GE Energy

Security Notice
This letter forwards Security-Related information in accordance with 10CFR2.390. Upon removal of Enclosure 1, the balance of this letter may be considered non-Security-Related.

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MFN 06-512

Docket No. 52-010

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U.S. Nuclear Regulatory Commission
Document Control Desk
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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 60 – Radiation Protection – RAI Numbers 12.3-7, 12.4-4, 12.4-6, and 12.4-17**

Enclosure 1 contains Security-Related information identified by the designation "{{{Security-Related Information - Withhold Under 10 CFR 2.390}}}." GE hereby requests this information be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390. A public version is contained in Enclosure 2

If you have any questions or require additional information regarding the information provided here, please contact me.

Sincerely,

Kathy Sedney for

James C. Kinsey
Project Manager, ESBWR Licensing

D068

Reference:

1. MFN 06-342, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 60 Related to ESBWR Design Certification Application*, September 18, 2006

Enclosures:

1. MFN 06-512 – Response to Portion of NRC Request for Additional Information Letter No. 60 – Radiation Protection – RAI Numbers 12.3-7, 12.4-4, 12.4-6 and 12.4-17 – Security-Related Information
2. MFN 06-512 – Response to Portion of NRC Request for Additional Information Letter No. 60 – Radiation Protection – RAI Numbers 12.3-7, 12.4-4, 12.4-6 and 12.4-17 – Public Version

cc: AE Cubbage USNRC (with enclosures)
GB Stramback GE/San Jose (with enclosures)
eDRF 0062-3284

ENCLOSURE 2

MFN 06-512

Partial Response to RAI Letter No 60
Related to ESBWR Design Certification Application

Radiation Protection

RAI Numbers 12.3-7, 12.4-4, 12.4-6 and 12.4-17

Public Version

RAI 12.3-07:

Provide the location within the plant of each source described in DCD Tier 2, Section 12.2.1, Revision 1 including all pertinent and necessary quantitative source parameters (i.e., dimensions, volumes, material, equipment self-shielding, etc.)

GE Response:

DCD Table 12.2-22, identifying the plant sources including their location and all pertinent and quantitative source parameters, will be provided in DCD Tier 2, Revision 3, as shown on the attached mark up.

DCD Impact:

The revised DCD Table 12.2-22 will be provided in DCD Tier 2, Revision 3.

Table 12.2-22
Radiation Sources Parameters

Component	Room	Assumed Shielding Source						Quantity
		Source Approx Geometry Rt. Cylinder (r, l)		Source Characteristics				
		Length (m)	Radius (m)	Type	Material	Density (g/cm^3)	Equipment Self-Shielding	
RWCU/SDC (Reactor Building)								
• Non-regenerative Heat Exchanger Tube side	1151/1250 1161/1260	7.00	0.16	Homogeneous	Water	0.967	Steel 2cm thick	Three
• Regenerative Heat Exchanger Tube side Shell side	1151/1250 1161/1260	7.00 7.00	0.16 0.25	Homogeneous Homogeneous	Water Water	0.836 0.990	Steel 2cm thick	Two
• Demineralizer	1251/52/61/62	4.12	0.48	Homogeneous	Resins	0.69	Steel 1cm thick	Four
FAPCS (Fuel Building)								
• Heat Exchanger	2150/2160	0.96	0.30	Homogeneous	Water	1.00	Steel 2cm thick	Two
• Filter / Demineralizer	2251/2261	2.06	1.12	Homogeneous	Resins	0.69	Steel 1cm thick	One
• Backwash Receiving Tank	2102	1.00	0.56	Homogeneous	Water	1.00	Steel 1cm thick	One
OFF-GAS System (Turbine Building)								
• Steam Jet Air Ejectors	4206/4207			Homogeneous	Offgas	5.95E-05	Steel 1cm thick	Two
• Preheater/Recombiner/Condenser	4381/4382	10.45m^3		Homogeneous	Offgas	6.5E-04	Steel 1cm thick	Two
• Cooler Condenser	4381/4382	0.12 m^3		Homogeneous	Offgas	1.04E-03	Steel 1cm thick	Two
• Dryer		5.81 m^3		Homogeneous	Offgas	1.02E-03	Steel 1cm thick	Two
• Guard Bed	4108	1.4	2.1	Homogeneous	Offgas	1.02E-03	Steel 1cm thick	Two
• Delay Bed	4108	7.5	1.5	Homogeneous	Offgas	1.02E-03	Steel 1cm thick	Eight
CPS (Turbine Building)								
• Condensate Demineralizer	42F1A to F1H	0.92	1.75	Homogeneous	Resins	0.69	Steel 2cm thick	Eight
TURBINE CONDENSER (Turb Building)								
• Main Condenser Shell Lower shell (tube chase)	4186	1284 m^3 2136 m^3		Homogeneous Homogeneous	Water Water	7.21E-04 1	Steel 1cm thick Steel 1cm thick	Three (Bodies)

Table 12.2-22 (Continued)
Radiation Sources Parameters

Component	Room	Assumed Shielding Source						
		Source Approx Geometry Rt. Cylinder (r, l)		Source characteristics				Quantity
		Length (m)	Radius (m)	Type	Material	Density (g/cm^3)	Equipment self-shielding	
LWMS (Radwaste Building)								
▪ Equipment Drain Collection Tank	6103/6/5	140m^3		Homogeneous	Water	1	Steel 1cm thick	Three
▪ Floor Drain Collection Tank	6150/6160	130m^3		Homogeneous	Water	1	Steel 1cm thick	Two
▪ Chemical Drain Collection Tank	6201	4m^3		Homogeneous	Water	1	Steel 1cm thick	One
▪ Detergent Drain Collection Tank	6184	15m^3		Homogeneous	Water	1	Steel 1cm thick	Two
▪ Equipment Drain Sample Tank	6172	140m^3		Homogeneous	Water	1	Steel 1cm thick	Two
▪ Floor Drain Sample Tank	6171	130m^3		Homogeneous	Water	1	Steel 1cm thick	Two
▪ Detergent Drain Sample Tank	6282	15m^3		Homogeneous	Water	1	Steel 1cm thick	Two
SWMS (Radwaste Building)								
▪ High Activity Resin Holdup Tank	6108	3.26	2.00	Homogeneous	Resins	0.69[1]	Steel 1cm thick	One
▪ Low Activity Resin Holdup Tank	6107	0.48	2.00	Homogeneous	Water	0.69[1]	Steel 1cm thick	One
▪ Low Activity Sludge Phase Separator	6151/6161	0.48	2.00	Homogeneous	Water	1.00	Steel 1cm thick	Two
▪ Condensate Resin Holdup Tank	6105	2.70	2.00	Homogeneous	Resins	0.69[1]	Steel 1cm thick	One
▪ Concentrate Waste Tank	6109	3.98	2.00	Homogeneous	Water	1.03	Steel 1cm thick	One

NRC RAI 12.4-04:

Radiation zones defined in Section 12.3.1.3 of the DCD Tier 2, classify all areas of >100 mr/hr as Zone F. Identify on the Zone Maps provided, all areas of the plant with dose rates >100 rads/hr during normal operations and anticipated operational occurrences, or that provide access to the spent fuel transfer tube. Identify each area of the plant that meets the definition of a Very High Radiation Area (VHRA) in 10 CFR 20. For each area identified, discuss the design features that ensure that personnel are not able to gain unauthorized or inadvertent access to the area.

GE Response:

10CFR20 §20.1003, Definitions, defines a *"Very High Radiation Area"* as an area, accessible to individuals in which radiation levels from radiation sources external to the body could result in an individual receiving an absorbed dose in excess of 500 rads (5 grays) in 1 hour at 1 meter from a radiation source or 1 meter from any surface that the radiation penetrates.

The Radiation Zone Classification, including a Very High Radiation Area, will be provided in DCD Tier 2 Revision 3, as shown on the attached mark up.

DCD Figures 12.2-1 through 12.2-22 show the Radiation Zones Maps in normal operation and shutdown for all Plant areas.

The following areas are anticipated to have dose rates >100 rads/hr during normal operations and anticipated operational occurrences:

1170	Lower Drywell
1570	Upper Drywell
1251	Reactor Water Cleanup/Shutdown Cooling Filter/Demineralizer Vault A1
1252	Reactor Water Cleanup/Shutdown Cooling Filter/Demineralizer Vault A2
1261	Reactor Water Cleanup/Shutdown Cooling Filter/Demineralizer Vault B1
1262	Reactor Water Cleanup/Shutdown Cooling Filter/Demineralizer Vault B2
17P3	Buffer Pool (during transfer of spent fuel)
18P1	Reactor Well (during transfer of spent fuel)
18P2	Inclined Fuel Transfer Tube Pool (during transfer of spent fuel)
21P0	Fuel Storage Pool
21P1	Inclined Fuel Transfer Tube Pit (during transfer of spent fuel)
6106	Condensate Resin Holdup Tank Room
6107	Low Activity Resin Holdup Tank Room
6108	High Activity Resin Holdup Tank Room
6151	Low Activity Sludge Phase Separator Room A
6161	Low Activity Sludge Phase Separator Room B

Radwaste Building at Elevation 4650 will also have areas with dose rates >100 rads/hr during normal operation of mobile plants. The COL holder will provide detailed zoning of these radiation areas.

The following areas meet the definition of 10CFR20 Very High Radiation Area (VHRA) during normal operations and anticipated operational occurrences, and are classified as Radiation Zone J:

1170	Lower Drywell
1570	Upper Drywell
17P3	Buffer Pool (during transfer of spent fuel; less than three days decay)
18P1	Reactor Well (during transfer of spent fuel; less than three days decay)
18P2	Inclined Fuel Transfer Tube Pool (during transfer of spent fuel; less than three days decay)
21P0	Fuel Storage Pool
21P1	Inclined Fuel Transfer Tube Pit (during transfer of spent fuel)
6108	High Activity Resin Holdup Tank Room

The following design features ensure that personnel are not able to gain unauthorized or inadvertent access to the VHRA areas:

1. Entrance to the VHRA identified above is possible only through the following ways:

- 1170 Lower Drywell

  Lower Drywell, room 1170 can be accessed through the lower drywell personnel airlock, and the lower drywell equipment hatch.

  Personnel access to Lower Drywell is only available through the lower drywell personnel airlock at elevation -6400, via entrance from room 1205.

  Entrance to room 1205 from adjacent rooms is not allowed: connecting doors are emergency doors to room 1205. Normal access is from stairway 1195 via door to room 1205 at elevation –6400.

  Access through the lower drywell equipment hatch is limited to equipment maintenance operations during shutdown. The lower drywell equipment hatch is locked during operation.

- 1570 Upper Drywell (During Operation)

  Upper Drywell, room 1570 can be accessed only through the wetwell access hatch at elevation 13570, and through the equipment hatch located at elevation 17500.

  Access through the equipment hatch is limited to equipment maintenance operations during shutdown, and is locked during operation.

- 17P3 Buffer Pool (during transfer of spent fuel; less than three days decay)

  No access is provided to this room.

- 18P1 Reactor Well (during transfer of spent fuel; less than three days decay)

  No access is provided to this room.

- 18P2 Inclined Fuel Transfer Tube Pool (during transfer of spent fuel; less than three days decay)

  No access is provided to this room. Provisions for controlled access from neighbouring rooms are described in response to RAI 12.4-20, which was submitted via MFN 06-477 dated November 22, 2006.

- 21P0 Fuel Storage Pool

  No access is foreseen to this pool (spent fuel pool).
- 6108 High Activity Resin Holdup Tank Room

  No access is provided to this room.

2. Each entrance or access point to a VHRA area is locked, and has one or more of the following features:

- A continuous direct or electronic surveillance that is capable of preventing unauthorized entry.
- A control device that energizes a conspicuous visible or audible alarm signal so that the individual entering the high radiation area and the supervisor of the activity are made aware of the entry.

3. Access to and activities in each area are controlled by means of a Radiation Work Permit (RWP), or equivalent, that includes specification of radiation dose rates in the immediate work area(s), personnel protection equipment, and any other pertinent information to keep doses ALARA.

4. In addition to the above requirements, as defined in DCD Subsection 16.5.7, additional administrative measures will be instituted to ensure that an individual is not able to gain unauthorized or inadvertent access to VHRA. The COL holder will define the specific radiation protection procedures and operational features to prevent unauthorized entry.

DCD Impact:

DCD Subsection 12.3.1.3 and Figures 12.3-1 through 12.3-22 will be revised in the DCD Tier 2, Revision 3, as shown on the attached markups.

maintenance room is used for disassembling control rod drives to reduce the contamination potential.

Consideration is given in the design of the plant for reducing the effort required for decontamination. Epoxy-type wall and floor coverings have been selected which provide smooth surfaces to ease decontamination. Expanded metal-type floor gratings are minimized in favor of smooth surfaces in areas where radioactive spills could occur. Equipment and floor drain sumps are stainless steel lined to reduce crud buildup and to provide surfaces easily decontaminated.

12.3.1.3 Radiation Zoning

Radiation zones are established in all areas of the plant as a function of both the access requirements of that area and the radiation sources in that area. Operating activities, inspection requirements of equipment, maintenance activities, and abnormal operating conditions are considered in determining the appropriate zoning for a given area. The relationship between radiation zone designations and accessibility requirements is presented in the following tabulation:

Zone Designation	Dose Rate μSv/hr	Access Description
A	D≤ 6 μSv/h	Uncontrolled, unlimited access
B	6 μSv/h <D≤ 10 μSv/h	Controlled and unlimited access. (None or very low radiation sources are present)
C	10 μSv/h<D ≤ 50 μSv/h	Controlled and limited access (20 hr/wk). (Low radiation sources are present)
D	50 μSv/h <D ≤ 250 μSv/h	Controlled and limited access (4 hr/w). (Low to moderate radiation sources are present)
E	250 μSv/h <D ≤ 1 mSv/h	Controlled and limited access (1 hr/wk). (Moderate radiation sources are present)
F	1 mSv/h <D ≤ 10 mSv/h	Limited and controlled access with special authorization permit required. (High radiation sources are present)
G	10 mSv/h <D ≤ 100 mSv/h	(Same as zone F above)
H	100mSv/hr<D≤ 1 Sv/h	(Same as zone F above)
I	1 Sv/h <D≤ 5 Sv/h	(Same as zone F above)
J	D > 5 Sv/h	Inaccessible during power and shutdown operations. (Very High radiation sources are present)

The dose rate applicable for a particular zone is based on operating experience and represents design dose rates in a particular zone, and should not be interpreted as the expected dose rates which would apply in all portions of that zone, or for all types of work within that zone, or at all periods of entry into the zone. Large BWR plants have been in operation for three decades, and operating experience with similar design basis numbers shows that only a small fraction of the

10 CFR 20 maximum permissible dose is received in such zones from radiation sources controlled by equipment layout or the structural shielding provided. Therefore, on a practical basis, a radiation zoning approach as described above accomplishes the as low as reasonably achievable objectives for doses as required by 10 CFR 20 Subpart C. The radiation zone maps for this plant with zone designations as described in the preceding tabulations are contained in Figures 12.3-1 through 12.3-22

Access to areas in the plant is controlled and regulated by the zoning of a given area. Areas with dose rates such that an individual would receive a dose in excess of 1000 μSv (100 mRem) in a period of one hour are locked and posted with "High Radiation Area" signs~~. Entry to these areas is on a controlled basis.~~ Areas in which an individual would receive a dose in excess of 5~~0~~ ~~μ~~Sv (0.5 ~~mRem~~ Rem) ~~up to 1000 μSv (100 mRem)~~ within a period of one hour at 1 meter from a radiation source or 1 meter from any surface that the radiation penetrates are posted with "Very High Radiation Area" ~~posted with~~ signs. Entry to these areas is on a controlled basis.

Figure 12.3-1 REACTOR, FUEL & CONTROL BUILDINGS RADIATION ZONES. EL –11500

{{{Security-Related Information – Withhold Under 10 CFR 2.390}}}

**Figure 12.3-2 REACTOR, FUEL & CONTROL BUILDINGS
RADIATION ZONES. EL. -6400**

{{{Security-Related Information – Withhold Under 10 CFR 2.390}}}

**Figure 12.3-3 REACTOR, FUEL & CONTROL BUILDINGS
RADIATION ZONES. EL. -1000**

{{{Security-Related Information – Withhold Under 10 CFR 2.390}}}

**Figure 12.3-4 REACTOR, FUEL & CONTROL BUILDINGS
RADIATION ZONES. EL. 4650**

{{{Security-Related Information – Withhold Under 10 CFR 2.390}}}

**Figure 12.3-5 REACTOR, FUEL & CONTROL BUILDINGS
RADIATION ZONES. EL. 9060**

{{{Security-Related Information – Withhold Under 10 CFR 2.390}}}

**Figure 12.3-6 REACTOR, FUEL & CONTROL BUILDINGS
RADIATION ZONES. EL. 13570**

{{{Security-Related Information – Withhold Under 10 CFR 2.390}}}

Figure 12.3-7 REACTOR, FUEL & CONTROL BUILDINGS RADIATION ZONES. EL. 17500

{{{Security-Related Information – Withhold Under 10 CFR 2.390}}}

**Figure 12.3-8 REACTOR, FUEL & CONTROL BUILDINGS
RADIATION ZONES. EL. 27000**

{{{Security-Related Information – Withhold Under 10 CFR 2.390}}}

**Figure 12.3-9 REACTOR, FUEL & CONTROL BUILDINGS
RADIATION ZONES. EL. 34000**

{{{Security-Related Information – Withhold Under 10 CFR 2.390}}}

Figure 12.3-10 REACTOR, FUEL & CONTROL BUILDINGS RADIATION ZONES. SECTION A-A

{{{Security-Related Information – Withhold Under 10 CFR 2.390}}}

Figure 12.3-11 REACTOR, FUEL & CONTROL BUILDINGS RADIATION ZONES. EL. SECTION B-B

{{{Security-Related Information – Withhold Under 10 CFR 2.390}}}

**Figure 12.3-12 TURBINE BUILDING
RADIATION ZONES. EL. -1400**

{{{Security-Related Information – Withhold Under 10 CFR 2.390}}}

**Figure 12.3-13 TURBINE BUILDING
RADIATION ZONES. EL. +4650**

{{{Security-Related Information – Withhold Under 10 CFR 2.390}}}

**Figure 12.3-14 TURBINE BUILDING
RADIATION ZONES. EL. +12000**

{{{Security-Related Information – Withhold Under 10 CFR 2.390}}}

**Figure 12.3-15 TURBINE BUILDING
RADIATION ZONES. EL. +20000**

{{{Security-Related Information – Withhold Under 10 CFR 2.390}}}

**Figure 12.3-16 TURBINE BUILDING
RADIATION ZONES. EL. +28000**

{{{Security-Related Information – Withhold Under 10 CFR 2.390}}}

**Figure 12.3-17 TURBINE BUILDING
RADIATION ZONES. EL.33000 & 38000**

{{{Security-Related Information – Withhold Under 10 CFR 2.390}}}

**Figure 12.3-18 TURBINE BUILDING
RADIATION ZONES. (VARIOUS)**

{{{Security-Related Information – Withhold Under 10 CFR 2.390}}}

**Figure 12.3-19 RADWASTE BUILDING RADIATION ZONES.
EL –9350**

{{{Security-Related Information – Withhold Under 10 CFR 2.390}}}

**Figure 12.3-20 RADWASTE BUILDING RADIATION ZONES.
EL –2350**

{{{Security-Related Information – Withhold Under 10 CFR 2.390}}}

**Figure 12.3-21 RADWASTE BUILDING RADIATION ZONES.
EL. 10650**

{{{Security-Related Information – Withhold Under 10 CFR 2.390}}}

**Figure 12.3-22 RADWASTE BUILDING RADIATION ZONES
EL. 10650**

{{{Security-Related Information – Withhold Under 10 CFR 2.390}}}

RAI 12.4-06:

Provide the composition and thickness of each radiation shield depicted in DCD Tier 2, Figures 12.3-1 through 12.3-22.

GE Response:

Table 12.3-8, identifying the wall thickness of rooms with the most significant plant radiation sources, will be provided in DCD Tier 2 Revision 3, as shown on the attached mark up.

Shielding walls and floors are reinforced concrete structures. If required, special shielding features using other materials such as lead blankets, lead curtains, etc., will be defined later by the COL holder.

DCD Impact:

The wall thickness of rooms with the most significant plant radiation sources as shown on the attached Table 12.3-8 will be provided in DCD Tier 2, Revision 3.

Table 12.3-8

Shielding Geometry in Meters

Nuclear Island

Elev.	Room	Room Name	North	East	South	West	Floor	Ceiling
-11500	1151	RWCS Heat Exchanger Room A	75	111	100	100/75	Ground	70
-11500	1152	RWCS Pump Room A	60	55	55	60/40	Ground	90
-11500	1161	RWCS Heat Exchanger Room B	75	100	100/75	111	Ground	70
-11500	1162	RWCS Pump Room B	60	60	70	35	Ground	70
-11500	2102	FAPCS Backwash Tank Room	70	80	90	110	Ground	90
-11500	2150	FAPCS Pump/Heat Exchanger Room A	35	70	60	30	Ground	70
-11500	2151	FAPCS Filter/Demineralizer Vault 1	90	105	70	95	Ground	70
-11500	2160	FAPCS Pump/Heat Exchanger Room B	35	30	60	35	Ground	70
-11500	2161	FAPCS Filter/Demineralizer Vault 2	70	105	70	95	Ground	70
-6400	1250	RWCS Heat Exchanger Room A	111	111	100	100	70	70
-6400	1251	RWCS Filter/Demineralizer Vault A1	135	150	40	135	110	90
-6400	1252	RWCS Filter/Demineralizer Vault A2	40	150	40	135	110	90
-6400	1260	RWCS Heat Exchanger Room B	111	100	100	100	70	70
-6400	1261	RWCS Filter/Demineralizer Vault B1	135	40	150	40	110	90
-6400	1262	RWCS Filter/Demineralizer Vault B2	135	40	150	70	110	90
-6400	2251	Backwash Transfer Pump Room A	90	70	30	90	70	70
-6400	2261	FAPCS Filter/Demineralizer Vault 2	30	70	115	90	70	70

Table 12.3-8 (Continued)

Shielding Geometry in Meters

Radwaste Building

Elev.	Room	Room Name	North	East	South	West	Floor	Ceiling
-9350	6104	Equipment Drain Collection Tank Room B	50	60	60	80	Ground	80
-9350	6106	Equipment Drain Collection Tank Room C	60	60	80	80	Ground	80
-9350	6161	Low Activity Sludge Phase Separator Room B	100	60	70	40	Ground	80
-2350	6103	Equipment Drain Collection Tank Room A	70	60	60	60	80	80
-2350	6106	Condensate Resin Holdup Tank Room	90	40	80	60	80	80
-2350	6107	Low Activity Resin Holdup Tank Room	100	80	60	100	80	80
-2350	6108	High Activity Resin Holdup Tank Room	70	90	70	100	80	80
-2350	6109	Concentrated Waste Tank Room	70	90	50	100	80	80
-2350	6150	Floor Drain Collection Tank Room A	70	80	60	60	80	80
-2350	6151	Low Activity Sludge Phase Separator Room A	100	90	70	40	80	80
-2350	6160	Floor Drain Collection Tank Room B	60	80	80	60	80	80
-2350	6171	Floor Drain Sample Tank Room	30	35	30	30	80	80
-2350	6172	Equipment Drain Sample Tank Room	30	35	30	30	80	80

Table 12.3-8 (Continued)

Shielding Geometry in Meters

Turbine Building

Elev.	Room	Room Name	North	East	South	West	Floor	Ceiling
-1400	4108	Off-Gas Charcoal Absorber Vessel Vault	150	150	120	120	Ground	-
-1400	4186	Main Condenser Area	60	40	70	120	Ground	-
-1400	4199	Pipe Chase	50	50	50	60	Ground	65
-1400	41F1A	Condensate Hollow Fiber Filter Vault A	50	50	30	60	Ground	65
-1400	41F1B/E	Condensate Hollow Fiber Filter Vault B/E	30	50	30	60	Ground	65
-1400	41F1F	Condensate Hollow Fiber Filter Vault F	30	50	50	60	Ground	65
-1400	41F2	Condensate Hff Backwash Receiving Vault	50	50	60	60	Ground	60
-1400	41F6	Condensate D/B Resin Receiving Tank Vault	50	100	50	80	Ground	60
-1400	41F8/9	Condensate D/B Demin. Resin Storage Tank Vault A/B	50	100	65	80	Ground	60
4650	4204	Feedwater Heaters 1A/B/C Drain Cooler Room	65	120	110	85	70	90/130
4650	4205	Condensate Drains Tank Room	100	100	110	120	100	120
4650	4206	Steam Jet Air Ejector Room A	120	100	100	120	70	30
4650	4207	Steam Jet Air Ejector Room B	100	100	100	120	100	120
4650	4293	Steam And Feedwater Piping Area	110	150	150	150	150	120/150
4650	42F1A	Condensate Deep Bed Demineralizer Vault A	65	65	50	55	60	70
4650	42F1B/G	Condensate Deep Bed Demineralizer Vault B/G	50	75	50	55	60	70
4650	42F1H	Condensate Deep Bed Demineralizer Vault H	50	75	65	55	60	70
12000	4303	Feedwater Heaters 6A/B & 7A/B (Channel Side) Room	150	150	110	90	150	-
12000	4381	H2 Recombiner And Cooler Room A	120	80	60	120	30	120
12000	4382	H2 Recombiner And Cooler Room B	60	120	90	30	30	120
12000	4390	Main Steam Piping Area	0	115	150	105	-	-
12000	4391	Turbine Extr. Steam And Cross Around Piping Area A	110	90	110	0	-	120/-

Table 12.3-8 (Continued)

Shielding Geometry in Meters

Turbine Building

Elev.	Room	Room Name	North	East	South	West	Floor	Ceiling
12000	4392	Turbine Extr. Steam And Cross Around Piping Area B	110		110	150	-	120/-
12000	4393	Turbine Building Steam Tunnel	150	150	150	150	-	-
20000	4401	Feedwater Heaters 3A/B/C & 4A/B/C Shell Side Room	60	150	100	90	-	115
28000	4503	Feedwater Heater 5 & Feedwater Storage Tank Room	90	120	80	80	115	115
28000	4504	Turbine Gland Steam Seal Evaporator Room	80	60	60	80	115	115
28000	4506	Moisture Separator And Reheater Room A	135	80	115		-	130
28000	4507	Moisture Separator And Reheater Room B	135		115	150	-	130

RAI 12.4-17:

DCD Tier 2, Figure 12.3.20 is missing radiation zone designations for several room in the –2350 mm elevation of the Radwaste Building. Provide the designed zones for all rooms and corridors. Provide detailed drawings of the access corridor (between sections WC-WD near section W4) showing the radiation shielding provided for the radwaste pipes coming into the Radwaste Building from the combined TB & RB radwaste piping gallery. Provide the analysis input parameters ands assumptions used in this shield design (including the maximum source strength, pipe dimensions, shielding thickness, etc.)

GE Response:

The missing radiation zone designations are the following:

- Stairs in rooms 6191, 6192, 6193 and 6194 are radiation zone B.
- Room 6283-Low activity/Condensate resin transfer pump room is radiation zone E/F.
- Room 6287-Foyer with personnel contamination monitors is radiation zone B.

Figures 12.3-19 and 12.3-20 will be revised in the DCD Tier 2, Revision 3, as shown on the attached markups to RAI 12.4-04.

Detailed analyses of the parameters and assumptions used for the shielding of the radwaste gallery, and the sections that go through the Reactor Building and Turbine Building will be subsequently provided by separate letter in response to RAIs 12.4-07 and 12.4-08. The results are similar when the connection to the Radwaste Building is studied.

Sump water transport piping and resin transfer piping have been considered, with inside diameters of 14.4 cm and 10.2 cm respectively, and thicknesses of 0.7 cm and 0.6 cm. The source strength radiation considered is indicated in the attached table.

A horizontal chase connection with a shielding thickness of 50 cm of concrete, results in a 1.05×10^{-1} mSv/h dose rate during resin transfer from the RWCU.

DCD Impact:

No DCD changes will be made in response to this RAI.

Source	Specific source Strength, MeV/sec·gm					
	0.8 MeV	1.3 MeV	1.7 MeV	2.5 MeV	4.0 MeV	5.0 MeV
Resins from RWCU	1.73E+07	2.49E+07	2.45E+06	1.02E+06	1.54E+05	8.70E-01
Resins from FAPCS	4.46E+05	6.05E+05	1.06E+05	1.13E+05	1.85E+04	0.0
Sumps from RB	2.67E+04	1.21E+04	1.24E+04	5.47E+04	1.05E+04	0.0
Resins from HFF	2.02E+06	7.93E+05	4.13E+05	3.33E+05	7.38E+02	3.47E-01
Sumps from TB	2.67E+01	1.21E+01	1.24E+01	5.47E+01	1.05E+01	0.0