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MFN 06-461 Supplement 5

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**Subject: Response to Portion of NRC Request for Additional
Information Letter No. 79 - Containment Isolation Design - RAI
Numbers 6.2-104 S01 and 6.2-109 S01**

Enclosure 1 contains the GE Hitachi Nuclear Energy (GEH) response to the subject NRC RAIs originally transmitted via the Reference 1 letter and supplemented by NRC requests for clarification in Reference 2.

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

Sincerely,

James C. Kinsey
Vice President, ESBWR Licensing

References:

1. MFN 06-393, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 79 Related to ESBWR Design Certification Application*, October 11, 2006
2. E-Mail from Shawn Williams, U.S. Nuclear Regulatory Commission, to George Wadkins, GE Hitachi Nuclear Energy, dated May 30, 2007 (ADAMS Accession Number ML071500023)

Enclosure:

1. MFN 06-461 Supplement 5 - Response to Portion of NRC Request for Additional Information Letter No. 79 - Related to ESBWR Design Certification Application - Containment Isolation Design - RAI Numbers 6.2-104 S01 and 6.2-109 S01

cc: AE Cabbage USNRC (with enclosures)
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Enclosure 1

MFN 06-461 Supplement 5

Response to Portion of NRC Request for

Additional Information Letter No. 79

Related to ESBWR Design Certification Application

Containment Isolation Design

RAI Numbers 6.2-104 S01 and 6.2-109 S01

NRC RAI 6.2-104 S01:

One part of RAI 6.2-104 pointed out that DCD, Chapter 6.2.4, 2nd paragraph, stated that the plant meets the relevant requirements of various GDC for containment isolation design. The staff noted that, to the contrary, at least four systems did not meet the specific requirements of GDC 55 and 56. Three of the systems were listed in DCD, Tier 2, Revision 3, Table 1.9-6, and the 4th was the PCCS. The staff asked the applicant to clarify or correct this apparent discrepancy.

The applicant responded by referring to RAI 6.2-102, which addressed the PCCS CIV issue, and concluded that they would make no changes to the DCD.

Putting aside the PCCS issue, which is unresolved RAI 6.2-102, the applicant failed to address the other three systems, as requested in the original RAI, for which still states in DCD, Tier 2, Revision 3, Table 1.9-6, in the row titled, "SRP 6.2.4," that:

"ESBWR design takes specific exceptions to GDC 55 and GDC 56, while satisfying the intent.

- (1) FAPCS suppression pool suction line contains one isolation valve outside containment;*
- (2) ICS piping contains two isolation valves inside containment; and*
- (3) Containment Inerting System piping contains two isolation valves outside containment."*

Please address the above three systems as they relate to the inconsistency between Chapter 6.2.4, 2nd paragraph, 4th bullet, "the plant meets the relevant requirements of various GDC 55 and 56..." to the statement in Table 1.9-6, "ESBWR design takes specific exceptions to GDC 55 and GDC 56..."

GEH Response:

The statement in DCD Tier 2, Subsection 6.2.4, second paragraph, fourth bullet, will be revised to add a statement that there are exceptions to the explicit requirements of GDC 55 and 56, and that these exceptions are listed in Table 1.9-6.

DCD Impact:

DCD Tier 2, Subsection 6.2.4, second paragraph, fourth bullet, will be revised as shown in the attached markup.

6.2.4 Containment Isolation Function

[DCD Tier 2, Subsection 6.2.4, Second Paragraph, Fourth Bullet]

- GDC 55 and 56 as they relate to lines that penetrate the primary containment boundary and either are part of the reactor coolant pressure boundary or connect directly to the containment atmosphere being provided with isolation valves as follows:
 - One locked closed isolation valve inside and one locked closed isolation valve outside containment; or
 - One automatic isolation valve inside and one locked closed isolation valve outside containment; or
 - One locked closed isolation valve inside and one automatic isolation valve outside containment. A simple check valve may not be used as the automatic isolation valve outside containment; or
 - One automatic isolation valve inside and one automatic isolation valve outside containment. A simple check valve may not be used as the automatic isolation valve outside containment.

Certain systems require alternative containment isolation arrangements that are an exception to the above requirements. These exceptions are listed in Table 1.9-6 and are qualified on a case-by-case basis.

NRC RAI 6.2-109 S01:

RAI 6.2-109 requested information about containment isolation valve (CIV) closure times. In DCD, Revision 3, the applicant made appropriate revisions and included acceptable CIV closure times in Tables 6.2-16 through 6.2-42, except as follows:

Isolation Condenser System - In DCD, Tier 2, Revision 3, Tables 6.2-24, 6.2-26, 6.2-28, and 6.2-30, a number of 20 mm (0.8 inch) CIVs have closure times of 30 seconds or less.

High Pressure Nitrogen Gas Supply System - The CIVs are 50 mm (2 inches) in diameter with closure times for valves F0009 and F0026 listed in Table 6.2-40 as 30 seconds or less.

Because DCD, Tier 2, Revision 3, subsection 6.2.4.2.1, states that CIVs which are 80 mm (3 inches) or less in diameter "generally close within 15 seconds," consistent with national standard ANS-56.2/ANSI N271-1976, section 4.4.4, "Valve Closure Time," staff is unsure if the quoted closure times of "30 seconds or less" for the above two systems are correct. Please verify. Revise and explain any inconsistency in the DCD.

GEH Response:

The closure time for the containment isolation valves (CIVs) for the Isolation Condenser System and High Pressure Nitrogen Gas Supply System as listed in DCD Tier 2, Tables 6.2-24, 6.2-26, 6.2-28, 6.2-30 and 6.2-40 will be revised to indicate that they close within 15 seconds.

DCD Impact:

DCD Tier 2, Tables 6.2-24, 6.2-26, 6.2-28, 6.2-30 and 6.2-40, will be revised as shown in the attached markup.

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Design Control Document/Tier 2

Table 6.2-24

Containment Isolation Valve Information for the Isolation Condenser System Loop A

Penetration Identification	B32-MPEN-0009 ¹		B32-MPEN-0013 ²				B32-MPEN-0017 ⁴	
	F007A	F008A	F009A	F010A	F011A	F012A	F013A	F014A
Valve Number	F007A	F008A	F009A	F010A	F011A	F012A	F013A	F014A
Valve Location	Upper Header Vent	Upper Header Vent	Lower Header Vent	Lower Header Vent	Lower Header Bypass Vent	Lower Header Bypass Vent	Purge line	Excess Flow Purge
Applicable Basis	GDC 55*							
Tier 2 Figure	5.1-3	5.1-3	5.1-3	5.1-3	5.1-3	5.1-3	5.1-3	5.1-3
ESF	Yes							
Fluid	Cond/Steam /Non Cond Gases							
Line Size	20mm							
Type C Leakage Test	Yes							
Pipe Length from Cont. to Inboard/Outboard Isolation Valve	COL holder to provide							
Leakage Through Packing ^(b)	N/A							
Leakage Past Seat ^(b)	b6							

¹Two in series valves

²Two in series valves (F009/F010) in parallel with two in series valves (F011/F012)

³Closed barrier outside containment

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Design Control Document/Tier 2

Table 6.2-24

Containment Isolation Valve Information for the Isolation Condenser System Loop A

Penetration Identification	B32-MPEN-0009 ¹		B32-MPEN-0013 ²				B32-MPEN-0017 ⁴		
	Valve Number	F007A	F008A	F009A	F010A	F011A	F012A	F013A	F014A
Location	Inboard	Inboard	Inboard	Inboard	Inboard	Inboard	Inboard	Inboard	Inboard
Valve Type	GB, QBL	GB, QBL	GB, QBL	GB, QBL	QBF, QBL, GT	QBF, QBL, GT	QBF, QBL, GT	Excess-CK	
Operator ^(b)	SO	SO	SO	SO	SO	SO	NO	Flow CV	
Normal Position	Closed	Closed	Closed	Closed	Closed	Closed	Open	Open	
Shutdown Position	Closed	Closed	Closed	Closed	Closed	Closed	Open	Open	
Post-Acc Position	Closed	Closed	Closed	Closed	Closed	Closed	Open	Open	
Power Fail Position	Closed	Closed	Closed	Closed	Closed	Closed	Closed	As is	
Cont. Iso. Signal ^(d)	P	P	P	P	P	P	I	Q	
Primary Actuation	Remote manual	Remote manual	Remote manual	Remote manual	Remote manual	Remote manual	Automatic	Diff Pressure	
Secondary Actuation	N/A	N/A	N/A	N/A	N/A	N/A	Remote Manual	N/A	
Closure Time (sec)	<3015	<3015	<3015	<3015	<3015	<3015	<3015	<3015	
Power Source	Div. 1	Div. 1	Div. 2, 4	Div. 2, 4	Div. 1	Div. 1	Div. 1, 2, 3	N/A	

¹ The piping and valve arrangement for these lines meet the requirement of 10 CFR50, App. A, GDC 55 because there are two normally closed valves in series in the line that leads from the suppression chamber back to the closed IC loop outside the containment.

Note: For explanation of codes, see legend on Table 6.2-15.

Table 6.2-26
Containment Isolation Valve Information for the Isolation Condenser System Loop B

Penetration Identification	B32-MPEN-0010 ⁴		B32-MPEN-0014 ⁵				B32-MPEN-0018 ⁶	
	F007B	F008B	F009B	F010B	F011B	F012B	F013B	F014B
Valve Number	F007B	F008B	F009B	F010B	F011B	F012B	F013B	F014B
Valve Location	Upper Header Vent	Upper Header Vent	Lower Header Vent	Lower Header Vent	Lower Header Bypass Vent	Lower Header Bypass Vent	Purge line	Excess Flow Purge
Applicable Basis	GDC 55 [*]							
Tier 2 Figure	5.1-3	5.1-3	5.1-3	5.1-3	5.1-3	5.1-3	5.1-3	5.1-3
ESF	Yes							
Fluid	Cond/Steam /Non Cond Gases							
Line Size	20mm							
Type C Leakage Test	Yes							
Pipe Length from Cont. to Inboard/Outboard Isolation Valve	COL holder to provide							
Leakage Through Packing ^(a)	N/A							
Leakage Past Seat ^(b)	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/6
Location	Inboard							

⁴Two in series valves

⁵Two in series valves (F009/F010) in parallel with two in series valves (F011/F012)

⁶Closed barrier outside containment

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Design Control Document/Tier 2

**Table 6.2-26
Containment Isolation Valve Information for the Isolation Condenser System Loop B**

Penetration Identification	B32-MPEN-0010 ⁴		B32-MPEN-0014 ⁵				B32-MPEN-0018 ⁶	
	F007B	F008B	F009B	F010B	F011B	F012B	F013B	F014B
Valve Type ^(a)	GB, QBL	GB, QBL	GB, QBL	GB, QBL	QBF, QBL, GT	QBF, QBL, GT	QBF, QBL, GT	Excess-CK
Operator ^(a)	SO	SO	SO	SO	SO	SO	NO	Flow CV
Normal Position	Closed	Closed	Closed	Closed	Closed	Closed	Open	Open
Shutdown Position	Closed	Closed	Closed	Closed	Closed	Closed	Open	Open
Post-Acc Position	Closed	Closed	Closed	Closed	Closed	Closed	Open	Open
Power Fail Position	Closed	Closed	Closed	Closed	Closed	Closed	Closed	As is
Cont. Iso. Signal ^(b)	P	P	P	P	P	P	I	Q
Primary Actuation	Remote manual	Remote manual	Remote manual	Remote manual	Remote manual	Remote manual	Automatic	Diff Pressure
Secondary Actuation	N/A	N/A	N/A	N/A	N/A	N/A	Remote Manual	N/A
Closure Time (sec)	<3015	<3015	<3015	<3015	<3015	<3015	<3015	<3015
Power Source	Div. 2	Div. 2	Div. 1, 3	Div. 1, 3	Div. 2	Div. 2	Div. 2, 3, 4	N/A

* The piping and valve arrangement for these lines meet the requirements of 10 CFR50, App. A, GDC 55 because there are two normally closed valves in series in the line that leads from the suppression chamber back to the closed IC loop outside the containment.

Note: For explanation of codes, see legend on Table 6.2-15.

Table 6.2-28
Containment Isolation Valve Information for the Isolation Condenser System Loop C

Penetration Identification	B32-MPEN-0011 ⁷		B32-MPEN-0015 ⁸				B32-MPEN-0019 ¹⁶	
	F007C	F008C	F009C	F010C	F011C	F012C	F013C	F014C
Valve Number	F007C	F008C	F009C	F010C	F011C	F012C	F013C	F014C
Valve Location	Upper Header Vent	Upper Header Vent	Lower Header Vent	Lower Header Vent	Lower Header Bypass Vent	Lower Header Bypass Vent	Purge line	Excess Flow Purge
Applicable Basis	GDC 55*	GDC 55*						
Tier 2 Figure	5.1-3	5.1-3	5.1-3	5.1-3	5.1-3	5.1-3	5.1-3	5.1-3
ESF	Yes	Yes						
Fluid	Cond/Steam /Non Cond Gases	Cond/Steam /Non Cond Gases						
Line Size	20mm	20mm						
Type C Leakage Test	Yes	Yes						
Pipe Length from Cont. to Inboard/Outboard Isolation Valve	COL holder to provide	COL holder to provide						
Leakage Through Packing ^(a)	N/A	N/A						
Leakage Past Seat ^(b)	⁹ b6	b6	b6	b6	b6	b6	b6	b6
Location	Inboard	Inboard						
Valve Type ^(c)	QB, QBL	QB, QBL	QB, QBL	QB, QBL	QBF, QBL	QBF, QBL	QBF, QBL	Excess-CK

⁷Two in series valves

⁸Two in series valves (F009/F010) in parallel with two in series valves (F011/F012)

⁹Closed barrier outside containment

Table 6.2-28
Containment Isolation Valve Information for the Isolation Condenser System Loop C

Penetration Identification	B32-MPEN-0011 ⁷		B32-MPEN-0015 ⁸				B32-MPEN-0019 ¹⁶	
	F007C	F008C	F009C	F010C	F011C	F012C	F013C	F014C
Operator ⁽⁹⁾	SO	SO	SO	SO	SO	SO	NO	Flow CV
Normal Position	Closed	Closed	Closed	Closed	Closed	Closed	Open	Open
Shutdown Position	Closed	Closed	Closed	Closed	Closed	Closed	Open	Open
Post-Acc Position	Closed	Closed	Closed	Closed	Closed	Closed	Open	Open
Power Fail Position	Closed	Closed	Closed	Closed	Closed	Closed	Closed	As is
Cont. Iso. Signal ⁽¹⁰⁾	P	P	P	P	P	P	I	Q
Primary Actuation	Remote manual	Remote manual	Remote manual	Remote manual	Remote manual	Remote manual	Automatic	Diff Pressure
Secondary Actuation	N/A	N/A	N/A	N/A	N/A	N/A	Remote Manual	N/A
Closure Time (sec)	<3015	<3015	<3015	<3015	<3015	<3015	<3015	<3015
Power Source	Div. 3	Div. 3	Div. 2, 4	Div. 2, 4	Div. 3	Div. 3	Div. 3, 4, 1	N/A

* The piping and valve arrangement for these lines meet the requirements of 10 CFR 50, App. A, GDC 55 because there are two normally closed valves in series in the line that leads from the suppression chamber back to the closed IC loop outside the containment.

Note: For explanation of codes, see legend on Table 6.2-15.

Table 6.2-30
Containment Isolation Valve Information for the Isolation Condenser System Loop D

Penetration Identification	B32-MPEN-0012 ¹⁰		B32-MPEN-0016 ¹¹				B32-MPEN-0020 ²²	
	F007D	F008D	F009D	F010D	F011D	F012D	F013D	F014D
Valve Number	F007D	F008D	F009D	F010D	F011D	F012D	F013D	F014D
Valve Location	Upper Header Vent	Upper Header Vent	Lower Header Vent	Lower Header Vent	Lower Header Bypass Vent	Lower Header Bypass Vent	Purge line	Excess Flow Purge
Applicable Basis	GDC 55*	GDC 55*	GDC 55*	GDC 55*	GDC 55*	GDC 55*	GDC 55*	GDC 55*
Tier 2 Figure	5.1-3	5.1-3	5.1-3	5.1-3	5.1-3	5.1-3	5.1-3	5.1-3
ESF	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fluid	Cond/Steam /Non Cond Gases	Cond/Steam /Non Cond Gases	Cond/Steam /Non Cond Gases	Cond/Steam /Non Cond Gases	Cond/Steam /Non Cond Gases	Cond/steam /Non Cond Gases	Cond/Steam /Non Cond Gases	Cond/Steam /Non Cond Gases
Line Size	20mm	20mm	20mm	20mm	20mm	20mm	20mm	20mm
Type C Leakage Test	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pipe Length from Cont. to Inboard/Outboard Isolation Valve	COL holder to provide	COL holder to provide	COL holder to provide	COL holder to provide	COL holder to provide	COL holder to provide	COL holder to provide	COL holder to provide
Leakage Through Packing ^(b)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Leakage Past Seat ^(b)	¹² b6	b6	b6	b6	b6	b6	b6	b6
Location	Inboard	Inboard	Inboard	Inboard	Inboard	Inboard	Inboard	Inboard
Valve Type ^(a)	GB, QBL	GB, QBL	GB, QBL	GB, QBL	OBF, OBL	OBL, OBF	OBL, OBF	Excess-CK

¹⁰Two in series valves

¹¹Two in series valves (F009/F010) in parallel with two in series valves (F011/F012)

¹²Closed barrier outside containment

Table 6.2-30
Containment Isolation Valve Information for the Isolation Condenser System Loop D

Penetration Identification	B32-MPEN-0012 ¹⁰		B32-MPEN-0016 ¹¹				B32-MPEN-0020 ²²	
	F007D	F008D	F009D	F010D	F011D GT	F012D GT	F013D GT	F014D
Operator ⁽⁶⁾	SO	SO	SO	SO	SO	SO	NO	Flow CV
Normal Position	Closed	Closed	Closed	Closed	Closed	Closed	Open	Open
Shutdown Position	Closed	Closed	Closed	Closed	Closed	Closed	Open	Open
Post-Acc Position	Closed	Closed	Closed	Closed	Closed	Closed	Open	Open
Power Fail Position	Closed	Closed	Closed	Closed	Closed	Closed	Closed	As is
Cont Iso. Signal ^(d)	P	P	P	P	P	P	I	Q
Primary Actuation	Remote manual	Remote manual	Remote manual	Remote manual	Remote manual	Remote manual	Automatic	Diff Pressure
Secondary Actuation	N/A	N/A	N/A	N/A	N/A	N/A	Remote Manual	N/A
Closure Time (sec)	<2015	<2015	<2015	<2015	<2015	<2015	<2015	<2015
Power Source	Div. 4	Div. 4	Div. 1, 3	Div. 1, 3	Div. 4	Div. 4	Div. 4, 1, 2	N/A

* The piping and valve arrangement for these lines meet the requirements of 10 CFR50, App. A, GDC 55 because there are two normally closed valves in series in the line that leads from the suppression chamber back to the closed IC loop outside the containment.

Note: For explanation of codes, see legend on Table 6.2-15.

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Table 6.2-40
Containment Isolation Valve Information for the High Pressure Nitrogen Gas Supply System

Penetration Identification	PS4-MPEN-0001		PS4-MPEN-0002	
	Valve No.	F0026	F027	F009
Applicable Basis	GDC 56	GDC 56	GDC 56	GDC 56
Tier 2 Figure	N/A	N/A	N/A	N/A
ESF	No	No	No	No
Fluid	Air/N ₂	Air/N ₂	N ₂	N ₂
Line Size	50 mm	50 mm	50 mm	50 mm
Type C Leakage Test	Yes	Yes	Yes	Yes
Pipe Length from Cont. to Inboard/Outboard Isolation Valve	COL holder to provide			
Leakage Through Packing ^(a)	(s ₁)	N/A	(s ₁)	N/A
Leakage Past Seat ^(b)	(b ₂)	(b ₂)	(b ₂)	(b ₂)
Location	Outboard	Inboard	Outboard	Inboard
Valve Type	GB, QT	CK	GB, QT	CK
Operator ^(c)	AO	PM	AO	PM
Normal Position	Open	Open/Closed	Open	Open/Closed
Shutdown Position	Open/Closed	Open/Closed	Open/Closed	Open/Closed
Post-Acc Position	Closed	Closed	Closed	Closed
Power Fail Position	Closed	Closed	Closed	Closed
Cont. Iso. Signal ^(d)	C,H	Q	C,H	Q
Primary Actuation	Automatic	Automatic	Automatic	Automatic
Secondary Actuation	Remote manual	Process Actuated	Remote manual	Process Actuated
Closure Time (sec.)	< 2015	N/A	< 2015	N/A
Power Source	Div. 2, 4	N/A	Div. 2, 4	N/A

Note: For explanation of codes, see legend on Table 6.2-15.