



# HITACHI

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Subject: **GEH Proposed Resolution of Item #25 – Control Room Design with “State of the Art” HFE - NRC Suggested U.S. Advanced Boiling Water Reactor Design Changes**

### References:

1. Letter from USNRC to Jerald G. Head, GEH, Subject: GE-Hitachi Nuclear Energy – United States Advanced Boiling Water Reactor Design Certification Renewal Application, July 20, 2012 (ML12125A385)
2. Letter from GEH to USNRC, Subject: NRC Review of GE-Hitachi Nuclear Energy – United States Advanced Boiling Water Reactor (ABWR) Design Certification Renewal Application – Submittal Date for ABWR DCD Revision 6, March 17, 2014 (ML14078A070)

In Reference 1, the NRC requested that GEH consider certain design changes that might be included in the Advanced Boiling Water Reactor (ABWR) design certification renewal application. For Item #25 on the list, the NRC suggested design changes to the ABWR Control Room design in order to conform to current HFE regulations, industry standards, and regulatory guidance. GEH responded to the NRC in Reference 2 with information on Item #25. The NRC provided further detail regarding Item #25 in a meeting held on May 7, 2015.

Enclosure 1 contains GEH's position on Item #25 of the “28-item backfit list” transmitted in Reference 1. GEH has considered the suggested design change as well as NRC's comments from the meeting. GEH has determined that, for the reasons set forth in Enclosure 1, the ABWR Control Room design described in the ABWR design certification complies with NRC regulations

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and orders applicable and in effect at the time the design certification was issued. No changes to the renewal application are proposed at this time.

If you have any questions concerning this letter, please contact Hugh Upton at 408-314-8499.

I declare, under penalty of perjury, that the foregoing information is true and correct to the best of my knowledge, information, and belief.

Sincerely,

A handwritten signature in cursive script that reads "Peter M. Yandow" followed by the word "FOR" in a slightly larger, more formal script.

Jerald G. Head  
Senior Vice President, Regulatory Affairs

Commitments: No additional commitments are made in this response.

Enclosures:

1. GEH Response to Item #25 – Control Room Design with “State of the Art” HFE

cc: Adrian Muniz, NRC  
David Sledzik, GEH  
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DBR-0013149

## **Enclosure 1**

**MFN 15-077**

### **GEH Response to Item #25 – Control Room Design with “State of the Art” HFE**

#### **IMPORTANT NOTICE REGARDING CONTENTS OF THIS DOCUMENT Please Read Carefully**

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**NRC Suggested Design Change Item #25 – Control Room Design with “State of the Art” HFE**

*Provide a control room design that reflects state-of-the-art human factor principles in accordance with 10 CFR 50.34(f)(2)(iii).<sup>1</sup>*

**GEH Response**

First and foremost, for any future ABWR, GEH is committed to providing a control room design that is state-of-the-art for both the technology available and the understanding of the human interface with the technology. The ABWR design and licensing basis establishes a process that will meet the objective of providing such a control room when an ABWR is designed and constructed. In addition and as explained further below, the process ensures that the customer (applicant/licensee) is directly involved in the development and decision-making in meeting the NRC regulatory requirements and in determining which guidance documents will be used to inform the main control room HFE design process in those instances where the referenced or new guidance may have evolved.

The requirement in 10 CFR 50.34(f)(2)(iii) for control room design and implementation of human factors engineering (HFE) principles is addressed in the ABWR Design Control Document, both in Tier 1 and Tier 2. With respect to the ABWR design certification, complete and detailed descriptions of the HFE aspects of the plant (i.e., the human-system interface design (HSI), procedures, and training), were not provided to the NRC staff for review. One reason for this is that the NRC recognized, as described in the ABWR Final Safety Evaluation Report (FSER), NUREG-1503, Chapter 18, that computer-based HSIs (and digital instrumentation and controls (I&C) systems, in general) evolve very quickly as new technology is continuously being developed. For the ABWR, which was the first design certified under the provisions in 10 CFR Part 52, the NRC and industry expected that the time between certification and plant construction could be long. Thus, it was deemed prudent to delay detailed design to a time close to construction so the designs could take advantage of new technological developments and innovations. In lieu of design details, the ABWR DCD described the process to be used to design and implement the HFE aspects of the plant. These same considerations apply today.

Up to the time when the ABWR was certified, the NRC's HFE review guidance focused on the detailed design of analog control rooms, rather than the process used to develop and implement computer-based HSIs. New guidance was needed to support the design certification review of the ABWR control room design and HSI, which is based on digital I&C technology. The NRC developed review guidance in SECY-92-299 and attached the guidance to the ABWR FSER as Appendix J, "Human Factors Engineering Program Review Model and Acceptance Criteria for Evolutionary Reactors."<sup>2</sup> The NRC FSER states that the review was based on the then current regulatory requirements in 10 CFR 50.34(f); and guidance in Standard Review Plan (NUREG-0800) Sections 13 and 18, NUREG-0700, and NUREG-0933.

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<sup>1</sup> 10 CFR 50.34(f)(2)(iii): Provide, for Commission review, a control room design that reflects state-of-the-art human factor principles prior to committing to fabrication or revision of fabricated control room panels and layouts. (I.D.1)

<sup>2</sup> According to "Trends in HFE Methods and Tools and Their Applicability to Safety Reviews" (NRC JCN Y-6529; BNL-90424-2009; ML102720240), while the first publication of NUREG-0711 was in 1994, the review guidance was used for the ABWR design certification review and published as Appendix J of the ABWR FSER, 1994.

The ABWR HFE is structured with a set of criteria in DCD Tier 1, Section 3.1, with high level requirements that are verified by the licensee for a particular ABWR facility through inspections, tests, analyses, and acceptance criteria (ITAAC). The ABWR DCD Tier 2, Section 14.3, discusses the approach for HFE and HSI in Tier 1. Specifically, DCD Section 14.3.3.1, "Human Factors Engineering," explains the certification of processes rather than specific design features as being necessary for the following reasons: (1) rapidly evolving and improving technology of equipment associated with HSI implementation and allowing licensees to take advantage of beneficial technological advances; (2) detailed implementation of HSI being dependent upon details of as-procured, as-installed equipment (necessitating knowledge of specific equipment characteristics); and (3) the fundamental design work for ABWR HSI being included in the DCD with comments that provide confidence in the execution of the processes resulting in acceptable control room and remote shutdown station detailed design in the future.

Design Acceptance Criteria (DAC) ITAAC, which provide details of implementation of each stage of the HFE/HSI development process and the related acceptance criteria, are included in Tier 1. Detailed supporting information for the DAC is contained primarily in DCD Tier 2, Appendix 18E. Specific to 10 CFR 50.34(f)(2)(iii), the COL applicant items are discussed in Section 18.8.1, "HSI Design Implementation Process," which refers to Appendix 18E, and lists additional specific COL license information in Sections 18.8.2 through 18.8.16. Chapter 13 includes information related to HFE/HSI as it related to procedure development and operator training.

The development and review of the ABWR design certification HFE/HSI process were thorough and established a detailed process that has the flexibility to adapt to evolving knowledge of HFE/HSI technologies, as well as the interface with evolving digital I&C systems, with the functional requirements set forth in the Tier 1 DAC ITAAC. The NRC in the FSER recognized that the supporting information in Tier 2 of the DCD may be changed by a COL applicant or licensee in accordance with a 50.59-like process, but that the information in Appendix 18E must be submitted to the NRC for review and approval prior to implementation (i.e., Tier 2\* material).

In a meeting on May 7, 2015, and in follow-up interactions, the NRC staff identified that there have been regulatory guidance changes related to HFE/HSI that may provide guidance that either replaces or expands upon guidance referenced in the ABWR DCD. One example given was the guidance related to verification and validation. However, the ITAAC DAC Table 3.1 specifies an extensive list of elements to include in the "Human Factors V&V Implementation Plan," that are high-level criteria that can encompass elements from future guidance that may exist when the ITAAC implementation is developed for these criteria. This is an approach that would apply to other elements of guidance that may exist in the future and which could be used to inform the HFE/HSI process implementation.

It is expected that the guidance will continue to evolve and change as more nuclear plants are constructed or as control systems are modified to implement digital I&C technology. GEH supports the use of the latest applicable NRC guidance available at the time that an ABWR design may be implemented to inform the HFE/HSI process, as it is set forth in the Tier 1 DAC ITAAC. Appendix 18E refers to a number of guidance documents that provide acceptable methods and criteria for implementing the steps in the HFE/HSI process. Although GEH proposes to retain the information in Appendix 18E intact for the renewal, there is no prohibition on using later guidance to inform the process, when implemented, to ensure that the HFE/HSI process and its interface with the digital I&C systems provide a state-of-the-art control room design. When guidance is specifically replaced in support of implementing the process, NRC approval will be necessary as the information in Table 18E-1 is designated as Tier 2\* material.

On this basis, GEH considers that the ABWR DCD contains sufficient requirements and supporting information to ensure that a future ABWR control room design will be state-of-the-art for human factors principles.

**Impact on the DCD**

No changes were made to the DCD as a result of this response to NRC Item #25.