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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 357 Related to ESBWR Design Certification Application – PCCS Performance – RAI Number 21.6-106 S03**

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) sent by the Reference 1 NRC letter. GEH response to RAI Number 21.6-106 S03 is addressed in Enclosure 1. LTR markups associated with these responses are provided in Enclosure 2.

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

Sincerely,

Richard E. Kingston

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Vice President, ESBWR Licensing

Reference:

1. MFN 09-472, Letter from U.S. Nuclear Regulatory Commission to Jerald G. Head, *Request for Additional Information Letter No. 357 Related to ESBWR Design Certification Application,* July 1, 2009

Enclosures:

1. Response to Portion of NRC Request for Additional Information Letter No. 357 Related to ESBWR Design Certification Application – PCCS Performance – RAI Number 21.6-106 S03
2. Response to Portion of NRC Request for Additional Information Letter No. 357 Related to ESBWR Design Certification – PCCS Performance – RAI Number 21.6-106 S03 – DCD Markups

cc:	AE Cubbage	USNRC (with enclosures)
	JG Head	GEH (with enclosures)
	DH Hinds	GEH (with enclosures)
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Enclosure 1

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Response to Portion of NRC Request for

Additional Information Letter No. 357

Related to ESBWR Design Certification Application

PCCS Performance

RAI Number 21.6-106 S03

NRC RAI 21.6-106 S03

GEH's response to RAI21.6-106 S02, part (C) (MFN 09-202), stated that, "No change will be made in the LTR NEDE-32176P. During the development and evolution of the ESBWR design, changes have been made to the original design presented in NEDE-32176P. Due to this fact, the descriptions presented in NEDE-32176P were provided to facilitate the initial review of the models developed for safety analysis. The ESBWR design is presented in the DCD, therefore, it is not required to maintain NEDE-32176P up to date with ESBWR design information."

1. Staff requests GEH place a table in the applicable chapter/section(s) of DCD Revision 6 describing the differences between the ESBWR DCD and the referenced LTR NEDE-32176P.

2. Please correct the following internal LTR NEDE-32176P inconsistency. Figure 7-43 (6 PCCS heat exchangers) is inconsistent with Section 7.11.5 (4 PCCS heat exchangers).

GEH Response

Item 1 of this RAI is addressed by adding a table (Table 6B-2), and accompanying text to ESBWR DCD Appendix 6B, as shown in the attached markup. The basis for this table is shown in Table 21.6-106S03-1.

Item 2 is will be addressed through GEH standard practices regarding the updating and correcting of current LTRs. No revision to the NEDE-32176P is currently scheduled.

DCD Impact

DCD Tier 2, Appendix 6B will be revised as noted in the attached markup to add Table 6B-2.

Table 21.6-106S03-1 Comparison of NEDE 32176P and ESBWR DCD Tier 2 Revision 6

	Item	NEDE 32176P		DCD Tier 2 Rev. 6		Notes
		Subsection	Detail	Subsection	Detail	
1	Containment Nodalization Figure	7.11	Figure 7-43	6.2	Figure 6.2-7	Most updated nodalization can be found in the DCD Tier 2 Rev. 6.
2	Number of PCCS Heat Exchangers	7.11.5	4	6.2.2.1	6	There are 6 PCCS heat exchangers. PCCS vent fans are modeled in DCD Tier 2 Rev. 6. Vent fans were not modeled in NEDE-32176P.
3	Number of ICS Heat Exchangers	7.11.5	6	Table 6.2-6a	4	There are 4 ICS heat exchangers
4	Number of GDCS Equalization lines connecting to the RPV downcomer.	7.11.7.8	3	Table 6.3-5a	4	Current GDCS and RPV design allows for four GDCS equalizing lines.
5	Number of Vacuum Breakers modeled as operating.	7.11.8	2	6.2.1.1.4	1	DCD Tier 2 Rev. 6 assumes only one functioning VB.

Enclosure 2

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DCD Markups

cooling period results, as noted in Figures 6.2-13a1 through Figures 6.2-13c3 and Figures 6.2-14a1 through Figures 6.2-14c3, are also applicable to the FWLB and with minimum impact to the respective noncondensable gas migration.

A slightly more noticeable and conservative impact due to nodalization changes is the inclusion of two pipes in the TRACG nodalization. These two pipes simulate the connection between the GDCS air space and the upper DW. This nodalization change increases the DW pressure as a result of a more effective migration of noncondensable gases from the GDCS air space to the DW, and eventually to the WW. The current TRACG nodalization of the ESBWR Containment includes these changes as seen in Figure 6.2-7. These changes result in a MSLB DW pressure increase of about 1% when compared to a single pipe and a pressure margin reduction from 19% to about 14% for the FWLB.

The difference in the effect on DW pressure between these two events is attributed to their corresponding scenarios. During the initial part of the FWLB, the lower DW accumulates more water, displacing the noncondensable gases and forcing them to migrate faster to the WW area than during the MSLB; as seen in Figure 6.2-13d4 and Figure 6.2-14d4. During this period some amount of noncondensable gases migrate and hide in the GDCS drained volume by a greater amount and at a faster rate than during the MSLB, due to earlier and greater inventory drainage from the GDCS pool to the RPV. At the same time this hideout is minimized by the carry over of noncondensable gases to the WW, thereby increasing the containment pressure, as seen in Figure 6.2-13d5, Figure 6.2-14d5, Table 6.2-7e and Table 6.2-7d.

These two main scenarios contribute to their different noncondensable gases migration pattern, such that the difference in noncondensable gases migration patterns is attributed mainly to different system event responses and not to nodalization changes.

Even though these two scenarios have a different noncondensable gas migration, the two-pipe nodalization stated above and the assumption that all DW noncondensable gases migrate to the WW airspace at 72 hours adds sufficient conservatism to their DW pressure. The addition of two pipes promotes migration of noncondensable gases from the DW to the WW resulting in a conservatively high DW pressure increase. Furthermore this migration enhancement is maximized when all the containment noncondensable gases, including those added to the containment from pneumatic supplies are assumed to relocate to the WW, see Appendix 6E.2.

Table 6B-2 provides a summary of differences from the ESBWR description given in Reference 6B.1-2 and the ESBWR design in the DCD.

6B.1 References

6B.1-1 GE Nuclear Energy, "TRACG Application for ESBWR," NEDC-33083P-A, Class III, (Proprietary), March 2005, and NEDO-33083-A, Class I (Non-proprietary), October 2005.

6B.1-2 GE Nuclear Energy, "TRACG Model Description," NEDE-32176P, Class III, (Proprietary), April 2006.

Table 6B-2

Summary of Differences from Reference 6B.1-2

	Item	NEDE 32176P		DCD Tier 2		Notes
		Subsection	Detail	Subsection	Detail	
1	Containment Nodalization Figure	7.11	Figure 7-43	6.2	Figure 6.2-7	Most updated nodalization can be found in the DCD Tier 2.
2	Number of PCCS Heat Exchangers	7.11.5	4	6.2.2.1	6	PCCS vent fans are modeled in DCD Tier 2. Vent fans were not modeled in NEDE-32176P.
3	Number of ICS Heat Exchangers	7.11.5	6	Table 6.2-6a	4	None.
4	Number of GDCS Equalization lines connecting to the RPV downcomer.	7.11.7.8	3	Table 6.3-5a	4	Current GDCS and RPV design allows for four GDCS equalizing lines.
5	Number of Vacuum Breakers modeled as operating.	7.11.8	2	6.2.1.1.4	1	DCD Tier 2 assumes only one functioning Vacuum Breaker.