UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2900
ATLANTA, GEORGIA 30323-0199

Report Nos.: 50-327/95-27 and 50-328/95-27

Licensee: Tennessee Valley Authority
6N 38A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Docket Nos.: 50-327 and 50-328 License Nos.: DPR-77 and DPR-79

Facility Name: Sequoyah Units 1 and 2

Inspection Conducted: December 11 - December 16, 1995, January 8, 1996

Inspector: S. E. Sparks 1/17/96
S. E. Sparks, Project Engineer Date Signed

Approved by: 1/17/96
Mark S. Lesser, Chief Date Signed
Reactor Projects Branch 6
Division of Reactor Projects

SUMMARY

Scope:

This special inspection was conducted to review the circumstances regarding an issue which occurred on December 9-10, associated with increasing leakage on the Unit 2, #2 Reactor Coolant Pump (RCP), #1 seal leakoff flow.

Results:

In the area of Operations, one violation was identified, associated with failure to follow Abnormal Operating Procedure (AOP) AOP-R.04 regarding increasing #1 seal flow on the Unit 2, #2 RCP. The inspector concluded that once initial indication of a #1 seal leakage greater than or equal to 5 gpm was received, the licensee did not demonstrate appropriate urgency necessary to conduct a complete technical review of the issue, and make a timely revision to AOP-R.04, Rev. 1, prior to exceeding the time at which a normal plant shutdown should have been completed.

Enclosure 2

In the area of Engineering, the inspector concluded that the licensee did not take appropriate actions, prior to the event, to develop contingency plans, pursue alternative vendor direction to address a specific RCP seal performance condition, and/or make appropriate procedural revisions, to preclude this issue.

REPORT DETAILS

1. **PERSONS CONTACTED**

Licensee Employees

R. Adney, Site Vice President
R. Alsup, QA Supervisor
*J. Baumstark, Plant Manager
*M. Burzynski, Engineering and Materials Manager
*M. Cooper, Components Engineering Supervisor
*D. Chapman, Technical Support Supervisor
*R. Driscoll, Nuclear Assurance and Licensing Manager
*G. Enterline, Operations Manager
*F. Fink, Business and Work Performance Manager
*T. Flippo, Site Support Manager
M. Lorek, Design Engineering
*K. Meade, Compliance Manager
*L. Poage, Site Quality Assurance Manager
J. Reynolds, Acting Operations Superintendent
F. Roddy, Assistant Shift Operations Supervisor
G. Sanders, Shift Operations Supervisor
*R. Shell, Site Licensing Manager
H. Tirey, Shift Operations Supervisor
T. Van Huis, Assistant Shift Operations Supervisor
K. Wilkes, Shift Operations Supervisor

NRC Employees

*W. Holland, Senior Resident Inspector
*R. Starkey, Resident Inspector

* Attended exit interview.

Other licensee employees contacted included shift operation supervisors, shift technical advisors, plant operators, and other plant personnel.

2. **EVENT REVIEW** (71707, 37551, 92901, and 92903)

EVENT SUMMARY

The inspector reviewed the circumstances regarding an issue which occurred on December 9-10, associated with the Unit 2, #2 RCP, #1 seal high leakoff flow. The issue occurred with Unit 2 at 100 percent power, and involved increasing #1 seal leakoff flow after Unit 2 operators added primary water to the RCS. Seal leakoff for all four RCPs began to increase, however, all but #2 RCP seal leakoff returned to normal. Seal leakoff continued to increase, causing operators to enter AOP-R.04, REACTOR COOLANT PUMP MALFUNCTIONS, Rev. 1. Seal leakage continued to

increase above a threshold which would require a plant shutdown within 8 hours as directed by the AOP. However, licensee technical support, engineering, and vendor review of the issue resulted in a recommendation for a procedure change to AOP-R.04, Rev. 1. An approved procedure was placed in the MCR after the expiration of the 8 hour shutdown required by procedure. The following is a sequence of events, based on interviews with control room operators, licensee technical support and engineering personnel, control room logs, Quality Assurance (QA) personnel, and other inspectors.

SEQUENCE OF EVENTS

December 9:

~9:00 p.m. Primary water added to the Unit 2 Reactor Coolant System (RCS) via the alternate dilute flowpath, which caused changes in the seal leakoff flowrates for all 4 RCPs. All returned to normal except #2 RCP.

9:34 p.m. Unit 2, #2 RCP, #1 seal leakoff high flow alarm was received. The alarm setpoint is 4.8 gpm, while the Main Control Room (MCR) recorder indicated the flow as 4.9 gpm. At that time, AOP-R.04, REACTOR COOLANT PUMP MALFUNCTIONS, Rev. 1, was reviewed, which requires no action until leakoff flow is greater than or equal to 5 gpm. The Assistant Shift Operations Supervisor (ASOS) requested the Reactor Operator (RO) to closely monitor leakage and other temperatures.

11:27 p.m. The SOS contacted plant technical personnel and Westinghouse for recommendations to reduced seal leakage flow, which included cycling the No. 2 RCP lift oil pump, and slightly increasing the Volume Control Tank (VCT) outlet temperature. These actions were taken.

December 10:

2:30 a.m. #2 RCP, #1 seal leakoff is noted in control room logs to be at 5 gpm. The MCR operators enter the Response Not Obtained (RNO) section of AOP-R.04, Rev. 1, step 2.2.2, which requires the following to be performed within 8 hours: (a) Perform normal plant shutdown using appropriate plant procedure, (b) contact Technical Support and Westinghouse for operating recommendations while continuing with this procedure, (c) when reactor power is less than 10%, go to Section 2.1, RCP Tripped or Shutdown Required. The Shift Operations Supervisor (SOS) contacted technical personnel and Westinghouse personnel at this time, where a recommendation was made to not shut down, but to perform a bucket test to verify the seal leakoff flow. Discussion centered around Westinghouse Technical Bulletin NSD-TB-93-01-RO, dated 3/30/93, associated with revised procedures for RCP shutdown with #1 seal leakage outside operating limits. The Westinghouse Technical Bulletin recommends that with #1 seal leakoff indication greater than 6 gpm, total seal flow greater than 6 gpm and less than 8 gpm, and pump bearing/seal inlet and/or #1 leakoff temperatures

stable, perform an orderly RCP shutdown within 8 hours. The Westinghouse Technical Bulletin also recommends that with total #1 seal flow greater than 8 gpm, perform an immediate RCP shutdown (within 5 minutes), and with the above temperatures increasing and total #1 sealflow greater than 6 gpm, perform an immediate RCP shutdown (within 5 minutes). However, as discussed later, part of this information was miscommunicated to the onshift SOS.

The SOS is made aware by technical personnel and a vendor representative of the parameters to monitor to identify further #2 RCP, #1 seal degradation.

5:55 a.m. Results of the bucket test indicate the #2 RCP, #1 seal leakoff flow is 5.7 gpm.

7:25 a.m. SOS notes a conference call with the Site Vice President, Operations Manager (who is the acting Plant Manager), Operations Superintendent, Maintenance Manager, and others, to discuss actions. The decision was made to revise AOP-R.04, Rev. 1, to reflect the Westinghouse Technical Bulletin. The revision of AOP-R.04 was planned such that monitoring would occur until seal leakoff flow was greater than 6 gpm. At a seal leakoff rate greater than 6 gpm and less than 8 gpm, the performance of a normal shutdown within 8 hours would be required.

~8:39 a.m. After receiving a copy of the Westinghouse Technical Bulletin in the MCR, the SOS noted that his original understanding (from the 2:30 am discussions) is different that actually stated in the Bulletin. The SOS originally understood the letter to indicate that the plant can run indefinitely with seal flow between 6-8 gpm, as long as other parameters were stable. The Westinghouse letter actually states that if the RCP seal leakoff is between 6-8 gpm, the plant has an additional 8 hours to shut down the plant, provided no other parameters indicate a problem.

~9:00 a.m. Additional discussions were held to more comprehensively revise the AOP, consistent with the latest vendor guidance and additional plant specific information, and the possibility of continued increases in #1 seal leakoff rate. These discussions involved Operations, Component Engineering, Technical Support, vendor personnel, and others.

10:00 a.m. The control room strip chart 2-FR-62-24 indicates that #2 RCP, #1 seal leakoff flow exceeds 6 gpm. The scale for this recorder is 0-6 gpm, thus, flows greater than 6 gpm would be offscale.

10:30 a.m. The licensee fails to adhere to the requirements specified in AOP-R.04, Rev. 1, Section 2.2.2, RNO action (a), which requires the performance of a normal plant shutdown within 8 hours (if #1 seal leakoff flow is greater than or equal to 5 gpm).

11:00 a.m. The SOS logs that he was informed by the Operations Superintendent

that AOP-R.04 is being revised to reflect the guidelines of the Westinghouse Technical Bulletin which say with a #1 seal leakoff at greater than or equal to 6 gpm, within 8 hours have the pump off. The log also notes problems with the computer system used to revise this procedure, so the procedure revision will be handwritten. According to licensee personnel, these computer problems occurred approximately 8:30 am.

11:05 a.m. A bucket test was performed, however, problems were encountered due to a failed pressure indicator.

12:00 p.m. An ultrasonic flow meter, installed earlier in the morning, indicates a seal leakoff of 6.9 gpm. The completion of the bucket test indicates a flow of 6.54 gpm. The SOS log notes that during the bucket test, the Unit 2 #2 RCP, #1 seal leakoff flow recorder 2-FR-62-24 failed (it had been offscale prior to this time).

~12:00 p.m. The MCR staff receives written recommendations from technical personnel regarding #1 seal leakage, outlining actions to be performed should seal return flow start to increase.

2:50 p.m. Seal leakoff via a bucket test was measured to be approximately 6.25 gpm, with an ultrasonic measurement of 6.94 gpm.

~3:00 p.m. The oncoming SOS briefs the operations crew on the changes to AOP-R.04. A marked up copy of the AOP was in the MCR, and had been used prior to that time as part of the validation process with assistance of MCR operators. However, during the briefing, the SOS finds that a revised AOP was not in the MCR as was his understanding. An NRC inspector question the ASOS and SOS regarding which approved AOP Unit 2 is currently in.

~4:00 p.m. Revision 2 to AOP-R.04 is approved, and is handcarried to the MCR. At this time, the Unit 2 crew is briefed on the details of the revised AOP-R.04.

4:30 p.m. Shift Orders arrive in the MCR. The shift orders direct that if #1 seal flow starts trending up, then take various actions recommended by Engineering.

Discussions with plant management indicated that they considered AOP-R.04, Rev. 1, to be revised prior to 10:30 am such that a normal plant shutdown would be performed within 8 hours when #1 seal leakoff flow was greater than 6 gpm (instead of 5 gpm, as was indicated in Revision 1 to AOP-R.04). According to the control room strip chart recorder, #1 seal leakoff flow exceeded 6 gpm at approximately 10:00 am. The licensee stated this position was based on a complete discussion with Engineering and Technical Support personnel, the vendor, licensee management, and all individuals who would normally be involved in an "intent" change to that specific AOP.

Based on a review of the above information, the inspector concluded that

a violation of Technical Specification (TS) 6.8.1.a occurred regarding the failure to follow the requirements of an existing, approved procedure, AOP-R.04, Rev. 1. This is identified as violation 50-328/95-27-01, Failure to Follow AOP-R.04 Requiring an 8 Hour Shutdown.

In addition, the inspector reviewed the issue to determine if it met the requirements for a 1-hour non-emergency events report as required by 10 CFR 50.72 (b)(1)(ii)(C). This requires a 1-hour report for any event or condition during operation that results in the nuclear power plant being in a condition not covered by the plant's operating and emergency procedures. The inspector held discussions with Region II management and personnel from the Office of Analysis and Evaluation of Operational Data (AEOD), and concluded that this issue was not reportable.

Subsequent to the event, the licensee initiated a Problem Evaluation Report (PER) based on discussions between the Operations staff and QA, to document the condition. This level C PER was first discussed at a Management Review Committee (MRC) meeting on December 13, and upgraded on December 15 as a level B PER. In addition, a level A PER SQ952228PER was initiated December 10 due to the increased #1 seal leakage on all RCPs after the addition of primary water to the RCS.

The inspector also concluded that operators were provided adequate verbal guidance, prior to exceeding the 8 hour shutdown requirement per procedure, regarding the upper bounds of various parameters at which action would need to be taken prior to significant degradation of the Unit 2, #2 RCP, #1 seal. However, once initial indication of a #1 seal leakage greater than 5 gpm was received, the licensee did not demonstrate appropriate urgency necessary to conduct a complete technical review of the issue, and make a timely revision to AOP-R.04, Rev. 1, prior to exceeding the time at which a normal plant shutdown should have been completed.

The inspector learned via discussions with licensee personnel that prior to the event, the #2 RCP, #1 seal return flow had been measured to be slightly below 4.8 gpm. The seal return flow had been gradually increasing since August 1995, from 3.5 gpm to slightly below the alarm setpoint of 4.8 gpm. Also, the inspector observed that the licensee issued Revision 0 to AOP-R.04, which became effective September 2, 1995. The AOP was revised to include the two-column format. Westinghouse Technical Bulletin NSD-TB-93-01-R0, REVISED PROCEDURES FOR RCP SHUTDOWN WITH NO. 1 SEAL LEAKAGE OUTSIDE OPERATING LIMITS, dated March 30, 1993, provides procedures relative to RCP emergency operation and shutdown for high or low #1 seal leakage. Revision 2 to AOP-R.04, issued as a result of this abnormal condition, allows for the implementation of alternative Technical Support and Westinghouse direction to address specific RCP seal performance conditions, which the licensee decided to develop as a result of this issue, and was implemented. Based on this information, the inspector concluded that the licensee did not take appropriate actions, prior to this abnormal condition, to develop contingency plans, pursue alternative vendor direction to address a specific RCP seal performance condition, and/or make appropriate procedural revisions, to

preclude this issue.

3. EXIT INTERVIEW

The inspection scope and results were summarized on January 8, 1996, with those individuals identified by an asterisk in paragraph 1 above. The inspectors described the areas inspected and discussed in detail the inspection findings listed below. Proprietary information is not contained in this report. Dissenting comments were not received from the licensee.

Item Number	Status	Description and Reference
VIO 328/95-27-01	OPEN	Failure to Follow AOP-R.04 Requiring an 8 Hour Shutdown.

Strengths and weaknesses summarized in the results paragraph were discussed in detail.