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U.S. Nuclear Regulatory Commission
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Subject: **Response to NRC Request for Additional Information Letter No. 366 Related to ESBWR Design Certification - Radiation Protection - RAI Number 12.4-31 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) sent by NRC letter No. 366, dated August 25, 2009 (Reference 1).

Enclosure 1 provides the GEH response to the subject RAI as requested in Reference 1. Enclosure 2 contains DCD markups resulting from the changes in the GEH response. Verified DCD changes associated with this RAI response are identified in the enclosed markups by enclosing the text within a black box.

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

Sincerely,

Richard E. Kingston
Vice President, ESBWR Licensing

References:

1. MFN 09-574 - Letter from U.S. Nuclear Regulatory Commission to Jerald G. Head, *Request For Additional Information Letter No. 366 Related To ESBWR Design Certification Application*, dated August 25, 2009

Enclosures:

1. Response to NRC Request for Additional Information Letter No. 366 Related to ESBWR Design Certification Application - Radiation Protection - RAI Number 12.4-31 S02
2. Response to NRC Request for Additional Information Letter No. 366 Related to ESBWR Design Certification Application - Radiation Protection - RAI Number 12.4-31 S02 – DCD Markups

cc: AE Cabbage USNRC (with enclosures)
JG Head GEH/Wilmington (with enclosures)
DH Hinds GEH/Wilmington (with enclosures)
eDRF Section 0000-0095-4895 (RAI 12.4-31 S02)

Enclosure 1

MFN 09-575

Response to NRC Request for

Additional Information Letter No. 366

Related to ESBWR Design Certification Application

Radiation Protection

RAI Number 12.4-31 S02

NRC RAI 12.4-31 S02

Table 12.3-14 (DCD Tier 2, Rev. 5) shows that, at 72 hours after an accident, the mission dose to access the standby liquid control pump room (Room 1703) to perform long-term boron refilling is $4.02E+01$ mSv (4.02 rem), which is close to the GDC 19 limit of $5E+01$ mSv (5 rem) limit for performing post-accidents in vital areas (as defined in Section II.B.2 of NUREG-0737).

In response to staff RAI 12.4-31 S01, however, GEH stated that there is no design requirement to provide additional boron from the standby liquid control room and no event that credits it. Therefore, GEH stated that the detailed design which is needed to perform a time motion study of boron refill has not been performed. In this response, GEH also stated that, if this action (boron refill) had to be done, it would not be a 72-hour activity. Since GEH stated that the detailed design which is needed to perform a time motion study has not been performed and that, if a boron refill would be performed, it would more likely be performed after 7 days (and not 72 hours), when dose rates were considerably lower, then including a listing of radiation mission doses for boron refill at 72 hours in Table 12.3-14 presents an unrealistically high estimated mission dose for this task.

Modify Table 12.3-14 to correct this apparent inaccurate listing. One way to do this would be to add a footnote for the mission dose for the standby liquid control pump room in Table 12.3-14. This footnote should include the information provided in GEH's response to item 10 of RAI 12.4-31 S01 regarding the likely performance of boron refilling at a later post-accident time (beyond 72 hours) when the area dose rates to access the standby liquid control pump room are considerably lower, thereby permitting more time to perform this function with a potentially lower overall mission dose.

GEH Response

Table 12.3-14 will be revised with a footnote to explain this listing.

DCD Impact

DCD Tier #2, Table 12.3-14 will be revised as noted in the attached markup.

Enclosure 2

MFN 09-575

**Response to NRC Request for
Additional Information Letter No. 366
Related to ESBWR Design Certification Application
Radiation Protection
RAI Number 12.4-31 S02
DCD Markups**

Table 12.3-14
Reactor Building Post Accident Access Area

| Way | Room | Walked distance (m) | Time (min) | Dose (mSv) |
|---|------|---------------------|--------------|------------------------------|
| <u>Mission at 72 hours to Room 1323: Remote Shutdown Control Panel Room Division 2</u> | | | | |
| Lobby | -- | 21.49 | 0.39 | 6.56E-04 5.86E-04 |
| Corridor 1 | -- | 37.76 | 0.69 | 9.48E-04 8.46E-04 |
| Stairs 2 | -- | 27.71 | 0.92 | 8.29E-04 7.41E-04 |
| Corridor 2 | -- | 17.28 | 0.31 | 2.50E-04 2.24E-04 |
| Clean Personal Access Tunnel | 9101 | 31.02 | 0.62 | 8.02E-04 7.56E-04 |
| Electrical Equipment Division 3 | 1331 | 30.33 | 0.55 | 2.81E-01 9.39E-02 |
| Controlled Equipment Removal Access Room | 1308 | 8.38 | 0.15 | 4.36E-02 1.47E-02 |
| Electrical Equipment Division 2 | 1321 | 6.50 | 0.12 | 5.70E-02 1.91E-02 |
| Remote Shutdown Control Panel Room Division 2 | 1323 | 9.38 | 0.67 + 5 (1) | 1.20E+00 4.06E-01 |
| Electrical Equipment Division 2 | 1321 | 6.50 | 0.12 | 5.70E-02 1.91E-02 |
| Controlled Equipment Removal Access Room | 1308 | 8.38 | 0.15 | 4.36E-02 1.47E-02 |
| Electrical Equipment Division 3 | 1331 | 30.33 | 0.55 | 2.81E-01 9.39E-02 |
| Clean Personal Access Tunnel | 9101 | 31.02 | 0.60 | 7.78E-04 7.34E-04 |
| Corridor 2 | -- | 17.28 | 0.31 | 2.50E-04 2.24E-04 |
| Stairs 2 | -- | 27.71 | 1.12 | 1.02E-03 9.07E-04 |
| Corridor 1 | -- | 37.76 | 0.69 | 9.48E-04 8.46E-04 |
| Lobby | -- | 21.49 | 0.39 | 6.56E-04 5.86E-04 |
| (1) 5 min time of operation and 0.5 min for opening the door are assumed | | Total dose: | | 6.68E-01 1.97E+00 |
| Way | Room | Walked distance (m) | Time (min) | Dose (mSv) |
| <u>Mission at 72 hours to Room 1703: Standby Liquid Control Pump Room</u> | | | | |
| Lobby | -- | 16.27 | 0.30 | 4.97E-04 4.44E-04 |
| Stairs 1 | -- | 17.58 | 0.54 | 4.86E-04 4.35E-04 |
| ED Pickup | -- | 53.51 | 0.98 | 1.68E-03 1.50E-03 |
| Health Physics Facility | -- | 12.41 | 0.23 | 1.86E-04 3.04E-04 |
| Controlled Personnel Access Tunnel | 9201 | 16.86 | 0.35 | 4.24E-04 4.03E-04 |
| Stairwell B | 1191 | 40.07 | 1.54 | 8.26E+00 8.70E+00 |
| Corridor A Division 3 | 1730 | 11.69 | 0.21 | 1.52E+00 1.26E+00 |

**Table 12.3-14
Reactor Building Post Accident Access Area**

| Way | Room | Walked distance (m) | Time (min) | Dose (mSv) |
|------------------------------------|------|---------------------|--------------|---|
| Standby Liquid Control Pump Room | 1703 | 11.70 | 0.71 + 5 (1) | 2.92E+01 2.18E+0 ↓ |
| Corridor A Division 3 | 1730 | 11.69 | 0.21 | 1.52E+00 1.26E+0 0 |
| Stairwell B | 1191 | 40.07 | 1.27 | 6.81E+00 7.17E+0 0 |
| Controlled Personnel Access Tunnel | 9201 | 13.90 | 0.28 | 3.42E-04 3.25E-04 |
| Health Physics Facility | -- | 39.23 | 0.71 | 5.87E-04 9.61E-04 |
| ED Pickup | -- | 29.72 | 0.54 | 9.31E-04 8.31E-04 |
| Stairs 1 | -- | 17.75 | 0.66 | 5.92E-04 5.29E-04 |
| Lobby | -- | 16.27 | 0.30 | 4.97E-04 4.44E-04 |

(1) 5 min time of operation and 0.5 min for opening the door are assumed

(2) There is no design requirement to provide additional boron and no event that credits it. If this action had to be done, it would not be a 72-hour activity. All post-accident dose analysis was performed at 72 hours for consistency (with the exception of the RWCU cross-tie which is described in the design). If boron addition is performed at 7 days, a dose rate of 9 mSv/hr would result in a mission time greater than 4 hours. Like more complicated Emergency Response repair activities, long-term boron injection would be performed with preplanning including mock-ups and walk-throughs prior to execution to ensure the dose is managed as low as possible. The dose tables show that there will be a reasonable amount of time to accomplish this function even if it has to be approached using multiple entries.

Total dose: ~~4.74E+01~~ ~~4.02E+0~~
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