HITACHI

GE Hitachi Nuclear Energy

Richard E. Kingston
Vice President, ESBWR Licensing

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

T 910.675.6192
F 910.362.6192
rick.kingston@ge.com

MFN 06-260 Supplement 7

Docket No. 52-010

September 22, 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. 219 Related to the ESBWR Design Certification Application – Nuclear Boiler System - RAI Number 5.2-36 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 219 dated June 30, 2008 (Reference 1).

Enclosure 1 contains the GEH response to RAI Number 5.2-36 S02.

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

Sincerely,

Richard E. Kingston

Richard E. Kingston
Vice President, ESBWR Licensing

Reference:

1. MFN 08-560, Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, GEH, *Request For Additional Information Letter No. 219 Related To ESBWR Design Certification Application*, dated June 30, 2008

Enclosure:

1. Response to Portion of NRC Request for Additional Information Letter No. 219 Related to ESBWR Design Certification Application – Nuclear Boiler System- RAI Number 5.2-36 S02

cc:	AE Cubbage	USNRC (with enclosure)
	RE Brown	GEH/Wilmington (with enclosure)
	DH Hinds	GEH/Wilmington (with enclosure)
	eDRF	0000-0088-4790 – RAI 5.2-36 S02

Enclosure 1

MFN 06-260 Supplement 7

Response to Portion of NRC Request for Additional Information Letter No. 219 Related to ESBWR Design Certification Application

Nuclear Boiler System

RAI Number 5.2-36 S02

NRC RAI 5.2-36 S02

The staff reviewed DCD Tier 2, Revision 5, Table 5.2-4. In order for the staff to complete its review of the ESBWR DCD, the staff requests that the applicant provide the following information and make the appropriate modifications to Table 5.2-4.

(a) For DPV Body, feedwater valves and feedwater disc, GEH listed SA-426 "Specification for Centrifugally Cast Ferric Alloy Steel Pipe for High Temperature Service," Gr CP22. The staff requests that GEH explain how it intends to use a cast pipe specification to make valve bodies and valve disc.

(b) References to SA-376 TP 304L and 316L should be TP304LN and TP 316LN to be consistent with SA-376 and Section II, Part D

(c) Under welding filler metals for P3, G3 base materials, the applicant lists SFA-5.23, FS8PO-ECF2-F2H2. The staff notes that this classification specifies that the welding flux is made solely from crushed slag or is a blend of crushed slag with unused (virgin) flux. The staff requests that GEH explain how a consistent weld metal chemistry will be maintained using crushed slag or a combination of crushed slag and unused flux rather than unused flux. In addition, neither submerged arc welding specification listed in Table 5.2-4 contains an 'N' designator for special requirements related to nuclear components.

(d) Note 4 of the table should be deleted. Part 52 has a process for the applicant to change materials after design certification.

GEH Response

Regarding the questions on DCD Tier 2, Revision 5, Table 5.2-4:

(a) Listing material specification SA-426 Gr. CP22 against parts of the DPV is an unintended transcription. The intended fabrication material specification for the DPV body, feedwater valve body/bonnet and feedwater valve disc or seat ring material is a comparable 2.25% chrome cast alloy steel. The correct material specification and grade is SA-217, "Specification for Steel Castings, Martensitic Stainless and Alloy, for Pressure-Containing Parts, Suitable for High-Temperature Service," Grade WC9.

(b) The grade designations for specification SA-376 material, where listed in Table 5.2-4, will be corrected from TP-304L/316L to TP-304L<u>N</u>/316L<u>N</u>. Due to some material listings in Table 5.2-4, this change also affects the grades listed with specification SA-312 as shown in the accompanying markup.

(c) Based on further review, GEH will revise Table 5.2-4 to remove the use of weld filler metal that uses recycled flux. The two weld filler metals

specified under specification SFA-5.23 will incorporate the 'N' designator. Also, the specific chemical composition for both of these weld filler metals is matched as an overall selection improvement such that the A3 composition of solid electrode material is replaced with an F2 composition.

(d) GEH agrees to delete Note 4 of Table 5.2-4.

DCD Impact

DCD Revision 5, Tier 2, Table 5.2-4 will be revised per the above responses:

Items (a) and (b) – change the material specifications, as noted in the attached markup.

Item (c) – change the weld filler metal tabulation, as noted in the attached markup.

Item (d) – delete Note 4, as noted in the attached markup.

Table 5.2-4

Reactor Coolant Pressure Boundary Materials

Component	Form	Material[1]	Specification[1] (ASTM/ASME)
Main Steam Isolation Valves (MSIVs)			
Valve Body	Cast	Carbon steel	SA352 Grade LCB
Cover	Forged	Carbon Steel	SA350 Grade LF2 Class 1
Poppet	Forged	Carbon Steel	SA350 Grade LF2 Class 1
Valve stem, guides[3]	Rod or Bar	Precipitation-hardened steel	SA564[2] Gr 630 or XM-13; SA479 Type XM-19 or 410 Condition 2
Body bolt	Bolting	Alloy steel	SA540 Gr B23 CL5
Hex nuts	Bolting Nuts	Alloy steel	SA194 Gr 7
Safety Relief and Depressurization Valves			
Body (SRV)	Forging or Casting	Carbon steel Carbon steel	SA350 Gr LF2 Class 1 SA352 Gr LCB
Body (DPV)	Forging or Casting	Stainless Steel Alloy Steel	SA182 or SA336, Gr F304L or F316L SA351 Gr CF3 or CF3A SA182 or SA336 Gr F22 SA217 Gr WC9~~SA426 Gr CP22~~
Bonnet (yoke)	Forging or Casting	Carbon steel Carbon steel	SA350 Gr LF2 Class 1 SA352 Gr LCB
Nozzle (seat)	Forging or Casting	Stainless steel Carbon steel	SA182 Gr F316 SA350 Gr LF2 Class 1
Body to bonnet stud	Bar/rod	Alloy steel	SA193 Gr B7
Body to bonnet nut	Bar/rod	Alloy steel	SA194 Gr 7
Disk	Forging or Casting	Stainless steel	SA182 or SA336 Gr F304L or F316L SA351 Gr CF3 or CF3A

Table 5.2-4

Reactor Coolant Pressure Boundary Materials

Component	Form	Material(1)	Specification(1) (ASTM/ASME)
Reactor Pressure Vessel			
Shells and Heads	Plate Forging	Mn-1/2 Mo-1/2 Ni Low Alloy Steel 3/4 Ni-1/2 Mo-Cr-V Low Alloy Steel	SA533/SA533M Type B, Class 1 SA508/SA508M Grade 3, Class 1
Shell and Head Flange	Forging	3/4Ni-1/2 Mo-Cr-V Low Alloy Steel	SA508/SA508M Grade 3, Class 1
Main Closure Bolting	Bolting	Low Alloy Steel	SA540/SA540M Grade B23 or B24, Class 3
Standard Flange Bolting	Bolting	Low Alloy Steel	SA193/SA193M Grade B7 or SA540/SA540M Grade B23, Class 3
Nozzles	Forging	3/4 Ni-1/2 Mo-Cr-V Low alloy steel	SA508/SA508M Grade 3, Class 1
Nozzle Safe Ends	Forging	Carbon Steel Low Alloy Steel	SA350/SA350M Grade LF2 Class 1 or SA508/SA508M Grade 1 SA508/SA508M Grade 3, Class 1
Drain Nozzles	Forging Seamless Pipe Bar	Cr-Ni-Mo Stainless steel	SA182/SA182M or SA336/SA336M Gr F304/F304L/F316/F316L; SA376/SA376M TP-304/304LN/316/316LN; SA479/SA479M 304/304L/316/316L

Table 5.2-4

Reactor Coolant Pressure Boundary Materials

Component	Form	Material[1]	Specification[1] (ASTM/ASME)
Instrumentation Nozzles	Forging Bar, Seamless Pipe Forging	Cr-Ni-Mo Stainless steel or Ni-Cr-Fe	SA182/SA182M or SA336/SA336M Grades F304/F304L/F316/F316L or Code Case N-580-1 with Base Material = SB-166, SB-167 or SB-564
Stub Tubes	Bar, Smls. Pipe Forging	Ni-Cr-Fe	Code Case N-580-1 with Base Material = SB-166, SB-167 or SB-564
Isolation Condenser			
Steam pipe	Seamless	Carbon steel	SA333 Grade 6
Steam pipe fittings	Forging or Fitting	Carbon Steel Carbon Steel	SA350 Grade LF2 Class 1 or SA508 Grade 1 SA420 Grade WPL-6
Valves	Forging or Casting	Carbon Steel Carbon Steel	SA350 Gr LF2 Class 1 SA352 Gr LCB
Disc	Forging Casting	Carbon Steel Carbon Steel Stainless Steel	SA350 Gr LF2 Class 1 SA352 Gr LCB SA351 Gr CF3 or CF3A
Valve Stem[3]	Rod or Bar	Precipitation-hardened Steel	SA564[2] Gr 630 or XM-13; SA479 Type XM-19 or 410 Condition 2
Condensate pipe	Seamless	Stainless steel	SA312 ~~or SA376~~ Grades TP-304/~~TP~~304L/304LN TP-316/~~TP~~316L/316LN or, SA376 Grades TP-304/304LN TP-316/316LN

Table 5.2-4

Reactor Coolant Pressure Boundary Materials

Component	Form	Material[1]	Specification[1] (ASTM/ASME)
Condensate pipe fittings	Forging or Fitting	Stainless Steel	SA182 or SA336 Grades F304/F304L/F316/F316L or SA403 Grades WP 304/304L/316/316L
Valves	Forging or Casting	Stainless Steel Stainless Steel	SA182 Gr F304, F304L, F316 or F316L; SA351 Gr CF3 or CF3A
Disc	Forging or Casting	Stainless Steel Stainless Steel	SA182 Gr F304, F304L, F316 or F316L; SA351 Gr CF3 or CF3A
Valve Stem[3]	Rod or Bar	Precipitation-Hardened Steel	SA564[2] Gr 630 or XM-13; SA479 Type XM-19 or 410 Condition 2
Feedwater			
Pipe	Seamless Forged & Bored	Low Alloy Low Alloy	SA335 Grade P22 SA369 Gr FP22
Fittings	Forging	Low Alloy	SA234 Gr WP22; SA336 Grade F22
Valves	Forging or Casting	Low Alloy Low Alloy	SA336 Gr F22 or ~~SA426 Gr CP22~~SA217 Gr WC9
Disc	Forging or Casting	Low Alloy Stainless Steel	SA336 Gr F22 or ~~SA426 Gr CP22~~SA217 Gr WC9 SA182 or SA336 Gr F304L or F316L SA351 Gr CF3 or CF3A
Valve Stems, Guides[3]	Bar, Rod	Low Alloy Stainless Steel	SA739 Gr B22 SA564[2] Gr 630, XM-13; SA479 Type XM-19 or Type 410 Condition 2

Table 5.2-4

Reactor Coolant Pressure Boundary Materials

Component	Form	Material[1]	Specification[1] (ASTM/ASME)
Valve Seat Rings	Forging or Casting	Low Alloy Stainless Steel Low Alloy	SA182 or SA336 Gr F22 SA182 Gr F304, F304L, F316 or F316L ~~SA426 Gr CP22~~SA217 Gr WC9
Reactor Water Cleanup/Shutdown Cooling			
Cleanup Piping	Seamless Pipe	Carbon steel	SA333 Grade 6
Fittings	Forging or Fitting	Carbon steel	SA350 Grade LF2 Class 1or SA508 Grade 1 SA420 Grade WPL-6
Valves	Forging or Casting	Carbon Steel Carbon Steel	SA350 Gr LF2 Class 1 SA352 Gr LCB
Disc	Forging Casting	Carbon Steel Carbon Steel Stainless Steel	SA350 Gr LF2 Class 1 SA352 Gr LCB SA351 Gr CF3 or CF3A
Valve Stem[3]	Rod or Bar	Precipitation-hardened Steel	SA564[2] Gr 630 or XM-13; SA479 Type XM-19 or 410 Condition 2
Drain Line Piping	Seamless Pipe	Stainless steel	SA312 ~~or SA376~~ Grades TP-304/~~TP~~304L/304LN TP-316/~~TP~~316L/316LN, or SA376 Grades TP-304/304LN TP-316/316LN
Fittings	Forging or Fitting	Stainless steel	SA182 or SA336 Grades F304/F304L/F316/F316L SA403 Grades WP 304/304L/316/316L
Valves	Forging or Casting	Stainless Steel Stainless Steel	SA182 Gr F304L or F316L SA351 Gr CF3 or CF3A

Table 5.2-4

Reactor Coolant Pressure Boundary Materials

Component	Form	Material[1]	Specification[1] (ASTM/ASME)
Disc	Forging or Casting	Stainless Steel Stainless Steel	SA182 Gr F304, F304L, F316 or F316L; SA351 Gr CF3 or CF3A
Valve Stem[3]	Rod or Bar	Precipitation-hardened Steel	SA564[2] Gr 630 or XM-13; SA479 Type XM-19 or 410 Condition 2
Gravity Driven Cooling			
Piping Downstream of Check Valves	Seamless Pipe	Stainless Steel	SA312 ~~or SA376~~ Grades TP-304/~~, TP~~304L/304LN~~,~~ TP-316/~~, or TP~~316L/316LN, or SA376 Grades TP-304/304LN, TP-316/316LN
Check Valves	Forging or Casting	Stainless Steel Stainless Steel	SA182 Gr F304, F304L, F316 or F316L; SA351 Gr CF3 or CF3A
Squib-activated Valves	Forging or Casting	Stainless Steel Stainless Steel	SA182 Gr F304, F304L, F316 or F316L; SA351 Gr CF3 or CF3A
Disc	Forging or Casting	Stainless Steel Stainless Steel	SA182 Gr F304, F304L, F316 or F316L; SA351 Gr CF3 or CF3A
Valve Stem, Guides[3]	Bar, Rod	Stainless Steel	SA564[2] Type 630 or XM-13; SA479 Type XM-19 or 410 Cond.-2
Valve Seat Ring	Forging or Casting	Stainless Steel Stainless Steel	SA564[2] Type 630 or XM-13; SA479 Type XM-19 or 410 Cond.-2 SA351 Gr CF3 or CF3A
Standby Liquid Control			
Piping	Seamless Pipe	Stainless Steel	SA312 Gr TP316L

Table 5.2-4

Reactor Coolant Pressure Boundary Materials

Welding Filler Metals			
Base Material	**Filler Metal Type**	**SFA Number**	**AWS Classification** ~~(4)~~
Carbon Steel P1, G1	Covered Electrodes or Filler Wire	SFA-5.1 SFA-5.18	E7018 ER70S-2 ER70S-3 ER70S-6
Carbon Steel and Low Alloy Steel P1, G2 (C, Mn, Si, Cb)	Covered Electrodes or Filler Wire	SFA-5.1 SFA-5.18 SFA-5.28	E7018 ER70S-2 ER80S-D2
Low Alloy Steel P3, G1 (C, 1/2 Mo)	Covered Electrodes or Filler Wire	SFA-5.1 SFA-5.5 SFA-5.18 SFA-5.28	E7018 E8018-C3 ER70S-2 ER80S-D2
Low Alloy Steel P3, G3 (3/4 Ni, 1/2 Mo, 1/3 Cr, V) or (Mn, 1/2 Mo, 1/2 Ni)	Covered Electrodes or Filler Wire	SFA-5.5 SFA-5.1 SFA-5.28 SFA-5.18 SFA-5.23	E8018-C3 E7018 ER80S-D2 ER70S-2 F8P0-~~EA3K-A3H2~~EF2N-F2NH2 F~~S~~8P0-ECF2N-F2NH2
Low Alloy Steel P5A, G1 (2-1/4 Cr, 1 Mo)	Covered Electrodes or Filler Wire	SFA-5.5 SFA-5.1 SFA-5.28 SFA-5.18	E9016-B3 E9018-B3 E7018 ER90S-B3 ER70S-2
(Deleted)			
Stainless Steel P8, G1	Covered Electrodes or Filler Wire	SFA-5.4 SFA-5.9	E308L-16 E309L-16 E316L-16 ER308L ER309L ER316L

Table 5.2-4

Reactor Coolant Pressure Boundary Materials

Welding Filler Metals			
Base Material	**Filler Metal Type**	**SFA Number**	**AWS Classification** ~~(4)~~
Nickel Alloy P43	Filler Wire	SFA-5.14	ERNiCr-3

Notes:

(1) Carbon content of all RCPB wrought austenitic stainless steel (304/304L/304LN~~/~~ and 316/316L/316LN) is 0.02% maximum.

(2) SA564 Type 630 or XM-13 material used for other than RCPB applications shall be in Condition H1100 or H1150, unless specifically approved by GEH. Where mechanically installed and replaceable parts requiring wear resistance (as substitutes for cobalt bearing alloys) require additional precipitation/age hardening, valve guides or other parts may be formed down to Condition H900 for Type 630 material and down to Condition H950 for Type XM-13 material, subject to demonstrated mechanical reliability.

(3) Items fabricated from these materials are wetted by reactor coolant, but are not required to be part of the design ASME Code pressure-boundary. Therefore, some of the specific material specifications or material specification grades identified under this category are not required to be listed in the ASME Code, Section II, Part D, Table 2A.

(4) ~~The filler materials specified are representative. Alternate filler metal specifications are acceptable provided the filler metal is qualified for use per Subsection 5.2.3.3 or 5.2.3.4.~~ Deleted