Request for Additional Information No. 49 (873), Revision 0

8/21/2008

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 03.09.06 - Functional Design Qualification and Inservice Testing Programs for Pumps, Valves, and Dynamic Restraints
Application Section: 3.9.6
CIB1 Branch

QUESTIONS

03.09.06-1

General Design Criterion 1 requires that structure, systems and components (SSCs) important to safety be designed to quality standards commensurate with the importance of the safety functions to be performed. Where generally recognized codes and standards are used, they shall be identified and evaluated to determine their applicability, adequacy, and sufficiency as necessary to assure a quality product in keeping with the required safety function.

ASME QME-1-2007, Qualification of Active Mechanical Equipment Used in Nuclear Power Plants (Revision of ASME QME-1-2002), provides acceptable measures and guidelines to ensure that pumps, valves, and dynamic restraints are functionally designed and qualified to perform their safety functions during accident conditions. This Standard was approved as an American National Standard on June 25, 2007.

FSAR Tier 2, Section 3.9.6.1 does not provide a discussion of whether or not all or portions of this Code will be used to functionally qualify safety-related pumps, valves, and dynamic restraints for the U.S. EPR. FSAR Tier 2, Section 3.11.2.2 states that the U.S. EPR's approach to qualification of mechanical equipment is based on methods developed and accepted by the NRC for operating reactors as described in South Texas Project docketed correspondence regarding the elimination of equipment qualification (EQ) of mechanical components. The applicant states in Section 3.11.2.2 that the need to maintain a separate mechanical equipment qualification (MEQ) program for the U.S. EPR was determined to be redundant, considering engineering design programs.

Considering the above, please address the following:

1. FSAR Tier 2 Section 3.9.6.1 does not address ASME QME-1-2007. Will the design and qualification requirements with respect to safety-related pumps, valves, and dynamic restraints adhere to the requirements of this standard? If not all, will portions of this standard be applied to the U.S. EPR?

2. If this standard is not being utilized, provide the bases for how what is being proposed in FSAR Tier 2 Sections 3.9.6.1 and 3.11.2.2 is the equivalent of what is required by this standard. Provide descriptions and examples of how:

a) Thermal and radiation aging for both normal and accident conditions and the resulting qualified lives of non-metallic components used in pumps, valves and dynamic restraints are determined, documented and then incorporated into procurement and design specifications of SSCs.

b) How will qualified lives for non-metallic components be established?

c) What type of qualification testing will be performed for these components? Will they be qualified by analyses, testing, or some combination of analysis and testing?

d) Describe how the specific environmental effects resulting from both normal operation and design basis accident conditions are accounted for in the proposed qualification program for pumps, valves, and dynamic restraints?

e) Identify the differences between the proposed functional qualification program and the ASME QME-1-2007 requirements for dynamic restraints as provided in Section QDR, for pumps as provided in Section QDP, and for valves as provided in Section QV. Provide a discussion regarding how what is proposed is the equivalent of the standard and define any differences.

03.09.06-3

GDCs 37, 40, 43, and 46 specify that safety-related systems be designed to permit periodic functional testing. NUREG-0800 Section 3.9.6 states that an acceptable means of meeting these GDC requirements for new plant applications, is that safety related pump, valve, and piping designs include provisions to allow testing of pumps and valves at the maximum flow specified in the plant accident analyses. It also states that the design and qualification should be accomplished such that each pump and valve is capable of performing its intended function for a full range of system differential pressure and flow, ambient temperatures, and available voltages.

FSAR Tier 2 Section 3.9.6.1 states that the IST program requires pump and valve testing over the full range of system differential pressures, flowrates, temperatures and available voltages. It also states that system design includes alternate flow paths and required instrumentation, to allow full flow testing of pumps under the IST program. Considering the above, please answer the following:

1. Flow diagrams containing safety-related pumps and valves in the application did not typically show the layout of full-flow test lines and/or other provisions (instrument taps, DP gauges) necessary to fully assess the ability to test these components. Are all safety-related pumps provided with full-flow test lines such that IST testing will be performed at accident assumed flow-rates?

2. If there are any exceptions to the answer to Item 1 above, please list them and describe why they cannot be full flow tested.

3. Will all safety-related valves be IST tested at accident assumed flowrates? If there are any exceptions, please list them and describe why they cannot be full flow tested.

4. Provide, if available, flow diagrams for safety-related pumps and valves in sufficient detail (e.g., line sizes and flowpaths) such that the full-flow test capacity can be determined. If unavailable, provide a reason why, or provide alternative information such that the review can make this determination.

03.09.06-4

In the IST program for pumps and in accordance with ISTB-5300, please address a requirement to measure the discharge pressure of three positive displacement pumps at a quarterly frequency. These pumps are fuel transfer and auxiliary fuel pumps identified as 30XJN10AP100A, 30XJN10AP100B, and 30XJN10AP120.

03.09.06-5

In the IST program for valves, please address the following additional requirements:

1. As required by ISTC-5220, air release and vacuum breaker valves (identified as 30PEB10AA190, 30PEB10AA191, 30XJG10AC001, 30PEB20AP001, SAQ20AC001, 30XJG20AC001, 30XJG30AC001, PEB30AP001, SAQ30AC001, 30XJG40AC001, PEB40AP001, and SAQ40AC001) should have a stroke testing frequency of two years.

2. The IST valve table needs to show valve sizes and associated P&ID drawing numbers.

3. Since the main steam isolation valves are single inline components and are required to isolate flow in the forward and reverse direction, address the need for leak testing in each direction.

4. On the safety injection system P&ID (Figure 6.3-3), there are shown 3-port power -operated valves (30JNK10AA001, 30JNK20AA001, 30JNK30AA001, and 30JNK40AA001) that should be added to the IST program.

5. There are valves in the IST table (30JMQ41AA002, 30JMQ42AA002, 30JMQ43AA002, 30JNG10AA010, 30JNG20AA010, 30JNG30AA010, 30JNG40AA010) that have a passive designation, which is inconsistent with having both open and closed safety positions.

6. The IST table should indicate that all power-operated valves requiring an exercise test should also require a stroke time test (ISTC-5113).

7. In accordance with ISTC-3560, required fail-safe testing should be indicated in the IST table.

03.09.06-6

In discussing inservice operability testing of power-operated valves, the applicant states that this testing includes testing in static system conditions with diagnostic measurements or dynamic system conditions that include flow and differential pressure. Although the lessons learned from operating experience have proven that static tests are ineffective for assessing the design-basis capability of MOVs, the applicant should clarify the use of static tests for operability determinations of POVs.

03.09.06-7

The design of the U.S. EPR system should incorporate provisions to permit all safety-related check valves to be tested for performance in both the forward and reverse flow directions. The ASME OM Code (2004 Edition) includes this requirement for bi-directional testing of check valves (as does the 1995 Edition of the ASME Code through the 2003 Addenda as is currently incorporated by reference in 10 CFR 50.55a(b)(3)). Specifically, the Code states that the necessary valve obturator movement during exercise testing shall be demonstrated by performing both an open and close test. Does the U.S. EPR system design incorporate provisions, including alternate flow paths and required instrumentation, to allow for bi-directional flow testing of check valves? For which check valves is bi-directional flow testing impractical? What alternative testing is proposed by the applicant for these check valves?

03.09.06-8

In SECY-90-016, the staff recommended that check valve testing for ALWR designs should incorporate the use of nonintrusive diagnostic techniques to address degradation and performance characteristics. In its SRM to SECY-90-016, dated June 26, 1990, the Commission approved the staff's recommendations. Discuss the extent to which the U.S. EPR certified design use advanced nonintrusive techniques to periodically assess degradation and performance characteristics of the check valves.

03.09.06-9

In SECY-90-016, the staff recommended that, for ALWR designs, provisions should be established to determine the frequency necessary for disassembly and inspection of pumps and valves to detect unacceptable degradation not detectable through the use of advanced nonintrusive techniques. In its SRM to SECY-90-016, dated June 26, 1990, the Commission approved the staff's recommendations. Discuss the extent to which the U.S. EPR certified design will use periodic disassembly and inspection of pumps and valves to detect unacceptable degradation not detectable through the use of advanced nonintrusive techniques.

03.09.06-10

The sample disassembly examination program proposed by the DC applicant groups check valves by similar design, application, and service condition. Will the sample disassembly examination program further group check valves by valve manufacturer, design, service, size, materials of construction, and orientation as required by the ASME OM Code (reference ISTC-5221(c)(1))?

03.09.06-11

Per FSAR Tier 2, Chapter 3, Section 3.9.6.4.1, snubber selection is based on reconciling restraint stiffness values used in the piping analysis. However, no mention of clearances, lost motion or mismatch snubber criteria is given in the FSAR description or topical report. As stated in NUREG 0800 Section 3.9.3, Acceptance Criteria 3.B.(ii):

> "The snubber end fitting clearance, mismatch of end fitting clearances, mismatch of activation and release rates, and lost motion should be minimized and should be considered when calculating snubber reaction loads and stress which are based on a linear analysis of the system or component. This is especially important in multiple snubber applications where mismatch of end fitting clearance has a greater effect on the load sharing of these snubbers than does the mismatch of activation level or release rate. Equal load sharing of multiple snubber supports should not be assumed if mismatch in end fitting clearance exists."

How are clearances and different snubber activation and release rates addressed in U.S. EPR snubber design process?

03.09.06-12

FSAR Tier 2, Chapter 16, Technical Specification 5.5.7 "Inservice Testing Program" states:

> "This program provides controls for inservice testing of ASME Code Class 1, 2, and 3 pumps and valves."

What technical specification is applicable for dynamic restraints (snubbers)?

03.09.06-13

FSAR Tier 2, Chapter 3, Section 3.9.6.4 states:

> "Section 3.7.3 of the referenced topical report describes the piping stress and support analysis for various plant systems."

This appears to be incorrect. Section 3.7.3 of topical report ANP-10264NP refers to NRC Bulletin 88-08 (Unisolable piping due to leaking valves). What is the correct reference for piping stress and support analysis?