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Motor-Operated Valve Regulatory Activities

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MOV Users Group
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NRC Regulations

- 10 CFR 50.55a(b)(3)(ii) Motor-Operated Valve Testing
  - Licensees shall comply with the provisions for testing motor-operated valves in OM Code ISTC 4.2, 1995 Edition with the 1996 and 1997 Addenda, or ISTC-3500, 1998 Edition through the latest edition and addenda incorporated by reference in paragraph (a)(1)(iv) of this section, and must establish a program to ensure that motor-operated valves continue to be capable of performing their design basis safety functions. Licensees implementing ASME OM Code, Mandatory Appendix III, "Preservice and Inservice Testing of Active Electric Motor Operated Valve Assemblies in Light-Water Reactor Power Plants," of the 2009 Edition, 2011 Addenda, and 2012 Edition shall comply with the following conditions:

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NRC Regulations (cont'd)

A. MOV diagnostic test interval. Licensees shall evaluate the adequacy of the diagnostic test intervals established for MOVs within the scope of ASME OM Code, Appendix III, not later than 5 years or three refueling outages (whichever is longer) from initial implementation of ASME OM Code, Appendix III.

B. MOV testing impact on risk. Licensees shall ensure that the potential increase in core damage frequency and large early release frequency associated with the extension is acceptably small when extending exercise test intervals for high risk MOVs beyond a quarterly frequency. (Regulatory Guide RG-1.174)

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NRC Regulations (cont'd)

C. MOV risk categorization. When applying Appendix III to the ASME OM Code, licensees shall categorize MOVs according to their safety significance using the methodology described in ASME OM Code Case OMN–3, "Requirements for Safety Significance Categorization of Components Using Risk Insights for Inservice Testing of LWR Power Plants," subject to the conditions applicable to OMN–3 which are set forth in Regulatory Guide 1.192, or using an MOV risk ranking methodology accepted by the NRC on a plant-specific or industry-wide basis in accordance with the conditions in the applicable safety NRC evaluation.

D. MOV stroke time. When applying Paragraph III–3600, "MOV Exercising Requirements," of Appendix III to the ASME OM Code, licensees shall verify that the stroke time of MOVs specified in plant technical specifications satisfies the assumptions in the plant's safety analyses.

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Current MOV Issues/Activities

- 50.55a Rulemaking
- Regulatory Guide 1.192 Revision 3
- Anchor Darling Double Disk Gate Valve Part 21 Wedge Pin Failure Update
- NRC Initiative to Update Reactor Oversight Process (ROP) Engineering Inspections
- Focused Engineering Inspections (FEI) for Power Operated Valves (POV)

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50.55a Rulemaking

- Rulemaking for ASME OM Code 2015 Edition and 2017 Edition completed
- Published in the Federal Register and issued for public comment November 9, 2018
- Public comment period 75 days (last day 1/23/2019)
- NRC staff addressed public comments
- Final rule currently scheduled to be issued March 2020

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50.55a Rulemaking – Items of Interest in Proposed Rulemaking

- Add NRC Inservice Testing (IST) Plan submittal and reporting requirements (replaces ASME requirement)
- Revise 10 CFR 50.55a(f)(4)(i) and (ii) and (g)(4)(i) and (ii) to relax the time schedule for complying with the latest edition and addenda of the ASME OM or BPV Codes for IST and Inservice Inspection (ISI) programs, respectively, from 12 months to 18 months
- Streamline the references to editions of the ASME OM Code in each condition to simplify future 10 CFR 50.55a rulemaking, and to update specific conditions to reflect the latest ASME OM Code editions.

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Reg Guide 1.192 Operation and Maintenance Code Case Acceptability, ASME OM Code

- Regulatory Guide (RG) lists OM Code Cases that are acceptable to the NRC for implementation in the Inservice Test (IST) of light-water-cooled nuclear power plants
- RG 1.192 Revision 2 is currently applicable to Code Cases published in the 2009 Edition through the 2012 Edition of the ASME OM Code
- RG1.192 Revision 3 is applicable to Code Cases published in the 2015 Edition and 2017 Edition of the ASME OM Code

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Reg Guide 1.192 Operation and Maintenance Code Case Acceptability, ASME OM Code

- RG1.192 Revision 3 was published for public comment on August 16, 2018 with a 75 day comment period
- NRC staff has addressed all comments
- Final approval of these code cases is currently scheduled for January 2020

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Anchor/Darling Update

- Failure of A/D DDGV at Browns Ferry in 2013 revealed that threaded stem-to-wedge connection had not been properly torqued
- Flowserve Part 21 notification February 25, 2013
  - Recommended assessing wedge pin susceptibility to shear and rework the valve if needed
- BWROG developed guidance to address Part 21 to include:
  - Prioritization and Screening Criteria
  - Evaluation Methods
  - Inspection and Diagnostics
  - Repair Methods

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Progress to Date

- Industry has performed over 100 disassembly's, inspections, and repairs in accordance with BWROG recommended guidance
- Data review noted majority of valves inspected experienced no wedge pin failure
- Evaluation of data resulted in changes to BWROG guidance document (Revision 5) to include:
  - Allow specific application of stem-wedge thread friction to reduce the torque resisted by the wedge pin susceptibility analysis
  - Low risk valves 6 inches or smaller recommends non-repair and periodically monitor. Larger low risk valves (excluding 10-12" MOVs in high pressure applications) recommends non-repair periodic monitor only provided positive wedge pin margin demonstrated with a thread COF no greater that 0.2.

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Staff Assessment of Data

- NRC staff has reviewed the submitted industry data and recommended changes to the BWROG guidance document have been incorporated into Revision 5
- Review of valves reworked data and updated recommended changes to the guidance document provide reasonable assurance that the MOVs are operationally ready
- NRC staff to review plant progress during upcoming Focused Engineering Inspections (FEI) for Power Operated Valves (POV)

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NRC Initiative to Update ROP Engineering Inspections

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NRC Initiative to Update ROP Engineering Inspections

- Initiative is to improve effectiveness and efficiency of engineering inspections
- Primary focus of inspections remains unchanged
- Inspection sample selection has shifted since the 1990s from verifying compliance with the original plant design bases to inspecting licensee performance in maintaining risk significant equipment
- SECY-18-0113 “Recommendations for Modifying the Reactor Oversight Process Engineering Inspections” issued 11/13/2018 (ADAMS Accession # ML18441A567)

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NRC Initiative to Update ROP Engineering Inspections

- Recommended changes include:
  - Perform inspections on a 4 year cycle instead of current 3 year
  - Inspection consolidation and two new types of inspections to be performed during the 4 year cycle, Comprehensive Engineering Team Inspection (CETI) and the Focused Engineering Inspection (FEI)
  - Focusing inspection towards operating experience, aging management, facility changes, and risk
  - NRC staff is evaluating an industry proposal to allow plants to perform a licensee self-assessment in lieu of one FEI during each 4 year cycle

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NRC ROP Initiative Summary

- Propose quadrennial inspection cycle, with a CETI or FEI inspection every year at each site. (1 CETI and 3 FEI)
- CETI to incorporate aspects of modifications, 10 CFR 50.59, and design bases assurance inspection with a focus on operating experience, aging management, and changes to the design basis and PRA model
- Development and implementation of new FEIs
- FEIs are intended to verify the licensee's implementation of NRC approved engineering programs (e.g., MOV, AOV, EQ). Topics chosen based on risk, operating experience and potential for engineering challenges.

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FEI – POVs

- FEI for POVs will evaluate capability
  - Valve/Actuator design and safety function
  - Design basis conditions
  - Uncertainty assumptions applied
  - Diagnostic equipment
  - Weak link evaluations
  - Design basis capability tests
  - Design basis capability basis
- NRC staff has developed training for regional inspectors on implementation of FEI process
- Training to be completed by first quarter of 2020

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POV Actuators and Valve Types

- POVs include:
  - motor-operated valves (MOVs)
  - pneumatic-operated valves (AOVs)
  - hydraulic-operated valves (HOVs)
  - solenoid-operated valves (SOVs)
  - pyrotechnic-actuated (Squib) valves
- Valve types include gate, globe, butterfly, ball, and plug valves with variations of these valve types.

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POV FEI Procedure

ADAMS Accession No. ML19067A240

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POV FEI Procedure

- Sample Selection
- POV Detailed Review
- Scope
- Design
- Testing
- Maintenance

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Sample Selection

- As pre-inspection activity, about 30 POVs will be selected based on NRR and SRA input:
  - Multiple systems
  - MOVs, AOVs, HOVs, SOVs, and Squib Valves (as applicable)
  - Risk assessment
  - Historical performance
  - Various sizes, types, and manufacturers
- For the 30 valves selected request licensee to make available:
  - Design-basis capability information including function, safety significance, sizing, margin, and setting assumptions

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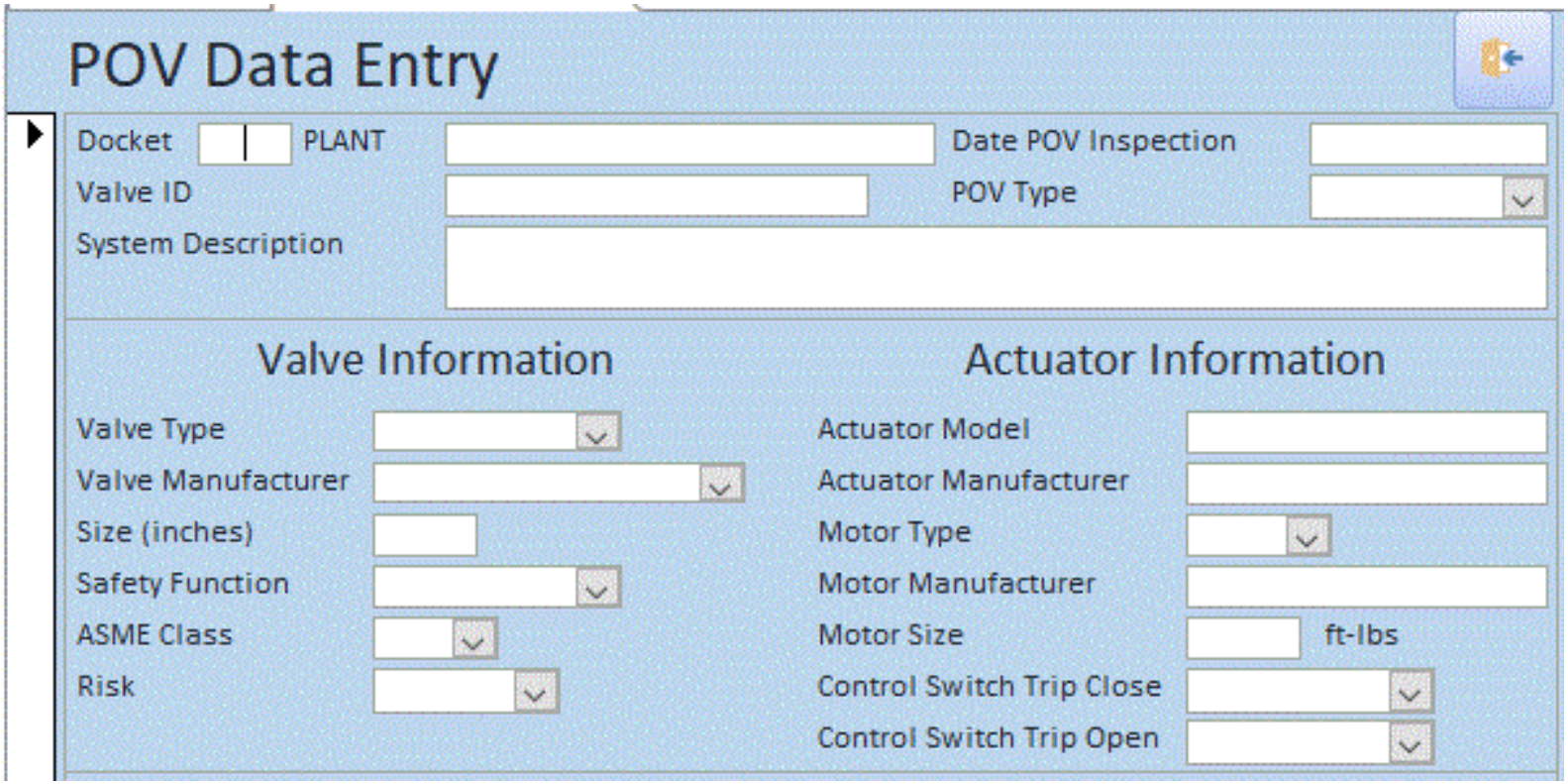
POV Data Entry Form



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POV Data Entry Form

Design Information					
Required Thrust Close		lbs	LSB Assumed (percent)		%
Required Torque Close		ft-lbs	Bearing COF Assumed (AOV)		
Required Thrust Open		lbs	Min Air Begin Stroke (AOV)		psig
Required Torque Open		ft-lbs	Min Air End Stroke (AOV)		psig
Design D/P Close		psig	Max Air Begin Stroke (AOV)		psig
Design D/P Open		psig	Max Air End Stroke (AOV)		psig
Design Flow Close		gpm	Min Spring Preload Begin		psig
Design Flow Open		gpm	Min Spring Preload End		psig
Valve Factor Assumed Close			Max Spring Preload Begin		psig
Valve Factor Assumed Open			Max Spring Preload End		psig
Stem COF Assumed			Least Available		lbs

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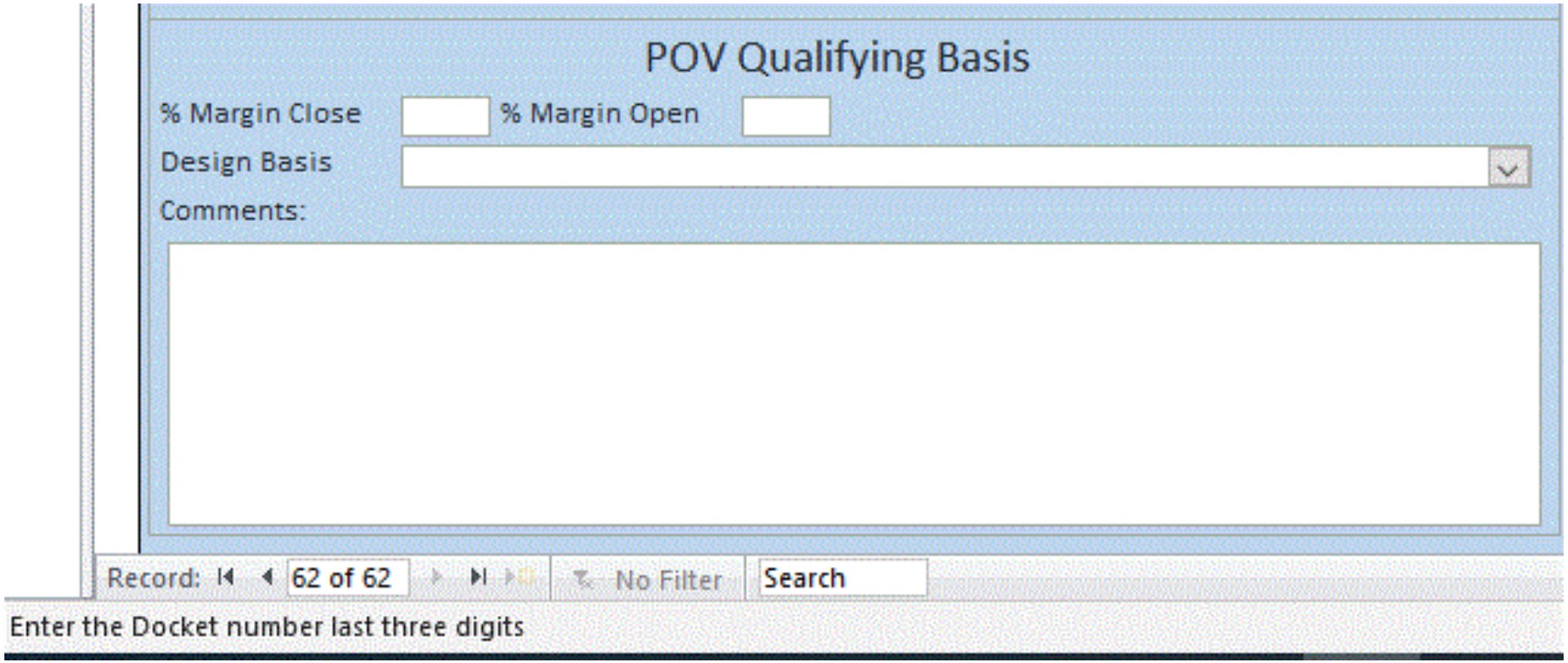
POV Data Entry Form

Test Information					
Test D/P Close		psig	Test Thrust Close		lbs
Test Pressure Close		psig	Test Torque Close		ft-lbs
Test Flow Close		gpm	Test Thrust Open		lbs
Test System Temp Close		°F	Test Torque Open		ft-lbs
Test Ambient Temp Close		°F	Valve Factor Measured Close		
Test Motor Voltage Close			Valve Factor Measure Open		
Test D/P Open		psig	Valve Factor Available Close		
Test Pressure Open		psig	Valve Factor Available Open		
Test Flow Open		gpm	Stem COF Measured Close		
Test System Temp Open		°F	Stem COF Measured Open		
Test Ambient Temp Open		°F	LSB Measured		%
Test Motor Voltage Open			Bearing COF Measured Close		
% Uncertainty Applied		%	Bearing COF Measured Open		

POV Data Entry Form



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Sample Selection
(cont'd)

- Based on POV design-basis capability information, the selection of a POV sample for detailed inspection review shall consider:
  - System Risk
  - POVs with high incidence of corrective maintenance and/or poor performance
  - POVs with low margin
  - POVs with questionable assumptions (e.g., low VF, low friction values, not all uncertainties captured)
  - POVs in systems with untreated water
  - POVs in high energy systems
  - POVs in elevated environments (e.g., high temperature, high radiation area)

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POV Detailed Review

- Approximately 10 POVs will be selected for a detailed review and assessment of operational readiness to perform their design-basis functions.
- Selection will be based on performance assumptions (such as valve factor, stem friction coefficient, rate of loading, degraded voltage, bearing torque coefficient, and uncertainties) and margin assessment.
- Sample size may be expanded based on inspection experience with specific types of POVs and their valves.

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Scope

- Sampled POVs will be evaluated to be within scope of licensee's activities consistent with NRC regulations.
  - Sampled POVs are being addressed by applicable regulatory requirements, such as 10 CFR 50.55a (IST), 10 CFR 50.49 (environmental qualification), and Appendix B to 10 CFR Part 50 (quality assurance).
  - Licensee is implementing applicable ASME OM Code as incorporated by reference in 10 CFR 50.55a for IST program for sampled POVs.
  - Licensee is implementing applicable commitments to provide reasonable assurance of POV capability, such as GLs 89-10, 95-07 and 96-05.

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Design

- Sampled POVs will be evaluated for capability of performing design-basis functions to meet applicable regulatory requirements and commitments.
  - Evaluation of licensee design bases documentation demonstrating that sampled POVs are capable of performing their design-basis functions and meet applicable codes and commitments, including design documents and calculations for POV functional requirements under normal, abnormal, and accident conditions.
  - Confirm adequacy of POV operating requirements and actuator sizing; methods for selecting, setting, and adjusting POVs, as applicable; and modifications to system or valves that could affect POV capability in as-modified configuration.

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Testing

- Evaluate whether testing of sampled POVs satisfies regulatory requirements and commitments for POV design-basis capability, and Preservice Test (PST) and Inservice Test (IST)
  - Confirm adequacy of documents for verification of POV design-basis capability.
  - Ensure that PST and IST procedures satisfy ASME OM Code as incorporated by reference in 10 CFR 50.55a.
  - Confirm adequacy of test equipment and instrumentation, including calibration.
  - Verify training of licensee evaluation and test personnel.
  - Confirm proper test acceptance criteria.
  - Evaluate test results for sampled POVs.
  - If testing is conducted during inspection, review ongoing testing activities for sampled POVs and evaluate test results.

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Maintenance

- Evaluate maintenance activities including walkdown of sampled POVs.
  - Review available POV monitoring reports, failure analyses, corrective actions, nonconformance reports, or other plant documents that may indicate that a POV is not properly sized, has improper settings, or is not properly maintained, as applicable.
  - Review POV preventive maintenance to determine whether it is appropriate for frequency of operation, working environment, and operational experience.
  - Determine whether licensee is periodically reviewing information related to POV failures and effectiveness of corrective actions.

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Maintenance
(cont'd)

- Review sample of POV maintenance packages and determine whether post-maintenance tests and results demonstrate that POVs are capable of performing their design-basis functions.
- Review adequacy of licensee's processing and control of POV operating experience information and vendor notifications.
- Evaluate implementation of licensee's activities to periodically verify POV design-basis capability.
- Review significant changes made in activities affecting sampled POVs since previous NRC reviews or inspections.

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QUESTIONS?

Future Questions

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