From: O'Banion (Watford), Margaret
Sent: Friday, March 5, 2021 4:49 PM
To: Hash Hashemian
Cc: Greg Morton; Brent Shumaker; Ryan D. O'Hagan; Kate M. Davy
Subject: Final Request for Additional Information Re: AMS Topical Report AMS-TR-0720R1 (EPID NO. L-2020-TOP-0037)
Attachments: Final RAIs for AMS re Topical Report AMS-TR-0720R1.pdf

Dear Dr. Hashemian,

On February 23, 2021, the U.S. Nuclear Regulatory Commission (NRC) staff sent Analysis and Measurement Services Corporation (AMS) a draft Request for Additional Information (RAI). The final version of the RAI is attached to this email. The RAI relates to a topical report request regarding online monitoring technology to extend calibration intervals of nuclear plant pressure transmitters.

AMS subsequently informed NRC staff that the information requested by the NRC staff was understood. Dr. Hashemian agreed to provide a response to this final RAI within **45 days** from the date of this correspondence. The NRC staff also informed AMS that a publicly available version of this final RAI would be placed in ADAMS.

Thank you,

Maggie O'Banion
Project Manager, Licensing Projects Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Phone: 301-415-1233
Email: Margaret.O'Banion@nrc.gov

Hearing Identifier: NRR_DRMA
Email Number: 1059

Mail Envelope Properties (SA1PR09MB7935A9AE282A9A6A57CB7090AD969)

Subject: Final Request for Additional Information Re: AMS Topical Report AMS-TR-0720R1 (EPID NO. L-2020-TOP-0037)
Sent Date: 3/5/2021 4:49:16 PM
Received Date: 3/5/2021 4:49:16 PM
From: O'Banion (Watford), Margaret

Created By: Margaret.O'Banion@nrc.gov

Recipients:
"Greg Morton" <greg@ams-corp.com>
Tracking Status: None
"Brent Shumaker" <brent@ams-corp.com>
Tracking Status: None
"Ryan D. O'Hagan" <Ryan@ams-corp.com>
Tracking Status: None
"Kate M. Davy" <kate@ams-corp.com>
Tracking Status: None
"Hash Hashemian" <hash@ams-corp.com>
Tracking Status: None

Post Office: SA1PR09MB7935.namprd09.prod.outlook.com

Files	**Size**	**Date & Time**
MESSAGE	1037	3/5/2021 4:49:16 PM
Final RAIs for AMS re Topical Report AMS-TR-0720R1.pdf	156484	

Options
Priority: Normal
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:

REQUEST FOR INFORMATION

ANALYSIS AND MEASUREMENT SERVICES CORPORATION
AMS-TR-0720R1, "ONLINE MONITORING TECHNOLOGY TO EXTEND CALIBRATION INTERVALS OF NUCLEAR PLANT PRESSURE TRANSMITTERS"
(EPID NO. L-2020-TOP-0037)

By letter dated July 10, 2020 (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML20231A208), as supplemented by letter dated October 9, 2020 (ADAMS Package Accession No. ML20317A111), Analysis and Measurement Services Corporation (AMS) submitted a topical report (TR) regarding online monitoring (OLM) technology to extend calibration intervals of nuclear plant pressure transmitters. AMS requested formal review of the TR in accordance with the U.S. Nuclear Regulatory Commission (NRC) TR program for review and acceptance for referencing in regulatory actions. The NRC staff is focusing its efforts on the evaluation of Revision 1 of the TR, referred to as AMS-TR0720R1. The NRC staff conducted an audit to increase efficiency in the review and understanding of the technical content of the TR. The scope of the audit was defined in the audit plan provided to AMS on January 28, 2021 (ADAMS Accession No. ML21027A334). To support this audit, your organization made available to the staff a number of documents that support the basis for technical conclusions and statements made in the Topical Report, as well as prepared a document, dated February 21, 2021, to address several of the staff's questions raised during the audit. The staff has reviewed these materials and has prepared the following request for information (RAI) questions to enable the staff to complete its evaluation.

Regulatory Basis

Although the NRC staff is not making a safety conclusion regarding its evaluation of this submittal, based on the scope and purpose of TR, the staff is evaluating its technical content with the following regulatory bases in mind for future license applications or amendments referencing this TR:

- Title 10 of the *Code of Federal* Regulations (10 CFR) 50.36(c)(1)(ii)(A) states that limiting safety system settings (LSSS) are settings for automatic protective devices related to those variables having significant safety functions. This clause requires that where a LSSS is specified for a variable on which a safety limit has been placed, the setting must be chosen so that automatic protective action will correct the abnormal situation before a safety limit is exceeded. It also requires that the licensee notify the NRC if the licensee determines that an automatic safety system does not function as required. The licensee is then required to review the matter and record the results of the review.

- 10 CFR 50.36 requires, in part, that the technical specifications (TSs) contain surveillance requirements (SRs). Specifically, 10 CFR 50.36(c)(3) states, "Surveillance requirements are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met."

- 10 CFR 50.55a(h), *Protection and safety systems,* states that protection systems of nuclear power reactors of all types must meet the requirements specified in this paragraph. Each combined license for a utilization facility is subject to the following conditions:

- (2) Protection systems. For nuclear power plants with construction permits issued after January 1, 1971, but before May 13, 1999, protection systems must meet the requirements in IEEE Std 279–1968, "Proposed IEEE Criteria for Nuclear Power Plant Protection Systems," or the requirements in IEEE Std 279–1971, "Criteria for Protection Systems for Nuclear Power Generating Stations," or the requirements in IEEE Std 603–1991, "Criteria for Safety Systems for Nuclear Power Generating Stations, and the correction sheet dated January 30, 1995. For nuclear power plants with construction permits issued before January 1, 1971, protection systems must be consistent with their licensing basis or may meet the requirements of IEEE Std. 603–1991 and the correction sheet dated January 30, 1995.
- (3) Safety systems. Applications filed on or after May 13, 1999, for construction permits and operating licenses under this part, and for design approvals, design certifications, and combined licenses under part 52 of this chapter, must meet the requirements for safety systems in IEEE Std. 603–1991 and the correction sheet dated January 30, 1995.

Clause 4.3, “Quality of Components and Modules,” of IEEE 279-1971 states that components and modules shall be of a quality that is consistent with minimum maintenance requirements and low failure rates. Quality levels shall be achieved through the specification of requirements known to promote high quality, such as requirements for design, for the derating of components, for manufacturing, quality control, inspection, calibration, and test.

Clause 6.5.1 of IEEE 603-1991 states that means shall be provided for checking, with a high degree of confidence, the operational availability of each sense and command feature input sensor required for a safety function during reactor operation. This may be accomplished in various ways; for example:

a) By perturbing the monitored variable,
b) Within the constraints of 6.6, by introducing and varying, as appropriate, a substitute input to the sensor of the same nature as the measured variable, or
c) By cross-checking between channels that bear a known relationship to each other and that have readouts available.

Clause 6.5.2 of IEEE 603-1991 states that one of the following means shall be provided for assuring the operational availability of each sense and command feature required during the post-accident period:

a) Checking the operational availability of sensors by use of the methods described in 6.5.1.
b) Specifying equipment that is stable and the period of time it retains its calibration during the post-accident time period.

- Appendix A to 10 CFR Part 50, General Design Criteria (GDC) 13, "Instrumentation and control," requires that instrumentation be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions, as appropriate, to assure adequate safety, including those variables and systems that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary, and the containment and its associated systems. Appropriate controls shall be provided to maintain these variables and systems within prescribed operating ranges.

- Appendix A to 10 CFR Part 50, GDC 20, “Protection system functions,” states that the protection system shall be designed (1) to initiate automatically the operation of appropriate systems including the reactivity control systems, to assure that specified acceptable fuel design limits are not exceeded as a result of anticipated operational occurrences and (2) to sense accident conditions and to initiate the operation of systems and components important to safety.

Request for Additional Information

1) AMS provided the OLM implementation methodology in Section 11, “OLM Implementation Methodology,” of the TR; however, it is not clear, from the contents of Section 11, what specific content a license amendment request referencing this TR should include or how to determine the acceptability of the provided information. For example, Section 11.1, “Data Acquisition and Analysis to Monitor for Drift,” Step No. 1, “Select Transmitters to be Monitored,” contains one requirement: “As a first step towards OLM implementation, a list of transmitters to be included in the OLM program must be developed.” There is no method or criteria to determine which make and model, service function, or other classification criteria should be used for identifying transmitters having adequate historical data, or how one would determine whether a new or different make and model of transmitter is similar enough to the covered transmitters to allow it to be included in the OLM program. In addition, there is no method or criteria to determine which specific application (service function) is appropriate for OLM. **Where appropriate, please provide the step-by-step instructions and methods for implementing an OLM program, using descriptive criteria for each of the steps in Section 11. This would enable licensees and applicants to accomplish the implementation appropriate for their own facilities, as well as enable the NRC staff to evaluate, in a consistent manner, whether licensees are accurately proposing an implementation of the OLM processes described in the TR.**

2) The TR provides anecdotal evidence for the Sizewell B and McGuire plants in which the results of manual calibrations are compared against conclusions drawn during OLM sampling as to whether a manual calibration is warranted. Referenced documents in the TR provide a catalogue of data comparing OLM results against subsequent manual calibration results. The data shows that in a small number of instances, non-conservative drift of a transmitter was discovered during a subsequent manual calibration that had not been detected with the OLM processes implemented. There is minimal analysis of the anecdotal evidence, however, within the TR or within the referenced documents which support a technical basis for concluding that undetected common mode drift is not of concern when implementing OLM processes. A recent (February 21, 2021) addition to the Audit Documents library provides a clearer justification supporting a conclusion that common mode drift and occasional drift that was not detected by OLM techniques is not a concern. However, this more thorough explanation and citing of specific data analyses from other studies does not appear in the TR. The TR simply makes conclusions based on these previous studies. **Please provide a summary of your analysis of the data referenced in those studies which justifies continued long-term operation of OLM transmitters without a periodic calibration against a known standard of at least one transmitter within a functional service grouping, at a maximum period of time that can reasonably be justified.**

3) AMS stated that setpoints were determined to be within 10 percent of the operating levels for all transmitters in historical OLM programs as a means of substantiating the idea that OLM data collected over only a portion of the transmitter span experienced under startup,

normal operations, and shutdown can support calibration accuracy assumptions at the safety actuation setpoint levels even if these levels are not achieved during normal plant operation. **The NRC staff requests AMS to provide a description of how an OLM program would establish a method for analyzing the OLM data in relation to the instrument safety setpoints. This analysis should include either criteria for determining if OLM data can be used to provide assurance of accuracy at the instrument setpoint level even though only a portion of the range is monitored, or it should include a method of establishing such criteria to be used by licensee's when implementing an OLM program.**

4) The NRC staff's expectation is that the plant OLM program would include a method of evaluating the characteristics (e.g., dynamics) of the process being measured by a group of transmitters within each service function to determine the required minimum sample rate and minimum duration of data collection needed for OLM. **The NRC staff requests AMS to provide a description of how a licensee or applicant implementing an OLM program for its facility would determine the minimum sample rate and data collection duration appropriate for a group of pressure transmitters serving specific processes to be included in the OLM program.**

5) The NRC staff notes that smaller exercised ranges during normal plant operation would result in greater uncertainties in the unexercised portions of a transmitter span. An analysis of the uncertainties associated with unexercised portions of transmitter span could be used to support assumptions of calibration accuracy in these regions of transmitter operation. **The NRC staff requests AMS to provide a description of how an OLM program will address uncertainties associated with the portions of transmitter range that are not exercised during normal plant operation. This discussion should explain how uncertainties are to be quantified and how assumptions of calibration accuracy in these regions of transmitter operation will be supported as part of an OLM program. If appropriate, include a discussion regarding the expected systematic effects of transmitter zero or span shifts in predicting the impact on transmitter performance when operating at the portion of the range where the instrument channel setpoint is expected to activate.**

6) Example TS changes were provided for illustration (in TR Appendix C) in response to an NRC request, as an example of changes that may be needed, but they were not provided as TS changes to be approved by the NRC. These TS mark-ups were useful for stimulating discussion; however, there is still ambiguity on how these proposed changes are to be described and implemented. Additional explanation is needed for licensees to identify the type of information that may need to be changed within a TS table of instrument channel surveillance requirements. For example, the "OR" proposed in Appendix C means the licensee can switch back and forth between the two "FREQUENCIES" in the final TS; however, there is no explanation (in the TR) of how this is expected to be implemented. Also, if the other "FREQUENCY" is a fixed calibration interval, and if there was inadequate data collected during the monitoring period, then the transmitter should be calibrated at the next calibration interval. However, if the other "FREQUENCY" is "In accordance with the Surveillance Frequency Control Program," how is the timing of the next calibration determined. Finally, the TS Bases section should be modified to explain how the incorporation of OLM affects the TS surveillance, since applies to only the transmitter within the channel, and not the other devices in the loop. **Please provide additional information using either examples or simple narratives to provide guidance for licensees as to the *type of information* that is needed to mark up their TS surveillance tables as well as the TS Bases. This guidance should clearly differentiate what portion of the TS SR is**

applicable to the transmitter versus what portion is applicable to the balance of the instrument channel.

7) The NRC staff have determined that the following documents are necessary for staff use in evaluating AMS-TR-0720R1. These documents contain explanations which serve to enhance the staff's understanding of OLM processes described in the TR, as well as provide evidence that OLM techniques are successful at predicting when transmitters are drifting beyond their designated monitoring acceptance limits and should be scheduled for manual calibration during the upcoming outage. **Please submit the following documents for staff use in evaluating AMS-TR-0720R1**.

   Note: Documents are listed using the file names they were referred to during the recent audit.

   Audit Documents

   Agenda – NRC Audit of Understanding (1.26.21-1.27.21)
   AMS Presentation for NRC Audit 1-26-2021
   AMS Supporting References 02-21-2021
   AMS Talking Points for NRC Discussion 02-17-2021
   NRC Audit Questions and AMS Responses 1-25-2021

   Reference Documents

   (17) PWROG WDS1601R2 (May 2017)
   (24) PWROG-15057-P
   (38) OLM at ATR
   (40) Sizewell B OLM Acceptance Criteria
   (42) DOE/ER84626 Volume1 and DOE/ER84626 Volume2
   (43) OLM at Vogtle 1 VOG1905R0
   (44) OLM at Vogtle 2 VOG1906R0
   (45) OLM at Vogtle 1 VOG2005R0
   (49) Sizewell Sensor Calibration Extension ESR-503