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U-602553
L30-96(02-09)LP
8G.120

WC-048-96
February 9, 1996

Docket No. 50-461

Document Control Desk
Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Illinois Power's (IP's) Response to Generic Letter (GL) 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves"

Dear Sir:

Introduction

This letter with attachments constitutes Illinois Power's response to the 180-day reporting requirements outlined in GL 95-07. GL 95-07 requires that licensees evaluate the operational configuration of all their safety-related power operated gate valves (POVs) for susceptibility to pressure locking and/or thermal binding and to take appropriate actions to ensure that these valves are capable of performing their safety functions within the current licensing basis of the facility.

Evaluation Description

The Clinton Power Station (CPS) scope of GL 95-07 valves is limited to those having an active safety function to open. This scope is consistent with industry/NRC discussions and feedback regarding GL applicability. Portions of the analyses and modifications described below were completed prior to GL 95-07 issuance to address earlier NRC Information Notices and Generic Letters. IP performed design basis reviews of potential design basis accident (DBA) conditions and the effects of operational configurations which included normal system operation, surveillance tests, plant startup and shutdown and other commonly performed operational modes. This review included both Probabilistic Risk Assessment (PRA) safety significant and low safety significant valves. Since PRA safety significant valves collectively contribute more than 99.99% of the power operated valve (POV) contributions to core damage frequency, failure to isolate containment, provide for containment heat removal, containment venting and containment/ reactor pressure flooding these valves were evaluated first.

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Evaluation Results

The following PRA safety significant valves were determined to be susceptible to pressure locking: High Pressure Core Spray (HPCS) injection, Reactor Core Isolation Cooling (RCIC) injection, Low Pressure Core Spray (LPCS) injection, Residual Heat Removal (RHR) test return "A" and "B" and Low Pressure Coolant Injection (LPCI) "A" "B" and "C" valves. Of these valves, all but the LPCI "B" injection, RHR test return "A" and "B" and RCIC injection valves have been modified to preclude pressure locking. These remaining four valves will be modified during the sixth refueling outage (RF-6) scheduled to start in October 1996.

The following four PRA low safety significant valves were determined to be susceptible to pressure locking: RHR containment spray isolation "A" and "B" valves and two Main Steam Isolation Valve (MSIV) Leakage Control System (LCS) valves. However, two other MSIV LCS valves, which are presently not susceptible to pressure locking, become susceptible when the two previously mentioned LCS valves are modified. These six valves will be modified during RF-7 scheduled for April 1998. If appropriate analytical techniques are available prior to that time, these valves may be dispositioned by analytical means, supported by testing instead of modification.

An operability evaluation in accordance with the guidance provided in GL 91-18, "Information to Licensees Regarding Two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming Material Conditions and Operability," was performed on the eight valves currently susceptible to pressure locking to be dispositioned during RF-6 and RF-7. The evaluation determined that the valves are operable.

The GL 95-07 review identified no scenarios under which PRA safety significant or low safety significant valves would be subjected to thermal binding conditions. The review identified certain procedures where enhancements would be made to preclude potential pressure locking concerns. Procedure changes are to be completed by the start of RF-6.

Attachment 2 further explains the methodology used and the results of IP's evaluation for pressure locking and thermal binding.

Attachment 1 provides an affidavit attesting to the facts set forth in this letter.

Sincerely yours,

Wilfred Connell

Wilfred Connell
Vice President

JSP/csm

Attachment 1: Affidavit
Attachment 2: Methodology and Results of IP's Evaluation for Pressure Locking and Thermal Binding
Enclosure 1 to Attachment 2: Affected Valve List Summary

cc: NRC Clinton Licensing Project Manager
NRC Resident Office, V-690
Regional Administrator, Region III, USNRC
Illinois Department of Nuclear Safety

Attachment 1
to U-602553

Wilfred Connell, being first duly sworn, deposes and says: That he is Vice President of the Nuclear Program at Illinois Power; that this letter supplying information for Generic Letter 95-07 has been prepared under his supervision and direction; that he knows the contents thereof; and that to the best of his knowledge and belief said letter and the facts contained therein are true and correct.

Date: This 9th day of February 1996.

Signed: Wilfred Connell
Wilfred Connell

STATE OF ILLINOIS } SS.
DeWitt COUNTY }

"OFFICIAL SEAL"
Jacqueline S. Matthias
Notary Public, State of Illinois
My Commission Expires 11/29/97

Subscribed and sworn to before me this 9th day of February 1996.

Jacqueline S. Matthias
(Notary Public)

Methodology and Results of IP's Evaluation
for Pressure Locking and Thermal Binding

Introduction

This Attachment constitutes Illinois Power's response to the 180-day reporting requirements outlined in Generic Letter (GL) 95-07. GL 95-07 requires that licensees evaluate all their safety-related power operated gate valves (POVs) for susceptibility to pressure locking and/or thermal binding and to take appropriate actions to ensure that these valves are capable of performing their safety design basis functions within the current licensing basis of the facility. The 180-day reporting requirements are as follows:

Reporting Requirements

1. A summary description of the susceptibility evaluation of operational configurations.

2. The basis or criteria for determining that valves are or are not susceptible to pressure locking or thermal binding.

3. The results of the susceptibility evaluation (item 1) including a list of the susceptible valves.

4. The corrective actions, or other dispositioning, for the valves identified as susceptible to pressure locking or thermal binding, including:

   a. Equipment or procedural modifications completed and planned including the completion schedule.

   b. Justification for determination of any valve susceptible to pressure locking or thermal binding is acceptable as is.

5. Justify schedules longer than those given in the generic letter for requested corrective actions.

Evaluation Description

The scope of valves included in the GL 95-07 analyses are the gate POVs having an active safety function to open. This is consistent with industry/NRC discussions and feedback regarding GL applicability. Portions of analyses and modifications listed below were completed prior to GL 95-07 issuance to address earlier NRC Information Notices and Generic Letters.

Discussion Regarding Pressure Locking and Thermal Binding Criteria

Pressure locking: The screening criteria for determining susceptibility to pressure locking was if a valve could experience rapid depressurizations while the valve was closed and then required to open in order to perform its safety function. When rapid depressurization occurs, higher pressure fluid in the bonnet can push both disk faces outward thereby sealing both the upstream and downstream faces. With both faces seated, higher pullout force may be needed to open the valve. Increase in area ambient temperature further compounds the problem by increasing the pressure of the fluid trapped in the bonnet. Examples of some events that may cause a rapid depressurization include a Loss of Coolant Accident (LOCA) or a pump start at high developed heads followed by lower head (i.e., higher flow) conditions.

Thermal Binding: The criteria for determining if a valve was susceptible to thermal binding was if a valve which was closed while hot could be followed by a significant cooling and then required to be reopened while cool. Under this scenario, the disk and stem which are cool, being primarily outside of the hot fluid stream, are driven into the valve seat at design thrust. The valve disk and stem begin expanding as they are heated by the hot fluid in the valve. At the same time the hot valve body begins to cool and contract around the disk. This phenomenon then wedges the valve disk tightly into the seat. Abnormally high unseating force may be required to open the valve. It should be noted that this concern is applicable to those valves whose design basis requires multiple actuations after the design basis event or on valves closed hot and required to open during design basis accidents.

NRC Information Notice 92-26 Actions

Based on information provided in NRC Information Notice 92-26, "Pressure Locking of Motor Operated Flexible Wedge Gate Valves," issued April 2, 1992, Clinton Power Station (CPS) modified the High Pressure Core Spray (HPCS) injection valve by drilling a hole in the reactor side of the valve disk to prevent potential pressure locking. This modification was implemented during the fourth refueling outage (RF-4) which started in March 1993, and was a portion of a larger modification being implemented to support NRC GL 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance."

Design Basis Pressure Locking Evaluations on PRA Safety Significant Valves

As part of GL 89-10 activities, a review for susceptibility to pressure locking was made for Probabilistic Risk Assessment (PRA) safety significant valves {safety significant valves}. PRA safety significant valves collectively, contribute to more than 99.99% of the POV contributions to core damage frequency, failure to isolate containment, provide for containment heat removal, containment venting and containment/reactor pressure vessel flooding. The review addressed design basis accident (DBA) conditions.

This review identified the Low Pressure Core Spray (LPCS) injection valve and the Low Pressure Coolant Injection (LPCI) "A" "B" and "C" injection valves as being susceptible to pressure locking. During normal operation, the valve bonnet's pressure for these valves may be as high as reactor pressure. If rapid depressurization of the reactor occurs due to a DBA, the pressure in the bonnet could become trapped resulting in potential pressure locking. The LPCI "A" injection valve was modified during RF-5 (March 1995) by installing a bonnet bypass line back to the high pressure side of the valve. The LPCI "C" and the LPCS injection valves were also modified during RF-5 by drilling a hole in the high pressure side of the valve disk. An evaluation was prepared which provided justification for deferring modification of the LPCI "B" valve until RF-6. The LPCI "B" injection valve will be modified by drilling a hole in the high pressure side of the valve disk or installing a bonnet bypass line back to the high pressure side of the valve during the next refueling outage, RF-6, which is scheduled to start October 1996. A description and schedule of valves that have been or are to be modified is included in Enclosure 1 of this Attachment.

An operability evaluation per GL 91-18, "Information to Licensees Regarding Two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming Material Conditions and Operability," for LPCI "B" has determined it remains operable until such time that it can be modified during RF-6

Design Basis Thermal Binding Evaluations on PRA Safety Significant Valves

The review identified no design basis scenarios under which PRA safety significant valves would be subjected to thermal binding conditions.

Design Basis Pressure Locking Evaluations on PRA Low Safety Significant Valves

PRA low safety significant valves {low safety significant valves} were also reviewed for potential susceptibility to pressure locking. The review addressed design basis accident conditions.

This review identified two (1E32-F006 and 1E32-F008) of the Main Steam Isolation Valve (MSIV) Leakage Control System (LCS) valves as susceptible to pressure locking. During normal operation, valves 1E32-F006 and 1E32-F008 are subjected to main steam line pressure. During a design basis LOCA, a rapid depressurization could occur resulting in trapped pressure in the valve bonnet and potential pressure locking of 1E32-F006 and 1E32-F008. Downstream valves 1E32-F007 and 1E32-F009 are not currently susceptible since 1E32-F006 and 1E32-F008 isolate them from the reactor pressure vessel (RPV) pressure and rapid depressurization associated with a LOCA. If, however 1E32-F006 and 1E32-F008 are modified by drilling holes in the high pressure side of their valve disks, the pressure transient for the 1E32-F007 and 1E32-F009 valves

may change. A hole in the disk of the 1E32-F006 and 1E32-F008 valves could depressurize the portion of the line containing 1E32-F007 and 1E32-F009 valves thereby making them susceptible to pressure locking.

Inboard Residual Heat Removal (RHR) containment spray "A" and "B" isolation valves were also determined to be potentially susceptible to pressure locking. The piping downstream of the 1E12-F028A and 1E12-F028B valves will be at containment pressure. Under a pump start, RHR pump discharge pressure, at minimum flow conditions, will be on the upstream side of the valves. When injection and subsequent depressurization of the vessel occur, RHR pump discharge and system pressure will decrease potentially leaving pump minimum flow discharge pressure in the valve bonnet. The pressure in the bonnet may push the upstream and downstream disk faces against the seat.

An operability evaluation per GL 91-18 has determined that these four valves susceptible to pressure locking are operable until such time they can be modified.

Actions to be Taken for the RHR Containment Spray Isolation and MSIV LCS Valves

PRA low safety significant valves contribute less than 0.01% to core damage frequency, mitigation, etc. These are PRA low safety significant valves. As such, these valves have even less than a 0.01% impact to core damage frequency, failure to isolate containment, provide for containment heat removal, containment venting and containment/reactor pressure vessel flooding. Current plans are to modify the two RHR and four MSIV LCS valves by drilling holes in the high pressure side of their valve disks during RF-7, scheduled for April 1998. However, if acceptable analytical techniques supported by testing have been developed by that time, which show the valves capable of performing their safety function even if pressure locking were to occur, these valves may be dispositioned analytically instead of being modified.

Design Basis Thermal Binding Evaluations on PRA Low Safety Significant Valves

The review identified no design basis scenarios under which low safety significant valves would be subjected to thermal binding conditions.

Operational/Surveillance/Startup & Shutdown Review of PRA Safety Significant and Low Safety Significant Valves for Pressure Locking

The operational review for GL 95-07 included both PRA safety significant and low safety significant valves. The operational review included surveillance tests, plant startup and shutdown and all other identified modes of operation. A valve was determined not to be susceptible to pressure locking if water could not get into the bonnet of the valve. In addition, if a valve did not experience any sudden depressurizations and did not exhibit a

tendency to pressure lock as identified in the NUREG-1275, Volume 9, and AEOD/S92-07, and the NRC portions of NUREG/CP-0146, it was concluded that a valve was not susceptible to pressure locking.

The operational review determined that the Reactor Core Isolation Cooling (RCIC) injection valve was susceptible to pressure locking. During pump operability testing, turbine operation creates a condition where, as the turbine comes on initially and before rated flow is established, the valve experiences a high pressure condition due to the minimum flow valve not having yet opened. The normally closed RCIC pump minimum flow valve will open if RCIC flow is less than 85 gpm and pump discharge pressure is greater than 125 psig. Once rated test flow is established, system pressure will decrease and as the test is completed, the RCIC turbine is tripped and system pressure decreases even further. As a result, the valve experiences a depressurization event and is judged to be susceptible to pressure locking.

The operational review also determined that the RHR test return "A" and "B" valves are susceptible to pressure locking. The RHR test return valves are used to channel water back to the suppression pool when the system is in the suppression pool cooling mode. When a discharge boundary valves goes closed, the minimum flow valve does not open until system flow is less than 1100 gpm for greater than 8 seconds. During this time, RHR system pressure may increase to pump shutoff head pressure. During depressurization, the higher pressure water may be trapped in the valve bonnet. The pressure in the bonnet may become even greater due to increases in ambient temperature. Therefore, the valves are judged to be susceptible to pressure locking.

An operability evaluation per GL 91-18, based on the reasonable expectation that some amount of air would remain in the valve bonnet, concluded these valves remain operable until such time they can be modified.

Actions to be Taken for the RCIC Injection and RHR Test Return Valves

The RCIC injection valve will be modified by the completion of RF-6. The modification will entail drilling a hole in the high pressure side of the valve disk. The RHR test return valves will also be modified by the completion of RF-6. The RHR valves are being replaced with new valves. These new valves will be purchased from the vendor with the high pressure side of the disks predrilled in order to eliminate potential pressure locking.

Operational/Surveillance/Startup & Shutdown Review of PRA Safety Significant and Low Safety Significant Valves for Thermal Binding

Except for one double disk valve, all of the CPS reviewed safety-related gate valves have flex wedges. The screening criteria for determining applicability to thermal binding was limited to those valves having a maximum operating temperature greater than

200°F. In addition, if a valve did not experience any operational manipulations when it was hot and did not exhibit a tendency to thermal bind as identified in the NUREG-1275, Volume 9, and AEOD/S92-07, and the NRC portions of NUREG/CP-0146, a valve was determined not to be susceptible to thermal binding. During the review, no valves were determined to meet the criteria for thermal binding susceptibility.

Justification for Schedule Outside the 180-Day Window

Operability evaluations in accordance with GL 91-18 have determined the valves susceptible to pressure locking are operable. These evaluations are based on reasonable expectations and on recent industry testing which indicates that some air will remain trapped in the valve bonnet, thereby mitigating the impact of potential changes in ambient temperature. During the review, no valves were determined to be susceptible to thermal binding.

At present, CPS has completed modifications on all but one division (LPCI "B") of Low Pressure Coolant Injection. The other two divisions have already been modified. The HPCS and LPCS systems have been modified to preclude pressure locking.

In accordance with the NRC November 30, 1995, Summary of Public Workshops to Discuss Generic Letter 95-07 memorandum, "If an immediate operability concern does not exist and risk considerations are appropriate, a licensee might consider corrective action on one train at the next available outage and the other train the following." IP has committed to modify the remaining safety significant POVs during the next refueling outage, RF-6, scheduled for October 1996. This will be the first planned outage of adequate duration to complete the planned modifications for these POVs. The low safety significant POVs, intended to be dispositioned during RF-7 do not contribute significantly (less than 0.01%) to mitigation of core damage, etc. As such, delaying the dispositioning until RF-7 will have negligible impact on plant safety.

Procedure Changes

Several procedure changes will be made as a result of the operational review for this issue. A summary description of the proposed procedure changes is listed below. As stated in the 60-day response to GL 95-07, U-602506, dated October 16, 1995, the procedure changes will be completed prior to the beginning of RF-6.

CPS No. 1302.02, "Conduct of CPS Testing"
CPS No. 2800.03, "Reactor Coolant System Leakage Test"
CPS No. 2800.04, "Generic Flush Procedure"
CPS No. 2800.05, "Generic Pressure Test of ASME 1, 2, 3, Systems"
CPS No. 9843.01, "ISI Category A Valve Leak Rate Test"
CPS No. 9861.05, "Water Local Leak Rate Testing"

These procedures are involved with pressure testing. The procedures are being revised to require that normally closed test boundary valves are electrically stroked following pressure testing. This will eliminate potential concerns of normally closed boundary valves becoming pressure locked due to action performed during the performance of these procedures. The valves identified in these procedures are those which have an active safety function to open which could potentially become pressure locked.

Affected Valve List Summary

Listed below is a summary of valves affected by GL 95-07. Included are the valve Equipment Identification Numbers (EINs), valve name, which phenomena (pressure locking or thermal binding) was potentially present, the corrective action taken/to be taken and the corrective action schedule.

Valve EIN	Valve Name	Phenomena	PRA Type	Corrective Action (CA)	CA Schedule
1E22-F004	HPCS Injection Valve	Pressure Locking	Safety Significant	Drill Hole in Disk	Complete RF-4, March 1993
1E12-F042A	LPCI "A" Injection Valve	Pressure Locking	Safety Significant	Bonnet Bypass Line	Complete RF-5, March 1995
1E12-F042B	LPCI "B" Injection Valve	Pressure Locking	Safety Significant	Bonnet Bypass Line or Drill Hole in Disk	To Be Complete RF-6, Starting October 1996
1E12-F042C	LPCI "C" Injection Valve	Pressure Locking	Safety Significant	Drill Hole in Disk	Complete RF-5, March 1995
1E21-F005	LPCS Injection Valve	Pressure Locking	Safety Significant	Drill Hole in Disk	Complete RF-5, March 1995
1E12-F028A/B	RHR Containment Spray Isolation Valves	Pressure Locking	Low* Safety Significant	Valve Modification or Analysis**	To Be Complete in RF-7, Starting April 1998
1E32-F006 1E32-F007† 1E32-F008 1E32-F009†	Main Steam Isolation Valve Leakage Control System	Pressure Locking	Low* Safety Significant	Valve Modification or Analysis**	To Be Complete in RF-7, April 1998
1E12-F024A/B	RHR Test Return Valves	Pressure Locking	Safety Significant	New Valves With Disks Pre Drilled by Vendor	To Be Complete RF-6, October 1996
1E51-F013	RCIC Injection Valve	Pressure Locking	Safety Significant	Drill Hole in Disk	To Be Complete RF-6, October 1996

* Low PRA safety significant valves {low safety significant valves} collectively, contribute less than 0.01% of the power operated valve (POV) contributions to core damage frequency, failure to isolate containment, provide for containment heat removal, containment venting and containment/reactor pressure vessel flooding.

** Analytical means may consist of demonstrating air in a valve bonnet or other such methods demonstrated to mitigate the effects of pressure locking. This would be acceptable in accordance with the NRC November 30, 1995, Summary of Public Workshops to Discuss Generic Letter 95-07 memorandum. Furthermore, it was stated that a licensee might establish a program to monitor air in valve bonnets and if air was present, pressure rise would be minimal except in the case of large temperature rises. It was proposed that this could be part of a long-term resolution plan.

† These valves are not susceptible until the 1E32-F006 and 1E32-F008 valves are modified by drilling holes in the high pressure side of their valve disks.