HITACHI

GE Hitachi Nuclear Energy

Richard E. Kingston
Vice President, ESBWR Licensing

P.O. Box 780 M/C A-65
Wilmington, NC 28402-0780
USA

T 910.675.6192
F 910.362.6192
rick.kingston@ge.com

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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 344 Related to ESBWR Design Certification Application - Radiation Protection - RAI Number 12.5-1 S02**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) 12.5-1 S02 sent by NRC Letter 344, Reference 1. The response to RAI Number 12.5-1 S01 was previously submitted to the NRC via Reference 2 in response to Reference 3.

GEH response to RAI Number 12.5-1 S02 is addressed in Enclosure 1.

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

Sincerely,

Richard E. Kingston

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Vice President, ESBWR Licensing

References:

1. MFN 09-336, Letter from U.S. Nuclear Regulatory Commission to Jerald G. Head, *Request for Additional Information Letter No. 344 Related to ESBWR Design Certification Application*, May 18, 2009
2. MFN 08-614, Response to Portion of NRC Request for Additional Information Letter Number No. 190 Related to ESBWR Design Certification Application – Radiation Protection - RAI Number 12.5-1 S01, August 27, 2008
3. MFN 08-476, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request for Additional Information Letter No. 190 Related to ESBWR Design Certification Application*, May 14, 2008

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 344 Related to ESBWR Design Certification Application - Radiation Protection - RAI Number 12.5-1 S02

cc:	AE Cubbage	USNRC (with enclosure)
	JG Head	GEH/Wilmington (with enclosure)
	DH Hinds	GEH/Wilmington (with enclosure)
	eDRF Section	0000-0105-3190

Enclosure 1

MFN 09-516

Response to Portion of NRC Request for Additional Information Letter No. 344 Related to ESBWR Design Certification Application

Radiation Protection

RAI Number 12.5-1 S02

NRC RAI 12.5-1 S02

(a) In GEH's response to RAI item 1c), describe what is meant by the bulleted item "Elimination of shield penetration and shield plug removal" in DCD Revision 5, Tier 2, Subsection 12.4.5.

(b) Five out of the six references cited by GEH (in response to item 2 of this RAI) to develop the dose assessment in DCD Revision 5, Tier 2, Subsection 12.4 are at least thirty years old. Describe why more recent data (such as recent operational job dose data) was not used in the development of the dose assessment for the ESBWR.

(c) DCD Revision 5, Tier 2, Subsection 12.4.1 states that "Additional shielding is provided to reduce radiation levels in routinely occupied areas during power operation from N-16 sources." In RAI 12.5-1 S01, the staff asked GEH to state where in the DCD the use of additional shielding for N-16 is described. In response to this staff request, GEH referred the staff to DCD Revision 5, Tier 2, Subsection 11.1.2. This subsection does not describe any additional shielding for N-16, but states, instead, that the HWC concentration of 9.25 MBq/gm is used as the design basis N-16 concentration in steam for the ESBWR shielding design. Verify that this statement was the basis for GEH's statement above that additional shielding is provided to reduce radiation levels from N-16 sources.

GEH Response

(a) The bullet in DCD Tier 2, Subsection 12.4.5 ("Elimination of shield penetration and shield plug removal") pertains to the savings incurred through the lack of recirculation lines and pumps in the ESBWR design. The elimination of recirculation lines and pumps provides savings in the elimination of the applicable nozzle inspections (the first bullet in DCD Tier 2, Subsection 12.4.5) and the activities associated with the recirculation line and pump shield plug removal (the second bullet in DCD Tier 2, Subsection 12.4.5).

(b) An explanation for the use of the older references was provided in the response to item 2 of RAI 12.5-1 S01 (MFN 08-614, dated August 27, 2008) as follows:

"In addition to the design information cited above, operational information from the NUREG-0713, 'Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities' series of reports was reviewed as a possible source of man-hour and collective dose information. Prior to 1997, NUREG-0713 reports were formatted with occupational exposure information in a format similar to that required by Regulatory Guide 8.19. However, it was found that after 1997 the NUREG-0713 reports were reformatted to not include these data. In addition, collective dose information prior to 1997 was considered out-dated to reflect the current downward trend in collective occupational exposure, and as a result, was not used in the analyses supporting the development of the DCD Revision 5, Tier 2, Section 12.4. In addition, the International Atomic Energy Agency (IAEA) "Information System on Occupational Exposure" (ISOE)

reports were also reviewed and were also found to not contain information in a format which would support the analyses required for the revised section."

Based on the discussion above, GEH determined that the references provided in DCD Tier 2, Subsection 12.4.9 are acceptable for the purpose of comparing the ESBWR collective doses to those of existing plants, as these documents provide a conservative estimate of dose based on extensive GE BWR operating history and experience. Significant collective dose reductions are expected based on continued improvements in implementation of ALARA exposure reduction techniques learned from the operating plants.

(c) It is confirmed that the statement regarding HWC is the basis for additional shielding. The intent of the response to item 3 of RAI 12.5-1 S01 (MFN 08-614, dated August 27, 2008) is that the ESBWR shielding design considers the elevated N-16 steam concentration due to the implementation of HWC. This is validated by the statements in DCD Tier 2, Subsection 11.1.2: "Plants with HWC are specified at 9.25 MBq/gm (250 µCi/gm). This HWC concentration is used as the design basis N16 concentration in steam for the ESBWR shielding design." Thus, the statement in DCD Subsection 12.4.1 ("Additional shielding is provided to reduce radiation levels in routinely occupied areas during power operation from N-16 sources.") is supported by the fact that the ESBWR shielding design uses the increased N-16 specific activity from HWC in its shielding calculations.

DCD Impact

No DCD changes will be made in response to this RAI.