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MFN 08-466

Docket No. 52-010

May 15, 2008

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555-0001

Subject: **Response to NRC Request for Additional Information Letter No. 60 Related to the ESBWR Design Certification – Radiation Protection – RAI Number 12.4-25**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) responses to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) sent by NRC letter dated September 18, 2006. GEH response to RAI Number 12.4-25 is addressed in Enclosure 1. DCD Markups related to this response are provided in Enclosure 2.

If you have any questions or require additional information, please contact me.

Sincerely,

James C. Kinsey

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Vice President, ESBWR Licensing

D068
NRO

Reference:

MFN 06-342, Letter from U.S. Nuclear Regulatory Commission to David H. Hinds, GEH, *Request For Additional Information Letter No. 60 Related To ESBWR Design Certification Application*, dated September 18, 2006.

Enclosures:

1. Response to Portion of NRC Request for Additional Information Letter No. 60 Related to ESBWR Design Certification Application – Radiation Protection – RAI Number 12.4-25
2. Response to Portion of NRC Request for Additional Information Letter No. 60 Related to ESBWR Design Certification Application – Radiation Protection – RAI Number 12.4-25 – DCD Markups

cc:	AE Cubbage	USNRC (with enclosure)
	GB Stramback	GEH/San Jose (with enclosure)
	RE Brown	GEH/Wilmington (with enclosure)
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Enclosure 1

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Response to Portion of NRC Request for Additional Information Letter No. 60 Related to ESBWR Design Certification Application

Radiation Protection

RAI Number 12.4-25

NRC RAI 12.4-25:

DCD Tier 2, Sections 12.3.4.1 and 12.3.4.2 describe the ESBWR Area Radiation Monitoring (ARM) System. Tables 12.3-2 through 12.3-6 list the monitors with their locations provided on Figures 12.3-23 through 12.3-42. However, the information is unclear. Clearly indicate which Regulatory Guide (RG) 1.97 category and accident monitoring type variable, each ARMs is provided to meet, and show that the range of each monitor is consistent with RG 1.97. For those ARMs not provided for accident monitoring, clearly demonstrate that they meet the guidance in ANSI/ANS 6.8.1, or provide a justification for an alternative.

GEH Response:

GEH response to RAI 7.5-3 Supplement 2 (MFN 06-137, Supplement 3) includes Enclosure 2 – Preliminary List of Post-Accident Monitoring Variables. Area Radiation Monitors (ARMs) are identified as Type E. DCD Tier 2, Table 7.1-1 and Branch Technical Position (BTP) references in Subsection 7.5.4.3.4 have been revised to reflect that the ARMs comply with BTP HICB-10.

DCD Tier 2 Table 12.3-7 describes the ranges of the ARMs listed in Tables 12.3-2 through 12.3-6.

Additional detail for range and instrument pedigree is provided during design process in accordance with the outline in DCD Tier 2 Chapter 7 and confirmed through several ITAAC.

In DCD Chapter 7 Subsection 7.5.1.3.4, Regulatory Guides, RG-1.97 conformance, the DCD states that the ESBWR design meets the intent of RG 1.97, which endorses, with certain exceptions specified in Section C of the RG, IEEE Standard 497. In the same DCD Subsection, under Variable Types and Selection Criteria, it describes a Human Factors Engineering (HFE) process that generates a list of required RG-1.97 parameters from Functional Requirements Analysis (FRA), Allocation of Functions (AOF), and Task Analyses (TA) via their respective Results Summary Reports (RSR). The FRA, AOF, and TA are iteratively integrated into the design process. Performance criteria, identified in IEEE Standard 497, Section 5, are developed during the design process using inputs from the HFE process together with other design and accident analysis inputs. The performance criteria (range, accuracy, response time, required instrument duration, and reliability) for each required variable are then documented in a Post-Accident Monitoring (PAM) Variable List. This HFE process and analyses involves the plant system engineers, and the output RSR is provided to other disciplines including Control and Instrumentation as requirements for accident monitoring category, type, and ranges.

The following ITAACs apply to ARMS:

- DCD Tier 1, Rev. 4, Table 2.3.2-2, ITAAC for The Area Radiation Monitoring System

- DCD Tier 1, Rev. 4, Table 3.7-1, ITAAC for Post-Accident Monitoring Instrumentation.
- DCD Tier 1, Rev. 4, Table 3.3-1, ITAAC for Human Factors Engineering, Item 6, bullet 4, provides a list of instruments comprising the minimum inventory of Human-System Interface (HSI) that complies with RG 1.97 and supporting analysis.
- DCD Tier 1, Rev. 4, Table 3.4-1, ITAAC for Ventilation and Airborne Monitoring and Shielding, Item 2.

DCD Impact:

DCD Tier 2 Table 7.1-1 and BTP references in Subsection 7.5.4.3.4 are revised to reflect ARM compliance with BTP HICB-10.

Enclosure 2

MFN 08-466

Response to Portion of NRC Request for Additional Information Letter No. 60 Related to ESBWR Design Certification Application

Radiation Protection

RAI Number 12.4-25

DCD Markups

- Conformance: The ARMS design conforms to RG 1.180~~ as discussed in Subsection 7.1.6~~.

RG 1.204—, Guidelines for Lightning Protection of Nuclear Power Plants:

- Conformance: The RMS design conforms to RG 1.204~~ as discussed in Subsection 7.1.6~~.

7.5.4.3.4 Branch Technical Positions

BTP HICB-10, Guidance on Application of Regulatory Guide 1.97:

- Conformance: The ARMS design conforms to BTP HICB-10.

BTP HICB-16, Guidance on the Level of Detail Required for Design Certification Applications Under 10 CFR Part 52:

- Conformance: The ~~DCD Tier 2~~ level of detail provided for the ARMS complies with BTP HICB-16~~the above BTP~~.

7.5.4.3.5 Three Mile Island Action Plan Requirements

In accordance with SRP 7.5 and with Table 7.1-1, 10 CFR 50.34(f)(2)(xvii) [II.F.1],~~ and~~ 10 CFR 50.34(f)(2)(xix) [II.F.3], and 10 CFR 50.34(f)(2)(xxvii)[III.D.3.3] apply to the ARMS. The ARMS design complies with these requirements, as indicated above. TMI action plan requirements are addressed generically in Appendix 1A.

7.5.4.4 Testing and Inspection Requirements

~~Surveillance Testing and In-Service Inspection (ISI) activities for the ARMS follow.~~

ARMS channels are tested and calibrated using the plant operating and maintenance procedures. Each Signal Conditioning Unit (SCU) is equipped with an internal self-diagnostic feature to detect and locate instrument failures. The SCU is also equipped with internal software to facilitate electronic calibration. Each SCU is provided with a means for adjustment of electronic calibration and trip setting. These adjustments do not require equipment removal from its associated panel. The SCU is also provided with a means for generating internal signals that can be used both to check the calibration of the electronic circuits that process the Radiation Detector Assembly's signal and to verify trip setpoints.

The SCU is provided with a means for administrative control of all adjustments and setpoints.

7.5.4.5 Instrumentation and Control Requirements

Every ARM channel consists of a gamma sensitive detector and a digital area radiation processor. All channels are provided with local visual and audible alarms and local readouts. Where appropriate, additional readouts and alarms are provided by local auxiliary units.

7.5.5 Pool Monitoring Subsystems

General Functional Requirements Conformance

Table 7.1-1

Regulatory Requirements Applicability Matrix

Applicable Criteria Guidelines: SRP NUREG-0800, Section 7.1	Reference Standard	System																											
		RPS (Q)	NMS (Q)	SPTM Function (Q)	ADS (Q)	GDCS (Q)	LD&IS (Q)	CRHS (Q)	SSLC /ESF (Q)	VB Isolation Function (Q)	SLC (Q)	RSS (Q & N)	RWCU /SDC (N)	ICS (Q)	PAM (Q & N)	CMS (Q &N)	PRMS (Q &N)	ARMS (N)	Interlock Systems (~~Q & N~~) ‡	NBS (Q)	RC&IS (N)	FWCS (N)	PAS (N)	~~SB&PC~~SB&PCS (N)	NMS (N)	CIS(N)	DPS(N) ATWS/SLC (Q)	Q-DCIS (Q)	N-DCIS (N)
BTP HICB-6	IEEE Std. 603	N/A																											
BTP HICB-8	Refer to RG 1.22	X	X	X	X	X	X	X	X		X			X													X	X	
BTP HICB-9	Refer to RG 1.153	X																										X	
BTP HICB-10	Refer to RG 1.97		X	X											X		X	X										X	X
BTP HICB-11	Refer to RG1.75 RG 1.153	X	X	X	X	X	X	X	X	X	X	X		X		X	X		X	X							X	X	X
BTP HICB-12	Refer to RG 1.105	X	X	X	X	X	X	X	X	X	X			X		X	X		X	X							X	X	X
BTP HICB-13	Refer to RG 1.153	N/A																											
BTP HICB-14*	Refer to RG 1.152	X	X	X	X	X	X	X	X	X		X		X		X	X		X	X							X	X	X
BTP HICB-16		X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X
BTP HICB-17*	Refer to RG 1.22, 1.47, 1.53, 1.118, 1.152 & 1.153	X	X	X	X	X	X	X	X	X		X		X		X	X		X	X							X	X	X
BTP HICB-18*	Refer to RG 1.152	X	X	X	X	X	X	X	X	X		X		X		X	X		X	X							X	X	X
BTP HICB-19*	NUREG/CR-6303	X	X	X	X	X	X	X	X	X										X		X					X	X	X
BTP HICB-21*	NUREG/CR-6083	X	X	X	X	X	X	X	X	X		X		X		X	X		X	X							X	X	X

Notes:
Q=Safety-related, N=Nonsafety-related
X = The code or regulation is applicable to the specified system.
N/A = The code or regulation is not applicable to the ESBWR design.
(1) = Parts or all of this code or regulation are voluntarily invoked for the specified system..
*These criteria are addressed with the digital computer-related functions of the Q-DCIS
‡~~Interlocks are embedded within system logic~~
††N-DCIS hardware uses industrial methods for EMI/EMF compliance
#Initiates the 10 CFR 50.62 alternate rod insertion, SLC and FW runback and trip functions as described in Section 7.8.
@ Sections of the ANSI/ISA standard that are not specific to safety-related systems, but provide guidance on design practices for tubing, vents, & drains apply to identified (N) systems.