INNOVATING NUCLEAR TECHNOLOGY

ANALYSIS AND MEASUREMENT SERVICES CORPORATION

Operating Experience with Noise Analysis in Nuclear Power Plants

Presented by:

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Senior Engineering Manager

September 11, 2024

Presented To:
iMORN-31 Meeting

Response Time Testing of Pressure Transmitters

- **Conventional methods**
  - Step test
  - Ramp test

- **In-situ methods**
  - Noise analysis technique
  - Power interrupt test

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Conventional Test Procedure

- Take the channel out of service
- Valve-off the sensing lines
- Inject a test signal to the transmitter
- Measure the transmitter delay with respect to a high speed reference transmitter

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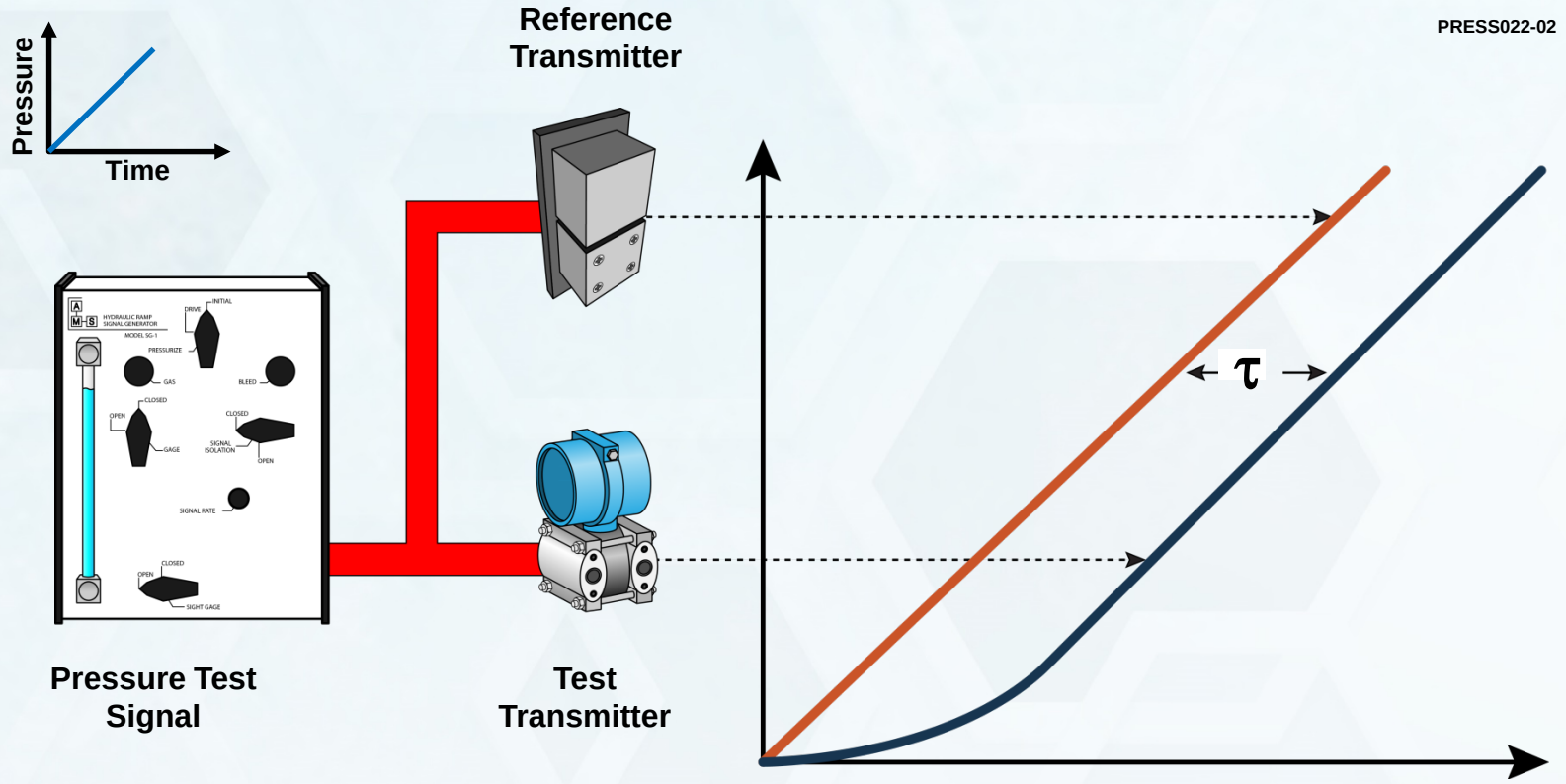
Ramp Test Setup



The ramp test involves applying a pressure ramp signal both to the transmitter being tested and to a high-speed reference transmitter.

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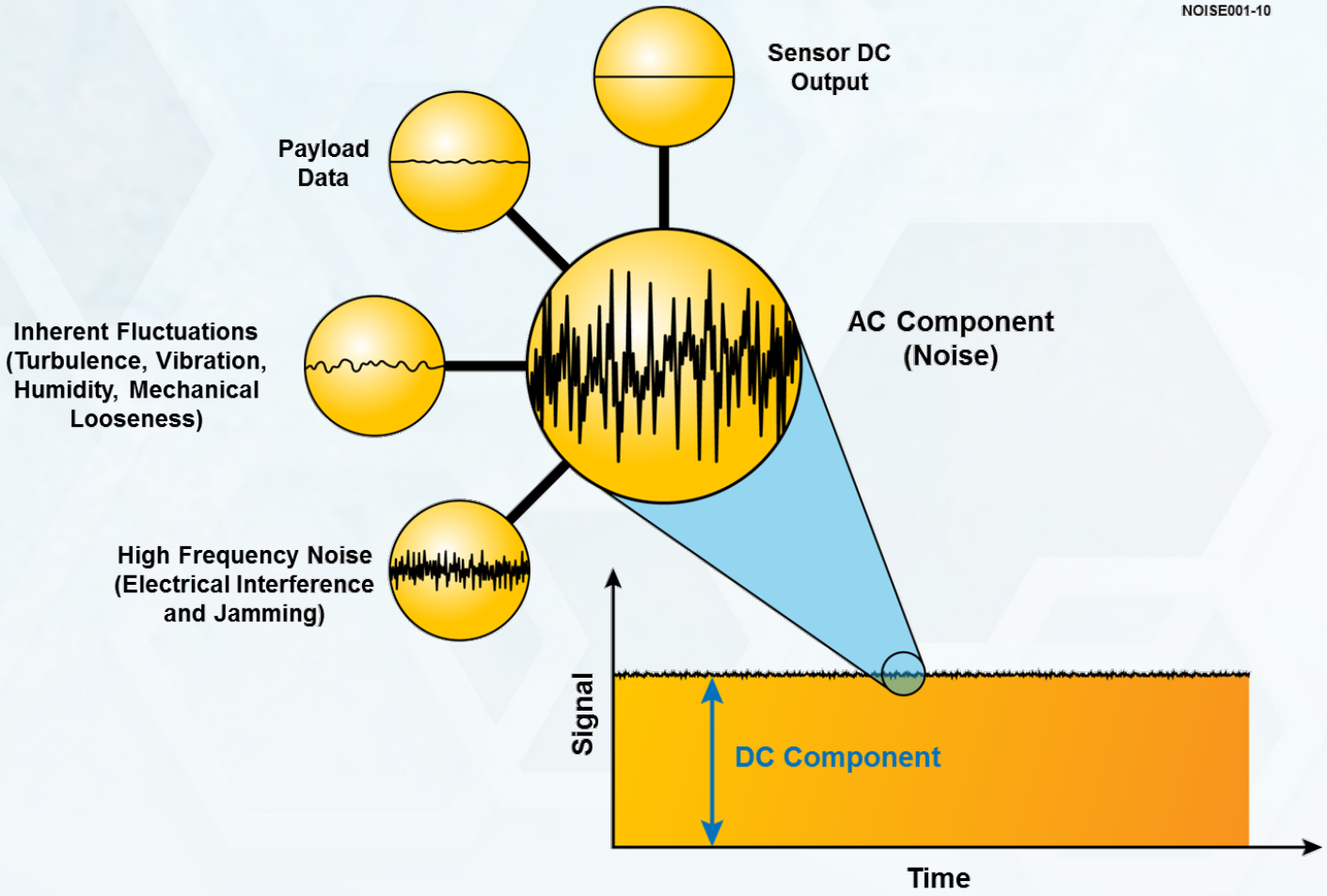
Principle of Noise Analysis Technique



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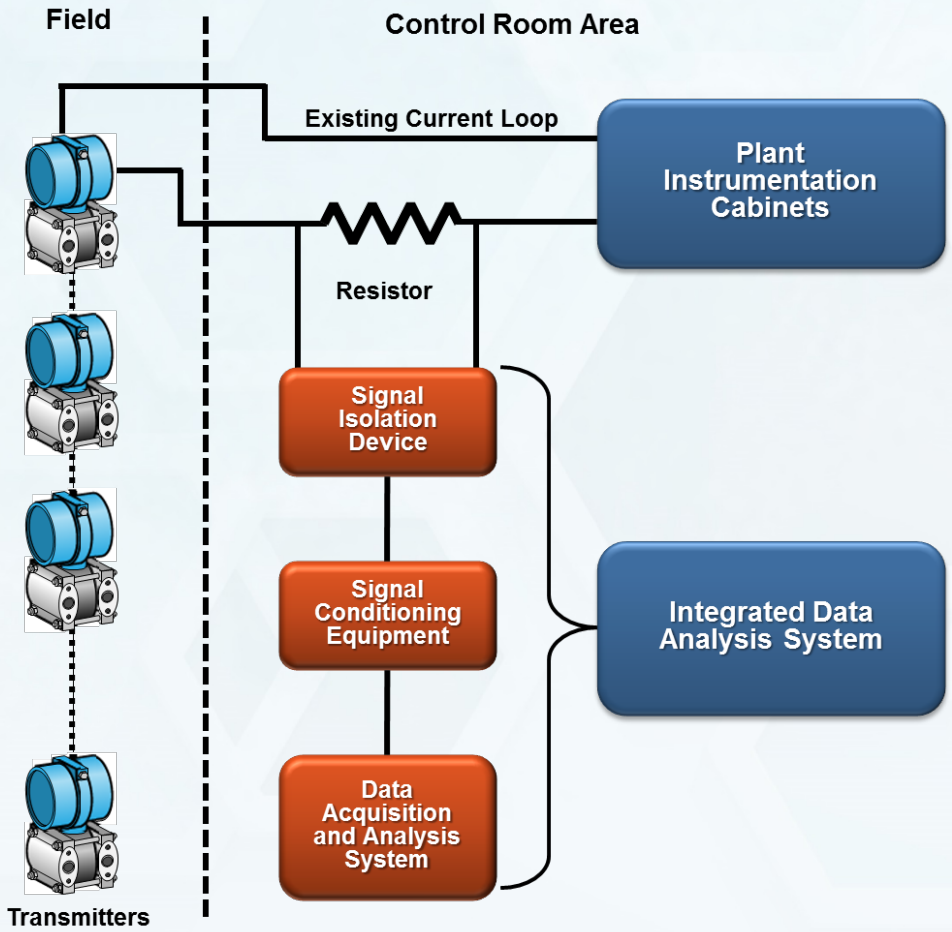
Equipment Set-up for Noise Measurement



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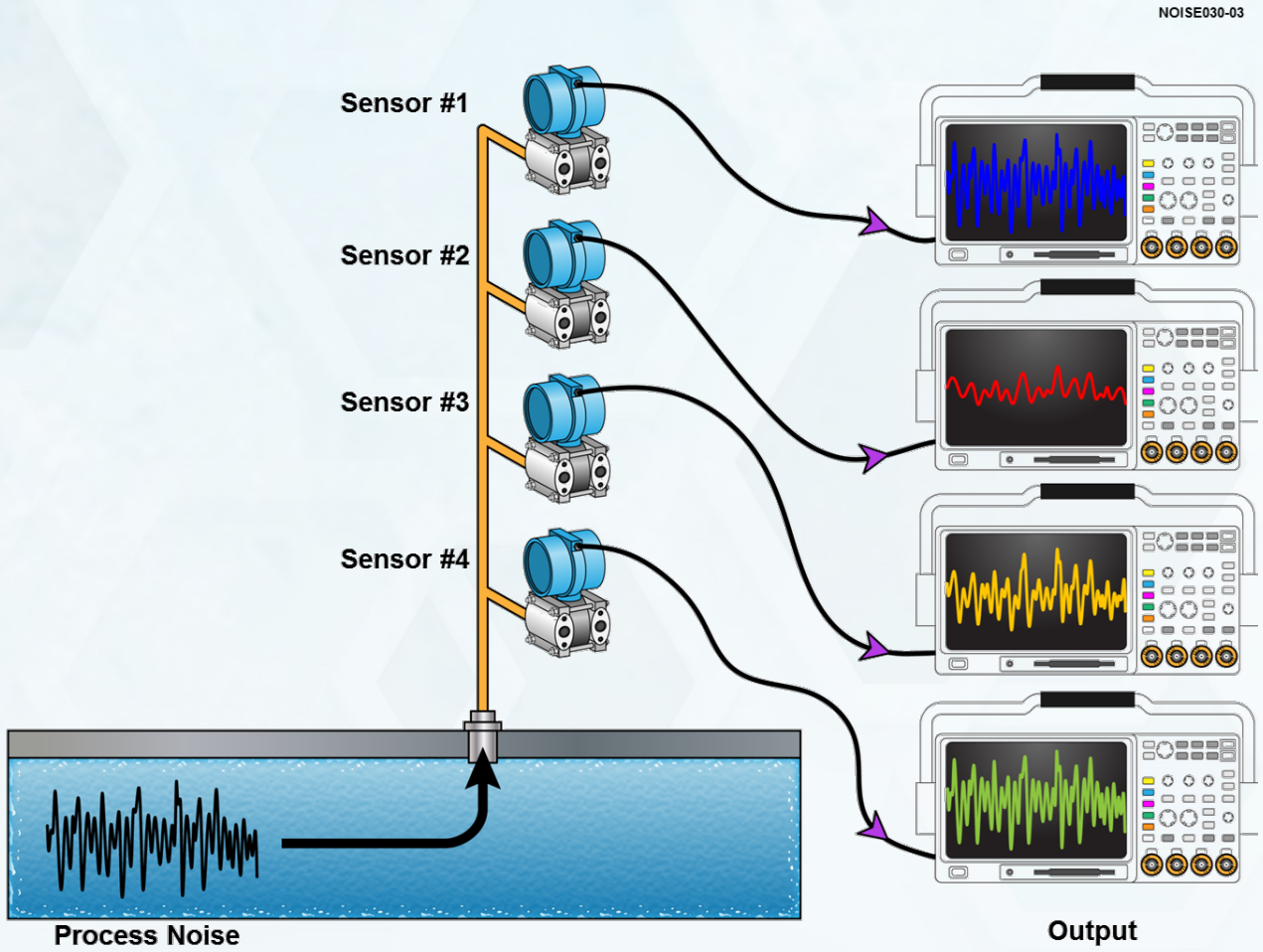
Process Noise Going to Four Redundant Sensors



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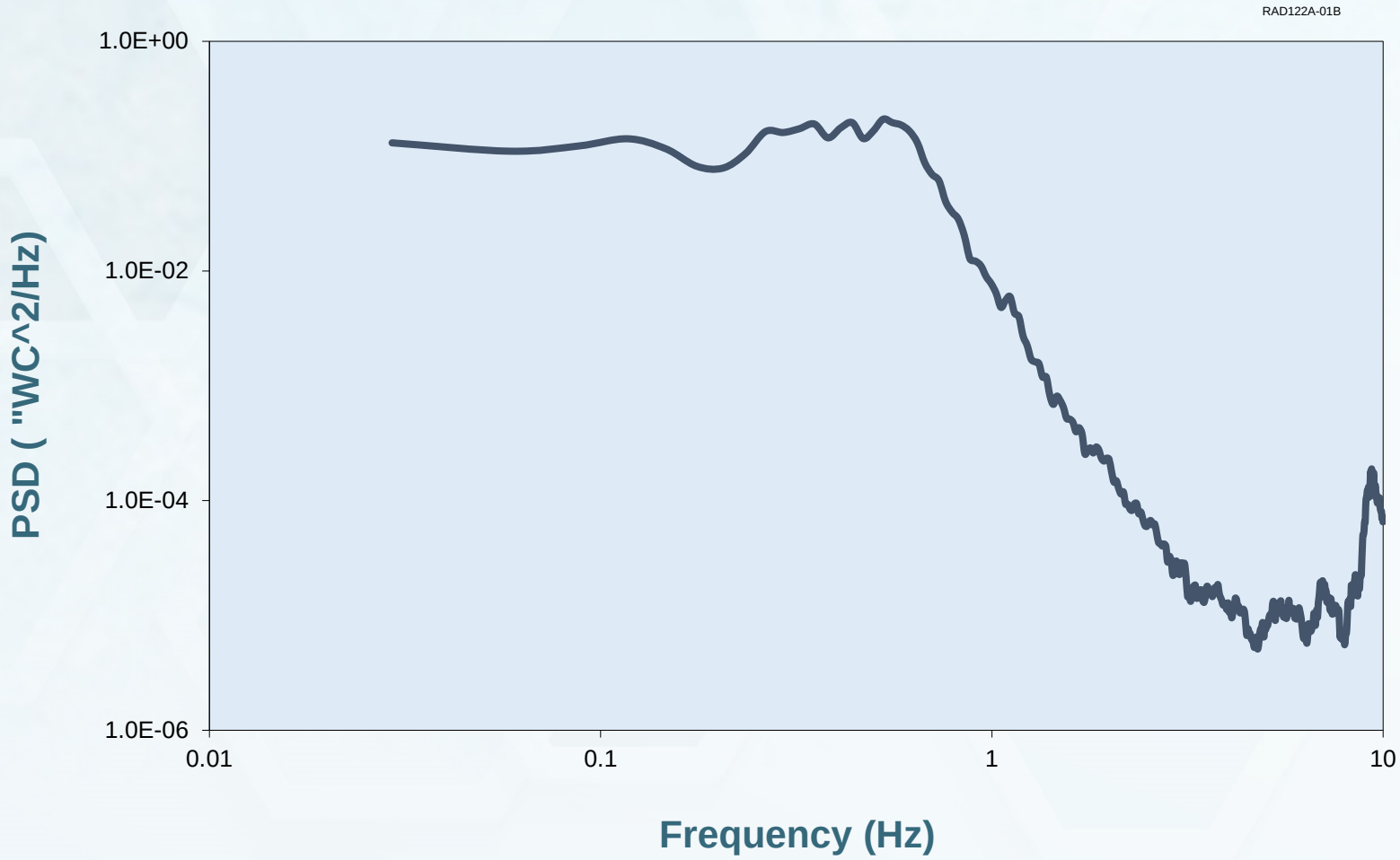
Spectrum of a Pressure Transmitter’s Noise Data



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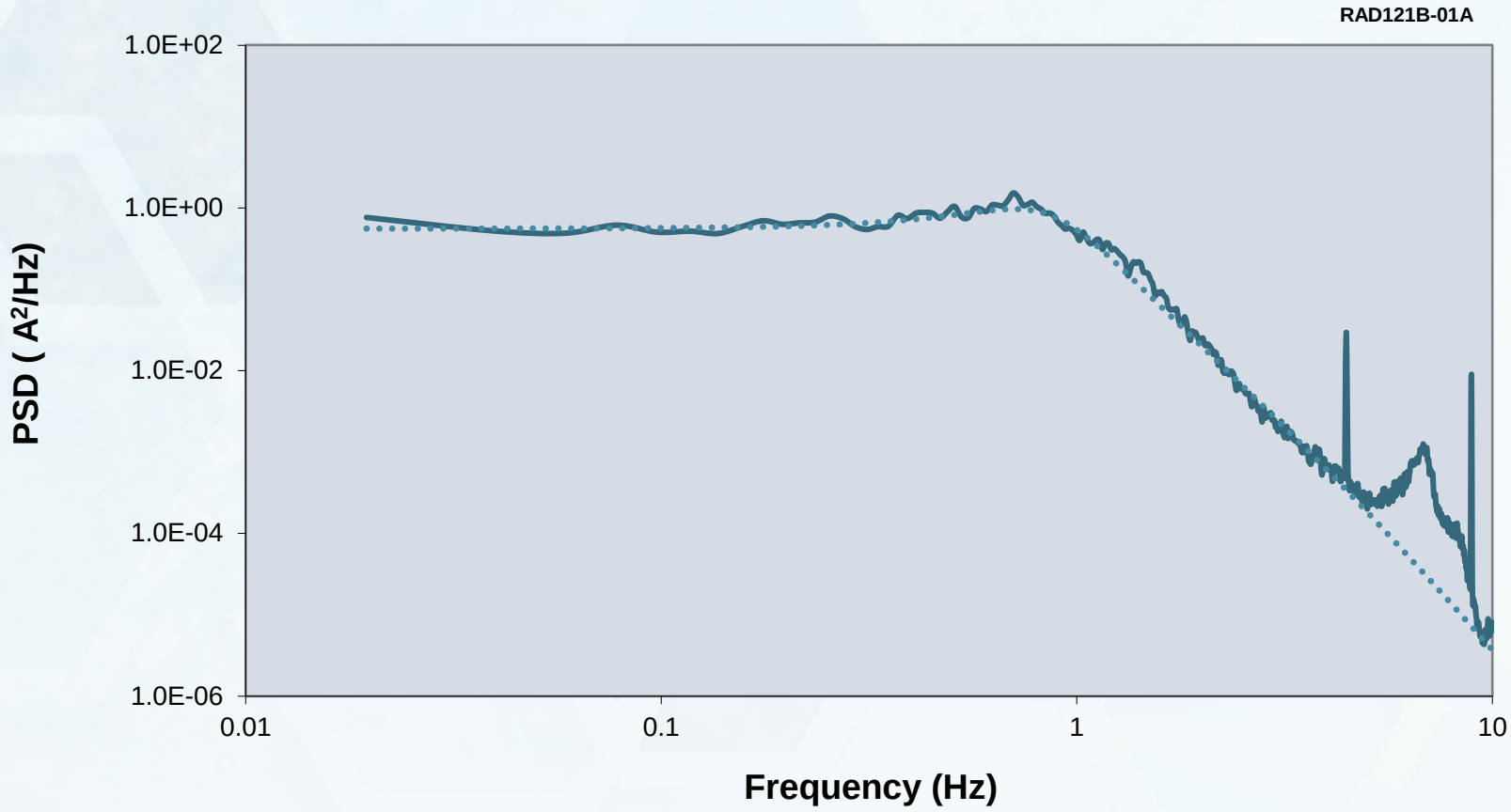
Pressure Sensor PSD and the Model Fit to PSD



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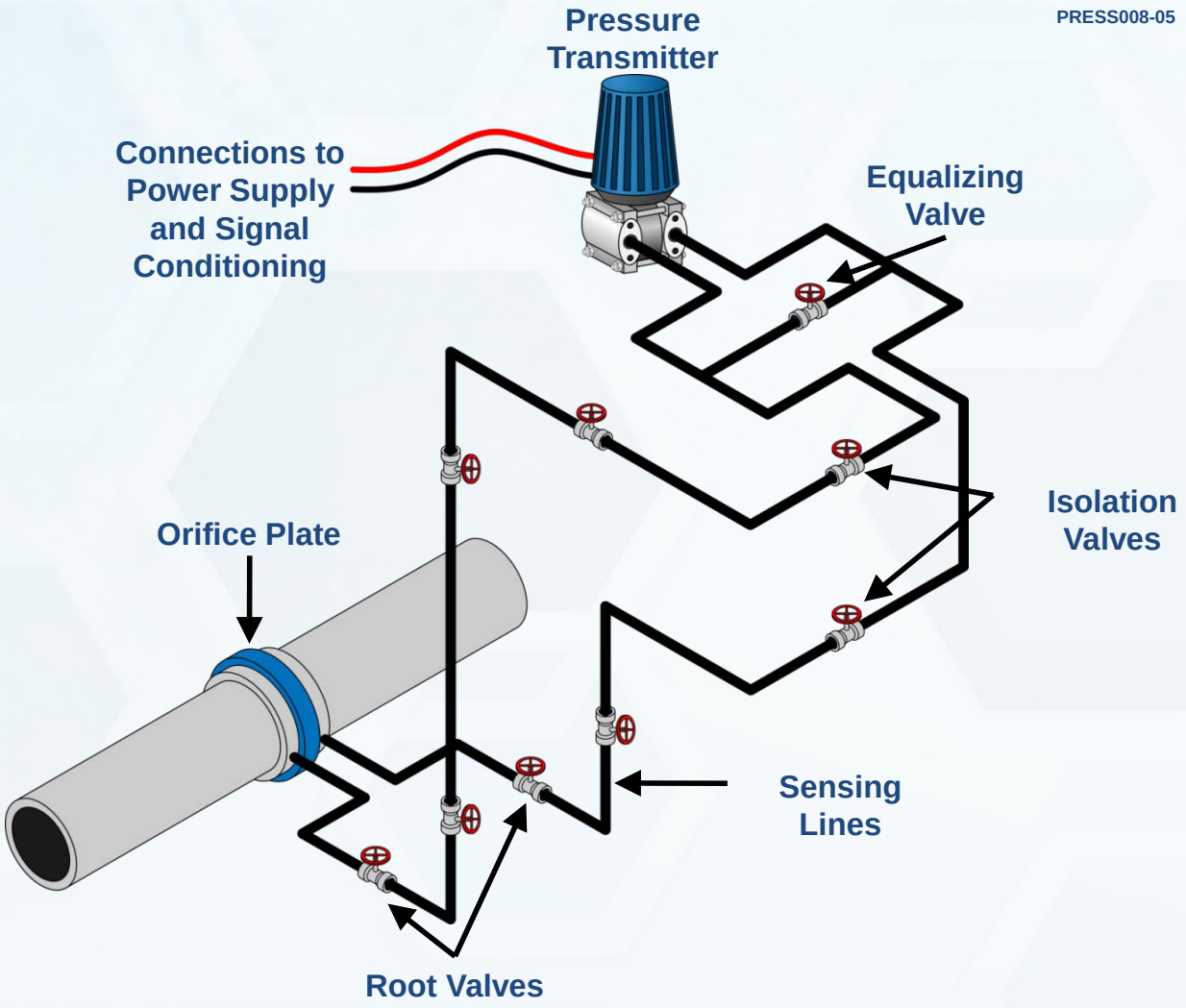
Pressure Transmitter Sensing Lines

- Sensing lines connect a pressure transmitter to the process.

- Sensing line installations are usually designed to allow for thermal expansion and vibration without deformation, to ensure drainage by gravity, and to allow the lines to vent themselves.



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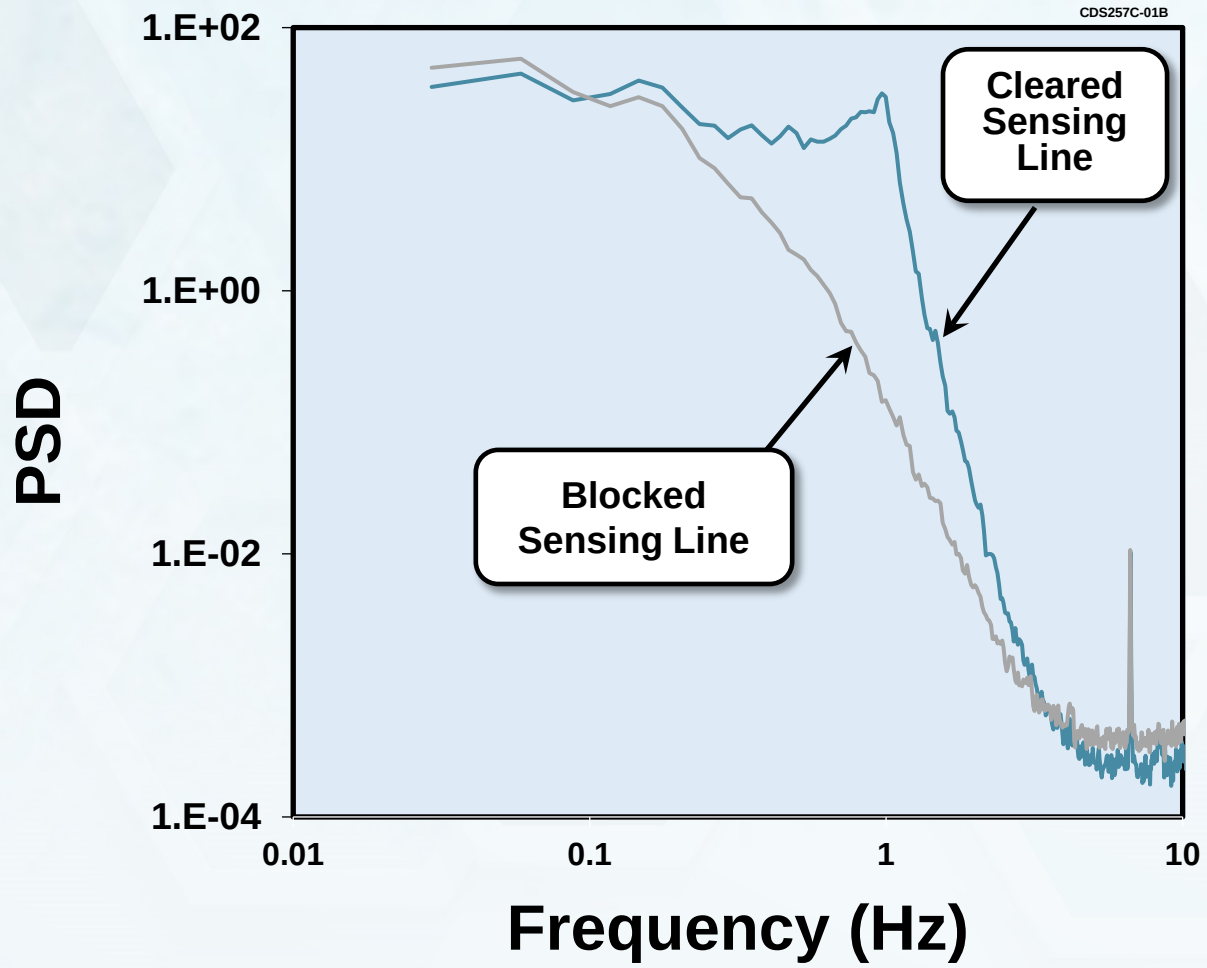
Example of Sensing Line Blockage Detected With Noise Analysis



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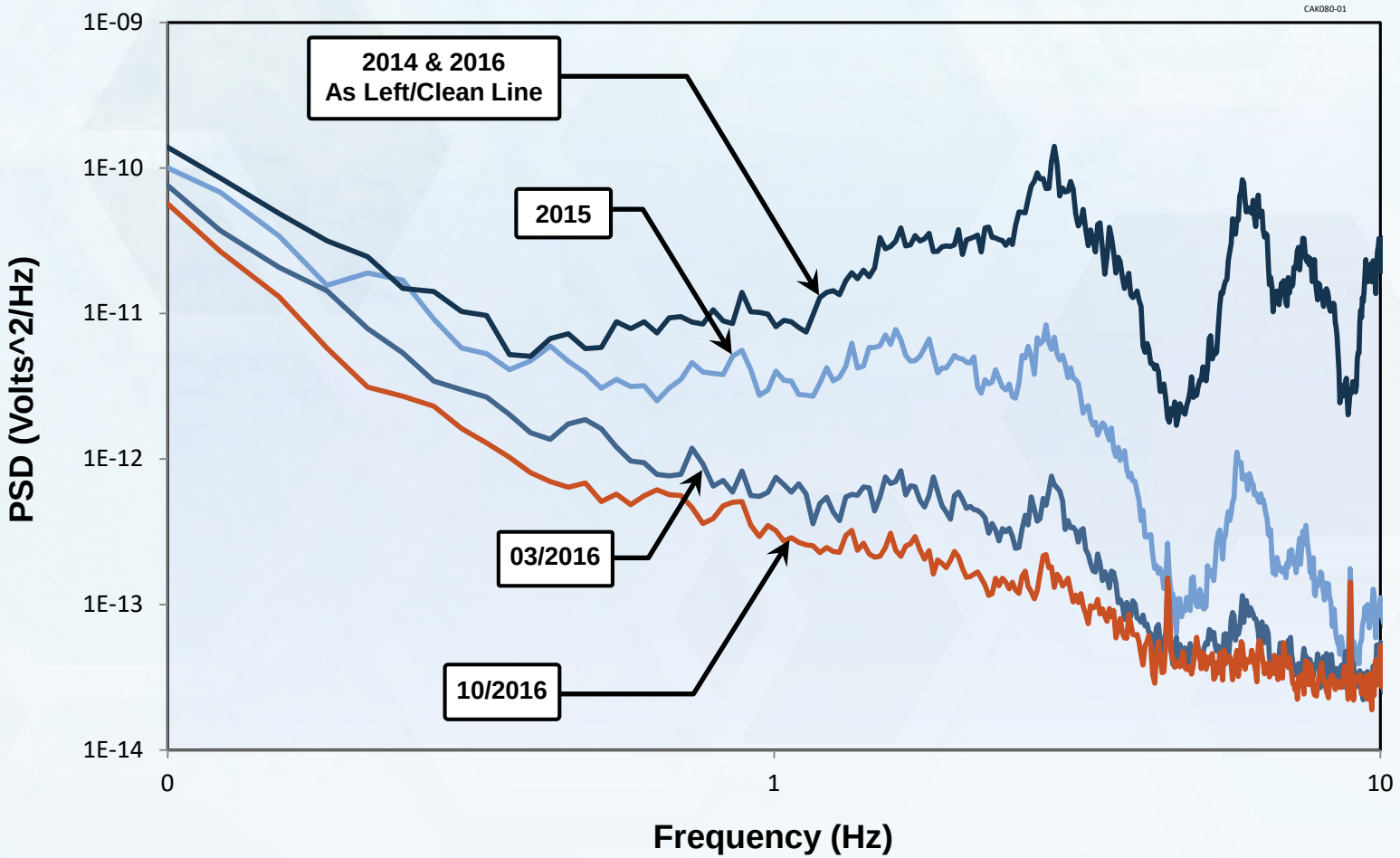
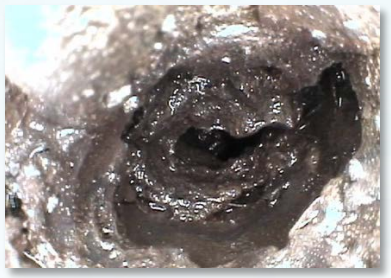
Monitoring Sensing Line Degradation Over Time





Dirty Sensing Line

Clean Sensing Line

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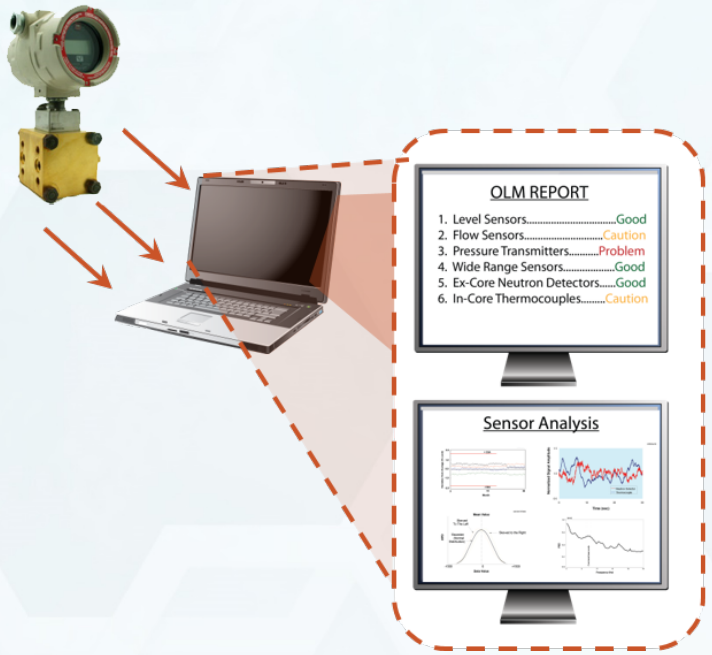
On-Line Monitoring (OLM)

- **What is on-line monitoring?**
  - Methods for evaluating the health and reliability of plant sensors, processes, and equipment from data acquired while the plant is operating.
  - What are the benefits?
- **Reduce testing time of surveillance activities**
  - Provide early warning of equipment degradation or failure
  - Facilitate switch from time-based maintenance to condition-based maintenance.



Bottom-line: OLM helps save the plant time and money by monitoring equipment using currently available data.

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What is On-Line Calibration Monitoring?

- Verifying calibration
- Not adjusting anything

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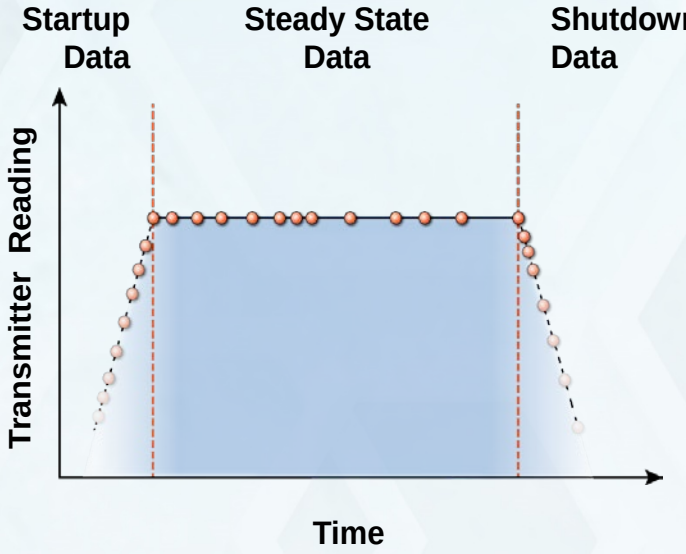
OLM Data Comes from Plant Computer

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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U.S. Nuclear Regulatory Commission (NRC) Transmitter Response Time Elimination

- Pressure transmitter response time testing was previously performed on a Staggered Test Basis, i.e., one channel every 18 months

- WCAP-13632-P-A, Rev. 2 and NPSD-1167-A, Rev. 2 justified eliminating the pressure transmitter response time testing and stated that the pressure transmitter calibrations would detect any degradation in the channel response time

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Topical Report Approval

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.

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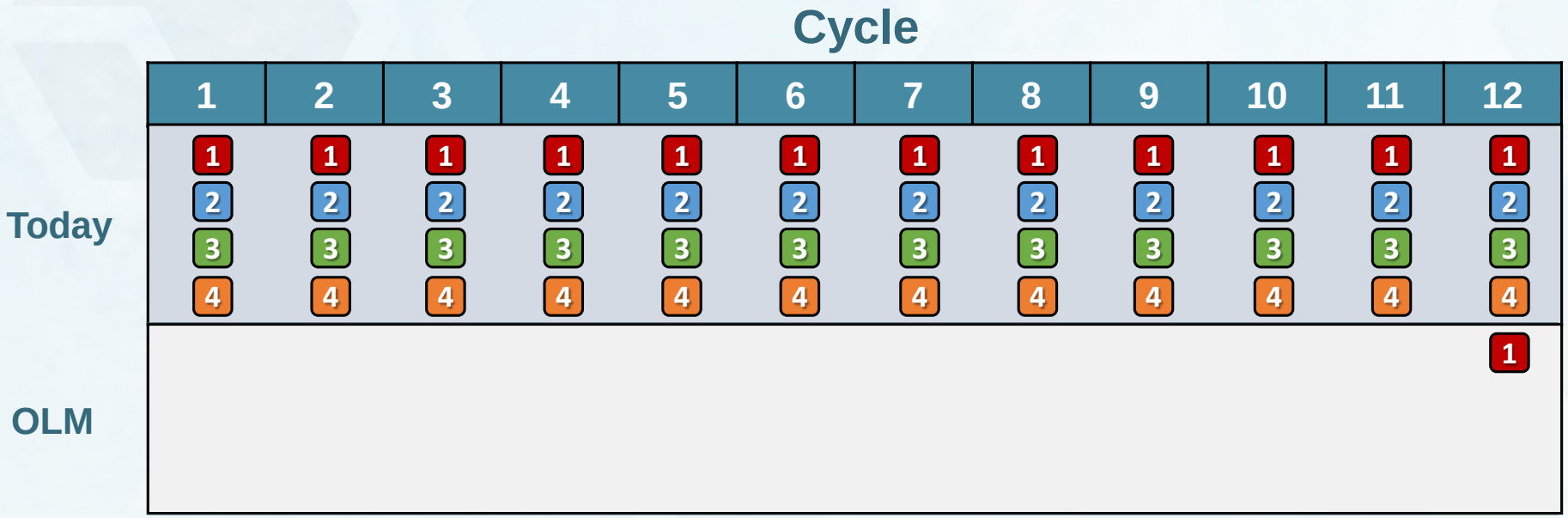
Opportunity Provided by OLM Using Noise Analysis



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Thank You!

Questions?

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