

September 3, 2002

Mr. Michael M. Corletti
Passive Plant Projects & Development
AP600 & AP1000 Projects
Westinghouse Electric Company
Post Office Box 355
Pittsburgh, Pennsylvania 15230-0355

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 4 -
AP1000 DESIGN CERTIFICATION REVIEW (TAC NO. MB4683)

Dear Mr. Cummins:

By letter dated March 28, 2002, Westinghouse Electric Company (Westinghouse) submitted its application for final design approval and standard design certification for the AP1000.

The Nuclear Regulatory Commission (NRC) staff is performing a detailed review of your design certification application to ensure that the information is sufficiently complete to enable the NRC staff to reach a final conclusion on all safety questions associated with the design before the certification is granted.

The NRC staff has determined that additional information is necessary to continue the review. Enclosure 1 contains requests for additional information (RAIs) regarding the human factors portion of the AP1000 design certification application. These RAIs were sent to you via electronic mail on August 19, 2002, and were discussed with you on August 22, 2002. It was agreed that Westinghouse would submit a response to these RAIs by December 2, 2002. Receipt of the information by December 2, 2002, will support the schedule documented in our letter dated July 12, 2002.

In formulating these RAIs, the NRC staff utilized the following guidance documents:
(1) NUREG-0711, "Human Factors Engineering Program Review Model," Revision 1, May 2002
and (2) NUREG-0700, "Human-System Interface Design Review Guideline," Revision 2,
May 2002.

Enclosure 2 contains a history of previously-issued RAI correspondence.

M. Corletti

- 2 -

If you have any questions or comments concerning this matter, you may contact me at (301) 415-3053 or ljb@nrc.gov.

Sincerely,

/RA/

Lawrence J. Burkhart, AP1000 Project Manager
New Reactor Licensing Project Office
Office of Nuclear Reactor Regulation

Docket No. 52-006

Enclosure: As stated

cc: See next page

If you have any questions or comments concerning this matter, you may contact me at (301) 415-3053 or ljb@nrc.gov.

Sincerely,

/RA/

Lawrence J. Burkhart, AP1000 Project Manager
New Reactor Licensing Project Office
Office of Nuclear Reactor Regulation

Docket No. 52-006

Enclosure: As stated

cc: See next page

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Request for Additional Information (RAI)
AP1000 Standard Plant Design
Series 620 - Human Factors

NOTE: It appears that the guidance utilized in development of the AP1000 Human Factors Engineering (HFE) program was NUREG-0711, "Human Factors Engineering Program Review Model," Rev. 0, and NUREG-0700, "Human-System Interface Design Review Guideline," Rev. 1 (the same as was utilized for the development of the AP600 HFE program). However, the staff recently issued revised guidance as NUREG-0711, Rev. 1, and NUREG-0700, Rev. 2, in May 2002. As part of the responses for the following RAIs, please provide, where applicable, a discussion of the basis for using NUREG-0711, Rev. 0, and NUREG-0700, Rev. 1, in lieu of the current revisions, and to what extent your proposed HFE program meets the guidance of NUREG-0711, Rev. 1, and NUREG-0700, Rev. 2.

Some of the questions/comments are editorial in nature (e.g., typographical errors). Please verify corrections, where appropriate.

Design Control Document (DCD) Introduction:

620.001

DCD Rev. 0, pages Intro-8 and -9. The following documents are listed in Table 1-1 "Index of AP1000 Tier 2 Information Requiring NRC [Nuclear Regulatory Commission] Approval for Change": WCAP-14396, "Man-In-The Loop Test Plan Description," Rev. 2; WCAP-14401, "Programmatic Level Description of the AP-600 Human Factors Verification and Validation Plan," Rev. 2; WCAP-14701, "Methodology & Results of Defining Evaluation Issues for the AP600 Human System Interface Design Test Program," Rev. 1; and WCAP-14822, "AP600 Quality Assurance Procedures Supporting NRC Review of AP600 SSAR Sections 18.2 and 18.8," Rev. 0. The table lists the Tier 2 references for these documents as Chapter 8 and Table 1.6-1 of the DCD. However, DCD, Rev. 0, Table 1.6-1 does not cite these WCAPs nor does Chapter 18. In addition, DCD Rev. 0, Table 1.6-1 identifies materials referenced as Tier 2* that do not appear in Table 1-1. Please clarify and reconcile these discrepancies.

620.002

DCD Rev. 0, Intro-9, Table 1-1, "Index of AP1000 Tier 2 Information Requiring NRC Approval for Change." Fourth item from the bottom, typographical error: should read "Main" not "Mail."

620.003

DCD Rev. 0, Intro-9, Table 1-1, "Index of AP1000 Tier 2 Information Requiring NRC Approval for Change." Last item, "Human System Interface [HSI] Design Test Program." DCD Rev. 0 was changed to "Human Factors Engineering Verification and Validation [V & V]." Please reconcile this inconsistency.

DCD Tier 1:

620.004

DCD Rev. 0, page 1.4-4, "List of Acronyms and Abbreviations." The abbreviation "RSR" is included in the list. However, in several places in the DCD (e.g., in Tier 2, Chapter 18), RSR has been deleted and replaced with the term "remote shutdown workstation" or the abbreviation "RSW." It is used in, for example, the General Arrangement Plan, Figure 1.2-7. Please clarify this inconsistency. Is the term "remote shutdown room" (and abbreviation "RSR") applicable to the AP1000 design? If so, how does it differ from the "remote shutdown workstation" and why has it been removed from the DCD in certain sections of the DCD?

620.005

DCD Rev. 0, page 2.5.2-9, Table 2.5.4-1, "Minimum Inventory of Controls, Displays, and Alerts in the MCR (Main Control Room)" and page 2.5.4-3, Table 2.5.4-1, "Minimum Inventory of Controls, Displays, and Alerts at the RSW (Remote Shutdown Station)." Please explain why containment hydrogen concentration has been eliminated from the AP1000 inventory as a fixed position control.

620.006

DCD Rev. 1, page 3.2-1, "Human Factors Engineering," Design Description. Please explain why the term "remote shutdown room" and its associated abbreviation "RSR" was replaced by "remote shutdown workstation" and "RSW" in the first paragraph of the design description. In the third paragraph, "RSW" is now being used to describe a "facility and resources," which was previously described in the AP600 DCD as the remote shutdown room. (See previous question 620.004.)

620.007

DCD Rev. 0, page 3.2-2, Item 5. Please describe how these activities associated with the HFE V & V implementation plan meet the guidance contained in NUREG-0711, Rev. 1, May 2002. If this guidance was not utilized, please describe the guidance that was utilized and the basis for using this guidance. The activities should be modified if they are to remain in agreement with NUREG-0711, Rev. 1, May 2002.

620.008

DCD Rev. 1, page 3.2-5, "Acceptance Criteria." Man-in-the-loop concept test reports have been eliminated as an acceptance criterion. Conceptual testing and rapid prototyping are not included in the AP1000 design process. For the AP600 design, man-in-the-loop concept testing was "an integral part of the human system interface design process" and was designated as Tier 2* information. The staff has no basis for accepting the elimination of the man-in-the-loop concept testing from the AP1000 human factors engineering design process. Please provide a detailed explanation and justification for eliminating rapid prototyping and conceptual testing from the AP1000 human factors engineering design process. In the explanation, please address questions such as, but not limited to, was concept testing completed for the AP600

design? If so, what concept tests were completed and what were their results? Have any changes to the functional requirements, operator activities, cognitive demands of the operators, etc., occurred as a result of performing the concept tests and if changes have occurred, how have they affected the AP1000 design? This comment applies to all other instances where reference to concept tests, conceptual design, etc. and the applicable WCAP have been eliminated from the AP1000 DCD.

620.009

DCD Rev. 0, page 3.2-6, "Acceptance Criteria." (See previous question 620.007.)

620.010

DCD Rev. 0, page 3.2-7, "Design Commitment" and "Acceptance Criteria." (See previous question 620.007.)

620.011

DCD Rev 0, page 3.2-10, Number 10, "Design Commitment." Please explain how this design commitment meets the guidance contained in NUREG-0711, Rev. 1, May 2002. If this guidance was not utilized, please describe the guidance that was utilized and the basis for using this guidance. (See previous question 620.007.)

620.012

DCD Rev. 0, page 3.2-10. Please describe how the HFE design implementation process depicted in Figure 3.2-1 meets the guidance contained in NUREG-0711, Rev. 1, May 2002. If this guidance was not utilized, please describe the guidance that was utilized and the basis for using this guidance. Figure 3.2-1 should be modified if it is to remain in agreement with current NRC guidance, NUREG-0711, Rev. 1, May 2002.

DCD Tier 2:

620.013

DCD Rev. 1, page 1.6-19, Table 1.6-1, "Materials Referenced." WCAP 10170, "Emergency Response Facilities Design and V & V Process," WCAP-14695, "Description of the Westinghouse Operator Decision-Making Model and Function-Based Task Analysis Methodology," and WCAP-14651, "Integration of Human Reliability Analysis With Human Factors Engineering Design Implementation Plan" are referenced in the table but are not cited and do not appear as references in Chapter 18, Section 18.5. Also, WCAP-15847, "AP1000 Quality Assurance Procedures Supporting NRC Review of AP1000 DCD Sections 18.2 and 18.8," should be referenced as April, not March, 2002. WCAP-15847 does not appear in Table 1-1 (Intro-8). Please reconcile these inconsistencies.

620.014

DCD Rev. 1, page 1.6-20, Table 1.6-1, "Materials Referenced." WCAP-15860, "Programmatic Level Description of the AP1000 Human Factors Verification and Validation Plan," should be identified with an April 2002 date, not March (two citations). Also see previous comment re: WCAP-10170.

620.015

DCD Rev. 0, page 13-1. Title of Chapter 13 should be "Conduct of Operations," if the title is to be consistent with the guidance of NUREG-0800, "Standard Review Plan [SRP] for the Review of Safety Analysis Reports for Nuclear Power Plants."

620.016

DCD Rev. 0, page 13-3. Please explain why reference to WCAP-14837, "AP600 Shutdown Evaluation Report," was deleted. Is there a document comparable to this for the AP1000 design? If not, please provide explanation.

620.017

DCD Rev. 0, page 18.1-2. The first paragraph refers to "remote shutdown rooms." Is there more than one remote shutdown room for the AP1000 design? Also, please see previous Tier 1 questions related to remote shutdown room vs. remote shutdown workstation (See previous question 620.004).

620.018

DCD Rev. 0, pages 18.1-2 and 18,1-3. The "annotated outline" titles of the chapter should be modified if they are to remain in agreement with current NRC guidance, NUREG-0711, Rev. 1, May 2002.

620.019

DCD Rev. 0, pages 18.1-2, 18,1-3, 18.1.1, "References." NUREG-0711 should be cited as Rev. 1, May 2002.

620.020

DCD Rev. 0, page 18.1-5. The figure depicting the HFE design and implementation process should be modified if it is to remain in agreement with current NRC guidance, NUREG-0711, Rev. 1, May 2002.

620.021

DCD Rev. 1, page 18.2-2, "Regulatory Requirements." Due to the recent issuance of Rev. 1 to NUREG-0711, this guidance document no longer has an Appendix B. If NUREG-0711, Rev. 1 is referenced, NUREG/CR-6400, "HFE (Human Factors Engineering) Insights for Advanced

Reactors Based on Operating Experience,” (Higgins and Nasta) may cited instead of the previous Appendix B.

620.022

DCD Rev. 0, page 18.2-3, 18.2.1.3, “Applicable Facilities.” The terms “remote shutdown room” and “emergency operations facility (EOF)” are used. See also page 18.2-12, last paragraph, for use of the term “remote shutdown room.” Please clarify the proper use of terminology. (See previous questions 620.004, 620.006, 620.017.)

620.023

DCD Rev. 0, Section 18.2.3.5, page 18.2-16. As part of the AP1000 design certification application, Westinghouse submitted WCAP-15847, “AP1000 Quality Assurance Procedures Supporting NRC Review of AP1000 DCD Section 18.2 and 18.8.” However, this topical report is not cited in Tier 2* material, Table 1-1, pages Intro-7 and -8. Please add this topical report to the documents listed in Table 1-1 or provide reason for not including.

620.024

DCD Rev. 1, page 18.2-18, 18.2.7, “References.” Reference Number 6 (WCAP-15847) was submitted in April 2002 not March 2002 as indicated in the DCD. Please correct.

620.025

DCD Rev. 1, page 18.2-19 (Figure 18.2-1). Please explain the basis for changing the human-system interface (HSI) design team’s responsibility for building a “control room mock-up” to building a “partial mockup (as needed).”

620.026

DCD Rev. 1, page 18.2-21, Figure 18.2-3. The figure should be modified if it is to remain in agreement with current NRC guidance, NUREG-0711, Rev. 1, May 2002. In addition, please provide the basis for all changes made to the HFE process from the process approved for the AP600 design.

620.027

DCD Rev. 0, page 18.4-2, 18.4.2, “References.” If the most current revision to NUREG-0711 is utilized, the citation should be to NUREG-0711, Rev. 1, May 2002. See also, other instances within the DCD.

620.028

DCD Rev. 0, page 18.8-1. Use is again made of the terms “remote shutdown room” and “emergency operations facility.” See previous questions related to the definition and use of these terms. In addition, there is an inconsistency in the use of the term “wall panel information system” and “wall panel information station.” Please clarify.

620.029

DCD Rev. 1, page 18.8-2, Paragraph 3. Please explain what is meant by the information in the middle of the paragraph that begins with the sentence “Application of the computerized procedure system...” and ends with “...presented by Reference 9.” It appears that credit is being taken for computerized procedures testing by referring to applications of computerized procedures outside the United States. It is unclear that the application of the computerized procedures referred to in this paragraph are for the same type of computerized procedure system that is planned for use in the AP1000 design. It is also unclear whether a computerized procedures system is being proposed as part of the AP1000 design scope for review and approval by the NRC. Please elaborate on the basis that supports using a computerized procedures system for the AP1000 design. Explain the rationale for eliminating the following statement from the AP1000 DCD: “The acceptability of the computerized procedure system, and its backup, for application to the AP1000 design, will be determined during the implementation of the AP1000 verification and validation program.”

620.030

DCD Rev. 1, page 18.8-4. Typographical error in the first sentence at the top of the page—should read, “local control **stations**.”

620.031

DCD Rev. 1, page 18.8-4, Paragraph 3 from the top of the page. Please explain how Sub-section 18.8.1.7 describes the mapping of HSI resources to the major classes of operator cognitive activities. In addition, we suggest re-writing this paragraph to reflect more of the information that was provided in Section 5.4, “Human Performance Evaluation Issues,” contained in WCAP-14701, “Methodology and Results of Defining Evaluation Issues for the AP600 Human System Interface Design Test Program,” Rev. 1, because the paragraph as currently written, is difficult to understand, e.g., how are the “resulting set of human performance issues” derived? The set of issues is nearly identical to the human performance issues previously identified as being addressed through the concept and evaluation test program for AP600. (See previous question 620.009.)

620.032

DCD Rev. 1, page 18.8-5, paragraph 18.8.1.4. Please explain the basis for eliminating Man-In-The-Loop Concept Testing from the AP1000 HSI design process. (See previous question 620.009).

620.033

DCD Rev. 1, page 18.8-7, paragraph 18.8.1.5. Please explain the basis for using only a partial mock-up for the AP1000 design process.

620.034

DCD, Rev. 1, page 18.8-9, paragraph 18.8.1.8, first paragraph, top of the page. Please explain why the reference to WCAP-14701 has been eliminated. However, WCAP-14701 is cited in Table 1-1, (page Intro-8), as Tier 2* material (information that requires NRC approval to change).

620.035

DCD Rev. 1, page 18.8-27. Reference to WCAP-14701 has been eliminated. However, this topical report was cited as Tier 2* material (information that requires NRC approval to change). Please correct or explain. (See previous question 620.034.)

620.036

DCD Rev. 1, page 18.8-31. Please clarify the guidance utilized (Rev. 0 or Rev. 1 to NUREG-0711) as a basis for Figure 18.8-3, "Mapping of Human-System Interface to Operator Decision-Making Model." Please provide a discussion for using the respective guidance.

620.037

DCD Rev. 1, page 18.11-1. WCAP-15860, "Programmatic Level Description of the AP1000 Human Factors Verification and Validation Plan," was dated in April 2002. However, the date indicated in the DCD is March, 2002. Please correct.

620.038

DCD Rev. 1, page 18.11-5. Please describe the guidance utilized in development of Figure 18.11-1 with respect to the HFE Verification and Validation Elements. If the guidance utilized is in NUREG-0711, Rev. 1, we recommend re-titling the figure to better represent the intent of the figure.

620.039

DCD Rev. 1, pages 18.12-1, 18.12-2, paragraph 18.12.2. Please explain the basis for eliminating the terminology "soft controls" from the last sentence on page 18.12-1 and from the first sentence, second paragraph, on page 18.12-2.

620.040

DCD Rev. 0, page 18.12-9. Please explain why containment hydrogen concentration has been eliminated from the AP1000 inventory as a fixed position control. (See previous question 620.005.)

620.041

DCD Rev. 1, page 7.1-29. On page 7.1-4, both the emergency operations facility (EOF) and local control stations are identified as included in the operation and control centers system

(OCS). Figure 7.1-1, "Instrumentation and Control Architecture," page 7.1-23, does not identify either the EOF or local control stations as included in the OCS. Please clarify/explain.

620.042

WCAP-15847, page 1-1. Does the WCAP contain all or some examples of the "pertinent procedures" applicable to the AP1000 design? If all the pertinent procedures are not included, how does Westinghouse propose to provide the remainder?

620.043

WCAP-15847, page 2-1. Reference 1 should be revised if it is to remain consistent with current NRC guidance.

HISTORY OF PREVIOUSLY-ISSUED
REQUESTS FOR ADDITIONAL INFORMATION

Letter No.	Date issued	ADAMS Accession No.	RAI Nos.	Date of response	ADAMS Accession No.
1	6/26/2002	ML021780568	440.001 - 440.008	7/24/2002	ML022110430
2	8/16/2002	ML022280379	720.001		
3	8/27/02	ML022390103	420.001 - 420.046, 435.001 - 435.015		

AP 1000

cc:

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