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Motor-Operated Valve Regulatory Activities

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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
- Design Bases Assurance Inspection (Programs) for Power Operated Valves (POVs) Findings

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50.55a Rulemaking

- Ongoing rulemaking for ASME OM Code (2020 Edition) with conditions.
- Proposed rulemaking is scheduled to be published in the *Federal Register* and issued for public comment in the spring of 2021.
- Public comment period will be 60 days.
- Final rule currently scheduled to be published in the spring of 2022.

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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).
- Incorporate by reference Subsection ISTE in the ASME OM Code (2020 Edition) without conditions.
- Modify 10 CFR 50.55a(f)(4) to clarify relationship between 50.55a(f)(4) and (g)(4) regarding the inservice testing or inservice inspection programs for snubbers.
- Consideration of proposed relaxation of the interval for position indication testing required in ISTC-3700 for valves that are not susceptible to stem-disk separation.

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RG 1.192 Operation and Maintenance Code Case Acceptability, ASME OM Code

- RG 1.192 lists OM Code Cases that are acceptable to the NRC with or without conditions.
- RG 1.192, Revision 3, is applicable to OM Code Cases published up to the 2017 Edition of the ASME OM Code.
- NRC staff has reviewed new Code Cases (OMN-22 through OMN-27) and revised Code Cases up to the 2020 Edition of the ASME OM Code. Proposed rulemaking and RG for these Code Cases scheduled to be published early 2021 with 60 day comment period.

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Design Bases Assurance Inspection (Programs) for Power Operated Valves (POVs) 2020 Inspection Findings

POV Inspection Findings 2020

- A total of 18 sites / 30 plants inspected in 2020
- Inspection at each site focused on a select 8 – 12 POVs including
  - motor-operated valves (MOVs),
  - air-operated valves (AOVs),
  - hydraulic-operated valves (HOVs),
  - solenoid-operated valves (SOVs), and
  - squib valves
- Many inspections were conducted using remote means due to COVID-19.

POV Inspection Findings 2020

- Many remote inspections conducted walkdowns onsite, or used resident inspectors as proxy in conducting walkdowns.
- Early communications between NRC inspectors and licensee staff were instrumental in focusing the inspection on safety significant and risk-informed valve samples.

POV Inspection Findings 2020

- 8 Green Non-Cited Violations (NCVs) identified.
- Multiple minor and licensee identified violations
  - Many licensee identified violations were found using experience from first two POV inspections
- Findings were collated into 14 high level event categories and presented at a public meeting held on December 8, 2020.

POV Inspection Findings 2020 – Issue # 1

1. IST Programs were not fully consistent with the ASME OM Code as incorporated by reference in 10 CFR 50.55a for POVs within the scope of the ASME OM Code. Licensees need to update their IST Program Plans every 120 months including appropriate POV risk rankings for risk-informed approaches.

POV Inspection Findings 2020 – Issue # 1

- Many licensees are testing MOVs in accordance with Joint Owners Group (JOG) Periodic Verification Program.
- JOG diagnostic test program intervals are based on risk and margin.
- Licensees periodically update component risk value. In some instances, the updated risk is not being reviewed by MOV program engineer and/or an expert panel. The updated risk value can cause some MOVs to require their JOG diagnostic test interval to change.
- Some POV safety functions are not captured in IST program plan. One Plan included Close function only but POV also has an Open function under certain conditions.

POV Inspection Findings 2020 – Issue # 2

2. Some licensees did not address the ASME OM Code, Appendix III, requirement for a mix of static and dynamic testing of MOVs. For MOVs within JOG program scope, licensees may rely on dynamic testing conducted as part of JOG program to satisfy Appendix III requirement for a mix of static and dynamic testing.

POV Inspection Findings 2020 – Issue # 2

- Mandatory Appendix III requires a mix of static and dynamic testing to check and monitor valve performance. The mix can be altered when justified by engineering evaluation of test data.
- Some licensees are installing new valves and not performing dynamic testing.
- For licensees implementing the JOG program, a new valve requires re-establishing its qualifying basis and/or determining the current operating valve friction value to compare against the JOG stated threshold value.
- Appendix III MOVs require a one time design basis verification. This verification must be repeated for valve modifications.

POV Inspection Findings 2020 – Issue # 3

3. Licensee modified their original plans in their response to GL 96-05 (e.g., not implementing certain provisions of the JOG program), which invalidated supporting NRC safety evaluation. To modify a GL 96-05 program, a licensee should follow its NRC-accepted commitment change process and notify the NRC in accordance with that process.

POV Inspection Findings 2020 – Issue # 3

- Licensees implementing the JOG program is a commitment made when responding to Generic Letter (GL) 96-05.
- JOG program is a diagnostic testing plan for MOVs.
- JOG diagnostic test intervals are based on risk and margin.
- JOG program plan does not include grace periods. Some licensees are exceeding the JOG test interval without justification.
- Licensees need to follow their commitment change process if they are planning to deviate from the JOG program plan.

POV Inspection Findings 2020 – Issue # 4

4. Some licensees were not properly determining the operating requirements for POVs to perform their safety functions. For example, appropriate parameters for calculating valve operating requirements and actuator capability (such as valve friction coefficients, maximum differential pressure conditions, motor torque temperature derating factors, stem friction coefficients, and butterfly valve bearing friction coefficients) need to be adequately addressed.

POV Inspection Findings 2020 – Issue # 4

- Need to evaluate impact of radiation hot spot on environmental qualification (EQ) actuator life.
- Need to assume appropriate temperature when calculating motor derate value.
- Need to address potential side loading on globe valves under high flow conditions.
- Non-conservative torque values being used on overthrust events.
- JOG guidance for determining friction value sometimes not followed.
- Need to justify use of friction values obtained from outside sources.

POV Inspection Findings 2020 – Issue # 4

- Incorrect parameters used in calculations (e.g., stem pitch/lead, tested valve factor greater than design, and incorrect uncertainty values from ComEd White Paper 125).
- Need to ensure new software being used for calculations and trending is carried over to calculation of record.
- Procedures specified that measured stem friction values for AOVs should be less than the design values, but measured values (which were greater) were being used and not evaluated appropriately.

POV Inspection Findings 2020 – Issue # 5

5. Some licensees incorrectly assumed that the valve friction coefficients determined for MOVs as part of the JOG Program on MOV Periodic Verification represented a database of friction coefficients that can be applied in general to calculate the thrust and torque required to operate various MOVs under design-basis conditions.

POV Inspection Findings 2020 – Issue # 5

- JOG periodic verification program plan was developed to determine which valves under specific conditions are susceptible to degradation over time.
- JOG final plan was never designed to be a “database” of bounding friction values
  - Diagnostic test data analysis was never questioned or reviewed for consistency
  - No knowledge on plant preventive maintenance (PM) programs for maintaining components or specific environmental conditions
  - During development of JOG program plan, industry specified to NRC staff that the program plan was intended to determine degradation over time, and that valve friction threshold values were not intended to be used to justify a valve with no additional dynamic testing.

POV Inspection Findings 2020 – Issue # 6

6. Some licensees had not established methods to periodically demonstrate the design-basis capability of their MOVs that are JOG Class D valves (valves outside JOG scope). Static diagnostic testing does not provide information on the operating requirements related to differential pressure and flow.

POV Inspection Findings 2020 – Issue # 6

- JOG program did not test all makes and model valves (such that some valves are outside the JOG scope called Class D valves)
- Licensees need to develop their own plans for Class D valves.
- 10 CFR 50.55a(b)(3)(ii) requires MOVs to be tested per the ASME OM Code and must have a program that periodically demonstrates the capability of the MOV to satisfy its design-basis safety function.
- In Regulatory Issue Summary (RIS) 2011-13, the NRC staff discusses an acceptable approach for licensees to address Class D JOG valves.

POV Inspection Findings 2020 – Issue # 7

7. Some licensees that evaluated MOVs using the Electric Power Research Institute (EPRI) MOV Performance Prediction Methodology (PPM) did not address all of the applicable provisions when implementing the EPRI MOV PPM to determine valve operating requirements.

POV Inspection Findings 2020 – Issue # 7

- Some licensees are applying EPRI PPM to valves that were not covered by the EPRI PPM test program.
- EPRI PPM report states that the method is based on testing of valves known to be in good operating condition. For the PPM to remain valid, end users must ensure that the internals remain in good condition.
- End users are extending the limits of PPM (e.g., stainless steel materials can be subject to galling above 150 degrees).

POV Inspection Findings 2020 – Issue # 8

8. Some confusion exists in the nuclear industry with respect to the justification for increasing the thrust ratings for certain Limitorque motor actuators. For example, Limitorque Technical Update 92-01 allows 140% actuator thrust rating with conditions, while some licensees assumed a higher thrust increase.

POV Inspection Findings 2020 – Issue # 8

- Limitorque Technical Update (TU) 92-01 allows actuator thrust limit increase to 140% with conditions based on KALSI Engineering Report 1707C.
- KALSI Report 1707C intended to allow actuator thrust limit increase to 162% with conditions based on testing funded by Duke Energy
- Limitorque TU 92-01 is its official position; however, Limitorque has approved use of KALSI Report 1707C for Duke Energy and other participating licensees to extend actuator thrust limit to 162%.

POV Inspection Findings 2020 – Issue # 8

- Limitorque has stated that licensees that have the proprietary KALSI 1707C report can use this as justification to extend actuator increase to 162% without Limitorque approval.
- Limitorque has no plans to update TU 92-01.

POV Inspection Findings 2020 – Issue # 9

9. Some POV testing was not conducted properly and results not adequately evaluated to demonstrate the POVs can perform their safety functions. For example, POV test acceptance criteria must be properly translated from design calculations to test procedures.

POV Inspection Findings 2020 – Issue # 9

- Overthrust event evaluated for a Limitorque SMB-0 actuator when it should have evaluated an SMB-00 actuator.
- Several instances of changes to design calculations did not translate new acceptance criteria into test procedures.
- Testing not completed for MOV thermal overload devices (GL 89-10, Supplement 1, Question 21).

POV Inspection Findings 2020 – Issue # 9

- Diagnostic sensor placed in the wrong position (above anti-rotation device) causing as-found data to be incorrect.
- Licensees not evaluating tested data (e.g., measured valve factor (VF) greater than design, and stem factor not evaluated for change).
- Used JOG threshold valve friction value in design calculation even after tested value much greater.

POV Inspection Findings 2020 – Issue # 10

10. Some licensees with MOVs that have a safety function to close are setting the motor control switch trip circuit to be controlled by the limit switch gear train instead of the torque switch.

POV Inspection Findings 2020 – Issue # 10

- Valves with safety function to close are being set by limit switch control instead of torque switch. This is acceptable where certain considerations are addressed:
  - If a valve has a leakage requirement and is required to close under dynamic conditions (flow and pressure), setting up the limit switch control under static conditions (no pressure or flow) needs to have reasonable assurance that the valve will meet its leakage requirement when it performs its safety function. This can be accomplished via setting the valve close limit under expected dynamic conditions in-situ or in a test facility.

POV Inspection Findings 2020 – Issue # 11

11. Some licensees did not provide additional attention to the qualified life of POVs installed in their nuclear power plants.

POV Inspection Findings 2020 – Issue # 11

- Limitorque has qualified its safety-related actuators for 40 years of operation or 2000 cycles, whichever comes first.
- EPRI Technical Report 1016701, Limitorque Actuator Fatigue Life Extension, provides a method to extend the qualified life of Limitorque actuators to 60 years of operation or 4000 cycles, provided certain conditions and restrictions are satisfied.
- Radiation hot spots can affect qualified life.
- Licensees need to ensure that replacement frequencies are performed as specified in plant procedures.

POV Inspection Findings 2020 – Issue # 12

12. Some licensees did not properly implement the guidance provided by the Boiling Water Reactor Owners Group (BWROG) when assessing the susceptibility for separation of the stem-disk connection in Anchor/Darling double-disk gate (DDG) valves.

POV Inspection Findings 2020 – Issue # 12

- BWROG guidance for Anchor/Darling DDG valves needs to be followed in evaluating stem-disk connection weak link under a motor stall event.
- Some licensees have a weak link justification for the stem-disk connection for Anchor/Darling DDG valves that are determined to be non-susceptible, and do not require additional attention in response to the stem-disk connection failure issue.

POV Inspection Findings 2020 – Issue # 13

13. There appears to be confusion in the nuclear industry with respect to the condition in 10 CFR 50.55a(b)(3)(xi), “OM condition: Valve Position Indication,” associated with ISTC-3700, “Position Verification Testing,” in Subsection ISTC of the 2012 Edition, and later editions, of the ASME OM Code. The NRC regulations require implementation of the condition upon updating the IST Program to the 2012 or later edition of the ASME OM Code.

POV Inspection Findings 2020 – Issue # 13

- In the 2017 rulemaking to incorporate by reference the 2012 Edition of the ASME OM Code in 10 CFR 50.55a, the NRC staff included 10 CFR 50.55a(b)(3)(xi) to supplement the implementation of the valve position verification requirements in paragraph ISTC-3700 of the ASME OM Code.
- 10 CFR 50.55a(b)(3)(xi) is a condition on paragraph ISTC-3700 effective when licensees update their IST program plan to the 2012 Edition of the ASME OM Code.

POV Inspection Findings 2020 – Issue # 13

- When performing ISTC-3700 under the requirements of 2012 Edition, licensees shall verify that valve operation is accurately indicated by supplementing valve position indicating lights with other indications, such as flow meters or other suitable instrumentation to provide assurance of proper obturator position for valves with remote position indication.
- The proposed rulemaking would have had the condition become effective 30 days after publication of the final rule in the *Federal Register*. Addressing public feedback, NRC changed the rule to become effective when updating to the 2012 Edition of the OM Code.
- The new condition does not start a new 2-year clock.

POV Inspection Findings 2020 – Issue # 14

14. Inspectors found issues with POV preventive maintenance.

POV Inspection Findings 2020 – Issue # 14

- Licensees need to justify their POV preventive maintenance schedules based on vendor recommendations and their own plant experience:
  - MOVs in high temperature areas might require more frequent stem cleaning and lubrication
  - As-found degraded grease needs to be evaluated for its potential impact on performance assumptions
- MOVs installed in non-normal position may need additional evaluation for PM activities:
  - MOVs installed with limit switch cover facing down may have grease intrusion over time with potential to cause electrical contact issues
  - MOVs installed horizontally can experience abnormal increase in friction values on disk/seat over time

POV Inspection Findings 2020 – Issue # 14

- Temporary shielding needs be addressed if installed permanently.
- Where specified in plant procedures, tracking and trending of maintenance activities should be conducted in a timely manner (e.g., a licensee missed a procedure requirement to prepare a track and trend report within 90 days after each refueling cycle).

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QUESTIONS?

Future Questions

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