TU ELECTRIC

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U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES) - UNIT 2
DOCKET NO. 50-446
AUXILIARY FEEDWATER SYSTEM CHECK VALVES
SDAR CP-89-015 (SUPPLEMENTAL REPORT FOR UNIT 2)

Gentlemen:

On November 30, 1992, TU Electric provided a Final Report for SDAR CP-89-015 which discussed the corrective actions regarding Unit 2 check valves supplied by BW/IP. These actions and other corrective actions were reviewed by NRC during an inspection performed from November 30 through December 7, 1992. During the exit meeting the NRC stated that SDAR CP-89-015 would remain open pending completion of a root cause analysis and implementation of corrective actions for two BW/IP check valves that failed testing on December 1, 1992.

This letter provides the requested analysis and identifies the completed corrective actions. A complete evaluation of these deficiencies was documented in CPSES Engineering Report, ER-ME-078, which is available on site for your inspectors review.

Background

On December 1, 1992, check valves 2CC-0693 and 2CC-0697 did not fully close during preoperational testing. In addition, a retest of valve 2CC-0693 on January 6, 1993 failed after the valve had been reworked. The failure mode during the retest was different than that discovered for this valve on December 1, 1992. These valves are in the Component Cooling Water return lines from the Reactor Coolant Pump Motor Coolers and are four-inch, ANSI Class 150, ASME III, Class 3 bolted bonnet swing check valves.

Root Cause Analysis and Corrective Actions

2CC-0693 - Based on testing results, radiography, physical observations and dimensional checks, it is believed that this valve failed to close on December 1, 1992, due to interaction of the valve disk with internal valve body obstructions as described below.

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The valve exhibited reduced disk-to-body clearances along the disk swing path due to two sets of protrusions located below the body neck on the sides of the body cavity and on the ceiling of the waterway just downstream of the neck. These protrusions were caused by inadequate machining by the vendor. During valve opening, the disk apparently passed the protrusions by gimballing slightly toward the hinge pin when moving upward into the neck. When the valve began to close, flow induced movement and interaction with the protusions caused the disk to gimbal away from the hinge pin. This gimballing placed the edge of the disk face in contact with one or more of the protusions due to the downward pull on the center of the disk-swing arm linkage from the weight of the assembly. This exerted a wedging action between the protusions and the hinge pin which lodged the disk swing-arm assembly in the valve neck.

On January 6, 1993, following removal of excessive protrusions, 2CC-0693 was retested and failed to close. The valve failed to close due to a gimbal range which allowed the disk lip to approach the valve seat at an elevation and angle which resulted in the disk lodging under the seat lip. The measured axial gap for this valve was within the BW/IP specified tolerance but relatively high, compared to other four inch valves, which effects the range of gimballing on the swing arm. The valve was determined to have consistently opened each time forward flow was established. When the valve was subsequently isolated and allowed to close, the disk repeatedly returned to the same lodged position under the seat lip.

The valve was reworked to reduce axial gap and limit the gimbal range. The valve retested satisfactorily.

2CC-0697 - Using techniques similar to those described above, TU Electric determined the disk of this valve was lodged beneath the upper portion of the seat preventing full valve closure. The disk face was found to have a slightly reduced radius which created a "step" on the outer edge of the disk face. When the valve was moved in the closed direction, the step in the disk caught under the upper seat lip. Similar to the second 2CC-0693 failure, 2CC-0697 consistently opened during forward flow and repeatedly returned to a lodged open (under the seat lip) position after the valve was isolated and allowed to close. This failure mode was subsequently verified by manually exercising the valve several times and the cause was confirmed by temporarily replacing the internals of this valve with those of another valve which did not have the "step". When the other internals were used the disk closed properly.

The valve was reworked to replace the disk and minor internal body protrusions were removed. As part of disk replacement, the axial gap was also reduced. The valve retested satisfactorily. As an additional measure, spare valve disks in the warehouse were checked. None contained the step feature described above.

Generic Implications

In both cases of disks lodging under the valve seat, the failure to fully close was consistent and repeatable. Therefore it was concluded that this failure mode was not random or occasional in nature. Valves which have previously functioned properly should not be susceptible to lodging in this manner. Additionally, BWIP check valves are being subjected to initial closure verification testing and will be tested, where appropriate, in accordance with site post work test guidelines and inservice testing requirements. This testing is designed to confirm proper check valve function. Proper functioning of BWIP check valves is further assured by evaluation of acoustic monitoring results. Acoustic baseline signatures have been established for twenty-three BWIP check valves representing a cross-section of the total population. The monitoring program will continue to establish acoustic baselines for selected valves and if additional internal interactions are identified, they will be appropriately investigated and corrected.

The testing and monitoring programs, along with a previously enhanced maintenance procedure provide assurance that check valves operate properly. CPSES will revise the applicable maintenance procedure to add a new step to inspect the valve disk for the "step" to insure that if others are found, their effect on valve operation will be addressed and/or the disk will be replaced. In addition, the existing procedural requirement to inspect for internal obstructions which interfere with free disk travel will be strengthened.

BW/IP has been advised of these test failures, root causes and corrective actions.

Sincerely,

William J. Cahill, Jr.

TLH/ds

c - Mr. J. L. Milhoan, Region IV
Resident Inspectors, CPSES (2)
Mr. B. E. Holian, NRR