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Subject: **ESBWR Design Certification Application — Non-RAI Related Changes for DCD Chapter 16 (Technical Specifications) and Chapter 16B (Bases)**

The purpose of this letter is to submit an advance copy of non-RAI related changes that GE Hitachi Nuclear Energy (GEH) will incorporate in the next revision to the ESBWR DCD Chapter 16 Technical Specifications and Chapter 16B Bases.

Specifically, the changes noted below will be incorporated in the Revision 6 DCD, as shown in the Enclosure 1 markups:

1. Chapter 16, Technical Specification (TS) 5.6.3, paragraphs a.1 and a.2 are revised to remove excessive detail and incorrect information by deleting "(including power and flow dependent limits)." The appropriate detail will be included and correctly stated in the Bases for TS 3.2.1 and 3.2.2, as noted in item 2 below.
2. Chapter 16B, Bases 3.2.1 and 3.2.2 Applicable Safety Analyses (ASA) discussions are revised to correctly state that, for ESBWR, the LHGR and MCPR operating limits are "power and <u>feedwater temperature</u> dependent" rather than "power and <u>flow</u> dependent." In addition, the ASA discussions are revised to state that the LHGR and MCPR operating limits specified in the COLR include power dependent limits and feedwater temperature dependent limits. These changes reconcile this Bases information with the GEH responses to resolved RAI Numbers 4.3-16, 4.3-18 and 4.3-28 (References 1 and 2).

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3. Chapter 16B, Bases 3.3.2.1 Background discussion (third paragraph) is revised to replace "the current value within a predefined time," with "a reference feedwater temperature." This change reconciles this Bases information with the changes to DCD Tier 2 Subsection 7.7.2.2.7.7 that were submitted with the GEH response to resolved RAI 4.3-32 (Reference 3).

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

Sincerely,

Richard E. Kingston

Richard E. Kingston
Vice President, ESBWR Licensing

References:

1. MFN 08-790, Letter from GEH to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 208 - Related To NEDO-33338, "ESBWR Feedwater Temperature Operating Domain For Transient And Accident Analysis" - RAI Number 4.3-16,* October 20,2008.
2. MFN 08-820, Letter from GEH to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 208 - Related To NEDO-33338, "ESBWR Feedwater Temperature Operating Domain For Transient And Accident Analysis" – RAI Numbers 4.3-18 and 4.3-28*, October 27, 2008.
3. MFN 08-883, Letter from GEH to U.S. Nuclear Regulatory Commission, *Response to Portion of NRC Request for Additional Information Letter No. 208 - Related To NEDO-33338, "ESBWR Feedwater Temperature Operating Domain for Transient and Accident Analysis" - RAI Number 4.3-32*, November 17, 2008.

Enclosure:

1. MFN 09-125 – DCD Markups for Chapter 16 (Technical Specifications) and Chapter 16B (Bases).

cc:	AE Cubbage	USNRC (with enclosure)
	RE Brown	GEH (with enclosure)
	DH Hinds	GEH (with enclosure)
	eDRF	94-2626, 95-6728

Enclosure 1

MFN 09-125

DCD Markups for Chapter 16 (Technical Specifications) and Chapter 16B (Bases)

5.6 Reporting Requirements

5.6.2 Radioactive Effluent Release Report

COL 16.0-1-A 5.6.2-1

[-- NOTE --
A single submittal may be made for a multiple unit station. The submittal shall combine sections common to all units at the station; however, for units with separate radwaste systems, the submittal shall specify the releases of radioactive material from each unit.
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The Radioactive Effluent Release Report covering the operation of the unit during the previous year shall be submitted prior to May 1 of each year in accordance with 10 CFR 50.36a. The report shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit. The material provided shall be consistent with the objectives outlined in the ODCM and Process Control Program and in conformance with 10 CFR 50.36a and 10 CFR Part 50, Appendix I, Section IV.B.1.

5.6.3 CORE OPERATING LIMITS REPORT (COLR)

a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:

1. Specification 3.2.1, "LINEAR HEAT GENERATION RATE (LHGR)" ~~(including power and flow dependent limits)~~

2. Specification 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)" ~~(including power and flow dependent limits)~~

3. Specification 3.3.1.1, Reactor Protection System (RPS) Instrumentation," Functions 14, 15, and 16

4. Specification 3.3.1.4, Neutron Monitoring System (NMS) Instrumentation, Function 3

~~3~~5.[Specification 3.7.4, "Main Turbine Bypass System"

COL 16.0-1-A 5.6.3-1

~~4~~6.] Specification 3.7.6, "Selected Control Rod Run-In (SCRRI) and Select Rod Insert (SRI) Functions"

COL 16.0-1-A 5.6.3-2

[Any additional individual specifications that address core operating limits must be referenced here.]

BASES

APPLICABLE SAFETY ANALYSES (continued)

The LHGR operating limit is power and feedwater temperature dependent. Therefore, the LHGR operating limits specified in the COLR include power dependent limits and feedwater temperature dependent limits.

The LHGR satisfies Criterion 2 of 10 CFR 50.36(d)(2)(ii).

LCO

The LHGR is a basic assumption in the fuel design analysis. The fuel has been designed to operate at rated core power with sufficient design margin to the LHGR calculated to cause 1% fuel cladding plastic strain. The operating limit to accomplish this objective is specified in the COLR.

APPLICABILITY

The LHGR limits are derived from fuel design analysis that is limiting at high power level conditions. At core thermal power levels < 25% RTP, the reactor is operating with a substantial margin to the LHGR limits and, therefore, the Specification is only required when the reactor is operating at ≥ 25% RTP.

ACTIONS

A.1

If any LHGR exceeds its required limit, an assumption regarding an initial condition of the fuel design analysis is not met. Therefore, prompt action should be taken to restore the LHGR(s) to within its required limits such that the plant is operating within analyzed conditions. The 2 hour Completion Time is normally sufficient to restore the LHGR(s) to within its limits and is acceptable based on the low probability of a transient or Design Basis Accident (DBA) occurring simultaneously with the LHGR out of specification.

B.1

If the LHGR cannot be restored to within its required limits within the associated Completion Time, the plant must be brought to a MODE or other specified condition in which the LCO does not apply. To achieve this status, THERMAL POWER must be reduced to < 25% RTP within 4 hours. The 4 hour Completion Time is reasonable, based on engineering judgment, to reduce THERMAL POWER to < 25% RTP in an orderly manner and without challenging plant systems.

B 3.2 POWER DISTRIBUTION LIMITS

B 3.2.2 MINIMUM CRITICAL POWER RATIO (MCPR)

BASES

BACKGROUND

MCPR is a ratio of the fuel assembly power that would result in the onset of boiling transition to the actual fuel assembly power. The Fuel Cladding Integrity Safety Limit (FCISL) is established as greater than 99.9% of the fuel rods in the core would be expected to avoid boiling transition (refer to the Bases for SL 2.1.1.2). The operating limit MCPR is established to ensure that no fuel damage results during anticipated operational occurrences (AOOs). Although fuel damage does not necessarily occur if a fuel rod actually experiences boiling transition (Ref. 1), the critical power at which boiling transition is calculated to occur has been adopted as a fuel design criterion.

The onset of transition boiling is a phenomenon that is readily detected during the testing of various fuel bundle designs. Based on these experimental data, correlations have been developed to predict critical bundle power (i.e., the bundle power level at the onset of transition boiling) for a given set of plant parameters (e.g., reactor vessel pressure, mass flux, and subcooling). Because plant operating conditions and bundle power levels are monitored and determined relatively easily, monitoring the MCPR is a convenient way of ensuring that fuel failures due to inadequate cooling do not occur.

APPLICABLE SAFETY ANALYSES

The analytical methods and assumptions used in evaluating the AOOs to establish the operating limit MCPR are presented in Chapter 4. To ensure that the FCISL is not exceeded during any transient event that occurs with moderate frequency, limiting transients have been analyzed to determine the critical power ratio (CPR) transient uncertainty. The types of transients evaluated are decrease in core coolant temperature, increase in reactor pressure, increase in reactor coolant inventory, decrease in reactor coolant inventory. The steady-state and CPR transient uncertainties and the uncertainties in monitoring and simulating the core operating state are incorporated by the statistical model (Ref. 2) to determine the required operating limit MCPR.

The MCPR operating limits ~~derived from the transient analysis are dependent on the power state ($MCPR_p$) to ensure adherence to fuel~~ are power and feedwater temperature dependent. Therefore, the MCPR operating limits specified in the COLR include power dependent limits and feedwater temperature dependent limits.

APPLICABLE SAFETY ANALYSES (continued)

~~design limits during the worst transient that occurs with moderate frequency.~~

~~Power-dependent MCPR limits ($MCPR_p$) are determined for the anticipated transients that are significantly affected by power.~~

The MCPR satisfies Criterion 2 of 10 CFR 50.36(d)(2)(ii).

LCO

The MCPR operating limits specified in the COLR are the result of fuel design and transient analyses.

APPLICABILITY

The MCPR operating limits are primarily derived from transient analyses that are assumed to occur at high power levels. Below 25% RTP, the moderator void fraction is very small. Surveillance of thermal limits below 25% RTP is unnecessary due to the large inherent margin that ensures that the FCISL is not exceeded even if a limiting transient occurs.

Studies of the variation of limiting transient behavior have been performed over the range of operational conditions. These studies encompass the range of key actual plant parameter values important to typically limiting transients. The results of these studies demonstrate that a margin is expected between performance and the MCPR requirements, and that margins increase as power is reduced to 25% RTP. Comparison of test data at low pressure and flow conditions to expected bundle operating conditions at less than 25% RTP has determined that the bundle powers would have to increase by multiples ~~greater than five~~ of three or more prior to reaching critical bundle powers. When in MODE 2, the Startup Range Neutron Monitor (SRNM) provides rapid scram initiation for any significant power increase transient, which effectively eliminates any MCPR compliance concern. Therefore, at THERMAL POWER levels < 25% RTP, the reactor is operating with substantial margin to the MCPR limits and this LCO is not required.

ACTIONS

A.1

If any MCPR is outside the required limits, an assumption regarding an initial condition of the design basis transient analyses may not be met. Therefore, prompt action should be taken to restore the MCPR(s) to

BASES

BACKGROUND (continued)

temperature decrease causes thermal limit violations. The ATLM provides a feedwater temperature valve one-way block and rod withdrawal block, if the feedwater temperature decreases by more than a set value from ~~the current value within a predefined time~~ a reference feedwater temperature. The safety analyses do not credit the feedwater temperature-related blocks (Refs. 2 and 3); therefore, the feedwater temperature-related blocks of the ATLM are not required for the ATLM to be OPERABLE.

The purpose of the RWM is to ensure control rod patterns during startup are such that only specified control rod sequences and relative positions are allowed over the operating range from all control rods inserted to just below the LPSP. The sequences enforced by the RWM effectively limit the potential amount and rate of reactivity increase during a RWE.

The RWM Function of the RC&IS will initiate control rod withdrawal and insert blocks when the actual sequence deviates beyond allowances from the specified sequence. The rod block logic circuitry is the same as that described above. The RC&IS also uses the APRM signals to determine when THERMAL POWER is less than or equal to the LPSP to enable the RWM rod block Function.

The purpose of the MRBM is to limit control rod withdrawal if local power changes during rod withdrawal exceed a preset rod block setpoint. It is assumed to function to block further control rod withdrawal to prevent fuel damage by ensuring that the MCPR and MLHGR do not violate fuel thermal safety limits. The MRBM supplies a trip signal to the RAPI subsystem of RC&IS to appropriately inhibit control rod withdrawal during power operations above the low power setpoint (LPSP). There are two MRBM channels, either of which can initiate a control rod block when local neutron flux exceeds the rod block setpoint. The rod block logic circuitry in the RC&IS is arranged as two redundant and separate logic circuits. Control rod withdrawal is permitted only when the two channels agree, unless one of the channels of logic has been manually bypassed. Control rod position, LPRM, and APRM data are the primary data input for the MRBM. APRM signals are used to determine when THERMAL POWER is greater than or equal to the LPSP to enable the MRBM rod block Function.

With the reactor mode switch in the shutdown position, a control rod withdrawal block is applied to all control rods to ensure that the shutdown condition is maintained. This Function prevents criticality resulting from inadvertent control rod withdrawal during MODE 3, 4, or 5, or during