OCT 2 6 1988

Docket No. STN 50-605

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

Dear Mr. Marriott:

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING THE GENERAL ELECTRIC COMPANY APPLICATION FOR CERTIFICATION OF THE ABWR DESIGN

In our review of your application for certification of your Advanced Boiling Water Reactor Design, we have identified a need for additional information. Our request for additional information, contained in the enclosure, addresses the areas of SRP Chapters 6.3, 9.3.5 and 15 reviewed by the Reactor Systems Branch. This completes the initial request for additional information on the ABWR related to SSAR Chapters 4, 5, 6 & 15. However, the need for additional information may occur during the development of the staff's safety evaluation. If this should occur, the need will be identified in a draft Safety Evaluation Report which will be provided for your consideration.

In order for us to maintain the ABWR review schedule, we request that you provide your responses to this request by December 1, 1988. If you have any concerns regarding this request please call me on (301) 492-1104.

Sincerely,

/S/

Dino C. Scaletti, Project Manager
Standardization and Non-Power Reactor Project Directorate
Division of Reactor Projects - III, IV, V and Special Projects
Office of Nuclear Reactor Regulation

Enclosure:
As stated

cc: See next page

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

OCT 26 1988

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Reactor Project Directorate
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V and Special Projects
Office of Nuclear Reactor Regulation

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As stated

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ADVANCED BOILING WATER REACTOR (ABWR)

SSAR CHAPTERS 6.3, 9.3.5 AND 15

440.75 (6.3) In the ABWR design, the HPCF is tested by taking suction from and returning water to the suppression pool. Normally the suppression pool water is a lower quality than that of the CST; therefore, draining, flushing and refilling the system is required prior to returning the system to standby after testing. Please discuss the pros and cons of using the CST for testing the HPCF system.

440.76 (6.3) Address the following TMI-2 action items related to ECCS.

(a) II.K.1.5
(b) II.K.1.10
(c) II.K.3.17
(d) II.K.3.18
(e) II.K.3.21
(f) II.K.3.25
(g) II.K.3.30
(h) II.K.3.31

440.77 (6.3) Confirm that the HPCF system meets the guidelines of Regulatory Guide 1.1 regarding pump Net Positive Suction Head (NPSH).

440.78 (6.3) SRP 6.3 identifies GDCs 35, 36 and 37 in the acceptance criteria. Confirm that the HPCF system, described in Chapter 6.3 of the SSAR, meets the requirements of the above GDCs.

440.79 (6.3) Normally, the HPCF pump takes suction from the Condensate Storage Tank (CST). But, the CST is not seismically qualified or safety related. Confirm that the system piping and level transmitters, which interface with CST, will be designed and installed such that the automatic switchover to the suppression pool takes place without failure.

440.80 (6.3) What is the minimum quantity of water required in the condensate storage tank (CST) for HPCF operation? Give the basis for the required quantity of water in the CST.

440.81 (6.3) What is the closing time of test return valves F009.01C, F011.01C, F015B and F016B? They should close earlier than 36 seconds to prevent any flow diversion to the suppression pool during a LOCA.

440.82 (6.3) Since HPCF is part of the ECCS network, the HPCF pump minimum flow line should be designed to operate for a reasonable length of time. How long can HPCF run in minimum flow mode?

440.83 (6.3) In the resolution of TMI-2 Action Item II.K.3.13, the BWR Owners' Group decided and the staff agreed to keep the initiating RPV level setpoint L2 for starting RCIC and HPCI systems. In ABWR design RCIC is still started at RPV level L2, but the HPCF is started at level 1.5. What is the basis for the initiating level 1.5 for HPCF?

440.84 (6.3) In Section 7.3.1.1.1.2(3)(9) it is stated that HPCF pump discharge pressure is used as a permissive to start ADS automatically. If HPCF is available, ADS may not be requ' d. In the current BWR designs, only low pressure pumps discharge pressures, not HPCS, are used as permissive to start ADS. What is the basis for this change in ADS logic?

440.85 (6.3) In SSAR Section 7.3.1.1.1.2, it is stated that ADS timer will be set at 29 seconds. Submit the analysis to support the 29 seconds time delay.

440.86 (6.3) SSAR Section 6.3.1.1.4, "ECCS Environmental Design Basis" refers to SSAR Section 3.11 for Qualification of ECCS Equipment. However, Section 3.11 does not provide the required information. Provide the necessary equipment qualification information.

440.87 (6.3) Confirm that there are provisions for equipment maintenance during long-term coolant recirculation in the post LOCA environment for ECCS equipment.

440.88 (6.3) Confirm that long-term cooling capacity is adequate in the event of failure of any single active or passive component of the ECCS.

440.89 (6.3) In SSAR Section 6.3.6, References 1 and 4, latest approved revisions of NEDE-29011-P-A are given as references. Identify the latest revisions which are used for ABWR.

440.90 (6.3) In Table 6.3-6 "Plant variables with nominal and sensitivity study values," Item #5 metal water reaction rate, nominal value is given as "EPRI coefficients." Confirm that the EPRI coefficients are the same as used in the model already approved by the staff or identify the EPRI report which discusses these EPRI coefficients.

440.91 (6.3) SSAR Sections 6.3.3.5 and 6.3.3.6 refer to Reference 4 instead of addressing the subjects "use of dual function components for ECCS" and "Limits on ECCS system parameters." Briefly describe the above subjects in the SSAR.

440.92 (6.3) List all computer codes used in the LOCA analysis and give a brief description of each code.

440.93 (6.3) Section 6.3.3.7.2 accident description refers to Reference 4. Provide a brief description of the accident. For details Reference 4 can be used.

440.94 (6.3) Why is there no discharge line fill pump provided for the HPCF system? How does the system design reduce water hammer during the pump start-up?

440.95 (6.3) List the capacity and settings of all relief valves provided for the ECCS to satisfy system overpressure.

440.96 (6.3) Revise SSAR Section 6.3.2.2.1 HPCF to include a description of relief valves provided in the suction and discharge of the HPCF pump.

440.97 (6.3) SSAR Table 5.4-2 gives the design parameters for RCIC system components. Provide similar information for RHR and HPCF systems.

440.98 (6.3) Confirm that 0.099ft^2 is the lower limit of pipe break size for which ECCS operation is required.

440.99 (6.3) In the RCIC system description (Ref. 5.4.6.1.1.1) it is stated that the mixture of the cool RCIC water and the hot steam quenches the steam. Since RCIC is injected to the reactor through the feedwater system, this statement may not be true.

440.100 (6.3) In the Remote Shutdown System RCIC controls are replaced by HPCF controls. Traditionally, RCIC was used for remote shutdown because the system will be available during station blackout. Describe the basis for replacing RCIC controls with HPCF controls in the Remote Shutdown Panel.

440.101 (9.3.5) SSAR Table 9.3-1 is not complete. Include pump flow and other parameters for all modes of operation. The existing Table 9.3-1 gives only test modes.

440.102 (9.3.5) In current BWRs explosive valves are used at SLCS pump discharge. Why are they deleted? How is boron leakage into the reactor vessel prevented during testing?

440.103 (9.3.5) The ATWS rule states that "Each Boiling Water Reactor must have a Standby Liquid Control System (SLCS) with a minimum flow capacity and boron content equivalent in control capacity to 86 gpm of 13 weight percent sodium pentaborate solution." (251 vessel, Ref: NEDE 31096-P-A) How dues the ABWR design with 278 diameter vessel meet the requirement of the ATWS rule, 10 CFR 50.62?

440.104 (9.3.5) In the ABWR design, SLCS pump is started manually. But the ATWS rule 10 CFR 50.62 states that "The SLCS initiation must be automatic and must be designed to perform its function in a reliable manner for plants granted construction permits after July 26, 1984." How does the ABWR design satisfies the ATWS rule?

440.105 (9.3.5) We understand that boron mixing tests were performed for optimizing the location of boron injection. Describe the test criteria and the test results.

440.106 (9.3.5) In SSAR Section 9.3.5.3, under criterion 26, it is stated that "The requirements of this criterion do not apply within the SLCS itself." Elaborate on this assumption.

440.107 (9.3.5) In SSAR Section 9.3.5.3, under criterion 27, it is stated that "this criterion applies no specific requirements onto the SLCS and therefore is not applicable." Describe in detail the justification for the above statement.

440.108 (15) Provide further justification for the fact that the input parameters and initial conditions for analyzed events are conservative. Provide a list of what parameters will be checked at startup and which will be in the Technical Specifications. You should define the range of operating conditions and fuel types for which your input parameters will remain valid. For example, would these parameters remain valid for 9x9 or 7x7 fuel or for a similar large change in the fuel lattice.

440.109 (15) Provide an analysis of the loss of instrument air (nitrogen).

440.110 (15) In SSAR Table 15.0-2, the following transients are not categorized as moderate frequency event [(Category (a)]

(a) Runout of two feedwater pumps (Cat. c)
(b) Opening of all Control and Bypass Valves (Cat. c)
(c) Pressure Regulator Downscale failure (Cat. c)
(d) Generator Load Rejection, Failure of One Bypass Valve (Cat. b)
(e) Generator Load Rejection with Bypass Off (Cat. c)
(f) Turbine Trip with Failure of One Bypass Valve (Cat. b)
(g) Turbine trip, Bypass Off (Cat. c)
(h) Loss of Aux. Power Transformer and one S/up transformer (Cat c)
(i) Trip of all Reactor Internal Pumps (Cat. c)
(j) Fast Runback of all Reactor Internal Pumps (Cat. c)
(k) Inadvertent HPCF pump start-up (Cat. b)

Category b refers to Infrequent event and Category c refer to limiting faults.

The above categorization of transients is a significant deviation from the SRP and hence sufficient justification must be submitted to support the change in the categorization.

440.111 (15) Provide a table similar to 15.0-2 showing your evaluation of anticipated transients with single failure. List the single failure chosen for each event and provide a justification for why the chosen failure is the most limiting.

440.112 (15) Provide the following:

(1) A listing of all equipment which is not classified as safety-related but is assumed in FSAR analyses to mitigate the consequences of transients or accidents.

(2) Justification for the assumption of operability of this equipment based upon equipment quality, reliability, and proposed surveillance requirements.

(3) Discuss the consequences of those events concerning (i) number of fuel failures, (ii) delta CPR and (iii) delta peak pressure that would result if only safety grade systems or components were considered in the specific transients analyses taking credit of non-safety grade systems or components.

440.113 (15) You have classified the trip of all reactor internal pumps as a limiting fault. This is based on your assumption that the loss of greater than three reactor internal pumps is 10^{-6} per year. Provide operating experience data to justify this failure rate.

440.114 (15) The ABWR feedwater control system and the steam bypass and pressure control system use a triplicated digital system. Your claim is that no single failure in these systems will cause a minimum demand to all turbine control valves and bypass valves or the runout of two feedwater pumps.

a) What is the reliability of the systems?

b) What design feature of these systems prevent common mode failure to more than one channel?

c) What protection is provided in these systems against a technician disabling a second channel while performing maintenance on the first?

d) What are the most limiting events for the case where two channels are lost in these systems?

440.115 Provide further analysis and numerical justification for your
(15) assertion that FMCRD design is equivalent to an ARI system and that the SLCS is not required to respond to an ATWS event.

440.116 For each transient and accient, identify the computer code used in
(15) the analysis in the respective section of Chapter 15.