GE Nuclear Energy

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

March 5, 1993

Docket No. STN 52-001

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

Subject: **Submittal Supporting Accelerated ABWR Review Schedule - Chapter 6 DFSER Outstanding Items**

Dear Chet:

Enclosed is a markup of SSAR Chapter 6 addressing: Open Items 6.2.5-3 and 6.2.6-6; and COL Action Item 6.2.5-1.

Sincerely,

Jack Fox

Jack Fox
Advanced Reactor Programs

cc: Bill Fitzsimmons (GE)
Norman Fletcher (DOE)
Bernie Genetti (GE)

JF93-51

Response

This requirement is not applicable to the ABWR. It applies only to PWR-type reactors.

19A.2.26 Isolation Dependability [Item (2) (xiv)]

NRC Position

Provide containment isolation systems that: [II.E.4.2]

(A) Ensure all non-essential systems are isolated automatically by the containment isolation system,

(B) For each non-essential penetration (except instrument lines) have two isolation barriers in series,

(C) Do not result in reopening of the containment isolation valves on resetting of the isolation signal,

(D) Utilize a containment set point pressure for initiating containment isolation as low as is compatible with normal operation,

(E) Include automatic closing on a high radiation signal for all systems that provide a path to the environs.

Response

This item is addressed in Subsection 1A.2.14.

19A.2.27 Purging [Item (2) (xv)]

NRC Position

Provide a capability for containment purging/venting designed to minimize the purging time consistent with ALARA principles for occupational exposure. Provide and demonstrate high assurance that the purge system will reliably isolate under accident conditions. [II.E.4.4]

Response

The ABWR primary containment vessel (PCV) operates with an inert atmosphere. During normal operation, all large valves in containment ventilation lines are closed. Only small, 2", nitrogen-makeup valves are opened during power operation. These are air-operated valves with rapid closure times, presenting little opportunity for substantial releases from the PCV in the event of a transient requiring containment isolation. Note that under the technical specifications, containment inerting and purging with the larger ventilation lines is permitted during power operation above 15% for limited periods at either end of the operating cycle. The process of purging the containment with air also serves to remove any potential activity for ALARA considerations prior to actual personnel entry into the PCV.

The large ventilation valves will be tested regularly and after any valve maintenance to assure that closing times are within the limits assured in the radiological design basis. See Subsection 19A.3.3 for COL license information.

19A.2.28 Design Evaluator [Item (2) (xvi)]

NRC Position

Establish a design criterion for the allowable number of actuation cycles of the emergency core cooling system and reactor protection system consistent with the expected occurrence rates of severe over cooling events (considering both anticipated transients and accidents). (Applicable to B&W designs only.) [II.E.5.1]

Response

This requirement is not applicable to the ABWR. It applies only to PWR-type (B&W designed) reactors.

19A.2.29 Additional Accident Monitoring Instrumentation [Item (2) (xvii)]

NRC Position

Provide instrumentation to measure, record and readout in the control room: (A) containment pressure, (B) containment water level, (C) containment hydrogen concentration, (D) containment radiation intensity (high level), and (E) noble gas effluents at all potential, accident release points. Provide for continuous sampling of radioactive iodines and particulates in gaseous effluents from all potential accident release points, and for onsite capability to analyze and measure these samples. [II.F.1]

with the exception of two large valves where flow is prevented by rupture discs in the piping.

Influent and effluent lines of this group are isolated by automatic or remote-manual isolation valves located as close as possible to the containment boundary.

6.2.4.3.2.4 Evaluation Against Regulatory Guide 1.11

Instrument lines that connect to the RCPB and penetrated the containment have 1/4-inch orifices and manual isolation valves, in compliance with Regulatory Guide 1.11 requirements.

6.2.4.3.3 Evaluation of Single Failure

A single failure can be defined as a failure of a component (e.g., a pump, valve, or a utility such as offsite power) to perform its intended safety functions as a part of a safety system. The purpose of the evaluation is to demonstrate that the safety function of the system will be completed even with that single failure. Appendix A to 10CFR50 requires that electrical systems be designed specifically against a single passive or active failure. Section 3.1 describes the implementation of these standards as well as General Design Criteria 17, 21, 35, 38, 41, 44, 54, 55 and 56.

Electrical as well as mechanical systems are designed to meet the single-failure criterion, regardless of whether the component is required to perform a safety action. Even though a component, such as an electrically-operated valve, is not designed to receive a signal to change state (open or closed) in a safety scheme, it is assumed as a single failure if the system component changes state or fails. Electrically-operated valves include valves that are electrically piloted but air operated, as well as valves that are directly operated by an electrical device. In addition, all electrically-operated valves that are automatically actuated can also be manually actuated from the main control room. Therefore, a single failure in any electrical system is analyzed, regardless of whether the loss of a safety function is caused by a component failing to perform a requisite mechanical motion or a component performing an unnecessary mechanical motion.

6.2.4.4 Test and Inspections

The containment isolation system is scheduled to undergo periodic testing during reactor operation. The functional capabilities of power-operated isolation valves are tested remote-manually from the control room. By observing position indicators and changes in the affected system operation, the closing ability of a particular isolation valve is demonstrated.

Air-testable check valves are provided on influent emergency core cooling lines of the HPCF and RHR systems whose operability is relied upon to perform a safety function.

A discussion of testing and inspection of isolation valves is provided in Subsection 6.2.1.6. Instruments are periodically tested and inspected. Test and/or calibration points are supplied with each instrument. Leakage integrity tests shall be performed on the containment isolation valves with resilient material seals at least once every 3 months.

6.2.5 Combustible Gas Control in Containment

The atmospheric control system (ACS-T31) is provided to establish and maintain an inert atmosphere within the primary containment during all plant operating modes except during shutdown for refueling or equipment maintenance and during limited periods of time to permit access for inspection at low reactor power. The flammability control system (FCS-T49) is provided to control the potential buildup of oxygen from design-basis radiolysis of water. The objective of these systems is to preclude combustion of hydrogen and damage to essential equipment and structures. INSERT 6.2.5 COL 6.2.5-1

6.2.5.1 Design Bases

Following are criteria that serve as the bases for design:

(1) Since there is no design requirement for the ACS or FCS in the absence of a LOCA and there is no design-basis accident in the ABWR that results in core uncovery or fuel failures, the following requirements mechanistically assume that a LOCA

INSERT 6.2.5

The COL applicant is required to provide a comparison of costs and benefits for any optional alternate systems of hydrogen control.

Included in the leak rate test summary report will be, a report detailing the containment inspection, a report detailing any repairs necessary to pass the tests, and the leak rate test results.

6.2.6.5 Special Testing Requirements

The maximum allowable leakage rate into the secondary containment and the means to verify that the inleakage rate has not been exceeded, as well as the containment leakage rate to the environment, are discussed in Subsections 6.2.3 and 6.5.1.3.

(Change TOC) COL 6.2.5-1

OPEN 6.2.6-6

6.2.7 COL License Information

6.2.7.1 Alternate Hydrogen Control

A comparison of costs and benefits will be provided for alternate hydrogen control in accordance with Subsection 6.2.5.

6.2.7.2 Administrative Control Maintaining Containment Isolation

The COL applicant will maintain the primary containment boundary by administrative controls in accordance with Subsection 6.2.6.3.1

6.2.8 References

1. W.J. Bilanin, *The G.E. Mark III Pressure Suppression Containment Analytical Model*, June 1974, (NEDO-20533).

2. F.J. Moody, *Maximum Discharge Rate of Liquid-Vapor Mixtures from Vessels*, General Electric Company, Report No. NEDO-21052, September, 1975.

3. W.J. Bilanin, *The G.E. Mark III Pressure Suppression Containment Analytical Model*, Supplement 1, September 1975 (NEDO-20533-1).

4. J.P. Dougherty, SCAM-*Subcompartment Analysis Method*, January 1977, (NEDE-21526).