



INNOVATING NUCLEAR TECHNOLOGY
ANALYSIS AND MEASUREMENT SERVICES CORPORATION

Slide Set #3
Day 1 – July 6, 2026
16:30 - 17:00am

Application of Noise Analysis in Online Calibration Monitoring of Nuclear Plant Pressure Transmitters

Presented by:

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*President & CEO
AMS Corporation*

*President
American Nuclear Society
2025-2026*



Presented to:

**33rd International Meeting
on Reactor Noise**

Grenoble, France

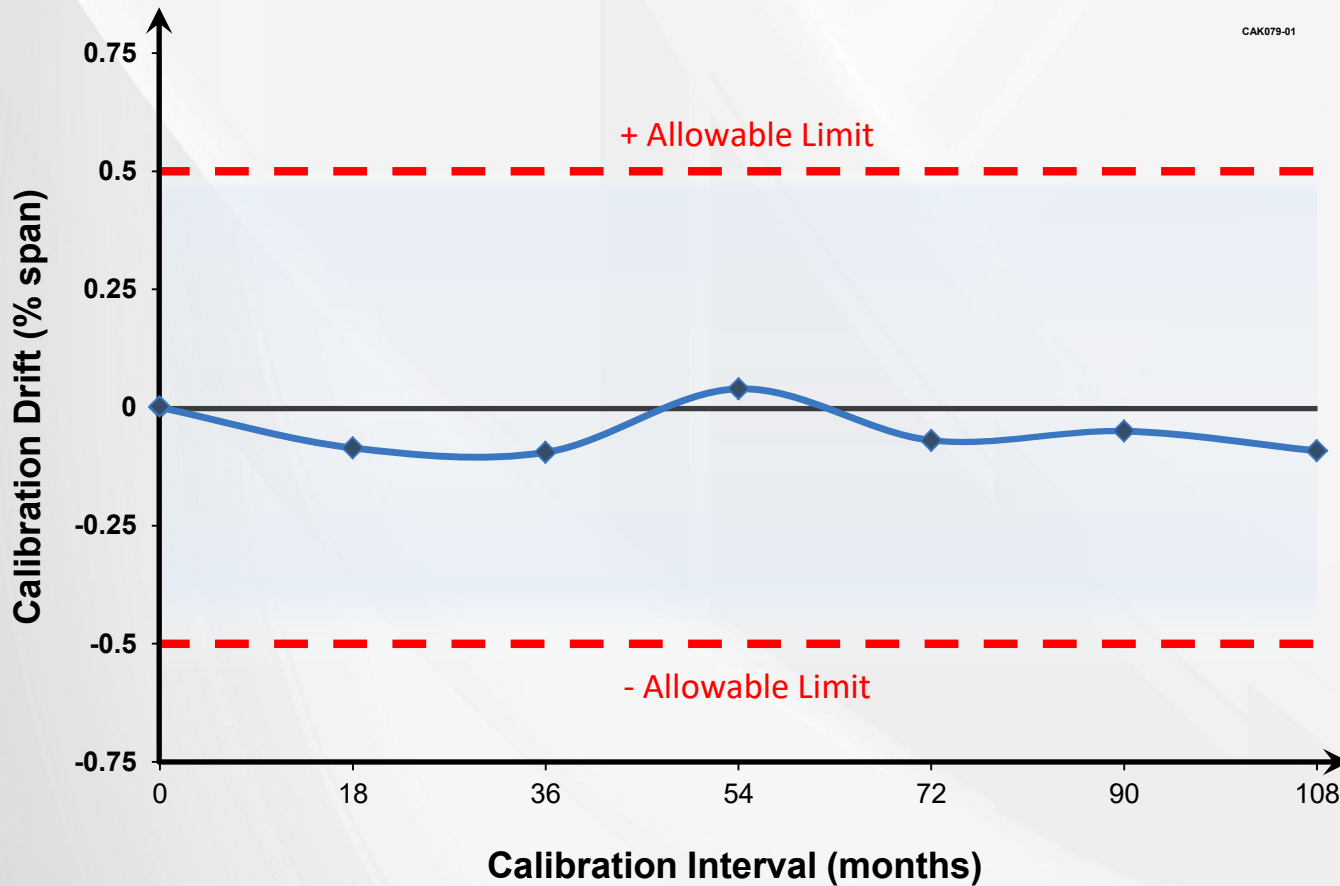


July 6, 2026



Nuclear Grade Transmitters Do Not Normally Drift Much

Nuclear Grade Pressure Transmitter
(Manual Calibration Data)





Calibration Basics

Traditional Calibration

Step 1. Determine if calibration is needed (manual)

Step 2. Calibrate if needed

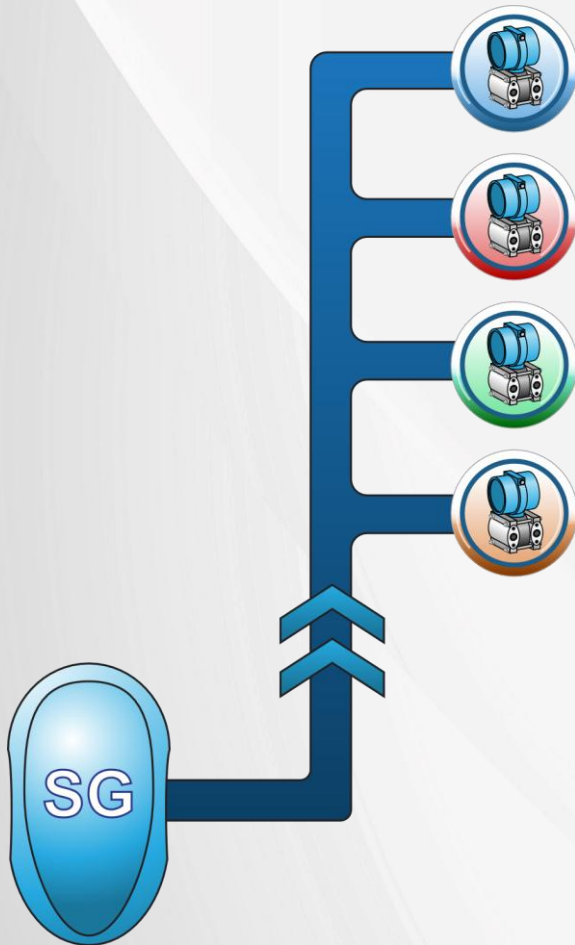
OLM

Step 1. Determine if calibration is needed (automated)

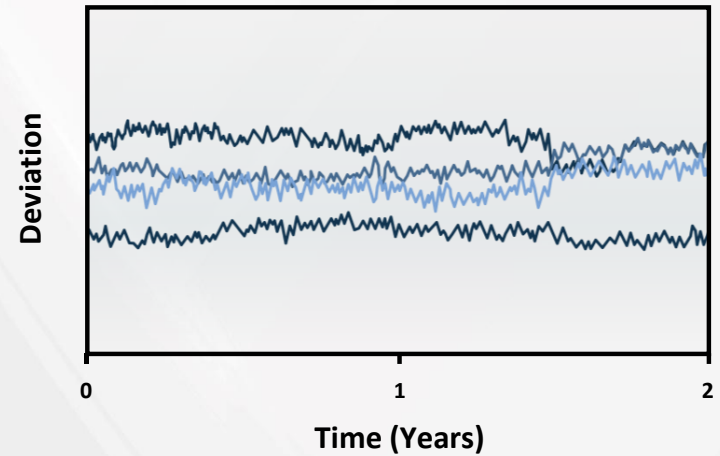
Step 2. Calibrate if needed



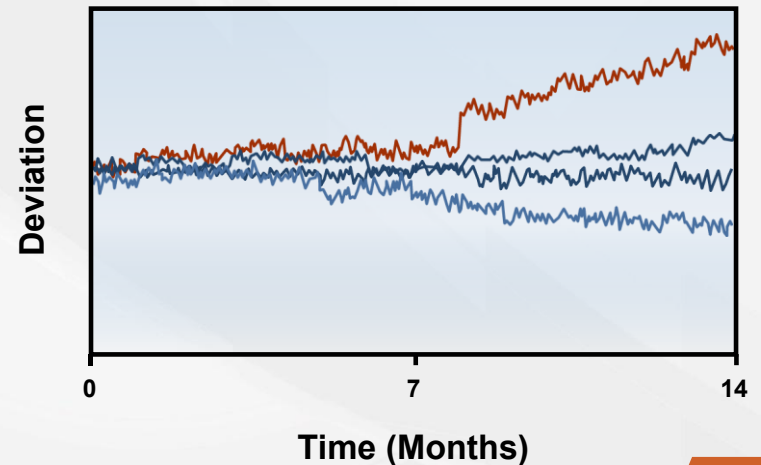
OLM Identifies Drifting Transmitters



No Drift



Drift

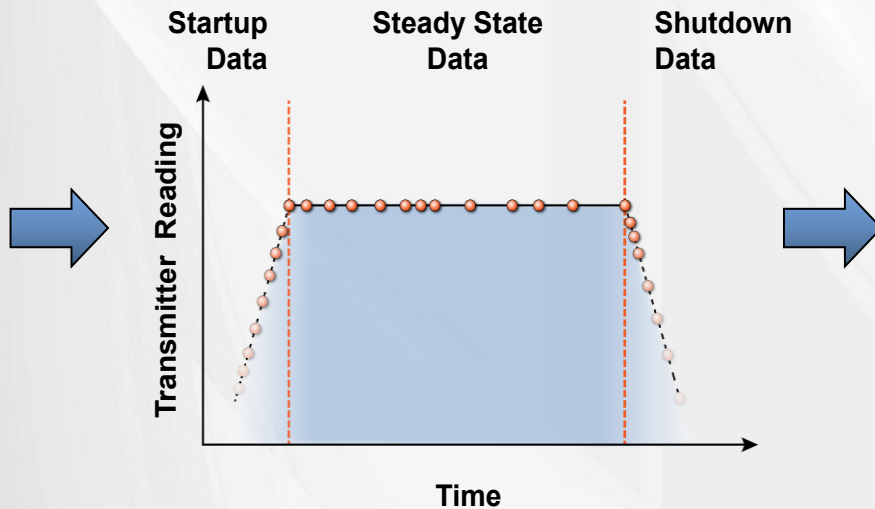




OLM Covers the Whole Range of a Transmitters Operations



Data Historian



Item	Group Name	Tag Name	Result
1	SG A OUTLET PRESSURE	PT0474	Good
2	SG A OUTLET PRESSURE	PT0475	Good
3	SG A OUTLET PRESSURE	PT0476	Good
4	SG A NARROW RANGE LEVEL	LT0474	Good
5	SG A NARROW RANGE LEVEL	LT0475	Good
6	SG A NARROW RANGE LEVEL	LT0476	Good
7	PRESSURIZER LEVEL	LT0459	Good
8	PRESSURIZER LEVEL	LT0460	Bad
9	PRESSURIZER LEVEL	LT0461	Good

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Summary of FMEA of Pressure Transmitters

Number	Sensor Type	Failure Mode	Response Time Detectable	OLM Detectable
1	Force Balance Pressure Transmitters	Force bar/ linkage pivot point degradation	No	Yes
2		Force bar/ linkage excessive friction	No	Yes
3		Feedback coil burnout	Unknown	Yes
4		Feedback coil magnet aging	No	Yes
5		Detector armature loosening	No	Yes
6		Change in zero adjustment spring force	No	Yes
7		Housing seal process fluid leak	No	Yes
8		Bent force bar/linkage	Unknown	Yes
9		Sensing diaphragm leak	Yes	Yes
10		Sensing diaphragm deformation	Unknown	Yes
11		Diaphragm loss of pressure barrier	No	Yes
12		Electronic component failure	No	Yes
13		Increased fill fluid viscosity	Yes	No
14		Fill plug pressure boundary loss	Unknown	Yes
15	Strain Gage Pressure Transmitters	Incorrect strain characteristic	No	Yes
16		Strain gage beam deformation	Unknown	Yes
17		Increased fill fluid viscosity	Yes	No
18		Bourdon tube/force bar deformation	Unknown	Yes
19		Bourdon tube leak	No	Yes
20		Bourdon tube/force bar detachment	Yes	Yes
21		Housing seal pressure boundary loss	No	Yes
22		Isolation diaphragm pressure boundary loss	No	Yes

Number	Sensor Type	Failure Mode	Response Time Detectable	OLM Detectable
23	Strain Gage Pressure Transmitters	Process chamber housing leak	No	Yes
24		Fill plug leak	No	Yes
25		Electronic component performance change	No	Yes
26		High pressure bellows incorrect spring	No	Yes
27		High pressure bellows spring constant change	No	Yes
28		Fill plug seal fill fluid leak; small	No	No
29		Fill plug seal fill fluid leak; large	No	Yes
30		Strain gage feed through seal fill fluid leak; small	No	No
31		Strain gage feed through seal fill fluid leak; large	No	Yes
32		Valve stem shaft incorrect position	No	Yes
33		Valve stem shaft position change	No	Yes
34		High pressure bellows overrange valve	No	Yes
35		Low pressure bellows overrange valve	No	Yes
36		Low pressure bellows incorrect spring	No	Yes
37		Low pressure bellows spring constant change	No	Yes
38		High pressure inlet leak	No	Yes
39		Low pressure inlet leak	No	Yes
40		Ceramic insulation crack / porosity	No	Unknown
41		Electrical isolation leakage path	No	No
42	Generic Capacitance Pressure Transmitters	Sensing diaphragm leakage	Yes	Yes
43		Electronics cover seal pressure boundary loss	Unknown	Yes
44		Electronics package shorting	Yes	Yes
45		Sensing cell process fluid leakage	No	Yes
46		Fill fluid chemical changes	No	Yes
47		Increased fill fluid viscosity	Yes	No
48		Underfill of fill fluid	Yes	Yes
49		Fill tube leak	Yes	Yes
50		Ceramic insert partial blockage	Yes	No
51		Ceramic insert severe blockage	Yes	Yes
52		High / low pressure isolation diaphragm leak	Yes	Yes
53		High / low pressure isolation diaphragm weld failure	Yes	Yes
54		High / low pressure cell cup to glass seal leak	Yes	Yes



NRC Approval of OLM

PROPRIETARY



AMS TOPICAL REPORT
Report Number:
AMS-TR-0720R2-A (PROPRIETARY)
Online Monitoring Technology
to Extend Calibration Intervals
of Nuclear Plant Pressure
Transmitters

August 2012

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SAFETY EVALUATION BY THE U.S. NUCLEAR REGULATORY COMMISSION FOR
ANALYSIS AND MEASUREMENT SERVICES CORPORATION TOPICAL REPORT
AMS-TR-0720R1, "ONLINE MONITORING TECHNOLOGY TO EXTEND CALIBRATION
INTERVALS OF NUCLEAR PLANT PRESSURE TRANSMITTERS"
BY THE OFFICE OF NUCLEAR REACTOR REGULATION
(EPID NO. L-2020-TOP-0037)

1.0 INTRODUCTION

By letter dated July 10, 2020 (Ref. 1), as supplemented by letter dated October 9, 2020 (Ref. 2), Analysis and Measurement Services Corporation (AMS) submitted the Topical Report (TR) AMS-TR-0720R1, "Online Monitoring [OLM] Technology to Extend Calibration Intervals of Nuclear Plant Pressure Transmitters." AMS requested a formal review of the AMS OLM TR in accordance with the U.S. Nuclear Regulatory Commission (NRC) TR program.

The NRC staff performed an audit (Refs. 5, 6, and 7) of the documentation materials which support AMS positions and statements regarding the efficacy of OLM methodologies. The NRC staff issued request for additional information (RAI) questions (Ref. 3) to obtain information needed to complete this safety evaluation (SE). AMS provided the responses to these RAI questions and described revisions to the AMS OLM TR in References 4, 11, and 14 to address the NRC staff's RAI questions.

5.0 CONCLUSION

The NRC staff determined that the methodology outlined in the AMS OLM TR for applying OLM techniques to pressure, level, and flow transmitters can be used to provide reasonable assurance that required TS instrument calibration requirements for transmitters will be maintained. This determination is based on the NRC staff finding that OLM techniques: a) are effective at identifying instrument calibration drift during plant operation, b) provide an acceptable means of identifying when manual transmitter calibration using traditional calibration methods are needed, and c) will maintain an acceptable level of performance that is traceable to calibration prime standards. The NRC staff determined that reliance on a carefully developed OLM program to determine appropriate calibration surveillance intervals, within the conditions and limitations described in the AMS OLM TR, supports meeting the calibration surveillance requirements for safety related pressure, level, and flow transmitters is acceptable under 10 CFR 50.36(c)(1)(ii)(A) and 10 CFR 50.36(c)(3).

The NRC staff notes that the OLM methods described in the AMS OLM TR are not applicable for meeting the instrument channel functional test surveillance requirements in the plant TS. Therefore, the NRC staff finds that implementation of an OLM program in accordance with the approved AMS OLM TR provides an acceptable alternative to periodic manual calibration surveillance requirements upon implementation of the application-specific action items in Section 4.0 of this SE.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

June 15, 2023

Mr. R. Keith Brown
Regulatory Affairs Director
Southern Nuclear Operating Co., Inc.
3535 Colonnade Parkway
Birmingham, AL 35243

SUBJECT: **VOGTLE ELECTRIC GENERATING PLANT, UNITS 1 AND 2 - ISSUANCE OF AMENDMENTS REGARDING REVISION TO TECHNICAL SPECIFICATIONS TO USE ONLINE MONITORING METHODOLOGY (EPID L-2022-LLA-0190)**

Dear Mr. Brown:

The U.S. Nuclear Regulatory Commission (NRC) has issued the enclosed Amendment No. 218 to Renewed Facility Operating License NPF-68 and Amendment No. 201 to Renewed Facility Operating License NPF-81 for the Vogtle Electric Generating Plant (Vogtle), Units 1 and 2, respectively. The amendments consist of changes to the Technical Specifications (TSs) in response to your application dated December 21, 2022.

The amendments would revise TS 1.1, "Use and Application Definitions" and add a new TS 5.5.23 "Online Monitoring Program." The amendments would allow use of an online monitoring (OLM) methodology as the technical basis to switch from time-based surveillance frequency for channel calibrations to a condition-based calibration frequency based on OLM results. **The proposed amendments are based on the NRC-approved topical report AMS-TR-0720R2-A, "Online Monitoring Technology to Extend Calibration Intervals of Nuclear Plant Pressure Transmitters."**

A copy of the related Safety Evaluation is also enclosed. A Notice of Issuance will be included in the Commission's monthly *Federal Register* notice.

Thank you!



Vera!

