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**Proprietary Notice**

This letter forwards proprietary information in accordance with 10CFR2.390. Upon the removal of Enclosure 2, the balance of this letter may be considered non-proprietary.

MFN 09-775, Revision 1

Docket No. 52-010

February 16, 2010

U.S. Nuclear Regulatory Commission  
Document Control Desk  
Washington, D.C. 20555-0001

Subject: **Revised Response to NRC Request for Additional Information Letter No. 387 Related to ESBWR Design Certification Application – RAI 7.1-141 including Revised Licensing Topical Report NEDE-33304P**

The purpose of this letter is to submit the revised response to RAI 7.1-141 (Reference 1) and Licensing Topical Report (LTR) NEDE-33304P, "*GEH ESBWR Setpoint Methodology*," Revision 3 for your review and use. This revision was requested to resolve NRC questions received during a January 20 2010 phone call related to the LTR submitted in the original response to RAI 7.1-141, Reference 2. This letter is to support NRC review of the GEH application for final design approval and standard design certification of the ESBWR standard plant design pursuant to 10 CFR Part 52.

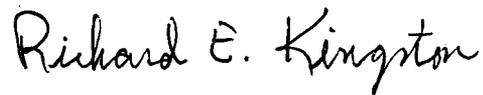
Enclosure 2 contains proprietary information as defined in 10CFR2.390. A non-proprietary version is contained in Enclosure 3.

The affidavit contained in Enclosure 4 identifies that the information contained in Enclosure 2 has been handled and classified as proprietary to GEH. GEH hereby requests that the information of Enclosure 2 be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390 and 9.17.

Dob8  
NRC

If you have any questions about the information provided here, please let me know.

Sincerely,



Richard E. Kingston  
Vice President, ESBWR Licensing

References:

1. MFN 09-692, Letter from U.S. Nuclear Regulatory Commission to Jerald G. Head, "Request for Additional Information Letter No. 387 Related to ESBWR Design Certification Application" dated October 30, 2009.
2. MFN 09-775, Letter from Richard E Kingston to the U.S. Nuclear Regulatory Commission, "Response to NRC Request for Additional Information Letter NO. 387 Related to ESBWR Design Certification Application – RAI 7.1-141" dated December 12, 2009.

Enclosures:

1. Revised Response to NRC Request for Additional Information Letter No. 387 Related to ESBWR Design Certification Application - RAI Number 7.1-141, Revision 1 and DCD Markups
  2. Revised Response to NRC Request for Additional Information Letter No. 387 Related to ESBWR Design Certification Application - NEDE-33304P, Revision 3 - GEH Proprietary Information
  3. Revised Response to NRC Request for Additional Information Letter No. 387 Related to ESBWR Design Certification Application - DCD Markups and NEDO-33304, Revision 3 – Public Version
  4. Affidavit – Larry J. Tucker
- cc: AE Cabbage USNRC (with enclosures)  
RE Brown GEH/Wilmington (with enclosures)  
LJ Tucker GEH/Wilmington (with enclosures)  
PM Yandow GEH/Wilmington (with enclosures)  
EDRF Section 0000-0110-4894

**Enclosure 1**

**MFN 09-775, Revision 1**

**Revised Response to NRC Request for**

**Additional Information Letter No. 387**

**Related to ESBWR Design Certification Application**

**RAI Number 7.1-141, Revision 1 and  
DCD Markups**

### **NRC RAI 7.1-141**

*Based on the review of NEDE-33304P and GEH's responses to RAIs 7.1-86 and 102, NRC staff finds that GEH has not demonstrated that the ESBWR setpoint methodology, as described in NEDE-33304P, conforms to the 95/95 tolerance limit as an acceptable criterion for uncertainties specified in NRC Regulatory Guide (RG) 1.105, Revision 3. Specifically, the use of single-sided distribution and the subsequent use of the 1.645/2 factor to calculate the setpoints are not justified to demonstrate conformance to the 95/95 criterion in RG 1.105, Revision 3. This staff finding was confirmed by the Department of Energy's Oak Ridge National Laboratory (ORNL), which was contracted by the staff for a detailed evaluation. Therefore, the NRC staff requests that GEH revise NEDE-33304P to remove the reduction factor of 1.645/2 and to make corresponding changes to the supporting information. This is considered to be the staff's preferred resolution option. The evaluation prepared by ORNL is included as an enclosure.*

*Alternatively, GEH may provide an alternative to the RG 1.105, Revision 3 acceptance criterion and explain in sufficient detail and bases to demonstrate compliance with the relevant regulatory requirements.*

*This RAI supersedes and closes RAIs 7.1-86 and 7.1-102.*

### **GEH Response – Revision 1**

The equations and sample calculations in NEDE-33304P have been updated in accordance with this RAI request, and all DCD references to this licensing topical report (LTR) will be revised to update the title, revision status and issue date of the LTR. Information related to the calculation of LER avoidance margins and spurious trip avoidance margins have been removed from the report because they are operational issues unrelated to the calculation of Limiting Safety System Settings. In addition references to the historical GE setpoint methodology LTR, NEDE-31336P, have been removed.

This change and the revised NEDE-33304P are applicable only to ESBWR setpoint methodology.

### **DCD Impact**

DCD Tier 2, Table 1.6-1 and References 7.1-9, 7.2-1, 7.3-2, 7.4-2, 7.5-2 and 7.8-4, will be revised in Revision 7 as noted in the attached markups to update the title, revision status and issue date of LTR NEDE-33304P.

LTR NEDE-33304P, Revision 3, incorporates the changes to the methodology and the sample calculation, and revises the LTR so that it only applies to ESBWR. The revised LTR is an enclosure to the letter transmitting this RAI response.

**Table 1.6-1**  
**Referenced GE / GEH Reports**

<b>Report No.</b>	<b>Title</b>	<b>Section No.</b>
NEDO-25370	General Electric Company, "Anticipated Chemical Behavior of Iodine under LOCA Conditions," NEDO-25370, January 1981.	15.4
NEDE-30130-P-A NEDO-30130-A	General Electric Company, "Steady State Nuclear Methods," NEDE-30130-P-A, Class III (Proprietary), April 1985, and NEDO-30130-A, Class I (Non-proprietary), May 1985.	15.3
NEDE-31152P NEDO-31152	Global Nuclear Fuel, "Global Nuclear Fuels Fuel Bundle Designs," NEDE-31152P, Revision 9, Class III (Proprietary), May 2007, and NEDO-33152, Revision 9, Class I (Non-proprietary), May 2007.	4.2
<del>NEDC-31336P-A</del> <del>NEDO-31336-A(Deleted)</del>	<del>GE Nuclear Energy, "General Electric Instrument Setpoint Methodology," "Licensing Topical Report NEDC-31336P-A (NRC Accepted), Class III (Proprietary), and NEDO-31336-A, Class I (Non-proprietary), September 1996.</del>	<del>7.1</del>
NEDE-31758P-A	GE Nuclear Energy, "GE Marathon Control Rod Assembly," NEDE-31758P-A (Proprietary), October 1991.	4.2
NEDG-31831	GE Nuclear Energy, "SBWR Design and Certification Program Quality Assurance Plan," NEDG-31831, May 1990.	17.0
NEDC-31858P	GE Nuclear Energy, "BWROG Report for Increasing MSIV Leakage Rate Limits and Elimination of Leakage Control Systems," NEDC-31858P (Proprietary), Revision 2, September 1993.	15.4
NEDC-31959P	GE Nuclear Energy, "Fuel Rod Thermal-Mechanical Analysis Methodology (GSTRM)," NEDC-31959P (Proprietary), April 1991.	4.2
NEDO-31960-A	GE Nuclear Energy, "BWR Owners' Group Long-Term Stability Solutions Licensing Methodology," NEDO-31960-A, November 1995.	1.9, 4D

**Table 1.6-1**  
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Report No.	Title	Section No.
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NEDO-33289	GE Hitachi Nuclear Energy, "ESBWR Reliability Assurance Program," NEDO-33289, Class I (Non-proprietary), Revision 2, September 2008.	17.4
NEDE-33295P NEDO-33295	<i>GE Hitachi Nuclear Energy, "ESBWR Cyber Security Program Plan," NEDE-33295P, Class III (Proprietary), Revision 1, July 2009, and NEDO-33295, Class I (Non-proprietary), Revision 1, July 2009.]*</i>	7.1, 7B
NEDE-33304P NEDO-33304	GE-Hitachi Nuclear Energy, "GEH <del>ABWR</del> /ESBWR Setpoint Methodology," NEDE-33304P, Class III (Proprietary), and NEDO-33304, Class I (Non-proprietary), Revision <del>123</del> , <del>Nov</del> <del>December</del> <u>February</u> <del>2010</del> <del>08</del> <u>2010</u> .	7.1, 7.2, 7.3, 7.4, 7.5, 7.8 Chapter 16 Sect. 5.5.11
NEDO-33306	GE Hitachi Nuclear Energy, "ESBWR Severe Accident Mitigation Design Alternatives," NEDO-33306, Class I (Non-proprietary), Revision 1, August 2007.	19.2
NEDE-33312P NEDO-33312	GE Hitachi Nuclear Energy, "ESBWR Steam Dryer Acoustic Load Definition," NEDE-33312P, Class III (Proprietary), Revision 1, July 2009, and NEDO-33312, Class I (Non-Proprietary), Revision 1, July 2009.	3L
NEDE-33313P NEDO-33313	GE Hitachi Nuclear Energy, "ESBWR Steam Dryer Structural Evaluation," NEDE-33313P, Class III (Proprietary), Revision 1, July 2009, and NEDO-33313, Class I (Non-Proprietary), Revision 1, July 2009.	3.9, 3L
NEDC-33326P NEDO-33326	<i>[Global Nuclear Fuel, "GE14E for ESBWR Initial Core Nuclear Design Report," NEDC-33326P, Class III (Proprietary), and NEDO-33326, Class I (Non-proprietary), Revision 1, March 2009.]*</i>	4.3, 4.4, 4A, 4D, 15.0, 15.2, 15.3, 15.5

**7.1.7 COL Information**

None.

**7.1.8 References**

7.1-1 (Deleted)

7.1-2 (Deleted)

7.1-3 (Deleted)

7.1-4 GE Hitachi Nuclear Energy, "ESBWR I&C Diversity and Defense-In-Depth Report." NEDO-33251, Class I (Non-proprietary), Revision 2, May 2009.

7.1-5 (Deleted)

7.1-6 (Deleted)

7.1-7 (Deleted)

7.1-8 [*GE Hitachi Nuclear Energy, "ESBWR Cyber Security Program Plan," NEDE-33295P, Class III (Proprietary), Revision 1, ~~July~~ ~~October~~ 2007*, and NEDO-33295, Class I (Non-Proprietary), Revision 1, ~~July~~ ~~October~~ 2007].\*

7.1-9 GE-Hitachi Nuclear Energy, "GEH ABWR/ESBWR Setpoint Methodology," NEDE-33304P, Class III (Proprietary), Revision ~~123~~, ~~Nov~~ ~~December~~ February 2009~~108~~, and NEDO-33304, Class II (Non-proprietary), Revision ~~123~~, ~~Nov~~ ~~December~~ February 2008~~910~~.

7.1-10 [*GE Hitachi Nuclear Energy, "ESBWR - Software Quality Assurance Program Manual," NEDE-33245P, Class III (Proprietary), Revision 5, February 2010* ~~Revision 4, July 2009~~, and NEDO-33245, Class I (Non-Proprietary), Revision 5, February 2010 ~~Revision 4, July 2009~~.]\*

7.1-11 ~~GE Nuclear Energy, "General Electric Instrument Setpoint Methodology," NEDC-31336P-A, Class III (Proprietary), September 1996, and NEDO-31336-A, Class I (Non-proprietary), September 1996.~~ (Deleted)

7.1-12 [*GE Hitachi Nuclear Energy, "ESBWR - Software Management Program Manual," NEDE-33226P, Class III (Proprietary), Revision 4, May 2009* Revision 5, February 2010, and NEDO-33226, Class I (Non-proprietary), ~~Revision 4, May 2009~~ Revision 5, February 2010.]\*

7.1-13 (Deleted)

\*References that are bracketed and italicized with an asterisk following the brackets are designated as Tier 2\*. Prior NRC approval is required to change.

#### 7.2.3.4 Testing and Inspection Requirements

Proper functioning of analog temperature sensors is verified by channel cross-comparison during the plant normal operation mode. The bulk pool temperatures are continuously compared between divisions and indicated by the PCF.

Each of four SPTM safety-related divisions is testable during plant normal operation to determine the operational availability of the system. Each safety-related SPTM division has the capability for testing, adjustment, and inspection during a plant outage.

#### 7.2.3.5 Instrumentation and Controls Requirements

The I&C requirements related to SPTM are addressed in Subsections 7.2.3.1 and 7.2.3.2.

#### 7.2.4 COL Information

None.

#### 7.2.5 References

7.2-1 GE-Hitachi Nuclear Energy, "GEH ABWR/ESBWR Setpoint Methodology," NEDE-33304P, Class III (Proprietary), Revision ~~123, NovDecember~~ February 2008910, and NEDO-33304, Class II (Non-proprietary), Revision ~~123, NovDecember~~ February 2008910.

7.2-2 (Deleted)

7.2-3 [*GE Hitachi Nuclear Energy, "ESBWR - Software Management Program Manual," NEDE-33226P, Class III (Proprietary), Revision 4, May 2009 Revision 5, February 2010, and NEDO-33226, Class I (Non-proprietary), Revision 4, May 2009 Revision 5, February 2010.*]\*

7.2-4 [*GE Hitachi Nuclear Energy, "ESBWR - Software Quality Assurance Program Manual," NEDE-33245P, Class III (Proprietary), Revision 4, July 2009 Revision 5, February 2010, and NEDO-33245, Class I (Non-proprietary), Revision 4, July 2009 Revision 5, February 2010.*]\*

\*References that are bracketed and italicized with an asterisk following the brackets are designated as Tier 2\*. Prior NRC approval is required to change.

### 7.3.8 References

7.3-1 (Deleted)

7.3-2 GE-Hitachi Nuclear Energy, "GEH ~~ABWR~~/ESBWR Setpoint Methodology," NEDE-33304P, Class III (Proprietary), Revision ~~123~~, ~~Nov~~~~December~~February 2009~~8~~10, and NEDO-33304, Class II (Non-proprietary), Revision ~~123~~, ~~Nov~~~~December~~February 2008~~9~~10.

7.3-3 [*GE Hitachi Nuclear Energy, "ESBWR - Software Management Program Manual," NEDE-33226P, Class III (Proprietary), Revision 4, May 2009, and NEDO-33226, Class I (Non-proprietary), Revision 4, May 2009.*]\*

7.3-4 [*GE Hitachi Nuclear Energy, "ESBWR - Software Quality Assurance Program Manual," NEDE-33245P, Class III (Proprietary), Revision 4, July 2009, and NEDO-33245, Class I (Non-proprietary), Revision 4, July 2009.*]\*

7.3-5 (Deleted)

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- Status indication of HP CRD isolation bypass valve position;
- GDCS pool level indication;
- RPV water level indication; and
- Drywell and RPV pressure indication.

The HP CRD isolation bypass function instrumentation located in the drywell is designed to operate in the harsh drywell environment that results from a LOCA. Instrumentation, located outside the drywell, is qualified for the environment in which they must perform their function.

#### 7.4.6 COL Information

None.

#### 7.4.7 References

7.4-1 (Deleted)

7.4-2 GE-Hitachi Nuclear Energy, "GEH ABWR/ESBWR Setpoint Methodology," NEDE-33304P, Class III (Proprietary), Revision ~~123~~, ~~Nov~~DecemberFebruary 2008910, and NEDO-33304, Class II (Non-proprietary), Revision ~~123~~, ~~Nov~~DecemberFebruary 2008910.

BTP HICB-16, Guidance on the Level of Detail Required for Design Certification Applications Under 10 CFR Part 52:

- Conformance: The level of detail provided for the Pool Monitoring instrumentation design conforms to BTP HICB-16.

#### ***7.5.5.4 Testing and Inspection Requirements***

See Subsection 9.1.3.4.

#### ***7.5.5.5 Instrumentation and Control Requirements***

See Subsection 9.1.3.5.

#### **7.5.6 (Deleted)**

#### **7.5.7 COL Information**

None.

#### **7.5.8 References**

- 7.5-1 GE Nuclear Energy, "GE Nuclear Energy Quality Assurance Program Description," NEDO 11209-04A, Class I (Non-proprietary), Revision 8, March 1989.
- 7.5-2 GE-Hitachi Nuclear Energy, "GEH ~~ABWR~~/ESBWR Setpoint Methodology," NEDE-33304P, Class III (Proprietary), Revision ~~123~~, ~~Nov~~~~December~~February 2009~~108~~, and NEDO-33304, Class II (Non-proprietary), Revision ~~123~~, ~~Nov~~~~December~~February 2009~~108~~.

### 7.8.5 Instrumentation and Control Requirements

The ATWS/SLC uses logic that is diverse from the RPS. Logic and controls for ATWS/SLC are located in divisional RTIF cabinets. Operating status is available to the operator in the MCR. Division of sensors bypass capability is provided for the ATWS/SLC logic. Communication with external interfaces is through isolation devices. Provisions are made to allow testing of the ATWS/SLC logic and maintenance of the ATWS/SLC equipment.

The DPS uses triple redundant microprocessor-based automatic actuation logic that is diverse from the RPS and SSLC/ESF automatic actuation logic.

The information available to the operator from the diverse I&C systems is described in Subsection 7.8.1.3.

### 7.8.6 COL Information

None.

### 7.8.7 References

- 7.8-1 GE Hitachi Nuclear Energy, "ESBWR I&C Diversity and Defense-In-Depth Report," NEDO-33251, Class I (Non-proprietary), Revision 2, May 2009.
- 7.8-2 NUREG/CR-6303, "Method for Performing Diversity and Defense-in-Depth Analyses of Reactor Protection Systems, December 1994
- 7.8-3 [*GE Hitachi Nuclear Energy, "ESBWR - Software Quality Assurance Program Manual," NEDO-33245P Class III (Proprietary), ~~Revision 4, July 2009~~ Revision 5, February 2010, and NEDO-33245, Class I (Non-proprietary), ~~Revision 4, July 2009~~ Revision 5, February 2010.*]\*
- 7.8-4 GE Hitachi Nuclear Energy, "GEH ~~ABWR~~/ESBWR Setpoint Methodology," NEDE-33304P, Class III (Proprietary), Revision ~~123, NovDecember~~ February 2009108, and NEDO-33304, Class II (Non-proprietary), Revision ~~123, NovDecember~~ February 2009108.

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**Enclosure 3**

**MFN 09-775, Revision 1**

**Revised Response to NRC Request for**

**Additional Information Letter No. 387**

**Related to ESBWR Design Certification Application**

**DCD Markups and NED0-33304, Revision 3**

**Public Version**

**Table 1.6-1**  
**Referenced GE / GEH Reports**

<b>Report No.</b>	<b>Title</b>	<b>Section No.</b>
NEDO-25370	General Electric Company, "Anticipated Chemical Behavior of Iodine under LOCA Conditions," NEDO-25370, January 1981.	15.4
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NEDE-31152P NEDO-31152	Global Nuclear Fuel, "Global Nuclear Fuels Fuel Bundle Designs," NEDE-31152P, Revision 9, Class III (Proprietary), May 2007, and NEDO-33152, Revision 9, Class I (Non-proprietary), May 2007.	4.2
<del>NEDC-31336P-A</del> <del>NEDO-31336-A(Deleted)</del>	<del>GE Nuclear Energy, "General Electric Instrument Setpoint Methodology," "Licensing Topical Report NEDC-31336P-A (NRC Accepted), Class III (Proprietary), and NEDO-31336-A, Class I (Non-proprietary), September 1996.</del>	<del>7.1</del>
NEDE-31758P-A	GE Nuclear Energy, "GE Marathon Control Rod Assembly," NEDE-31758P-A (Proprietary), October 1991.	4.2
NEDG-31831	GE Nuclear Energy, "SBWR Design and Certification Program Quality Assurance Plan," NEDG-31831, May 1990.	17.0
NEDC-31858P	GE Nuclear Energy, "BWROG Report for Increasing MSIV Leakage Rate Limits and Elimination of Leakage Control Systems," NEDC-31858P (Proprietary), Revision 2, September 1993.	15.4
NEDC-31959P	GE Nuclear Energy, "Fuel Rod Thermal-Mechanical Analysis Methodology (GSTRM)," NEDC-31959P (Proprietary), April 1991.	4.2
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NEDE-33295P NEDO-33295	<i>GE Hitachi Nuclear Energy, "ESBWR Cyber Security Program Plan," NEDE-33295P, Class III (Proprietary), Revision 1, July 2009, and NEDO-33295, Class I (Non-proprietary), Revision 1, July 2009.]*</i>	7.1, 7B
NEDE-33304P NEDO-33304	GE-Hitachi Nuclear Energy, "GEH <del>ABWR</del> /ESBWR Setpoint Methodology," NEDE-33304P, Class III (Proprietary), and NEDO-33304, Class I (Non-proprietary), Revision <del>423, Nov</del> <u>December</u> <del>February</del> <u>2010</u> <del>089</del> .	7.1, 7.2, 7.3, 7.4, 7.5, 7.8 Chapter 16 Sect. 5.5.11
NEDO-33306	GE Hitachi Nuclear Energy, "ESBWR Severe Accident Mitigation Design Alternatives," NEDO-33306, Class I (Non-proprietary), Revision 1, August 2007.	19.2
NEDE-33312P NEDO-33312	GE Hitachi Nuclear Energy, "ESBWR Steam Dryer Acoustic Load Definition," NEDE-33312P, Class III (Proprietary), Revision 1, July 2009, and NEDO-33312, Class I (Non-Proprietary), Revision 1, July 2009.	3L
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**7.1.7 COL Information**

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**7.1.8 References**

7.1-1 (Deleted)

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7.1-3 (Deleted)

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7.1-6 (Deleted)

7.1-7 (Deleted)

7.1-8 [*GE Hitachi Nuclear Energy, "ESBWR Cyber Security Program Plan," NEDE-33295P, Class III (Proprietary), Revision 1, ~~July~~October 2007~~9~~, and NEDO-33295, Class I (Non-Proprietary), Revision 1, ~~July~~October 2007~~9~~.*]\*

7.1-9 GE-Hitachi Nuclear Energy, "GEH ABWR/ESBWR Setpoint Methodology," NEDE-33304P, Class III (Proprietary), Revision ~~1~~23, ~~Nov~~December~~February~~ 2009108, and NEDO-33304, Class II (Non-proprietary), Revision ~~1~~23, ~~Nov~~December~~February~~ 2008910.

7.1-10 [*GE Hitachi Nuclear Energy, "ESBWR - Software Quality Assurance Program Manual," NEDE-33245P, Class III (Proprietary), Revision 5, February 2010~~Revision 4, July 2009~~, and NEDO-33245, Class I (Non-Proprietary), Revision 5, February 2010~~Revision 4, July 2009~~.*]\*

7.1-11 ~~GE Nuclear Energy, "General Electric Instrument Setpoint Methodology," NEDC-31336P-A, Class III (Proprietary), September 1996, and NEDO-31336-A, Class I (Non-proprietary), September 1996.~~(Deleted)

7.1-12 [*GE Hitachi Nuclear Energy, "ESBWR - Software Management Program Manual," NEDE-33226P, Class III (Proprietary), Revision 4, May 2009 Revision 5, February 2010, and NEDO-33226, Class I (Non-proprietary), Revision 4, May 2009 Revision 5, February 2010.*]\*

7.1-13 (Deleted)

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#### 7.2.3.4 Testing and Inspection Requirements

Proper functioning of analog temperature sensors is verified by channel cross-comparison during the plant normal operation mode. The bulk pool temperatures are continuously compared between divisions and indicated by the PCF.

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#### 7.2.3.5 Instrumentation and Controls Requirements

The I&C requirements related to SPTM are addressed in Subsections 7.2.3.1 and 7.2.3.2.

#### 7.2.4 COL Information

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#### 7.2.5 References

7.2-1 GE-Hitachi Nuclear Energy, "GEH ~~ABWR~~/ESBWR Setpoint Methodology," NEDE-33304P, Class III (Proprietary), Revision ~~123, Nov~~December ~~2008~~February 2009~~10~~, and NEDO-33304, Class II (Non-proprietary), Revision ~~123, Nov~~December ~~2008~~February 2009~~10~~.

7.2-2 (Deleted)

7.2-3 [*GE Hitachi Nuclear Energy, "ESBWR - Software Management Program Manual," NEDE-33226P, Class III (Proprietary), ~~Revision 4, May 2009~~ Revision 5, February 2010, and NEDO-33226, Class I (Non-proprietary), ~~Revision 4, May 2009~~ Revision 5, February 2010.]*\*

7.2-4 [*GE Hitachi Nuclear Energy, "ESBWR - Software Quality Assurance Program Manual," NEDE-33245P, Class III (Proprietary), ~~Revision 4, July 2009~~ Revision 5, February 2010, and NEDO-33245, Class I (Non-proprietary), ~~Revision 4, July 2009~~ Revision 5, February 2010.]*\*

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**7.3.8 References**

7.3-1 (Deleted)

7.3-2 GE-Hitachi Nuclear Energy, "GEH ~~ABWR~~/ESBWR Setpoint Methodology," NEDE-33304P, Class III (Proprietary), Revision ~~123~~, ~~Nov~~~~December~~February 2009~~810~~, and NEDO-33304, Class II (Non-proprietary), Revision ~~123~~, ~~Nov~~~~December~~February 2008~~910~~.

7.3-3 [*GE Hitachi Nuclear Energy, "ESBWR - Software Management Program Manual," NEDE-33226P, Class III (Proprietary), Revision 4, May 2009, and NEDO-33226, Class I (Non-proprietary), Revision 4, May 2009.*]\*

7.3-4 [*GE Hitachi Nuclear Energy, "ESBWR - Software Quality Assurance Program Manual," NEDE-33245P, Class III (Proprietary), Revision 4, July 2009, and NEDO-33245, Class I (Non-proprietary), Revision 4, July 2009.*]\*

7.3-5 (Deleted)

\*References that are bracketed and italicized with an asterisk following the brackets are designated as Tier 2\*. Prior NRC approval is required to change.

- Status indication of HP CRD isolation bypass valve position;
- GDACS pool level indication;
- RPV water level indication; and
- Drywell and RPV pressure indication.

The HP CRD isolation bypass function instrumentation located in the drywell is designed to operate in the harsh drywell environment that results from a LOCA. Instrumentation, located outside the drywell, is qualified for the environment in which they must perform their function.

#### 7.4.6 COL Information

None.

#### 7.4.7 References

7.4-1 (Deleted)

7.4-2 GE-Hitachi Nuclear Energy, "GEH ABWR/ESBWR Setpoint Methodology," NEDE-33304P, Class III (Proprietary), Revision ~~123~~, ~~Nov~~December~~February~~ 20089~~10~~, and NEDO-33304, Class II (Non-proprietary), Revision ~~123~~, ~~Nov~~December~~February~~ 20089~~10~~.

BTP HICB-16, Guidance on the Level of Detail Required for Design Certification Applications Under 10 CFR Part 52:

- Conformance: The level of detail provided for the Pool Monitoring instrumentation design conforms to BTP HICB-16.

#### ***7.5.5.4 Testing and Inspection Requirements***

See Subsection 9.1.3.4.

#### ***7.5.5.5 Instrumentation and Control Requirements***

See Subsection 9.1.3.5.

#### **7.5.6 (Deleted)**

#### **7.5.7 COL Information**

None.

#### **7.5.8 References**

- 7.5-1 GE Nuclear Energy, "GE Nuclear Energy Quality Assurance Program Description," NEDO 11209-04A, Class I (Non-proprietary), Revision 8, March 1989.
- 7.5-2 GE-Hitachi Nuclear Energy, "GEH ~~ABWR~~/ESBWR Setpoint Methodology," NEDE-33304P, Class III (Proprietary), Revision ~~123, Nov~~December~~February 2009~~108, and NEDO-33304, Class II (Non-proprietary), Revision ~~123, Nov~~December~~February 2009~~108.

### 7.8.5 Instrumentation and Control Requirements

The ATWS/SLC uses logic that is diverse from the RPS. Logic and controls for ATWS/SLC are located in divisional RTIF cabinets. Operating status is available to the operator in the MCR. Division of sensors bypass capability is provided for the ATWS/SLC logic. Communication with external interfaces is through isolation devices. Provisions are made to allow testing of the ATWS/SLC logic and maintenance of the ATWS/SLC equipment.

The DPS uses triple redundant microprocessor-based automatic actuation logic that is diverse from the RPS and SSLC/ESF automatic actuation logic.

The information available to the operator from the diverse I&C systems is described in Subsection 7.8.1.3.

### 7.8.6 COL Information

None.

### 7.8.7 References

- 7.8-1 GE Hitachi Nuclear Energy, "ESBWR I&C Diversity and Defense-In-Depth Report," NEDO-33251, Class I (Non-proprietary), Revision 2, May 2009.
- 7.8-2 NUREG/CR-6303, "Method for Performing Diversity and Defense-in-Depth Analyses of Reactor Protection Systems, December 1994
- 7.8-3 [*GE Hitachi Nuclear Energy, "ESBWR - Software Quality Assurance Program Manual," NEDO-33245P Class III (Proprietary), Revision 4, July 2009 Revision 5, February 2010, and NEDO-33245, Class I (Non-proprietary), Revision 4, July 2009 Revision 5, February 2010.*]\*
- 7.8-4 GE Hitachi Nuclear Energy, "GEH ~~ABWR~~/ESBWR Setpoint Methodology," NEDE-33304P, Class III (Proprietary), Revision ~~123~~, ~~Nov~~~~December~~February 2009~~108~~, and NEDO-33304, Class II (Non-proprietary), Revision ~~123~~, ~~Nov~~~~December~~February 2009~~108~~.

\*References that are bracketed and italicized with an asterisk following the brackets are designated as Tier 2\*. Prior NRC approval is required to change.