Docket File

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

May 4, 1992

Docket No. 52-001

Mr. Patrick W. Marriott, Manager
Licensing & Consulting Services
GE Nuclear Energy
175 Curtner Avenue
San Jose, California 95125

Dear Mr. Marriott:

SUBJECT: ADVANCED BOILING WATER REACTOR (ABWR) INSERVICE TESTING (IST) REVIEW (DRAFT SAFETY EVALUATION REPORT OPEN ITEM NUMBER 1.11)

In Section 3.9.6 of the ABWR Standard Safety Analysis Report (SSAR), GE Nuclear Energy (GE) has made certain commitments regarding the ability to test all safety-related pumps and valves in the ABWR design. In particular, GE stated that IST of safety-related pumps and valves will be performed in accordance with the requirements of Section XI, Subsections IWP and IWV of the American Society of Mechanical Engineers (ASME) Code and the applicable Code of record for ABWR is ASME, 1989 Edition. It should be noted that O&M Part 6, IST of Pumps, and Part 10, IST of Valves, were referenced in Section XI, ASME Code, 1989 Edition. GE also stated that code testing flexibility in the ASME/American Nuclear Standards Institute O&M Part 6 and Part 10 produced no need for relief requests. GE has also included a test plan, as described in Table 3.9.8 of the SSAR.

The Mechanical Engineering Branch, with technical assistance from Science Applications International Corporation, has reviewed and evaluated the test plan to ensure that the commitments, as described in Section 3.9.6 of the SSAR, can be met. As a sample, we chose eight systems for the contractor to review. They represented a wide spectrum of the systems and were selected from the systems most frequently associated with pump and valve IST relief requests for the most recently licensed BWRs.

Enclosed is a list of questions resulting from that review. The significant findings can be categorized into a number of areas which are described below:

1. The test plan scope may not be complete. Some pumps and valves appear to have safety-related functions but are not included in the test plan.

2. The test plan has not included all the needed information. For example, safety positions of the valves need to be added to Table 3.9.8. Test parameters for some valves are not identified in the table.

3. The ABWR design feature may not allow inservice testing, as described in Section 3.9.6 of the SSAR. For example, some check valves are in series with no intermediate test tap to allow for closure verification or leak testing each valve individually. For the power operated valves, which

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appear to be controlled by the same single remote manual switch, it is not clear how individual valve testing will be accomplished. For the suppression pool suction line check valve, it is not clear how the quarterly full-flow testing, as indicated in the test plan, will be accomplished without compromising the chemical purity of water in either the reactor pressure vessel or the condensate storage tank. For the reactor core isolation coolant pump, it is not clear how full-flow pump testing can be accomplished with the system design figure provided by GE.

4. The testing frequency for some pumps, as described in the test plan, does not comply with the code requirement.

In summary, our review has found some significant weaknesses in the ABWR IST test plan. At this time, the GE submittal is not adequate to support the staff's safety findings in the IST area applicable to the design certification review. The staff requests that GE address the issues in the enclosed list of questions. It should be noted that the enclosed questions should not be used to determine a comprehensive list of the problem areas of Table 3.9.8. We recommend that GE systematically review and revise its ABWR IST test plan, with emphasis on the design configuration to provide assurance that its commitment regarding the ability to test pumps and valves can be met. Our safety evaluation will reflect these weaknesses. We will participate in conference calls or meetings, as necessary, to resolve this item on a timely basis. Please provide a schedule for resolving this issue by May 18, 1992.

Sincerely,
Original Signed By:
Chester Poslusny, Project Manager
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Division of Advanced Reactors
and Special Projects
Office of Nuclear Reactor Regulation

Enclosure:
As stated

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Mr. Patrick W. Marriott
GE Nuclear Energy

Docket No. 52-001

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GE ABWR PUMP AND VALVE IST PROGRAM

PUMPS

General

1. The system pump section of Table 3.9-8 of the ABWR SAR does not include P&ID coordinates to locate the pump. It also lacks the IST program revision number or date.

2. Test parameter Vv is undefined.

3. Table 3.9-8 should specifically state which IST parameters are to be measured and recorded every three months for each applicable pump in this table designated as E10.

4. Explain the technical basis for not including the following pumps in the ABWR IST program:

   Control Rod Drive Pump
   Control Rod Drive Oil Pump
   RCIC Barometric Condenser Vacuum Tank Vacuum Pump
   RCIC Barometric Condenser Vacuum Tank Condensate Pump
   Diesel Oil Transfer Pump

5. Although Section 3.9.6 of the SSAR states that no relief requests will be needed for the pump IST program, Table 3.9-8 indicates that exceptions to the ASME code are identified such as SLCS pump test frequency and the exclusion of important pumps from the IST program. Therefore, identify all pumps in the ABWR IST program which can not be tested in accordance with the ASME Code Part 6.

PUMPS

Specific

1. The Reactor Service Water pump figure is not identified.

2. Provide the technical justification for selecting a two year test frequency for measuring Standby Liquid Control System pump flow rate. In accordance with the ASME Code Part 6, all safety related pumps which are not in regular use should be tested every three months.

3. In light of the requirements set forth in Table 2 of ASME Part 6, explain why the Standby Liquid Control, Residual Heat Removal, and High Pressure Core Flooder Pumps do not include Vd (peak-to-peak vibration displacement) as one of their IST test parameters in Table 3.1-8 while the Reactor Core Isolation Cooling pump does include Vd.

4. Provide a technical justification for not including measurement of pump speed as one of the IST parameters for the RHR and HPCF pumps. It is not apparent from the SSAR whether or not these two pumps are constant speed pumps.

5. In Figure 5.4-8, the RCIC pump bypass return line to the suppression pool is shown as having a 2-inch diameter as compared to the 6-inch diameter for the RCIC pump discharge line connected directly to the feedwater system. Explain how the RCIC pump can be full flow tested with this system design.

VALVES

General

1. The following information needs to be added to Table 3.9-8:

   P&ID Coordinates for each valve,
   Valve Type,
   Safety Position,
   Valve Size, and
   Valve Actuator Type.

2. Section 4.2.1 of OM-10 of the ASME code provides considerable flexibility in selecting the valves exercising frequency. This flexibility allows for a stepped relaxation of the three month frequency to part stroke exercising, cold shutdown, and/or refueling outage frequencies. This relaxation in exercise frequency, however, is based on whether the more frequent time period is not practicable. For those valves in the IST program which are taking advantage of this flexibility to relax the exercise test procedure frequency, provide a technical justification as to why the more restrictive frequency is not practicable.

3. Does the ABWR system and valve design provide for both the forward and reverse flow testing of all check valves in the IST program? Provide a technical discussion as to how the ABWR design accommodates this test goal.

4. GE has stated that periodic leak testing of all reactor coolant system pressure isolation valves in the ABWR will be performed in accordance with the ABWR Technical Specifications. Identify the valves listed in Table 3.9-8 which are pressure isolation valves and would have a leak test frequency set by the technical specifications once they are approved by the NRC. It should be noted that the technical specification mandated test frequency may be different than that in the ASME code.

VALVES

Specific

REACTOR SERVICE WATER SYSTEM

1. Correct the discrepancy between the valves numbered F401, F402, F403 and F404 in Table 3.9-8 which are shown as valves F501, F502, F503, and F504 in the corresponding P&ID.

2. The quantities of the following valves are incorrectly listed as 6 instead of the correct value of 9: F003, F005, F007, F010 F011, F012, F401(501), F402(502), F403(503), F404(504.

3. Valve F014 should actually be listed as F013 and the quantity should be 6 instead of 3.

4. SSAR Figure needs to be included in this listing.

5. Explain why Valve F007 is listed as Code Category B when it is a check valve in the P&ID and as such should be a Code Category C valve.

6. Provide a technical justification for excluding Valves F008, F009, and F013 from the IST program.

7. Check valves F007 and F008 are in series on the same pipeline with no intermediate pipe tap to allow for testing each valve individually. Explain how check valve F007 can be tested in accordance with the ABWR IST program since its operation can not be distinguished from that of valve F008.

8. From Figure 9.2-7, MOVs F006 and F013 are controlled by a single remote manual switch and solenoid valves F009 and F011 are controlled by a single remote manual switch. Explain how valves F006 and F011 can be individually tested in accordance with the ABWR IST program when their operation will also cause the operation of another valve.

STANDBY LIQUID CONTROL SYSTEM

1. Provide a technical justification for excluding valves F011, F013, F015, F016, F017, F019, F023, F024, F503, F504, and F505 from the IST program.

2. Section 4.3.1 of the ASME Code Part 10 refers to ASME OM-1 for in-service testing of safety or relief valves. OM-1 requires that Class 2 pressure relief valves like F003 and F026 be tested on a ten year period with a minimum of 20% of all valves tested within each 48 month period. Provide a technical justification for a five year test frequency for valves F003 and F026. Also, explain why these two valves which have the same safety class, code category, and valve function and are both relief valves have different test parameters (i.e. "P,S" for F003 and "L,P" for F026).

3. The Standby Liquid Control System (SLCS) is required to be operable when the ABWR is at power. Stroke testing of valves F006, F007, and F008 could affect power operation if the SLCS is needed. Therefore, explain the basis for a stroke test frequency of two years for valves F007 and F008 and a stroke test frequency of three months for valve F006. Also, discuss potential accessibility problems with testing valve F008 since it is inside the containment. A more practical and realistic frequency would be either refuelling outage or cold shutdown.

INSTRUMENT AIR SYSTEM

1. In accordance with the ASME Code Part 10, valves F276 and F277 should be tested for local position verification and stroke exercised which are not shown in Table 3.9-8 of the SAR. Provide a technical justification for excluding these test parameters in light of the code requirements. The test frequency of valves F276 and F277 should be either refueling outage or cold shutdown due to their location and function during plant operation, not every two years as indicated in Table 3.9-8. Provide a technical justification for the test frequency for these two valves in Table 3.9-8.

2. SSAR Figure 9.3-6 shows numerous valves, mostly unnumbered, besides F276 and F277 in the instrument air system. None of these other valves are included in the instrument air system IST program as indicated by Table 3.9-8 of the SSAR. Provide a technical justification for excluding all valves in the instrument air system other than F276 and F277 from the IST program.

3. Explain how check valve F277 which is located inside the containment will be tested for closure with the introduction of backflow in its connected piping.

VALVES

Specific (Continued)

CONTROL ROD DRIVE SYSTEM

1. SSAR Figure 4.6-8 shows numerous valves besides F719 and F720 in the control rod drive system. None of these other valves are included in the control rod drive system IST program as indicated by Table 3.9-8 of the SSAR. Provide a technical justification for excluding all valves in the control rod drive system other than F719 and F720 from the IST program.

REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

1. Provide a technical justification for excluding the following RCIC system valves from the IST program:

   F014
   F715
   F042
   F043
   F058
   Unnumbered valve between the vacuum pump discharge and the vacuum tank
   Unnumbered relief valve on the vacuum tank
   Two Unnumbered valves on the turbine steam supply line for the RCIC pump
   Four unnumbered valves connecting vent/HCW lines to the RCIC pump

2. Provide the test parameters and test frequency for valves F040, F041, and F044.

3. Correct the SSAR Figure number for valve F037 from 5.4-8a to 5.4-8b.

4. Provide a technical justification for not labelling the function of valve F046 as containment isolation. This valve serves the same function in its pipeline as check valve F038 does in its respective line.

5. Valves F720 and 721 are not shown in Figure 5.4-8b, however, this same figure has two valves which are each labelled F718 and F719. Explain this apparent discrepancy or correct either the P&ID or Table 3.9-8.

6. In the past, BWR IST relief requests have been made regarding the full flow quarterly testing of the suppression pool suction line check valve (F007 for the ABWR). The basis for relief request is that full flow testing will inject chemically impure suppression pool water either into the RPV or the Condensate Storage Tank (CST). Since the ABWR IST indicates a three month test frequency for valve F007, explain how this full flow testing will be accomplished without compromising the chemical purity of water in either the RPV or the CST.

VALVES

Specific (Continued)

REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM (Continued)

7. Correct the typographical error in the SSAR figure number for valve F056.

8. Check valves F022 and F023 are in series on the same pipeline with no pipe tap in between them. Explain how the required IST program tests can be performed so that each of these valves can be tested individually.

9. A single remote manual switch controls both air operated valves F005 and F026. A single remote manual switch controls valve F723 and the unnumbered trip and throttle MOV on the RCIC pump turbine steam exhaust line. Explain how each individual valve of these sets of two valves can be tested since one switch controls both valves.

LEAK DETECTION AND ISOLATION SYSTEM

1. Provide a technical justification for selecting code category B instead of A for valves F001 and F006.

2. Explain why valves F002, F003, and F004 which are code category A and have a valve function of both primary containment isolation and active do not include stroke exercise as one of their IST test parameters.

3. Valves F701, F702, F703, and F704 were not located on any of the Figure 5.2-8 P&ID drawings. Provide a drawing with these valves shown or delete them from Table 3.9-8.

4. Provide a technical justification for excluding the following valves from the IST program:

   F007, F008, F512, F513, F711, and F712

VALVES

Specific (Continued)

RESIDUAL HEAT REMOVAL SYSTEM

1. Explain why suppression pool suction valve F001 which is both a code category A valve and provides primary containment isolation does not include leak rate testing as one of its IST test parameters in Table 3.9-8 of the SSAR.

2. Test parameter "E3" for valve F009 is not defined in the notes to Table 3.9-8. Either define "E3" or replace it with the correct test parameter.

3. Provide the test parameter for valve F028 which is missing from Table 3.9-8.

4. Provide the technical justification for denoting the following valves' code categories as both B and C : F020, F023, F028, F041 and F042 or as both A and C : F039.

5. Explain the technical basis for determining that valves F036 and F037 are used for operating convenience (i.e. test parameter E1 in Table 3.9-8 of the SSAR) Valve F036 is required to equalize pressure around the RPV injection line check valve F006 which has the function of primary containment isolation. Valve F037 is connected to the shutdown cooling suction line in between MOVs F010 and F011 which are both primary containment isolation valves.

6. What is the basis for stroke testing the RPV injection valves F005 on a frequency of every cold shutdown instead of every three months? These valves are outside the drywell and can be isolated from allowing flow into the RPV.

NUCLEAR BOILER SYSTEM (MAIN STEAM)

1. The five year frequency for leak rate testing of the SRVs (F010) does not comply with ASME OM-10 which refers to OM-1. Table 1 of OM-1 requires that a minimum cumulative fraction of Class 1 pressure relief valves be tested during each 12 month period of a five year interval. Provide a technical justification for the test frequency presented in Table 3.9-8 for the SRVs.

2. Provide a technical justification for not including local position verification as a test parameter for valve F004.

3. Provide the missing test parameters and test frequency for valve F018.

4. The SSAR figure reference for valve F039 should be corrected to read Figure 5.3-3d.

VALVES

Specific (Continued)

NUCLEAR BOILER SYSTEM (MAIN STEAM) (Continued)

5. The following valves appear to be incorrectly identified as code category C since they are not safety, relief, or check valves. These valves should be labeled code category B or an explanation should be provided substantiating their C category.

   F701, F703, F705, F710, F712, F714, F716, F718, F720, F724, and F726.

6. Provide a technical justification for excluding the following valves, which appear in the P&ID drawings, from the IST program as delineated in Table 3.9-8 of the SSAR:

   F013, F014, F015, F017, F029B, F037, F038, F504, F727

7. SSAR Table 3.9-8 show that MSIV valves F008 and F009 will be stroke exercised every three months. This test will directly affect plant operation since it will interrupt main steam flow. In addition, the inboard MSIV is inside the primary containment therefore limiting its accessibility during power operation. Provide a technical explanation as to how the MSIVs will be stroke exercised every three months as stated in the ABWR IST program or modify this schedule.

8. Many of the valves listed in SSAR Table 3.9-8 for the nuclear boiler system have test frequencies of every two years and/or every three months. However, most, if not all, of these valves directly affect the normal power operation of the ABWR. The ASME Code Part 10 Section 4.2.1 allows for the test frequency for such valves to be either during cold shutdown or refuelling outages. Explain the basis for selecting a test frequency for valves in this system which can not be achieved without inhibiting plant operation.

9. Explain the inconsistency in selecting a two year frequency for stroke testing some valves which are code category A and have an active function including containment isolation (e.g. F001) while other valves with the same category and function (e.g. F007, F008, F009, F011, F012) have a three month frequency for this test.