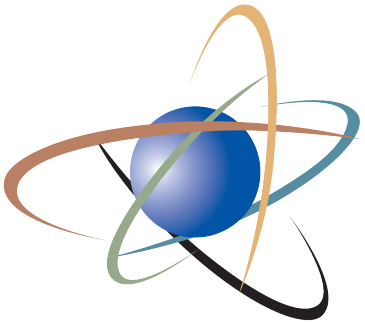

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# Motor-Operated Valve Regulatory Activities

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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.

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# Current MOV Issues/Activities

- 50.55a Rulemaking
- Regulatory Guide 1.192 Revision 1
- 2016 MOV Events/Issues/Activities
  - 2016 MOV event summary
  - MOV T-Drains
  - Thermal Overload Protection
  - Active vs. Passive
  - PPM Calc
  - Appendix III Section III-3300(c) – “The inservice test will include a mix of static and dynamic MOV performance testing.”

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# 50.55a Rulemaking

- Rulemaking for ASME OM Code 2009 Edition, 2011 Addenda, and 2012 Edition completed
- Published in the Federal Register and issued for public comment September 2015
- Public comment period ended 12/2/2015
- NRC staff completed addressing public comments
- Final rule scheduled to be published February/March 2017
- Final rule takes effect 30 days after being published in the Federal Register

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# 50.55a Rulemaking – Impact on MOV

- Mandatory Appendix III will now be required when updating to the next 10 Year IST interval
- ASME OM Code Case OMN-20 “Inservice Test Frequency” endorsed by NRC (grace period)
- MOV program will now be a requirement vs. a commitment
- MOV program scope likely to increase when transitioning from MOV program commitment to IST program requirement

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# 50.55a Rulemaking

- Rulemaking for ASME OM Code 2015 Edition has started
- Current schedule to be published for public comment April 2017
- If final draft of 2016 Edition of the OM Code is made available by late 2016, NRC staff to consider incorporating by reference in 10 CFR 50.55a with 2015 Edition
- Items of interest in the proposed rulemaking:
  - Add NRC IST Plan submittal and reporting requirements
  - Relax time schedule for complying with the latest edition and addenda for IST and IST programs from 12 months to 18 months

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

- Regulatory guide lists OM Code Cases that are acceptable to the NRC for implementation in the Inservice Test (IST) of light-water-cooled nuclear power plants
- Revision 1 to RG 1.192 (NRC approval of ASME OM Code Cases, 2002-2006 Edition / Addenda) – Approved and effective in the Federal Register 12/05/2014
- RG 1.192 Revision 2 to be issued after final rulemaking is published (tentatively April 2017)
- ASME OMN-1 is acceptable as an alternative to MOV quarterly stroke-time testing using periodic diagnostic testing and exercising with conditions

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# 2016 MOV Event Summary

- OE data (LER, Part 21, Inspection Reports, NOV, etc.) 6 events
  - 3 events due to failed circuitry
  - 2 events due to human performance
  - 1 event due to stem/disk separation
  - 1 event due to disk/seat binding (flexible wedge gate)
- INPO ICES data review – 12 additional events
  - 6 events due to failed circuitry
  - 2 events due to wear, FME or material fatigue
  - 4 events due to human performance

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# MOV T-drains on EQ Motors

- Are T-drains required to be installed on actuators located inside containment?
- IEEE Std 382-1972 “IEEE Trial Use Guide for Type Test of Class I Electric Valve Operators for Nuclear Generating Stations”
  - Draft standard developed to provide direction for establishing a type test that will yield data which verifies that Class I electric valve operators for nuclear power stations can meet their design basis performance requirements
  - This draft standard was later incorporated into IEEE Std 323-1974 “IEEE Standard for Qualifying Class IE Equipment for Nuclear Power Generating Stations”

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# MOV T-drains on EQ Motors

- Regulatory Guide (RG) 1.73 endorsed IEEE Std 382-1972, with conditions, in January 1974
- RG 1.89 endorsed IEEE Std 323-1974, with conditions, in November 1974
- Plants being built after 1974 needed to implement the guidance noted in these regulatory guides
- Mid 70's, in response to a petition from the Union of Concerned Scientists, NRC initiated a series of actions to confirm environmental qualification of electrical equipment required to perform a safety function under postulated accident conditions

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# MOV T-drains on EQ Motors

- Results of NRC initiative was captured in IE Circular 78-08 dated May 31, 1978
  - Plants needed to examine installed safety related EQ equipment and ensure appropriate documentation of its qualification to function under postulated accident conditions
  - Specific guidance can be found in IEEE 323-1971 and 1974 as augmented by RG 1.89
  - This circular was later beefed up with Bulletin 79-01 “Environmental Qualification of Class IE Equipment” which in short said plants needed to re-review their EQ program as described in Circular 78-08

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# MOV T-drains on EQ Motors

- Limitorque responded to the additional requirements by performing additional testing and documented its results in report B0058 “Limitorque Valve Actuator Qualification For Nuclear Power Station Service Report B0058 Tests Conducted Per IEEE 382-1982, 323-1974, and 344-1975” dated 1/11/1980
  - Report stated that tests were completed with the actuator mounted in the worst possible configuration which was limit switch compartment facing up with the motor mounted horizontally. This configuration allows condensate to collect in the unit to flow through the motor which could damage insulation
  - T-drains were installed to permit motors to breathe and allow condensation to flow out

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# MOV T-drains on EQ Motors

- Under the design section of report B0058, Limitorque states that T-drains are installed for those actuators located inside containment to accommodate extreme temperatures and pressures of containment design basis event environments
- This statement was clarified by the Nuclear Utility Group on Equipment Qualification (NUGEQ) in report "Clarification of Information Related to the Environmental Qualification of Limitorque Motorized Valve Operators" dated August 1989
  - Report was generated in response to industry receiving violations for various reasons

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# MOV T-drains on EQ Motors

- NUGEQ report stated that Reliance Rad H and Class B motors were tested by Limitorque without T-drains and recommended by Limitorque to not install
- Industry pushed back on receiving violations providing analysis that showed MOV would operate to its safety position before it would encounter conditions that would require the use of a T-drain

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# MOV T-drains on EQ Motors

- NRC staff acknowledged industry response and issued an internal memo to NRC staff on 3/21/1989:
  - Experience has shown that licensees are often able to develop sufficient data to demonstrate that operators with missing T-drains are qualifiable for the application in question. Therefore, significance of missing T-drains should be examined on a case by case basis”
- Are T-drains required? – Yes and No
  - Limitorque states in its test report that T-drains are part of the design configuration for MOVs inside containment

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# MOV T-drains on EQ Motors

- Are T-drains required? – Yes and No (cont'd)
  - IEEE 323-1974 has a requirement for test procedures that equipment shall be mounted in a manner and a position that simulates its expected installation
  - IEEE 323-1974 also states that qualification by analysis is acceptable
- Related documents on this issue:
  - Generic Letters GL 85-15, GL-8615, & GL 88-07
  - NUREG-0588 "Interim Staff Position On Equipment Qualifications Of Safety-Related Electrical Equipment"
  - IEEE 382-1972 (ADAMS accession No. ML032200228)
  - IEEE 323-1974 (ADAMS accession No. ML032200206)

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# Thermal Overload Protection

- Typical MOV motors are intermittent duty, high torque design
- Prolonged operation can generate heat high enough that can damage motor internal wiring
- Thermal overload protection for MOVs can be categorized as:
  - thermal overload relays, usually housed in the motor starter
  - temperature-sensing elements that are embedded in the motor windings
- Do you have to test these devices periodically?

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# Thermal Overload Protection

- Yes – For devices that are connected as part of the MOV circuitry (question 21 in GL 89-10 supplement 1 "Results of Public Workshops" (ADAMS ML031140169)
- Guidance is provided in:
  - Regulatory Guide RG-1.106 "Thermal Overload Protection for Electric Motors on Motor-Operated Valves"
  - IEEE 741-2007 "Standard Criteria for the Protection of Class 1E Power Systems and Equipment in Nuclear Power Generating Stations"
  - IEEE 603-2009 "Standard Criteria for Safety Systems for Nuclear Power Generating Stations"
  - IEEE 1290-2015 "Guide for Motor-Operated Valve Motor Application, Protection, Control, and Testing in Nuclear Power-Generating Stations"

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# ASME OM Code Active vs. Passive

- ASME OM Code Definitions:
  - Valves active: valves that are required to change obturator position to accomplish a specific function in shutting down a reactor to the safe shutdown condition, maintaining the safe shutdown condition, or mitigating the consequences of an accident.
  - Valves passive: valves that maintain obturator position and are not required to change obturator position to accomplish the required function(s) in shutting down a reactor to the safe shutdown condition, maintaining the safe shutdown condition, or mitigating the consequences of an accident.

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# ASME OM Code Active vs. Passive

- Can a passive valve be out of its safe position as long as it is under administrative control?
  - NUREG-1482 Revision 2, Section 2.4.2 states that “A valve need not be considered “active” if it is only temporarily removed from service or from its safety position, such as manually opening a sample valve for a short time to take a sample, while maintaining administrative control over the valve.”
  - NUREG-1482 statement was meant as a convenience from the ASME OM Code requirement and only on a temporary short term basis
  - If MOV moved to non-safe position manually and returned to the safe position manually, verification that the MOV is electrically ready to perform would be necessary

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# ASME OM Code Active vs. Passive

- Can a passive valve be out of its safe position as long as it is under administrative control? (cont'd)
  - If a plant administratively holds a valve for long periods of time in the non-safety position, NRC staff would consider these valves to be "active" because they would have to be moved to their safety position during a design basis event

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# EPRI Performance Prediction Methodology (PPM)

- EPRI PPM is a computational methodology to be used in demonstrating the design basis capability of MOVs when valve specific test data is not available. Key elements include:
  - System Flow Model
  - Gate Valve Model
  - Globe Valve Model
  - Butterfly Valve Model
- EPRI TR-103237 “EPRI MOV Performance Prediction Program”
- NRC SE issued 3/15/1996 on Rev.1 (ML15142A761)

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# EPRI Performance Prediction Methodology (PPM)

- NRC safety evaluation approves PPM with conditions
- PPM model predicts the thrust and/or torque requirements to operate gate, globe, and butterfly valves under specified fluid conditions and differential pressures
- Key elements for PPM to remain valid:
  - Use of the computer model assumes that the valve is in good condition
  - Model users will need to establish an adequate internal valve preventive maintenance program

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# Appendix III Section III-3300(c)

- Inservice testing program will include a mix of static and dynamic MOV performance testing
- Static Testing:
  - Verifies the actuator settings to insure the MOV will perform its safety function
  - Verifies and trends friction factors in the stem-to-stem nut interface
  - Verifies limit switch settings
  - Verifies running loads such as packing forces and motor current
  - Monitor and trend stem nut wear
  - Monitor overall actuator performance

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# Appendix III Section III-3300(c)

- Dynamic Testing:
  - Verifies MOV will perform its intended safety function
  - Verifies valve factor
  - Additional dynamic tests may be needed to be performed until the valve factor has reached a plateau
  - Verifies and trends rate of loading (ROL)
  - Periodic dynamic testing may be needed to determine if a valve is susceptible to degradation over a long period of operation (applicable to valves that were not included in the Joint Owners Group (JOG) MOV final program)

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# QUESTIONS?

**Future Questions**

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