

APPENDIX

U. S. NUCLEAR REGULATORY COMMISSION  
REGION IV

NRC Inspection Report: 50-267/84-25

Docket: 50-267

License: DPR-34

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

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

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

Inspection Conducted: September 5, 6, and 11, 1984

Inspector: Blaine Murray 10/17/84  
for H. D. Chaney, Radiation Specialist Date

Approved: Blaine Murray 10/17/84  
Blaine Murray, Chief, Facilities Radiological Date  
Protection Section

R. E. Ireland 10/19/84  
R. E. Ireland, Chief, Special Projects and Date  
Engineering Section

Inspection Summary

Inspection Conducted September 5, 6, and 11, 1984 (Report 50-267/84-25)

Areas Inspected: Nonroutine, announced reactive inspection of licensee planning, preparations, and operations involving the movement of a highly radioactive and unshielded damaged reactor control rod from the core to the hot services facilities. The inspection involved 19 inspector-hours onsite by one NRC inspector.

Results: Within the one area inspected, no violations or deviations were identified.

DETAILS

1. Persons Contacted

PSCO

- \*\*J. W. Gahm, Manager, Nuclear Production
- \*\*C. H. Fuller, Station Manager
- \*F. J. Novachek, Technical Services Supervisor
- \*F. J. Borst, Radiation Protection Manager (RPM)
- \*L. W. Singleton, Manager, Quality Assurance
- T. E. Schleiger, Health Physics (HP) Supervisor
- W. E. Woodard, Plant Health Physicist
- L. O. Bishard, Test Director
- D. O. Brown, Results Engineer

Others

- \*G. L. Plumlee, III, NRC Resident Inspector

\*Denotes those present during the exit interview held on September 6, 1984.

\*\*Denotes those present during the exit interview held on September 11, 1984.  
The NRC resident inspector was briefed separately on September 11, 1984.

2. Background

During the removal of a control rod drive (CRD) mechanism from region seven of the core using the auxiliary transfer cask (ATC) the licensee could not effect closure of the reactor isolation valve (RIV) or the ATC isolation shutter valve (IV) in preparation for removal of the ATC to the hot servicing facility (HSF) for discharge of the CRD assembly for inspection. The licensee hypothesized that either one or both of the two control rods (absorbers) were not in a fully retracted mode prior to being lifted into the ATC. The circumstances surrounding this occurrence will be reported in more detail in subsequent documents submitted by the licensee. The licensee performed boroscope inspections, on or about August 31, 1984, of a small region between the RIV and the ATC-IV using a penetration on the ATC. These visual inspections revealed that an object the size of an absorber was located in the region. The licensee then proceeded to plan for the test lifting of the ATC to allow for the visual inspection (using remote television cameras) of the entire area between the RIV and ATC-IV and to obtain specific distance radiation dose rate measurements.

3. Inspection, September 5 and 6, 1984

A regional based inspector (radiation specialist) was dispatched to FSV on September 5, 1984, to observe licensee preparations to resolve the control rod problem.

The NRC inspector determined that the licensee was going to perform a limited lift of the ATC to a height of approximately 4 inches. The licensee assumed that this height would allow a visual observation (by remote TV cameras) of the area between the ATC bottom and the RIV, and allow measurement of the radiation dose rates from the absorber which was expected to be in the area.

The licensee issued a plant test procedure (T-242) for the conduct of the ATC lift and subsequent inspection. Preparations for the lift included:

- An extensive review of the proposed procedure by the plant operations review committee (PORC), HP staff, engineering and maintenance staff and by the onsite NRC inspectors.
- Scheduling the lift for backshift occurrence which would minimize the number of personnel on site.
- Staging video cameras (2), recorders, and TV monitors to record and display actual observations.
- Staging at a predetermined distance from the ATC remote readout high range (Kilo-R/hour) gamma radiation dose rate measuring equipment.
- Briefing all participants on the operations to be conducted.
- Establishing radiological controls for the operation that included.
  - multiple whole body and extremity monitoring dosimetry for personnel to be near the ATC
  - measured dose rates at which the lift operation would be terminated
  - sampling for airborne radioactivity
  - evacuation of and control of adjacent areas that may be affected by the increased radiation levels during lifting of the ATC
- Prelift checkout of radiation monitoring, video, and communication equipment.

- Providing ladders (work platform) for the two workers that would be on the refueling floor (RF) during the ATC lift; i.e., HP technician and crane operator. These ladders would put the workers several feet above the floor level radial beam of gamma radiation.
- Briefing of the HP technician and the crane operator on the expected high radiation levels to be streaming radially outward from the gap produced during the ATC lift, and actions to take in case the ATC could not be resealed on the RIV.
- Establishing a well shielded and remote area within the reactor building to direct the lift from, and to view the remote TV monitors and radiation monitoring equipment.

The RPM determined that the lift could be made without any personnel receiving excessive radiation exposures or there being a significant release of radioactivity to the work area. The NRC inspectors, after discussions with the RPM on expected radiological conditions and controls to be implemented, determined that no undue risk to the workers or public would be incurred during the ATC lift and absorber exposure.

At approximately 8:15 p.m., on September 5, 1984, the ATC was lifted and reached a height of approximately 4 inches by 8:25 p.m. The ATC-IV was closed around the absorber to prevent a possible dropped control rod. The licensee recorded the entire operation including what appeared to be the lower portion of the control rod/absorber which was askew and hanging below the ATC into the RIV area. Dose rates were determined to be approximately 4.6 R/hr at 4 feet from the absorber/center of the ATC. Dose rates at the HP technician's and crane operator's positions above the plane of the ATC/RIV gap were measured to be less than 10 millirem per hour. After completion of the observations and recording video displays the ATC was resealed on the RIV. Area radiation levels returned to normal following resealing of the ATC. The test lift of the ATC and viewing of the area beneath the ATC was accomplished without causing any abnormal personnel radiation exposures or a spread of contamination.

No violations or deviations were identified.

4. Inspection, September 11, 1984

On September 11, 1984, an NRC regional based inspector (radiation specialist) was dispatched to Ft. St. Vrain to review preparations and actual operations to lift the ATC, movement to the HSF, and discharge of the CRD assembly.

The licensee's preparations for this operation involved the issuance of a PORC approved fuel handling procedure work packet (FHPWP)-82. This procedure involved detailed instructions for establishing initial conditions that required various quality control, health physics and plant manager sign-offs prior to allowing the actual ATC movement to begin. The licensee anticipated that radiation dose rates from the fully exposed control rod segments (one absorber can and the shock absorber on the end of the control rod assembly) would increase the dose rates to between 4 to 10 times those measured during the 4-inch lift of the ATC. Very little radioactive contamination was expected to be spread during this operation so long as the control rod was not dropped or dragged across the RF. The licensee effected an evacuation and accountability of all site personnel who were not necessary for plant operation or conduct of the ATC movement. All areas where personnel would be located were continuously monitored by permanently installed radiation monitors or roving HP technicians. Video cameras and radiation monitors were staged so the entire route of the ATC movement could be monitored and recorded.

The licensee staged a nylon net to be pulled up around the ATC bottom to captivate the dangling control rod segment after lifting of the ATC from over the RIV. A platform was constructed and rigged to the ATC on which a HP technician and a crane operator could stand (platform deck was covered with lead wool blankets), during movement of the ATC to the HSF. Since the exposed control rod would be directly under the ATC the two workers would be adequately shielded by the ATC lower body so long as they remained on the platform. The HP technician would provide continuous dose rate monitoring on the platform. The HP technician and the crane operator were outfitted with seven film badges for whole body and extremity monitoring; i.e., lower and upper legs, torso back, head, and chest. Self-reading pocket dosimeters were provided for interim dose assessment, and continuous dose assessment was handled by the RPM based on elapsed time and dose rate surveys by the HP technician on the platform. A trial run to determine transit time for the ATC was accomplished and showed that the move could be completed in approximately 16 minutes. This time would be used in planning personnel dose commitments once the ATC was lifted clear of the RIV and general area dose rates on the platform were established. The licensee covered all areas adjacent to the ATC transit path with sheet plastic to aid in post movement clean up. The licensee also prepared the fuel handling machine so it could be used, if necessary, to remotely pick up debris (control rod pieces). The HSF adapter plate was fitted with a funnel shaped insert to ensure that the control rod end would be guided into the HSF and not hang up on entry into the adapter. The licensee's FHPWP also required that the ATC-IV be closed around the control rod.

At approximately 10:15 p.m., on September 11, 1984, the licensee conducted a prework briefing on the ATC/control rod movement and made station assignments. The licensee conducted a physical accountability (including a roll call) of all personnel on site. At 11:15 p.m., the licensee commenced lifting and movement of the ATC utilizing the FHPWP. All systems worked properly. With the ATC lifted to maximum height and the control rod clearing the floor a dose rate of 43.3 R/hour was measured at approximately 4 feet from the fully exposed control rod lower segments (one neutron absorber and shock absorber). The transfer of the ATC to the HSF was completed at approximately 11:40 p.m. without incident.

During the ATC transfer, dose rates on the ATC where the two workers were positioned averaged 50 mR/hour. Areas adjacent to the reactor building did not exceed 1.0 mR/hour during the operation. Post ATC movement radiological surveys determined that only a minimal amount of radioactivity was spread during the ATC movement and the majority of this contamination was spread during the attempts to position the captivating net under the dangling control rod. Each worker on the ATC only registered 16 mR exposure for the operation.

No violations or deviations were identified.

5. Exit Interview

The NRC inspector met with the licensee's representatives denoted in paragraph 1, and the NRC resident inspector at the conclusion of site visits on September 6 and 11, 1984. The scope and findings of the inspections were discussed.