GE Energy

David H. Hinds
Manager, ESBWR

PO Box 780 M/C L60
Wilmington, NC 28402-0780
USA

T 910 675 6363
F 910 362 6363
david.hinds@ge.com

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Subject: **Response to Portion of NRC Request for Additional Information Letter No. 6 Related to ESBWR Design Certification Application – Tier 1 – RAI Numbers 14.3-1 and 14.3-4**

Enclosure 1 contains GE's response to the subject NRC RAIs transmitted via the Reference 1 letter.

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

Sincerely,

Kathy Sedney for

David H. Hinds
Manager, ESBWR

D068

Reference:

1. MFN 06-045, Letter from U.S. Nuclear Regulatory Commission to David Hinds, *Request for Additional Information Letter No. 6 Related to ESBWR Design Certification Application,* January 31, 2006

Enclosure:

1. MFN 06-204 – Response to portion of NRC Request for Additional Information Letter No. 6 for the ESBWR Design Certification Application – Tier 1 – RAI Numbers 14.3-1 and 14.3-4

cc:

WD Beckner	USNRC (w/o enclosures)
AE Cubbage	USNRC (with enclosures)
LA Dudes	USNRC (w/o enclosures)
GB Stramback	GE/San Jose (with enclosures)
eDRF	0000-0055-5253

ENCLOSURE 1

MFN 06-204

Response to Portion of NRC

Request for Additional Information Letter No. 6

for the ESBWR Design Certification Application

Tier 1 – RAI Numbers 14.3-1 and 14.3-4

NRC RAI 14.3-1

Provide DCD, Tier 1, ITAAC commitments which include the attributes of the system and its components. This would include not only operational tests, currently listed, of the systems and components but also each of these separate ITAACs and their associated design basis accident conditions:

- *Seismic capability of all Category I equipment.*
- *Surge withstand capability (SWC) of Class 1E equipment.*
- *Electromagnetic interference (EMI) capability of Class 1E equipment.*
- *Radio frequency interference (RFI) capability of Class 1E equipment.*
- *Electrostatic discharge (ESD) capability of Class 1E equipment.*
- *Environmental capability of Class 1E equipment including room ambient temperature, humidity, pressure and vibration conditions.*
- *Class 1E equipment is powered from its respective Class 1E source.*
- *Separation is provided between Class 1E divisions, between Class 1E divisions & non-Class 1E systems.*
- *The system initiates automatic initiation of ESF and/or RPS as identified when plant process signals reach identified limits.*
- *Data communication between safety and nonsafety systems do not inhibit the performance of the safety function.*

The inspections tests or analyses, for many of the qualification attributes would be confirmation that a report exists and concludes the particular function is provided.

GE Response

The contents of the ESBWR Tier 1 design descriptions (DD) and ITAAC are currently governed by Tier 2 Subsection 14.3.2, which is based on 10 CFR 52 and its associated Statements of Consideration. The level of detail in the ESBWR DD and ITAAC is consistent with the guidance in Subsection 14.3.2 and is based on the NRC approved ABWR ITAAC, because the ABWR is the most technically equivalent plant to the ESBWR, and the ABWR Tier 1 was the prototype plant for determining the appropriate content and level of detail of Tier 1 content. However, RAI 14.3-1 and RAI 14.3-4 appear to be based on the contents of the AP1000 Tier 1, and would effectively result in an inappropriate increase in the level of detail and content of the ESBWR DDs and ITAAC. The ABWR-ESBWR and the AP1000 interpretations of the appropriate content of a Tier 1 are not consistent. Based on a thorough review of this matter, the basis for ITAAC, the ESBWR design, relevant regulation, Commission policy, and NRC guidance, a revised approach to ESBWR Tier 1 DD and ITAAC has been developed, as described below.

SRPs for 14.3 through 14.3.11 are drafts that are not in effect and only became available to the public (i.e., placed on the NRC website) in late 2005, and thus, are not part of the licensing basis for the ESBWR, as shown in Tier 2 Table 1.9-14. However, they provide some insights with

regard to Tier 1 content. RAI 14.3-1 requests RFI, ESD and SWC information, which is not required by Draft SRP 14.3.5, *Instrumentation and Control.*

RAIs 14.3-1 and 14.3-4 request repetitive, generic information on a system-by-system basis. For example, RAI 14.3-4 requests that the RPS description should state "The RPS is powered from its Class 1E division," and RAI 14.3-1 has an equivalent statement. However, Tier 1 Subsection 1.2.1, *Definitions*, states "***Division** refers to safety-related electrical and/or instrumentation and control (I&C) equipment connected to a common electrical power source.*" Therefore, the request is already addressed in Tier 1. Further, by definition and design, any given safety-related divisional load is powered from its Class 1E division supply. It is not necessary to provide global ESBWR information into Tier 1 on a system-by-system basis.

Draft SRP 14.3, Appendix A, Section IV, Item B states "*The design descriptions (DD) address the most safety-significant aspects of each of the systems of the design, and were derived from the detailed design information contained in Tier 2. The applicant should put the top-level design features and performance characteristics that were the most significant to safety in the Tier 1 design descriptions.*" An example of "top-level" information is that a system is safety-related and Seismic Category I, and is not the specific details of the "Seismic capability of all Category I equipment," as requested in this RAI. Therefore, per Draft SRP 14.3, RAI 14.3-1 requests more information than is required by 10 CFR 52.

Per the above Draft SRP 14.3, Appendix A, Section IV, Item B statement, both the ABWR and ESBWR Tier 1 sections are considered to contain significant excess information, i.e., beyond the "*most safety-significant aspects*" and "*top-level.*" In addition, considering this SRP guidance, the AP1000 Tier 1 appears to contain more system information than either the certified ABWR or the ESBWR under review. Neither the draft SRP 14.3, Part 52, nor its associated Statement of Considerations (59 FR 15377) provide generic sets of specific criteria and an application process for determining the correct level of detail of Tier 1 DDs and ITAAC. Such criteria and application process are needed to consistently determine the correct and verifiable level of detail in a Tier 1. Furthermore, it is important to understand that the ESBWR has no safety-related (1) ECCS pump, (2) emergency diesel generators, (3) service water system or (4) active auxiliary system, and thus, the ESBWR Tier 1 content should be expected to be significantly less than the ABWR and AP1000.

The "*most safety-significant aspects*" of the ESBWR involve the performance of safety-related functions and the risk significant functions of the nonsafety-related equipment. This latter grouping of nonsafety-related equipment is determined by applying the Regulatory Treatment on Nonsafety Systems (RTNSS) criteria.

To ensure the appropriate level of detail for Tier 1, GE proposes to (a) add sets (shown below) of Tier 1 DD and ITAAC selection criteria into Tier 2 Subsection 14.3.2, (b) add an application process into Subsection 14.3.2, (b) update the Tier 1 system DDs, (d) update the ITAAC based on the updated DDs, and (e) provide resulting changes in future revisions of Tier 2, Section 14.3 and Tier 1, Chapter 2.

A Commission directive in the Statement of Considerations (SOC) for Part 52 (59 FR 15377) states that the certified design (i.e., Tier 1) should "*encompass roughly the same design features that Section 50.59 prohibits changing without prior NRC approval.*" 10 CFR 50.59 mainly deals with items that may invalidate or change the safety analyses in a FSAR, which is analogous to

the generic Tier 2 in content. The Tier 2 safety analyses are mostly based on system-level assumed and analyzed safety functions being performed and the key parameters of each safety-related function (e.g., water injection in "x" seconds with a flow rate of "y" gallons per minute), and not all the aspects of every individual component in a system. Therefore, component-level details that are already covered by a verifiable design characteristic, feature or function (DCFF) of safety-related function or a system-level detail are not the "*most safety-significant*" and "*top-level,*" and thus, should not be included in the Tier 1 DDs or ITAAC.

Another Commission directive in the SOC for Part 52 (59 FR 15377) states that the certified design (i.e., Tier 1) should "*Moreover, the level of design detail in certifications should afford licenses an opportunity to take advantage of improvements in equipment.*" Therefore, values and design details that could change should not be included in Tier 1. For example, instrumentation is constantly improving, resulting in reduced setpoint variances (e.g., calibration accuracy and instrument drift) and measurement errors, and thus, although plant safety analysis values do not change, items like nominal trip setpoints and allowable values could change. Therefore, these types of values should not be included in Tier 1, and Tier 1 should simply make reference to the values in the Tier 2 analyses and descriptions, e.g., "*Verify that the flow value is greater than or equal to the value used in the ECCS-LOCA performance analysis in Tier 2, Section 6.3.*"

10 CFR 52.93(a) states "*Applicants for a combined license under this subpart, or any amendment to a combined license, may include in the application a request, under 10 CFR 50.12, for an exemption from one or more of the Commission's regulations, including any part of a design certification rule.*" Tier 1 will be (by reference) part of a design certification rule, and thus, after certification, making any Tier 1 change requires a 10 CFR 50.12 exemption. This would be very burdensome on both the NRC and the applicant. One of the goals of the Part 52 certification process is to reduce the burden associated with regulatory compliance. Having excessive information within Tier 1 would maximize the regulatory burden required to implement future plant improvements, and thus, create a negative incentive with respect to making plant improvements. Therefore, the level of detail within Tier 1 should be at such a high level as to minimize the potential for future 10 CFR 50.12 exemption requests.

The above two SOC clearly limit the level of detail within Tier 1 to the *top-level* details and criteria. *Top-level* Tier 1 information should be at a sufficiently high level of detail such that the information is not expected to change and the need for future 10 CFR 50.12 exemptions is minimized.

To ensure the safety of the as-built plant, the ITAAC should confirm the safety-significant DCFFs assumed and/or modeled in the Tier 2 safety analyses.

To ensure compliance with 10 CFR 52 in a thorough and consistent manner, GE proposes to re-review and update, as needed, Section 14.3 and the Tier 1 system DDs and ITAAC using the process outlined below and illustrated in Figure 14.3-1-1.

Criteria and Application Process

Each system addressed in Tier 2 shall be addressed in Tier 1. The following graded three-level approach is used to determine the general level of detail in each Tier 1 system description. Draft SRPs for 14.3 through 14.3.11 were considered as guidance for establishing details of the system-specific DDs and ITAAC.

A. General Tier 1 Content Determination:

(1) Systems with system-level or component-level safety-related, RTNSS and/or special event (e.g., ATWS, Station Blackout and Safe Shutdown Fire in Tier 2, Chapter 15) mitigation functions shall be considered safety significant, and their Tier 1 descriptions shall include DD and ITAAC.

(2) For non-safety significant systems with (nonsafety-related) design functions or features that (a) prevent or mitigate AOOs or Infrequent Events analyzed in Tier 2, (b) perform fuel protection or cooling (inside or outside the reactor vessel) functions, or (c) are included in the plant to actively/automatically control offsite doses below 10 CFR 20 limits, Tier 1 shall include DDs but not require any ITAAC.

(3) The Tier 1 content of those systems that do not qualify under Items A.(1) or A.(2) need not include DDs or ITAAC. (These systems will only be included in Tier 1 by subject (i.e., title), for completeness.)

B. DD Content Determination:

(1) For each Item A.(1) safety-significant system, the following DCFFs shall be included in the Tier 1 DDs. (The level of detail of each DCFF in the DDs should be such that it is not expected to change.)

a. Classifications (i.e., safety-related, seismic category, and ASME Code Classes);

b. Safety-related functions (i.e., modes of operation);

c. Application of 10 CFR 50, Appendix A single failure criterion (e.g., separate trains, loops and divisions) to provide each safety-related function;

d. Features or functions used to mitigate the special events evaluated in the Tier 2 safety analyses;

e. Safety-related electrical trip signals and initiations modeled in the Tier 2 safety analyses;

f. The configuration of a safety-related system's safety-significant components (usually provided by means of a figure or table), generally showing which equipment must be qualified for a harsh environment (i.e., within the primary containment);

g. Use of Class 1E electrical power;

h. The safety-related instruments and manual controls located in the Main Control Room;

i. In a separate Tier 1 subsection, Remote Shutdown System instruments and controls for performing safety-related functions;

j. Equipment initiations and system performance parameters used in the Tier 2 accident analyses;

k. Non-system level safety-related functions in nonsafety-related systems (e.g., containment isolation); and

l. Features or functions described in the Tier 2 RTNSS evaluation.

(2) For the each Item A.(2) system, the following DCFFs shall be included in the Tier 1 DDs. (The level of detail of each DCFF in the DDs should be such that it is not expected to change.)

a. Those that are specifically provided to prevent or mitigate Anticipated Operational Occurrences or Infrequent Events analyzed in Tier 2, Chapter 15;

b. Those that are specifically provided to perform nonsafety-related fuel protection or cooling (inside or outside the reactor vessel) functions; and

c. Those that actively/automatically control offsite doses below 10 CFR 20 limits.

C. ITAAC Table Line Item Topics Determination:

Starting with the DCFFs determined in Item B.(1), and reviewing them against the functions and features assumed in the Tier 2 safety analyses, use the following criteria to determine the ITAAC table line item topics for each system.

(1) The as-built configuration and performance characteristic of the DCFF, which can be confirmed prior to fuel load;

(2) The DCFF is assumed or modeled in a Tier 2 safety analysis; and

(3) The DCFF is not already covered by the confirmation of a higher level (e.g., system or function vs. component) ITACC table line item. (However, do not combine DCFFs if it would be easier to confirm them separately, via separate line items.)

At this time, no Tier 1 or Tier 2 change will be made in response to this RAI.

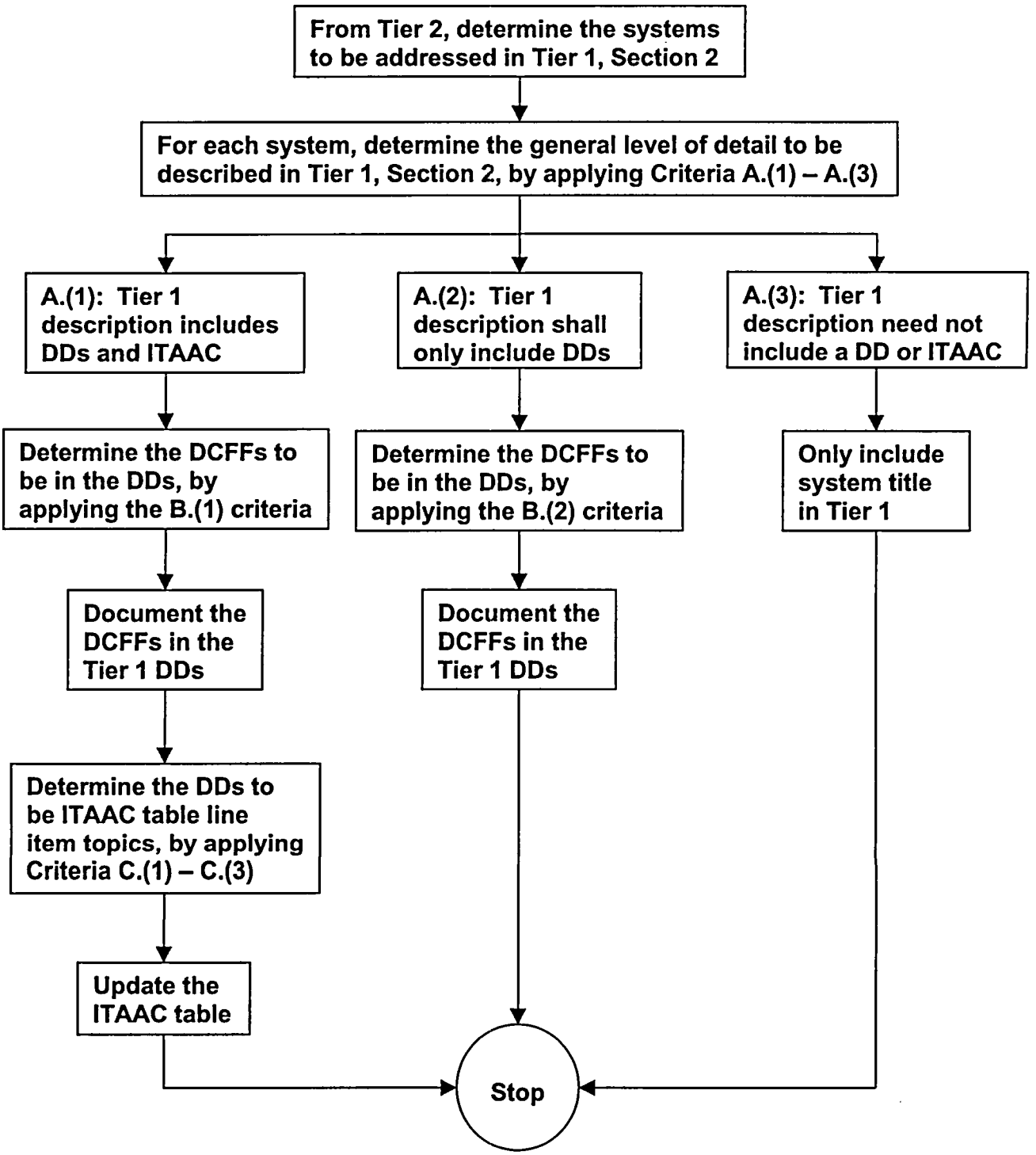

Figure 14.3-1-1Tier 1 Design Description and ITAAC Update Process

NRC RAI 14.3-4

DCD Tier 1 Section 2.2.7, Reactor Protection System (RPS), should address but not be limited to the following requirements:

- *The RPS can withstand seismic design basis loads without loss of safety function.*
- *The RPS has electrical surge withstand capability (SWC), and can withstand the electromagnetic interference (EMI), radio frequency interference (RFI), and electrostatic discharge (ESD) conditions that would exist before, during, and following a design basis accident without loss of safety function for the time required to perform the safety function.*
- *The RPS can withstand the room ambient temperature, humidity, pressure, and mechanical vibration conditions that would exist before, during, and following a design basis accident without loss of safety function for the time required to perform the safety function.*
- *The RPS is powered from its Class 1E division.*
- *The RPS provides process signals to the Essential Distributed Control and Information System (E-DCIS) through isolation devices. Data communication between safety and nonsafety systems does not inhibit the performance of the safety function.*
- *The RPS provides the transfer of control capability from the main control room to the remote shutdown panel.*
- *The RPS trip setpoints are determined using a methodology which accounts for loop inaccuracies, and accommodates response time testing.*
- *The RPS hardware and software is developed using a planned life cycle process.*

GE Response

Covered by the response to RAI-14.3-1. At this time, no Tier 1 or Tier 2 change will be made in response to this RAI.