ENCLOSURE 1

MFN 05-117

DCD Markups to Reflect Response to Generic Letter 96-05, Generic Letter 88-01, and Generic Letter 96-02

Conditional Release – pending closure of design verifications

5.3.1.4 Special Controls for Ferritic and Austenitic Stainless Steels

Regulatory Guide 1.31: Control of Stainless Steel Welding

Controls on stainless steel welding are discussed in Subsection 5.2.3.4.2. Consistent with Generic letter 88-01 and NUREG-0313 Rev. 2, control of weld filler metal ferrite content is described in Paragraph 5.2.3.4.1.

Regulatory Guide 1.34: Control of Electroslag Weld Properties

The requirements of this regulatory guide are not applicable to the ESBWR vessel, because electroslag welding is not employed in structural welds of low alloy steel. Electroslag welding is not used except for cladding.

Regulatory Guide 1.43: Control of Stainless Steel Weld Cladding of Low Alloy Steel Components

Regulatory Guide 1.43 is concerned with cracking of low alloy steels underneath stainless steel weld deposited cladding. The requirements of this Regulatory Guide are not applicable to the ESBWR vessel because the RPV is constructed from low alloy steel forgings or plates conforming to SA-508, Grade 3 or SA-533, Type B, which are produced to fine grain practice. Therefore, underclad cracking is not a concern, and the requirements of this regulatory guide are not applicable.

Regulatory Guide 1.44: Control of the Use of Sensitized Stainless Steel

Sensitization of stainless steel is controlled by the use of service proven low carbon materials and by use of appropriate design and processing steps, including solution heat treatment, control of welding heat input, control of heat treatment during fabrication and control of stresses. As more completely described in Paragraph 5.2.3.4.1, these controls conform to the guidance of Generic letter 88-01 and NUREG-0313 Rev. 2.

9.1.5 Overhead Heavy Load Handling Systems (OHLHS)

9.1.5.1 Design Bases

The objective for the OHLHS is to control the movement of heavy loads in order to ensure the safe handling of heavy loads, to reduce the potential for uncontrolled movement of heavy loads or load drops, and to limit the consequences of dropping a heavy load.

9.1.5.2 General

The equipment described in this subsection covers items considered as heavy loads that are handled under conditions that mandate critical handling compliance.

Critical load handling conditions relate to the moving of loads, the use of equipment and the performance of operations, which, by inadvertent operation or equipment malfunctions, either separately or in combination, could cause:

- A release of radioactivity
- A criticality accident
- The inability to cool fuel within the reactor vessel or within the Spent Fuel Pool
- Prevent a safe shutdown of the reactor

This includes risk assessments of spent fuel and of storage pool levels, cooling of fuel pool water, or new fuel criticality. Critical load handling therefore includes all components and equipment used for moving loads weighing more than one fuel assembly with its associated handling devices.

The Reactor and Fuel Building cranes provide a safe and effective means for transporting heavy loads including the handling of new and spent fuel, plant equipment, service tools and fuel casks. Safe handling includes design considerations for maintaining occupational radiation exposure as low as practicable during transportation and handling.

Where applicable, the appropriate seismic category, safety classification, ASME, ANSI, industrial and electrical codes have been identified (refer to Tables 9.1-4 and 9.1-5). The designs conform to the relevant requirements of General Design Criteria 2, 4, and 61 of 10 CFR 50, Appendix A.

The lifting capacity of each crane or hoist is designed to at least the maximum actual or anticipated weight of equipment and handling devices in a given area serviced. The hoists, cranes, or other lifting devices comply with the requirements of NRC Bulletin 96-02, NUREG-0554, ANSI N14.6, ANSI B30.9, ANSI B30.10 and NUREG-0612 Subsection 5.1.1(4) or 5.1.1(5). Cranes and hoists are also designed to criteria and guidelines of NUREG-0612 Subsection 5.1.1(7), ANSI B30.2 and CMAA-70 specifications for electrical overhead traveling cranes, including ANSI B30.11, and ANSI B30.16 as applicable.

9.1.6.2 COL Licensee Information

Dynamic and Impact Analyses of New Fuel Storage Racks

The COL licensee shall provide the NRC confirmatory dynamic and impact analyses of the new fuel storage racks. Refer to Subsection 9.1.1.1, under subheading Dynamic and Impact Analysis.

The COL licensee shall confirm the fuel storage racks are designed to provide sufficient natural convection coolant flow through the rack and fuel to remove decay heat without reaching excessive water temperatures (100°C; 212°F).

Fuel Handling Procedural Control

The COL licensee shall develop fuel handling procedures and administrative controls.

Handling of Heavy Loads

The COL licensee shall provide the NRC the following for confirmatory review:

- A listing of all heavy loads, heavy load handling equipment, and their associated heavy load attributes.
- Heavy load handling safe load paths and routing plans including descriptions of automatic and manual interlocks and safety devices and procedures to assure safe load path compliance.
- Heavy load handling equipment maintenance manuals and procedures.
- Heavy load handling equipment inspection and test plans.
- Heavy load personnel qualifications, training, and control programs.
- QA programs to monitor, implement, and assure compliance to heavy load handling operations.

For Strongbacks used to handle heavy loads in conjunction with the overhead crane, testing programs shall be developed for compliance with ANSI-14.6.

3.9.6 In-Service Testing of Pumps and Valves

This subsection considers in-service testing of certain safety-related pumps and valves typically designated as Class 1, 2, or 3 under the Code as discussed in SRP 3.9.6 draft R3. Other pumps and valves not categorized as Code Class 1, 2, or 3 may be included if they are considered to be safety related. The in-service testing of pumps and valves is in conformance with the relevant requirements of 10 CFR Part 50, Appendix A, General Design Criteria 1, 37, 40, 43, 46, 54, and 10 CFR 50.55a(f). The relevant requirements are as follows:

(1) GDC 1, as it relates to testing safety-related components to quality standards commensurate with the importance of the safety functions to be performed.

(2) GDC 37, as it relates to periodic functional testing of the emergency core cooling system to ensure the leak tight integrity and performance of its active components.

(3) GDC 40, as it relates to periodic functional testing of the containment heat removal system to ensure the leak tight integrity and performance of its active components.

(4) GDC 43, as it relates to periodic functional testing of the containment atmospheric cleanup systems to ensure the leak tight integrity and the performance of the active components, such as pumps and valves.

(5) GDC 46, as it relates to periodic functional testing of the cooling water system to ensure the leak tight integrity and performance of the active components.

(6) GDC 54, as it relates to piping systems penetrating containment being designed with the capability to test periodically the operability of the isolation and determine valve leakage acceptability.

(7) Subsection 50.55a(f) of 10 CFR, as it relates to including pumps and valves whose function is required for safety in the in-service testing program to verify operational readiness by periodic testing.

Additional guidance regarding the development and implementation of in-service testing programs for pumps and valves provided in NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants," has been considered and implemented as appropriate. ASME Code cases that refer to in-service testing of pumps and valves are used as endorsed in Regulatory Guide 1.192.

This subsection outlines the in-service testing program plan based on the requirements of ASME OM Code, Subsections ISTB, ISTC, and (mandatory) Appendix I. The ESBWR design does not use pumps to mitigate the consequences of an accident or to maintain the reactor in a safe shutdown condition. Therefore, there are no pumps listed in Table 3.9-8. Table 3.9-8 lists the in-service testing parameters, frequencies, and exemptions for the safety-related valves. Valves having a containment isolation function are also noted in the listing. In-service inspection is discussed in Subsection 5.2.4 and Section 6.6.

Details of the in-service testing program, including test schedules and frequencies, are reported in the in-service inspection and testing plan, which shall be provided by the

applicant referencing the ESBWR design. The plan integrates the applicable test requirements for safety-related valves including those listed in the technical specifications (Chapter 16) and the containment isolation system (Subsection 6.2.4). For example, the periodic leak testing of the reactor coolant pressure isolation valves in Table 3.9-8 is performed in accordance with Technical Specification surveillance requirement(s). This plan includes baseline pre-service testing to support the periodic in-service testing of the components. Depending on the test results, the plan provides a commitment to disassemble and inspect the safety-related valves when the OM Code limits are exceeded, as described in the following paragraphs. The primary elements of this plan, including the requirements of Generic Letters 89-10 and 96-05 for motor-operated valves, are delineated in the subsections to follow. (Refer to Subsection 3.9.9.3 for COL information requirements.)

3.9.6.1 In-Service Testing of Safety-Related Valves

Check Valves

All safety-related piping systems incorporate provisions for testing to demonstrate the operability of the check valves under design conditions. In-service testing incorporates the use of advance non-intrusive techniques to periodically assess degradation and the performance characteristics of the check valves in accordance with the provisions of ISTC. The Subsection ISTC tests are performed, and check valves that fail to exhibit the required performance may be disassembled for evaluation. The Code provides criteria limits for the test parameters identified in Table 3.9-8. A program shall be developed by the applicant referencing the ESBWR design to establish the frequency and the extent of each disassembly. The program may be revised throughout the plant life to minimize disassembly based on past disassembly experience. (Refer to Subsection 3.9.9.3 (1) for COL information requirements.)

Power -Operated Valves

The power operated valves consists of motor-operated, pneumatically-operated, hydraulically-operated and solenoid-operated valves.

The motor-operated valve (MOV) equipment specifications require the incorporation of the results of either in-situ or prototype testing with full flow and pressure or full differential pressure to verify the proper sizing and correct switch settings of the valves. Guidelines to justify prototype testing are contained in Generic Letter 89-10, Supplement 1, Questions 22 and 24 through 28. The concerns and issues identified in Generic Letter 89-10 for MOVs shall be addressed prior to plant startup. The method of assessing the loads, the method of sizing the actuators, and the setting of the torque and limit switches, are specifically addressed. (Refer to Subsection 3.9.9.3 (1) for COL information requirements.)

The in-service operability testing of power-operated valves relies on diagnostic techniques that are consistent with the state of the art and which permit an assessment of the performance of the valve under actual loading. Periodic testing is conducted under

adequate differential pressure and flow conditions that allow a justifiable demonstration of continuing valve capability for design basis conditions, including recovery from inadvertent valve positioning. Valves that fail the acceptance criteria, and are "declared inoperable," for stroke tests and leakage rate can be disassembled for evaluation. The Code provides criteria limits for the test parameters identified in Table 3.9-8. The frequency for operability testing is a maximum of every 10 years. The initial test frequency is the longer of every 3 refueling outages or 5 years until it can be justified from existing data that a longer interval between testing is appropriate in accordance with NRC Generic Letter 96-05.

The COL applicant will develop a program to establish the extent of disassembly and inspection based on suspected degradation of all safety-related MOVs, including the basis for the extent of each disassembly. The program may be revised throughout the plant life based on past disassembly experience. (Refer to Subsection 3.9.9.3 (1) for COL information requirements.)

The COL applicant will develop the inservice valve operability test program and determine which of the valves identified in Table 3.9-8 will require operability testing and determine whether the testing will be static with diagnostic measurement or dynamic testing under flow and differential pressure.**Isolation Valve Leak Tests**

The leaktight integrity is verified for each valve relied upon to provide a leaktight function. These valves include:

(1) Pressure Isolation Valves — valves that provide isolation of pressure differential from one part of a system from another or between systems.

(2) Temperature Isolation Valves — whose leakage may cause unacceptable thermal loading on supports or stratification in the piping and thermal loading on supports or whose leakage may cause steam biding of pumps.

(3) Containment Isolation Valves — valves that perform a containment isolation function in accordance with Evaluation Against Criterion 54, Subsection 3.1.2.5.5.2, including valves that may be exempted from Appendix J, Type C testing but whose leakage may cause loss of suppression pool water inventory.

Leakage rate testing of valves is in accordance with Subsection ISTC, Paragraph ISTC-3600.

Table 3.9-8

In-Service Testing

No.	Qty	Description (g)	Code Class (a)	Code Cat. (c)	Valve Func. (d)	Test Para. (e)	Test Freq. (f)
F421	1	Emergency makeup IC pool water line check valve (g3)	3	C	A	S	R0
G31 Reactor Water Cleanup/Shutdown Cooling System Valves							
F001	2	RWCU/SDC mid-vessel suction line maintenance valve	1	B	P		E1
F002	2	RWCU/SDC mid-vessel suction line inboard isolation valve (g1)	1	A	I, A	L, P, S O	R0 E4
F003	2	RWCU/SDC mid-vessel suction line outboard isolation valve	1	A	I, A	L, P S O	R0 3 mo E4
F005	2	RWCU/SDC bottom head suction line maintenance valve	1	B	P		E1
F006	2	RWCU/SDC bottom head suction line maintenance valve	1	B	P		E1
F007	2	RWCU/SDC bottom head suction line inboard isolation valve (g1)	1	A	I, A	L, P, S O	R0 E4
F008	2	RWCU/SDC bottom head suction line outboard isolation valve	1	A	I, A	L, P S O	R0 3 mo E4
F022	2	RWCU/SDC to FW injection line motor-operated valve	2	B	P	- O	E1 E4
F023	2	RWCU/SDC to FW injection line check valve (g1)	2	A, C	A	L, S	R0

Table 3.9-8

In-Service Testing

No.	Qty	Description [g]	Code Class (a)	Code Cat. (c)	Valve Func. (d)	Test Para. (e)	Test Freq. (f)
F024	2	RWCU/SDC to FW injection line check valve (g1)	2	A, C	A	L, S	R0
F038	2	RWCU/SDC bottom head suction line sample line inboard isolation valve (g1)	1	A	I, A	L, P, S	R0
F039	2	RWCU/SDC bottom head suction line sample line outboard isolation valve	1	A	I, A	L, P S	R0 3 mo
F500	2	RWCU/SDC mid-vessel suction line inboard valve first test connection valve	1	B	P		E1
F501	2	RWCU/SDC mid-vessel suction line inboard valve second test connection valve	1	B	P		E1
F504	2	RWCU/SDC bottom head suction line drain valve	1	B	P		E1
F505	2	RWCU/SDC bottom head suction line drain valve	1	B	P		E1
F506	2	RWCU/SDC bottom head suction line back flushing valve	1	B	P		E1
F507	2	RWCU/SDC bottom head suction line back flushing valve	1	B	P		E1
F508	2	RWCU/SDC bottom head suction line inboard valve first test connection valve	1	B	P		E1
F509	2	RWCU/SDC bottom head suction line inboard valve second test connection valve	1	B	P		E1

Table 3.9-8

In-Service Testing

No.	Qty	Description [g]	Code Class (a)	Code Cat. (c)	Valve Func. (d)	Test Para. (e)	Test Freq. (f)
F700/ F704	4	RWCU/SDC mid-vessel suction line FE upstream first instrument root valve	1	B	P		E1
F701/ F705	4	RWCU/SDC mid-vessel suction line FE upstream second instrument root valve	1	B	P		E1
F702/ F706	4	RWCU/SDC mid-vessel suction line FE downstream first instrument root valve	1	B	P		E1
F703/ F707	4	RWCU/SDC mid-vessel suction line FE downstream second instrument root valve	1	B	P		E1
F708/ F712	4	RWCU/SDC bottom head suction line FE upstream first instrument root valve	1	B	P		E1
F709/ F713	4	RWCU/SDC bottom head suction line FE upstream second instrument root valve	1	B	P		E1
F710/ F714	4	RWCU/SDC bottom head suction line FE downstream first instrument root valve	1	B	P		E1
F711/ F715	4	RWCU/SDC bottom head suction line FE downstream second instrument root valve	1	B	P		E1
U50 Equipment and Floor Drain System Valves							

Notes:

a) 1, 2 or 3 – ASME Section III Code classes per, Section 3.2.

c) A, B, C or D – Valve category per ASME OM Code –Subsection ISTC.

d) Valve Function:

I – Primary containment isolation per Subsection 6.2.4.

A or P – Active or passive per ASME OM Code – Paragraph ISTC-1300.

e) Valve test parameters per ASME OM Code – Subsection ISTC and Appendix I:

L - Seat leakage rate (Paragraph ISTC-3600 and DCD Tier 2 Subsection 6.2.6.3 for valves with function I in (d) above)

P - Valve position verification (Paragraph ISTC-3700)

R - Safety and relief test including visual examination, set pressure and seat tightness testing in accordance Paragraph ISTC-3000, -5230, -5240, Table ISTC-3500-1, Note (2), and Appendix I). Category A and B requirements for safety and relief valves of ISTC-3500 and ISTC-3700 are excluded per ISTC-1200.

S - Exercising tests for Category A and B valves (Paragraph ISTC-3521) and Category C valves (Paragraph ISTC-3522).

X - Explosively actuated valve tests (Paragraph ISTC-5260)

O - May be subject to operability testing as determined by the COL applicant

f) Valve test frequency for the specified test parameter including summary of exclusions and alternatives per ASME OM Code – Subsection ISTC and Appendix I:

CS -– Cold shutdown

R0 -– Refueling outages. For position verification: refueling outages, but in no case greater than two years.

E1 – Valves used only for operating convenience, i.e., passive vent, drain, instrument, test, maintenance and system control valves. These valves are not required for primary containment isolation. Tests are not required per Paragraph ISTC-1200 (i.e., the valves are exempt per the criteria given in ISTC-1200).

E2 – Fired and replaced per Paragraph ISTC-5260.

E3 – Test scheduled per Appendix I, Paragraph I-3000.

E4 - The frequency for operability testing is a maximium of every 10 years. The initial test frequency is the longer of every 3 refueling outages or 5 years until it can be justified from existing data that a longer interval between testing is appropriated in accordance with NRC Generic Letter 96-05.

g) Summary justification for code defined testing exceptions or alternatives against Paragraphs ISTC-3510 for exercising tests and ISTC-3630 for seat leakage rate tests.

g1) Inaccessible inerted containment and/or steam tunnel radiation during power operations.

g2) Avoid valve damage during power operations.

g3) Avoid impacts on power operations.

g4) May not be Category C tested, but is subject to the periodic Category A test per DCD Tier 2 Subsection 6.2.6.3 for instrument lines that penetrate containment.

g5) These lines are subject to periodic Category A test for verifying their leaktight integrity and may not be Category C tested.

g6) These lines terminate below the drywell sumps water level and are sealed from the containment atmosphere. No Category C leakage rate test is required.

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 shall be used for verification of valve operation.

3.9.9.3 Pump and Valve In-Service Testing Program

COL applicants shall provide a plan for the detailed valve in-service testing and inspection program. This plan:

(1) Includes baseline pre-service testing to support the periodic in-service testing of the components required by technical specifications. Provisions are included to test the pumps, valves, and MOVs in accordance with the O&M Code (Reference 3.9-5) and safety-related classification as necessary, depending on test results.

(2) Provides a study to determine the optimal frequency for valve stroking and operability testing (as per NRC Generic Letter 96-05) during in-service testing.

(3) Address the concerns and issues identified in Generic Letter 89-10; specifically, the method of assessment of the loads, the method of sizing the actuators, and the setting of the torque and limit switches.