioning Project had been exempted from the requirements of revised 10 CFR Part 20, which meant that FSV activities were conducted under the previous revision of 10 CFR Part 20. In two separate letters dated November 5, 1996, the licensee submitted to the NRC the "Radiation Exposure Report for 1996," and FSV notified the NRC that they discontinued the personnel dosimetry program. The licensee's letters included a "Statistical Summary Dose Report" that was submitted pursuant to old 10 CFR 20.407(a) and (b). Also, a "Number of Personnel and Person-Rem by Work and Job Function Report 1996" was submitted pursuant to the DTS 5.5.1. The inspector reviewed the reports and noted that they were based on thermoluminescent dosimeter data. The dose summary showed that 513 personnel were monitored at FSV during 1996 for a collective dose of 3.41 person-rem. The inspector noted that 444 persons received no measurable exposure, 62 individuals received 10 - 100 millirem, and 7 individuals received 100 - 250 millirem.

The inspector noted that the licensee's ALARA goal for 1996 was 10 person-rem. The licensee set a decommissioning project ALARA goal of 433 person-rem, and FSV completed the project at 360 person-rem, well below the goal. Additionally, the inspector reviewed several other indicators of FSV's ALARA performance such as bioassay results, personnel contamination reports, RORs, and ALARA suggestions made by workers. The inspector noted that during the decommissioning project, only five positive bioassay results were reported, including one in 1996.

The inspector determined that the licensee's radiation exposure controls and ALARA program had been effectively implemented during the decommissioning project. Workers were aware of the ALARA goals and involved in the ALARA program.

Occupational Exposure Records

The inspector reviewed personnel exposure records to determine if the licensee had maintained the records according to 10 CFR Part 20. The records review included personnel exposure termination letters that were sent to former FSV radiation workers in accordance with 10 CFRs 19.13 and 20.408. At the time of this inspection, the licensee's radiation protection manager (RPM) maintained personnel exposure records at FSV; however, all personnel exposure records will be retained at the PSCo office building in Denver, Colorado, starting in 1997. The inspector noted that the licensee maintained a "Dosimetry Record File Checklist" as part of the personnel exposure file to assure that all 10 CFR Parts 19 and 20 requirements were complete. The inspector determined that the licensee's personnel exposure records retention plan and the exposure letter issued to terminated workers met the requirements of 10 CFRs 19.11, 20.401, and 20.408.

Control of Radioactive Materials

Plans for transferring the inventory of FSV radiation instrument calibration and check sources that were used during the 10 CFR Part 50 decommissioning project were reviewed by the inspector. The licensee's inventory list included 12 radiation sources. Six of the radiation sources, five technetium-99 and one thorium-230, were owned by SEG. Two cesium-137 calibration sources, 130 and 400 curies, were to be transferred from PSCo to SEG. The inspector verified that, in accordance with 10 CFR 30.41, PSCo had determined that SEG was authorized to receive the cesium-137 sources. Scientific Ecology Group planned to ship all eight radiation sources back to the SEG corporate office in January 1997. The remaining four radiation check sources were being stored at the Independent Spent Fuel Storage Installation located outside the FSV site. The inspector determined that all radiation sources associated with FSV's 10 CFR Part 50 operations were in the process of being transferred to an authorized recipient.

The inspector noted that once the two cesium-137 sources leave the FSV site, the licensee will no longer have a "Radiologically Controlled Area" or "Restricted Area" pursuant to 10 CFR Part 20.

c. Conclusion

The licensee's radiation protection program was found to be in compliance with the DTS, 10 CFR Part 19, and 10 CFR Part 20.

4 Radioactive Waste Management (84101)

a. Inspection Scope

The purpose of this inspection activity was to determine if FSV's radwaste management program was meeting the requirements of the DTS, Offsite Dose Calculation Manual (ODCM), and Radiological Environmental Monitoring Program (REMP).

b. Observations and Findings

Post Decommissioning Effluent and Environmental Monitoring

The inspector reviewed an internal memorandum to the FSV Decommissioning Safety Review Committee dated July 9, 1996. The memorandum explained the following:

- The ODCM and REMP were no longer necessary because the site had completed effluent releases.
- FSV had dismantled the liquid radwaste system.
- The liquid effluent pathway as described in the ODCM had not been used since July 3, 1996.
- FSV would submit a final REMP report and a final Annual Radiological Effluent Release Report (ARERR) to the NRC.

On November 20, 1996, FSV sent a letter to the NRC regarding the reactor building sump (RBS) groundwater releases being conducted pursuant to the National Pollutant Discharge Elimination System. In the letter to the NRC, the licensee provided a copy of the RBS groundwater radiological analysis and a copy of an FSV letter to the state of Colorado dated November 19, 1996. The FSV letter to the state explained the following:

- Groundwater inleakage to the RBS was approximately 10 gallons per day

- RBS water will be transferred to the turbine building sump before being discharged off site.
- RBS water was radiologically analyzed and determined that it met NRC release criteria.

The inspector reviewed the licensee's RBS release analysis dated October 21, 1996, which FSV attached to the NRC letter. The licensee's minimum detection activity (MDA) for tritium analysis met ODCM requirements for both effluent and environmental releases. The licensee reported that they detected no significant gamma radioactivity, but the licensee did not provide the MDA capability for the RBS gamma analysis. The inspector noted that the licensee's RBS analysis form indicated that standard MDAs would be used. Licensee personnel stated that standard MDAs meant that effluent MDAs ($5.0E-7$ microcuries/milliliters ($\mu\text{Ci/ml}$)) and counting times (2,000 seconds) were used. At the inspector's request, the licensee provided the gamma analysis report from the RBS sample. The gamma spectrum report revealed that no FSV contamination was in the RBS sample. However, the report also revealed the licensee's gamma spectrum MDAs did not completely meet the requirements established in the ODCM, Table F-2, "Detection Capabilities for Environmental Sample Analysis Lower Limit of Detection (LLD)." The inspector determined this matter was of minor significance, but recommended that the MDA be determined. The RPM committed to collect a water sample from the RBS and have the samples analyzed by Colorado State University (CSU) at the environmental MDA level.

Solid Radwaste Storage and Processing

The inspector toured the site and held discussions with the licensee regarding FSV solid radwaste. According to the licensee, no solid radwaste exists at the FSV site, and the inspector did not observe any radwaste storage areas on site. The inspector determined that some FSV solid radwaste which had been previously shipped to off-site processors had not yet been buried at an authorized disposal facility. Licensee management provided the inspector the status of all FSV radwaste from 1995 and 1996. A SEG FSV Customer Summary Report dated November 18, 1996, estimated that 1,614 cubic feet (ft^3) of radwaste at 5,480 millicuries (mCi) was unprocessed and needed to be buried or returned to FSV. The inspector reviewed FSV radwaste shipping manifest to the processor Envirocare of Utah dated January 5, 1996. According to the RPM, only contaminated lead ingots remained to be buried at the Envirocare facility, approximately 40 ft^3 at less than 1 mCi. The inspector determined that this matter should be addressed in the licensee's final ARERR, which will be submitted in the first quarter of 1997.

c. Conclusion

The licensee met the requirements of the radwaste management program.

5 Exit Meeting

An exit meeting was conducted on December 5, 1996. During the meeting, the inspector reviewed the scope and findings of the inspection. The RPM committed to collect a water sample from the RBS and have the sample analyzed by CSU at the environmental MDA level. The licensee did not identify as proprietary any information provided to, or reviewed by, the inspector.

ATTACHMENT

SUPPLEMENTAL INSPECTION INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

Licensee

T. Borst, Radiation Protection Manager
S. Chesnutt, Senior Project Assurance Engineer/Licensing & Compliance
M. Holmes, Project Assurance Manager
J. McCauley, Decommissioning Engineering Manager
D. Seymour, Senior Quality Assurance Engineer

Contractor Personnel

R. Argall, Radiochemistry Supervisor, SEG
B. Dyck, Westinghouse Licensing Engineer
B. Hug, Operations Manager, MK-Ferguson
B. Mann, PSCo Project Assurance Consultant
J. Rood, Final Survey Lead Engineer, SEG
H. Story, Project Radiation Protection Manager, SEG

NRC Region IV Personnel

L. Carson II, Health Physicist, Division of Nuclear Materials Safety

INSPECTION PROCEDURES USED

IP	2560	"Decommissioning Inspection Program"
IP	83100	"Occupational Exposure During SAFESTOR and DECON"
IP	83890	"Closeout and Inspection Survey"
IP	84101	"Radioactive Waste Management"

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

LIST OF ACRONYMS USED

ALARA	As Low As is Reasonably Achievable
ARERR	Annual Radiological Effluent Release Report
CSF	Core Support Floor
CSU	Colorado State University
dpm	Disintegrations Per Minute
DTSs	Decommissioning Technical Specifications
FSV	Fort Saint Vrain
MDA	Minimum Detection Activity
ODCM	Offsite Dose Calculation Manual
PCRV	Prestressed Concrete Reactor Vessel
PDR	Public Document Room
PSCo	Public Service Company of Colorado
RBS	Reactor Building Sump
REMP	Radiological Environmental Monitoring Program
ROR	Radiological Occurrence Report
RPM	Radiation Protection Manager
SEG	Scientific Ecology Group