



# Regulatory Perspectives on Mandatory Appendix IV: Inservice Testing (IST) of Air-Operated Valves (AOVs)

Jason Carneal  
U.S. Nuclear Regulatory Commission

# Background: Air Operated Valve History

- [GL-88-14](#) : “Instrument Air Supply System Problems Affecting Safety-Related Equipment”
- [GL-89-10](#) : “Safety-Related Motor-Operated Valve Testing and Surveillance”
- [GL 96-05](#) : “Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves”
- AOVs were included in [Generic Safety Issue \(GSI\) 158](#), “Performance of Safety-Related Power-Operated Valves under Design Basis Conditions”
- Issues with performance of Air-Operated Valves (AOVs) , including common-cause failures, were documented in [NUREG-1275, Volume 13](#) and [NUREG/CR-6654](#)
- Nuclear Regulatory Commission (NRC) staff comments on the Joint Owner’s Group [AOV Program Document](#) are contained in a [letter from NRC](#) to NEI dated October 8, 1999

# Background: The Need for Mandatory Appendix IV

- [RIS 2000-03](#): Documented the resolution of GSI-158 and stated that the NRC would continue to work with industry to ensure that power operated valves are capable of performing their specified functions under design basis conditions
- NRC staff have pursued use of the ASME Code for Operation and Maintenance of Nuclear Power Plants (OM Code), a national consensus standard, to resolve remaining concerns with AOV performance
- Efforts have resulted in the development of Mandatory Appendix IV, “Preservice and Inservice Testing of Active Pneumatically Operated Valve Assemblies in Light-Water Reactor Power Plants”

# Mandatory Appendix IV: Development and Publication Status

- Mandatory Appendix IV, Revision 0 was approved by ASME in 2013
- ASME OM Subgroup on Air-Operated Valves (SG-AOV) is currently developing Revision 1 of Mandatory Appendix IV
- Mandatory Appendix IV will be included in 2014 Edition of the ASME OM Code
- Publication in the ASME OM Code begins official NRC review process for incorporation by reference in 10 CFR 50.55a
- NRC conditions (if any) on the use of Mandatory Appendix IV will be determined during NRC rulemaking process

# Design Review Requirements

- Appendix IV, Section IV-3100 requires a design review for each AOV to meet its intended function
- Design review establishes the required loads, output capability, limits, margin, etc., and uses one of the following methods to verify design basis capability of the valve:
  - Test at or near design basis conditions (in situ or prototype facility)
  - Analytical techniques where justified by an engineering evaluation
  - Data from other valves if justified by an engineering evaluation
  - Grouping at plant with similar valves
  - Operating experience for certain valve types
- Bottom line: Establish reasonable assurance that AOVs will perform their safety function under design basis conditions, based on sound engineering practices

# Diagnostic Testing Requirements

- Mandatory Appendix IV requires a Preservice Test and Inservice Diagnostic Tests every 3 refueling cycles or 6 years (whichever is longer)
- Licensee shall consider more frequent testing for AOVs with high safety significance, adverse environment, or low margin
- Exemption in Section IV-3410(d) - if normal operation provides adequate demonstration, Diagnostic Testing may be omitted provided that periodic cycling conditions meet or exceed the design basis conditions
- Grouping of AOVs for inservice diagnostic testing is allowed per Section IV-3600

# Risk Categorization – Optional

- Mandatory Appendix IV allows categorization of valves as HSSC/LSSC using a risk categorization technique
- Initial Diagnostic test, Stroke Testing, and Fail Safe Testing are required for both HSSC and LSSC AOVs
- Regular Diagnostic Testing required for HSSC AOVs
- Regular Diagnostic Testing not required for LSSC AOVs
- Method used to categorize components must be approved by NRC
- For more information on NRC's policy on the use of risk information, see [RG 1.174](#), "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis"

# Overview of NRC Rulemaking Process

- In order to make changes to 10 CFR 50.55a, NRC staff follows the [NRC rulemaking process](#)
- Rulemaking process includes the following steps:
- Development of Proposed Rule includes technical review by NRR and NRO, legal and upper management reviews
- Proposed Rule is published in the Federal Register (FR)
- Public comment period (typically 75 to 90 days)
- Comment resolution period and concurrence on Final Rule
- Final Rule is published in the FR
- Effective date of the Final Rule is generally 30 days after the date of FR publication

# NRC Perspectives on Implementation of Mandatory Appendix IV

- Mandatory Appendix IV will first appear in the 2014 Edition of the ASME OM Code
- Using the rulemaking for the 2012 Edition of the ASME OM Code as an example, the estimated schedule for the 2014 Edition would be:
  - Proposed Rule published in Federal Register 4QFY16 (tentative)
  - Final Rule published in Federal Register by 4QFY17 (tentative)
- Final Rule becomes effective, in general, 30 days after the date of publication in the FR.
- IST program intervals beginning 12 months after the effective date of the Final Rule need to incorporate the requirements of the 2014 Edition of the ASME OM Code (tentatively by 4QFY18)

# Code Applicability and Relief Request Process

- 10 CFR 50.55a(f)(4)(ii) states that IST programs must comply with the requirements of the ASME OM Code incorporated by reference in 10 CFR 50.55a(b)(3) 12 months prior to the start of the IST interval
- The 12 month criterion is applied to the date the Final Rule becomes effective
- Licensee's may request alternatives to or relief from the requirements of the ASME OM Code as per 10 CFR 50.55a(a)(3) and 50.55a(f)(5)(iii) & (iv), respectively
- Relief or alternative requests from requirements of the 2014 Edition (including Appendix IV) would require review and approval prior to use
- For new or complex relief requests, NRC staff recommends early submittal of relief request to ensure adequate review time

# NRC Oversight, Inspections, and Involvement with Appendix IV / IST Programs

- NRC understands that Mandatory Appendix IV is a national consensus standard, and anticipates relief or alternative requests from plants that are not able to meet all requirements of Mandatory Appendix IV
- NRC oversight of IST programs is handled by regional NRC staff and resident inspectors (see [Inspection Procedure 73756](#))
- NRR serves as a technical point of contact for resident inspectors when IST program or operability questions arise in the field
- NRC periodically reviews operating experience to monitor effectiveness of programs and policies
- Experience from implementation and oversight will be included in NRC participation on the ASME OM SG-AOV

# Contact / Questions?

Jason Carneal

(301) 415-1451

[jason.carneal@nrc.gov](mailto:jason.carneal@nrc.gov)