January 29, 2009

Mr. Robert E. Brown
Senior Vice President, Regulatory Affairs
GE Hitachi Nuclear Energy
3901 Castle Hayne Road, MC A-50
Wilmington, NC 28401

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 301 RELATED TO ESBWR DESIGN CERTIFICATION APPLICATION

Dear Mr. Brown:

By letter dated August 24, 2005, GE Hitachi Nuclear Energy (GEH) submitted an application for final design approval and standard design certification of the economic simplified boiling water reactor (ESBWR) standard plant design pursuant to 10 CFR Part 52. The U.S. Nuclear Regulatory Commission (NRC) staff is performing a detailed review of this application to enable the staff to reach a conclusion on the safety of the proposed design.

The NRC staff has identified that additional information is needed to continue portions of the review. The staff's request for additional information is contained in the enclosure to this letter.

If you have any questions or comments concerning this matter, you may contact me at 301-415-6590 or David.Misenhimer@nrc.gov or you may contact Amy Cubbage at (301) 415-2875 or Amy.Cubbage@nrc.gov.

Sincerely,

/RA/

David Misenhimer, Project Manager
ESBWR/ABWR Projects Branch 1
Division of New Reactor Licensing
Office of New Reactors

Docket No. 52-010

Enclosure:
Request for Additional Information

cc w/encl: See next page

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The NRC staff has identified that additional information is needed to continue portions of the review. The staff's request for additional information is contained in the enclosure to this letter.

If you have any questions or comments concerning this matter, you may contact me at 301-415-6590 or David.Misenhimer@nrc.gov or you may contact Amy Cubbage at (301) 415-2875 or Amy.Cubbage@nrc.gov.

Sincerely,

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Division of New Reactor Licensing
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Enclosure:
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cc w/encl: See next page

ADAMS ACCESSION NO.: ML090290034 NRO-002

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SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 301 RELATED TO ESBWR DESIGN CERTIFICATION APPLICATION DATED

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TECHNICAL SPECIFICATIONS BRANCH REVIEW OF
ESBWR DESIGN CERTIFICATION APPLICATION
DESIGN CONTROL DOCUMENT CHAPTERS 16 and 16B, REVISION 5
REQUESTS FOR ADDITIONAL INFORMATION

RAI NUMBER	REVIEWER	QUESTION SUMMARY	FULL TEXT
16.2-186	Harbuck C	(1) The name of GTS 3.3.1.1, RPS Function 3 does not use “Low Low” and “HCU” (2) GTS 3.3.2.1 does not contain the rod block function of low pressure in the CRD accumulator charging water header.	Correct inconsistency between DCD Section 4.6.1.2.6, Instrumentation and Control, and GTS 3.3.1.1, RPS Function 3, and GTS 3.3.2.1. Page 4.6-17 of Rev 5 of the DCD states: “Four safety-related pressure sensors are located in the HCU accumulator charging water header. The output signals from these sensors are provided to the RC&IS logic and RPS logic. A low pressure condition from two-out-of-four sensors causes the RC&IS to generate an all-rod-withdrawal block. A low-low pressure condition causes the RPS to generate a reactor scram.” However, (1) the name of GTS 3.3.1.1, RPS Function 3 does not use “Low Low” and “hydraulic control unit (HCU)”, and (2) GTS 3.3.2.1 does not contain the rod block function of low pressure in the [control rod drive] HCU accumulator charging water header.
16.2-187	Harbuck C	Testing of automatic functions of high pressure makeup mode of operation of the CRD system	Rev 5 of DCD Section 4.6.1.2.5, Control Rod Drive System Operation, Page 4.6-16 states: “The high pressure makeup mode of operation [of the CRD system] initiates on receipt of a low reactor water Level 2 signal.” And on page 4.6-17, the DCD states: “The high pressure makeup mode of operation is automatically stopped and the CRD pumps tripped by coincident low water level in two of the three GDCS pools. This action prevents a reduction of the containment air

RAI NUMBER	REVIEWER	QUESTION SUMMARY	FULL TEXT
			space continued
187 (cont'd)	Harbuck C	Testing of automatic functions of high pressure makeup mode of operation of the CRD system	volume and increased containment pressurization that could be caused by injecting water from outside containment during accident conditions." And on page 4.6-18, the DCD states: "The high pressure makeup flow control valves close to stop flow to the reactor at high reactor water Level 8. The pump minimum flow bypass line isolation valve opens and both pumps continue to operate in a low flow condition by directing their flow back to the CST through the pump minimum flow lines. The control valves reopen and the pump minimum flow bypass isolation valve closes to restart high pressure makeup flow if a subsequent Level 2 signal should occur." In consideration of the above, and assuming no operator action for 72 hours after either: (a) a total loss of feedwater flow without a loss of offsite power, or (b) a LOCA without a loss of offsite power but with ADS and GDCS actuation, explain why each of the following instrumentation functions should not be specified in GTS Section 3.3: (1) Automatically start the standby CRD pump and align the CRD system to the high pressure makeup mode of operation on a Reactor Vessel Water Level - Low, Level 2 signal; (2) Automatically stop the CRD pumps on coincident low level in two GDCS pools;

RAI NUMBER	REVIEWER	QUESTION SUMMARY	FULL TEXT
			continued
187 (cont'd)	Harbuck C	Testing of automatic functions of high pressure makeup mode of operation of the CRD system	(3) Automatically stop high pressure makeup into the reactor vessel from the CRD system (by valve repositioning) on a Reactor Vessel Water Level - High, Level 8 signal; and (4) Automatically resume high pressure makeup (by valve repositioning) on a subsequent Reactor Vessel Water Level - Low, Level 2 signal. On page 4.6-26, Rev 5 of DCD Section 4.6.3.5, Surveillance Tests, describes the surveillance requirements for the CRD system and states the following: "The high pressure makeup mode of operation is tested every refueling outage to verify the automatic response of the system to a simulated or actual initiation signal. Every quarter each CRD pump is tested to verify that it can develop the required flow rate for high pressure makeup against a system head corresponding to the required reactor pressure. This test uses the system test return line to the CST." However, this testing does not correspond to any GTS surveillance requirements. Clarify in the DCD that the described testing includes channel calibration, channel functional test, and logic system functional test of all four functions, as listed above, and that the pump testing is in accordance with the IST program. Also indicate throughout the DCD which of the surveillance tests are included or are not included in the GTS; for those not included, explain why.

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22.5-22 S01	Harbuck C	Clarify ACM provisions.	Parts 1and 4 of the response to RAI 22.5-22 are acceptable. 1. Regarding Part 2 of the response: • Clarify AC 3.3.2 and bases as needed to resolve the following ambiguities: ○ Are four divisions required by ACLCO 3.3.2? ○ What is meant by the phrase “on each required division” in ACSR 3.3.2.4, LSFT, if the test interval for each division is based on four divisions (24 months on a Staggered Test Basis)? ○ Does the ACSR 3.3.2.4 apply to all three ATWS/SLC Actuation Functions? ○ Are the main control room manual switches for ATWS ADS inhibit included as part of Function 3 in Table 3.3.2-1; why does AC 3.3.2 not specify surveillance requirements for them? • From Figure 6.3-1 in Rev 5 of DCD Tier 2 Chapter 6, each of the four GDCS trains has a deluge line that branches into three lines, each with a deluge squib valve. From this it appears there are 12 deluge squib valves in the GDCS design. ACLCO 3.5.1 requires just two deluge [squib] valves to be Available. Therefore, it appears that as a minimum, the deluge function can be performed with one GDCS pool (A or D), and just two of the three deluge squib valves associated the pool. Revise the bases to include this point (with corrections if necessary) for clarification and completeness. In addition, address in your response the roles of the maintenance rule, reliability

RAI NUMBER	REVIEWER	QUESTION SUMMARY	FULL TEXT
			assurance, and the inservice testing programs, as well as ACSRs 3.5.1.1, 3.5.1.2, and 3.5.1.3 for ensuring all 12 deluge squib valves are maintained Available. • Explain what ACSR 3.5.1.3 means by "each required Deluge actuation division." Are not all four divisions required? 2. Part 3 of your response stated, "Failure of components related to the subject AC functions would result in entry into the associated Condition A until repairs are effected, or <u>until an evaluation determines that the function is still Available</u>." Does the underlined part of this statement mean "until an evaluation determines that the function is *degraded but* still Available *while the related component, which was previously thought to be necessary for function Availability, is failed or unavailable*?" If your response alludes to RIS 2005-20, Rev 1, Revision to NRC Inspection Manual Part 9900 Technical Guidance, "Operability Determinations & Functionality Assessments for Resolution of Degraded or Nonconforming Conditions Adverse to Quality or Safety", explain how that guidance applies to RTNSS nonsafety-related systems.
22.5-30	Harbuck C	Surveillance requirements for GDCS deluge function instrumentation.	For the GDCS deluge function, explain why neither GTS Section 3.3.5 nor generic ACM Section 3.3 requires performing a Channel Check and a Channel Calibration on each drywell atmosphere and lower drywell basemat thermocouple; or add these surveillances to the GTS or the generic ACM.
22.5-31	Harbuck C	Reactor building purge exhaust ventilation filter testing.	The Frequency of ACSR 3.7.5.2 (Perform [Reactor Building HVAC Purge Exhaust] filtration unit testing in accordance with Section 9.4.6.4) is stated as "In accordance with Section 9.4.6.4." DCD Section 9.4.6.4 states "The Reactor Building HVAC Purge Exhaust Filter components are periodically tested in accordance with Regulatory Guide 1.140, Design, Inspection, and

RAI NUMBER	REVIEWER	QUESTION SUMMARY	FULL TEXT
			Testing Criteria for Air Filtration and Adsorption Units of Normal Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants." Section C.6, "In-Place Testing Criteria," of RG 1.140, Rev 2, specifies • a 24 month Frequency for in-place aerosol leak testing for HEPA filters upstream from the carbon adsorbers in accordance with Section 10 of ASME N510-1989, in addition to other condition-based frequencies (6.2) • a 24 month Frequency for in-place leak testing for adsorbers in accordance with Section 11 of ASME N510-1989, in addition to other condition-based frequencies (6.3) If Reactor Building HVAC Purge Exhaust Filtration units are needed to satisfy GDC 19 dose limits, explain why RG 1.52 does not apply to their testing? If RG 1.52 applies, then the associated NRC-endorsed Frequencies should be adopted. The Reactor Building HVAC Purge Exhaust Filtration units, according to AC B 3.7.5 (page 19ACM 3.7-13), are relied upon to provide "exhaust filtering efficiency to ensure that theoretical control room doses are not exceeded for certain beyond design basis LOCAs"? Where is this beyond-design basis LOCA theoretical control room radiological consequence mitigation discussed in the DCD?
22.5-24 S01	Harbuck C	Revise (1) ACLCOs to be consistent with PRA modeling assumptions; (2) AC required action completion times to be	(1) Technical specification (TS) limiting conditions for operation (LCOs), for systems satisfying 10 CFR 50.36(c)(2)(ii) criteria, are written to satisfy the single failure criterion. Actions are written to limit the duration of unit operation for loss of redundancy and in most cases require unit shutdown for loss of function. Availability control (AC) LCOs (ACLCOs) for non-TS systems satisfying RTNSS criteria, may be written to satisfy the single

RAI NUMBER	REVIEWER	QUESTION SUMMARY	FULL TEXT
		consistent with reasonable repair times and the standard technical specifications; and (3) ACLCO 3.0.3 to require risk assessment and management.	failure criterion, but must be written to be consistent with the availability and reliability assumptions of the PRA. This is especially important given the lack of any AC Actions requiring unit shutdown. Therefore, ACLCO's should require all trains and components of a RTNSS system (including necessary support systems) to be Available in the plant operational conditions (Modes) during which the PRA assumes the system is Available; a train or component may be omitted from the ACLCO only if the PRA explicitly assumes the train or component is out-of-service. Therefore, in Modes 1, 2, 3, and 4, the ACLCOs should be revised to require both Standby DGs, and all 12 GDCS deluge flow paths to be Available. (2) AC Required Action completion times should be consistent with those provided for corresponding systems in standard technical specifications (STS); 3 or 7 days for loss of redundancy and immediate entry into ACLCO 3.0.3 for loss of function (loss of risk mitigation). The STS completion times allow appropriate time to repair most problems with inoperable systems or components when the risk of operation during the specified time is considered comparable to the risk associated with a unit shutdown. Since a unit shutdown is not required by any AC action requirement, revise the AC completion times to be based only on reasonable repair-time considerations, as modeled in the STS. (3) Should a RTNSS system remain unavailable beyond its specified repair completion time, then the risk of the resulting unit configuration must be assessed and managed in accordance with the maintenance rule program. ACLCO 3.0.3 only requires initiating action to restore the system to Available status and entering the circumstances of the unavailability into the corrective action program. ACLCO 3.0.3 should also require assessing and managing the risk of the resulting unit configuration in accordance with the maintenance rule program; revise ACLCO 3.0.3 with this requirement. In addition, in the AC Bases for ACLCO 3.0.3, refer to RG 1.182 and NUMARC 93-01 Rev 3, Section 11.3.2.8 regarding emergent conditions.

RAI NUMBER	REVIEWER	QUESTION SUMMARY	FULL TEXT
22.5-32	Harbuck C	Establish either in the generic TS or in the ACM, unavailability and risk limits, and a shutdown action requirement for exceeding an unavailability or risk limit.	In the ACM, a failure to restore a specified RTNSS system or function to Available status within the specified completion time does not result in a requirement to shut the unit down. Therefore, it is unclear how the specified completion times will ensure that the availability of the system or function "is consistent with the functional availability in the ESBWR PRA" as asserted in the bases for each AC. That is, when RTNSS functions remain unavailable beyond the specified completion times, it is reasonable to establish unavailability and risk limits that, if exceeded, would lead to a unit shutdown. The applicant is requested to either (1) explain why the generic TS and the ACM should not contain requirements to be in Mode 5, or to otherwise exit the affected TS's or AC's applicability, for the condition of exceeding an unavailability or risk limit; or (2) establish such action requirements (for example, in ACLCO 3.0.3).
22.5-33	Harbuck C	Explain how functional availability and reliability for RTNSS functions in the ESBWR PRA are used to derive the proposed required action completion times and surveillance requirements in the Availability Control Manual.	Each Availability Control (AC) bases contains statements similar to the following: "The short-term availability controls for this function, which are specified as Completion Times, are acceptable to ensure that the availability of this function is consistent with the *functional availability* in the ESBWR PRA. The surveillance requirements also provide an adequate level of support to ensure that component performance is consistent with the *functional reliability* in the ESBWR PRA." For each system covered by an AC, including all of its support systems which may or may not be covered by an explicit AC, explain how the proposed required action completion times and surveillance requirements are derived from the *functional availability* and *functional reliability*, respectively, as given in the ESBWR PRA, for the functions the PRA assumes the system performs. Along with the explanation, justify the 24-hour Frequency for the Channel Check (ACSR 3.3.5.1) and the 24-month Frequency for the Channel Functional Test (ACSR 3.3.5.2) for the 7 DPS functions in Table 3.3.5-1, or revise the Frequencies to be consistent with the STS for these instrumentation surveillances.

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22.5-34	Harbuck C	Verify appropriate use of adjective "required" in AC action and surveillance requirements.	The adjective "required" should only be used if necessary to make an AC provision clear. For example, there is no need to use required in Condition A of AC 3.3.2 and AC 3.3.5, because only the three actuation functions given in Table 3.3.2-1 and the seven actuation functions given in Table 3.3.5-1 are required to be Available by ACLCO 3.3.2 and ACLCO 3.3.5, respectively. Condition A of AC 3.7.1 also uses "required" unnecessarily.
22.5-35	Harbuck C	Revise DCD Section 19A.8.4.3 to include the ADS inhibit function.	DCD Section 19A.8.4.3, "Diverse Protection System," does not list the ADS inhibit function, which is specified in AC 3.3.5, Table 3.3.5-1, Function 7. Revise the DCD to include the ADS inhibit function.
22.5-36	Harbuck C	Explain how PCCS vent fans reduce overall containment pressure.	DCD Section 19A.8.4.10, "Long-Term Containment Integrity" states that long-term containment pressure control is accomplished by a combination of passive autocatalytic recombiners (PARs) in the containment airspaces and PCCS Vent Fans, which are operated <u>to redistribute the non-condensable gases from the wetwell to the drywell</u> so that overall containment pressure is reduced. Explain how the underlined text reduces pressure "overall"?
22.5-37	Harbuck C	ACM Section 3.3 instrumentation settings.	Confirm that instrumentation settings for Availability Control Manual Section 3.3 instrumentation functions are controlled by GTS 5.5.11, "Setpoint Control Program (SCP)."
22.5-38	Harbuck C	Bases for AC 3.3.5 incomplete.	AC 3.3.5 Action A would permit operation for 30 days with a complete loss of one or more of the following DPS functions: • Reactor scram – protection logic • MSIV closure – initiation logic • SRV actuation – initiation logic • Fine Motor CRD Run-in actuation – initiation logic • ICS actuation – initiation logic • SLCS actuation (for LOCA) (not described in bases) • ADS [actuation initiation by DPS] Inhibit The bases descriptions of these DPS functions are too brief, compared to the discussions in the bases for AC 3.3.2 and AC 3.3.3. Referencing the DCD sections that discuss these functions is acceptable; and the staff

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			recommends adding such references to all other AC bases. Please revise the bases for AC 3.3.5 to add a discussion, including a DCD reference, of the SLCS actuation on a LOCA signal DPS function.
22.5-39	Harbuck C	ACSR 3.5.1.4 note unnecessary.	Explain why ACSR 3.5.1.4 contains the note, “Squib actuation may be excluded,” or remove the note. Describe how the deluge line flow paths are verified to not be obstructed.
22.5-40	Harbuck C	Availability controls for RPV Make-up Pump and MCR Ancillary Air Conditioning Units.	Figure 8.3-3, “Ancillary Power Functional Figure” shows that the Ancillary diesel buses power an RPV Make-up Pump and MCR Ancillary Air Conditioning Units. Where in the DCD are these components discussed? Explain why they are not included in the ACM?
22.5-41	Harbuck C	FAPCS pump surveillance	• AC 3.7.2 has no surveillance requirement for FAPCS pumps. • Explain why DCD Tier 1, Table 2.6.2-1, which lists mechanical components of the Fuel and Auxiliary Pools Cooling System, does not list the FAPCS pumps. • Editorial – page 19ACM 3.7-5 is missing the section heading.
22.5-42	Harbuck C	Motor-driven fire pump surveillance.	The staff requests that GEH revise AC 3.7.1 to provide a surveillance requirement for the electric fire pump.
22.5-43	Harbuck C	Ancillary diesel required fuel volume.	The staff requests that GEH revise AC 3.8.3 bases to state the required fuel volume to meet ACSR 3.8.3.1. Where is this stated in the DCD?
22.5-44	Harbuck C	AC surveillance requirement to verify support system availability.	Most support systems for RTNSS systems are included in the ACM only through the definition of Availability. The staff requests that GEH add an AC surveillance requirement to each AC to verify Availability of all necessary support systems for the ACLCO-required system, as appropriate, and list the necessary support systems in the ACSR or the bases.

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