

APPENDIX

U. S. NUCLEAR REGULATORY COMMISSION  
REGION IV

NRC Inspection Report: 50-267/88-16

License: DPR-34

Docket: 50-267

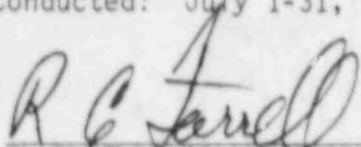
Licensee: Public Service Company of Colorado (PSC)

Facility Name: Fort St. Vrain Nuclear Generating Station

Inspection At: Fort St. Vrain (FSV) Nuclear Generating Station,  
Platteville, Colorado

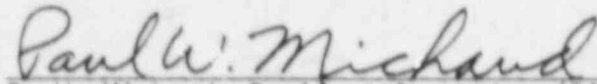
Inspection Conducted: July 1-31, 1988

Inspector:



R. F. Farrell, Senior Resident Inspector (SRI)

8-15-88  
Date



P. W. Michaud, Resident Inspector (RI)

8-15-88  
Date

Approved:



T. F. Westerman, Chief  
Reactor Projects Section B

8-20-88  
Date

Inspection SummaryInspection Conducted July 1-31, 1988 (Report 50-267/88-16)

Areas Inspected: Routine, unannounced inspection of operational safety verification, licensee event report review, monthly maintenance observation, monthly surveillance observation, radiological protection, and monthly security observation.

Results: Within the six areas inspected, no violations or deviations were identified.

## DETAILS

1. Persons ContactedPSC

- D. Alps, Supervisor, Security
- \*F. Borst, Nuclear Training Manager
- \*L. Brey, Manager, Nuclear Licensing and Resources
- M. Block, System Engineering Manager
- \*M. Cappello, Central Planning and Scheduling Manager
- R. Craun, Manager, Nuclear Site Engineering
- \*M. Deniston, Superintendent, Operations
- D. Evans, Operations Manager
- C. Fuller, Manager, Nuclear Production
- \*J. Gramling, Supervisor, Nuclear Licensing Operations
- \*J. Hak, Superintendent, Maintenance
- M. Holmes, Manager, Nuclear Licensing
- \*F. Novachek, Manager, Nuclear Support
- \*H. O'Hagan, Outage Manager
- \*L. Scott, QA Services Manager
- \*T. Staley, Supervisor, Systems Engineering
- \*L. Sutton, Supervisor, QA Auditing
- \*P. Tomlinson, Manager, QA
- R. Walker, Chairman of the Board and CEO
- \*D. Warembourg, Manager, Nuclear Engineering
- R. Williams Jr., Vice President, Nuclear Operations

The NRC inspectors also contacted other licensee and contractor personnel during the inspection.

\*Denotes those attending the exit interview conducted August 9, 1987.

2. Plant Status

The plant was shut down on July 6, 1988, beginning a planned 99 day circulator maintenance outage. The planned work involves replacing secondary-side helium circulator bolting which has been identified as being susceptible to stress-assisted corrosion cracking.

Reactor restart was planned for October 7, 1988, with electrical production to resume October 12, 1988. At the end of the inspection period, the reactor restart date had slipped approximately one week. Due to moisture ingress, as a result of a Helium circulator buffer upset, the electrical production resumption date has slipped three to four weeks to allow for drying out of the primary system following restart.

### 3. Operational Safety Verification (71707)

The NRC inspectors reviewed licensee activities to ascertain that the facility is being operated safely and in conformance with regulatory requirements and that the licensee's management control system is effectively discharging its responsibilities for continued safe operation.

The NRC inspectors toured the control room on a daily basis during normal working hours and weekly during backshift hours. The reactor operator and shift supervisor logs and Technical Specification compliance logs were reviewed daily. The NRC inspectors observed proper control room staffing at all times and verified that operators were attentive and adhered to approved procedures. Control room instrumentation was observed by the NRC inspectors and the operability of the plant protective system and nuclear instrumentation system were verified by the NRC inspectors on each control room tour. Operator awareness and understanding of abnormal or alarm conditions was verified. The NRC inspectors reviewed the operations order book, operations deviation report (ODR) log, clearance log, and temporary configuration report (TCR) log to note any out-of-service, safety-related systems and to verify compliance with Technical Specification requirements. Shift turnovers were observed at least weekly by the NRC resident inspectors. The information flow appeared to be good, with the shift supervisors routinely soliciting comments or concerns from reactor operators, equipment operators, and auxiliary tenders.

On July 6, 1988, with the reactor shut down and in the process of depressurizing the PCRV for outage work, the control room operators did not observe an expected increase in core support floor vent flow. An equipment operator was dispatched to check the valve lineup.

Valve V-111063 is a bellows sealed globe valve operated by a reach rod through a concrete wall. The operators noticed flow increased and decreased when the valve was moved in the open direction, indicating a malfunction with the valve.

On July 12, 1988, radiography was performed on Valve V-111063, and the results indicated the stem had separated from the valve disc. The licensee removed the valve and found a set screw had loosened and allowed the stem and disc to separate. The valve vendor was contacted and indicated that this was not an uncommon occurrence in this type of valve. The valve vendor recommended tack welding the assembly before reinstallation. The licensee is also looking into replacing the valve with a diaphragm-sealed valve. The NRC inspectors will continue to monitor the licensee's activities on this valve.

At 8:30 a.m. on July 9, 1988, with the reactor shut down and depressurized to less than 50 psia, the licensee interrupted forced circulation (primary flow) in order to perform work on the Loop 2 Main Steam Isolation Valve HV-2224. Loop 1 was cleared out and thus unavailable. The Loop 2 helium circulators were brought to self-turbining. The condensate pumps, which were supplying both secondary flow and the motive power to drive the

helium circulators, were then shut off and the interruption of forced circulation was commenced. The allowable time before forced circulation was required was 5.74 hours according to calculations performed in accordance with Technical Specification 4.0.4 and Procedure CMG-4. This calculation was based on data obtained on July 7, 1988. Since the duration of the work to be performed on HV-2224 was short, the licensee did not recalculate the allowable time based on the actual interruption of forced circulation since the previous calculation was conservative and provided more time than the operators thought would be required.

At 9:07 a.m., on July 9, 1988, C and D Helium Circulators automatically shut down due to a low bearing water surge tank level. The condensate system normally provides makeup to the bearing water system during shutdown operations. The licensee failed to realize that securing the condensate system would result in no makeup to the bearing water surge tank and subsequent circulator trips. Had the licensee considered this, the circulators could have been manually shut down at the outset.

At 12:37 p.m., the condensate system was returned to service and flow was restored to the Loop 2 steam generators. Auxiliaries were placed on C Helium Circulator but would not work properly. Auxiliaries were then placed on D Helium Circulator, but it would not self turbine. Several attempts were made to get D Helium Circulator to roll, but all were unsuccessful. At 1:15 p.m. the limit of the 5.74 hours per the CMG-4 calculation was exceeded without having restored forced circulation. This placed this plant in LCO 4.1.9 and LCO 4.2.18. These LCO's required depressurization within 19 1/2 hours, a condition the plant was already in. The control room operators were making every attempt to get C or D Helium Circulator in service while a parallel effort, directed by the shift supervisor, was in process to remove the clearance on A Helium Circulator.

At 4:45 p.m., forced circulation was restored when C Helium Circulator was placed in service. A problem with its main drain valve was found and repaired prior to placing the circulator in service. Average core outlet temperature peaked at 568°F, with a calculated maximum average fuel temperature of 332°F. This was significantly below the limit of 760°F bulk core temperature which is the basis for Technical Specification 4.0.4.

The situation during these events was somewhat unique due to the fact that actions required by the Technical Specifications had been performed prior to entering the interruption of forced circulation. The applicable Technical Specification was LCO 4.0.4, which provided time limit for the interruption of forced circulation. When this time limit was exceeded, LCO 4.1.9 became applicable. Since the minimum flow requirements of LCO 4.1.9 could not be met, the action statement required depressurization of the PCRV per LCO 4.2.18. LCO 4.2.18 allowed an additional 19 1/2 hours to start depressurization of the primary system to less than 50 psia. The

primary system pressure was at 43 psia at the start of the interruption of forced circulation. In addition, forced circulation was restored before the time period in the TS action statement elapsed.

Although within the requirements of the Technical Specifications, these events indicate a lack of proper planning or in-depth review of a maintenance activity prior to its initiation. The condensate pump(s) could have remained in service and the maintenance on Valve HV-2224 could have been performed by shutting Valve HV-2238, emergency condensate supply to the Loop 2 steam generators, to remove secondary flow. The helium circulators could have remained in operation and restoration, following the maintenance, could have been made by opening Valve HV-2238, thus avoiding any challenge to the helium circulator's operation. The NRC inspectors will closely monitor licensee activities in the review of maintenance planning and initiation.

No violations or deviations were identified in the review of this program area.

4. Review of Licensee Event Reports (LERs) (90712)

(Open) LER 88-010: Wide Range Nuclear Channel Upscaled From Noise Source and Actuated Scram Channel. This LER reported two scram actuations while the reactor was shut down with all rods fully inserted. In each case, a scram channel was tripped for surveillance testing when another channel was tripped by electronic noise satisfying the two out of three logic for scram actuation.

This has been a continuing problem at Fort St. Vrain and has received considerable licensee and NRC attention. The events described do not require additional attention outside the ongoing licensee program to reduce electronic noise. However, in the LER, it appears that the licensee has not specifically determined whether or not a scram actuation actually occurred on May 10, 1988. The licensee has indicated that they will clarify the ambiguity with regard to the scram actuation.

The licensed reactor operators on duty logged a scram actuation. The NRC inspectors are satisfied that the equipment in the plant protection system functioned as designed. The remaining questions involve licensee investigation, followup, and generation of LERs.

No violations or deviations were identified in this program area.

5. Monthly Maintenance Observation (62703)

With the reactor in cold shutdown for an extended maintenance outage, the majority of the NRC inspection effort was in the area of maintenance. The licensee's plan for the outage included refurbishment of three helium circulators, replacement of one helium circulator, addition of one helium



circulator turbine water removal pump (a commitment to the NRC), and extensive secondary side work including replacement of the station batteries and expansion of the auxiliary boilers.

The NRC inspectors observed preparation for and removal of the auxiliary piping and lower assemblies of A and B Helium Circulators.

The NRC inspectors observed work being performed in accordance with Controlled Work Procedure (CWP)-880173 that implementing Change Notice (CN)-2715, "S/N 2004 Steam Inlet & Water Piping Modification." Step 1 of the CWP required the measurement of a bolting detail and included acceptance criteria. The CWP specified notification of the cognizant engineer if as-found conditions are out of tolerance. The NRC inspector observed the licensee's engineer evaluating an out-of-tolerance measurement as required by the procedure.

The NRC inspectors witnessed the inspection and removal of the internals from the Core Support Floor Vent Valve V-111063 discussed in paragraph 3 of this report. The NRC inspectors reviewed Station Service Request (SSR) 88504746, the authorizing document which incorporated Procedure MP-1077, Issue 1, "Valve Bellows Sealed Valve Maintenance." The licensee's welders followed their fire prevention procedures and obtained Fire Prevention Work Permit 88-07-44 prior to grinding away the bonnet welds. Health physics was present as required by the SSR prior to removal of the valve internals. The area had previously been checked and found radiologically clean. Health physics monitoring was required to prevent valve internal contamination from spreading.

The NRC inspectors observed electrical tests done on the new turbine water removal pump motor as part of the initial installation. This system removes water from the helium circulator water turbine drives. A third pump is being installed to meet an Appendix R commitment to the NRC as the two existing turbine water removal pumps are adjacent to each other. The pump is being installed under CN-2006 and CWP-88-07. Procedure PE-1904, Issue 5, "Megger Testing of Electrical Components," and Procedure MPE-1900, Issue 2, "Disconnecting, Reconnecting, and Cleaning Non EQ Motors (600 volt or less)" were incorporated in the CWP by reference. The new pump motor, P-21035X, was meggered in accordance with Procedure MPE-1904, Issue 5.

The NRC inspectors observed portions of maintenance activities on the B Emergency Diesel Generator (EDG) under SSR 88504683. This SSR required the performance of annual preventive maintenance per Procedure MP-7090, Issue 2, "Emergency Diesel Generator Preventive Maintenance." The NRC inspectors verified a controlled copy of the procedure was being used and that all required reviews and authorizations were obtained prior to commencing work. The clearance associated with this work was independently verified by the NRC inspectors.

Work on the EDG began July 9, 1988, and included lubrication adjustments, general inspections, and postmaintenance testing. On July 26, 1988, the

engines were reassembled and a cylinder leakdown test was performed on Engine K-9204-X in accordance with Step 5.17 of Procedure MP-7090.

The licensee's preventive maintenance program for the EDGs was recently revised to include a cylinder leakdown test as part of the annual preventive maintenance activities. This test checks the integrity of the valves and rings for each cylinder. The results of this test on the No. 1 cylinder of Engine K-9204-X indicated some degradation. Work under Procedure MP-7090 was suspended and SSR 88504683 was revised to determine the cause of the high cylinder leakage. The cylinder head for cylinders 1 and 3 was removed and the valves appeared to be in satisfactory condition. The No. 1 piston was then removed and was found to have the second (middle) piston ring broken into three pieces and a piece approximately 2 1/2 inches long broken out of the side of the piston. The licensee has not experienced any problems of this type in the past and had no indication or reason to suspect this type of problem. The engine vendor was called for assistance and the licensee was awaiting resolution of this problem at the end of this report period.

It should be noted that this problem could have remained undetected except for the licensee's expanded testing in their revised preventive maintenance program for the EDGs. The inspectors will monitor the licensee's activities to restore the "B" EDG to service and the subsequent preventive maintenance on the "A" EDG.

No violations or deviations were identified in this program area.

6. Monthly Surveillance Observation (61726)

At the beginning of the outage, the NRC inspectors observed a pair of non-Technical Specification surveillances of interest. These were the turbine generator overspeed trip test and backup overspeed trip test. These tests were satisfactorily performed in accordance with licensee Procedures SR-OP-6-SA, Issue 7, "G. E. Turbine Generator," and SR-OP-3-A, Issue 11, "GE Turbine Generator."

The NRC inspectors observed technicians performing SR 5.4.6-R, Issue 14, "Core Delta P Indicator Calibration." The NRC inspector observed a technician interrupt work when an unmarked valve was encountered. The technician was sure which valve the unmarked valve was, but chose to verify this with a drawing before proceeding. The unmarked valve was an instrument valve located inside a reactor vessel instrument penetration. The NRC inspector also noted the use of and compliance with a radiation work permit for this calibration.

During this inspection period, the NRC inspector had the opportunity to make a fuel storage building entry. The entry was made while the licensee performed a Security Program Surveillance, SR-SE-16-W, Issue 10, "Fuel Storage Building Alarm System and 4 Key/Core Inventory."



The NRC inspectors also observed a special "surveillance type" test done under a temporary change, TCR-88-0710. This test was done to verify whether the static seal actuation hardware on the B Helium Circulator was leaking purified helium. If the test confirmed that the leak was in the circulator hardware, the circulator would be removed from the reactor. This test was performed as a temporary change because it involved a temporary hardware change of installed plant equipment. The purified helium supply line to the static seal mechanism was removed and a fitting was installed on the circulator end of the line. A helium supply bottle isolation valve and pressure gauge were installed. The static seal mechanism was then pressurized to 450 psia and isolated. The rate of pressure decay was measured to determine the integrity of the seal actuation mechanism. The NRC inspectors observed performance of the test and noted that the circulator hardware was leaking purified helium. The circulator was subsequently removed from the reactor.

The NRC inspectors also monitored the Technical Specification surveillance logs to assure that Technical Specification required surveillances were current.

No violations or deviations were identified in this program area.

7. Radiological Protection (71709)

The NRC inspectors verified that required area surveys of exposure rates were made and posted at entrances to radiation areas and in other appropriate areas. The NRC resident inspectors observed health physics professionals on duty on all shifts including backshifts. The NRC inspectors observed the health physics technicians checking area radiation monitors, air samplers, and doing area surveys for radioactive contamination.

The NRC inspectors observed that when workers are required to enter areas where radiation exposure is possible or contamination exists, the health physics technicians are present and available to provide assistance.

During this inspection period, the NRC inspectors had several opportunities to observe workers in contaminated or potentially contaminated areas. In all cases health physics technicians were present providing assistance to workers. The NRC inspectors observed that plant workers paid close attention to and heeded directions and suggestions from the health physics technicians.

No violations or deviations were identified in the review of this program area.

8. Monthly Security Observation (71881)

The NRC inspectors verified that there was a lead security officer (LSO) on duty as authorized by the facility security plan, to direct security

activities on site for each shift. The LSO did not have duties assigned that would interfere with the direction of security activities.

The NRC inspectors verified, randomly and on the backshift, that the minimum number of armed guards required by the facility's security plan were present. Search equipment, including the X-ray machine, metal detector, and explosive detector, were operational or a 100 percent hands-on search was being utilized.

The protected area barrier was surveyed by the NRC inspectors. The barrier was properly maintained and was not compromised by erosion; openings in the fence fabric or walls; or proximity of vehicles, crates, or other objects that could be used to scale the barrier. The NRC inspectors observed that the vital area barriers were well maintained and not compromised by obvious breaches or weaknesses. The NRC inspectors observed that persons granted access to the site are badged indicating whether they had unescorted or escorted access authorization.

No violations or deviations were identified in the review of this program area.

9. Exit Meeting (3070j)

An exit meeting was conducted on August 9, 1988, attended by those identified in paragraph 1. At this time, the NRC inspectors reviewed the scope and findings of the inspection.