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MFN 08-086, Supplement 23

Docket No. 52-010

April 17, 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. 126 Related to ESBWR Design Certification Application RAI Numbers 14.3-175, 14.3-356 and 14.3-378.**

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 dated December 20, 2007 (Reference 1).

Enclosure 1 contains the GEH response to RAIs 14.3-175, 14.3-356 and 14.3-378. The enclosed changes will be incorporated in the upcoming DCD Revision 5 submittal.

Verified DCD changes associated with this RAI response are identified in the enclosed DCD markups by enclosing the text within a black box. The marked-up pages may contain unverified changes in addition to the verified changes resulting from this RAI response. Other changes shown in the markup(s) may not be fully developed and approved for inclusion in DCD Revision 5.

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

Sincerely,

James C. Kinsey

James C. Kinsey
Vice President, ESBWR Licensing

D068
NRO

Reference:

1. MFN 07-718, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request For Additional Information Letter No. 126 Related To ESBWR Design Certification Application*, December 20, 2007.

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 126 Related to ESBWR Design Certification Application – RAIs 14.3-175, 14.3-356 and 14.3-378.

cc:

AE Cubbage	USNRC (with enclosure)
GB Stramback	GEH/San Jose (with enclosure)
RE Brown	GEH/Wilmington (with enclosure)
DH Hinds	GEH/Wilmington (with enclosure)
eDRF	0000-0080-4821 – RAI 14.3-356, 14.3-378
	0000-0081-7333 – RAI 14.3-175

MFN 08-086, Supplement 23

Enclosure 1

Response to Portion of NRC Request for Additional Information Letter No. 126 Related to ESBWR Design Certification Application

RAI Numbers **14.3-175, 14.3-356 and 14.3-378**

VERIFIED DCD CHANGES ASSOCIATED WITH THIS RAI RESPONSE ARE IDENTIFIED IN THE ENCLOSED DCD MARKUPS BY ENCLOSING THE TEXT WITHIN A BLACK BOX. THE MARKED-UP PAGES MAY CONTAIN UNVERIFIED CHANGES IN ADDITION TO THE VERIFIED CHANGES RESULTING FROM THIS RAI RESPONSE. OTHER CHANGES SHOWN IN THE MARKUP(S) MAY NOT BE FULLY DEVELOPED AND APPROVED FOR INCLUSION IN DCD REVISION 5.

NRC RAI 14.3-175

NRC Summary:
Modify DCD Tier 1, Revision 4, Table 2.3.2-1 to provide a listing of each individual ARM so that the table is consistent with the ITAAC in Table 2.3.2-2.

NRC Full Text:
In DCD Tier 1, Revision 4, Table 2.3.2-1 (Arm Locations) was modified to delete the elevation of each ARM and to no longer list the number of individual area radiation monitors (ARMs) located in each location (e.g., Revision 4 lists a single listing for the ARMs in the Instrument Rack Area in the Reactor Building while Revision 3 had eight separate listings (numbered 1 – 8) for ARMs in the Instrument Rack Area in the Reactor Building). This modification to the data in Table 2.3.2-1 makes this table inconsistent with the ITAAC for the Area Radiation Monitoring System shown in DCD Tier 1, Revision 4, Table 2.3.2-2, since the ITAAC is based on inspections, tests, and analysis being performed on each ARM channel and Table 2.3.2-1 in DCD Tier 1, Revision 4, no longer lists each individual ARM location (as was indicated in the Revision 3 version of Tier 1, Table 2.3.2-1). In order to make the ITAAC consistent with the table, modify Table 2.3.2-1 to provide a listing of each individual ARM.

GEH RESPONSE

1. a) DCD Tier 1, Revision 4, Table 2.3.2-1, will be revised to list each individual ARM (as was indicated in the Revision 3 version of Tier 1, Table 2.3.2-1), so that this table is consistent with the ITAAC of Table 2.3.2-2. The revision will also delete ten (10) ARMs that were inadvertently duplicated and one ARM that was inadvertently omitted.
   The ten (10) ARMs being deleted are located in the Turbine Building:
   - Filters and Demineralizers Area
   - Turbine Operating Floor Areas (Quantity: 2)
   - Crane Travel Area (Various)
   - Equipment Main Access Area
   - RCCW System Area Entrance
   - Offgas Charcoal Adsorber Room Entrance Area
   - Backwash Transfer Pumps Furnace Area
   - Condensate Hollow Fiber Valve Room
   - Sample Room Area

The one ARM added is located in the FAPCS Heat Exchangers Area in the Fuel Building.

b) The revised Table 2.3.2-1 will use an asterisk (*) to identify ARMs located in accessible areas where abnormal plant evolutions or anticipated operational occurrences can potentially result in dose rate increases of 1 mSv/hr (100mRem/hr) or more. This is to be consistent with the response to RAI 14.3-136 submitted via MFN 07-355 dated July 25, 2007.

2. DCD Tier 2, Revision 4, Tables 12.3-2, 12.3-3, 12.3-4, 12.3-5, and 12.3-6 will be revised as shown in the attached tables so that they are in agreement with above response for Table 2.3.2-1.

DCD IMPACT

1. DCD Tier 1, Revision 4, Table 2.3.2-1 will be revised as shown in the Attachment.

2. DCD Tier 2, Revision 4, Tables 12.3-2, 12.3-3, 12.3-4, 12.3-5, and 12.3-6 will be revised as shown in the Attachment.

Table 2.3.2-1

ARM Locations

Area	Description & Location
Reactor Building	Refueling Floor Area #1
Reactor Building	Refueling Floor Area #2
Reactor Building	New Fuel ~~Storage~~ Buffer Pool
Reactor Building	New Fuel Buffer Pool
Reactor Building	RWCU/SDC Pump
Reactor Building	RB Sump Pumps
Reactor Building*	RWCU/SDC Train A ~~& B~~ Heat Exchanger
Reactor Building*	RWCU/SDC Train B Heat Exchanger
Reactor Building	Equipment Hatch Pathway
Reactor Building	Personnel Hatch Pathway
Reactor Building	FMCRD HCU ~~Area~~ Room B
Reactor Building	FMCRD HCU Room D
Reactor Building	RWCU/SDC Filter Demineralizer Area ~~(Near Equip. Hatch)~~
Reactor Building	Radiological Control Area Entrance
Reactor Building	Hydrogen/Oxygen Monitoring (CMS) Skid
Reactor Building	Hydrogen/Oxygen Monitoring (CMS) Skid
Reactor Building	Instrument Rack Area #1
Reactor Building	Instrument Rack Area #2
Reactor Building	Instrument Rack Area #3
Reactor Building	Instrument Rack Area #4
Reactor Building	Instrument Rack Area #5
Reactor Building	Instrument Rack Area #6
Reactor Building	Instrument Rack Area #7
Reactor Building	Instrument Rack Area #8
Reactor Building	Fuel Transfer System (FTS) Maintenance Rooms (Multiple)
Reactor Building	Fuel Handling Machine (IFTS)
Reactor Building	Remote Shutdown Panel A ~~& B~~ Area
Reactor Building	Remote Shutdown Panel B Area
Fuel Building	Spent Fuel Floor
Fuel Building	Fuel Handling Machine

Table 2.3.2-1

ARM Locations

Area	Description & Location
Fuel Building	Fuel Transfer Cask Area
Fuel Building	FAPCS Heat Exchangers
Fuel Building	FAPCS Heat Exchangers
Fuel Building*	FAPCS System Transfer Pumps
Fuel Building	Sump Pumps
Fuel Building	Ground Grade Access Pathway
Fuel Building	Wash Down Bay Entry Door (Truck)
Fuel Building	Fuel Transfer System (FTS) Maintenance Rooms (Multiple)
Radwaste Building	Electrical Board Room
Radwaste Building	Control Room
Radwaste Building	High Activity Resin Recirculation Pump Room
Radwaste Building	High Activity Resin Transfer Pump Room
Radwaste Building*	Trailer Access Area
Radwaste Building*	Liquid Radioactive Waste Treatment Area (Deep-Bed Demineralizer, Reverse Osmosis System, etc.)
Radwaste Building*	Wet Solid Radioactive Waste Treatment Area (Dewatering Equipment, Concentrate Treatment System, etc.)
Radwaste Building*	Dry Solid Waste Treatment Area (High Dose Rate Waste Storage Area, etc.)
Radwaste Building*	Packaged Waste Staging Area
Turbine Building*	Main Condenser Floor Area
Turbine Building*	Drain Cooler Area
Turbine Building	Offgas Sampling Area
Turbine Building	Condensate Pumps Area
Turbine Building*	Low Pressure Heater Area
Turbine Building*	Deaerator Area;
Turbine Building*	SRV/MSIV Maintenance Area
Turbine Building*	Steam Jet Air Ejector (SJAE) ~~B~~ A Area
Turbine Building*	Steam Jet Air Ejector (SJAE) B Area
Turbine Building*	High Pressure Heater Area
~~Turbine Building~~	~~Filters and Demineralizers Area~~
~~Turbine Building~~	~~Turbine Operating Floor Area~~

Table 2.3.2-1

ARM Locations

Area	Description & Location
~~Turbine Building~~	~~Turbine Operating Floor Area~~
~~Turbine Building~~	~~Crane Travel Area (Various)~~
~~Turbine Building~~	~~Equipment Main Access Area~~
~~Turbine Building~~	~~RCCW System Area Entrance~~
~~Turbine Building~~	~~Offgas Charcoal Adsorber Room Entrance Area~~
~~Turbine Building~~	~~Backwash Transfer Pumps Entrance Area~~
~~Turbine Building~~	~~Condensate Hollow Fiber Filter Valve Room~~
~~Turbine Building~~	~~Sample Room Area~~
Turbine Building	Filters and Demineralizers Area
Turbine Building	Turbine Operating Floor Area
Turbine Buidling	Turbine Operating Floor Area
Turbine Building	Crane Travel Area (Various)
Turbine Building	Equipment Main Access Area
Turbine Building	RCCW System Area ~~Entrance~~
Turbine Building*	Offgas Charcoal Adsorber Room ~~Entrance~~ Area
Turbine Building	Backwash Transfer Pumps ~~Entrance~~ Room Area
Turbine Building	Condensate Hollow Fiber Filter Valve Room
Turbine Building	Sample Room Area
Turbine Building	Condensate D/B Demineralizer Entrance Area
Turbine Building*	Offgas Hydrogen Recombiner A ~~& B~~
Turbine Building *	Offgas Hydrogen Recombiner B
Turbine Building	Instrument Air Compressor Area
Turbine Building	MCC Water Chiller ~~Room~~ Area A
Turbine Building	MCC Water Chiller Area B
Turbine Building	Turbine Building Exhaust Duct Area
Turbine Building	RCCWS Area ~~Entrance~~
Control Building	Main Control Room

* ARMs located in accessible areas where abnormal plant evolutions or anticipated operational occurrences can potentially result in dose rate increases of 1mSv/hr (100mRem/hr) or more.

Table 12.3-2

Area Radiation Monitors for Reactor Building

ARM No.[1]	Description & Location	Figure No.	Monitoring Range
1	Refueling Floor Area #1, EL 34000	12.3-31	H
2	Refueling Floor Area # 2, EL 34000	12.3-31	H
3	New Fuel ~~Storage~~ Buffer Pool, EL 27000	12.3-30	H
4	New Fuel ~~Storage~~ Buffer Pool, EL 27000	12.3-30	H
17	RWCU/SDC Pump, EL -11500	12.3-23	H
18	RB Sump Pumps, EL -11500	12.3-23	H
19*	RWCU/SDC Train A Heat Exchanger EL -11500	12.3-23	H
20*	RWCU/SDC Train B Heat Exchanger EL -11500	12.3-23	H
21	Equipment Hatch Pathway, EL -6400	12.3-24	M
22	Personnel Hatch Pathway, EL -6400	12.3-24	H
23	FMCRD HCU ~~Area #1~~Room B, EL -6400	12.3-24	M
25	FMCRD HCU ~~Area # 3~~Room D, EL -6400	12.3-24	M
27	RWCU/SDC Filter Demineralizer Area ~~(Near Equip. Hatch),~~ EL -1000	12.3-25	H
28	Radiological Control Area Entrance, EL 17500	12.3-29	M
29	Hydrogen/Oxygen Monitoring (CMS), Skid EL 13570	12.3-28	H
30	Hydrogen/Oxygen Monitoring (CMS), Skid EL 13570	12.3-28	H
31	Instrument Rack Area #1, EL -11500	12.3-23	H
32	Instrument Rack Area #2, EL -11500	12.3-23	H
33	Instrument Rack Area #3, EL -11500	12.3-23	H
34	Instrument Rack Area #4, EL -11500	12.3-23	H
35	Instrument Rack Area #5, EL -11500	12.3-23	H
36	Instrument Rack Area #6, EL -11500	12.3-23	H
37	Instrument Rack Area #7, EL -11500	12.3-23	H
38	Instrument Rack Area #8, EL -11500	12.3-23	H
39[2]	Fuel Transfer System (FTS) Maintenance Room (Multiple), EL 17500	12.3-29	H
40	Fuel Handling Machine (IFTS), EL 34000	12.3-31	H
41	Remote Shutdown Panel A Area, EL –1000	12.3-25	H
42	Remote Shutdown Panel B Area, EL –1000	12.3-25	H

[1] Note:~~s~~ #Numbers 5 through 16, 24 and 26 not used.

[2] Utilizes auxiliary units.

* ARMs located in accessible areas where abnormal plant evolutions or anticipated operational occurrences can potentially result in dose rate increases of 1mSv/hr (100mRem/hr) or more.

Table 12.3-3

Area Radiation Monitors for Fuel Building

ARM No.[1]	Description & Location	Figure No.	Monitoring Range
1	Spent Fuel Floor, EL 4650	12.3-26	H
2	Fuel Handling Machine, EL 4650	12.3-26	M
3	Fuel Transfer Cask Area, EL 4650	12.3-26	H
5	FAPCS Heat Exchangers, EL -11500	12.3-23	H
6*	FAPCS System Transfer Pumps, EL -11500	12.3-23	H
9	Sump Pumps, EL -11500~~H~~	12.3-23	H
10	FAPCS Heat Exchangers, EL -11500	12.3-23	H
10	Ground Grade Access Pathway, EL 4650	12.3-26	M
11	Wash Down Bay Entry Door, EL 4650 (Truck)	12.3-26	H
12	Fuel Transfer System (FTS) Maintenance Rooms (Multiple) EL 4650	12.3-26	H

[1] ~~Notes~~ Note: Numbers #4, 7 & 8 not used.
* ARMs located in accessible areas where abnormal plant evolutions or anticipated operational occurrences can potentially result in dose rate increases of 1mSv/hr (100mRem/hr) or more.

Table 12.3-4

Area Radiation Monitors for Radwaste Building

ARM No.	Description & Location	Figure No.	Monitoring Range
1	Electrical Board Room, EL - 9350	12.3-39	H
2	Control Room, EL-2350	12.3-3940	H
3	High Activity Resin Recirculation Pump Room, EL - 9350	12.3-39	H
4	High Activity Resin Transfer Pump Room, EL-2350	12.3-3940	H
5*	Trailer Access Area, EL –4650	12.3-41	H
6*	Liquid Radioactive Waste Treatment Area (Hallover Fiber Deep-Bed Demineralizer, Reverse Osmosis System, etc.) EL –4650	12.3-41	H
7*	Wet Solid Radioactive Waste Treatment Area (Dewatering Equipment, Concentrate Treatment System, etc.), EL –4650	12.3-41	H
8*	Dry Solid Waste Treatment Area (High Dose Rate Waste Storage Area, etc.) EL –4650	12.3-41	H
9*	Packaged Waste Staging Area, EL –4650	12.3-41	H

* ARMs located in accessible areas where abnormal plant evolutions or anticipated operational occurrences can potentially result in dose rate increases of 1mSv/hr (100mRem/hr) or more.

Table 12.3-5

Area Radiation Monitors for Turbine Building

ARM No.[1]	Description & Location	Figure No.	Monitoring Range
1*	Main Condenser Floor Area EL -1400	12.3-32	M
2*	Drain Cooler Area EL 4650	12.3-33	M
3	Offgas Sampling Area EL 4650	12.3-33	M
4	Condensate Pumps Area EL -1400	12.3-32	M
5*	Low Pressure Heater Area EL 20000	12.3-35	M
6*	Deaerator Area, EL 28000	12.3-36	M
7*	SRV/MSIV Maintenance Area EL 20000	12.3-35	M
8*	Steam Jet Air Ejector (SJAE) B Area EL 4650	12.3-33	M
9*	Steam Jet Air Ejector (SJAE) A Area EL 4650	12.3-33	M
10*	High Pressure Heater Area EL ~~20000~~12000	12.3-~~35~~34	M
11	Filters and Demineralizers Area EL 4650	12.3-~~34~~33	M
12	Turbine Operating Floor Area EL 28000	12.3-36	M
13	Turbine Operating Floor Area EL 28000	12.3-36	M
14	Crane Travel Area (Various)	12.3-~~38~~37	M
15	Equipment Main Access Area, EL 4650	12.3-33	M
16	RCCW System Area ~~Entrance~~ EL 4650	12.3-33	M
17*	Offgas Charcoal Adsorber Room ~~Entrance~~ Area EL -1400	12.3-32	M
18	Backwash Transfer[1] Pumps ~~Entrance~~ Room Area EL -1400	12.3-32	M
19	Condensate Hollow Fiber Filter Valve Room EL -1400	12.3-32	M
20	Sample Room Area EL -1400	12.3-32	M
22	Condensate D/B Demineralizer Entrance Area, EL 4650	12.3-33	M
23*	Offgas Hydrogen Recombiner A, EL 12000	12.3-34	M
24*	Offgas Hydrogen Recombiner B, EL ~~4650~~12000	12.3-~~33~~34	M
25	Instrument Air Compressor Area, EL 12000	12.3-34	M
26	MCC Water Chiller ~~Room~~ Area A, EL 28000	12.3-36	M
27	MCC Water Chiller ~~Room~~ Area B, EL 28000	12.3-36	M
28	Turbine Building Exhaust Duct Area EL 33000	12.3-37	M
29	RCCWS Area ~~Entrance~~ EL 4650	12.3-33	M

[1] Note: Number #21 not used; Numbers #1, #3, #8, #11, #12, and #14 utilize auxiliary units.
*ARMs located in accessible areas where abnormal plant evolutions or anticipated operational occurrences can potentially result in dose rate increases of 1mSv/hr (100mRem/hr) or more.

Table 12.3-6

Area Radiation Monitors for Control Building

No.	Description & Location	Figure No.	Monitoring Range	Local Alarms
1.	Main Control Room, EL -~~1000~~2000	12.3-25	H	

NRC RAI 14.3-356

NRC Summary:
GDCS flow and water coverage

NRC Full Text:
For ITAAC Table 2.4.2-3 Item 8, the staff requests that the applicant modify the ITA to include "analysis" and the AC should be modified to include test results in addition to analysis. In addition, the applicant should provide specific acceptance criteria to determine acceptability.

GEH RESPONSE

DCD Tier 1 Table 2.4.2-3, items 8a and 8b ITA will be revised to include analysis as shown on the attached markup.
DCD Tier 1 Table 2.4.2-3, items 8a and 8b AC will be revised to include test as shown on the attached markup.

The acceptance criterion for the test as stated in the AC is correct. The observed flow rates will be used to demonstrate that water level remains at least 1 meter above the top of the active fuel (TAF). Refer to the responses to RAI 6.3-18 S01 and 6.3-19 S01 (MFN 06-241, Supplement 2, dated December 10, 2007).

DCD IMPACT

DCD Tier 1, Table 2.4.2-3 will be revised as noted in the attached markup.

Table 2.4.2-3

ITAAC For The Gravity-Driven Cooling System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8a. The GDCS injections lines provide sufficient flow to maintain water coverage one meter above TAF for 72 hours following a design basis LOCA.	For each loop of the GDCS, an open reactor vessel test will be performed utilizing two test valves in place of the parallel squib valves in the GDCS injection line and connected to the GDCS actuation logic. Flow measurements will be taken on flow into the RPV. An analysis of the test configuration will be performed.	A~~n analysis~~ report exists ~~that~~ and demonstrates that, based on analysis and test data, that the observed flow rate, in conjunction with vessel depressurization and other modes of GDCS operation, maintains water coverage one meter above TAF for 72 hours following the design basis LOCA.
b. The GDCS equalizing lines provide sufficient flow to maintain water coverage one meter above TAF for 72 hours following a design basis LOCA.	For each loop of the GDCS, open reactor testing will be performed utilizing one test valve in place of the squib valve in the GDCS equalizing line and connected to the GDCS actuation logic. Flow measurements will be taken on flow into the RPV. An analysis of the test configuration will be performed.	~~An analysis~~A report exists ~~that~~ and demonstrates that, based on analysis and test data, that the observed flow rate, in conjunction with vessel depressurization and other modes of GDCS operation, will maintain water coverage one meter above TAF for 72 hours following the design basis LOCA.
9. The GDCS squib valve used in the injection and equalization open as designed.	A vendor type test will be performed on a squib valve to open as designed.	Records of vendor type test concludes GDCS squib valves used in the injection and equalization open as designed.

NRC RAI 14.3-378

NRC Summary:
Containment system hydrostatic pressure testing

NRC Full Text:
For ITAAC Table 2.15.1-2 Item 4i, the DC refers to components and piping while the ITA and AC refer only to components. The staff requests that the applicant make the DC, ITA, and AC consistent in scope.

Also, the ITA refers to "a hydrostatic or pressure test" while the AC refers only to "pressure test". The staff requests that the applicant ensure consistency between the ITA and AC and notes that this ITAAC involves ASME equipment where the hydrostatic test requirements (not pressure testing) would normally be the applicable requirement.

GEH RESPONSE

The ITA and AC have already been changed to incorporate the phrase "components and piping" in response to RAI 14.3-377 in Letter MFN 08-086 Supplement 3 date February 15, 2008.

Table 2.15.1-2 ITA and AC will be changed to refer to hydrostatic testing as shown in the attached mark-up.

DCD IMPACT

Tier 1 Table 2.15.1-2 will be changed as shown on the attached mark-up.

Table 2.15.1-2

ITAAC For The Containment System

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
3. Pressure Boundary Welds a. Pressure boundary welds in components ~~and piping~~ identified in Table 2.15.1-1 as ASME Code Section III meet ASME Code Section III requirements.	Inspection~~(s)~~ of the as-built pressure boundary welds will be performed in accordance with ASME Code Section III.	An ASME Code Report~~A report~~ exists and ~~documents~~ concludes that the ASME Code Section III requirements are met for non-destructive examination of pressure boundary welds in the CS.
b. Pressure boundary welds in piping identified in Table 2.15.1-1 as ASME Code Section III meet ASME Code Section III requirements.	Inspection of the as-built pressure boundary welds will be performed in accordance with ASME Code Section III.	An ASME Code Report exists and concludes that the ASME Code Section III requirements are met for non-destructive examination of pressure boundary welds in the CS.
4. The components and piping identified in Table 2.15.1-1 as ASME Code Section III retain their pressure boundary integrity at their design pressure.	i) A hydrostatic ~~or~~ pressure test will be performed on the components and piping required by the ASME Code Section III to be tested.	i) An ASME Code report exists and ~~documents~~ concludes that the results of the hydrostratic pressure test of the components and piping identified in Table 2.15.1-1 as ASME Code Section III ~~conform~~ comply with the requirements of the ASME Code Section III.
	ii) Impact testing will be performed on the containment and pressure-retaining materials in accordance with the ASME Code Section III to confirm the fracture toughness of the materials.	ii) An ASME Code report exists and ~~documents~~ concludes that the containment and pressure-retaining penetration materials ~~conform~~ comply with fracture toughness requirements of the ASME Code section III.