HITACHI

GE Hitachi Nuclear Energy

James C. Kinsey
Vice President, ESBWR Licensing

PO Box 780 M/C A-55
Wilmington, NC 28402-0780
USA

T 910 675 5057
F 910 362 5057
jim.kinsey@ge.com

MFN 08-393

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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 166 Related to ESBWR Design Certification Application - Design of Structures, Components, Equipment, and Systems - RAI Numbers 3.9-178 S01, 3.9-188 S01, and 3.9-189 S01**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) received from the NRC March 28, 2008, via Reference 1. Enclosure 1 contains GEH's response to RAIs 3.9-178 S01, 3.9-188 S01 and 3.9-189 S01.

Previously, GEH responses to RAIs 3.9-178, 3.9-188, and 3.9-189 were submitted via Reference 2 in partial response to NRC Letter No. 24 (Reference 3).

Verified DCD changes associated with this RAI response are identified in the enclosed DCD markups by enclosing the text within a black box. The marked-up pages may contain unverified changes in addition to the verified changes resulting from this RAI response. Other changes shown in the markup(s) may not be fully developed and approved for inclusion in DCD Revision 5.

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NRO

Should you have any questions about the information provided here, please contact me.

Sincerely,

James C. Kinsey

James C. Kinsey
Vice President, ESBWR Licensing

References:

1. MFN 08-316, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 166 Related to the ESBWR Design Certification Application,* dated March 28, 2008
2. MFN 08-131, *Response to Portion of NRC Request for Additional Information Letter No. 124 Related to ESBWR Design Certification Application - Mechanical Systems and Components - RAI Numbers 3.9-178, 3.9-180 through 3.9-196 and - Environmental Qualification of Mechanical and Electrical Equipment - RAI Number 3.11-19, dated February 17, 2008*
3. MFN 08-029, *Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, Request For Additional Information Letter No. 124 Related To ESBWR Design Certification Application*, dated January 14, 2008

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 166 Related to ESBWR Design Certification Application – Design of Structures, Components, Equipment, and Systems - RAI Number 3.9-178 S01, 3.9-188 S01, and 3.9-189 S01

cc:	AE Cubbage	USNRC (with enclosure)
	RE Brown	GEH/Wilmington (with enclosure)
	DH Hinds	GEH/Wilmington (with enclosure)
	GB Stramback	GEH/San Jose (with enclosure)
	eDRF	0000-0076-7579, Revision 1

Enclosure 1

MFN 08-393

Response to Portion of NRC Request for

Additional Information Letter No. 166

Related to ESBWR Design Certification Application

Design of Structures, Components, Equipment, and Systems

RAI Numbers 3.9-178 S01, 3.9-188 S01, and 3.9-189 S01

Verified DCD changes associated with this RAI response are identified in the enclosed DCD markups by enclosing the text within a black box. The marked-up pages may contain unverified changes in addition to the verified changes resulting from this RAI response. Other changes shown in the markup(s) may not be fully developed and approved for inclusion in DCD Revision 5.

For historical purposes, the original text of RAIs 3.9-178, 3.9-188, and 3.9-189 and the GE responses are included. These responses do not include any attachments or DCD mark-ups.

NRC RAI 3.9-178

NRC Summary:

Valve design-basis capability verification

NRC Full Text:

Section 3.9.3.5, "Valve Operability Assurance," discusses operability assurance of active Code valves, including the actuator, and states that safety-related valves are qualified by testing and analysis. The American Society of Mechanical Engineers (ASME) has prepared ASME Standard QME-1-2007, "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants," to incorporate lessons learned from nuclear power plant operation and research programs for the design and qualification of the capability of valves (including power-operated valves, check valves, and pressure relief valves) to perform their design-basis functions. The NRC staff is proposing a revision to RG 1.100 to address ASME QME-1-2007. GEH is requested to revise the DCD to incorporate lessons learned for the functional qualification of valves used in nuclear power plants, such as through reference to ASME Standard QME-1-2007.

GEH Response

DCD Section 3.9.3.5 will be revised to discuss functional qualification of valves used in the ESBWR.

DCD Impact

DCD Tier 2, Section 3.9.3.5 will be revised in Revision 5 as noted in the attached markup.

NRC RAI 3.9-178 S01

Question Summary:

Valve design-basis capability verification

Full Text:

GEH is requested to clarify its intention to use ASME QME-1-2007. In response to RAI 3.9-178 in MFN 08-131 (dated February 17, 2008), GEH states that Section 3.9.3.5 in the ESBWR DCD Tier 2 will be revised to state that ASME QME-1-2007 is used as guidance in performing the functional qualification of valves. It is unclear how the standard used as guidance will incorporate lessons learned from nuclear power plant operation and research programs for the design and qualification of the capability of valves.

GEH Response

GEH's intention with regard to use of ASME QME-1-2007 is to meet QME-1 without requiring complete re-qualification of valve designs that have already been qualified to standards other than QME-1-2007. A primary objective of design and qualification of ESBWR valves is to ensure lessons learned from nuclear power plant operations and research programs, many of which are included in QME-1-2007, are considered.

For valve designs developed for the ESBWR that have not yet been qualified, the qualification programs implemented will meet the requirements of QME-1-2007. For valve designs previously qualified to standards other than QME-1-2007, the following approach will be used:

- The ESBWR general valve requirements specification will include requirements related to design and functional qualification of safety-related valves that incorporate lessons learned from nuclear power plant operations and research programs.
- Qualification specifications (e.g., design specifications) consistent with Appendices QV-I and QV-A of QME-1 will be prepared to ensure the operating conditions and safety functions for which the valves are to be qualified are communicated to the manufacturer or qualification facility.
- Suppliers will be required to submit, for GEH review and approval, application reports, as described in QME-1-2007, that describe the basis for the application of specific predictive methods and/or qualification test data to a valve application.
- GEH will review the application reports provided by the suppliers for adherence to specification requirements to ensure the methods used are applicable and justified and to verify any extrapolation techniques used are justified. A gap analysis will be performed to identify any deviations from QME-1-2007 in the valve qualification. Each deviation will be evaluated for impact on the overall valve qualification. If the

conclusion of the gap analysis is that the valve qualification is inadequate, then the valve may be qualified using a test-based methodology, as allowed by QME-1-2007.

- GEH will perform independent sizing calculations, using bounding design parameters (such as sliding friction coefficients), to verify supplier actuator sizing. Commercially available computer software that uses test-based methodologies for predicting valve performance may be used in this effort.

DCD Impact

DCD Tier 2, Section 3.9.3.5 and Table 1.9-22 will be revised in Revision 5 as noted in the attached markup.

All valves and their extended structures are designed to withstand the accelerations due to seismic and other RBV loads. The attached piping is supported so that these accelerations are not exceeded. The stress analysis of these valves is performed using elastic methods. Refer to Subsection 3.9.3.5 for additional information on valve operability.

ASME Class 1, 2 and 3 Piping

The Class 1, 2 and 3 piping (all piping not previously discussed) is constructed in accordance with the Code. For Class 1 piping, stresses are calculated on an elastic basis and evaluated in accordance with NB-3600 of the Code, and fatigue usage is in accordance with Regulatory Guide (RG) 1.207 and NUREG/CR-6909. For Class 2 and 3 piping, stresses are calculated on an elastic basis and evaluated in accordance with NC/ND-3600 of the Code. In the event that a NB-3600 analysis is performed for Class 2 or 3 pipe, all the analysis requirements for Class 1 pipe as specified in this document and the ASME code is performed. Table 3.9-9 shows the specific load combinations and acceptance criteria for Class 1 piping systems. For the Class 1 piping that experiences the most significant stresses during operating conditions, the thermal loads per Equation 12 of NB-3600 are less than 2.4 S_m, and are more limiting than the dynamic loads that are required to be analyzed per Equation 13 of NB-3600. The piping considered in this category is the RWCU/SDC, feedwater, main steam, and isolation condenser steam piping within the containment. These were evaluated to be limiting based on differential thermal expansion, pipe size, transient thermal conditions and high energy line conditions. If Code Case N-122-2 is used for analysis of a class 1 pipe, the analysis complying with this Case is included in the Design Report for the piping system.

For submerged piping and associated supports, the applicable direct external loads (e.g. hydrodynamic etc.) applied to the submerged components is included in the analysis.

3.9.3.5 Valve Operability Assurance

~~Active mechanical (with or without electrical operation) equipment designed to perform a mechanical motion for its safety related function is Seismic Category I. Equipment with faulted condition functional requirements includes active pumps and valves in fluid systems such as the Residual Heat Removal (RHR) System, Emergency Core Cooling System (ECCS), and MS system.~~

This subsection discusses operability assurance of active Code valves, including ~~the~~ actuators ~~that is a part of the valve~~ (Subsection 3.9.2.2).

[Valves that perform an active safety-related function are functionally qualified to perform their required functions. For valve designs developed for the ESBWR that were not previously qualified, the qualification programs meet the requirements of QME-1-2007. For valve designs previously qualified to standards other than ASME QME-1-2007, the following approach is used.

- *The ESBWR general valve requirements specification includes requirements related to design and functional qualification of safety-related valves that incorporate lessons learned from nuclear power plant operations and research programs.*
- *Qualification specifications (e.g., design specifications) consistent with Appendices QV-I and QV-A of QME-1-2007 are prepared to ensure the operating conditions and safety*

functions for which the valves are to be qualified are communicated to the manufacturer or qualification facility.

- *Suppliers are required to submit, for GEH review and approval, application reports, as described in QME-1-2007, that describe the basis for the application of specific predictive methods and/or qualification test data to a valve application.*
- *GEH reviews the application reports provided by the suppliers for adherence to specification requirements to ensure the methods used are applicable and justified and to verify any extrapolation techniques used are justified. A gap analysis is performed to identify any deviations from QME-1-2007 in the valve qualification. Each deviation is evaluated for impact on the overall valve qualification. If the conclusion of the gap analysis is that the valve qualification is inadequate, then the valve may be qualified using a test-based methodology, as allowed by QME-1-2007.*
- *GEH performs independent sizing calculations, using bounding design parameters (such as sliding friction coefficients), to verify supplier actuator sizing.*

*Functional qualification addresses key lessons learned from industry efforts, particularly on air- and motor-operated valves, many of which are discussed in Section QV-G of QME-1-2007.]** For example:

- Evaluation of valve performance is based on a combination of testing and analysis, using design similarity to apply test results to specific valve designs.
- Testing to verify proper valve setup and acceptable operating margin is performed using diagnostic equipment to measure stem thrust and/or torque.
- Sliding friction coefficients used to evaluate valve performance (e.g. disk-to-seat friction coefficients for gate valves and bearing coefficients for butterfly valves) account for the effects of temperature, cycle history, load and internal parts.
- Actuator sizing allows margin for aging/degradation, test equipment accuracy and other uncertainties, as appropriate.
- Material combinations that may be susceptible to galling or other damage mechanisms under certain conditions are not used.

Subsection 3.9.2.2 and Section 3.10 provide details on the seismic qualification of valves. Section 3.11 provides details on the environmental qualification of valves.~~Safety-related valves are qualified by testing and analysis and by satisfying the stress and deformation criteria at the critical locations within the valves. Operability is assured by meeting the requirements of the programs defined in Subsection 3.9.2.2, Section 3.10, Section 3.11 and the following subsections.~~

Section 4.4 of GE's Environmental Qualification Program (Reference 3.9-3) applies to this subsection, and the seismic qualification methodology presented therein is applicable to mechanical as well as electrical equipment.

3.9.3.5.1 Major Active Valves

Some of the major safety-related active valves (Tables 6.2-21, 6.2-42 and 3.2-1) discussed in this subsection for illustration are the main steamline isolation valves and safety relief valves, and

Table 1.9-22

Industrial Codes and Standards[2] Applicable to ESBWR

Code or Standard Number	Year	Title
QME-1-2007	2007	Qualification of Active Mechanical Equipment Used in Nuclear Power Plants
BPVC Sec I	2001 including Addenda through 2003	Boiler & Pressure Vessel Code (BPVC) Section I, Rules for Construction of Power Boilers
BPVC Sec II	2001 including Addenda through 2003	BPVC Section II, Materials Part A Ferrous Material Specifications Part B Non-Ferrous Material Specifications Part C Specifications for Welding Rods, Electrodes, and Filler Metals Part D Properties
BPVC Sec III	2004	BPVC Section III, Rules for Construction of Nuclear Facility Components Division 1: NCA, NE Division 2: CC, NCA Code for Concrete Containments
BPVC Sec III	2001 including Addenda through 2003	BPVC Section III, Rules for Construction of Nuclear Facility Components Division 1: NB, NC, ND, NF, NG Note: All limitations and modifications specified in 10 CFR 50.55a(b)(1) are required to be met.
BPVC Sec V	2001 including Addenda through 2003	BPVC Section V: Nondestructive Examination
BPVC Sec VIII	2001 including Addenda through 2003	BPVC Section VIII: Rules for Construction of Pressure Vessels Div. 1 Div. 2 Alternative Rules
BPVC Sec IX	2001 including Addenda through 2003	BPVC Section IX, Welding and Brazing Qualifications
BPVC Sec XI	2001 including Addenda through 2003	BPVC Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components
BPVC OM Code	2001 including Addenda through 2003	BPVC Code for Operation and Maintenance of Nuclear Power Plants
ASME Steam Tables	1967	Thermodynamic and Transport Properties of Steam

NRC RAI 3.9-188

NRC Summary:

Other power-operated valve (POV) testing

NRC Full Text:

Paragraph b, Other Power-Operated Valve Operability Tests, under Item (1) in Subsection 3.9.6.1.5 states that Power-Operated Valves other than active MOVs are exercised quarterly in accordance with ASME OM ISTC. GEH is requested to revise the DCD to address the implementation of Regulatory Issue Summary 2000-003, "Resolution of Generic Safety Issue 158: Performance of Safety-Related Power-Operated Valves Under Design Basis Conditions."

GEH Response

As discussed in the response to RAI 3.9-189, this paragraph will be deleted from the DCD since quarterly stroking of power-operated valves is covered in Section 3.9.6.1.4, paragraph (1), and design basis verification testing is covered by Section 3.9.3.5.2. Regulatory Issue Summary (RIS) 2000-003 informed the industry of the closure of Generic Safety Issue (GSI) 158, "Performance of Safety- Related Power-Operated Valves Under Design Basis Conditions," and of the NRC staff's intent to continue to monitor activities associated with verification of power-operated valve capability. The RIS also discusses some performance issues and industry initiatives related to air operated valves (AOVs), and discusses a "voluntary initiative" to establish a program to ensure AOVs are designed and set up to perform their intended functions. The RIS mentions the Joint Owners' Group (JOG) AOV Program and the NRC's comments on the JOG AOV Program Document, and also provides a list of attributes of a successful AOV program. However, the RIS requires no actions or written responses.

AOVs in the ESBWR will be functionally qualified to perform their intended function(s) as discussed in the response to RAI 3.9-178. This functional qualification will address some of the successful program attributes in Attachment 1 of RIS 2000-003, for example, thrust/torque prediction methods will incorporate lessons learned from industry efforts, valve weak links will be determined and diagnostic testing will be performed. However, establishment of a voluntary AOV program in response to RIS 2000-003 is the decision and responsibility of the plant license holder. Since such a program is not a regulatory requirement, a COL holder item is not included in the DCD.

DCD Impact

No DCD changes will be made in response to this RAI. DCD Tier #2, Section 3.9.6.1.5 will be revised in Revision 5 as noted in the response to RAI 3.9-189.

NRC RAI 3.9-188 S01

Question summary:

Other power operated valve (POV) testing

Full text:

GEH is requested to indicate that consideration of lessons learned from motor-operated valve (MOV) operating experience for other power-operated valves (POVs) is the responsibility of the COL applicant in developing its Inservice Testing operational program description.

In response to RAI 3.9-188 in MFN 08-131 (dated February 17, 2008), GEH states that the establishment of an air-operated valve (AOV) program in response to Regulatory Issue Summary (RIS) 2000-003, "Resolution of Generic Safety Issue 158: Performance of Safety-Related Power-Operated Valves Under Design Basis Conditions," is the decision and responsibility of the plant license holder. This information should be provided by the COL applicant in fully describing the inservice testing operational program per Commission guidance to enable the NRC staff to reach a safety finding on the ability of the IST program to maintain the design-basis capability of safety-related power-operated valves.

GEH Response

Comment is accepted, and the DCD will be revised as suggested.

DCD Impact

DCD Tier 2, Section 3.9.6.1.5 will be revised in Revision 5 as noted in the attached markup.

- Category D rupture disks are replaced on a 5 year frequency unless historical data indicates a requirement for more frequent replacement, in accordance with Mandatory Appendix I of the ASME OM Code.

  Category D rupture disks are identified in DCD Table 3.9-8.

3.9.6.1.5 Specific Valve Test Requirements

~~(1)Power Operated Valve Exercise Tests~~

~~a.Active Motor Operated Valve Tests~~

~~The inservice operability testing of active motor operated valves relies on nonintrusive diagnostic techniques to permit periodic assessment of the valve's ability to perform its safety-related function during design basis conditions. MOVs upon which inservice testing is performed are identified in Table 3.9-8. Test frequencies are developed in accordance with Generic Letter 96-05 and ASME Code Case OMN-1, Rev. 1 and will not exceed 10 years.~~

~~Inservice testing of active MOVs consists of both static and dynamic testing. The specific testing frequencies are based on the individual valve's risk ranking and functional margin. These factors are described below.~~

~~□Risk Ranking~~

~~The MOV's risk ranking is determined by review of the valve's individual Probabilistic Safety Assessment (PSA) which is documented on the individual component's ranking worksheet and reviewed and approved by an expert panel. Guidance for this process is outlined in the Joint Owners' Group (JOG) Motor Operated Valve Periodic Verification Program Summary [MPR-2524-A].~~

~~□Functional Margin~~

~~Functional margin is that increment by which the MOV's available capability exceeds the capability required to operate the MOV under design basis conditions. The required capability of the MOV is a known, calculated quantity, which is then compared to the valve's actual capability, a measured quantity.~~

~~Diagnostic equipment inaccuracies, degraded voltage, control switch repeatability, load sensitive MOV behavior and margin for degradation are considered in the calculations used to determine the valve's capacity from the valves measured test values.~~

~~The MOV Program utilizes guidance from Generic Letter 96-05 and the Joint Owners Group (JOG) MOV Periodic Verification (PV) study, MPR-2524-A (November 2006).~~

~~**Design Basis Verification Test** – Prior to power operation a design basis verification test is performed upon each active motor-operated valve to verify the capability of each valve to meet its safety-related design basis requirements. The test is performed at conditions that are as close to design basis conditions as practicable. Results from this test are used along with the valves preservice test to develop the valve's initial (periodic verification) testing frequency.~~

~~**Active MOV Test Frequency Determination** – The ability of a valve to meet its design basis functional requirements (i.e. required capability) is verified during the valve's design basis verification test. The preservice test measures the valve's actual actuator output capability. The difference between the two capabilities is termed "functional margin." With the valves functional margin and risk ranking, a periodic verification test interval/frequency is determined. This determined test frequency is first compared to the valve's historical data to verify that any potential valve degradation during the test period would not reduce the functional margin to less than zero prior to the next scheduled periodic verification test. If the data shows that the functional margin may be reduced to less than zero, the frequency is reduced to ensure that the next periodic verification test is performed prior to a loss of functional margin. If there is not sufficient data to determine whether there will be a loss of functional margin prior to the next periodic verification test, the test frequency is limited to not exceed two (2) refueling cycles or three (3) years, whichever is longer, for high risk safety significant components, and is limited to not exceed three (3) refueling cycles or five (5) years, whichever is longer, for low risk safety significant components.~~

~~A motor operated valve with an adequate functional margin is assured of being able to open and/or close under design basis conditions.~~

~~b.Other Power Operated Valve Operability Tests~~

~~Power operated valves other than active MOVs are exercised quarterly in accordance with ASME OM ISTC. Active and passive power operated valves upon which operability testing is performed are identified in Table 3.9-8.~~

~~**Design Basis Verification Test** – Prior to power operation a Design Basis Verification Test will be performed upon each Power-Operated Valve so as to verify the capability of each valve to meet it's safety-related design requirements. The test will be performed at conditions that are as close to design basis conditions as practicable.~~

(1) Power Operated Valve Tests

Power operated valves are tested in accordance with the ASME OM Code, Subsection ISTC. Specific testing activities for each valve are listed in Table 3.9-8. Active power operated valves will have their stroke times measured during the exercise tests. Any abnormalities or erratic actions will be documented and evaluated. Test failures (e.g., failure to fully stroke or high stroke time measurements) will be addressed per the OM Code by repair, replacement or analysis.

The IST program for power operated valves will consider the guidance in the NRC Regulatory Issue Summary 2000-03, which incorporates lessons learned from MOV analyses and tests in response to Generic Letter 89-10. The COL Applicant is responsible for describing, in the IST program description (see COL Item 3.9.9-3-A), how the IST program addresses these lessons learned.

(2) Manual Valve Exercise Tests

Active Category A and B manual valves are exercised once every two years in accordance with 10 CFR 50.55a(b)(3)(vi).

NRC RAI 3.9-189

NRC Summary:

Other POV design basis capability verification

NRC Full Text:

The paragraph titled "Design Basis Verification Test" in Paragraph b under Item (1) in Subsection 3.9.6.1.5 states, prior to power operation, a design-basis verification test is performed upon each Power-Operated Valve (POV) to verify its capability to meet the safety-related design-basis requirements. As discussed with regard to MOVs, the verification of design-basis capability needs to be accomplished for each safety-related POV as part of the design and qualification process prior to installation of the POV in the nuclear power plant. G EH is requested to revise the DCD to indicate the need to verify the design-basis capability of safety-related POVs as part of the design and qualification process prior to installation (such as through application of ASME Standard QME-1-2007).

GEH Response

Paragraph b under Item (1) in Subsection 3.9.6.1.5 will be deleted. Quarterly stroking of power-operated valves is covered in Section 3.9.6.1.4, paragraph (1), and design basis verification testing is covered by Section 3.9.3.5.2. The response to RAI 3.9-178 revises DCD Tier 2, Section 3.9.3.5, to clarify that valves are functionally qualified to perform their required functions as part of "Valve Operability Assurance," using QME-1- 2007 as guidance.

DCD Impact

DCD Tier # 2, Section 3.9.6.1.5 will be revised in Revision 5 as noted in the attached markup.

NRC RAI 3.9-189 S01

Question summary:

Other POV design-basis capability verification

Full text:

GEH is requested to address the "Specific Testing Requirements" in the ASME Code for Operation and Maintenance of Nuclear Power Plants (OM Code), such as stroke-time testing, for POVs. GEH is also requested to indicate that lessons learned from motor-operated valves (MOVs) will be considered for other POVs.

In response to RAI 3.9-189 in MFN 08-131 (dated February 17, 2008), GEH states that the discussion of power-operated valves (POVs) other than MOVs would be deleted from Subsection 3.9.6.1.5 in the ESBWR DCD Tier 2. Safety-related POVs need to satisfy the IST provisions in the ASME OM Code. Also, the NRC Standard Review Plan includes acceptance criteria for the NRC staff to consider lessons learned from MOV operating experience for the capability of POVs to perform their safety functions.

GEH Response

Comment is accepted, and the DCD will be revised as suggested. It is also noted that, as discussed in the response to RAI 3.9-178, DCD Tier 2, Section 3.9.3.5 (Valve Operability Assurance) is being revised to state "Functional qualification [of valves that perform an active safety-related function] addresses key lessons learned from industry efforts, particularly on air- and motor-operated valves."

DCD Impact

DCD Tier 2, Section 3.9.6.1.5 will be revised in Revision 5 as noted in the attached markup.

- Category D rupture disks are replaced on a 5 year frequency unless historical data indicates a requirement for more frequent replacement, in accordance with Mandatory Appendix I of the ASME OM Code.

  Category D rupture disks are identified in DCD Table 3.9-8.

3.9.6.1.5 Specific Valve Test Requirements

~~(1)Power Operated Valve Exercise Tests~~

~~a.Active Motor Operated Valve Tests~~

~~The inservice operability testing of active motor operated valves relies on nonintrusive diagnostic techniques to permit periodic assessment of the valve's ability to perform its safety-related function during design basis conditions. MOVs upon which inservice testing is performed are identified in Table 3.9-8. Test frequencies are developed in accordance with Generic Letter 96-05 and ASME Code Case OMN-1, Rev. 1 and will not exceed 10 years.~~

~~Inservice testing of active MOVs consists of both static and dynamic testing. The specific testing frequencies are based on the individual valve's risk ranking and functional margin. These factors are described below.~~

~~□Risk Ranking~~

~~The MOV's risk ranking is determined by review of the valve's individual Probabilistic Safety Assessment (PSA) which is documented on the individual component's ranking worksheet and reviewed and approved by an expert panel. Guidance for this process is outlined in the Joint Owners' Group (JOG) Motor Operated Valve Periodic Verification Program Summary [MPR-2524-A].~~

~~□Functional Margin~~

~~Functional margin is that increment by which the MOV's available capability exceeds the capability required to operate the MOV under design basis conditions. The required capability of the MOV is a known, calculated quantity, which is then compared to the valve's actual capability, a measured quantity.~~

~~Diagnostic equipment inaccuracies, degraded voltage, control switch repeatability, load-sensitive MOV behavior and margin for degradation are considered in the calculations used to determine the valve's capacity from the valves measured test values.~~

~~The MOV Program utilizes guidance from Generic Letter 96-05 and the Joint Owners Group (JOG) MOV Periodic Verification (PV) study, MPR 2524-A (November 2006).~~

~~**Design Basis Verification Test** – Prior to power operation a design basis verification test is performed upon each active motor operated valve to verify the capability of each valve to meet its safety-related design basis requirements. The test is performed at conditions that are as close to design basis conditions as practicable. Results from this test are used along with the valves preservice test to develop the valve's initial (periodic verification) testing frequency.~~

~~**Active MOV Test Frequency Determination** – The ability of a valve to meet its design basis functional requirements (i.e. required capability) is verified during the valve's design basis verification test. The preservice test measures the valve's actual actuator output capability. The difference between the two capabilities is termed "functional margin." With the valves functional margin and risk ranking, a periodic verification test interval/frequency is determined. This determined test frequency is first compared to the valve's historical data to verify that any potential valve degradation during the test period would not reduce the functional margin to less than zero prior to the next scheduled periodic verification test. If the data shows that the functional margin may be reduced to less than zero, the frequency is reduced to ensure that the next periodic verification test is performed prior to a loss of functional margin. If there is not sufficient data to determine whether there will be a loss of functional margin prior to the next periodic verification test, the test frequency is limited to not exceed two (2) refueling cycles or three (3) years, whichever is longer, for high risk safety significant components, and is limited to not exceed three (3) refueling cycles or five (5) years, whichever is longer, for low risk safety significant components.~~

~~A motor operated valve with an adequate functional margin is assured of being able to open and/or close under design basis conditions.~~

~~b.Other Power Operated Valve Operability Tests~~

~~Power-operated valves other than active MOVs are exercised quarterly in accordance with ASME OM ISTC. Active and passive power-operated valves upon which operability testing is performed are identified in Table 3.9-8.~~

~~**Design Basis Verification Test** – Prior to power operation a Design Basis Verification Test will be performed upon each Power-Operated Valve so as to verify the capability of each valve to meet it's safety-related design requirements. The test will be performed at conditions that are as close to design basis conditions as practicable.~~

(1) Power Operated Valve Tests

Power operated valves are tested in accordance with the ASME OM Code, Subsection ISTC. Specific testing activities for each valve are listed in Table 3.9-8. Active power operated valves will have their stroke times measured during the exercise tests. Any abnormalities or erratic actions will be documented and evaluated. Test failures (e.g., failure to fully stroke or high stroke time measurements) will be addressed per the OM Code by repair, replacement or analysis.

The IST program for power operated valves will consider the guidance in the NRC Regulatory Issue Summary 2000-03, which incorporates lessons learned from MOV analyses and tests in response to Generic Letter 89-10. The COL Applicant is responsible for describing, in the IST program description (see COL Item 3.9.9-3-A), how the IST program addresses these lessons learned.

(2) Manual Valve Exercise Tests

Active Category A and B manual valves are exercised once every two years in accordance with 10 CFR 50.55a(b)(3)(vi).