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MFN 06-528 Supplement 3

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U.S. Nuclear Regulatory Commission
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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 218 Related to ESBWR Design Certification Application – Radiation Protection – RAI Number 12.2-19 S02**

Enclosure 1 contains the GE Hitachi Nuclear Energy (GEH) response to the subject NRC RAI originally transmitted via the Reference 1 letter and supplemented by an NRC request for clarification and GEH responses addressed in References 2 through 4.

If you have any questions about the information provided here, please contact me.

Sincerely,

Richard E. Kingston

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Vice President, ESBWR Licensing

References:

1. MFN 08-561, Letter from the U.S. Nuclear Regulatory Commission to Robert E. Brown, Request for Additional Information Letter No. 218, Related To ESBWR Design Certification Application, dated July 1, 2008
2. MFN 06-342, Letter from the U.S. Nuclear Regulatory Commission to David Hinds, Request for Additional Information Letter No. 60, Related To ESBWR Design Certification Application, dated September 18, 2006
3. MFN 06-528, Response to Portion of NRC Request for Additional Information Letter No. 60 – Radiation Protection – RAI Numbers 12.2-19, 12.3-10, 12.3-12, 12.4-5, and 12.4-7, dated December 22, 2006
4. MFN 06-528 Supplement 2, Response to Portion of NRC Request for Additional Information Letter No. 60 Related to ESBWR Design Certification Application – Radiation Protection – RAI Number 12.2-19S01, dated June 27, 2007

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 218, Related to ESBWR Design Certification Application – Radiation Protection – RAI Number 12.2-19 S02

cc:

AE Cubbage	USNRC (with enclosure)
RE Brown	GEH/Wilmington (with enclosure)
DH Hinds	GEH/Wilmington (with enclosure)
eDRF	0000-0095-4892

Enclosure 1

MFN 06-528
Supplement 3

Response to Portion of NRC Request for

Additional Information Letter No. 218

Related to ESBWR Design Certification Application

Radiation Protection

RAI Number 12.2-19 S02

NRC RAI 12.2-19 S02:

1. *Provide the justification for modifying the values for accumulated activity in HVAC filters 1. In GEH response to RAI 12.2-19, GEH stated that the maximum estimated dose rate to a worker in the upper drywell at elevation 22800 in the event of a fuel bundle drop (with a burnup of 35 GWd/MTU) on the shield/seal ring would be 4.7 Sv/hr (470 rem/hr). State what effect the dropping of a higher burnup fuel assembly (assume 58 GWd/MTU, as per the response to RAI 12.2-19 S01) would have on the estimated dose rate of 4.7 Sv/hr at elevation 22800 in the upper drywell.*

2. *In GEH initial response to RAI 12.2-19, GEH provided Figure 2 which shows egress routes from the drywell area. In the event of a fuel bundle drop on the shield/seal ring while personnel are in the upper portions of the drywell (on elevation 21000), describe; 1) how personnel in the drywell would be alerted to this situation, 2) approximately how long it would take for personnel in the vicinity of the fuel bundle drop to leave the drywell, and 3) the approximate dose that a worker in the upper level of the drywell would receive from the dropped fuel assembly before leaving the area.*

GEH Response:

1. The response to RAI 12.2-19 S01 (MFN 06-528 Supplement 2, dated June 27, 2007) provided the difference in gamma source by energy group between fuel with 35 GWd/MTU and 58 GWd/MTU burnup that had been used for that sensitivity study. The 4.7 Sv/hr dose rate to a worker at the worst position in the event of a fuel bundle drop (35 GWd/MTU burnup) reported in the response to RAI 12.2-19 (MFN 06-528, dated December 22, 2006) has more recently been modified based on the sensitivity study performed in response to RAI 12.2-19 S01 (MFN 06-528 Supplement 2) to assess the impact of 58 GWd/MTU burnup fuel. The values reported in this RAI response supersede the values provided in the response to the RAI 12.2-19.

   The dose rates for each gamma energy group for the two fuel burnups at the worst position are:

Mean Gamma Energy group (MeV)	MCNPX dose rate at 35 GWd/MTU (Sv/hr)	Difference (%)	New dose rate at 58 GWd/MTU (Sv/hr)
0.01	4.89E-06	125	6.11E-06
0.025	2.07E-05	108	2.24E-05
0.0375	5.39E-05	106	5.71E-05

Mean Gamma Energy group (MeV)	MCNPX dose rate at 35 GWd/MTU (Sv/hr)	Difference (%)	New dose rate at 58 GWd/MTU (Sv/hr)
0.0575	2.93E-04	120	3.52E-04
0.085	3.29E-03	122	4.02E-03
0.125	2.85E-02	124	3.53E-02
0.225	2.64E-01	121	3.20E-01
0.375	4.87E-01	112	5.45E-01
0.575	1.12E+00	112	1.26E+00
0.85	1.40E+00	107	1.49E+00
1.25	1.70E+00	139	2.36E+00
1.75	1.69E+00	102	1.73E+00
2.25	2.08E-01	163	3.39E-01
2.75	1.60E-01	100	1.60E-01
3.5	2.55E-03	101	2.57E-03
5.0	3.46E-05	77	2.67E-05
7.0	2.17E-14	608	1.32E-13
9.5	3.79E-15	607	2.30E-14
Total	**7.06E+00**	**117**	**8.25E+00**

The resulting worker dose rate for 35 GWd/MTU burnup fuel at the worst position is 7.06 Sv/hr (706 rem/hr) and for 58 GWd/MTU burnup fuel is 8.25 Sv/hr (825 rem/hr).

2. In the event of a fuel drop on the shield/seal ring while personnel are in the upper portions of the drywell:

   (1) Personnel in the drywell would be alerted to anomalous radiation conditions by means of portable radiation instrumentation.

   (2) Considering the usual precautions taken during fuel loading and the proximity of the grating platform to the personnel airlock, an average time of 1 minute for leaving the drywell can be reasonably assumed once the personnel are alerted to the situation. The egress route up to the personnel airlock is by way of the platforms at elevations 21000 and 18500.

   (3) The radiation dose rate decreases very quickly as a function of distance. As discussed above, the resulting worker dose for 58 GWd/MTU burnup fuel is 8.25 Sv/hr. Thus, for distances of 0.5 m, 1 m; 2 m and 3 m the estimated dose rates are 6.55 Sv/hr, 4.04 Sv/hr, 1.17 Sv/hr and 0.37 Sv/hr, respectively.

Assuming that the personnel located close to the dropped fuel element, take 15 seconds to disengage from their work, take 1 minute to evacuate the area, and that the walking speed is 1 m/s, an estimated dose has been performed distributing this egress time of 1 minute in five different points of distance to the fuel element source:

(8.25 x 15+6.55 x 1 +4.04 x 1+ 1.17 x 1 +0.37 x (60-18)) (Sv/hr) x s /3600 (s/hr) = 4.2E-02 Sv (4.2 rem).

DCD Impact:

No DCD changes will be made in response to RAI.