HITACHI

GE Hitachi Nuclear Energy

Richard E. Kingston
Vice President, ESBWR Licensing

PO Box 780
3901 Castle Hayne Road, M/C A-55
Wilmington, NC 28402 USA

T 910 819 6192
F 910 362 6192
rick.kingston@ge.com

MFN 08-753

Docket No. 52-010

October 23, 2008

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

Subject: Response to Portion of NRC Request for Additional Information Letter No. 222 Related to ESBWR Design Certification Application ESBWR RAI Number 19.1-176

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) Letter No. 222, dated August 15, 2008 (Reference 1).

The GEH response to RAI Number 19.1-176 is in Enclosure 1.

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

Sincerely,

Lee F. Dougherty for

Richard E. Kingston
Vice President, ESBWR Licensing

D068
NRO

Reference:

1. MFN 08-649, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, GEH, *Request For Additional Information Letter No. 222 Related To ESBWR Design Certification Application*, dated August 15, 2008.

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 222 Related to ESBWR Design Certification Application Probabilistic Risk Assessment RAI Number 19.1-176

cc:	AE Cubbage	USNRC (with enclosure)
	RE Brown	GEH/Wilmington (with enclosure)
	eDRF Section	0000-0090-5768

Enclosure 1

MFN 08-753

Response to Portion of NRC Request for Additional Information Letter No. 222 Related to ESBWR Design Certification Application ESBWR Probabilistic Risk Assessment RAI Number 19.1-176

NRC RAI 19.1-176 Response

Question Summary:

Additional offsite consequence information

Full Text:

In NEDO-33201, Revision 3, Table 22.10-1 shows long-term source term sensitivity consequence results, with the assumption of elevated plume release and buoyant effect. A review of this table identified several inconsistencies.

A. Please provide a discussion of why for a number of release categories (i.e., BOC, EVE, FR) the individual and societal risk values in this table are similar to those listed in Table 10.5-7b. Note that the values given in Table 10.5-7b correspond to releases after 72 hours, and those listed in Table 22.10-1 are for the long-term (beyond 130 hrs, see Table 20.9-2).

B. Please provide the assumed values for the time of release, the release duration, and the release energy for the sensitivity analysis.

C. It appears that there is an error in the assignment of relative fractions in the Filtered Release (FR) category. Currently, the assigned relative fraction to T-AT_nIN_nCHR_FR50_R1 is 5.0E-06, whereas, the assigned value for T-AT_nIN_nCHR_FR50_R1 is 0.625. Please clarify and if needed, provide the corrected values.

GEH Response

A. Table 22.10-1 was for longer than 72 hours source terms as well as for the 72 hours source terms.

There are two types of data in Table 22.10-1. One type showed a continued release plume rise after 72 hours, and the other did not show a continued release plume rise post 72 hours.

The items identified in the RAI, i.e., BOC, EVE and FR release categories, were those in the group that did not have a continued release plume rise post 72 hours. As such, they were similar to those in Table 10.5-7b, except for their release frequencies.

For clarification, Table A below shows the source terms used for the sensitivity study (Section 22.10).

Table A

Radionuclide Source Terms
(Release Fraction 72 hrs and beyond after onset of core damage

Section 22.10 Source Term [2]	Section 9 Source Term [1]	Section 22.9 Source Term [3]	MAAP Case	Time (hr)
1	1		BOCsd_nIN_R1	72
2	2		BOCdr_nIN_R1	72
3	3	3	T_nIN_BYP_R1	138.89
4	4		T_nDP_nIN_BYP_R1	128.11
5	5	5	T_nIN-nD_CCID_R1	138.89
6	6		T_nDP_nIN_nD-CCID_R1	72
7	7	7	T_nIN_CCIW_R1	277.78
8	8	8	T_nDP_nIN_CCIW_R1	277.78
9			T_nDP_nIN_nD_DCH_R1	72
10	9		T_nIN-ND_EVE_R1	72
11	10		T_AT_nIN-nCHR_FR_R1	72
12			T_AT_nIN_nCHR_FR50_R1	277.78
13	11	11	T_nDP_nIN_VB_R1	72
14	12	12	T_nIN_VB_R1	277.78
15	13	13	T_nDP_nIN_nCHR_W1_R1	224.56
16	14	14	T_nDP_nIN_nCHR_W2_R1	277.78
17	15		T_AT_nIN_TSL2x_R1	72

[1] Table 9-3 included just 72 hours.
[2] Table 22.10-1 included both 72 hours and beyond 72 hours.
[3] Table 22.9-2 included just beyond 72 yours

B. Table B table shows the Time of Release, Release Duration and Release Energy used for the sensitivity study.

Table B

Source Term Release Parameters

Source Term	Release Category	MAAP CASE	Time of Release (hr)	Release Duration (hr)	Release Energy (watts)
1	BOC	BOCsd_nIN_R1	0.7	7.5	1E6
2		BOCdr_nIN_R1	0.6	5.5	1E6
3	BYP	T_nIN_BYP_R1	0.7	8.0	1E6
4		T_nDP_nIN_BYP_R1	1.3	7.5	1E6
5	CCID	T_nIN_nD_CCID_R1	25.8	10.0	1E6
6		T_nDP_nIN_nD_CCID_R1	16.0	2.6	1E6
7	CCIW	T_nIN_CCIW_R1	25.6	10.0	1E6
8		T_nDP_nIN_CCIW_R1	18.4	10.0	1E6
9	DCH	T_nDP_nIN_nD_DCH_R1	5.6	10.0	1E6
10	EVE	T_nIN_nD_EVE_R1	7.4	10.0	1E6
11	FR	T-AT_nIN_nCHR_FR_R1	28.9	10.0	1E6
12		T-AT_nIN_nCHR_FR50_R1	11.3	10.0	1E6
13	OPVB	T_nDP_nIN_VB_R1	13.8	10.0	1E6
14		T_nIN_VB_R1	8.7	3.0	1E6
15	OPW1	T_nDP_nIN_nCHR_W1_R1	34.2	10.0	1E6
16	OPW2	T_nDP_nIN_nCHR_W2_R1	53.1	10.0	1E6
17	TSL	T_AT_nIN_TSL2x_R1	0.5	7.5	1E6

C. The updated Table 22.10-1 is provided below based upon current information. The total offsite consequence results were not impacted. Section 9 and 10 will be updated as part of Rev 4 of NEDO-33201.

Table C

Table 22.10-1 – Update

Source Term	Release Category	MAAP CASE	Release Frequency (/yr)	Individual Risk (0-1 mile)	Weighted Individual Risk	Weighted Individual Risk Contribution	Societal Risk (0-10 miles)	Weighted Societal Risk	Weighted Societal Risk Contribution	Prob. of Dose > .2 Sv (0-0.5 mile)	Weighted Prob of Exceedance	Weighted Dose Contribution	Sequence Fraction
1	BOC	BOCsd_nIN_R1	5.0E-11	1.2E-01	2.9E-12	3.2E-02	1.5E-02	3.7E-13	2.7E-02	1.0E+00	2.5E-11	2.3E-02	50.0%
2		BOCdr_nIN_R1	5.0E-11	8.4E-02	2.1E-12	2.3E-02	1.3E-02	3.1E-13	2.2E-02	1.0E+00	2.5E-11	2.3E-02	50.0%
3	BYP	T_nIN_BYP_R1	4.5E-11	1.1E-01	1.6E-13	1.8E-03	1.7E-02	2.4E-14	1.7E-03	1.0E+00	1.4E-12	1.3E-03	3.1%
4		T_nDP_nIN_BYP_R1	4.5E-11	1.1E-01	4.7E-12	5.3E-02	5.1E-02	2.2E-12	1.6E-01	1.0E+00	4.4E-11	4.0E-02	96.9%
5	CCID	T_nIN_nD_CCID_R1	9.8E-13	1.0E-01	8.7E-14	9.8E-04	1.2E-02	1.0E-14	7.5E-04	1.0E+00	8.4E-13	7.7E-04	85.7%
6		T_nDP_nIN_nD_CCID_R1	9.8E-13	7.4E-02	1.0E-14	1.2E-04	9.5E-03	1.3E-15	9.6E-05	1.0E+00	1.4E-13	1.3E-04	14.3%
7	CCIW	T_nIN_CCIW_R1	9.9E-11	1.0E-01	9.4E-12	1.1E-01	1.1E-02	1.0E-12	7.2E-02	1.0E+00	9.0E-11	8.3E-02	90.5%
8		T_nDP_nIN_CCIW_R1	9.9E-11	9.4E-02	8.8E-13	9.9E-03	1.1E-02	1.0E-13	7.3E-03	1.0E+00	9.4E-12	8.7E-03	9.5%
9	DCH	T_nDP_nIN_nD_DCH_R1	1.0E-15	1.1E-01	1.1E-16	1.2E-06	1.3E-02	1.3E-17	9.4E-07	1.0E+00	1.0E-15	9.2E-07	100.0%
10	EVE	T_nIN_nD_EVE_R1	6.0E-10	1.1E-01	6.4E-11	7.2E-01	1.4E-02	8.2E-12	5.9E-01	1.0E+00	6.0E-10	5.6E-01	100.0%
11	FR	T-AT_nIN_nCHR_FR_R1	6.0E-11	7.8E-02	2.3E-12	2.6E-02	7.2E-03	2.2E-13	1.6E-02	1.0E+00	3.0E-11	2.8E-02	50.0%
12		T-AT_nIN_nCHR_FR50_R1	6.0E-11	8.5E-02	2.5E-12	2.9E-02	8.1E-03	2.4E-13	1.7E-02	1.0E+00	3.0E-11	2.8E-02	50.0%
13	OPVB	T_nDP_nIN_VB_R1	1.0E-15	1.1E-01	5.4E-18	6.0E-08	1.7E-02	8.5E-19	6.1E-08	1.0E+00	5.0E-17	4.6E-08	5.0%
14		T_nIN_VB_R1	1.0E-15	9.1E-02	8.7E-17	9.7E-07	8.9E-03	8.5E-18	6.1E-07	1.0E+00	9.5E-16	8.7E-07	95.0%
15	OPW1	T_nDP_nIN_nCHR_W1_R1	1.0E-15	1.1E-01	1.1E-16	1.2E-06	1.7E-02	1.7E-17	1.2E-06	1.0E+00	1.0E-15	9.2E-07	100.0%
16	OPW2	T_nDP_nIN_nCHR_W2_R1	2.4E-13	1.0E-01	2.5E-14	2.8E-04	1.4E-02	3.3E-15	2.4E-04	1.0E+00	2.4E-13	2.2E-04	100.0%
17	TSL	T_AT_nIN_TSL2x_R1	1.1E-08	0.0E+00	0.0E+00	0.0E+00	1.1E-04	1.2E-12	8.6E-02	2.0E-02	2.3E-10	2.1E-01	100.0%
Total	--	--		--	8.9E-11	1.0E+00	--	1.4E-11	1.0E+00	--	1.1E-09	1.0E+00	

DCD/NEDO-033201 Impact

DCD Impact – There is no impact as a result of this RAI response.

NEDO-33201 Impact – Section 9 and 10 will be updated as part of Rev 4 of NEDO-33201.