NRC INSPECTION MANUAL

IRIB

INSPECTION PROCEDURE 62710

POWER-OPERATED GATE VALVE
PRESSURE LOCKING AND THERMAL BINDING

PROGRAM APPLICABILITY: 2515

62710-01 INSPECTION OBJECTIVES

The objective of this procedure is to provide guidance to inspectors to independently assess licensee conclusions regarding extent of condition of issues, when selected, as a part of supplemental inspections using IP 95002, "Inspection for One Degraded Cornerstone or Any Three White Inputs in a Strategic Performance Area." The inspection procedure may also be used when power-operated gate valve pressure-locking and thermal-binding issues are applicable to each input contributing to a degraded cornerstone (2 white or 1 yellow) or to address extent of condition for any white input to the Strategic Performance Area that results in implementation of IP 95002.

62710-02 INSPECTION REQUIREMENTS

The scope of the inspection using this procedure should be specifically focused on an independent extent of condition review and oversight of licensee self-assessment consistent with the objectives of IP 95002.

The inspection plan should include one or more of the specific requirements listed below that are appropriate to perform an independent extent of condition review and oversight of licensee self-assessment necessary to assess the capability of power-operated gate valves in safety-related systems to operate under pressure-locking and thermal-binding conditions (or avoid such conditions) during normal, accident and abnormal conditions. The inspection may involve an in-depth review of calculations, analyses, diagnostic test results, modifications, and operating procedures used to ensure that proper operation of power-operated gate valves is not prevented by pressure-locking and thermal-binding conditions.

Select a sample of risk-significant power-operated gate valves from more than one system. The sample size should be appropriate for the scope of the inspection. Considerations for the review of the licensee's scope of its Generic Letter 95-07,"Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves," program are provided in the Attachment 1 to this inspection procedure. Attachment 2 provides a generic list of valves that are normally included in the scope of GL 95-07. Changes that have been made to GL 95-07 programs and modifications involving the installation of power-operated gate valves susceptible to pressure locking or thermal binding should be considered during the selection of the sample of power-operated gate valves for inspection review. These changes may involve revised design basis, plant modifications, power uprate, revised calculations, valves added to or removed from the program, revised safety valve setpoints, or the incorporation of new industry guidance into the program. Power-operated gate valve performance should be considered during valve selection. For example, review of trend reports, nonconformance reports, Licensee Event Reports, maintenance history or other plant documents may reveal that a valve was subjected to pressure-locking or thermal-binding conditions.

02.01 Program Scope. Review power-operated gate valve program scope to ensure that the appropriate safety-related valves are included and modifications to systems or valves that could have altered the susceptibility of a power-operated gate valve to pressure locking or thermal binding.

02.02 Design Bases Conditions. Review design documents used to determine power-operated gate valve functional requirements during normal, accident and abnormal conditions, and susceptibility to pressure locking or thermal binding.

02.03 Pressure-Locking and Thermal Binding Calculations. Review calculations used to demonstrate that power-operated gate valves are capable of operating if susceptible to pressure-locking and thermal binding conditions.

02.04 Testing. Review diagnostic test results used to support pressure-locking and thermal-binding assumptions in design calculations or other engineering documents.

02.05 Pressure Locking Corrective Actions. Review pressure-locking corrective actions including modifications that were implemented to eliminate the potential susceptibility of valves to pressure lock, or to provide for the capability of the valve to operate under such conditions, and operating procedures that contain special instructions for valves susceptible to pressure locking.

02.06 Thermal Binding Corrective Actions. Review thermal-binding corrective actions including modifications that were implemented to eliminate the potential susceptibility of valves to thermally bind, or to provide for the capability of the valve to operate under such conditions, and operating procedures that contain special instructions for valves susceptible to thermal binding.

02.07 Trending. Review trend reports, failure analysis, corrective actions, nonconformance reports, or other plant documents that may reveal pressure-locking or thermal-binding conditions.

02.08 PI&R Inspection Reports. Review past PI&R inspection reports on this subject. Determine if there were any significant problems identified with pressure locking or thermal binding of valves.

62710-03 INSPECTION GUIDANCE

General Guidance

In response to the identification of plant-specific power-operated gate valve pressure locking and thermal binding issues, the NRC staff may determine that an inspection of the licensee's GL 95-07 program is appropriate using IP 62710. In planning the inspection under this procedure, the assigned regional inspector should review the identified power-operated gate valve pressure locking and thermal binding performance issues. The inspector should then prepare an inspection plan incorporating one or more of the specific inspection requirements outlined in Section 62710-02 that the inspector considers necessary to perform an independent extent of condition review and oversight of the licensee self-assessment with respect to the pressure locking and thermal binding issues identified at the plant. Based on the extent of the selected inspection requirements, the inspector should estimate the resources necessary to perform the inspection as discussed in Section 62710-04.

This inspection procedure is intended to assess the adequacy of calculations, analyses, test results, operating procedures and modification packages that are used to ensure that power-operated gate valves are not prevented from performing their safety function by pressure locking and thermal binding.

Pressure locking and thermal binding represent potential common-cause failure mechanisms that can render redundant safety systems incapable of performing their safety functions. Pressure locking occurs in flexible-wedge and double-disk gate valves when fluid becomes pressurized inside the valve bonnet and the actuator is not capable of overcoming the additional thrust requirements resulting from the differential pressure created across both valve disks by the pressurized fluid in the valve bonnet. Thermal binding is generally associated with solid-wedge and flexible-wedge gate valves that are closed while the system is hot and then allowed to cool before an attempt is made to open the valve.

On August 17, 1995, the NRC issued Generic Letter (GL) 95-07 to request that licensees take certain actions to ensure that safety-related power-operated gate valves that are susceptible to pressure locking or thermal binding are capable of performing their safety functions within the current licensing bases of the facility. The NRC staff reviewed the licensees' actions in response to GL 95-07 in a safety evaluation (SE) for each unit. Each SE describes the actions taken by the licensee to ensure that power-operated gate valves operate during pressure-locking and thermal-binding conditions that were reviewed and accepted by the NRC staff when closing GL 95-07. This safety evaluation should be reviewed by the inspector prior to the inspection.

GL 89-10, “Safety-Related Motor-Operated Valve Testing and Surveillance,” requested that nuclear power plant licensees and construction permit holders ensure the capability of motor operated valves (MOVs) in safety-related systems to perform their intended functions by reviewing MOV design bases, verifying MOV switch settings initially and periodically, testing valves under design-basis conditions where practicable, improving evaluations of MOV failures and necessary corrective action, and trending MOV problems. GL 96-05, “Periodic Verification of Design-Basis Capability of Safety-Related Power-Operated Valves,” requested each nuclear power plant licensee to establish a program, or to ensure the effectiveness of its current program, to verify on a periodic basis that safety-related MOVs continue to be capable of performing their safety functions within the current licensing bases of the facility. In most instances, risk insights were used to develop MOV diagnostic test schedules developed in response to GL 89-10 and GL 96-05.

The vast majority of gate valves identified as susceptible to pressure locking and thermal binding were MOVs. Therefore, the MOV risk insights developed in response to GL 89-10 and GL 96-05 should be considered during the selection of sample valves to be inspected. Valves may be risk ranked with respect to their relative importance to core-damage frequency and other considerations added by an expert panel. The MOV selection should include valves ranked as high risk if possible. The NRC staff is describing its review of licensees’ actions in response to GL 96-05 in an SE for each unit. Each SE notes the MOV risk-ranking methodology that was accepted by the NRC staff when closing GL 96-05.

Several licensees did not use risk insights to rank their valves in the development of their GL 89-10 or GL 96-05 programs. Generic MOV risk insights for boiling water reactors (BWRs) may be obtained from BWR Owners Group Report NEDC-32264A (Revision 2). Generic MOV risk insights for Westinghouse plants may be obtained from Westinghouse Owners Group (WOG) Report V-EC-1658 (Revision 1). These risk ranking approaches were reviewed and accepted by the NRC staff in SEs dated February 27, 1997 (BWR), and April 14, 1998 (WOG).

The WOG MOV risk-ranking approach can also be used to provide insights for ranking MOVs in Combustion Engineering and Babcock & Wilcox design plants based on their safety significance, except that the generic list of high risk valves in WOG Report V-EC-1658 only apply to Westinghouse design plants.

Specific Guidance

03.01 Program Scope. The criteria for determining the scope of power-operated valves for GL 95-07 are consistent with the staff's acceptance of the scope of MOVs associated with GL 89-10. Considerations for the review of the licensee's scope of its GL 95-07 program are provided in the Attachment 1 to this inspection procedure. Attachment 2 provides a generic list of valves that are normally included in the scope of GL 95-07. Since the completion of SEs for GL 95-07, some licensees may have modified the scope of their power-operated gate valve pressure-locking and thermal-binding programs. Where a licensee has modified the scope of its program, the inspector should determine whether the licensee has adequately justified the removal of any power-operated valves from its program. Further, the inspector should be alert for modifications to systems or valves that could have altered the susceptibility of a power-operated gate valve to pressure locking or thermal binding.

03.02 Design Bases Conditions. The inspector should review the appropriate design documents and operating and surveillance procedures and verify that the licensee has considered (1) all credible leak paths into valve bonnets; (2) external and internal conditions that may exist or change during normal, surveillance or operating conditions that may cause the temperature of the valve to increase; (3) the potential for gate valves to pressure lock or thermally bind during surveillance testing or other special tests; and (4) the potential for valves to be closed while the system operating fluid is at a relatively high temperature, the valve is allowed to cool, and then required to open. For example, the fluid may enter the valve bonnet (1) during normal open and close valve cycling; (2) when pump discharge pressurizes a valve bonnet and the pressure becomes trapped in the bonnet after the pump is secured; (3) if the gate valve is in a line connected to a high-pressure system and isolated only by check valves (which may transmit pressure even when passing leak-tightness criteria); and (4) during a hydrostatic test of adjacent piping.

A valve bonnet that contains steam or gas is susceptible to hydraulic-induced pressure locking. However, thermally induced pressure locking is mitigated during conditions where the bonnet is filled with steam or gas. The licensee should address the heat transfer to the valve from the adjacent piping and atmosphere that can occur during accident conditions. For example, conditions that can cause the temperature of the valve bonnet to increase include heat from pump motors, steam driven turbines, and high temperature fluid in adjacent piping. Normal ambient temperature changes are not required to be considered. In some cases, reliance on entrapped gas to limit bonnet pressure was accepted in GL 95-07 when detailed justification was provided by the licensee.

03.03 Pressure-Locking and Thermal Binding Calculations Some licensees used pressure-locking and thermal-binding methodologies to demonstrate that valves are capable of operating under pressure-locking and thermal-binding conditions. Calculations used to demonstrate that selected valves are capable of operating during pressure-locking or thermal-binding conditions should be reviewed. Motor sizing calculations must consider degraded voltage and elevated ambient temperature conditions. For example, the inspector should ensure that the lowest motor terminal voltage commensurate with the design-basis conditions has been factored into the calculation. Proper actuator pullout efficiency and application factor must be used. The weak link capability of the MOV should also be evaluated to ensure that the valve or actuator is not damaged if required to operate during pressure-locking or thermal-binding conditions. In Technical Update 98-01 and its Supplement 1, Limitorque Corporation provided updated guidance for predicting the torque output of its ac-powered motor actuators. In its letter dated July 17, 1998, forwarding Technical Update 98-01, Limitorque indicates that a future technical update will be issued to address the application of dc-powered valves.

The inspector should verify that thermal induced pressure locking calculations assume a reasonable temperature/pressure rate increase. NUREG-1275, “Operating Experience Feedback Report-Pressure Locking and Thermal Binding of Gate Valves,” states that the rate of pressure rise can be as high as 100 psi per 1 °F temperature increase in a solid filled bonnet for system temperature above 450 °F. For lower system temperature (approximately 100 °F), the rate noted in NUREG-1275 is reduced to 33 psi per 1 °F temperature rise. Testing sponsored by the NRC that was conducted by the Idaho National Engineering and Environmental Laboratory (INEEL) suggested that a pressure rise of 50 psi per 1 °F temperature increase was applicable. The results of this testing are documented in NUREG/CR-6611, "Results of Pressure Locking and Thermal Binding Tests of Gate Valves." These thermal induced pressurization rates were accepted by the NRC staff in the SEs closing GL 95-07.

Adequate bases must exist for stem factors, valve factors, and other assumed parameters, as applicable, that are used in calculations. The inspector should verify that the valve and stem factors used in calculations are consistent with GL 89-10 program values. The following is a list of the pressure-locking methodologies most often used by licensees in their GL 95-07 submittals to demonstrate that valves are capable of operating under pressure-locking conditions.

a. A pressure-locking methodology developed by Commonwealth Edison Company (ComEd) was used for flexible wedge gate valves. The margins along with diagnostic equipment accuracy and methodology limitations are defined in a letter from ComEd to the NRC dated May 29, 1998. The use of the ComEd pressure locking methodology is acceptable provided these margins, diagnostic equipment accuracy requirements and methodology limitations are incorporated into the pressure-locking calculations as specified in the applicable GL 95-07 SE. The NRR Mechanical and Civil Engineering Branch (EMEB) developed a computer program to assist inspectors in assessing the capability of flexible gate valves to open during pressure-locking conditions using the ComEd thrust prediction pressure-locking methodology. Contact EMEB or the regional motor operated valve inspector for further information regarding use of the computer program.

b. A modified industry gate valve thrust equation was used to predict the thrust required to open flexible wedge gate valves during pressure locking conditions. Pressure locking tests sponsored by the NRC were conducted by the INEEL on a flexible wedge gate valve. The results of this testing are documented in NUREG/CR-6611. Test data demonstrated that the modified industry gate valve calculation conservatively estimated the thrust required to open a pressure-locked flexible wedge gate valve.

c. A modified industry gate valve thrust equation was used to predict the thrust required to open double disk gate valves during pressure-locking conditions. Pressure-locking tests sponsored by the NRC were conducted by INEEL on a double disk gate valve. The results of this testing are documented in NUREG/CR-6611. Test data demonstrated that the modified industry gate valve calculation underestimated the thrust required to open a pressure-locked double disk gate valve; however, the results of the calculation properly trended with actual test results. Sizing the power actuator to satisfy the modified industry gate valve thrust equation provides reasonable assurance that flexible wedge gate valves susceptible to pressure locking are capable of performing their intended safety-related function provided that the margin between predicted pressure-locking thrust and actuator capability is equal to or exceeds approximately 40 percent. The licensee should provide additional justification if it proposes a margin less than approximately 40 percent.

This is not a complete list of pressure-locking methodologies used by licensees to demonstrate that valves are capable of operating during pressure-locking conditions. Some licensees developed a site-specific pressure locking or thermal binding thrust prediction methodology to demonstrate that valves are capable of opening under pressure-locking or thermal-binding conditions. The conditions and limitations associated with the use of the individual methodology are discussed in the site-specific GL 95-07 SE. In instances where a licensee developed and used a site-specific methodology (methodology was not described in section 03.03a, b or c in this inspection procedure), the inspector should review the test data used to ensure that the methodology accurately predicts the thrust required for the valve to open during pressure-locking or thermal-binding conditions. The inspector should (1) verify test equipment is setup and calibrated in accordance with vendor recommendations; (2) verify qualification of test personnel; (3) determine test equipment inaccuracies and test data accuracy; and (4) verify that the methodology accurately predicts the thrust (torque) required to open the pressure-locked or thermally-bound valve.

Following the initial verification of valve capability under design-basis conditions, the valve settings will need to be re-verified if the valve is replaced (which would constitute the need for a complete demonstration of design-basis capability), modified, or overhauled to the extent that the licensee considers that the existing test results are not representative of the valve in its modified configuration. Because of the interrelationship of various operating parameters, the performance of the valve can be affected by routine maintenance work, such as valve packing adjustments.

03.04 Testing. The inspector should review the diagnostic test results used to support pressure-locking and thermal-binding assumptions in design calculations or other engineering documents. The assumptions include valve factors and stem factors for MOVs which were established under the GL 89-10 program and periodically verified under the GL 96-05 program. Diagnostic testing to support MOV pressure-locking and thermal-binding assumptions should be consistent with the diagnostic testing methods justified under the GL 89-10 and GL 96-05 programs.

03.05 Pressure Locking Corrective Actions. The inspector should review the corrective actions performed in response to GL 95-07 for the sampled valves. The following are examples of corrective actions to prevent or overcome pressure locking accepted in GL 95-07 SEs.

a. Procedures

1. Procedures were modified to cycle valves following evolutions that could potentially create a pressure-locking condition.

2. Procedures were revised to minimize the time that pumps could be operated at minimum flow conditions if temperature of the system increased due to operation of the pumps at minimum flow.

3. The bonnet of the valve was aligned to the reactor side piping on valves equipped with a body drain.

4. The position of the valve was changed from closed to open or procedures were revised to not require that the valve be opened during pressure-locking conditions.

5. The containment sump suction piping was filled with water or maintained in a dry-lay condition to prevent the temperature of the valves from increasing during accident conditions.

6. Procedures were revised to prevent one train from being inadvertently pressurized when testing the other train.

7. The suction of one train of residual heat removal was aligned to the refueling water storage tank when the other train of residual heat removal was aligned for shutdown cooling.

b. <u>Modifications</u>

1. Actuator control logic was changed to utilize the limit switch to minimize travel of the disk into the seat. Procedures were revised to periodically review diagnostic test data to ensure that disk travel was minimized.

2. Valves were modified to eliminate the potential for pressure locking by drilling a hole in the high pressure side of the valve disk or installation of a bonnet pressure equalization line.

3. Valves were replaced with valves not susceptible to pressure locking.

4. Valve bonnets were equipped with a relief valve or blowout plug to limit the pressure in the bonnet and a pressure locking analytical method used to calculate the thrust (torque) required to open the valve during pressure-locking conditions below the relief valve or blowout plug setpoint.

5. Valve bonnets were equipped with an accumulator to limit the pressure in the bonnet and a pressure locking analytical method used to calculate the thrust (torque) required to open the valve during pressure-locking conditions below the maximum accumulator pressure.

6. A bonnet vent with a manual valve was installed and procedures were revised to cycle the bonnet vent valve prior to opening the valve during pressure-locking conditions.

7. The actuator was modified or replaced with a larger actuator to increase thrust (torque) output to meet thrust prediction pressure-locking methodology requirements.

8. Insulation was installed on the valve body and bonnet to minimize the heat transfer to the bonnet during conditions when the ambient temperature could increase during a design basis accident.

9. Valve bodies were equipped with a 3-way check valve system to limit the pressure in the bonnet. The 3-way check valve usually has 3 connections to the valve body: upstream and downstream of the valve seats and the third connection between the upstream and downstream valve seats. The 3-way check valve system aligns the bonnet area of lower pressure to provide a pressure vent path, be it either upstream or downstream side of the valve.

c. Analyses/Calculations

1. Some licensees relied on pump discharge pressure to equalize pressure in the bonnet of a valve that is susceptible to pressure locking. As a result, the MOV may operate at locked rotor. The NRC staff accepted operation of actuators for approximately 1 second at locked-rotor conditions because testing performed by INEEL (NUREG/CR-6478) demonstrates that the capability of the actuator does not degrade over this short time period.

2. The ComEd pressure-locking thrust prediction methodology was used to demonstrate that flexible wedge gate valves would operate during pressure-locking conditions.

3. A modified industry gate valve thrust equation was used to demonstrate that double disk gate valves would operate during pressure-locking conditions.

4. A modified industry gate valve thrust equation was used to demonstrate that flexible wedge gate valves would operate during pressure-locking conditions.

5. In cases where 12 or more hours elapse between pressurizing the valve bonnet and opening the valve, leakage was credited to vent the valve bonnet provided that the temperature of the valve did not increase over the 12-hour period. In one case, valve leakage was credited to vent the bonnet of each of the unit's reactor coolant system hot leg injection valves. There were six hot leg injection valves and six redundant hot leg flow paths in each unit and one hot leg injection valve was required to be opened 5.5 hours or more after a loss of coolant accident. The basis for accepting this analysis was that the probability of a loss of coolant accident combined with the failure of all six hot leg injection valves to open due to pressure locking is exceedingly low. The results of valve seat leakage test performed by several licensees and INEEL (NUREG/CR-6611) demonstrate that valve leakage is probable when pressure-locking

conditions exist; however, the specific leakage rates that were obtained during the tests were inconclusive.

6. Heat transfer calculations were used to demonstrate that the temperature of valves would not increase during accident conditions. Normal ambient temperature changes were not required to be considered.

03.06 Thermal Binding Corrective Actions. The inspector should review the corrective actions performed in response to GL 95-07 for the sampled valves. The following are examples of accepted corrective actions to prevent or overcome thermal binding.

a. Procedures

1. Technical Specifications were changed to require that valves be declared inoperable and the appropriate Technical Specification action statement entered whenever the valves are closed while the system is hot and then allowed to cool before an attempt is made to open the valves.

2. Procedures were modified to cycle valves following evolutions that could potentially create a thermal-binding condition.

3. Procedures were revised to shut the valve prior to increasing the temperature of the valve.

b. Modifications

1. Valves were replaced with valves not susceptible to thermal binding.

2. Valves equipped with spring-compensating actuators, position seated, and/or set up with minimal unwedging thrust to reduce the potential for thermal binding.

c. Analyses/Calculations

1. When evaluating whether flexible and solid-wedge gate valves were susceptible to thermal binding, licensees assumed that thermal binding would not occur below specific temperature thresholds. These assumptions were based on industry experience.

2. Several thermal-binding methodologies were developed and used to demonstrate that valves were capable of operating during thermal-binding conditions. Test data that quantified the magnitude of the thermal binding effect were used to validate the thermal-binding methodology.

3. Diagnostic testing performed during thermal-binding conditions demonstrated that a valve was not susceptible to thermal binding at current settings.

4. Operational history was used to demonstrate that valves were not susceptible to thermal binding.

03.07 Trending. The inspector should review the adequacy of the licensee's analyses of power-operated gate failures that may be attributed to pressure locking or thermal binding. The inspector should review recent failures and the resulting corrective action. The licensee's failure analysis should include the results and history of each as-found deteriorated condition, malfunction, test, inspection, analysis, repair, or alteration.

03.08 PI&R Inspection Reports. No specific guidance.

62710-04 RESOURCES

This inspection procedure provides guidance that could be used to assess the entire GL 95-07 program. However, since the scope of the inspection is focused on an independent extent of condition review and oversight of licensee self-assessment and may be limited to specific inspection requirements identified in Section 62710-02, it is estimated that it may take an inspector a minimum of 4 hours to accomplish. If the nature of the problems prompting the inspection are extensive requiring a more broad review, then it may take up to 30 hours to accomplish the inspection.

Other factors that affect the amount of time required to complete the inspection are the knowledge and experience of the inspector(s) and the number of safety-related power-operated gate valves in each unit. It is recommended that inspector(s) knowledgeable of GL 89-10, GL 95-07, and GL 96-05 recommendations and power-operated gate valve mechanical and electrical characteristics perform the inspection. The majority of power-operated gate valves that were identified to be susceptible pressure locking and thermal binding in GL 95-07 submittals were MOVs. Some early-vintage units may have fewer safety-related power-operated gate valves than later-vintage units. The number of safety-related power-operated gate valves should be considered when determining the amount of time needed to accomplish the inspection.

62710-05 REFERENCES

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"

GL 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves"

BWR Owners Group (BWROG) Report NEDC-32264A (Revision 2), "Application of Probabilistic Safety Assessment to Generic Letter 89-10 Implementation"

Westinghouse Owners Group (WOG) Report V-EC-1658 (Revision 1), "Risk Ranking Approach for Motor-Operated Valves in Response to Generic Letter 96-05"

NUREG-1275 "Operating Experience Feedback Report – Pressure Locking and Thermal Binding Gate Valves."

NUREG/CR-6611 "Results of Pressure Locking and Thermal Binding Tests of Gate Valves."

NUREG/CR-6478 "Motor-Operated Valve Actuator Motor and Gearbox Testing"

END

Attachments:
1. Considerations in Reviewing Licensee Scope of Generic Letter 95-07 Programs.
2. Generic List of Valves Susceptible to Pressure Locking and Thermal Binding.
3. Revision History for IP 62710

Attachment 1 – Considerations in Reviewing Licensee Scope of GL 95-07 Program

1. The scope of the program extends to safety-related power-operated valves as defined in the NRC regulations. In GL 95-07, the staff requests licensees to determine the design basis for the operation of each safety-related power-operated valve including the maximum pressure and temperature conditions expected during normal operations and abnormal events, to the extent that these valve operations and events are included in the existing approved design basis.

2. Safety-related power-operated valves that are always in their safety position, or would have no affect on the operation of the safety train if placed in the non-safety position, can be removed from the GL 95-07 program.

3. Section 3.1.2 of NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants," issued by GL 89-04 (Supplement 1), "Guidance on Developing Acceptable Inservice Testing Programs," dated April 4, 1995, discusses the capability of plant components and surveillance testing. In this regard, safety-related power-operated valves that are placed in a position that prevents the safety-related system (or train) from performing its safety function must be capable of returning to their safety position, or the system (or train) must be declared inoperable and the appropriate plant technical specifications followed.

4. In the second footnote in GL 89-10, the staff states that design-basis events are defined as conditions of normal operation, including anticipated operational occurrences, design-basis accidents, external events, and natural phenomena for which the plant must be designed to ensure the function delineated as "safety-related" can be performed. The staff further states in the footnote that the design bases for each plant are those documented in pertinent licensee submittals, such as the final safety analysis report. In Bulletin 85-03, the staff requested Boiling Water Reactor (BWR) plants to ensure that valves in the Reactor Core Isolation Cooling system can perform their safety function.

5. Supplements 4 and 7 to GL 89-10 removed the recommendation that licensees of BWR and pressurized water reactor nuclear plants, respectively, consider inadvertent mispositioning of valves as part of their GL 89-10 programs.

6. The residual heat removal pump hot-leg injection valve(s) was (were) not in the scope of GL 95-07 if the final safety analysis report (FSAR) accident analysis did not credit the residual heat removal pumps for providing hot-leg injection. The pressurizer power-operated relief valve block valve was not in the scope of GL 95-07 if technical specifications allowed the unit to operate indefinitely with the pressurizer power-operated relief block valve shut and deenergized. Emergency core cooling system valves for modes other than criticality and recovery from an inadvertent reactor trip were not in the scope of GL 95-07 if technical specifications required that the emergency core cooling systems be operable for the criticality and recovery from an inadvertent reactor trip.

7. Licensees may rely on analysis results for each design-basis event and each system's required capability to satisfy event acceptance limits provided in the FSAR

where the licensee can demonstrate that the information in the updated FSAR is consistent with the licensing basis of the facility.

8. Licensees are required to meet the single failure criterion in the NRC regulations. Other criteria may also apply at the same time (e.g., loss of offsite power). Further, safety systems are required to meet the redundancy provisions of Appendix A to 10 CFR Part 50. The consideration of the single failure criterion as applied to anticipated operational transients should be consistent with the staff's licensing review for the individual facility.

9. The safe shutdown licensing basis for each facility is defined in licensing documents. Valves that are operated during conditions below the safe shutdown licensing basis are not required to be in the scope of the GL 95-07 program provided that the licensee does not have any other commitments that the MOV must operate during certain conditions. For example, if the safe shutdown licensing basis is Hot Shutdown, valves that are operated during conditions below Hot Shutdown are not required to be in the scope of the program.

END

BABCOCK & WILCOX-DESIGN PLANTS

Valve Susceptible to Pressure Locking

Decay Heat Cooler Discharge to Makeup Suction
Decay Heat Drop Line Isolation
Decay Heat Injection
Decay Heat Supply to High Pressure Injection (HPI) Pump Suction
Emergency Feedwater (EFW) Header Cross Connect
EFW Pump Discharge
EFW Pump Service Water Suction
EFW Turbine Steam Admission
HPI Pump Discharge Cross Connect
Low Pressure Injection (LPI) Header Isolation to HPI
LPI/Decay Heat Loop Isolation
LPI Isolation
LPI Reactor Building Isolation
LPI Return from Reactor Coolant System (RCS)
Post Loss of Coolant Accident Boron Dilution to the Emergency Sump
Pressurizer Electromatic Relief Valve Isolation
Pressurizer Power-Operated Relief Valve (PORV) Block
RCS Return from Letdown Line
Reactor Building Cooling Unit Inlet Isolation
Sodium Hydroxide Tank Suction
Spent Fuel Pool to RCS Makeup Pump Suction Block

Valves Susceptible to Thermal Binding

EFW Pump Injection
EFW Turbine Steam Inlet
LPI Injection
Pressurizer Electromatic Relief Valve Isolation
Pressurizer Sample Isolation
Pressurizer Vent Stop
Pressurizer PORV Block
Reactor Building Sump Isolation
Safety Injection Pump Suction

COMBUSTION ENGINEERING-DESIGN PLANTS

<u>Valves Susceptible to Pressure Locking</u>

Auxiliary Feed Water (AFW) Pump Discharge
AFW Pump Turbine Steam Supply
Boric Acid Gravity Feed Isolation
Boric Acid Makeup (BAMU) Pump to Charging Pump Suction Control Valve
BAMU Tank Gravity Feed to Charging Pump
BAMU Tank to Charging Pump Suction Header Control Valve
Containment Spray Header Isolation
Containment Spray Shutdown Cooling Heat Exchanger Bypass
Containment Sump Header Isolation
High Pressure Safety Injection Long Term Loop Recirculation
Low Temperature Overpressure Relief Isolation
Pressurizer Emergency Core Cooling Vent
Pressurizer Power-Operated Relief Valve (PORV) Block
Refueling Water Storage Tank to Charging Pump Suction
Safety Injection Pump Recirculation to Refueling Water Storage Tank
Service Water to Emergency Feedwater Pump Isolation
Shutdown Cooling Cross Tie
Shutdown Cooling Heat Exchanger Inlet
Shutdown Cooling Heat Exchanger Outlet
Shutdown Cooling Hot Leg Suction
Shutdown Cooling to Low Pressure Safety Injection Pump Suction

<u>Valves Susceptible to Thermal Binding</u>

Boric Acid Pump to Charging Pump Suction
Boric Acid Storage Tank Outlet Isolation
Charging Pump Suction Header and Boric Acid Supply
Emergency Feedwater Injection
Emergency Feedwater Turbine Steam Inlet
High Pressure Safety Injection/Charging Cross Tie
Pressurizer PORV Block
Shutdown Cooling Heat Exchanger Isolation
Shutdown Cooling Hot Leg Suction

WESTINGHOUSE-DESIGN PLANTS

<u>Valves Susceptible to Pressure Locking</u>

Alternate Charging Isolation
Auxiliary Feedwater Pump Discharge to Steam Generators
Boric Acid Tank Gravity Boration
Boron Injection Tank Inlet
Boron Injection Tank Outlet
Component Cooling Water from Residual Heat Removal (RHR) Heat Exchangers

Containment Spray Pump Discharge
Containment Sump to RHR Pump Suction
Diesel Generator Lube Oil Filter Bypass
High Head Safety Injection (SI) Pump to Cold Leg
Low Head SI Pump Suction
Main Steam to Turbine Driven Auxiliary Feedwater Pump
Normal Charging Isolation
Pressurizer Power Operated Relief Valve (PORV) Block
Quench Spray Pump Discharge
Reactor Building Cooling Unit Outlet Isolation
Refueling Water Storage Tank (RWST) to Charging Pump Suction
RHR Cross-Tie Isolation
RHR Heat Exchanger Outlet
RHR Heat Exchanger Outlet to Containment Spray Header
RHR Pump Suction from the RWST
RHR to Hot Leg Injection
RHR to Reactor Vessel Deluge
RHR to SI/Charging Suction
Recirculation Spray System (RSS) to RHR Cross Connect
RSS Cooling Pump Discharge Isolation
RSS Pump Discharge Isolation
RSS to SI
SI Pump Hot Leg Isolation
SI Pump Discharge Isolation
SI to Charging System
Service Water Supply to Standby Auxiliary Feedwater Pumps
Steam Generator Pressure Relief Isolation
Sodium Hydroxide to Reactor Building Spray Pump Suction
Volume Control Tank (VCT) Outlet
VCT Outlet

<u>Valves Susceptible to Thermal Binding</u>

Low Head SI Cold Leg Isolation
Pressurizer PORV Block
Reactor Coolant System to RHR Pump Suction
RHR Minimum Flow Control
Steam Generator PORV Block

GENERAL ELECTRIC-DESIGN PLANTS

<u>Valves Susceptible to Pressure Locking</u>

Containment Spray Isolation
Core Spray Injection
Drywell Spray
Essential Low Pressure Coolant Injection Inverter Room Cooler Inlet
High Pressure Coolant Injection (HPCI) Isolation

HPCI Turbine Steam Admission
High Pressure Core Spray (HPCS) Pump Minimum Flow
HPCS Pump Suction from Suppression Pool
Isolation Condenser Condensate Return
Low Head Safety Injection (SI) Cold Leg Isolation
Low Pressure Core Spray Pump Minimum Flow Bypass Isolation
Main Steam Drain Isolation
Main Steam Isolation Valve Leakage Control
Reactor Core Isolation Cooling (RCIC) Injection
RCIC Pump Suppression Pool Suction
RCIC Steam Exhaust to Suppression Pool
RCIC Steam Supply Isolation
Reactor Water Clean Up Isolation
Residual Heat Removal (RHR) Containment Spray Shutoff
RHR Heat Exchanger Inlet
RHR Heat Exchanger Outlet
RHR Loop Isolation
RHR Low Pressure Coolant Injection
RHR Pump Minimum Flow
RHR Pump Suction from Suppression Pool
RHR Pump Torus Suction
RHR Test Return to Suppression Pool
RHR Torus Cooling/Spray Block
Service Water (SW) from RHR Heat Exchanger
SW/RHR Containment Flooding Cross Tie
SW Return Isolation from Diesel Generator Cooler
SW to Control Room Chiller Isolation
SW to Spent Fuel Cooling Heat Exchanger Isolation
Shutdown Cooling Hot Leg Suction

<u>Valves Susceptible to Thermal Binding</u>

HPCI Injection
HPCI Turbine Steam Admission
Isolation Condenser Condensate Return Isolation
RCIC Injection
RHR Heat Exchanger Inlet and Outlet
RHR Minimum Flow Bypass

END

Attachment 3 – Revision History for IP 62710

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Accession Number
N/A	04/30/10 CN 10-013	Researched commitments for 4 years and found none. IP 62710 has been revised to address feedback form 62710-1482 a missed possible modification to or valve design of gate valves that can be used to address pressure-locking concerns.	NO	N/A	N/A