



1101 Market Street, Chattanooga, Tennessee 37402

CNL-22-081

July 21, 2022

10 CFR 50.55a

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Sequoyah Nuclear Plant, Unit 1
Renewed Facility Operating License No. DPR-77
NRC Docket No. 50-327

Subject: **Supplement to Sequoyah Nuclear Plant, Unit 1, American Society of Mechanical Engineers Operation and Maintenance Code, Request for Alternative RP-12 (EPID L-2022-LLR-0055)**

Reference: TVA Letter to NRC, CNL-22-079, "Sequoyah Nuclear Plant (SQN), Unit 1, American Society of Mechanical Engineers Operation and Maintenance Code, Request for Alternative RP-12," dated July 20, 2022 (ML22201A556)

In the referenced letter, Tennessee Valley Authority (TVA) submitted a request for alternative to the inservice testing requirements of the American Society of Mechanical Engineers (ASME) Operation and Maintenance (OM) Code, Section ISTB-3310, "Effect of Pump Replacement, Repair, and Maintenance on Reference Values." The alternative request (RP-12) applied to testing of the centrifugal charging pump (CCP) 1B-B for the Sequoyah Nuclear Plant (SQN), Unit 1.

TVA is supplementing the referenced letter to provide the following information as provided in the enclosure to this letter.

- Additional Information on the 1B-B CCP degradation
- Description of the baker testing of the motor
- The relative life or health of the 1A-A CCP

There are no new regulatory commitments contained in this letter. Please address any questions regarding this submittal to slymer@tva.gov.

Respectfully,

Digitally signed by Rymer, Stuart
Loveridge
Date: 2022.07.21 15:32:38 -04'00'

Stuart L. Rymer
Director (Acting), Nuclear Regulatory Affairs

Enclosure

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Supplement to Sequoyah Nuclear Plant (SQN), Unit 1, American Society of Mechanical Engineers Operation and Maintenance Code, Request for Alternative RP-12

cc (with Enclosure):

NRC Regional Administrator - Region II
NRC Senior Resident Inspector - Sequoyah Nuclear Plant
NRC Project Manager - Sequoyah Nuclear Plant

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Supplement to Sequoyah Nuclear Plant (SQN), Unit 1, American Society of Mechanical Engineers Operation and Maintenance Code, Request for Alternative RP-12

Additional Information on the 1B-B Centrifugal Charging Pump Degradation

SQN experienced several shaft failures in the 1990s as a result of cyclic fatigue. To address this condition, the Centrifugal Charging Pump (CCP) shafts were replaced with custom material, better machining tolerances, and different rotating element locking mechanisms. This upgrade provided better resistance to cyclic fatigue, increasing the service life on the order of five to ten times the original material service life. SQN has not experienced a failure since these upgrades began in 1999 and completed in 2003. The 1B-B CCP rotating shaft was replaced in November 2001 with upgraded shaft material and flow elements. With this CCP component upgraded to custom age 625 (CA-625) alloy material, periodic shaft replacements were no longer required as they were previously.

Though the upgraded material provides more resistance to fatigue, it does not eliminate the failure mechanism. The 1B-B CCP had approximately 100,000 hours of runtime when degradation was identified. This is within the five to ten times service life span estimated. In comparison, 1A-A CCP has upgraded CA-625 shaft material and has approximately 11,000 hours of run time.

In alignment with industry operating experience and Westinghouse WCAPs, the direct cause of the 1B-B CCP degradation is most likely pump element wear associated with cyclic fatigue. Other potential causes have been refuted through the troubleshooting process and a support/refute matrix.

Transitioning from a time-based maintenance strategy to a condition-based maintenance strategy, after shaft upgrades, failed to ensure all failure mechanisms were addressed by condition monitoring and contributed to the degradation of the 1B-B CCP.

The 1B-B CCP work scope will involve the replacement of the pump element and associated parts for a standard refurbishment. This work requires uncoupling the pump shaft from the motor, removing the inboard and outboard bearings, removing the mechanical seals, and then pulling the rotating element out. For reassembly, a refurbished and modified rotating element will be installed that is made of the CA-625 alloy material. New inboard and outboard bearings will be installed, and the mechanical seals will be rebuilt. Prior to restoring the 1B-B CCP pump to operable status, an adverse condition monitoring plan will be in place in accordance with TVA procedures to monitor parameters such as vibration data, balance drum recirculation flow, and other parameters.

Description of the Baker Testing of the Motor

As noted in the referenced letter, troubleshooting was performed for the 1B-B CCP, which indicated a pump rotating element degradation. As part of this troubleshooting, a current signature analysis test (CSA - commonly known as 'Online Baker') was performed.

The baker test indicated that the recent event associated with the 1B-B CCP is not expected to have adversely affected the performance of the motor. The operating current of the motor reported at the time of the event is consistent with the values that were recorded during the baker test performed during the subsequent troubleshooting run. The data obtained during this test confirmed that the operating current of the motor was well below the nameplate rating and

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that the phases were well balanced. The winding temperatures recorded during the event were also well below the thermal rating of the motor's insulation system and consistent with the expected small increase in current. Because the motor's torque is directly related to the operating current and the operating current is expected to have remained below the nameplate rating, no rotor or shaft degradation is expected to have occurred during the event. There was no noticeable change in motor bearing temperatures during the event and were well below alert limits. In addition, the 1B-B CCP motor stator was recently rewound in 2019 before being installed during the SQN Unit 1 Cycle 24 (U1R24) refueling outage. Therefore, the motor is expected to have sufficient winding life margin.

The Relative Life or Health of the 1A-A CCP

The 1A-A CCP element was last replaced in U1R22 (2018). The current run time is approximately 11,000 hours. The average balance drum recirculation flow since the replacement is 25 gallons per minute (gpm). The last recorded value from quarterly surveillance was 24.2 gpm. Pump vibration, oil analysis, and performance trends have been reviewed and support reliable operation.

The 1A-A CCP motor was last refurbished in 2014. Electrical test results from insulation resistance, winding resistance, polarization index, and direct current (DC) step voltage testing have been favorable with no adverse conditions noted. Bearing and winding temperatures have been stable and below alert limits, as well as current signature analysis data collected from online baker testing. Vibration data trends have also been stable and well below alert limits. The performance and trend data monitored for the 1A-A CCP motor support it being in good health and the motor is expected to perform reliably.

Reference

TVA Letter to NRC, CNL-22-079, "Sequoyah Nuclear Plant (SQN), Unit 1, American Society of Mechanical Engineers Operation and Maintenance Code, Request for Alternative RP-12," dated July 20, 2022 (ML22201A556)