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MFN 09-720

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Subject: **Response to Portion of Request for Additional Information Letter No. 380 Related to Design Control Document (DCD) Revision 6**

The purpose of this letter is to submit the GE Hitachi Nuclear Energy (GEH) response to a portion of the U.S. Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) letter number 380 sent by NRC letter dated October 28, 2009 (Reference 1). RAI Number 3.11-40 is addressed in Enclosure 1. Enclosure 2 contains the DCD changes as a result of GEH's response to this RAI.

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

Sincerely,

FOR

Richard E. Kingston
Vice President, ESBWR Licensing

References:

1. MFN 09-684 Letter from U.S. Nuclear Regulatory Commission to J. G. Head, GEH, *Request For Additional Information Letter No. 380 Related to Design Control Document (DCD) Revision 6* dated October 28, 2009

Enclosures:

1. Response to Portion of NRC RAI Letter No. 380 Related to ESBWR Design Control Document (DCD) Revision 6 – Equipment Qualification - RAI Number 3.11-40

2. Response to Portion of NRC RAI Letter No. 380 Related to ESBWR Design Control Document (DCD) Revision 6 - Equipment Qualification - DCD Markup for RAI Number 3.11-40

cc:	AE Cubbage	USNRC (with enclosures)
	JG Head	GEH/Wilmington (with enclosures)
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	eDRF Section	0000-0109-3612 (RAI 3.11-40)

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Enclosure 1

Response to Portion of NRC Request for Additional

Information Letter No. 380 Related to ESBWR Design

Control Document (DCD) Revision 6

Equipment Qualification

RAI Number 3.11-40

NRC RAI 3.11 - 40

DCD Tier 2 Section 3.11.3.1 includes electromagnetic interference/radio frequency interference (EMI/RFI) in the environmental design basis for environmental qualification.

DCD Tier 1 Section 3.8-1 provides ITAAC for equipment qualification of safety-related digital I&C equipment for the environmental design bases.

However, the definition of "Equipment Qualification" in DCD Tier 1, Section 1.1.1, includes,

> *"Safety-related equipment located in a mild environment will be qualified* for *their environmental conditions through specifications and certifications to the environments; however, for a mild environment, only safety-related digital instrumentation and control equipment will be addressed by ITAAC. Additionally*, *Electromagnetic Interference (EMI) susceptibility and emissions qualification is performed by type testing for the safety-related digital instrumentation and control equipment and is not specifically addressed in an ITAAC. ITAAC address analyses of material data for safety-related mechanical equipment located in a harsh environment. ITAAC are located in Section 3.8 to cover instrumentation and control equipment. Environmental qualification of electrical and mechanical equipment is covered in Section 3.8 ITAAC."*

This implies EMI is not covered by ITAAC, which would be inconsistent with Tier 2. Revise this statement to clarify that EMI susceptibility and emissions qualification by type testing for the safety-related digital instrumentation and control equipment is covered by Section 3.8 ITAAC and that it is part of the environmental design basis.

GEH Response

GEH agrees with the recommendation and has revised the paragraph accordingly. Also note that RAI 14.3-449 S02 addresses equipment qualification and may further amplify and clarify requirements in Section 3.8 and the definition in Section 1.1.1 but will not change the intent of the changes addressed herein.

DCD Impact

DCD Tier 1, Section 1.1.1 will be revised as noted in the attached markups.

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Enclosure 2

Response to Portion of NRC Request for Additional

Information Letter No. 380 Related to ESBWR

Design Control Document (DCD) Revision 6

Equipment Qualification

RAI 3.11-40 DCD Markup

1. INTRODUCTION

This document provides the Tier 1 material of the ESBWR Design Control Document (DCD).

1.1 DEFINITIONS AND GENERAL PROVISIONS

1.1.1 Definitions

The definitions below apply to terms which may be used in the Design Descriptions and associated Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC).

Acceptance Criteria means the performance, physical condition, or analysis results for a structure, system, or component that demonstrates a Design Commitment is met.

Analysis means a calculation, mathematical computation, or engineering or technical evaluation. Engineering or technical evaluations could include, but are not limited to, comparisons with operating experience or design of similar structures, systems, or components.

As-built means the physical properties of the structure, system, or component, following the completion of its installation or construction activities at its final location at the plant site. Determination of physical properties of the as-built structure, system, or component may be based on measurements, inspections, or tests that occur prior to installation provided that subsequent fabrication, handling, installation, and testing do not alter the properties. Many ITAAC require verification of "as-built" structures, systems, or components (SSCs). However, some of these ITAAC will involve measurements and/or testing that can only be conducted at the vendor site due to the configuration of equipment or modules or the nature of the test (e.g., measurements of reactor vessel internals). For these specific items where access to the component for inspection or test is impractical after installation in the plant, the ITAAC closure documentation (e.g., test or inspection record) will be generated at the vendor site and provided to the licensee.

ASME Code Report means a report required by the ASME Code and whose content requirements are stipulated by the ASME Code. Each such ASME Code report is final, and when required is certified in accordance with the Code.

Cold shutdown means a Safe Shutdown with the average reactor coolant temperature ≤ 93.3°C (200°F).

Component as used in Tier 1 for reference to ASME components means that subset of equipment that does not include piping.

Containment means the Reinforced Concrete Containment Vessel (RCCV) and the Passive Containment Cooling System (PCCS) Heat Exchangers, unless explicitly stated otherwise.

Design Commitment means that portion of the Design Description that is verified by ITAAC.

Design Description means that portion of the design that is certified.

Division is the designation applied to a given safety-related system or set of components that enables the establishment and maintenance of physical, electrical, and functional independence from other redundant sets of components.

Equipment as used in Tier 1 as related to ASME Code and Seismic Category I requirements means both components and piping.

Equipment Identification Number or **Equipment Identifier** as used in Tier 1 means the designation on a Tier 1 figure and is not representative of an actual equipment number or tag number.

Equipment Qualification

For purposes of ITAAC:

Environmental Qualification: Type tests, or type tests and analyses, of the safety-related electrical equipment demonstrate qualification to applicable normal, abnormal and design basis accident conditions without loss of the safety-related function for the time needed during and following the conditions to perform the safety-related function. These harsh environmental conditions, as applicable to the bounding design basis accident(s), are as follows: expected time-dependent temperature and pressure profiles, humidity, chemical effects, radiation, aging, submergence, and their synergistic effects which have a significant effect on equipment performance.

As used in the associated ITAAC, the term "safety-related electrical equipment" constitutes the equipment itself, connected instrumentation and controls, connected electrical components (such as cabling, wiring, and terminations), and the lubricants necessary to support performance of the safety-related functions of the safety-related electrical components identified as being subject to the environmental qualification requirements.

Type tests, or type tests and analyses, of the safety-related mechanical equipment demonstrate qualification to applicable normal, abnormal and design basis accident conditions without loss of the safety-related function for the time needed during and following the conditions to perform the safety-related function considering the applicable harsh environmental conditions. As used in this paragraph, "safety-related mechanical components" refers to mechanical parts, subassemblies or assemblies that are categorized as Quality Group A, B, or C. Mechanical components qualification also may be by type tests, analyses or a combination of tests and analyses of individual parts or subassemblies or of complete assemblies rather than by testing the individual parts or subassemblies separately.

Safety-related equipment located in a mild environment will be qualified for their environmental conditions through specifications and certifications to the environments; however, for a mild environment, only safety-related digital instrumentation and control equipment will be addressed by ITAAC. ~~Additionally,~~ Electromagnetic Interference (EMI) and Radio Frequency Interference (RFI) susceptibility and emissions qualification is performed by type testing for the safety-related digital instrumentation and control equipment ~~and is not specifically addressed in an ITAAC~~.

ITAAC address analyses of material data for safety-related mechanical equipment located in a harsh environment. ITAAC are located in Section 3.8. to cover environmental qualification of digital instrumentation and control equipment located in a mild environment. Environmental qualification of electrical (including digital I&C) and mechancial equipment located in a harsh environment is covered in Section 3.8 ITAAC.

Seismic Qualification: Type tests, analyses, or a combination of type tests and analyses of the Seismic Category I mechanical and electrical equipment (including connected instrumentation and controls) may be used to demonstrate that the as-built equipment, including associated anchorage, is qualified to withstand design basis dynamic loads without loss of its safety function. Seismic qualification for instrumentation and controls equipment is address in Section 3.8 Seismic qualification for mechanical and electrical equipment is covered by Section 3.8, but is also addressed in system ITAAC.

Exists, when used in Acceptance Criteria, means that the item is present and meets the design description.

Functional Arrangement/Physical Arrangement (for a Building) means the arrangement of the building features (e.g., floors, ceilings, walls, basemat and doorways) and of the structures, systems, or components within, as specified in the building Design Descriptions.

Functional Arrangement (for a System) means the physical arrangement of systems and components to provide the service for which the system in intended, and which is described in the system Design Description.

Hot shutdown means a Safe Shutdown with the average reactor coolant temperature > 215.6°C (420°F).

Inspect or **Inspection** means visual observations, physical examinations, or review of records based on visual observation or physical examination that compare the structure, system, or component condition to one or more Design Commitments. Examples include, but are not limited to, walk-downs, configuration checks, measurements of dimensions, and non-destructive examinations. Inspections also may include review of design and construction documents including drawings, calculations, analyses, test procedures and results, certificates of compliance, purchase records, and other documents that may verify that the acceptance criteria of a particular ITAAC are met.

Inspect for Retrievability of a display means to visually observe that the specified information appears on a monitor when summoned by the operator.

Operate means the actuation, control, running, or shutting down (*e.g.,* closing, turning off) of equipment.

Reactor Pressure Vessel (RPV) Water Level means the various levels used as reference points for instrumentation ranges. Figure 1.1.1-1 shows the relative location of the defined water levels and the overlap in the level measurement ranges.

Report means, as used in the Acceptance Criteria, a document created by or for the licensee that verifies that the acceptance criteria of the subject ITAAC have been met and references the supporting documentation. Reports typically include but are not limited to: results of walkdowns, results of visual inspections, field measurements, and reviews of design and construction documents. The Functional Arrangement verification report, for ASME Code Section III components or systems, may be or may include an ASME Code report.

Safe Shutdown (generic definition) is a shutdown with:

(1) The reactivity of the reactor kept to a margin below criticality consistent with Technical Specifications;

(2) The core decay heat being removed at a controlled rate sufficient to prevent core or reactor coolant system thermal design limits from being exceeded;

(3) Components and systems necessary to maintain these conditions operating within their design limits; and

(4) Components and systems, necessary to keep doses within prescribed limits, operating properly.

Safe Shutdown for Station Blackout means bringing the plant to those shutdown conditions specified in plant Technical Specifications as Hot Shutdown or Stable Shutdown.

Stable Shutdown means a Safe Shutdown with the average reactor coolant temperature ≤ 215.6°C (420°F) and > 93ºC (200ºF) (see "safe stable condition" in SECY-94-084 and stable shutdown in ESBWR Generic Technical Specifications).

Test or **Testing** means the actuation, operation, or establishment of specified conditions, to evaluate the performance or integrity of as-built structures, systems, or components, unless explicitly stated otherwise.

Train means a redundant, identical mechanical function within a system. For nonsafety-related systems, redundant trains may share passive components (e.g., piping, supports, manual shutoff valves).

Type Test means a test on one or more sample components of the same type and manufacturer to qualify other components of that same type and manufacturer. A type test is not necessarily a test of the as-built structures, systems, or components.

Verification of the Functional Arrangement of a system, as used in an ITAAC, means verifying that the system is constructed as depicted in the Tier 1 Design Description and figures, including equipment and instrument locations, if applicable.