GE Nuclear Energy

General Electric Company
175 Curtner Avenue, San Jose, CA 95125

January 25, 1994

Docket No. STN 52-001

Chet Poslusny, Senior Project Manager
Standardization Project Directorate
Associate Directorate for Advanced Reactors
and License Renewal
Office of Nuclear Reactor Regulation

Subject: Submittal Supporting Accelerated ABWR Schedule - **Response to Confirmatory Item F14.3.3-1**

Dear Chet:

Enclosed are SSAR markups addressing Confirmatory Item F14.3.3-1 pertaining to ACRS comments on the piping design acceptance criteria.

Please provide copies of this transmittal to Dave Terao and Tom Boyce.

Sincerely,

Jack Fox
Advanced Reactor Programs

cc: Alan Beard (GE)
Norman Fletcher (DOE)
Joe Quirk (GE)
Maryann Herzog (GE)
Tony James (GE)

JNF94-005

310044

D050
1/1

Table 1.9-1 Summary of ABWR Standard Plant COL License Information (Continued)

Item No.	Subject	Subsection
3.30	Audits of Design Specifications and Design Reports	3.9.7.4
3.31	ASME Class 1, 2, and 3 Piping System Clearance Requirements	3.9.7.5
3.32	Deleted ~~As-Built Reconciliation Analysis for ASME Class 1, 2 and 3 Piping Systems~~	~~3.9.7.6~~
3.33	Pipe Support Baseplate and Anchor Bolt Design	3.9.7.7
3.34	Pipe-Mounted Equipment Allowable Loads	3.9.7.8
3.35	Benchmark Requirements for Computer Codes Used to Perform Piping Dynamic Analysis	3.9.7.9
3.36	ASME Class 1, 2, and 3 Piping System Design Requirements for Thermal Stratification of Fluids	3.9.7.10
3.37	Equipment Qualification	3.10.5.1
3.38	Dynamic Qualification Report	3.10.5.2
3.39	Qualification by Experience	3.10.5.3
3.40	Environmental Qualification Document (EQD)	3.11.6.1
3.41	Environmental Qualification Records	3.11.6.2
3.42	Surveillance, Maintenance, and Experience Information	3.11.6.3
3.43	Radiation Environment Conditions	31.3.3.1
4.1	Thermal Hydraulic Stability	4.3.5.1
4.2	Power/Flow Operating Map	4.4.7.1
4.3	Thermal Limits	4.4.7.2
4.4	CRD Inspection Program	4.5.3.1
5.1	Conversion of Indicators	5.2.6.1
5.2	Plant Specific ISI/PSI	5.2.6.2
5.3	Reactor Vessel Water Level Instrumentation	5.2.6.3
5.4	Fracture Toughness Data	5.3.4.1
5.5	Materials and Surveillance Capsule	5.3.4.2
5.6	Plant Specific Pressure-Temperature Information	5.3.4.3
5.7	Testing of Mainsteam Isolation Valves	5.4.15.1
5.8	Analyses of 8-hour RCIC Capacity	5.4.15.2
5.9	ACIWA Flow Reduction	5.4.15.3
6.1	Protection Coatings and Organic Materials	6.1.3.1
6.2	Alternate Hydrogen Control	6.2.7.1

3.9.3 ASME Code Class 1, 2, and 3 Components, Component Supports, and Core Support Structures

3.9.3.1 Loading Combinations, Design Transients, and Stress Limits

This section delineates the criteria for selection and definition of design limits and loading combinations associated with normal operation, postulated accidents, and specified seismic and other Reactor Building vibration (RBV) events for the design of safety-related ASME Code components (except containment components, which are discussed in Section 3.8).

This section discusses the ASME Class 1, 2, and 3 equipment and associated pressure-retaining parts and identifies the applicable loadings, calculation methods, calculated stresses, and allowable stresses. A discussion of major equipment is included on a component-by-component basis to provide examples. Design transients and dynamic loading for ASME Class 1, 2, and 3 equipment are covered in Subsection 3.9.1.1. Seismic-related loads and dynamic analyses are discussed in Section 3.7. The suppression pool-related RBV loads are described in Appendix 3B. Table 3.9-2 presents the combinations of dynamic events to be considered for the design and analysis of all ABWR ASME Code Class 1, 2, and 3 components, component supports, core support structures and equipment. Specific loading combinations considered for evaluation of each specific equipment are derived from Table 3.9-2 and are contained in the design specifications and/or design reports of the respective equipment. (See Subsection 3.9.7.4, 3.9.7.5, 3.9.7.6 and 3.9.7.8 for COL license information requirements.)

Piping loads due to the thermal expansion of the piping and thermal anchor movements at supports are included in the piping load combinations. All operating modes are evaluated and the maximum moment ranges are included in the fatigue evaluation. Piping systems with maximum operating temperatures of less than or equal to 65°C are not required to be analyzed for thermal expansion loading.

Low-pressure piping systems that interface with the reactor coolant pressure boundary will be designed with either a schedule 40 pipe wall thickness, or a pipe wall thickness calculated for a pressure equal to 0.4 times the reactor coolant system pressure. See Appendix 3M for additional information on intersystem LOCA.

Thermal stratification of fluids in a piping system is one of the specific operating conditions included in the loads and load combinations contained in the piping design specifications and design reports. It is known that stratification can occur in the feedwater piping during plant startup and when the plant is in hot standby conditions following scram (Subsection 3.9.2.1.3). If, during design or startup, evidence of thermal stratification is detected in any other piping system, then stratification will be evaluated. If it cannot be shown that the stresses in the pipe are low and that movement due to

3.9.3.1.17 ASME Class 2 and 3 Pumps

The Class 2 and 3 pumps (all pumps not previously discussed) are designed and evaluated in accordance with ASME Code Section III. The stress analysis of these pumps is performed using elastic methods. See Subsection 3.9.3.2 for additional information on pump operability.

3.9.3.1.18 ASME Class 1, 2 and 3 Valves

The Class 1, 2, and 3 valves (all valves not previously discussed) are constructed in accordance with ASME Code Section III.

All valves and their extended structures are designed to withstand the accelerations due to seismic and other RBV loads. The attached piping is supported so that these accelerations are not exceeded. The stress analysis of these valves is performed using elastic methods. See Subsection 3.9.3.2 for additional information on valve operability.

3.9.3.1.19 ASME Class 1, 2 and 3 Piping

The Class 1, 2 and 3 piping (all piping not previously discussed) is constructed in accordance with ASME Code Section III. For Class 1 piping, stresses are calculated on an elastic basis and evaluated in accordance with NB-3600 of ASME Code Section III. For Class 2 and 3 piping, stresses are calculated on an elastic basis and evaluated in accordance with NC/ND-3600 of the Code.

⟹ 3.9.3.1.20 AS-BUILT STRESS REPORTS FOR ASME CLASS 1, 2 and 3 Piping Systems (See attachment A)

3.9.3.2 Pump and Valve Operability Assurance

Active mechanical (with or without electrical operation) equipment are Seismic Category I and each is designed to perform a mechanical motion for its safety-related function during the life of the plant under postulated plant conditions. Equipment with faulted condition functional requirements include active pumps and valves in fluid systems such as the RHR System, ECCS, and MS system.

This subsection discusses operability assurance of active ASME Code Section III pumps and valves, including motor, turbine or operator that is a part of the pump or valve (Subsection 3.9.2.2). The COL applicant must ensure that specific environmental parameters are properly defined and enveloped in the methodology for its specific plant and implemented in its equipment qualification program.

Safety-related valves and pumps are qualified by testing and analysis and by satisfying the stress and deformation criteria at the critical locations within the pumps and valves. Operability is assured by meeting the requirements of the programs defined in Subsection 3.9.2.2, design and qualification requirements Subsection 3.9.6, Sections 3.10 and 3.11, and the following subsections.

Attachment A

(2) Provide a study to determine the optimal frequency of the periodic verification of the continuing MOV capability for design basis conditions (Subsections 3.9.6.2.1, 3.9.6.2.2, and 3.9.6.2.3).

(3) Address the concerns and issues identified in Generic Letter 89-10; specifically the method of assessment of the loads, the method of sizing the actuators, and the setting of the torque and limit switches (Subsection 3.9.6.2.2).

The COL applicant will include the design qualification test, inspection and analysis criteria in Subsections 3.9.6.1, 3.9.6.2.1, 3.9.6.2.2 and 3.9.6.2.3 in the development of the respective safety-related pump and valve design specifications.

3.9.7.4 Audit of Design Specification and Design Reports

COL applicants will make available to the NRC staff design specification and design reports required by ASME Code for vessels, pumps, valves and piping systems for the purpose of audit (Subsection 3.9.3.1).

The COL applicant shall ensure that the piping system design is consistent with the construction practices, including inspection and examination methods, of the ASME Code edition and addenda as endorsed in 10CFR50.55a in effect at the time of application.

The COL applicant shall identify ASME Code editions and addenda other than those listed in Tables 1.8-21 and 3.2-3, that will be used to design ASME Code Class 1, 2 and 3 pressure retaining components and supports. The applicable portions of the ASME Code editions and addenda shall be identified to the NRC staff for review and approval with the COL application (Subsection 3.9.3.1).

3.9.7.5 ASME Class 1, 2 and 3 Piping System Clearance Requirements

ASME Class 1, 2 and 3 piping systems shall be designed to provide clearance from structures, systems, and components where necessary for the accomplishment of the structure, system, or component's safety function as specified in the representative structure or system design description. The COL applicant shall verify that the maximum calculated piping system deflections under service conditions do not exceed the minimum clearance between the piping system and nearby structures, systems, or components. The COL applicant shall document in the certified design stress report that the clearance requirements have been met (Subsection 3.9.3.1).

Move to page 3.9-35

3.9.3.1.20 Stress Reports

~~3.9.7.6~~ As-Built ~~Reconciliation Analysis~~ for ASME Class 1, 2 and 3 Piping Systems

For ASME Class 1, 2 and 3 piping systems, ~~the COL applicant shall reconcile~~ the as-built piping system [shall be reconciled] with the as-designed piping system. ~~The COL applicant will perform~~ An as-built inspection of the pipe routing, location and orientation, the location, size, move to pg. 3.9-35

shall be performed

clearances and orientation of piping supports, and the location and weight of pipe mounted equipment. This inspection will be performed by reviewing the as-built drawings containing verification stamps, and by performing a visual inspection of the installed piping system. The piping configuration and component location, size, and orientation shall be within the tolerances specified in the certified as-built piping stress report. The tolerances to be used for reconciliation of the as-built piping system with the as-designed piping system are provided in Reference 3.9-10. A reconciliation analysis using the as-built and as-designed information shall be performed. The certified as-built Stress Report shall document the results of the as-built reconciliation analysis. ~~(Subsection 3.9.3.1).~~

3.9.7.6 Deleted

3.9.7.7 Pipe Support Baseplate and Anchor Bolt Design

COL applicants shall provide justification for the use of safety factors for concrete anchor bolts other than those specified in Subsection 3.9.3.4. This justification shall be submitted to the NRC staff for review and approval prior to the installation of the concrete anchor bolts.

COL applicants shall account for pipe support base plate flexibility in the calculation of concrete anchor bolt loads in accordance with Subsection 3.9.3.4.

3.9.7.8 Pipe-Mounted Equipment Allowable Loads

The COL applicant shall inspect the piping design reports and document that the pipe applied loads on attached equipment; such as valves, pumps, tanks and heat exchangers, are less than the equipment vendor's specified allowable loads (Subsection 3.9.3.1)

3.9.7.9 Benchmark Requirements for Computer Codes Used to Perform Piping Dynamic Analysis

The COL applicant shall benchmark their computer code used for piping system dynamic analysis against the NRC Benchmark Problems for ABWR, defined in Reference 3.9-11. The results of the COL applicant's piping dynamic analysis shall be compared with the results of the Benchmark Problems provided in Reference 3.9-11. The piping results to be compared and evaluated and the acceptance criteria or range of acceptable values are specified in Reference 3.9-11. Any deviations from these values as well as justification for such deviations shall be documented and submitted by the COL applicant to the NRC staff for review and approval before initiating the final certified piping analysis (Subsection 3.9.1.2).

3.9.7.10 ASME Class 1, 2 and 3 Piping System Design Requirements for Thermal Stratification of Fluids

COL applicants shall design for thermal stratification of fluids in piping systems in accordance with Subsection 3.9.3.1.