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Docket No. 50-354

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Mr. R. L. Mittl, General Manager
Nuclear Assurance and Regulation
Public Service Electric & Gas Company
80 Park Plaza, T22A
Newark, New Jersey 07101

Dear Mr. Mittl:

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION - EQUIPMENT QUALIFICATION

Continued staff review of the Hope Creek OL application has resulted in the need for additional information in the area of equipment qualification (EQ). The individual EQ topics covered by this request and their Enclosure numbers are as follows:

EQ Topic	Enclosure
Dependability of Containment Isolation-Containment Purge and Vent Operability (TMI Item II.E.4.2)	1
Performance Testing of BWR Safety/Relief Valves (TMI Item II.D.1)	2
Environmental Qualification	3

Please inform the NRC Project Manager of your schedule for responding to these topics.

Sincerely,

Original signed by:

A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing

Enclosures: As stated

cc: See next page

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

NOV 21 1984

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Hope Creek

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Operability Qualification of Purge and Vent Valves

Demonstration of operability of the containment purge and vent valves and the ability of these valves to close during a design basis accident is necessary to assure containment isolation. This demonstration of operability is required by NUREG-0737, "Clarification of TMI Action Plan Requirements," II.E.4.2 for containment purge and vent valves which are not sealed closed during operational conditions 1, 2, 3 and 4.

1. For each purge and vent valve covered in the scope of this review, the following documentation demonstrating compliance with the "Guidelines for Demonstration of Operability of Purge and Vent Valves" (attached, Attachment #2) is to be submitted for staff review:

   A. Dynamic Torque Coefficient Test Reports (Butterfly valves only) - including a description of the test setup.

   B. Operability Demonstration or In-situ Test Reports (when used)

   C. Stress Reports

   D. Seismic Reports for Valve Assembly (valve and operator) and associated parts.

   E. Sketch or description of each valve installation showing the following (Butterfly valves only):

      1. direction of flow

      2. disc closure direction

      3. curved side of disc, upstream or downstream (asymetric discs)

      4. orientation and distance of elbows, tees, bends, etc. within 20 pipe diameters of valve

      5. shaft orientation

      6. distance between valves

   F. Demonstration that the maximum combined torque developed by the valve is below the actuator rating.

2. The applicant should respond to the "Specific Valve Type Questions" (attached) which relate to his valve.

3. Analysis, if used, should be supported by tests which establish torque coefficients of the valve at various angles. As torque coefficients in butterfly valves are dependent on disc shape aspect ratio, angle of closure flow direction and approach flow, these things should be accurately represented during tests. Specifically, piping installations (upstream and downstream of the valve) during the test should be representative of actual field installations. For example, non-symetric approach flow from an elbow upstream of a valve can result in fluid dynamic torques of double the magnitude of those found for a valve with straight piping upstream and downstream.

4. In-situ tests, when performed on a representative valve, should be performed on a valve of each size /type which is determined to represent the worst case load. Worst case flow direction, for example, should be considered.

   For two valves in series where the second valve is a butterfly valve, the effect of non-symetric flow from the first valve should be considered if the valves are within 15 pipe diameters of each other.

5. If the applicant takes credit for closure time vs. the buildup of containment pressure, he must demonstrate that the method is conservative with respect to the actual valve closure rate. Actual valve closure rate is to be determined under both loaded and unloaded conditions and periodic inspection under tech. spec. requirements should be performed to assure closure rate does not increase with time or use.

Specific Valve Type Questions

The following questions apply to specific valve types only and need to be answered only where applicable. If not applicable, state so.

A. Torque Due To Containment Backpressure Effect (TCB)
For those air operated valves located inside containment, is the operator design of a type that can be affected by the containment pressure rise (backpressure effect) i.e. where the containment pressure acts to reduce the operator torque capability due to TCB. Discuss the operator design with respect to the air vent and bleeds. Show how TCB was calculated (if applicable).

B. Where air operated valve assemblies use accumulators as the fail-safe feature, describe the accumulator air system configuration and its operation. Discuss active electrical components in the accumulator system, and the basis used to determine their qualification for the environmental conditions experienced. Is this system seismically designed? How is the allowable leakage from the accumulators determined and monitored?

C. For valve assemblies requiring a seal pressurization system (inflatable main seal), describe the air pressurization system configuration and operation including means used to determine that valve closure and seal pressurization have taken place. Discuss active electrical components in this system, and the basis used to determine their qualification for the environmental condition experienced. Is this system seismically designed?

D. Where electric motor operators are used to close the valve has the minimum available voltage to the electric operator under both normal or emergency modes been determined and specified to the operator manufacturer to assure the adequacy of the operator to stroke the valve at accident conditions with these lower limit voltages available? Does this reduced voltage operation result in any significant change in stroke timing? Describe the emergency mode power source used.

E. Where electric motor and air operator units are equipped with handwheels, does their design provide for automatic re-engagement of the motor operator following the handwheel mode of operation? If not, what steps are taken to preclude the possibility of the valve being left in the handwheel mode following some maintenance, test etc. type operation?

F. For electric motor operated valves have the torques developed during operation been found to be less than the torque limiting settings?

Enclosure 1
Attachment 2

GUIDELINES FOR DEMONSTRATION OF OPERABILITY OF PURGE AND VENT VALVES

OPERABILITY

In order to establish operability it must be shown that the valve actuator's torque capability has sufficient margin to overcome or resist the torques and/or forces (i.e., fluid dynamic, bearing, seating, friction) that resist closure when stroking from the initial open position to full seated (bubble tight) in the time limit specified. This should be predicted on the pressure(s) established in the containment following a design basis LOCA. Considerations which should be addressed in assuring valve design adequacy include:

1. Valve closure rate versus time - i.e., constant rate or other.
2. Flow direction through valve; ΔP across valve.
3. Single valve closure (inside containment or outside containment valve) or simultaneous closure. Establish worst case.
4. Containment back pressure effect on closing torque margins of air operated valve which vent pilot air inside containment.
5. Adequacy of accumulator (when used) sizing and initial charge for valve closure requirements.
6. For valve operators using torque limiting devices - are the settings of the devices compatible with the torques required to operate the valve during the design basis condition.
7. The effect of the piping system (turns, branches) upstream and downstream of all valve installations.
8. The effect of butterfly valve disc and shaft orientation to the fluid mixture egressing from the containment.

DEMONSTRATION

Demonstration of the various aspects of operability of purge and vent valves may be by analysis, bench testing, in-situ testing or a combination of these means.

Purge and vent valve structural elements (valve/actuator assembly) must be evaluated to have sufficient stress margins to withstand loads imposed while valve closes during a design basis accident. Torsional shear, shear, bending, tension and compression loads/stresses should be considered. Seismic loading should be addressed.

Once valve closure and structural integrity are assured by analysis, testing or a suitable combination, a determination of the sealing integrity after closure and long term exposure to the containment environment should be evaluated. Emphasis should be directed at the effect of radiation and of the containment spray chemical solutions on seal material. Other aspects such as the effect on sealing from outside ambient temperatures and debris should be considered.

The following considerations apply when testing is chosen as a means for demonstrating valve operability:

Bench Testing

A. Bench testing can be used to demonstrate suitability of the in-service valve by reason of its traceability in design to a test valve. The following factors should be considered when qualifying valves through bench testing.

   1. Whether a valve was qualified by testing of an identical valve assembly or by extrapolation of data from a similarly designed valve.

   2. Whether measures were taken to assure that piping upstream and downstream and valve orientation are simulated.

   3. Whether the following load and environmental factors were considered

      a. Simulation of LOCA
      b. Seismic loading
      c. Temperature soak
      d. Radiation exposure
      e. Chemical exposure
      d. Debris

B. Bench testing of installed valves to demonstrate the suitability of the specific valve to perform its required function during the postulated design basis accident is acceptable.

   1. The factors listed in items A.2 and A.3 should be considered when taking this approach.

In-Situ Testing

In-situ testing of purge and vent valves may be performed to confirm the suitability of the valve under actual conditions. When performing such tests, the conditions (loading, environment) to which the valve(s) will be subjected during the test should simulate the design basis accident.

NOTE: Post test valve examination should be performed to establish structural integrity of the key valve/actuator components..

Request for Additional Information by the Equipment Qualification Branch

TMI Action Plan II.D.1

Prior submittals do not provide the basis for the conclusion that the test results presented in NEDE-24988-P on safety/relief valve testing are applicable to Hope Creek. Describe the basis thoroughly, as indicated below:

1. The test program utilized a "rams head" discharge pipe configuration. Most plants utilize a "tee" quencher configuration at the end of the discharge line. Describe the discharge pipe configuration used at your plant and compare the anticipated loads on valve internals in the plant configuration to the measured loads in the test program. Discuss the impact of any differences in loads on valve operability.

2. The test configuration utilized no spring hangers as pipe supports. Plant specific configurations do use spring hangers in conjunction with snubber and rigid supports. Describe the safety relief valve pipe supports used at your plant and compare the anticipated loads on valve internals for the plant pipe supports to the measured loads in the test program. Describe the impact of any differences in loads on valve operability.

3. The purpose of the test program was to determine valve performance under conditions anticipated to be encountered in the plants. Describe the events and anticipated conditions at the plant for which the valves are required to operate and compare these plant conditions to the conditions in the test program. Describe the plant features assumed in the event evaluations used to scope the test program and compare them to the features at your plant. For example, describe high level trips to prevent water from entering the steam lines under high pressure operating conditions as assumed in the test event and compare them to trips used at your plant.

4. Describe how the values of valve C_V's in report NEDE-24988-P will be used at your plant. Show that the methodology used in the test program to determine the valve C_V will be consistent with the application at your plant.

REQUEST FOR ADDITIONAL INFORMATION
HOPE CREEK GENERATING STATION
ENVIRONMENTAL QUALIFICATION PROGRAM

References:
1. Hope Creek, FSAR
2. R. L. Mittl to A. Schwencer, "Environmental Qualification," August 24, 1984

1. Item 12, of FSAR Table 3.11-3, states that spray impingement will be evaluated to determine if testing under spray conditions in addition to 100% relative humidity conditions is required. It should be noted that 100% humidity test is not an acceptable alternative to spray testing. Provide a list of equipment which are subjected to spray but are not qualified by subjecting them to the spray. The list should include the justification for all such components to describe why it is not necessary to subject these equipment to spray condition.

2. Item 14, FSAR Table 3.11-3, states that aging is included -- except where equipment is not considered to be age sensitive. Confirm that you have included aging during the qualification testing for all equipment which are qualified to category I requirements, and have considered aging and established qualified life for all equipment qualified to category II requirements.

3. Item 15, FSAR Table 3.11-3, states that equipment that could be submerged have been identified and demonstrated to be qualified by test for the duration required. Provide a list of all the equipment which could be submerged along with the identification for the equipment which are qualified by test and the ones which are exempted from the qualification. Provide the basis for exempting individual equipment from submergence qualification. Also discuss the qualification method used to qualify the equipment for submergence.

4. Provide a discussion on how the normal/abnormal environmental condition (temperature) has been used in aging consideration.

5. Provide the temperature and radiation dose limit used to distinguish between the harsh and mild environmental zone.

6. Page VI-I of Reference 2 lists the DBAs causing the worst case harsh environmental condition. However, the list does not include fuel handling accidents which may result in a higher radiation dose for some equipment. Provide the reason for not including this accident into the list of DBAs considered.

7. Reference 2, page VII-8, item 5, states that exception to qualification is taken in those cases where safety function can be accomplished by some other designated equipment that has been adequately qualified and satisfies the single failure criterion. Provide a list of all such equipment which have been exempted from qualification based on this criterion and explain how it affects the defense in depth concept (redundancy and diversity).

8. Reference 2, page VIII-3, GE/HCGS Response to Item 4, does not define the acceptable time margin for the equipment which do not have the one hour required time margin. Provide the minimum time margin accepted by you and the basis for your acceptance.

9. Regarding Reference 2, note 2 on figures 2, 4, and 8 should be clarified to explain the reasons for not establishing harsh environment for these rooms.

10. Confirm that you have not utilized thermal equivalence analysis to qualify some equipment at HCGS. If you have, then confirm that you have utilized the method identified in NUREG-0588. Provide one example with the bases and criteria used in the thermal equivalence analysis.

11. Confirm that all category I and II equipment per Reg Guide 1.97 which are located in a harsh environment are included in your environmental qualification program.

12. Your response to the staff's request for additional information item 270.2b does not completely address the staff's concern. Justification should be provided for each system individually which is identified as safety related in FSAR Table 3.2-1 and is not included in your EQ program.

13. Radiation environment for HCGS is low compared to similar plant. Provide the basis, assumption and a sample calculation to determine the acceptability of the radiation environment for HCGS. Also, if credit is taken for any equipment because of the location of the equipment in a room, a sample calculation with the basis and assumption should also be provided.

14. FSAR Table 3.11-4 lists mechanical equipment required for harsh environment qualification. This table should be expanded to include individual tag numbers with functional description, manufacturer, model number and location for individual equipment.

15. Confirm that you plan to add the qualification status with the identification as to which category (I or II per NUREG-0588) it was qualified to. In addition to this, maintenance/replacement schedules to maintain the qualified life should also be identified.