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Subject: **Response to Portion of NRC RAI Letter No. 228 Related to ESBWR Design Certification Application - DCD Tier 2 Section 3.9 – Mechanical Systems and Components; RAI Numbers 3.9-249, 3.9-250 and 3.9-251**

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 number 228 sent by NRC letter dated August 6, 2008 (Reference 1). RAI Numbers 3.9-249, 3.9-250 and 3.9-251 are addressed 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 08-623 Letter from U.S. Nuclear Regulatory Commission to Robert E. Brown, *Request For Additional Information Letter No. 228 Related To ESBWR Design Certification Application*, dated August 6, 2008

Enclosure:

1. Response to Portion of NRC RAI Letter No. 228 Related to ESBWR Design Certification Application - DCD Tier 2 Section 3.9 – Mechanical Systems and Components; RAI Number 3.9-249, 3.9-250 and 3.9-251

cc:	AE Cubbage	USNRC (with enclosures)
	RE Brown	GEH/Wilmington (with enclosures)
	DH Hinds	GEH/Wilmington (with enclosures)
	eDRF	0000-0089-5018 (RAI 3.9-249, -250,-251)

Enclosure 1

MFN 08-777

Response to Portion of NRC Request for

Additional Information Letter No. 228

Related to ESBWR Design Certification Application

DCD Tier 2 Section 3.9

Mechanical Systems and Components

RAI Numbers 3.9-249 through 3.9-251

NRC RAI 3.9-249

Question Summary:
Deferral of quarterly valve testing.

Full Text:
ESBWR DCD (Revision 5) does not indicate any relief to be necessary from the Inservice Testing (IST) provisions of the ASME OM Code 2001 Edition/2003 Addenda. Item (1), "Valve Exercise Tests," of Subsection 3.9.6.1.4, "Valve Testing," in ESBWR DCD (Revision 5) Tier 2 states that valve exercise tests and frequencies are identified in Table 3.9-8 with quarterly stroke testing deferred to refueling outages or cold shutdowns in some cases as indicated in Note g. The ESBWR DCD also states that the bases for deferral are consistent with NUREG-1482, Revision 1. The NRC staff prepared NUREG-1482, Revision 1, to provide guidance for IST programs for currently operating nuclear power plants. New reactors should be designed to avoid the need for relief from the ASME OM Code. GEH is requested to confirm that the IST program for the ESBWR design will satisfy the ASME OM Code IST provisions consistent with Commission policy.

GEH Response

The ESBWR has been designed to avoid the need for relief from the ASME OM Code for inservice testing of valves, and the IST program for the ESBWR satisfies the ASME OM Code IST provisions. Section ISTC-3521 of the OM Code allows deferral of quarterly exercise testing during power operation to cold shutdown or refueling outages if full-stroke exercising is "not practicable during operation at power." Since such deferrals are allowed by the OM Code, they do not require relief requests, consistent with Section 3.1.1 of NUREG-1482 Revision 1, but must be justified. The justifications for deferral of quarterly testing for ESBWR valves are documented in Note g under DCD Tier 2, Table 3.9-8. These justifications are consistent with NUREG-1482, considering ESBWR is a new plant design. NUREG-1482 was originally written for operating plants, and some of the deferral justifications discussed in the NUREG can reasonably be addressed by the plant design. The ESBWR does not request deferral of quarterly testing in cases where the plant can reasonably be designed to accommodate the testing. The DCD will be revised to clarify this point.

DCD Impact

DCD Tier 2, Section 3.9.6.1.4 will be revised as noted in the attached markup.

NRC RAI 3.9-250

Question Summary:
Table 3.9-8 Notes g4 and g5.

Full Text:
Note g to Table 3.9-8 in the ESBWR DCD (Revision 5) Tier 2 is said to provide justifications for code defined testing exceptions or alternatives as allowed by Paragraphs ISTC-3510 for exercising tests and ISTC-3630 for seat leakage rate tests. Notes g4 and g5 indicate that the applicable valves cannot be tested at power because a reverse flow cannot be established. GEH is requested to clarify that the applicable valves can be tested with reverse flow during shutdown conditions.

GEH Response

There are five valve applications covered by notes g4 and g5. For all five applications, reverse flow can be established during shutdown conditions, as discussed below.

B32-F014 (Condenser purge line isolation valve): There are test connections upstream and downstream of these valves to allow testing (including reverse flow leakage testing) during shutdown conditions. Since these valves are inside the Drywell, the test connections cannot be accessed during power operation.

B32-F017 (High Pressure Nitrogen check valve): For each valve, there is an isolation valve (to isolate supply nitrogen) and a test line upstream of the valve to allow reverse flow leakage testing during shutdown conditions. Since these valves are inside the Drywell, the isolation valves and test connections cannot be accessed during power operation.

B32-F018 (High Pressure Nitrogen check valve): Same as B32-F017.

P54-F027 (N2 supply line inboard check valve to MSIV and other uses): Same as B32-F017.

P54-F010 (N2 supply line inboard isolation check valve to ADS, SRV and ICIV accumulator): Same as B32-F017.

DCD Impact

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

NRC RAI 3.9-251

Question Summary:
Table 3.9-8 Notes g17 and g18.

Full Text:
Note g to Table 3.9-8 in the ESBWR DCD (Revision 5) Tier 2 is said to provide justifications for code defined testing exceptions or alternatives as allowed by Paragraphs ISTC-3510 for exercising tests and ISTC-3630 for seat leakage rate tests. Note g17 indicates that the testing of the SLC injection line shutoff valves is deferred to refueling outages on the basis that "[i]f this test is performed on-line and the valve fails in a non-conservative position (i.e., closed), a total loss of system function would occur." Note g18 indicates that the testing of the chilled water system isolation valves is deferred to cold shutdowns on the basis that "[s]ince both trains are required to be operable during plant operation, failure of one of these valves during a test would render the system out-of-service." The temporary loss of system redundancy during an inservice test is covered by Limiting Conditions for Operation (LCOs) in the plant Technical Specifications. Therefore, the loss of system redundancy is not considered acceptable as a basis for deferral of inservice testing to a refueling outage or cold shutdown interval. GEH is requested to provide the appropriate Code test intervals for these and any other valves where the testing would be deferred based on loss of system redundancy.

GEH Response

This comment is accepted. The frequency for stroke testing of valves C41-F002 and P25-F023/F024/F025/F026 will be changed to 3 months, in accordance with the ASME OM Code.

DCD Impact

DCD Tier 2, Table 3.9-8 will be revised as noted in the attached markup.

- Maintain open (passive function)
- Transfer closed (active function)
- Transfer open (active function)

3.9.6.1.4 Valve Testing

Based on the valve category, active/passive function(s), and safety-related function(s) identified for each valve, the inservice tests to confirm the capability of the valve to perform these functions are identified in Table 3.9-8. ASME OM Code Table ISTC-3500-1, Inservice Test Requirements, specifies the required tests.

Table ISTC-3500-1 requires four basic valve tests which includes the following:

- exercise tests
- seat leakage tests
- remote position indicator tests
- special tests (i.e., fail-safe tests, explosive valve tests, rupture disc tests)

(1) Valve Exercise Tests

Active Category A valves, Category B valves, and Category C check valves are exercised periodically, except for self-actuated safety and relief valves. The ASME OM Code specifies a quarterly valve exercise frequency for all valves except power-operated safety and relief valves, which are required to be tested once per fuel cycle, and manual valves, as discussed in Subsection 3.9.6.1.5(2). Where it is not practicable to exercise a valve during normal power operation, the valve exercise test is deferred to either cold shutdown or refueling outages. Valve exercise tests and frequencies are identified in Table 3.9-8. In some cases, quarterly stroke testing is deferred to refueling outages or cold shutdown, as indicated in Table 3.9-8 Note g. The bases for deferral are consistent with NUREG 1482, Revision 1, considering the ESBWR is a new plant design. Where practical, the ESBWR is designed to accommodate quarterly stroke testing.

During valve exercise tests, the necessary valve obturator movement is determined while observing an appropriate direct indicator, such as indicating lights that signal the required changes of obturator position, or by observing other evidence or positive means, such as changes in system pressure, flow, level, or temperature that reflects change of obturator position.

Check valve exercise tests use direct observation or other positive means (ISTC-5221(a)) for verification of valve obturator position.

(2) Valve Leakage Tests

Active and passive Category A containment isolation valves are tested to verify seat leakage is within limits in accordance with 10 CFR 50 Appendix J. Frequencies of containment isolation valve seat leakage tests are in accordance with the Appendix J requirements. All containment isolation valves and seat leakage tests are identified in Table 3.9-8.

Table 3.9-8

Inservice Testing

No.	Qty	Description (g)	Valve Type (i)	Act (b)	Code Class (a)	Code Cat. (c)	Valve Func. (d)	Norm Pos	Safety Pos.	Fail Safe Pos	C I V	Test Para (e)	Test Freq. (f)
F715	4	Excess flow check valve – condensate return line differential pressure instrument sensing line (g6)	CK	SA	2	A, C	A	O	O/C	N/A	Y	L P SC SO	App J 2 yrs RO RO
C12 Control Rod Drive System Valves													
F022	1	High pressure makeup line check valve (g7)	CK	SA	2	C	A	O	O/C	N/A	--	SO SC	RO RO
D005	269	Ball check valve – CRD drive insert line (g7)	CK	SA	3	C	A	O	O/C	N/A	--	SO SC	RO RO
C41 Standby Liquid Control (SLC) System Valves													
F002A/B/C/D	4	SLC injection line shutoff valve ~~(g17)~~	QBL GT	AO	2	A	A	O	O/C	as-is	--	SO SC P L	~~RO~~3 mo ~~RO~~3 mo 2 yrs ~~RO~~2 yrs
F003A/B/C/D	4	SLC injection line squib valve	SQ	EX	1	A, D	A	C	O	as-is	Y	X L	E2 App J
F004A/B	2	SLC injection line outboard check valve (g14)	CK	SA	1	A, C	A	C	O/C	N/A	Y	L SC SO	App J RO RO

Table 3.9-8

Inservice Testing

No.	Qty	Description (g)	Valve Type (i)	Act (b)	Code Class (a)	Code Cat. (c)	Valve Func. (d)	Norm Pos	Safety Pos.	Fail Safe Pos	C I V	Test Para (e)	Test Freq. (f)
F	1	Drywell floor drain (HCW) sump discharge line outboard isolation valve	QBL GT	AO	2	A	A	C	C	C	Y	L P SC FC	App J 2 yrs 3 mo 3 mo
P10 Makeup Water System													
F016	1	Demin water drywell distribution system inboard containment isolation valve	CK	SA	2	A	P	C	C	N/A	Y	L P	App J 2 yrs
F015	1	Demin water drywell distribution system outboard containment isolation valve	GT QBL	M	2	A	P	C	C	N/A	Y	L P	App J 2 yrs
P25 Chilled Water System Valves													
F023A/B	2	Chilled water supply line to drywell cooler outboard isolation valve ~~(g18)~~	GT QBL	SO	2	A	A	O	C	C	Y	L P SC FC	App J 2 yrs ~~CS~~3 mo ~~CS~~3 mo
F024A/B	2	Chilled water supply line to drywell cooler inboard isolation valve ~~(g18)~~	QBL GB AF	NO	2	A	A	O	C	C	Y	L P SC FC	App J 2 yrs ~~RO~~3 mo ~~RO~~3 mo

Table 3.9-8

Inservice Testing

No.	Qty	Description (g)	Valve Type (i)	Act (b)	Code Class (a)	Code Cat. (c)	Valve Func. (d)	Norm Pos	Safety Pos.	Fail Safe Pos	C I V	Test Para (e)	Test Freq. (f)
F025A/B	2	Chilled water return line from drywell cooler inboard isolation valve ~~(g18)~~	QBL GB AF	NO	2	A	A	O	C	C	Y	L P SC FC	App J 2 yrs ~~RO~~3 mo ~~RO~~3 mo
F026A/B	2	Chilled water return line from drywell cooler outboard isolation valve ~~(g18)~~	GT QBL	SO	2	A	A	O	C	C	Y	L P SC FC	App J 2 yrs ~~CS~~3 mo ~~CS~~3 mo
P51 Service Air System													
F		Service air system inboard containment isolation valve	GB QBL	M	2	A	P	C	C	N/A	Y	L P	App J 2 yrs
F		Service air system outboard containment isolation valve	GB QBL	M	2	A	P	C	C	N/A	Y	L P	App J 2 yrs
P54 High Pressure Nitrogen Supply System Valves													
F026	1	N2 supply line outboard isolation valve to MSIV and other uses	QBL QBF	AO	2	A	A	O	C	C	Y	L P SC FC	App J 2 yrs 3 mo 3 mo

g11) Normal flow through these valves cannot be established at power. Since the valves are inside containment, an alternate test method using test connections cannot be used.

g12) These valves cannot be tested at power without potentially operating an SRV.

g13) These valves cannot be tested at power without potentially operating an MSIV.

g14) There are squib valves in series with these valves; therefore, normal flow cannot be established through the line. There is a test connection upstream of the valves; however, using this connection to test at power would inject cold water into the reactor.

g15) Normal flow cannot be established without initiating Drywell Spray. Since the valves are inside containment, an alternate test method using test connections cannot be used.

g16) Normal flow cannot be established because RWCU/SDC system pressure exceeds FAPCS system pressure.

g17) ~~These valves are the SLC injection line shutoff valves. If this test is performed on-line and the valve fails in a non-conservative position (i.e., closed), a total loss of system function would occur.~~Deleted

g18) ~~These valves are the chilled water system isolation valves. Since both trains are required to be operable during plant operation, failure of one of these valves during a test would render the system out-of-service.~~Deleted

g19) Although these valves could be tested one-at-a-time during power operation, there is a risk of purging/venting the containment during this test.

g20) These valves cannot be tested at power without interrupting feedwater flow.

g21) Valve opening is verified during normal plant operation. Valve closing cannot be verified because a reverse flow cannot be established.

h) General Note on Check Valves: To satisfy the requirement for position verification of ISTC-3700 for check valves, where local observation is not possible, other indications are used for verification of valve operation.

i) Valve Types (See Table 6.2-15 for a more detailed description of valve types):

GT Gate valve

GB Globe valve

QT Quarter-turn valve

QBL Quarter-turn ball valve