



HITACHI

GE Hitachi Nuclear Energy

Richard E. Kingston
Vice President, ESBWR Licensing

PO Box 780 M/C A-65
Wilmington, NC 28402-0780
USA

T 910 819 6192
F 910 362 6192
rick.kingston@ge.com

MFN 10-073

Docket No. 52-010

March 3, 2010

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

Subject: **Changes to ESBWR DCD Chapters 16 and 16B Related to GEH Internal Corrective Actions**

The purpose of this letter is to submit markups identifying changes to ESBWR DCD Chapters 16 and 16B, which are the result of GEH internal review.

Change lists and the markups for Chapters 16 and 16B are provided in Enclosure 1. Changes not previously submitted are boxed on the change lists and markups. The changes identified on these markups will be incorporated into ESBWR DCD Revision 7.

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

Sincerely,

Richard E. Kingston
Vice President, ESBWR Licensing

Enclosure:

1. ESBWR DCD, Chapters 16 and 16B Change Lists and Markups

cc: AE Cabbage USNRC (with enclosure)
JG Head GEH (with enclosure)
DH Hinds GEH (with enclosure)
JD Friday GEH (with enclosure)
eDRFSection 114-0775

Enclosure 1

MFN 10-073

ESBWR DCD, Chapters 16 and 16B

Change Lists and Markups

ESBWR DCD Chapter 16
26A6642BR Revision 6 to Revision 7 Change List

Item	Location	Description of Change
1	16.00, Table 16.0-1-A	Deleted COL item 3.3.3.2-1 in accordance with RAI 16.2-190 (MFN 09-665).
2	16.00, Table 16.0-1-A	Deleted COL item 5.6.5-1 in accordance with RAI 16.2-190 (MFN 09-665).
3	16.00 TOC	Where applicable, updated TOC information consistent with changes to the associated LCOs. The DCD Chapter 16 markups reflecting these changes were submitted in MFN 10-073.
4	16.03.03.03.02	Updated PAM specification in accordance with RAI 16.2-190 (MFN 09-665).
5	16.03.06.03.01, SR 3.6.3.1.5	Revised SR Frequency from “60 Months” to “24 Months” in accordance with RAI 16.2-50 S02 (MFN 09-638).
6	16.03.07.01	Updated specification in accordance with RAI 16.2-189 (MFN 09-672).
7	16.03.08.03, Action B.2	Changed inequality symbol from “<” to “≤” to be logically consistent with Action C.2 and SR 3.8.3.1. The DCD Chapter 16 markup reflecting this change was submitted in MFN 10-073.
8	16.04.03.01	Changed the value of k-infinity in Specifications 4.3.1.1.a and 4.3.1.2.a from 1.35 to 1.32; and deleted “beginning-of-life (BOL)” in Specification 4.3.1.2.a in accordance with RAI 9.1-129 (MFN 09-723).
9	16.04.03.01.02	Added Specification 4.3.1.2.c to describe storage spacing of new fuel assemblies in accordance with RAI 9.1-129 (MFN 09-723).
10	16.05.02	Changed title in heading from “High Radiation Area” to “Organization.” The DCD Chapter 16 markup reflecting this change was submitted in MFN 10-073.
11	16.05.03	Changed title in heading from “High Radiation Area” to “Unit Staff Qualifications.” Editorial correction. The DCD Chapter 16 markup reflecting this change was submitted in MFN 10-073.
12	16.05.05.06	Changed “Branch Technical Position (BTP) ETSB 11-5,” to “Branch Technical Position (BTP) 11-5,” and also revised the title to be consistent with the Revision 3 – March 2007 version of this BTP. The DCD Chapter 16 markup reflecting this change was submitted in MFN 10-072.
13	16.05.05.11.b	Changed title for LTR NEDE-33304P from “GEH ABWR/ESBWR Setpoint Methodology” to “GEH ESBWR Setpoint Methodology” in accordance with RAI 7.1-141 (MFN 09-775).

ESBWR DCD Chapter 16
26A6642BR Revision 6 to Revision 7 Change List

Item	Location	Description of Change
14	16.05.05.12.e	Added the words “less the amount designated for ingress and egress” after “DBA consequences” in the 3 rd sentence in accordance with RAI 6.4-22 S01 (MFN 09-759 Supp 1).
15	16.05.05.14	Added PAM Instrumentation Program in accordance with RAI 16.2-190 (MFN 09-665).
16	16.05.06.03.b, Reference 7	Reference for NEDE-33083P Supplement 3 was updated to indicate latest revision submitted in MFN 09-589. The DCD Chapter 16 markup reflecting this reference update was submitted in MFN 10-072.
17	16.05.06.04	Relocated opening and closing brackets for COL item 5.6.4-1 to provide for renumbering specification 5.6.5 to become 5.6.4 in the event that the PTLR option is not adopted by a COL applicant. The DCD Chapter 16 markup reflecting this change was submitted in MFN 10-073.
18	16.05.06.05	Revised Post-Accident Monitoring Report in accordance with RAI 16.2-190 (MFN 09-665).

TABLE OF CONTENTS / REVISION SUMMARY

Revision - Date

1.0	USE AND APPLICATION	
1.1	Definitions.....	6.0, 08/31/09
1.2	Logical Connectors.....	2.0, 12/22/06
1.3	Completion Times	2.0, 12/22/06
1.4	Frequency	2.0, 12/22/06
2.0	SAFETY LIMITS (SLs)	5.0, 05/31/08
2.1	SLs	
2.2	SL Violations	
3.0	LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY	2.0, 12/22/06
3.0	SURVEILLANCE REQUIREMENT (SR) APPLICABILITY.....	2.0, 12/22/06
3.1	REACTIVITY CONTROL SYSTEMS	
3.1.1	SHUTDOWN MARGIN (SDM).....	5.0, 05/31/08
3.1.2	Reactivity Anomalies	2.0, 12/22/06
3.1.3	Control Rod OPERABILITY	6.0, 08/31/09
3.1.4	Control Rod Scram Times	6.0, 08/31/09
3.1.5	Control Rod Scram Accumulators	6.0, 08/31/09
3.1.6	Rod Pattern Control.....	6.0, 08/31/09
3.1.7	Standby Liquid Control (SLC) System.....	6.0, 08/31/09
3.2	POWER DISTRIBUTION LIMITS	
3.2.1	LINEAR HEAT GENERATION RATE (LHGR)	3.0, 02/22/07
3.2.2	MINIMUM CRITICAL POWER RATIO (MCPR)	3.0, 02/22/07
3.3	INSTRUMENTATION	
3.3.1.1	Reactor Protection System (RPS) Instrumentation	6.0, 08/31/09
3.3.1.2	Reactor Protection System (RPS) Actuation.....	6.0, 08/31/09
3.3.1.3	Reactor Protection System (RPS) Manual Actuation	6.0, 08/31/09
3.3.1.4	Neutron Monitoring System (NMS) Instrumentation.....	6.0, 08/31/09
3.3.1.5	Neutron Monitoring System (NMS) Automatic Actuation.....	6.0, 08/31/09
3.3.1.6	Startup Range Neutron Monitor (SRNM) Instrumentation.....	6.0, 08/31/09
3.3.2.1	Control Rod Block Instrumentation.....	6.0, 08/31/09
3.3.3.1	Remote Shutdown System.....	5.0, 05/31/08
3.3.3.2	Post-Accident Monitoring (PAM) Instrumentation.....	6.0, 08/31/09, 03/10/10
3.3.4.1	Reactor Coolant System (RCS) Leakage Detection Instrumentation.....	6.0, 08/31/09
3.3.5.1	Emergency Core Cooling System (ECCS) Instrumentation	6.0, 08/31/09
3.3.5.2	Emergency Core Cooling System (ECCS) Actuation	6.0, 08/31/09
3.3.5.3	Isolation Condenser System (ICS) Instrumentation	6.0, 08/31/09
3.3.5.4	Isolation Condenser System (ICS) Actuation	6.0, 08/31/09
3.3.6.1	Main Steam Isolation Valve (MSIV) Instrumentation	6.0, 08/31/09
3.3.6.2	Main Steam Isolation Valve (MSIV) Actuation.....	6.0, 08/31/09
3.3.6.3	Isolation Instrumentation	6.0, 08/31/09
3.3.6.4	Isolation Actuation	6.0, 08/31/09

TABLE OF CONTENTS / REVISION SUMMARY

Revision - Date

3.3	INSTRUMENTATION (continued)	
3.3.7.1	Control Room Habitability Area (CRHA) Heating, Ventilation, and Air Conditioning (HVAC) Subsystem (CRHAVS) Instrumentation	6.0, 08/31/09
3.3.7.2	Control Room Habitability Area (CRHA) Heating, Ventilation, and Air Conditioning (HVAC) Subsystem (CRHAVS) Actuation	6.0, 08/31/09
3.3.8.1	Diverse Protection System (DPS)	6.0, 08/31/09
3.4	REACTOR COOLANT SYSTEM (RCS)	
3.4.1	Safety Relief Valves (SRVs).....	6.0, 08/31/09
3.4.2	RCS Operational LEAKAGE.....	2.0, 12/22/06
3.4.3	RCS Specific Activity	6.0, 08/31/09
3.4.4	RCS Pressure and Temperature (P/T) Limits	6.0, 08/31/09
3.4.5	Reactor Steam Dome Pressure	5.0, 05/31/08
3.5	EMERGENCY CORE COOLING SYSTEMS (ECCS)	
3.5.1	Automatic Depressurization System (ADS) - Operating.....	6.0, 08/31/09
3.5.2	Gravity-Driven Cooling System (GDCCS) - Operating.....	6.0, 08/31/09
3.5.3	Gravity-Driven Cooling System (GDCCS) - Shutdown	6.0, 08/31/09
3.5.4	Isolation Condenser System (ICS) - Operating	6.0, 08/31/09
3.5.5	Isolation Condenser System (ICS) - Shutdown	6.0, 08/31/09
3.6	CONTAINMENT SYSTEMS	
3.6.1.1	Containment	6.0, 08/31/09
3.6.1.2	Containment Air Lock	5.0, 05/31/08
3.6.1.3	Containment Isolation Valves (CIVs).....	6.0, 08/31/09
3.6.1.4	Drywell Pressure	6.0, 08/31/09
3.6.1.5	Drywell Air Temperature.....	5.0, 05/31/08
3.6.1.6	Wetwell-to-Drywell Vacuum Breakers	5.0, 05/31/08
3.6.1.7	Passive Containment Cooling System (PCCS).....	4.0, 09/28/07
3.6.1.8	Containment Oxygen Concentration	5.0, 05/31/08
3.6.2.1	Suppression Pool Average Temperature	5.0, 05/31/08
3.6.2.2	Suppression Pool Water Level	6.0, 08/31/09
3.6.3.1	Reactor Building (Contaminated Area Ventilation Subsystem (CONAVS) Area)	67.0, 08/31/09 03/10/10
3.7	PLANT SYSTEMS	
3.7.1	Isolation Condenser/Passive Containment Cooling System (IC/PCCS) Pools	67.0, 08/31/09 03/10/10
3.7.2	Control Room Habitability Area (CRHA) Heating, Ventilation, and Air Conditioning (HVAC) Subsystem (CRHAVS).....	6.0, 08/31/09
3.7.3	Main Condenser Offgas	5.0, 05/31/08
3.7.4	Main Turbine Bypass System.....	3.0, 02/22/07
3.7.5	Fuel Pool Water Level	2.0, 12/22/06
3.7.6	Selected Control Rod Run-In (SCRRI) and Select Rod Insert (SRI) Functions.....	6.0, 08/31/09

TABLE OF CONTENTS / REVISION SUMMARY

Revision - Date

3.8	ELECTRICAL POWER SYSTEMS	
3.8.1	DC Sources - Operating	6.0, 08/31/09
3.8.2	DC Sources - Shutdown	6.0, 08/31/09
3.8.3	Battery Parameters	67.0, 08/31/09 03/10/10
3.8.4	Inverters - Operating	6.0, 08/31/09
3.8.5	Inverters - Shutdown	6.0, 08/31/09
3.8.6	Distribution Systems - Operating.....	6.0, 08/31/09
3.8.7	Distribution Systems - Shutdown.....	6.0, 08/31/09
3.9	REFUELING OPERATIONS	
3.9.1	Refueling Equipment Interlocks.....	4.0, 09/28/07
3.9.2	Refuel Position One-Rod/Rod-Pair-Out Interlock	1.0, 02/28/06
3.9.3	Control Rod Position	1.0, 02/28/06
3.9.4	Control Rod Position Indication	1.0, 02/28/06
3.9.5	Control Rod OPERABILITY - Refueling	6.0, 08/31/09
3.9.6	Reactor Pressure Vessel (RPV) Water Level.....	6.0, 08/31/09
3.9.7	Decay Time	1.0, 02/28/06
3.10	SPECIAL OPERATIONS	
3.10.1	Inservice Leak and Hydrostatic Testing Operation.....	5.0, 05/31/08
3.10.2	Reactor Mode Switch Interlock Testing.....	1.0, 02/28/06
3.10.3	Control Rod Withdrawal - Hot / Stable Shutdown.....	6.0, 08/31/09
3.10.4	Control Rod Withdrawal - Cold Shutdown	6.0, 08/31/09
3.10.5	Control Rod Drive (CRD) Removal - Refueling	5.0, 05/31/08
3.10.6	Multiple Control Rod Withdrawal - Refueling.....	1.0, 02/28/06
3.10.7	Control Rod Testing - Operating.....	6.0, 08/31/09
3.10.8	SHUTDOWN MARGIN (SDM) Test - Refueling	6.0, 08/31/09
3.10.9	Oxygen Concentration - Startup Test Program	5.0, 05/31/08
3.10.10	Oscillation Power Range Monitor (OPRM) - Initial Cycle	5.0, 05/31/08
4.0	DESIGN FEATURES	67.0, 08/31/09 03/10/10
4.1	Site Location	
4.2	Reactor Core	
4.3	Fuel Storage	
5.0	ADMINISTRATIVE CONTROLS	
5.1	Responsibility	3.0, 02/22/07
5.2	Organization	67.0, 08/31/09 03/10/10
5.3	Unit Staff Qualifications	57.0, 05/31/08 03/10/10
5.4	Procedures	5.0, 05/31/08
5.5	Programs and Manuals	67.0, 08/31/09 03/10/10
5.6	Reporting Requirements	67.0, 08/31/09 03/10/10
5.7	High Radiation Area	6.0, 08/31/09

3.8 ELECTRICAL POWER SYSTEMS

3.8.3 Battery Parameters

LCO 3.8.3 Battery parameters shall be within limits.

APPLICABILITY: When associated DC Sources are required to be OPERABLE.

ACTIONS

- NOTE -

Separate Condition entry allowed for each battery.

	CONDITION	REQUIRED ACTION	COMPLETION TIME
COL 16.0-1-A 3.8.3-3	A. One or two batteries on one required division with one or more battery cells float voltage < [2.09] V.	A.1 Perform SR 3.8.1.1. <u>AND</u> A.2 Perform SR 3.8.3.1. <u>AND</u> A.3 Restore affected cell voltage ≥ [2.09] V.	2 hours 2 hours 24 hours
COL 16.0-1-A 3.8.3-1	B. One battery on one required division with [float current > 30 amps].	B.1 Perform SR 3.8.1.1. <u>AND</u> B.2 Restore battery [float current ≤ 30 amps].	2 hours 24 hours
COL 16.0-1-A 3.8.3-1	C. Two batteries on one required division with [float current > 30 amps].	C.1 Perform SR 3.8.1.1. <u>AND</u> C.2 Restore one battery [float current ≤ 30 amps].	2 hours 8 hours

5.0 ADMINISTRATIVE CONTROLS

5.2 Organization

5.2.1 Onsite and Offsite Organizations

Onsite and offsite organizations shall be established for unit operation and corporate management, respectively. The onsite and offsite organizations shall include the positions for activities affecting safety of the nuclear power plant.

- a. Lines of authority, responsibility, and communication shall be defined and established throughout highest management levels, intermediate levels, and all operating organization positions. These relationships shall be documented and updated, as appropriate, in organization charts, functional descriptions of departmental responsibilities and relationships, and job descriptions for key personnel positions, or in equivalent forms of documentation. These requirements including the plant-specific titles of those personnel fulfilling the responsibilities of the positions delineated in these Technical Specifications shall be documented in the FSAR;
- b. The plant manager shall be responsible for overall safe operation of the plant and shall have control over those onsite activities necessary for safe operation and maintenance of the plant;
- c. A specified corporate officer shall have corporate responsibility for overall plant nuclear safety and shall take any measures needed to ensure acceptable performance of the staff in operating, maintaining, and providing technical support to the plant to ensure nuclear safety; and
- d. The individuals who train the operating staff, carry out health physics, or perform quality assurance functions may report to the appropriate onsite manager; however, these individuals shall have sufficient organizational freedom to ensure their independence from operating pressures.

5.2.2 Unit Staff

The unit staff organization shall include the following:

COL 16.0-1-A
5.2.2-1

- a. A non-licensed operator shall be assigned to each reactor containing fuel and an additional non-licensed operator shall be assigned for each control room from which a reactor is operating in MODE 1, 2, 3, or 4. [With both units shutdown or defueled, a total of three non-licensed operators is required for the two units.]

5.0 ADMINISTRATIVE CONTROLS

5.3 Unit Staff Qualifications

- COL 16.0-1-A
5.3.1-1
- 5.3.1 Each member of the unit staff shall meet or exceed the minimum qualifications of [Regulatory Guide 1.8, Revision 3, 2000, or more recent revisions, or ANSI Standard acceptable to the NRC staff]. [The staff not covered by Regulatory Guide 1.8 shall meet or exceed the minimum qualifications of Regulations, Regulatory Guides, or ANSI Standards acceptable to NRC staff].
- 5.3.2 For the purpose of 10 CFR 55.4, a licensed Senior Reactor Operator (SRO) and a licensed Reactor Operator (RO) are those individuals who, in addition to meeting the requirements of Specification 5.3.1, perform the functions described in 10 CFR 50.54(m).
-
-

5.6 Reporting Requirements

5.6.3 CORE OPERATING LIMITS REPORT (COLR) (continued)

- d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

[5.6.4]

COL 16.0-1-A
5.6.4-1

Reactor Coolant System (RCS) PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR)

- a. RCS pressure and temperature limits for heatup, cooldown, low temperature operation, criticality, and hydrostatic testing as well as heatup and cooldown rates shall be established and documented in the PTLR for the following:

LCO 3.4.4, "RCS Pressure and Temperature (P/T) Limits."

- b. The analytical methods used to determine the RCS pressure and temperature limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

[Identify the Topical Report(s) by number and title or identify the NRC Safety Evaluation for a plant specific methodology by NRC letter and date. The PTLR will contain the complete identification for each of the TS referenced Topical Reports used to prepare the PTLR (i.e., report number, title, revision, date, and any supplements).]

- c. The PTLR shall be provided to the NRC upon issuance for each reactor vessel fluence period and for any revision or supplement thereto.}]

[5.6.5]

COL 16.0-1-A
5.6.5-1

Post-Accident Monitoring Report

When a Special Report is required by Condition B or C of LCO 3.3.3.2, "Post Accident Monitoring (PAM) Instrumentation," a report shall be submitted within the following 14 days. The report shall outline the preplanned alternate method of monitoring, the cause of the inoperability, and the plans and schedule for restoring the instrumentation channels of the Function to OPERABLE status.}]

ESBWR DCD Chapter 16B

26A6642BT Revision 6 to Revision 7 Change List

Item	Location	Description of Change
1	16B.00 TOC	Where applicable, updated TOC information consistent with changes to the associated LCOs. The DCD Chapter 16B markup reflecting this change was submitted in MFN 10-073.
2	16B.02.01.01, Reference 2	Changed Reference 2 from NEDC-32851P-A to NEDC-33237P in accordance with RAI 16.2-191 (MFN 09-766).
3	16B.03.03.03.02	Updated PAM specification bases in accordance with RAI 16.2-190 (MFN 09-665).
4	16B.03.03.03.02, References	Revised title for Reference 1, consistent with the title for Revision 4 of Regulatory Guide 1.97. The DCD Chapter 16B markup reflecting this change was submitted in MFN 10-072.
5	16B.03.03.05.01, SR 3.3.5.1.2	Deleted language that credited the self-diagnostic design feature to help justify the SR frequency in accordance with RAI 16.2-145 Supplement 2 (MFN 09-519).
6	16B.03.03.05.02, Function 3. GDCS Equalizing Lines	Changed “23 feet” to “23.0 feet” to provide significant figures, consistent with the other occurrences throughout the DCD. The DCD Chapter 16B markup reflecting this change was submitted in MFN 10-073.
7	16B.03.03.05.03, SR 3.3.5.3.4	Changed “...conducted on a 24-month on a...” to “...conducted on a 24-month...” The DCD Chapter 16B markup reflecting this change was submitted in MFN 10-073.
8	16B.03.03.06.01, Function 3. Main Steam Line Pressure - Low	Changed “55°C/hr” to “55.6°C/hr” to provide significant figures, consistent with the other occurrences throughout the DCD. Minor editorial changes to the surrounding text are also included. The DCD Chapter 16B markup reflecting this change was submitted in MFN 10-072.
9	16B.03.03.06.03, References	Reference 3 for NEDO-33201 was updated to indicate latest revision submitted in MFN 07-237 Supplement 6. The DCD Chapter 16B markup reflecting this reference update was submitted in MFN 10-073.
10	16B.03.03.06.04, References	Reference 3 for NEDO-33201 was updated to indicate latest revision submitted in MFN 07-237 Supplement 6. The DCD Chapter 16B markup reflecting this reference update was submitted in MFN 10-073.
11	16B.03.03.08.01, Background	Revised description of IC/PCCS pool cross-connect valves in accordance with RAI 16.2-189 (MFN 09-672) and RAI 19.5-21 (MFN-09-791).
12	16B.03.04.04, References	Changed Reference 3 from “ASTM E 185-02” to “ASTM E 185-82,” consistent with DCD Subsection 5.3.1.5 and 10 CFR 50, Appendix H. The DCD Chapter 16B markup reflecting this change was submitted in MFN 10-072.

ESBWR DCD Chapter 16B

26A6642BT Revision 6 to Revision 7 Change List

Item	Location	Description of Change
13	16B.03.05.05, References	Reference 2 for NEDO-33201 was updated to indicate latest revision submitted in MFN 07-237 Supplement 6. The DCD Chapter 16B markup reflecting this reference update was submitted in MFN 10-073.
14	16B.03.06.03.01, SR 3.6.3.1.5	Revised SR Frequency from "60 Months" to "24 Months" in accordance with RAI 16.2-50 S02 (MFN 09-638).
15	16B.03.07.01, Background, LCO, Actions, and SRs	Revised in accordance with RAI 16.2-189 (MFN-09-672) and RAI 19.5-21 (MFN-09-791).
16	16B.03.07.03, ASA	Changed "...well within the acceptance criterion is 25 mSv..." to "...well within the acceptance criterion of 25 mSv..." The DCD Chapter 16B markup reflecting this change was submitted in MFN 10-073.
17	16B.03.08.03, SR 3.8.3.4	Changed "15°C" to "16°C," consistent with DCD Table 8.3-3, Note 3. The DCD Chapter 16B markup reflecting this change was submitted in MFN 10-073.
18	16B.03.09.02, SR 3.9.2.2	Changed "Therefore, SR 3.9.2.1 has been modified by a Note..." to "Therefore, SR 3.9.2.2 has been modified by a Note..." The DCD Chapter 16B markup reflecting this change was submitted in MFN 10-073.

TABLE OF CONTENTS / REVISION SUMMARY

Revision - Date

B 2.0	SAFETY LIMITS (SLs)	
B 2.1.1	Reactor Core SLs	67.0, 08/31/09 03/10/10
B 2.1.2	Reactor Coolant System (RCS) Pressure SL	5.0, 05/31/08
B 3.0	LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY	5.0, 05/31/08
B 3.0	SURVEILLANCE REQUIREMENT (SR) APPLICABILITY	6.0, 08/31/09
B 3.1	REACTIVITY CONTROL SYSTEMS	
B 3.1.1	SHUTDOWN MARGIN (SDM)	6.0, 08/31/09
B 3.1.2	Reactivity Anomalies	2.0, 12/22/06
B 3.1.3	Control Rod OPERABILITY	6.0, 08/31/09
B 3.1.4	Control Rod Scram Times	6.0, 08/31/09
B 3.1.5	Control Rod Scram Accumulators	6.0, 08/31/09
B 3.1.6	Rod Pattern Control	6.0, 08/31/09
B 3.1.7	Standby Liquid Control (SLC) System	6.0, 08/31/09
B 3.2	POWER DISTRIBUTION LIMITS	
B 3.2.1	LINEAR HEAT GENERATION RATE (LHGR)	6.0, 08/31/09
B 3.2.2	MINIMUM CRITICAL POWER RATIO (MCPR)	6.0, 08/31/09
B 3.3	INSTRUMENTATION	
B 3.3.1.1	Reactor Protection System (RPS) Instrumentation	6.0, 08/31/09
B 3.3.1.2	Reactor Protection System (RPS) Actuation	6.0, 08/31/09
B 3.3.1.3	Reactor Protection System (RPS) Manual Actuation	6.0, 08/31/09
B 3.3.1.4	Neutron Monitoring System (NMS) Instrumentation	6.0, 08/31/09
B 3.3.1.5	Neutron Monitoring System (NMS) Automatic Actuation	6.0, 08/31/09
B 3.3.1.6	Startup Range Neutron Monitor (SRNM) Instrumentation	6.0, 08/31/09
B 3.3.2.1	Control Rod Block Instrumentation	6.0, 08/31/09
B 3.3.3.1	Remote Shutdown System	6.0, 08/31/09
B 3.3.3.2	Post-Accident Monitoring (PAM) Instrumentation	57.0, 05/31/08 03/10/10
B 3.3.4.1	Reactor Coolant System (RCS) Leakage Detection Instrumentation	6.0, 08/31/09
B 3.3.5.1	Emergency Core Cooling System (ECCS) Instrumentation	67.0, 08/31/09 03/10/10
B 3.3.5.2	Emergency Core Cooling System (ECCS) Actuation	67.0, 08/31/09 03/10/10
B 3.3.5.3	Isolation Condenser System (ICS) Instrumentation	67.0, 08/31/09 03/10/10
B 3.3.5.4	Isolation Condenser System (ICS) Actuation	6.0, 08/31/09
B 3.3.6.1	Main Steam Isolation Valve (MSIV) Instrumentation	67.0, 08/31/09 03/10/10
B 3.3.6.2	Main Steam Isolation Valve (MSIV) Actuation	6.0, 08/31/09
B 3.3.6.3	Isolation Instrumentation	67.0, 08/31/09 03/10/10
B 3.3.6.4	Isolation Actuation	67.0, 08/31/09 03/10/10
B 3.3.7.1	Control Room Habitability Area (CRHA) Heating, Ventilation, and Air Conditioning (HVAC) Subsystem (CRHAVS) Instrumentation	6.0, 08/31/09
B 3.3.7.2	Control Room Habitability Area (CRHA) Heating, Ventilation, and Air Conditioning (HVAC) Subsystem (CRHAVS) Actuation	6.0, 08/31/09
B 3.3.8.1	Diverse Protection System (DPS)	67.0, 08/31/09 03/10/10

TABLE OF CONTENTS / REVISION SUMMARY

Revision - Date

B 3.4	REACTOR COOLANT SYSTEM (RCS)	
B 3.4.1	Safety Relief Valves (SRVs).....	6.0, 08/31/09
B 3.4.2	RCS Operational LEAKAGE.....	5.0, 05/31/08
B 3.4.3	RCS Specific Activity	5.0, 05/31/08
B 3.4.4	RCS Pressure and Temperature (P/T) Limits	67.0, 08/31/09 03/10/10
B 3.4.5	Reactor Steam Dome Pressure	5.0, 05/31/08
B 3.5	EMERGENCY CORE COOLING SYSTEMS (ECCS)	
B 3.5.1	Automatic Depressurization System (ADS) - Operating.....	6.0, 08/31/09
B 3.5.2	Gravity-Driven Cooling System (GDCCS) - Operating.....	6.0, 08/31/09
B 3.5.3	Gravity-Driven Cooling System (GDCCS) - Shutdown	6.0, 08/31/09
B 3.5.4	Isolation Condenser System (ICS) - Operating	6.0, 08/31/09
B 3.5.5	Isolation Condenser System (ICS) - Shutdown.....	67.0, 08/31/09 03/10/10
B 3.6	CONTAINMENT SYSTEMS	
B 3.6.1.1	Containment.....	6.0, 08/31/09
B 3.6.1.2	Containment Air Lock	6.0, 08/31/09
B 3.6.1.3	Containment Isolation Valves (CIVs).....	6.0, 08/31/09
B 3.6.1.4	Drywell Pressure	6.0, 08/31/09
B 3.6.1.5	Drywell Air Temperature.....	5.0, 05/31/08
B 3.6.1.6	Wetwell-to-Drywell Vacuum Breakers	6.0, 08/31/09
B 3.6.1.7	Passive Containment Cooling System (PCCS).....	6.0, 08/31/09
B 3.6.1.8	Containment Oxygen Concentration	5.0, 05/31/08
B 3.6.2.1	Suppression Pool Average Temperature	5.0, 05/31/08
B 3.6.2.2	Suppression Pool Water Level	6.0, 08/31/09
B 3.6.3.1	Reactor Building (Contaminated Area Ventilation Subsystem (CONAVS) Area)	67.0, 08/31/09 03/10/10
B 3.7	PLANT SYSTEMS	
B 3.7.1	Isolation Condenser/Passive Containment Cooling System (IC/PCCS) Pools	67.0, 08/31/09 03/10/10
B 3.7.2	Control Room Habitability Area (CRHA) Heating, Ventilation, and Air Conditioning (HVAC) Subsystem (CRHAVS).....	6.0, 08/31/09
B 3.7.3	Main Condenser Offgas	67.0, 08/31/09 03/10/10
B 3.7.4	Main Turbine Bypass System.....	6.0, 08/31/09
B 3.7.5	Fuel Pool Water Level	5.0, 05/31/08
B 3.7.6	Selected Control Rod Run-In (SCRRI) and Select Rod Insert (SRI) Functions.....	5.0, 05/31/08
B 3.8	ELECTRICAL POWER	
B 3.8.1	DC Sources - Operating	6.0, 08/31/09
B 3.8.2	DC Sources - Shutdown.....	6.0, 08/31/09
B 3.8.3	Battery Parameters	67.0, 08/31/09 03/10/10
B 3.8.4	Inverters - Operating	6.0, 08/31/09
B 3.8.5	Inverters - Shutdown	6.0, 08/31/09
B 3.8.6	Distribution Systems - Operating.....	6.0, 08/31/09
B 3.8.7	Distribution Systems - Shutdown.....	6.0, 08/31/09

TABLE OF CONTENTS / REVISION SUMMARY

Revision - Date

B 3.9	REFUELING OPERATIONS	
B 3.9.1	Refueling Equipment Interlocks.....	5.0, 05/31/08
B 3.9.2	Refuel Position One-Rod/Rod-Pair-Out Interlock.....	57.0, 05/31/08 03/10/10
B 3.9.3	Control Rod Position	1.0, 02/28/06
B 3.9.4	Control Rod Position Indication	5.0, 05/31/08
B 3.9.5	Control Rod OPERABILITY - Refueling	6.0, 08/31/09
B 3.9.6	Reactor Pressure Vessel (RPV) Water Level.....	6.0, 08/31/09
B 3.9.7	Decay Time	5.0, 05/31/08
B 3.10	SPECIAL OPERATIONS	
B 3.10.1	Inservice Leak and Hydrostatic Testing Operation.....	6.0, 08/31/09
B 3.10.2	Reactor Mode Switch Interlock Testing.....	6.0, 08/31/09
B 3.10.3	Control Rod Withdrawal - Hot / Stable Shutdown.....	5.0, 05/31/08
B 3.10.4	Control Rod Withdrawal - Cold Shutdown.....	6.0, 08/31/09
B 3.10.5	Control Rod Drive (CRD) Removal Refueling	5.0, 05/31/08
B 3.10.6	Multiple Control Rod Withdrawal - Refueling.....	1.0, 02/28/06
B 3.10.7	Control Rod Testing - Operating.....	6.0, 08/31/09
B 3.10.8	SHUTDOWN MARGIN (SDM) Test - Refueling	6.0, 08/31/09
B 3.10.9	Oxygen Concentration - Startup Test Program	5.0, 05/31/08
B 3.10.10	Oscillation Power Range Monitor (OPRM) - Initial Cycle	6.0, 08/31/09

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Cooling System (GDCS) - Operating.” GDCS injection line actuation is required to be OPERABLE in MODES 5 and 6, except with the buffer pool gate removed and water level ≥ 7.01 meters (23.0 feet) over the top of the reactor pressure vessel flange, consistent with the requirements of LCO 3.5.3, “Gravity-Driven Cooling System (GDCS) - Shutdown.” Three actuation divisions are required to be OPERABLE to ensure that no single actuation failure can preclude the actuation function.

3. GDCS Equalizing Lines

The GDCS equalizing line actuation divisions receive input from the following instrumentation: Reactor Vessel Level - Low, Level 1.0 signal sustained for 10 seconds and Reactor Vessel Level - Low, Level 0.5. GDCS equalizing line actuation is required to be OPERABLE in MODES 1, 2, 3, and 4, consistent with the requirements of LCO 3.5.2, “Gravity-Driven Cooling System (GDCS) - Operating.” GDCS equalizing line actuation is required to be OPERABLE in MODES 5 and 6, except with the buffer pool gate removed and water level ≥ 7.01 meters (23.0 feet) over the top of the reactor pressure vessel flange, consistent with the requirements of LCO 3.5.3, “Gravity-Driven Cooling System (GDCS) - Shutdown.” Three actuation divisions are required to be OPERABLE to ensure that no single actuation failure can preclude that actuation function.

4. Standby Liquid Control (SLC)

The SLC actuation divisions receive inputs from the Reactor Vessel Level - Low, Level 1.0 signal sustained for 10 seconds. SLC actuation is required to be OPERABLE in MODES 1, 2, 3, and 4 consistent with the requirements of LCO 3.1.7, “Standby Liquid Control (SLC) System.” Three actuation divisions are required to be OPERABLE to ensure that no single actuation failure can preclude that actuation function.

BASES

SURVEILLANCE REQUIREMENTS (continued)

ICS SYSTEM RESPONSE TIME tests are conducted on a 24-month ~~on a~~ STAGGERED TEST BASIS for three channels. The Frequency of 24 months on a STAGGERED TEST BASIS ensures that each required channel is alternately tested. The 24-month test Frequency is consistent with the typical refueling cycle and with operating experience that shows that random failures of instrumentation components causing serious response time degradation, but not channel failure, are infrequent.

- REFERENCES
1. Chapter 15.
 2. Section 15.2.
-
-

BASES

SURVEILLANCE REQUIREMENTS (continued)

COL 16.0-1-A
3.3.6.3-2

[However, some sensors are allowed to be excluded from specific ISOLATION SYSTEM RESPONSE TIME measurement if the conditions of Reference XX are satisfied. If these conditions are satisfied, sensor response time may be allocated based on either assumed design sensor response time or the manufacturer's stated design response time. When the requirements of Reference XX are not satisfied, sensor response time must be measured. Furthermore, measurement of the instrument loops response time for some Functions is not required if the conditions of Reference XX are satisfied.]

ISOLATION SYSTEM RESPONSE TIME tests are conducted on a 24-month STAGGERED TEST BASIS for three channels. The Frequency of 24 months on a STAGGERED TEST BASIS ensures that the required channels associated with each division are alternately tested. The 24-month test Frequency is consistent with the refueling cycle and has with operating experience that shows that random failures of instrumentation components causing serious response time degradation, but not channel failure, are infrequent.

REFERENCES

1. Section 6.2.
 2. Chapter 15.
 3. NEDO-33201, ESBWR Certification Probabilistic Risk Assessment, Revision 45, ~~June 2009~~[February 2010](#).
 4. Subsection 15.4.4.
 5. Subsection 15.4.9.
 6. Section 15.2.
-
-

BASES

SURVEILLANCE REQUIREMENTS (continued)

ISOLATION SYSTEM RESPONSE TIME tests are conducted on a 24-month STAGGERED TEST BASIS for three divisions. The Frequency of 24 months on a STAGGERED TEST BASIS ensures that the channels associated with each required division are alternately tested. The 24-month test Frequency is consistent with the refueling cycle and with operating experience that shows that random failures of instrumentation components causing serious response time degradation, but not channel failure, are infrequent.

SR 3.3.6.4.3

A system functional test is performed to verify that the mechanical portions of the actuation function operate as designed when demanded. This includes verifying that RWCU/SDC isolation valves, feedwater isolation valves, and HP CRD makeup water injection isolation valves automatically close. The LOGIC SYSTEM FUNCTIONAL TEST in SR 3.3.6.4.1 and LCO 3.3.8.1 (for RWCU/SDC isolation valves) overlaps this SR to provide complete testing of the safety function.

The 24-month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power.

REFERENCES

1. Section 6.2.
 2. Chapter 15.
 3. NEDO-33201, ESBWR Certification Probabilistic Risk Assessment, Revision 45, ~~June 2009~~ [February 2010](#).
 4. Section 15.2.
-
-

BASES

SURVEILLANCE REQUIREMENTS (continued)

acceptable because the manual isolation valves between the IC/PCCS pool and the ICS subcompartments are locked open and maintained in their correct position under administrative controls.

SR 3.5.5.5

This SR requires verification every 24 months that the ICS actuates on an actual or simulated automatic initiation signal. The ICS is required to actuate automatically to perform its design function. This Surveillance test verifies that the automatic initiation logic will cause the ICS to operate as designed when a system initiation signal (actual or simulated) is received. The LOGIC SYSTEM FUNCTIONAL TEST performed in LCO 3.3.5.4 overlaps this Surveillance to provide complete testing of the assumed ICS function.

The 24-month Frequency for performing this SR is acceptable based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the SR were performed with the reactor at power.

REFERENCES

1. Section 5.4.6.
 2. NEDO-33201, ESBWR Certification Probabilistic Risk Assessment, Section 16.4.1, Revision ~~45, June 2009~~ [February 2010](#).
-

B 3.7 PLANT SYSTEMS

B 3.7.3 Main Condenser Offgas

BASES

BACKGROUND	<p>During unit operation, steam from the low-pressure turbine is exhausted directly into the condenser. Air and noncondensable gases are collected in the condenser, and then exhausted through the steam jet air ejectors (SJAEs) to the Main Condenser Offgas System. The offgas from the main condenser normally includes radioactive gases.</p> <p>The Main Condenser Offgas System has been incorporated into the unit design to reduce the gaseous radwaste emission. This system uses a catalytic recombiner to recombine radiolytically dissociated hydrogen and oxygen. The gaseous mixture is cooled by the offgas condenser, and the water and condensibles are stripped out by the offgas condenser and moisture separator. The radioactivity of the remaining gaseous mixture (i.e., the offgas recombiner effluent) is monitored downstream of the moisture separator prior to entering the holdup line.</p>
APPLICABLE SAFETY ANALYSES	<p>The main condenser offgas gross gamma activity rate is an initial condition of the Waste Gas System leak or failure event as discussed in Sections 11.3.7 and 15.0.3.4.7 (Refs. 1 and 2, respectively). The analysis assumes inadvertent operator action with the bypass of the delay charcoal beds leading to a direct release of radioactive noble gases from the Main Condenser Offgas System. The gross gamma activity rate is controlled to ensure that during the event, the calculated offsite doses using the annual average atmospheric dispersion factor will be well within the acceptance criterion <u>is of 25 mSv (2.5 rem) TEDE (Ref. 3).</u></p> <p>The main condenser offgas limits satisfy Criterion 2 of 10 CFR 50.36(c)(2)(ii).</p>
LCO	<p>To ensure compliance with the assumptions of the Waste Gas System leak or failure event (Refs. 1 and 2), the fission product release rate should be consistent with a noble gas release to the reactor coolant of 100 $\mu\text{Ci}/\text{second}/\text{MWt}$ after decay of 30 minutes. The LCO is established consistent with this requirement ($4500 \text{ MWt} \times 100 \mu\text{Ci}/\text{second}/\text{MWt} = 450 \text{ mCi}/\text{second}$).</p>

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.3.3

The limit specified for electrolyte level ensures that the plates suffer no physical damage and maintains adequate electron transfer capability. The Frequency is consistent with IEEE-450 (Ref. 4).

SR 3.8.3.4

COL 16.0-1-A
3.8.3-3

This Surveillance verifies that the required battery pilot cell electrolyte temperature is greater than or equal to the design minimum temperature (i.e., [165°C (60°F)]) to assure the battery can provide the required current and voltage to meet the design requirements. Temperatures lower than assumed in battery sizing calculations reduce battery capacity. The Frequency is consistent with IEEE-450 (Ref. 4).

SR 3.8.3.6

A battery performance discharge test is a test of constant current capacity of a battery, normally done in the as-found condition, after having been in service, to detect any change in the capacity determined by the acceptance test. The test is intended to determine overall battery degradation due to age and usage.

The acceptance criteria for this Surveillance are consistent with IEEE-450 (Ref. 4) and IEEE-485 (Ref. 5). These references recommend that the battery be replaced if its capacity is below 80% of the manufacturer's rating. A capacity of 80% shows that the battery rate of deterioration is increasing, even if there is ample capacity to meet the load requirements. The battery is sized to meet the assumed duty cycle loads when the battery design capacity reaches this [80%] limit.

COL 16.0-1-A
3.8.3-4

The Surveillance Frequency for this test is normally 60 months. If the battery shows degradation, or if the battery has reached 85% of its expected life and capacity is < 100% of the manufacturer's rating, the Surveillance Frequency is reduced to 12 months. However, if the battery shows no degradation but has reached 85% of its expected life, the Surveillance Frequency is only reduced to 24 months for batteries that retain capacity ≥ 100% of the manufacturer's rating. Degradation is indicated, according to IEEE-450 (Ref. 4), when the battery capacity drops by more than 10% relative to its capacity on the previous

Refuel Position One-Rod/Rod-Pair-Out Interlock
B 3.9.2BASES

SURVEILLANCE REQUIREMENTS (continued)

To perform the required testing, the applicable condition must be entered (i.e., a control rod must be withdrawn from its full-in position). Therefore, SR 3.9.2.4² has been modified by a Note that states the CHANNEL FUNCTIONAL TEST is only required to be performed within 1 hour after any control rod is withdrawn.

- REFERENCES
1. 10 CFR 50, Appendix A, GDC 26.
 2. Section 7.7.2.
 3. Section 15.3.7.
-
-