Docket File

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

December 20, 1996

Mr. Nicholas J. Liparulo, Manager
Nuclear Safety and Regulatory Analysis
Nuclear and Advanced Technology Division
Westinghouse Electric Corporation
P.O. Box 355
Pittsburgh, Pennsylvania 15230

SUBJECT: COMMENTS ON AP600 RELATED OPEN ITEMS ASSOCIATED WITH ELEMENT 1 OF THE HUMAN FACTORS ENGINEERING PROGRAM REVIEW MODEL (HFEPRM)

Dear Mr. Liparulo:

In a letter to Westinghouse dated March 22, 1996, the Nuclear Regulatory Commission (NRC) staff provided comments related to Element 1 of the HFEPRM for the AP600. Subsequently, Westinghouse revised the human factors discussions in Section 18.2 of the AP600 standard safety analysis report (SSAR, Revision 9). The staff has reviewed this material and provided an update on the Element 1 open item status as an enclosure to this letter.

In the March 22, 1996 letter to Westinghouse, and during a meeting with Westinghouse on May 21 and 22, 1996 (see meeting summary issued June 19, 1996), the staff noted that Westinghouse has supported its AP600 design certification with material that has never been docketed with the NRC. Specifically, information contained in the Westinghouse AP600 Program Operating Procedures document (WCAP-12601) and the Design Review Manual (WCAP-9817) is relied upon to support the staff's safety evaluation of the AP600 human factors engineering program. Until the pertinent information in these references is docketed with the NRC, the staff will not be able to reach a final safety conclusion related to the AP600 human factors engineering program.

DF03 1/1

240050

If you have any questions regarding this matter, you can contact me at (301) 415-1141.

Sincerely,

original signed by:

William C. Huffman, Project Manager
Standardization Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Docket No. 52-003

Enclosure: AP600 DSER Open Item Resolution of Element 1 Human Factors Program Plan

cc w/enclosure:
See next page

DISTRIBUTION:

Docket File	PDST R/F	TMartin
PUBLIC	DMatthews	TRQuay
TKenyon	BHuffman	JSebrosky
DJackson	JMoore, O-15 B18	WDean, O-17 G21
ACRS (11)	BBoger, O-9 E4	CThomas, O-9 H15
JBongarra, O-9 H15		

DOCUMENT NAME: A:EL-1REV1.LTR
To receive a copy of this document, indicate in the box: "C" = Copy without attachment/enclosure "E" = Copy with attachment/enclosure "N" = No copy

OFFICE	PM:PDST:DRPM		BC:HHFB:DRCH	E	D:PDST:DRPM					
NAME	WCHuffman:sg		CThomas		TRQuay					
DATE	12/20/96		12/20/96		12/20/96					

OFFICIAL RECORD COPY

Mr. Nicholas J. Liparulo
Westinghouse Electric Corporation

Docket No. 52-003
AP600

cc: Mr. B. A. McIntyre
Advanced Plant Safety & Licensing
Westinghouse Electric Corporation
Energy Systems Business Unit
P.O. Box 355
Pittsburgh, PA 15230

Mr. John C. Butler
Advanced Plant Safety & Licensing
Westinghouse Electric Corporation
Energy Systems Business Unit
Box 355
Pittsburgh, PA 15230

Mr. M. D. Beaumont
Nuclear and Advanced Technology Division
Westinghouse Electric Corporation
One Montrose Metro
11921 Rockville Pike
Suite 350
Rockville, MD 20852

Mr. Sterling Franks
U.S. Department of Energy
NE-50
19901 Germantown Road
Germantown, MD 20874

Mr. S. M. Modro
Nuclear Systems Analysis Technologies
Lockheed Idaho Technologies Company
Post Office Box 1625
Idaho Falls, ID 83415

Mr. Frank A. Ross
U.S. Department of Energy, NE-42
Office of LWR Safety and Technology
19901 Germantown Road
Germantown, MD 20874

Mr. Ronald Simard, Director
Advanced Reactor Programs
Nuclear Energy Institute
1776 Eye Street, N.W.
Suite 300
Washington, DC 20006-3706

Ms. Lynn Connor
Doc-Search Associates
Post Office Box 34
Cabin John, MD 20818

Mr. James E. Quinn, Projects Manager
LMR and SBWR Programs
GE Nuclear Energy
175 Curtner Avenue, M/C 165
San Jose, CA 95125

Mr. Robert H. Buchholz
GE Nuclear Energy
175 Curtner Avenue, MC-781
San Jose, CA 95125

Barton Z. Cowan, Esq.
Eckert Seamans Cherin & Mellott
600 Grant Street 42nd Floor
Pittsburgh, PA 15219

Mr. Ed Rodwell, Manager
PWR Design Certification
Electric Power Research Institute
3412 Hillview Avenue
Palo Alto, CA 94303

Mr. Charles Thompson, Nuclear Engineer
AP600 Certification
NE-50
19901 Germantown Road
Germantown, MD 20874

AP600 DSER Open Item Resolution
Element 1 Human Factors Program Plan

To address Element 1 open items, a number of review activities occurred:

1. A review of Westinghouse design files was conducted. During that review, conducted on April 5, 1995, and April 6, 1995, at the Westinghouse office in Rockville, Maryland, the following Westinghouse proprietary documents were examined:

   - WCAP-12601, AP600 Program Operating Procedures (Revision 15, dated April 1, 1995)
   - WCAP-9817, Design Review Manual (Revision 2, dated June, 1991)
   - A sample of a design review report.

   The design files review produced a number of questions which were addressed in a conference call on April 18, 1995, between NRC, BNL, and Westinghouse in which the issues were discussed and where additional information was presented.

2. Westinghouse submitted the following documents to address Element 1 issues:

   - Draft Revision 4 to SSAR Section 18.4 M-MIS Design Team, June 30, 1995
   - Draft Revision 4 to SSAR Sections 18.4.4 Human Factors Engineering Issues Tracking, June 30, 1995
   - Response to Open Item 18.2.3.3-6: HFE Subcontractor Efforts, April 25, 1995

These review activities addressed Open Items 18.2.3.2-1, 18.2.3.2-2, 18.2.3.3-1 to -6, and 18.2.3.4-1 through -4. The results of the review were documented in a letter dated 22 March 1996 from the NRC. Numerous telephone conversations were conducted to discuss and clarify NRC comments and Westinghouse technical information.

Westinghouse further addressed Element 1 open items in Revision 9 to the SSAR. The following is an overview of the results of the staff's review for all Element 1 open items.

OPEN ITEM STATUS

Open Item (OITS #, DSER #)			Current Status
General Program Goals and Scope			
1302	18.2.3.1-1:	HFE Program Assumptions and Constraints	Resolved
HFE Team and Organization			
1303	18.2.3.2-1:	HSI Team Composition	Resolved
1304	18.2.3.2-2:	HSI Team Staffing	Resolved
HFE Process and Procedures			
1305	18.2.3.3-1:	HFE Process and Procedures	Action W
1306	18.2.3.3-2:	HFE Process Management Tools	Action W
1307	18.2.3.3-3:	HFE Integration	Action W
1308	18.2.3.3-4:	HFE Program Milestones	Action W
1309	18.2.3.3-5:	HFE Documentation	Action W
1310	18.2.3.3-6:	HFE Subcontractor Efforts	Action W
Tracking System			
1311	18.2.3.4-1:	HFE Issues Tracking System Availability	Action W
1312	18.2.3.4-2:	HFE Issues Tracking System Method	Action N
1313	18.2.3.4-3:	HFE Issues Tracking System Documentation	Action N
1314	18.2.3.4-4:	HFE Issues Tracking System Responsibility	Resolved
Technical Program			
1315	18.2.3.5-1	HFE Program Elements and Documentation	Resolved

Open Item 18.2.3.1-1: HFE Program Assumptions and Constraints

2. Assumptions and Constraints

Criterion: The design assumptions (or constraints) should be clearly identified. An assumption/constraint is an aspect to the design, such as a specific staffing plan or the use of specific HSI technology, that is an input to the HFE program rather than the result of HFE analyses and evaluations. [The following is offered as an example only to illustrate the staff's review objective reflected in this criterion. If a design constraint imposed by a utility requirement (rather than by design analysis) is that the entire plant operation, including emergencies, is to be accomplished by a single operator, that constraint will impact all other human factors analyses such as allocation of function (much greater automation than is typical in commercial NPP would be required) and workstation design (a single operations console containing all plant monitoring and control function would be required). The staffing design constraint may drive the design without an acceptable HFE

rationale and may negatively impact the integration of plant personnel into the overall plant design. The point of this criterion is to make such design drivers explicit.]

DSER Evaluation: The SSAR (Revision 0) addressed the assumptions and constraints of the design by identifying them as inputs to the HFE program. The overall HFE design and implementation process was described in Section 18.8 of the SSAR (Revision 0). This section presented the inputs to the program (e.g., specific system details such as those represented by piping and instrumentation diagrams). See Figure 18.8.2-2 of the SSAR (Revision 0). While the high-level inputs are identified, the starting points for selected aspects of the detailed HFE program activities are unclear, specifically in the areas of function allocation and control room resource selection. The following paragraphs discuss the staff's concerns with the function allocation and control room resource selection. These concerns are provided as examples of the staff's overall concerns with these starting points.

- Function Allocation

  Westinghouse has made many decisions based on allocating functions as discussed in Chapter 7 of the SSAR (Revision 0). However, the applicant has not performed function allocation for the AP600 design. Nonetheless, a "baseline" allocation of functions (i.e., the function allocations identified in Section 7 of the SSAR) appears to be an input to the HFE program. Also, WCAP-14075 states that "...the assumption has been made that the AP600 will have instrumentation and control similar to that of two-loop low pressure PWR's previously designed by Westinghouse (Reference Plant). This information will be used as input to the task analysis as part of the man-machine interface design" (p. 38). Further, Table 4 of WCAP-14075 provides a detailed comparison showing that much of the instrumentation and controls (I&C) in the AP600 design is "similar" to the reference plant. This reinforces the concern that the design of the I&C is already predetermined before any of the detailed HFE design program has begun. Thus, the contributions of the HFE program to function allocation are unclear. However, the second sentence of the quote indicates that this detailed information is only a starting point in the design that will take place after the design certification as part of the HFE design process. Detailed information is needed from Westinghouse to determine which is the case, and how the information in WCAP-14075 will be used as an input to the overall HFE design process. Westinghouse should clarify the basis used for making the function allocations identified in Chapter 7 of the SSAR (Revision 0) and the role of function allocation in the AP600 design process.

- Control Room Resource Selection

  The use of a wall panel information station is not presented as a result of design analyses; rather, this design option appears to be an input to the HFE program. Section 18.9.1.1.1 of the SSAR (Revision 0) states that the wall panel information station is "important to maintaining situation awareness of the crew and for supporting crew coordination." However, these functions may be alternatively served using a similar display presented at the operators' workstations where there would be no requirements to look away from the workstation to the wall panel. It is unclear

why physical separation of the system overview display for the workstations is desirable. Also, it is plausible that the effect of such a separation on operator performance will not have the desired result, and that operators focusing on the tasks at their workstations will fail to attend to the wall panel information. Conversely, the wall panel may serve crew integration purposes. Westinghouse should clarify the intent and reason for selecting the panel design.

These examples illustrate that Westinghouse should further clarify the assumptions (or inputs) to the HFE program.

Proposed Resolution: This open item was addressed in SSAR Section 18.2.1.2 (Revision 9), Assumptions and Constraints. Assumptions and constraints stem from regulatory guidance, utility groups, and AP600 plant system design specifications. The SSAR provided an overview of the types of requirement associated with each. For example, it is a utility requirement that a single reactor operator be able to control major plant functions performed from the main control room during normal plant operations.

With respect to the specific concerns noted in the DSER, the process of function allocation was briefly discussed in SSAR Section 18.2.1.2 and further clarified in WCAP-14644 (Revision 0). Initial allocations are made by system engineers based on operating experience of previous designs.

With respect to control room resources, the inclusion of an wall panel display is an approach to meeting a utility requirement for an integrating overview and mimic display. While alternative approaches are possible, the wall panel approach will be designed and evaluated as part of the AP600 HFE program.

Appropriately, Westinghouse indicated that while all assumptions and constraints are provisionally treated as requirements, these are evaluated as part of the HFE design process for their appropriateness.

Based upon this information, the DSER issue is considered resolved and this criterion is satisfied. Note that the DSER review referenced Figure 18.8.2-2 of the SSAR (Revision 4) and that Figure has been removed in the Revision 9. However, SSAR (Revision 9) Section 18.2.1.2 adequately provides the information needed.

STATUS OF OPEN ITEM: Resolved

Open Item 18.2.3.2-1: HSI Team Composition

3. Composition

Criterion: The HFE PRM specifies that the HSI design team be composed of specific expertise including: Technical Project Management, Systems Engineering, Nuclear Engineering, Control and Instrumentation Engineering, Architect Engineering, Human Factors, Plant Operations, Computer System Engineering, Plant Procedure Development, Personnel Training, Systems Safety Engineering, and Reliability/ Availability/ Maintainability/Inspectability (RAMI) Engineering.

DSER Evaluation: SSAR (Revision 0) Section 18.4 provides the composition of the M-MIS Design Team. Each of the HFE PRM-identified areas of expertise is included in the M-MIS design team with the exception of:

- Plant Procedure Development - While this expertise is identified in 18.4.1 and a procedures group is identified as a component of the M-MIS design team, no design team members with procedures backgrounds are identified in Section 18.4.2.

- Systems Safety Engineering - No reference is identified to system safety engineering.

- Reliability/Availability/Maintainability/Inspectability (RAMI) Engineering - Maintainability engineering expertise is identified on the M-MIS design team, however, the other engineering skills are not identified.

The specific qualifications of the team members are not identified to the HFE PRM level of detail, i.e., education and years of relevant experience.

Proposed Resolution: Draft Revision 4 of the SSAR (June 30, 1995) provided more detail concerning the composition and qualifications of the M-MIS design team. In Section 18.4.1, the disciplines of plant procedure development, systems safety engineering, and reliability/availability/maintainability/ inspectability were identified.

SSAR (Revision 0) Section 18.4.2 identified the qualifications of the team members. The qualifications were reviewed using Appendix A of the PRM. The Westinghouse qualifications met the criteria of the PRM with one exception. The System Safety Engineering function did not identify certification by the Board of Certified Safety Professionals in System Safety. This exception was found acceptable because the qualification presented in SSAR (Revision 0) Section 18.4.2 were based on the experience requirements for system safety engineering that included acceptable background areas of experience.

SSAR (Revision 9) Section 18.2.2.4, Team Staffing Requirements incorporated the information provided by Westinghouse in their draft SSAR (Revision 4). Therefore, this DSER issue is considered resolved and the criterion is satisfied. It is noted that, in Revision 9 of the SSAR, the MMIS design team is referred to as the HSI Design Team.

STATUS OF OPEN ITEM: Resolved

Open Item 18.2.3.2-2: HSI Team Staffing

4. Team Staffing

Criterion: Team staffing should be described in terms of job descriptions and assignments of team personnel.

DSER Evaluation: Job descriptions and assignments were not provided in the SSAR (Revision 0). RAI 620.13 requested job descriptions and assignments of

key personnel. Westinghouse's response to the RAI was provided in general terms by describing responsibilities of the groups that make up the M-MIS design team.

Proposed Resolution: Draft Revision 4 of the SSAR (June 30, 1995) provided more detail concerning the M-MIS team personnel responsibilities. Section 18.4.3, M-MIS Design Team Role, identified the organization of the team into functional engineering design groups. A description of the responsibilities of each technical discipline (as identified in SSAR Section 18.2) are described.

SSAR (Revision 9) Section 18.2.2.3, Composition, incorporated the information from draft SSAR (Revision 4) which was reviewed and accepted by the staff. Therefore, based upon the MMIS description provided, this DSER issue is considered resolved and the criterion is satisfied.

STATUS OF OPEN ITEM: Resolved

Open Item 18.2.3.3-1: HFE Process and Procedures

1. General Process Procedures

Criterion: The process through which the team will execute its responsibilities should be identified. The process should include procedures for:

a. Assigning HFE activities to individual team members
b. Governing the internal management of the team
c. Making management decisions regarding HFE
d. Making HFE design decisions
e. Governing equipment design changes
f. Design team review of HFE products

DSER Evaluation: The programmatic aspects of the design process are described in SSAR (Revision 0) Section 18.8.2. Since the SSAR (Revision 0) does not fully describe the general HFE process and procedures, the staff requested additional information in RAIs 620.5, 620.14, 620.15, and 620.56. In their response to RAI 620.56, Westinghouse indicated that the process and documentation requirements are described in WCAP-12601 and WCAP-9817. In addition, Westinghouse's response to RAI 620.51 (Revision 2) identifies unnamed "Design Reviews and Configuration Control Documents" and, in the December 1993, NRC/Westinghouse meeting, an M-MIS Program Plan for first-of-a-kind engineering (FOAKE). These documents were not available in time for the staff to complete the DSER review, thus the review of HFE process and procedures has not been completed.

In Westinghouse's response to RAI 620.51 (Revision 2), it was stated that design reviews are an integral part of the design process. These reviews will be documented but "separate HFE Design Team DSER Evaluation Reports, as described in the program review model, are not necessary" (p. 620.51-1, Revision 2). The PRM does not identify that specific reports must be submitted. It states that the type of information addressed in the criterion be

available for review. A documented review process may satisfy the criterion, but there is not sufficient information in the Westinghouse material to make such a determination.

Proposed Resolution:

Introduction

On April 5, 1995, and April 6, 1995, the following Westinghouse documents were reviewed:

- WCAP-12601, AP600 Program Operating Procedures (Revision 15, dated April 1, 1995)
- WCAP-9817, Design Review Manual (Revision 2, dated June, 1991)
- A sample of a design review report.

The design files review produced a number of questions which were addressed in a conference call on April 18, 1995, between NRC, BNL, and Westinghouse in which the issues were discussed and where additional information was presented.

The documents reviewed address in part, the PRM criteria covered by this open item. However, additional information was still needed to resolve Open Item 18.2.3.3-1: HFE Process and Procedures. The documents also addressed, to varying extent, other open items of Element 1, as will be discussed in the following section.

Discussion of Reviewed Documents

WCAP-12601, Procedure AP-3.1, AP600 System Specification Documents (SSDs), Revision 1, dated February 28, 1991, establishes requirements for SSDs. SSDs identify specific system design requirements and show how the design satisfies the requirements. They provide a vehicle for controlling and documenting the design process. They also address information transmittal between and interfaces among the various design groups. General Step C states that the SSDs provide for the control room MMI design. Step E and Appendix C provide a list of the AP600 systems for which SSDs are required, which includes the Operation and Control Centers (OCS). Appendix A provides a top level Table of Contents by section for each SSD and Appendix B provides a summary description of what should go into sections of the SSD. Under Section 2, System Design Criteria & Objectives there is a requirement for a discussion of MMI considerations. Section 7, I & C requirements, should include alarms and status indicators. Attachment 2 contains questions related to MMI and components.

WCAP-12601, Procedure AP-3.2, Design Configuration Change Control, Revision 3, March 11, 1994, provides the required process and actions in order to implement a design change in a document that is under configuration control. The scope of the procedure includes SSDs, drawings, etc. It has considerable information on responsibilities, procedures, documentation, and approvals.

WCAP-12601, Procedure AP-3.5, Design Reviews, Revision 1, August 9, 1991, specifies the method for preparing, conducting, and documenting formal design reviews (DR) for the purpose of design verification. The DR is a systemic

overall evaluation of the design (of particular systems) by the DR Committee. Three levels of DR are normally performed, preliminary, intermediate, and final. The procedure also identifies the Action Item Chit, which is a form used to document reviewers' concerns, recommended corrective actions, and resolutions. Appendix A contains a DR Checklist which addresses items such as: human factors, system boundaries, I & C, control requirements, and interfacing system requirements.

WCAP-12601, Procedure AP-3.6, AP600 Design Criteria Documents, Revision 2, March 11, 1994, specifies requirements for the preparation, review, approval and revision of Design Criteria Documents, which define the requirements for specific aspects of the AP600 design, typically in a single discipline or subdiscipline. Item D on Page 2 requires that contractor documents be reviewed and approved by Westinghouse.

WCAP-12601, Procedure AP-3.7, Interface Control Document, Revision 0, February 8, 1991, identifies the responsibilities of organizations (including contractors) at the design interfaces and ensures that design changes affecting the interfaces are properly coordinated.

WCAP-12601, Procedure AP-3.12, AP600 Engineering Data Base (EDB) Access and Control, Revision 0, October 31, 1991, discusses requirements and responsibilities for preparing and approving movement of design data into the AP600 EDB. The EDB serves as the repository of AP600 design data for parties involved in the engineering design of the plant, so that all parties can be assured of using up-to-date data in their design tasks.

WCAP-12601, Procedure AP-3.14, AP600 Plant I & C Systems (PI&CS), Revision 0, dated October 31, 1991, addresses the following areas: a) MMI design of control rooms and control boards; b) I&C design; c) control room/equipment design. The Westinghouse PI&CS group has the responsibility for coordinating and integrating AP600 I&C and M-MIS with groups that support the AP600 organizations. A process is specified and elaborated upon for PI&CS engineering work (shown in Figure 1 of the WCAP) that includes: definition of an engineering plan, review of inputs, production of system documentation, verification of work, procurement and manufacturing followup, and acceptance testing. An iterative feature is built into the process.

WCAP-12601, Procedure AP-7.2, Control of Subcontractor Submittals, Revision 0, August 9, 1991, establishes the method for receipt, review, control, and issue of subcontractor design document submittals. It calls for the review of all subcontractor documents, but does not specify criteria for acceptance. Further information on this topic is presented under Open Item 18.2.3.3-6 below.

The Design Review Manual (WCAP-9817 Revision 2) describes the design review (DR) process, which is a method for identifying design problems during product development. It includes a preliminary, intermediate, and final DR and has a rough schedule. Section 3.0 specifies the formal documentation required in the DR reports. Section 5.0 includes the DR checklists, including Figure 5.5, the Human Factors Checklist, which contains 27 detailed questions to be answered by the DR team. Section 8.0, Action Item Chits (AIC), describes how these chits document issues raised by the DR team. It defines responsibilities for the AIC process. In the phone conversation on April 18, 1995,

Westinghouse stated that WCAP 9817 is a higher level, more general document and that the detailed criteria for a given project may vary. For the AP600 project the detailed criteria are contained in WCAP 12601.

Several questions were identified and were forwarded to Westinghouse for response. Some of these questions were addressed in the phone conversations on April 18, 1995. Pertinent questions to the review and the Westinghouse answers (where available) are summarized below.

WCAP-9817/DSER Item 18.2.3.4-2

Section 8.0 addresses Action Item Chits; however, a clear method for tracking them to closure was not provided.

WCAP-12601, AP-3.14/DSER Items 18.2.3.3., 1c; 1d; & 3.

This procedure details what goes into the System Specification Document for the I&C and MMI of Control Room, however it lacked details of human factors and MMI aspects. Further, from the information provided in this AP, it was not clear how the PI&CS SSD discussed here relates to the OCS SSD in Appendix C of AP-3.1 (particularly the Appendix B table of contents of AP-3.14).

Westinghouse responded to these questions by phone (April 18, 1995) noting that AP-3.14 tailors the requirements of AP-3.1 for I&C/MMI systems. Also, they noted that the design documents for MMI resources are the Functional Requirements documents. The OCS SSD will refer to these Functional Requirements documents (e.g., the Alarm System documents). Therefore, the concerns raised by the staff in its review of these documents were resolved.

Sample Design Review/DSER Item 18.2.3.3-1f and 18.2.3.4-2,3, & 4.

A document was reviewed as an example of the Design Review process. It was examined in conjunction with WCAP-9817 and AP-3.5. During the phone conversation on April 18, 1995, Westinghouse clarified that some differences between the sample DR package and the procedures identified in WCAP-9817.

The document was incomplete when compared to the information specified for a design review in WCAP-9817, for example:

1. Not all of the Action Item Chits were signed off as complete or had clear action identified, e.g., Items no. 2, 3, 4, 10, 11, & 14. The status and tracking of these chits was not identified. Attachment 3 was missing.

2. All of the items required by section 3.0 of 9817 were not included,

   e.g. 3.1 Findings

   3.3 Reference to minutes

   3.4 Reference to calculations, etc.

3.5 Copy of each Action Item with resolution or assigned completion date and tracking.

3.6 Copies of each action item not accepted, e.g., Item no 1 was missing.

3. Design review data package per Section 2 and completed checklists per Section 5 as specified by WCAP-9817 were not included.

4. The information also did not match that called for in Appendix B of AP-3.5.

Westinghouse stated in the phone conversation that the sample design review package was produced following a process that was slightly different from the AP600 process. Hence it did not precisely comply with the AP procedures for the AP600 in WCAP-12601. Also, WCAP-9817 is a top level guidance document which is used to write the detailed project level documents. Thus an individual project design review will not necessarily meet all of the requirements of WCAP-9817. They further stated that at the completion of the design review, before the product is turned over to the customer, all AITs and other paperwork will be complete. The Westinghouse responses from the phone conversation of April 19, 1995, resolved the staff's concerns related to this document.

Comparison to PRM Criteria

Items 1a and 1b of the criterion for general process procedures address the assignment of HFE activities to individual team members and the internal management of the team. Draft SSAR (Revision 4), Section 18.4.3, M-MIS Design Team Role, discussed the organization of the team (Figure 18.4-2) and its relation to the overall AP600 organization. The internal workings of the organization were also described. The key people of the M-MIS design team consist of an I&C Manager, a MMI Design Group Manager, the M-MIS technical lead , a review team, the core M-MIS design team. The M-MIS technical lead works in the Man-Machine Design Group and reports to the Manager of the Man-Machine Design Group, who in turn reports to the I&C Manager, who then reports to the AP600 Project Manager. Responsibilities are defined in Section 18.4.3. and the organization is depicted on SSAR (Revision 4) Figure 18.4-2. Individual technical skills were listed that will be brought to bear on the project and are coordinated by the M-MIS technical lead. These disciplines include: Technical project Management, Systems Engineering, Nuclear Engineering, I&C Engineering, Architect Engineering, Human Factors, Plant Operations, Computer Systems, Plant Procedures, Training, Systems Safety Engineering, Maintainability or Inspectability, and Reliability or Availability Engineering.

WCAP-12601, in several of its procedures, also covers these two areas, as described above. These activities are acceptably detailed and Westinghouse is experienced in implementing such an organization over the past several years.

Items 1c and 1d address management and design decisions relative to HFE. These topics are generally covered in the procedures of WCAP-12601 as discussed previously. Also, they were further addressed in draft SSAR (Revision 0) Section 18.4.3., M-MIS Design Team Role, which covered the roles of the various managers associated with the project. One outstanding concern related to WCAP-12601, AP-3.1 and AP-3.14. These procedures detail what goes

into the System Specification Documents for the I&C and MMI of Control Room, however they lack any details of the human factors and MMI aspects. Further, it was not clearly documented how the System Functional Requirements Documents addressed this and were properly tied-in and coordinated.

Criteria 1e and 1f address equipment design changes and design team review of HFE products. These areas are covered by WCAP-9817, WCAP-12601, AP-3.2 and AP-3.5, and SSAR (Revision 4) Section 18.4.4. These documents acceptably discuss the Westinghouse design change control and design review process, as noted previously.

Thus, based on the review of Westinghouse design files and the draft SSAR (Revision 4), all criteria except 1.c and 1.d were technically resolved. The draft SSAR information was acceptably included in SSAR (Revision 9) Section 18.2.3, Human Factors Engineering Process and Procedures. Thus these aspects of the PRM criterion are considered resolved.

The outstanding issues related to items 1.c and 1.d noted above, were addressed in Section 18.2.3.1 (Revision 9). The SSAR indicated that system specification documents document human factors and HSI requirements by including task requirements, information requirements, and operations requirements. They provide a mechanism to document and track HFE requirements. A functional requirements document is developed for each HSI resource, e.g., alarm system and wall panel information system. Design specification documents document design specifications and integration. This information acceptably provided an indication of how HFE information is documented and coordinated.

Based upon the information provided and reviewed by the staff, Westinghouse has acceptably addressed this DSER open item and the HFE PRM criterion. However, until the pertinent information in WCAP-12601 and WCAP-9817 are placed in the SSAR or a docketed secondary reference, this item remains open.

STATUS OF OPEN ITEM: Action W

<u>Open Item 18.2.3.3-2: HFE Process Management Tools</u>

2. <u>Process Management Tools</u>

Criterion: Tools and techniques (e.g., review forms) to be utilized by the team to ensure they fulfill their responsibilities should be identified.

DSER Evaluation: See previous DSER Evaluation for Criterion 1.

Proposed Resolution:

On April 5, 1995, and April 6, 1995, the following Westinghouse proprietary documents were reviewed:

- WCAP-12601, AP600 Program Operating Procedures (Revision 15, dated April 1, 1995)

- WCAP-9817, Design Review Manual (Revision 2, dated June, 1991)
- A sample of a design review report.

These documents addressed most of the PRM criteria covered by this open item as noted in the previous discussion of Item 18.2.3.3-1 above. However, two areas were not satisfactorily addressed.

First, WCAP-9817, Section 8.0 and WCAP-12601, AP-3.5, addressed Action Item Chits, but there was not a clear method discussed for tracking them to closure; and an actual example seemed to substantiate this concern. Namely, the sample design review was reviewed as an example of the Design Review process of Westinghouse in conjunction with WCAP-9817 and AP-3.5. Some Action Item Chits appeared to be missing or incomplete. For example, not all of the Action Item Chits were signed off as complete or had clear action identified, e.g. Items no. 2, 3, 4, 10, 11, & 14.

Further, some of the positive features of WCAP-9817 (a top level document) had not been carried forward to requirements for the project, for which sample design review product was being built. Thus the completed Human Factors checklists, required by Section 5 of WCAP 9817, were not included in the design review data package. Thus it was possible that the same would be the case for AP600.

Both of these issues were addressed in SSAR (Revision 9) Section 18.2.3.1, General Process and Procedures. The SSAR indicated that Action Items resulting from design reviews are tracked to closure through the design issues tracking database. SSAR (Revision 9) Section 18.2.4, Human Factors Engineering Issues Tracking, indicated that the database receives issues to track from several sources including design reviews. The responsibility for entering design review action items into the database and tracking them is the manager responsible for the system reviewed. This method is an acceptable approach to tracking the design review action items.

The issue associated with the use of HFE checklists was addressed in SSAR (Revision 9) Section 18.2.3.1, General Process and Procedures. HFE checklists are included in the design review package provided for each design review. An action item is defined for each issue identified through use of the checklist. This information acceptably addresses the staff's concern about the application of the HFE checklists to AP600.

Based upon the information provided and reviewed by the staff, Westinghouse has acceptably addressed this DSER open item and the HFE PRM criterion. However, until the pertinent information in WCAP-12601 and WCAP-9817 are placed in the SSAR or a docketed secondary reference, this item remains open.

STATUS OF OPEN ITEM: Action W

Open Item 18.2.3.3-3: HFE Integration

3. Integration of HFE and Other Plant Design Activities

Criterion: The integration of design activities should be identified, i.e., the inputs from other plant design activities to the HFE program and the outputs from the HFE program to other plant design activities. The iterative nature of the HFE design process should be addressed.

DSER Evaluation: See previous DSER Evaluation for Criterion 1.

Proposed Resolution:

On April 5, 1995, and April 6, 1995, the following Westinghouse proprietary documents were reviewed:

- WCAP-12601, AP600 Program Operating Procedures (Revision 15, dated April 1, 1995)
- WCAP-9817, Design Review Manual (Revision 2, dated June, 1991)
- A sample of a design review report.

Also reviewed for this section was the SSAR (Revision 0) Chapter 18 and the draft SSAR (Revision 4) Section 18.4 M-MIS Design Team, dated June 30, 1995.

As discussed previously with respect to Open Item 18.2.3.3-1, HFE Process and Procedures, WCAP-12601 provided an overall AP600 structure under which the AP600 is designed. This procedural structure (with the series of AP procedures) provides for an integration of design activities among the various entities, both within and external to Westinghouse. Procedure AP-3.1, AP600 System Specification Documents (SSDs), provides for SSDs that identify specific system design requirements and show how the design satisfies the requirements. SSDs provide a vehicle for controlling and documenting the design process. SSDs also address information transmittal between and interfaces among the various design groups.

Procedure AP-3.2, Design Configuration Change Control, provides the required process and actions in order to implement design changes. Procedure AP-3.7, Interface Control Document, identifies the responsibilities of organizations (including contractors) at the design interfaces. Procedure AP-3.12, AP600 Engineering Data Base (EDB) Access and Control, discusses requirements and responsibilities for preparing and approving movement of design data into the AP600 EDB. The EDB serves as the repository of AP600 design data for parties involved in the engineering design of the plant, so that all parties can be assured of using up-to-date data in their design tasks.

Procedure AP-3.14, AP600 Plant I&C Systems (PI&CS), addresses MMI and equipment design of control rooms, and I&C design. The PI&CS group has the responsibility for coordinating and integrating AP600 I&C and M-MIS with groups that support the AP600 organizations. A process is specified for PI&CS engineering work that includes: definition of an engineering plan, review of

inputs, production of system documentation, verification of work, procurement and manufacturing followup, and acceptance testing. An iterative feature is built into the process.

Additionally, SSAR (Revision 0) Figures 18.4-1, 18.4-2, 18.8.2-1 and 18.8.2-9 depicted organization and design process flow that includes iterative and feedback features. SSAR Section 18.12 (Revision 0) discussed the integration of the Westinghouse designed components of the M-MIS with those portions that are site-specific and are the responsibility of the Combined License applicant (COL). This included areas such as the Operations Support Center (OSC) and the Emergency Operations Facility (EOF). The staff concludes that Westinghouse has acceptably addressed the integration HFE and other plant design activities.

The information was provided in final form in SSAR (Revision 9) Section 18.2.3.3, Integration of HFE and Other Plant Design Activities.

Based upon the information provided and reviewed by the staff, Westinghouse has acceptably addressed this DSER open item and the HFE PRM criterion. However, until the pertinent information in WCAP-12601 and WCAP-9817 are placed in the SSAR or a docketed secondary reference, this item remains open.

STATUS OF OPEN ITEM: Action W

Open Item 18.2.3.3-4: HFE Program Milestones

4. HFE Program Milestones

Criterion: HFE milestones should be identified so that evaluations of the effectiveness of the HFE effort can be made at critical check points and show the relationship to the integrated plant sequence of events. A relative program schedule of HFE tasks showing relationships between HFE elements and activities, products, reviews should be available for review.

DSER Evaluation: See previous DSER Evaluation for Criterion 1.

Proposed Resolution:

On April 5, 1995, and April 6, 1995, the following Westinghouse proprietary documents were reviewed:

- WCAP-12601, AP600 Program Operating Procedures (Revision 15, dated April 1, 1995)
- WCAP-9817, Design Review Manual (Revision 2, dated June, 1991)

Based upon the high-level design process description provided by these documents and the conference call on April 18, 1995, between NRC, BNL, and Westinghouse, the program schedule of HFE tasks showing the relationships between the various HFE elements and activities, products, and reviews which was provided in the SSAR (Revision 0) was clarified. This relative schedule is summarized in SSAR (Revision 4) Figure 18.8.2-1, Design Integration by Design Iteration and Verification, and Figure 18.8.2-2, Man-Machine Interface

Design process. The program is described in some detail in SSAR (Revision 0) Section 18.8.2, Detailed Explanation of the Human Engineering Design Process. This contains subsections covering the details of many areas of the process, including: the M-MIS Design Process, the M-MIS Software Design and Implementation Process, the M-MIS Design Verification and Validation Process, and M-MIS Evaluations. Table 18.8.2-2 provides a detailed outline/discussion of the proposed M-MIS evaluations. Some further information is also provided in two additional SSAR figures, namely Figure 18.8.2-3, Software Design, Implementation and Verification Process, and Figure 18.8.2-6 Integration of the V&V Test Program in the M-MIS Design Process.

Internal design reviews that are to be performed throughout the design process are described in WCAP-12601, AP-3.5, Design Reviews, which specifies the method for preparing, conducting, and documenting formal design reviews for the purpose of design verification. The Design Review is a systemic overall evaluation of the design (of particular systems) by the Design Review Committee. Three levels of Design Review are normally performed, a preliminary, an intermediate, and a final review. The information provided by Westinghouse acceptably addresses the relative program schedule.

Based upon the information provided and reviewed by the staff, Westinghouse has acceptably addressed this DSER open item and the HFE PRM criterion. However, until the pertinent information in WCAP-12601 and WCAP-9817 are placed in the SSAR or a docketed secondary reference, this item remains open.

STATUS OF OPEN ITEM: Action W

Open Item 18.2.3.3-5: HFE Documentation

5. HFE Documentation

Criterion: HFE documentation items should be identified and briefly described along with the procedures for retention and access.

DSER Evaluation: See previous DSER Evaluation for Criterion 1.

Proposed Resolution: As discussed previously in the paragraph on Open Item 18.2.3.3-1, HFE Process and Procedures, WCAP-12601 provides an overall structure under which the AP600 is designed. A number of the procedures contained within WCAP-12601 address documentation, including retention and access. Typically the requirements and controls apply to all AP600 areas and are not specific to the HFE area, however some of the procedures of WCAP-12601 are more specifically oriented to HFE areas.

Procedure AP-3.1, AP600 System Specification Documents (SSDs), establishes requirements for SSDs. SSDs will be written for all systems and contain the design information for that system. They identify specific system design requirements and show how the design satisfies the requirements. Other WCAP 12601 procedures that also address documentation are: AP-3.2, Design Configuration Change Control, AP-3.5, Design Reviews, AP-3.6, AP600 Design Criteria Documents, AP-3.12, AP600 Engineering Data Base (EDB) Access and Control, and AP-7.2, Control of Subcontractor Submittals. SSAR (Revision 9)

Section 18.2.3.4, HFE Documentation, provided an overview of the HFE documentation process. Thus, Westinghouse has established a documentation process, including procedures, that address the requirements of the this criterion.

Based upon the information provided and reviewed by the staff, Westinghouse has acceptably addressed this DSER open item and the HFE PRM criterion. However, until the pertinent information in WCAP-12601 is placed in the SSAR or a docketed secondary reference, this item remains open.

STATUS OF OPEN ITEM: Action W

Open Item 18.2.3.3-6: HFE Subcontractor Efforts

6. HFE in Subcontractor Efforts

Criterion: HFE requirements should be included in each subcontract and the subcontractor's compliance with HFE requirements should be periodically verified.

DSER Evaluation: See previous DSER Evaluation for Criterion 1.

Proposed Resolution:

On April 5, 1995, and April 6, 1995, the following Westinghouse proprietary documents were reviewed:

- WCAP-12601, AP600 Program Operating Procedures (Revision 15, dated April 1, 1995)
- WCAP-9817, Design Review Manual (Revision 2, dated June, 1991)
- A sample of a design review report.

These documents address only a small part the PRM criteria covered by this open item as noted in the previous discussion of Item 18.2.3.3-1. Thus, additional information was required to close the item.

WCAP-12601, Procedure AP-3.6, AP600 Design Criteria Documents, Revision 2, March 11, 1994, specified requirements for the preparation, review, approval and revision of Design Criteria Documents, which defined the requirements for specific aspects of the AP600 design, typically in a single discipline or subdiscipline. Item D on Page 2 requires that contractor documents be reviewed and approved by Westinghouse. No criteria were given for this review.

WCAP-12601, Procedure AP-3.7, Interface Control Document, Revision 0, February 8, 1991, identified the responsibilities of orgarizations (including contractors) at the design interfaces and ensures that design changes affecting the interfaces are properly coordinated.

WCAP-12601, Procedure AP-7.2, Control of Subcontractor Submittals, Revision 0, August 9, 1991, established the method for receipt, review, control, and issue of subcontractor design document submittals. It called for the review of all

WCAP-12601, Procedure AP-7.2, Control of Subcontractor Submittals, Revision 0, August 9, 1991, established the method for receipt, review, control, and issue of subcontractor design document submittals. It called for the review of all subcontractor documents. However, no review criteria were specified.

Thus, these documents addressed only part the PRM criterion covered by this open item. Additional information was provided on April 25, 1995. Westinghouse submitted a response to this open item and indicated that WCAP-12601 was sent to all subcontractors of the AP600 and that they must follow its procedures. This requirement places subcontractor operating procedures and design reviews under the same procedures as those governing the rest of the AP600 design.

SSAR (Revision 9) Section 18.2.3.5, HFE in Subcontractor Efforts did not clearly indicate that subcontractors must follow Westinghouse design and review procedures. In fact, it stated that these organizations follow their own procedures, which is in apparent contradiction of the information received on April 25, 1995.

Based upon the information provided and reviewed by the staff, Westinghouse has not acceptably addressed this DSER open item and the HFE PRM criterion. Until the contradiction is resolved and the pertinent information in WCAP-12601 and WCAP-9817 is placed in the SSAR or a docketed secondary reference, this item remains open.

STATUS OF OPEN ITEM: Action W

Open Item 18.2.3.4-1: HFE Issues Tracking System Availability

1. Availability

Criterion: A tracking system should be available to address human factors issues that are (1) known to the industry (defined in the Operating Experience Review, Element 2 of the HFE PRM) and (2) identified throughout the life cycle of the HFE/HSI design, development and DSER Evaluation. Issues are those items which need to be addressed at some later date and thus need to be tracked to ensure that they are not overlooked. An existing tracking system may be adapted to serve this purpose.

DSER Evaluation: RAI 620.15 requested a description of how Westinghouse tracks and documents HFE-related issues. Westinghouse's response indicated that HFE issues are addressed and resolved through design change proposals (DCPs). DCPs are maintained in a computerized database. Since DCPs address proposed resolutions, they are part of an issues tracking process but such a system does not address the documentation and tracking of unresolved issues. RAI 620.54 reiterated the staff's request for information on an issues tracking system. Westinghouse's response indicated that "no formal system exists to track future issues." Westinghouse's response to RAI 620.80 indicated that HFE issues are tracked using a "human factors checklist."

In a meeting between the staff and Westinghouse held December 13 and 14, 1993, Westinghouse indicated that a tracking system is in place and is more fully described in WCAP's 9565 and 12601. The checklists are more fully described

in WCAP 9817. However, these documents were not available for review at the time this review was performed. Thus, it is not yet clear whether a tracking system meeting the HFE PRM criteria is available.

Proposed Resolution: Westinghouse's response to RAI 620.15, Revision 1 indicated that two methods are used to identify, track, and resolve design issues: the Design Configuration Change Control process and the Design Review process. The revised response did not address documentation and tracking of *unresolved* issues.

In addition, the response indicated that issues are identified and tracked through the Design Review process. The design review board includes a representative of the M-MIS design team. The board uses Human Factors checklists (described in WCAP-9817). For each issue identified, action items are identified and documented. The design review is not considered complete until all items are closed. The design review is documented in a report.

On April 5, 1995, and April 6, 1995, the following Westinghouse proprietary documents were reviewed:

- WCAP-12601, AP600 Program Operating Procedures (Revision 15, dated April 1, 1995)
- WCAP-9817, Design Review Manual (Revision 2, dated June, 1991)
- A sample of a design review report.

WCAP-12601, Procedure AP-3.1, AP600 System Specification Documents (SSDs), Revision 1, dated February 28, 1991, establishes requirements for the SSDs. The SSDs identify specific system design requirements and show how the design satisfies the requirements. They provide a vehicle for controlling and documenting the design process. At the March 1995 meeting at Westinghouse, Westinghouse stated that they were considering using the SSDs for a HFE tracking system. The mechanism for this was not clear.

WCAP-12601, Procedure AP-3.5, Design Reviews, Revision 1, August 9, 1991, specifies the method for preparing, conducting, and documenting formal design reviews (DR). The procedure also identifies the Action Item Chit, which is a form used to document reviewers' identified concerns, recommended corrective actions, and the resolutions.

These documents addressed only in part the PRM criteria covered by this open item (and the following three open items). Additional information was needed to close the item.

Further information was provided in SSAR (Revision 0) Section 18.4.4, HFE Issues Tracking (Draft Revision 4, June 30, 1995), which described the types of issues tracking methods and how each is used. Issues tracking was accomplished using a combination of four processes:

- The design configuration change control process,
- The design review process,
- The SSD, and
- The URD compliance database.

While the URD compliance database may be an important activity since many of its requirements were based on HFE issues and concerns, the staff considered it outside the scope of an issues tracking system with respect to this PRM criteria. URD compliance tracks requirements conformance.

The appropriate technique depended on the stage of the design process and on how the issue was identified. The combination of these approaches to issue tracking seemed to provide an acceptable means of identifying and resolving HFE concerns.

Westinghouse had described a generally acceptable approach to the tracking of HFE issues. However, the staff requested an audit of the system to verify its implementation and use.

However, a tracking system was described in SSAR (Revision 9) Section 18.2.4, HFE Issues Tracking, which differed from that reviewed earlier. Revision 9 described the use of a database to track AP600 issues to resolution. The database receives inputs from OER, design reviews, and design issues identified by AP600 designers. The staff considered the establishment of a single mechanism to track issues a better approach than the collection of mechanisms previously described. However, as noted in the discussions of the more detailed aspects of the tracking system below, the tracking system was not described in sufficient detail to establish that the tracking system criteria are satisfied. Therefore, resolution of tracking system open items will require a staff audit of the tracking system availability, description, and operating procedures.

Based upon the information provided and reviewed by the staff, Westinghouse has not acceptably addressed this DSER open item and the HFE PRM criterion. In addition, until the pertinent information in WCAP-12601 and WCAP-9817 is placed in the SSAR or a docketed secondary reference, this item remains open.

STATUS OF OPEN ITEM: Action W

<u>Open Item 18.2.3.4-2: HFE Issues Tracking System Method</u>

2. <u>Method</u>

Criterion: The method should document and track HFE issues from identification until elimination or reduction to an acceptable level.

DSER Evaluation: See previous DSER Evaluation for Criterion 1.

Proposed Resolution: SSAR Section 18.4.4, HFE Issues Tracking (Draft Revision 4, June 30, 1995), described the methods used to track and resolve such issues for each issue tracking technique. As indicated in the discussion of Open Item 18.2.3.4-1, issues tracking was to be accomplished using several processes, each with its own methodology. The design configuration change control process was to track issues through a formal database. The process was to be used to track proposed design changes from initiation to implementation of a design solution.

The design review process followed the formal procedures specified in Westinghouse design review procedures. Issues arising from design reviews are tracked through action item chits until they are resolved. Westinghouse procedures generally prohibit field implementation of a product until all such items are satisfactorily resolved and documented. While several questions remained concerning specific aspects of the Westinghouse design review process (see discussion under Open Item 18.2.3.3-1: HFE Process and Procedures above), it was an acceptable means of tracking HFE issues.

The SSD is used to track HFE issues prior to configuration control (when the other methods are used). Issues are tracked by entering them into the functional requirements and design basis document.

As noted above, SSAR (Revision 9) Section 18.2.4, HFE Issues Tracking, described a database for tracking issues. The general method by which issues are tracked was not specifically identified. It stated that design issues are entered, and that the actions taken to address the issue and the final resolution are documented. An audit of the tracking system is needed to establish the procedures that are use to enter and track issues in the database.

STATUS OF OPEN ITEM: Action N

Open Item 18.2.3.4-3: HFE Issues Tracking System Documentation

3. Documentation

Criterion: Each issue/concern that meets or exceeds the threshold established by the design team should be entered into the system when first identified, and each action taken to eliminate or reduce the issue/concern should be thoroughly documented. The final resolution of the issue should be documented in detail, along with information regarding design team acceptance.

DSER Evaluation: See previous DSER Evaluation for Criterion 1.

Proposed Resolution: The documentation of HFE issues was identified in the discussion of each HFE tracking method described in the discussion of Open Item 18.2.3.4-2 above. However, SSAR (Revision 9) Section 18.2.4, HFE Issues Tracking, did not specifically identify what information concerning an issue is documented. It stated that design issues are entered, and that the actions taken to address the issue and the final resolution are documented. An audit of the tracking system is needed to establish the precise documentation provided for issues in the database.

STATUS OF OPEN ITEM: Action N

Open Item 18.2.3.4-4: HFE Issues Tracking System Responsibility

4. Responsibility

Criterion: When an issue is identified, the tracking procedures should describe individual responsibilities for issue logging, tracking and resolution, and resolution acceptance.

DSER Evaluation: See previous DSER Evaluation for Criterion 1.

Proposed Resolution: SSAR Section 18.4.4, HFE Issues Tracking (Draft Revision 4, June 30, 1995), identified the M-MIS technical lead as the one central person responsible for tracking HFE issues to resolution (SSAR p. 18.4-10).

SSAR (Revision 9) Section 18.2.4, HFE Issues Tracking, provided further clarification and indicated that a responsible engineer is identified in the database for each issue. Design review issues, for example, are the responsibility of the manager who is responsible for the system under review. It is the AP600 project manager who is responsible for the overall maintenance and documentation of the tracking system.

Based upon this information, this DSER issue is considered resolved and the criterion is satisfied.

STATUS OF OPEN ITEM: Resolved

Open Item 18.2.3.5-1: HFE Program Elements and Documentation

1. Plans and Analyses

Criterion: Identify and describe the general development of implementation plans, analyses, and Evaluation of:

- Operating Experience Review
- Functional Requirements Analysis and Allocation
- Task Analysis
- Staffing
- Human Reliability Analysis
- Human-System Interface Design
- Procedure Design
- Training Program Development
- Human Factors Verification and Validation

DSER Evaluation: Westinghouse's technical program, as presented in SSAR (Revision 0) Sections 13 and 18, incorporates all of the identified HFE PRM elements except HRA. HRA activities are addressed in the PRA report, and other HRA related materials, (see DSER Section 18.7). The HFE program plan should identify the interface between the HRA effort and the HFE analysis, design, and DSER Evaluation activities. This interface is not addressed in the HFE program. It is discussed in the Westinghouse response to RAI 720.117 but the programmatic relationship for information exchange is not described.

For example, the use of HRA insights does not appear as an input on Figure 18.8.2-1. Additional information on the relationship between PRA/HRA and HFE activities is needed.

SSAR (Revision 0) Figures 18.8.2-1, 18.8.2-2, 18.8.2-3 identify the inputs and outputs (documentation) for the major activities of the HFE program. The documentation is complete with the following exceptions:

- OER
- HRA (see previous discussion)
- Documentation of T&E program (e.g., test plan and reports).

Additional information on the documentation requirements for these aspects of the HFE program is needed.

Proposed Resolution: SSAR (Revision 9) Section 18.2.5, HFE Technical Program and Milestones; SSAR (Revision 9) Figure 18.2.3, Overview of the AP600 HFE Process; and the individual section of Chapter 18 addressed this issue. HRA has been identified as part of the HFE effort. The relationships between the technical program elements and their technical outputs were identified.

Based upon this information, this DSER issue is considered resolved and the criterion is satisfied.

STATUS OF OPEN ITEM: Resolved