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THRU: Terence L. Chan, Chief
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FROM: Howard J. Rathbun, Mechanical Engineer
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SUBJECT: SUMMARY OF PUBLIC MEETING WITH PACIFIC GAS AND ELECTRIC TO DISCUSS GENERIC LETTER 95-07, "PRESSURE LOCKING AND THERMAL BINDING OF SAFETY-RELATED POWER-OPERATED GATE VALVES"

On August 17, 1995, the NRC issued Generic Letter (GL) 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves," to request that licensees take 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. By letter dated October 11, 1995, Pacific Gas and Electric company (PG&E), the licensee for Diablo Canyon Power Plant (DCPP) Units 1 and 2, submitted its 60-day response to GL 95-07. This letter stated, in part, that the licensee has completed the actions requested in GL 95-07. The licensee has performed a screening evaluation of the operational configurations of all safety-related power-operated gate valves and identified 46 valves (23 in each unit) that were susceptible to pressure locking and no valves susceptible to thermal binding. In addition, the letter states that all 46 valves susceptible to pressure locking have been modified to prevent this phenomenon from occurring.

On January 22 and 23, 1996, Mr. Christopher J. Myers of Region IV and I met with representatives of PG&E to discuss the licensee's response to GL 95-07. The meeting was held at the DCPP community center in San Luis Obispo and was open to members of the public. Attachment 1 is a list of meeting participants. Attachment 2 is a list of questions discussed during the meeting. The most significant discussion topics are summarized below:

1. The licensee had evaluated the operational configurations of all safety-related power-operated gate valves under normal operating conditions, design basis conditions, beyond design basis emergency operating procedures (EOP) conditions and test and surveillance conditions. This included a total of 122 valves between the two units. GL 95-07 requests

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that licensees evaluate safety-related power-operated gate valves for conditions which may occur within the plant's design basis; however, PG&E conservatively included conditions which are outside the plant's design basis to provide assurance of their operational readiness in all cases. Valve manipulations associated with recovery from mispositioning from the control room were excluded from consideration.

2. For safety-related power-operated gate valves which are closed for test or surveillance, the licensee declares the applicable train inoperable and enters the appropriate technical specification. Although this effectively resolves the issue for closeout of GL 95-07, the licensee did evaluate conditions which may occur during surveillance or test to ensure that the gate valve would be capable of returning to its safety position to preclude the valve from becoming bound closed during the test.

3. The licensee's evaluation process included the involvement of component engineers, systems engineers and operations personnel to ensure a multi-disciplinary review process for accuracy and completeness. The staff views this as a strength in the licensee's GL 95-07 program.

4. The licensee did not rely on analysis or calculations to evaluate the susceptibility of safety-related power-operated gate valves to pressure locking or thermal binding. The licensee evaluated the operational configurations of safety-related power-operated gate valves based on engineering judgement. The staff is currently reviewing the conclusions of the licensee's evaluations.

5. The licensee applied a 200 degree F cooldown temperature difference criteria for determining susceptibility to thermal binding for flexible wedge and split wedge gate valves based on information contained in Institute of Nuclear Power Operations (INPO) Significant Operating Experience Report 83-9, "Valve Inoperability Caused by Motor-Operator Failures." The licensee has not performed testing or analysis to provide additional justification for the use of this criterion. The licensee relied on three additional considerations:

   a. The licensee's plant procedures ensure that there is sufficient clearance between guide to disk fitup to prevent binding

   b. Similar thermal performance characteristics between the valve disk and body

   c. Relative flexibility of the disk wedge (i.e., thickness of the hub, diameter of the disk, thickness of the disk).

   The licensee's submittal states that flexible wedge gate valves with similar body/disk materials are not considered susceptible to thermal binding. During the meeting, the licensee qualified this statement by stating that similar body/disk materials do not necessarily preclude thermal binding. Rather, the licensee stated that similar thermal

expansion characteristics in combination with the other factors mentioned above could preclude thermal binding. The staff is currently evaluating the adequacy of this and other criteria and assertions based on industry and NRC testing and analysis.

6. The potential susceptibility of the pressurizer power-operated relief valve (PORV) block valves was discussed. The licensee stated that these valves are normally open, and are closed in a hot condition to isolate a postulated leaking PORV. The valves have an opening requirement for postulated steam generator tube rupture or low-temperature overpressure events. The licensee stated that these valves are seated using torque switch bypass logic which minimizes seating thrust and the resulting pullout thrust. The licensee stated that this condition precludes susceptibility to thermal binding. The staff is currently evaluating the adequacy of this assertion.

7. The licensee stated that certain valves are stroked during quarterly surveillance test procedures (STP), which are run at normal operating conditions and reflect similar temperatures under which the valves open to perform their safety function. The licensee stated that stroking of these valves under these conditions provides assurance that "normal operation" temperature fluctuations will not cause pressure locking. The licensee stated that certain testing is performed using diagnostic equipment and accounts for degraded voltage in the acceptance criteria. The staff is currently evaluating the adequacy of reliance on surveillance test data to evaluate susceptibility to pressure locking.

8. The licensee has performed design modifications to preclude pressure locking in 46 valves (23 in each unit). These modifications include drilling a hole in the high pressure side of the disk and installing a bonnet cavity leakoff (with a block valve) to the high pressure inlet line. The licensee's plant procedures have been appropriately modified to ensure proper operation and maintenance of the applicable valves.

The staff is currently evaluating several of the licensee's assertions involving susceptibility to pressure locking and thermal binding. The staff will resolve these issues with the licensee and will address them in a response to their October 11, 1995, letter.

Attachments:
1. List of Meeting Participants
2. List of Questions Discussed During Meeting

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LIST OF MEETING PARTICIPANTS

NAME	ORGANIZATION
S. Allen	Pacific Gas and Electric
R. Waltos	Pacific Gas and Electric
C. Harbor	Pacific Gas and Electric
M. Frauenheim	Pacific Gas and Electric
L. Pulley	Pacific Gas and Electric
M. Davido	Pacific Gas and Electric
R. Cahn	Pacific Gas and Electric
C. Myers	NRC/Region IV
H. Rathbun	NRC/NRR

Attachment 1

ATTACHMENT 2

LIST OF QUESTIONS DISCUSSED DURING MEETING

Generic Letter 95-07, "Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves" Meeting Diablo Canyon Units 1 and 2

Susceptibility Evaluation

1. How did the licensee derive the initial list of valves to be considered (i.e., IST program, FSAR review, etc.)?

2. Valves 8107 and 8108 (Normal Charging Isolation) appear to have been eliminated from consideration due to lack of safety function to open. Do these valves have a safety function to open?

3. Why were steam generator blowdown isolation and sample isolation valves eliminated from consideration?

4. Has the licensee considered safety-related power-operated gate valves that are closed for test or surveillance (which defeat the capability of a safety train) and either:

   i. Verified that the valve is not susceptible to pressure locking or thermal binding while closed,
   ii. Follow plant technical specifications for train/system while the valve is closed,
   iii. Demonstrated that the actuator has sufficient capacity to overcome these phenomena, or
   iv. Made appropriate hardware and/or procedural modifications to prevent pressure locking or thermal binding

5. Did the licensee employ a multi-disciplinary review team (system engineers, operations engineers, and maintenance engineers) to evaluate susceptibility of safety-related power-operated valves?

6. How did the licensee consider external conditions that may exist or change during normal, surveillance or operating conditions such as presence of valve body and/or bonnet insulation, potential heat sources such as pump motors, steam driven pump turbines, high energy piping or high temperature fluid in adjacent piping? Has the licensee performed any leakage, heat transfer, thrust requirement, or actuator capability calculations in evaluating susceptibility to pressure locking or thermal binding?

7. Is the split wedge gate valve design considered potentially susceptible to thermal binding? Why or why not?

8. The licensee's submittal states that several split wedge and flex wedge gate valves are not susceptible to thermal binding because the valve is not subjected to appreciable temperature difference between when closed and when it must reopen. Is there a specific temperature difference that was applied to reach this conclusion? Is there any analytical or test basis for this temperature difference?

9. The licensee's submittal states that several flex-wedge gate valves are not susceptible to thermal binding since they are seated using torque switch bypass logic. Has the licensee performed testing to verify this assertion? Does this condition involve potentially higher leakage past the valve seat and if so, how does the licensee address this issue?

10. The licensee's submittal states that flex-wedge gate valves with similar body/disk materials are not considered susceptible to thermal binding, since the potential for differential thermal expansion is inadequate. Has the licensee performed any analysis or testing to verify this assertion?

11. The licensee's submittal states that several valves are not susceptible to pressure locking since they are stroked during quarterly STP's which are run at normal operating conditions and reflect similar temperatures under which the valves open post LOCA. Has the licensee performed these surveillance tests with diagnostic equipment to determine the amount of thrust required to open the valves to support the assertion that the valves have sufficient capability to open under accident conditions? Has the licensee considered the potential effects of degraded voltage (which may be present during an accident) on actuator capability relative to thrust requirement?

12. The licensee's submittal discusses the potential susceptibility of the PORV block valves to pressure locking. Are the steam generator tube rupture (SGTR) and low-temperature over-pressure (LTOP) conditions part of the initial licensing basis, subsequent licensing basis, or current licensing basis of the plant? Also, are the SGTR or LTOP scenarios the ones which could lead to pressure locking of the PORV block valves?

<u>Further Analysis and Disposition</u>

1. Have operating procedures been modified involving operation of the block valves on bypass lines?

2. For valves that were modified to eliminate susceptibility to pressure locking by drilling a hole in the high pressure side, why was a hole drilled in the high pressure side of the disk (as opposed to the low pressure side of the disk)? Also, how has the licensee accounted for changing the valve to be unidirectional, including leakage requirements?

3. What size holes were drilled and why was this size chosen?

4. Is the choice of this size hole supported by test data?

5. Have plant procedures been modified to ensure that valves which have had a hole drilled in the high pressure side of the disk are replaced in their proper orientation following maintenance? May we see an example of this? Has there been training for maintenance personnel regarding this issue?