TENNESSEE VALLEY AUTHORITY

License Amendment Request

Application to Use Online Monitoring Methodology for the Sequoyah Nuclear Plant and Watts Bar Nuclear Plant

Open Session

October 16, 2024

Agenda

- Introduction
- Background
- License Amendment Request (LAR) Overview
- Technical Specification Changes
- Precedent
- Schedule Milestones
- Closing Remarks

Introduction

- The purpose of this meeting is to discuss a proposed license amendment request (LAR) for the Sequoyah Nuclear Plant (SQN), Units 1 and 2 and the Watts Bar Nuclear Plant (WBN) Units 1 and 2.
- Tennessee Valley Authority (TVA) proposes to use an online monitoring (OLM) methodology as the technical basis to switch from a time based surveillance frequency for channel calibrations to a condition based calibration frequency based on OLM results.
- The proposed license amendment revises SQN and WBN Technical Specification (TS) 1.1, “Use and Application Definitions” and adds new SQN 5.5.19 and new WBN TS 5.7.2.24 “Online Monitoring Program.”

Background

- OLM has been developed and validated for condition monitoring applications in a variety of process and power industries and used to optimize maintenance of transmitters used as sensor input to control and protection systems.
- OLM consists of collecting transmitter data throughout an operating cycle (including startup, shutdown, or other process cycles), analysis of data to detect transmitter drift or degradation in dynamic performance, and identification of transmitters that warrant a calibration check.
- OLM methodology has been used for more than twenty years at the Sizewell B nuclear power plant.

Background (cont.)

OLM is a proven methodology based on:

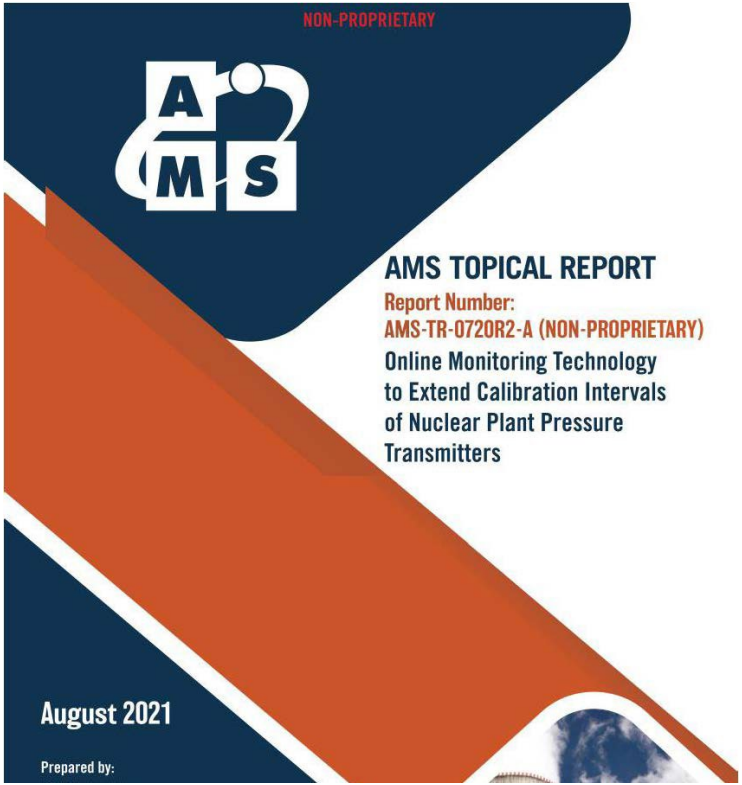
- Experience with OLM implementation in nuclear facilities
- Comparison between OLM results and manual calibrations
- Assessment of transmitter failure modes that can be detected by OLM
- Alignment with industry standards and guidelines

Background (cont.)

- In their Safety Evaluation (ML20231A208) the Nuclear Regulatory Commission (NRC) determined that the Analysis and Measurement Services Corporation (AMS) OLM methodology outlined can be used to provide reasonable assurance that required TS instrument calibration requirements for transmitters will be maintained because it:
  - Is effective at identifying instrument calibration drift during plant operation
  - Provides an acceptable means of identifying when manual transmitter calibration using traditional calibration methods are needed
  - Will maintain an acceptable level of performance that is traceable to calibration prime standards

License Amendment Request (LAR) Overview

- NRC approved AMS Topical Report AMS-TR- 0720R2-A, “Online Monitoring Technology to Extend Calibration Intervals of Nuclear Plant Pressure Transmitters” in August 2021:
- This TR was approved for use by licensees to support plant-specific technical specification changes to:
  - Switch from time-based calibration frequency of pressure, level, and flow transmitters to a condition-based calibration frequency based on OLM results; and
  - Assess dynamic failure modes of pressure sensing systems using the noise analysis technique



TVA TENNESSEE VALLEY AUTHORITY

LAR Overview (cont.)

- TVA is developing the OLM implementation process in accordance with OLM implementation methodology described in AMS-TR-0720R2-A for:
  - SQN Units 1 and 2
  - WBN Units 1 and 2

LAR Overview – OLM Technical Evaluations

OLM Implementation Process Development

- Implementation of the OLM program for SQN and WBN follows the steps identified in AMS-TR-0720R2-A Section 11.1.1.
- Steps 1-6 identify transmitters in the OLM program and determine how to obtain OLM data.
  - AMS Report SYA2307R0, "OLM Amenable Transmitters Report for Sequoyah Units 1 and 2.
  - AMS Report WBR2302R0, "OLM Amenable Transmitters Report for Watts Bar Units 1 and 2”

LAR Overview – OLM Technical Evaluations (cont.)

OLM Implementation Process Development (cont.)

- Steps 7-8 address calculation of OLM limits and establish methods of OLM data analysis.
  - AMS Report SYA2308R0, "OLM Analysis Methods and Limits Report for Report for Sequoyah Units 1 and 2."
  - AMS Report WBR2303R0, "OLM Analysis Methods and Limits Report for Watts Bar Units 1 and 2."

LAR Overview – OLM Technical Evaluations (cont.)

OLM Program Implementation

- Implementation of the OLM program for TVA follows AMS-TR-0720R2-A Section 11.1.2.
  - A mapping AMS-TR-0720R2-A Section 11.1.2 and LAR sections where items are addressed is provided
  - Implementation of these steps is performed using AMS software programs
  - AMS Report SYA2309R0, "OLM Drift Monitoring Program Report for Sequoyah Units 1 and 2."
  - AMS Report WBR2304R0, "OLM Drift Monitoring Program Report for for Watts Bar Units 1 and 2."

LAR Overview – OLM Technical Evaluations (cont.)

OLM Noise Analysis Implementation

- Implementation of the OLM program for TVA follows AMS-TR-0720R2-A Section 11.3.3.
  - A mapping AMS-TR-0720R2-A Section 11.3.3 and LAR sections where items are addressed is provided
  - Implementation of these steps is performed using the qualified noise data acquisition equipment and software programs developed by AMS
  - AMS Report SYA2310R0, "OLM Noise Analysis Program Report for Sequoyah Units 1 and 2."
  - AMS Report WBR2305R0, "OLM Noise Analysis Program Report for Watts Bar Units 1 and 2."

LAR Overview – OLM Technical Evaluations (cont.)

- SYA2307R0 and WBR2302R0 address steps 1-6, from AMS-TR-0720R2-A Section 11.1.1 to establish amenable transmitters and data collection
- Step 1. Determine if Transmitters are Amenable to OLM
  - AMS-TR-0720R2-A Chapter 12 includes Table 12.4 that lists the nuclear grade transmitter models that are amenable to OLM. Any transmitter model that is not listed in this table should only be added to the OLM program if it can be shown by similarity analysis that its failure modes are the same as the listed transmitter models or otherwise detectable by OLM.

LAR Overview – OLM Technical Evaluations (cont.)

- Step 2. List Transmitters in Each Redundant Group
  - This step establishes how to group the transmitters and evaluates the redundancy of each group.
- Step 3. Determine if OLM Data Covers Applicable Setpoints
  - This step evaluates the OLM data for each group to determine if it covers applicable setpoints as described in AMS-TR-0720R2-A Chapter 14.
- Step 4. Calculate Backstops
  - A backstop, as described in AMS-TR-0720R2-A Chapter 13, must be established for each group of redundant transmitters amenable to OLM as a defense against common mode drift. The backstop identifies the maximum period between calibrations without calibrating at least one transmitter in a redundant group.

LAR Overview – OLM Technical Evaluations (cont.)

- Step 5. Establish Method of Data Acquisition
  - OLM data is normally available in the plant computer or an associated data historian. If data is not available from the plant computer or historian, a custom data acquisition system including hardware and software must be employed to acquire the data.
- Step 6. Specify Data Collection Duration and Sampling Rate
  - OLM data must be collected during startup, normal operation, and shutdown periods at the highest sampling rate by which the plant computer takes data. AMS-TR-0720R2-A Chapter 15 describes a process to determine the minimum sampling rate for OLM data acquisition to monitor for transmitter drift.
    AMS-TR-0720R2-A Chapter 8 describes a process to help determine the optimal sampling rate and minimum duration of OLM data collection.

LAR Overview – OLM Technical Evaluations (cont.)

Application Specific Action Items from AMS OLM TR

- ASAI 1 – Evaluation and Proposed Mark-up of Existing Plant Technical Specifications
  - TS changes provided in LAR are an adaptation from illustrative changes presented in AMS-TR-0720R2-A
  - Simplify the required plant-specific changes with no required changes to Channel Calibration and Response Time Surveillance Requirements
  - Online Monitoring Program description reorganized to better align with OLM implementation activities

LAR Overview – OLM Technical Evaluations (cont.)

- ASAI 2 – Identification of Calibration Error Source
  - Calibration error for OLM signal path evaluated as part of the calculation of OLM limits as described in AMS-TR-0720R2-A
- ASAI 3 – Response Time Test Elimination Basis
  - OLM noise analysis methods adopted as basis for Response Time Test Elimination as prescribed in AMS-TR-0720R2-A
- ASAI 4 – Use of Calibration Surveillance Interval Backstop
  - Calibration surveillance interval backstop methods adopted as described in AMS-TR-0720R2-A

LAR Overview – OLM Technical Evaluations (cont.)

- ASAI 5 – Use of Criteria other than in AMS OLM TR for Establishing Transmitter Drift Flagging Limit
  - Criteria for Establishing Transmitter Drift Flagging Limits adopted as described in AMS-TR-0720R2-A

LAR Table of Contents

LAR Table of Contents (cont.)

ATTACHMENTS

1. Technical Specification Mark-ups – SQN Units 1 and 2
2. Technical Specification Mark-ups – WBN Units 1 and 2
3. Technical Specification Bases Mark-ups – SQN Units 1 and 2 (Information only)
4. Technical Specification Bases Mark-ups – WBN Units 1 and 2 (Information only)

Proposed TS Changes – TS Definitions

Proposed CHANNEL CALIBRATION – SQN 1 and 2

A CHANNEL CALIBRATION shall be the adjustment, as necessary, of the channel output such that it responds within the necessary range and accuracy to known values of the parameter that the channel monitors. The CHANNEL CALIBRATION shall encompass all devices in the channel required for channel OPERABILITY (excluding transmitters in the Online Monitoring Program). Calibration of instrument channels with resistance temperature detector (RTD) or thermocouple sensors may consist of an inplace qualitative assessment of sensor behavior and normal calibration of the remaining adjustable devices in the channel. The CHANNEL CALIBRATION may be performed by means of any series of sequential, overlapping, or total channel steps, and each step must be performed within the Frequency in the Surveillance Frequency Control Program for the devices included in the step.

Proposed TS Changes – TS Definitions (cont.)

Proposed CHANNEL CALIBRATION – WBN 1 and 2

A CHANNEL CALIBRATION shall be the adjustment, as necessary, of the channel output such that it responds within the necessary range and accuracy to known values of the parameter that the channel monitors. The CHANNEL CALIBRATION shall encompass all devices in the channel required for channel OPERABILITY (excluding transmitters in the Online Monitoring Program). Calibration of instrument channels with resistance temperature detector (RTD) or thermocouple sensors may consist of an inplace qualitative assessment of sensor behavior and normal calibration of the remaining adjustable devices in the channel. Whenever a sensing element is replaced, the next required CHANNEL CALIBRATION shall include an inplace cross calibration that compares the other sensing elements with the recently installed sensing element. The CHANNEL CALIBRATION may be performed by means of any series of sequential, overlapping, or total channel steps, and each step must be performed within the Frequency in the Surveillance Frequency Control Program for the devices included in the step.

Proposed TS Changes – TS Definitions (cont.)

Proposed ENGINEERED SAFETY FEATURE (ESF) RESPONSE TIME SQN 1 and 2 and WBN 1 and 2

ENGINEERED SAFETY FEATURE (ESF) RESPONSE TIME - The ESF RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its ESF actuation setpoint at the channel sensor until the ESF equipment is capable of performing its safety function (i.e., the valves travel to their required positions, pump discharge pressures reach their required values, etc.). Times shall include diesel generator starting and sequence loading delays where applicable. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured. In lieu of measurement, response time may be verified for selected components provided that the components and methodology for verification have been previously reviewed and approved by the NRC (including transmitters in the Online Monitoring Program), or the components have been evaluated in accordance with an NRC approved methodology.

Proposed TS Changes – TS Definitions (cont.)

Proposed REACTOR TRIP SYSTEM RESPONSE TIME SQN 1 and 2 and WBN 1 and 2

REACTOR TRIP SYSTEM (RTS) RESPONSE TIME - The RTS RESPONSE TIME shall be the time interval from when the monitored parameter exceeds its RTS trip setpoint at the channel sensor until loss of stationary gripper coil voltage. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured. In lieu of measurement, response time may be verified for selected components provided that the components and methodology for verification have been previously reviewed and approved by the NRC, (including transmitters in the Online Monitoring Program) or the components have been evaluated in accordance with an NRC approved methodology.

Proposed TS Changes – Programs

Online Monitoring Program

- SQN 1 and 2 TS 5.5.19
- WBN 1 and 2 TS 5.7.2.24

Proposed TS Changes – Programs

Online Monitoring Program

This program provides controls to determine the need for calibration of pressure, level, and flow transmitters using condition monitoring based on drift analysis. It also provides a means for in-situ dynamic response assessment using the noise analysis technique to detect failure modes that are not detectable by drift monitoring.

The Online Monitoring Program must be implemented in accordance with AMS-TR-0720R2-A, "Online Monitoring Technology to Extend Calibration Intervals of Nuclear Plant Pressure Transmitters" (proprietary version). The program shall include the following elements:

Proposed TS Changes – Programs (cont.)

a) Implementation of online monitoring for transmitters that have been evaluated in accordance with an NRC approved methodology during the plant operating cycle.

   1) Analysis of online monitoring data to identify those transmitters that require a calibration check and those that do not require a calibration check,

   2) Performance of online monitoring using noise analysis to assess in-situ dynamic response of transmitters that can affect response time performance,

   3) Calibration checks of identified transmitters no later than during the next scheduled refueling outage, and

   4) Documentation of the results of the online monitoring data analysis.

Proposed TS Changes – Programs (cont.)

b) Performance of a calibration check for any transmitter where the online monitoring was not implemented during the plant operating cycle no later than during the next scheduled refueling outage.

c) Performance of calibration checks for transmitters at the specified backstop frequencies.

d) The provisions of Surveillance Requirement 3.0.3 are applicable to the required calibration checks specified in items a.3, b, and c above.

Precedent

- This license amendment request (LAR) is similar to the NRC-approved LAR for Vogtle Electric Generating Plant Units 1 and 2 to extend calibration intervals of nuclear plant pressure transmitters using AMS-TR-0720R2 (ML23115A149)
- Additionally, on May 3, 2024, the Southern Nuclear Operating Company submitted a similar LAR for the Farley Nuclear Plant - Units 1 &2 and Hatch Nuclear Plant - Units 1 &2 to extend calibration intervals of nuclear plant pressure transmitters using AMS-TR-0720R2 (ML24124A133)

Schedule Milestones

- TVA to submit LAR to NRC by October 31, 2024.
- Request NRC approval within 1-year from submittal.
- 6-month implementation following NRC approval.


TVA
TENNESSEE
VALLEY
AUTHORITY