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MAR 15 1990

U.S. Nuclear Regulatory Commission
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Gentlemen:

In the Matter of	)	Docket Nos. 50-327
Tennessee Valley Authority	)	50-328

SEQUOYAH NUCLEAR PLANT (SQN) - REVISED RESPONSE TO NRC BULLETIN 88-04 - POTENTIAL SAFETY-RELATED PUMP LOSS

References: 1. TVA letter to NRC dated August 2, 1988, "Sequoyah Nuclear Plant (SQN) - NRC Bulletin (NRCB) 88-04, 'Potential Safety-Related Pump Loss'"

2. TVA letter to NRC dated December 22, 1989, "Tennessee Valley Authority - Sequoyah Nuclear Plant Unit 1 - Docket No. 50-327 - Facility Operating License DPR-77 - Licensee Event Report (LER) 50-327/89031"

The subject bulletin requested licensees to investigate and correct, as applicable, two miniflow design concerns. The two concerns are (1) potential for deadheading or adverse pump-to-pump interaction during miniflow operation and (2) adequacy of installed miniflow capacity for a single pump in operation.

The purpose of the letter is to provide TVA's revised response to the subject bulletin for SQN. Recent events (Reference 2) have shown that the corrective actions identified for the residual heat removal (RHR) pumps in the original assessment (Reference 1) were not adequate to detect the onset of pump-to-pump interaction.

The original corrective action (short- and long-term) for the RHR pumps was to evaluate, during each refueling outage, the pump differential pressure data obtained during the quarterly Section XI pump tests. This evaluation averaged the data for each pump and compared the average differential pressure between the two pumps against an acceptance value of 8 pounds per square inch differential (psid) (the actual calculated allowable value is 11.1 psid). As documented in Reference 2, the frequency of evaluating the pump differential pressures (every refueling outage) was not adequate since the averaging technique did not address real-time cases where the 11.1 psid criteria were not met. Actual plant testing showed the pressure differential was greater than 11.1 psid during plant power operation, and subsequent running of both RHR pumps on miniflow proved that deadheading of one of the pumps would occur.

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Enclosure 1 contains TVA's revised response that outlines new short- and long-term actions that will be taken for SQN's RHR pumps.

In addition, TVA's original corrective actions regarding SQN's motor-driven auxiliary feedwater pumps have been revised to include (1) additional information describing the intermittent operation of these pumps, (2) a description of SQN's full-flow test program, and (3) a commitment for installing additional miniflow capacity during the Cycle 5 refueling outage for each unit.

The adequacy of the miniflow lines for SQN's other safety-related pumps has been confirmed.

The commitments associated with this submittal are stated in Enclosure 2.

Please direct questions concerning this issue to Don V. Goodin at (615) 843-7734.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

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ENCLOSURE 1

Tennessee Valley Authority (TVA) has reevaluated Sequoyah Nuclear Plant's (SQN's) initial response to NRC Bulletin 88-04 (reference Enclosure 1 of TVA's letter to NRC dated August 2, 1988, "Sequoyah Nuclear Plant (SQN) - NRC Bulletin (NRCB) 88-04, 'Potential Safety-Related Pump Loss'"). As a result of this reevaluation, TVA's response for SQN's residual heat removal (RHR) and motor-driven auxiliary feedwater (MDAFW) pumps has been revised. TVA's original response for SQN's other safety-related pumps was confirmed and remains unchanged.

TVA REVISED RESPONSE

4. (a) Summarize the Problems and Systems Affected

RHR Pumps

SQN's two parallel RHR pumps are required to operate at miniflow conditions during a small-break loss of coolant accident (LOCA) or main steamline/main feedwater line break event. Because the discharge headers for the RHR pumps are connected by an open crosstie, there is a potential for pump-to-pump interaction resulting in the weaker of the two pumps deadheading because of pump head differences. Analysis and recent events (Licensee Event Report [LER] 50-327/89031) confirmed deadheading of a weaker pump for Unit 1 when both pumps operate on miniflow.

MDAFW Pumps

SQN's MDAFW pumps do not have a pump-to-pump interaction problem; however, the miniflow lines are not sized for continued long-term operation on miniflow. The pump manufacturer recommends a continuous flow through the pump of 165 gallons per minute (gpm). The MDAFW pumps are used for unit start-up to 5 percent power. During these start-up evolutions, the pumps are operated for relatively long periods of time at flows less than 165 gpm.

4. (b) Short-Term and Long-Term Corrective Actions

RHR Pumps

Short-term - As a result of recent events that confirmed that pump-to-pump interaction would occur if both RHR pumps were operated in parallel on miniflow, SQN has implemented the following short-term corrective actions.

1. TVA has revised SQN Emergency Instruction E-0, "Reactor Trip or Safety Injection (Revision 8)," to check if one RHR pump should be stopped following a safety injection (SI) signal, which automatically starts both RHR pumps. This revision requires one pump to be placed in standby if RCS pressure is greater than 180 pounds per square inch gauge (psig) (both pumps operating on

miniflow following the SI signal) and adds a precautionary statement that requires the operator to restart the pump placed in standby if the operating pump trips. A caution statement also requires operator action to ensure that the RHR pumps are manually started if (1) RCS pressure decreases below 180 psig and (2) offsite power is lost following an SI reset. These procedure changes ensure that extended operation in the deadheaded condition does not occur, thereby precluding pump damage.

2. TVA has revised SQN System Operating Instruction (SOI) 74.1, "Residual Heat Removal System" to ensure the RHR pumps do not operate in parallel while on miniflow for greater than 10 minutes.

Long-Term - TVA will install check valves in SQN's RHR pump discharge piping (downstream of the miniflow line) to preclude the possibility for pump-to-pump interaction. This will alleviate the need for one of the pumps to be stopped, as currently required in SQN's Emergency Instruction E-0 (Item 1 above). Following the installation of check valves in SQN's RHR system, Instructions E-0 and SOI-74.1 will be revised to remove the interim measures currently used to prevent extended pump operation in the deadheaded condition.

MDAFW Pumps

TVA's review of its initial response to NRC Bulletin 88-04, regarding SQN's MDAFW pumps, identified the need for a clearer description of the intermittent operation of these pumps.

During start-up to 5 percent power operation, SQN's MDAFW pumps are used to maintain water level in the steam generators. The MDAFW pumps operate on miniflow (25 gpm) until makeup to the steam generators is required. During the time that makeup is required, the flow through the pump is allowed to increase to 175 gpm until adequate steam generator levels are achieved. Once steam generator level has been achieved, the makeup flow is terminated, and the pump returns to the miniflow condition. Continuous operation of these pumps is necessary to support the start-up operation. The intermittent changes in flow through the pump cannot be eliminated because of the limitations on pump motor starts. Extended operation at 25 gpm is not desirable.

Short-Term - TVA had previously implemented a program to periodically test SQN's MDAFW pumps under full-flow conditions. This ongoing test program began during the Unit 2 Cycle 3 refueling outage and was designed to detect and trend any pump degradation. This testing is in addition to the quarterly American Society of Mechanical Engineers (ASME) Section XI miniflow tests for pump operability.

Long-Term - TVA has conducted a design study to evaluate the addition of a bypass line in parallel with the miniflow recirculation piping that would allow SQN's MDAFW pumps to operate at a higher flow rate during low steam generator flow conditions. As a result of this

evaluation, TVA has included as a commitment under Item 4(c) below a modification to install additional miniflow capacity during the Cycle 5 refueling outage for each unit.

4. (c) Schedule for Long-Term Resolution

RHR Pumps

TVA will install check valves in the RHR discharge piping downstream of the miniflow lines. Installation will be complete prior to start-up from the Cycle 5 refueling outage for each unit.

MDAFW Pumps

TVA will install additional miniflow capacity for SQN's MDAFW pumps. Installation will be complete prior to start-up from the Cycle 5 refueling outage for each unit.

4. (d) Justification for Continued Operation

RHR Pumps

A TVA calculation (SQN-74-D053 HCG-ML-071988) shows that the RHR pumps will operate for approximately 11 minutes at a deadhead condition before pump damage will occur. Step 15 of Emergency Instruction E-0 was revised to check if one RHR pump should be stopped following a safety injection signal. This ensures that the pumps will not run in parallel longer than 11 minutes after an SI initiates start of both pumps. This step in the procedure will be performed well before the 11 minutes. Also the SOI-74.1 has been revised to ensure that the RHR pumps are not run in parallel on miniflow for greater than 10 minutes.

MDAFW Pumps

Performance of the ASME Section XI tests indicates that these pumps can continue to meet design requirements.

TVA recently replaced the rotating elements on SQN's Unit 2 MDAFW pumps. The 2A A element was replaced in January 1988 during SQN's extended shutdown. The 2B-B element was replaced during the Unit 2 Cycle 3 refueling outage (between January and April 1989). In addition, full-flow testing of both Unit 2 MDAFW pumps was performed during start-up from the Unit 2 Cycle 3 refueling outage. This full-flow surveillance test showed that the pumps' performance exceeded the design requirements.

During the upcoming Unit 1 Cycle 4 refueling outage (currently projected to begin March 15, 1990), TVA will disassemble and inspect SQN's 1A-A MDAFW pump for damage and degradation. As part of SQN's

ongoing full-flow test program, TVA will conduct full-flow testing of the Unit 1 MDAFW pumps to ensure these pumps meet or exceed their design requirements. This testing will be completed during start-up from the Unit 1 Cycle 4 refueling outage. The above actions provide added assurance for the safe operation of SQN's AFW pumps.

ENCLOSURE 2

TVA Commitments

1. TVA will install check valves in Sequoyah Nuclear Plant's (SQN's) residual heat removal (RHR) discharge piping downstream of the miniflow lines. Installation will be complete no later than start-up from the Cycle 5 refueling outage for each unit.

2. Following the installation of check valves in SQN's RHR system, SQN Emergency Instruction E-0 and SQN System Operating Instruction (SOI) 74.1 will be revised to remove the short-term interim measures currently used to prevent pump-to-pump interactions. This revision will be complete prior to start-up from the Cycle 5 refueling outage for each unit.

3. TVA will install additional miniflow capacity for SQN's motor-driven auxiliary feedwater (MDAFW) pumps. Installation will be complete prior to start-up from the Cycle 5 refueling outage for each unit.

4. TVA will disassemble and inspect SQN's 1A-A MDAFW pump internals for damage and degradation. This inspection will be completed prior to start-up from the Unit 1 Cycle 4 refueling outage.

5. TVA will conduct full-flow testing of SQN's Unit 1 MDAFW pumps to ensure these pumps meet or exceed their design requirements. This testing will be completed during start-up from the Unit 1 Cycle 4 refueling outage.