Westinghouse Electric Corporation Energy Systems

Box 355
Pittsburgh Pennsylvania 15230-0355

NSD-NRC-97-5049
DCP/NRC0795
Docket No.: STN-52-003

April 2, 1997

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: T. R. QUAY

SUBJECT: AP600 DESIGN CERTIFICATION; FORMAL NOTIFICATION OF RESOLUTION OF ITEMS ASSOCIATED WITH CHAPTER 18

References: SECY-97-051, "Schedule for the Staff's Review of the AP600 Design Certification Application," dated February 26, 1997, forwarded by NRC letter "Westinghouse's Support of the Nuclear Regulatory Commission Review of the AP600 Design Certification Review," dated March 6, 1997.

Dear Mr. Quay:

This letter is to formally consolidate responses and resolutions of items associated with SSAR Chapter 18 and to confirm completion of submittal of final documentation related to SSAR Chapter 18 for our application for AP600 Design Certification. The Reference includes a milestone "Applicant Submits Final SSAR Revision & Documentation" by May 1997. Westinghouse interprets this to require NRC acknowledgement of receipt of final documentation supporting our application for AP600 Design Certification. To support this milestone, NRC and Westinghouse maintain a detailed activity plan which provides schedule goals for most SSAR/FSER sections and related activities, such as, the PRA, code validation, and ITAACs. In this detail activity plan, Westinghouse application input and NRC internal FSER input for Chapter 18 of the SSAR had a schedule goal of March 15, 1997. NRC and Westinghouse also maintain a joint open item tracking system to informally monitor the status and history of open items (DSER, RAI, meeting, and other) associated with our application.

NRC has requested that, although most items have been discussed and resolved using SSAR and RAI markups followed by formal revisions, Westinghouse consolidate their remaining resolutions into a single, formal response. Attachment 1 to this letter provides a chronology for each item discussed. Westinghouse believes it has submitted resolution for all items for SSAR Chapter 18. Attachment 2 provides formalized copies resubmitting the resolving documentation for items not acknowledged by NRC. Note that some responses were provided some months ago. NRC is requested to acknowledge receipt of this information by directing Westinghouse to change the "NRC Status" to "Action N" or "Resolved".

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Based upon a review of the information provided for Chapter 18 of the SSAR and a review of the related open item entries in our informal tracking system, Westinghouse confirms its completion of the submittal of information to support this portion of our application. Any additional questions or requests for additional information on Chapter 18 of the SSAR which require formal response must be received by Westinghouse by May 9, 1997 in order to support the May 1997 milestone in SECY-97-051.

If you have any comments or questions on this letter please contact J. W. Winters (412-374-5290) or S. P. Kerch (412-374-5104).

D. A. Lindgren /pkr

Brian A. McIntyre, Manager
Advanced Plant Safety and Licensing

jml

Attachment 1: Chronology for Chapter 18 Open Items
Attachment 2: Chapter 18 Open Resolving Documentation

cc: D. Jackson, NRC
N. J. Liparulo, Westinghouse (w/o Attachments)
W. C. Huffman, NRC (w/o Attachments)

Attachment 1 to NSD-NRC-97-5049

Chronology for Open Items Associated with Chapter 18

Open Item Number	NRC Status	Response Vehicle	Response Date	Appendix 2 Page
1395	Action W	Fax to Bongarra	3/10/97	1 & 12 through 19
1397	Action W	Fax to Bongarra	3/10/97	2 through 19

Attachment 2 to NSD-NRC-97-5049

Resolving Documentation for Open Items
Associated With Chapter 18

AP600 Open Item Tracking System Database: Executive Summary

Date: 3/27/97

Selection: [nrc st code]='Action W' And [DSER Section] like '18*' Sorted by Item #

Item No	Branch	DSER Section/ Question	Type	Title/Description Detail Status	Resp Engineer	(W) Status	NRC Status	Letter No. /	Date
1395	NRR/HHFB	18.12.3-1	DSER-OI		MMIS	Closed	Action W	NSD-NRC-4875	

Westinghouse should submit an acceptable minimum inventory of fixed-position controls, displays, and alarms for transient mitigation. Westinghouse should describe how the task analysis will define a minimum inventoryof alarms, displays, and controls necessary to perform crew tasks. Westinghouse should describe the technical basis for the minimum inventory. Westinghouse should describe how an inventory will be identified of fixed-position controls, displays, and alarms necessary to permit execution of the operator tesks to place and maintain the plant in a safe-shutdown condition. Westinghouse should describe how additional detailed characteristics of these controls, displays, and alarms (e.g., ranges, scales, physical dimensions, and actual information presentation) will be identified, defined, and implemented.

Per 2/16/95 conference call between Jim Bongarra, John O'Hara & Kerch, Easter, Roth, Mumaw:
Westinghouse to include this on the March meeting agenda.
Action N -- Give Westinghouse feedback on our proposed resolution (proposed during 2/2/95 meeting in Rockville).

3/8/95 meeting:
NRC requested Westinghouse consider that the detailed list remain completely in Tier 2. Tier 1 would include the process to select the final inventory.
ACTION W: If the inventory list is provided in chapter 7, then make the cross reference strong from chapter 18. Also, the list should include the process / criteria that was used to generate the list. Westinghouse position is that this list is an expansion of the RG 1.97 criteria and philosophy to address controls and displays. Should a Tier 1 list be required we will pursue use of critieria presented at the Feb 2 meeting versus the NRC criteria used on evolutionary plants. Also prepare a draft Tier 1 list. Need to take a stab at defining acceptable ITAAC and supporting SSAR information as to how the final inventory will be defined (Use PRA, EOPs, ERGs, FBTA). Caution from A. Sterdis -- There will be a strong push to be specific in defining these design ITAAC.

ACTION N: NRC staff to prepare a position paper for NRC senior management, proposing Tier 1 include the process / critieria. Goal is to produce the paper to support the next scheduled Senior management meeting of April 4.

2/2/95: Presentation of above made in Rockville, NRC staff to discuss and provide feedback.
2/9/95: Discussed during NRC/Westinghouse senior management meeting as one of the top 50 open items. Action N -- to provide feedback on Westinghouse proposal for resolution.
2/27/95: Conference call with NRC (J. Bongarra, G. Galletti, J. O'Hara, J.Easter, A.Sterdis & S.Kerch). 1. Agreed to following definition of "fixed position" -- unique location in the control room/control panel for alarms, displays, controls where present information from the minimum inventory; continuously available not continously displayed, doesn't have to be class 1E; always displayed at the same location; dedicated location where the operator can retrieve information that is part of the minimum inventory. 2. Scope of min. inv. -- failed to reach a mutual understanding on this; NRC stated that scope includes those controls and indications needed to execute the ERG high level operator actions including nonsafety system actions; disagreed on this. 3. Use of FBTA & ERG development task analysis I & C list. 4. When completed where does this go tier 1 or tier 2? Agreed to discuss at 3/8 meeting.
3/8/95 meeting: NRC requested Westinghouse consider that the detailed list remain completely in Tier 2. Tier 1 would include the process to select the final inventory. ACTION W: If the inventory list is provided in chapter 7, then make the cross reference strong from chapter 18. Also, the list should include the process / criteria that was used to generate the list. Westinghouse position is that this list is an expansion of the RG 1.97 criteria and philosophy to address controls and displays. Should a Tier 1 list be required we will pursue use of critieria presented at the Feb 2 meeting versus the NRC criteria used on evolutionary plants. Also prepare a draft Tier 1 list. Need to take a stab at defining acceptable ITAAC and supporting SSAR information as to how the final inventory will be defined (Use PRA, EOPs, ERGs, FBTA).
NRC staff prepared a position paper for NRC senior management, proposing Tier 1 include the process / critieria. Goal is to produce the paper to support the next scheduled Senior management meeting of April 4.
4/19/95 - Fax sent to J.Bongarra and G.Galletti of NRC that provided a preliminary (draft) description of how the total inventory list was developed and where in the tier 2 (SSAR) document it was found. A description of how the minimum inventory would be selected from the total inventory list (the criteria to be used) was also provided. This would be placed in the Tier 1 document. A very preliminary draft of a minimum inventory list, using this criteria, was provided for the NRC's information and use as backup to their position paper. The NRC (G.Galletti) has submitted the position paper for NRC management review.
NRC to: Determine whether the position paper is acceptable and the proposed Westinghouse appraoch is acceptable.
Action W - see NRC response sent 8/21/95.
Resolved - The minimum inventory is addressed in revised SSAR Section 18.12, submitted in Rev. 9, 7/31/96. An ITAAC will be prepared which will include the list of minimum inventory.
Closed - ITAAC submitted by NSD-NRC-96-4875 of 11/7/96.
Comments on Minimum Inventory rec'd by NRC letter 1/17/97.
A telecon is scheduled for Feb 5 to resolve these actions. rkn 1/30/97

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AP600 Open Item Tracking System Database: Executive Summary

Date: 3/27/97

Selection: [nrc st code]='Action W' And [DSER Section] like '18*' Sorted by Item #

Item No	Branch	DSER Section/ Question	Type	Title/Description / Detail Status	Resp Engineer	(W) Status	NRC Status	Letter No /	Date
				Closed - Response provided by fax to Bongerra on 3/10/97. jww					
1397	NRR/HHFB	18.13.3-2	DSER-OI		ITAAC/MMIS	Closed	Action W	NSD-NRC-4875	
				Westinghouse should provide the specified level of detail for the DCD, ITAAC, and DAC. Westinghouse should: 1. Provide a complete set of ITAAC/DAC describing the (a) design commitments, (b) inspections, test, and analyses, and (c) acceptance criteria for Element 3, "Functional Requirements Analysis and Allocation"; Element 4, "Task Analysis"; Element 5, "Staffing"; Element 6, "Human Reliability Analysis" Element 7, "Human-System Interface Design"; Element 8, "Procedure Development"; and Element 9, "Training Program Development 2. Provide a complete set of ITAAC/DAC for all V&V activities, including HSI task support verification, human factors issue resolution verification, and final plant HFE/SHI design verification 3. Resolve the staff's concern regarding the use of HFE guidelines for verification 4. Provide ITAAC/DAC for the minimum inventory					
				Action W: Westinghouse will discuss with the NRC HHFB our approach to ITAACS/ Tier 1 document for chapter 18. Closed - ITAAC submitted by NSD-NRC-96-4875 of 11/7/96. Closed - Response provided by fax to Bongerra on 3/10/97. jww					

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Westinghouse

FAX COVER SHEET

page 1 of 17

RECIPIENT INFORMATION		SENDER INFORMATION	
DATE:	3/18/97	NAME:	Steve Kerch
TO:	Jim Bongarra	LOCATION:	Monroeville, PA.
PHONE:	301-415-1846	PHONE:	412-374-5104
COMPANY:	NRC		
LOCATION:	Rockville, MD.	FAX:	(412) 374-5099

Cover + Pages = 1 + 16 (17 total)

- REMOVE ALL STAPLES
- PENCIL WILL NOT TRANSMIT - USE BLACK PEN
- PLEASE MAKE COPIES OF TWO-SIDED PAGES

Comments:

Jim,

Attached are the following documents: (1) Human Factors Engineering design description and ITAAC, pages 3.2-1 through 3.2-8; (2) markup of the Minimum inventory design description and ITAAC for the main control room, 4 pages; and (3) markup of the minimum inventory design description and ITAAC for the remote shutdown room, 4 pages. These have been reviewed and approved by my management and are forwarded in advance of the formal copies. We have not yet decided where to place the remote shutdown room ITAAC. We may place it with the Data Display and Processing System design description and ITAAC. You will also notice that a few minor changes have been made to the ITAAC on task analysis as compared to the draft that I faxed you on December 19, 1996. If you have any questions or comments following your review, please call me at 412-374-5104.

Thank You,
Steve Kerch

Phone Number of Receiving Equipment: Jim Bongarra 301-415-2222

3.2 Human Factors Engineering

Design Description

~~The main control room (MCR) provides a facility and resources for the safe control and operation of the plant.~~ The AP600 human-system interface (HSI) will be developed and evaluated based upon a human factors engineering (HFE) program. The HSI scope includes the main control room (MCR) and the remote shutdown room (RSR). The HSI scope provides the displays, controls, procedures, and alarms required for normal, abnormal and emergency plant operations. Implementation of the HFE program involves the completion of the following human factors engineering analyses and plans.

1. ~~2.~~ ~~The MCR includes two reactor operator workstations, one senior reactor operator workstation, safety-related displays, and safety-related controls.~~ The integration of human reliability with human factors engineering design is performed in accordance with the implementation plan. Critical human actions (if any) and risk important tasks are identified and used as an input to the task analysis activities.

2. ~~1.~~ ~~The MCR provides a suitable workspace environment for use by MCR operators.~~ Task analysis is performed in accordance with the task analysis implementation plan. Task analysis identifies the information and control requirements for the operators to execute the tasks allocated to them.

3. ~~The human system interface (HSI) resources available to the MCR operators include the alarm system, plant information system, computerized procedure system, safety-related displays, wall panel information system, and controls (soft and dedicated).~~ The HSI design is performed in accordance with the HSI design implementation plan. The HSI design includes the functional design of the operation and control centers and the HSI resources, the specification of design guidelines, the detailed HSI resource design specifications, and the man-in-the-loop concept testing.

4. ~~The MCR and the available HSI permit execution of MCR tasks by MCR operators to operate the plant and maintain plant safety.~~ An HFE program verification and validation implementation plan is developed. The plan establishes methods for conducting evaluations of the HSI design.

5. The HFE program verification and validation is performed in accordance with the HFE verification and validation plan and includes implementation of the following activities:

   a. Task support verification
   b. HFE design verification
   c. Integrated system validation
   d. Issue resolution verification
   e. Plant HFE/HSI verification

Inspection, Test, Analyses, and Acceptance Criteria

Table 3.2-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the MCR.

Table 3.2-1
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Test, Analyses	Acceptance Criteria
1. ~~2.~~ ~~The MCR includes two reactor operator workstations, one senior reactor operator workstation, safety related displays, and safety related controls.~~ The integration of human reliability analysis with human factors engineering design is performed in accordance with the implementation plan.	~~An inspection of the MCR workstations and control panels will be performed.~~ An inspection of the documentation associated with the integration of human reliability analysis with human factors engineering design will be performed.	~~The MCR includes two reactor operator workstations, one senior reactor operator workstation, safety related displays, and safety related controls.~~ A report exists and concludes that critical human actions (if any) and risk important tasks were identified and examined by task analysis, and used as input to the HSI design, and procedure development.
2. ~~1.~~ ~~The MCR provides a suitable workspace environment for use by the MCR operators.~~ Task analysis is performed in accordance with the task analysis implementation plan.	~~i) See Certified Design Material, subsection 2.7.1, Nuclear Island Non-radioactive Ventilation System.~~ ~~ii) See Certified Design Material, subsection 2.2.5, MCR Emergency Habitability System.~~ ~~iii) See Certified Design Material, subsection 2.6.3, Class 1E dc and UPS System.~~ An inspection of the task analysis documentation will be performed	~~i) See Certified Design Material, subsection 2.7.1, Nuclear Island Non-radioactive Ventilation System.~~ A report exists and concludes that function based task analyses were conducted in conformance with the task analysis implementation plan and include the following functions: Control reactivity; control RCS boron concentration; control fuel and clad temperature; control RCS coolant temperature, pressure, and inventory; provide RCS flow; control main steam pressure; control SG inventory; control containment pressure and temperature; provide control of main turbine.

Table 3.2-1 (cont)
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Test, Analyses	Acceptance Criteria
		~~ii. See Certified Design Material, subsection 2.2.5, MCR Emergency Habitability System.~~ A report exists and concludes that operational sequence analyses (OSAs) were conducted in conformance with the task analysis implementation plan. OSAs performed include the following: - plant heatup and startup from post refueling to 100% power; - reactor trip, turbine trip, and safety injection; - natural circulation cooldown (startup feedwater with SG); - loss of reactor or secondary coolant; - post LOCA cooldown and depressurization; - loss of RCS inventory during shutdown; - loss of RNS during shutdown; - manual ADS actuation; - manual reactor trip via PMS, via DAS; - ADS valve testing during mode 1

Table 3.2-1 (cont)
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Test, Analyses	Acceptance Criteria
3 ~~The HSI resources available to the MCR operators include the alarm system, plant information system, computerized procedure system, safety related displays, wall panel information system, and controls (soft and dedicated).~~ The HSI design is performed in accordance with the HSI design implementation plan.	~~An inspection of the HSI resources available in the MCR for the MCR operators will be performed.~~ An inspection of the HSI design documentation will be performed.	~~The as-built HSI includes an alarm system, plant information system, computerized procedure system, safety related displays, wall panel information system, and controls (soft and dedicated).~~ A report exists and concludes that the HSI design was conducted in conformance with the implementation plan and includes the following documents: - Operation and Control Centers System Specification Document - Functional requirements and design basis documents for the alarm system, plant information system, computerized procedure system, wall panel information system, soft controls, and the qualified data processing system. - Design guideline documents for the alarm system, plant information system displays, computerized procedure system, and soft control displays. - Design specifications for the alarm system, plant information system displays, computerized procedure system, qualified data processing system displays, wall panel information system displays, and controls (soft and dedicated). - Man-in-the-loop concept test reports.

Table 3.2-1 (cont)
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Test, Analyses	Acceptance Criteria
4 ~~The MCR and the available HSI permit execution of MCR tasks by MCR operators to operate the plant and maintain plant safety.~~ An HFE program verification and validation implementation plan is developed.	~~Tests and analyses of the following plant evolutions and transients, using a facility that physically represents the MCR configuration and dynamically represents the MCR HSI and the operating characteristics and responses of the AP600 design, will be performed:~~ ~~i) Normal plant heatup and startup to 100% power~~ ~~ii) Normal plant shutdown and cooldown to cold shutdown~~ ~~iii) Transients: reactor trip and turbine trip~~ ~~iv) Accidents:~~ ~~— small break loss of coolant accident~~ ~~— large break loss of coolant accident~~ ~~— steam line break~~ ~~— feedwater line break~~ ~~— steam generator tube rupture~~. An inspection of the HFE verification and validation plan will be performed.	~~The test and analysis results demonstrate that the MCR operators can perform the following:~~ ~~i) Heat up and start up the plant to 100% power~~ ~~ii) Shut down and cool down the plant to cold shutdown~~ ~~iii) Bring the plant to safe shutdown following the specified transients~~ ~~iv) Bring the plant to a safe, stable state following the specified accidents~~A report exists and concludes that the HFE verification and validation plan was developed and includes plans for the following activities: - Task support verification - HFE design verification - Integrated system validation - Issue resolution verification - Plant HFE/HSI verification

Table 3.2-1 (cont)
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Test, Analyses	Acceptance Criteria
5. The HFE program verification and validation is performed in accordance with the HFE verification and validation plan and includes implementation of the following activities: a. Task support verification b. HFE design verification c. Integrated system validation d. Issue resolution verification e. Plant HFE/HSI verification		A report exists and concludes that:
	a. An inspection of the documentation for the task support verification will be performed.	a. Task support verification was conducted in conformance with the implementation plan and includes verification that the information and controls provided by the HSI matches the display and control requirements generated by the function based task analyses and the operational sequence analyses.
	b. An inspection of the documentation for the HFE design verification will be performed.	b. HFE design verification was conducted in conformance with the implementation plan and includes verification that the HSI design is consistent with the AP600 specific design guidelines developed for each HSI resource.
	c. Tests and analyses of the following plant evolutions and transients, using a facility that physically represents the MCR configuration and dynamically represents the MCR HSI and the operating characteristics and responses of the AP600 design, will be performed: i) Normal plant heatup and startup to 100% power ii) Normal plant shutdown and cooldown to cold shutdown iii) Transients: reactor trip and turbine trip	c. The test and analysis results demonstrate that the MCR operators can perform the following: i) Heat up and start up the plant to 100% power ii) Shut down and cool down the plant to cold shutdown iii) Bring the plant to safe shutdown following the specified transients iv) Bring the plant to a safe, stable state following the specified accidents

Table 3.2-1 (cont)
Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Test, Analyses	Acceptance Criteria
	(v) Accidents: - small-break loss-of-coolant accident - large-break loss-of-coolant accident - steam line break - feedwater line break - steam generator tube rupture	
	d. An inspection of the documentation for the HFE design issue resolution verification will be performed.	d. HFE design issue resolution verification was conducted in conformance with the implementation plan and includes verification that human factors issues documented in the design issues tracking system have been addressed in the final design.
	e. An inspection of the plant HFE/HSI design verification documentation will be performed.	e. The plant HFE/HSI is consistent with the HFE/HSI verified in 5a. through 5d.

The controls, displays, and visual alerts listed in Table _____ are retrievable from the remote shutdown workstation.

Table ~~3.6-2~~ 9
Minimum Inventory of Displays and ~~Fixed Position~~ Controls

Description	Control	Display	Alert
Neutron Flux	-	Yes	yes
Reactor Coolant System (RCS) Pressure	-	Yes	yes
Wide-Range Hot Leg Temperature	-	Yes	
Wide-Range Cold Leg Temperature	-	Yes	yes
Containment Water Level	-	Yes	yes
Containment Pressure	-	Yes	yes
Pressurizer Water Level	-	Yes	yes
Pressurizer Reference Leg Temperature	-	Yes	
Pressurizer Pressure	-	Yes	
Core Exit Temperature	-	Yes	yes
RCS Subcooling	-	Yes	yes
In-Containment Refueling Water Storage Tank (IRWST) Water Level	-	Yes	yes
Passive Residual Heat Removal (PRHR) Flow	-	Yes	yes
PRHR Outlet Temperature	-	Yes	yes
Passive Containment Cooling System (PCS) Storage Tank Water Level	-	Yes	
PCS Cooling Flow	-	Yes	
IRWST to Normal Residual Heat Removal System (RNS) Sucuon Valve Status	-	Yes	yes
Containment Isolation Valve Status (2)	-	Yes	
Containment Area High-Range Radiation Level	-	Yes	yes
Containment Pressure (Extended Range)	-	Yes	[redacted]
Containment Hydrogen Concentration	-	Yes	
Manual Reactor Trip	Yes	-	
Manual Safeguards Actuation	Yes	-	
Manual Core Makeup Tank Actuation	Yes	-	

Insert ① a-b ②
Insert ③, ④ and ⑤
Insert ⑥
Insert ⑦
Insert ⑧
Remotely Operated
Insert ⑨

Note: Dash (-) indicates not applicable.

		Control	Display	Alarm (1)
Insert ①:	Neutron Flux doubling			yes
Insert ②:	Startup Rate		yes	yes
Insert ③:	RCS Cooldown Rate Compared to the Limit Based on RCS Pressure		yes	yes
Insert ④:	change of RCS temperature by more than 5°F in the last 10 minutes			yes
Insert ⑥:	Pressurizer Water Level Trend		yes	
Insert ⑦:	Reactor Vessel – Hot Leg Water Level		yes	yes
Insert ⑧:	RCS Cold Overpressure Limit		yes	yes
Insert ⑨:	CMT Level		yes	
Insert ⑤	Wide-Range Cold Leg Temperature Compared to the Limit Based on RCS Pressure		yes	yes

Table 2.5.2-5 (cont)
Minimum Inventory of Displays and Fixed Position Controls

Description	Control	Display	Alert (1)
Automatic Depressurization System (ADS) Stages 1, 2, and 3 Initiation	Yes	-	
ADS Stage 4 Initiation	Yes	-	
Manual PRHR Actuation	Yes	-	
Manual Containment Cooling Actuation	Yes	-	
Manual IRWST Injection Actuation	Yes	-	
Manual Containment Recirculation Actuation	Yes	-	
Manual Containment Isolation ~~(Solenoid)~~	Yes	-	
Manual Main Steam Line Isolation	Yes	-	
Manual Feedwater Isolation	Yes	-	
Manual Containment Hydrogen Igniter (Nonsafety-Related)	Yes	-	

Note: Dash (-) indicates not applicable.

(1) These parameters are used to generate visual alerts that identify challenges to the critical safety functions.

(2) These instruments are not required after 24 hours.

7. The PMS, in conjunction with the operator workstations, provides the following functions:

   a) The PMS provides for the minimum inventory of displays (visual alerts), and fixed position controls, as identified in Table 2.5.2-5, in the main control room (MCR).

   b) The PMS provides for the transfer of control capability from the MCR to the remote shutdown room (RSR).

   ~~c) The PMS provides for the minimum inventory of displays and controls, as identified in Table 2.5.2-5, in the RSR. The controls in the RSR do not need to be fixed position.~~

8. a) The PMS automatically removes blocks of reactor trip and engineered safety features actuation when the plant approaches conditions for which the associated function is designed to provide protection. These blocks are identified in Table 2.5.2-6.

   b) The PMS automatically produces a reactor trip or engineered safety feature initiation upon an attempt to bypass more than two channels of a function that uses two-out-of-four initiation logic.

   c) The PMS provides the interlock functions identified in Table 2.5.2-7.

9. Setpoints are determined using a methodology which accounts for loop inaccuracies, response testing, and maintenance or replacement of instrumentation.

10. The PMS hardware and software are verified and validated through a program that provides confirmation that system functional requirements are properly and correctly implemented in the delivered hardware and software.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.5.2-8 specifies the inspections, tests, analyses, and associated acceptance criteria for the PMS.

Table 2.5.2-5
Minimum Inventory of Displays and ~~Fixed-Position~~ Controls

Description	Control	Display	Alert (1)
Neutron Flux	-	Yes	yes
Reactor Coolant System (RCS) Pressure	-	Yes	yes
Wide-Range Hot Leg Temperature	-	Yes	
Wide-Range Cold Leg Temperature	-	Yes	yes
Containment Water Level	-	Yes	yes
Containment Pressure	-	Yes	yes
Pressurizer Water Level	-	Yes	yes
Pressurizer Reference Leg Temperature	-	Yes	
Pressurizer Pressure	-	Yes	
Core Exit Temperature	-	Yes	yes
RCS Subcooling	-	Yes	yes
In-Containment Refueling Water Storage Tank (IRWST) Water Level	-	Yes	yes
Passive Residual Heat Removal (PRHR) Flow	-	Yes	yes
PRHR Outlet Temperature	-	Yes	yes
Passive Containment Cooling System (PCS) Storage Tank Water Level	-	Yes	
PCS Cooling Flow	-	Yes	
IRWST to Normal Residual Heat Removal System (RNS) Suction Valve Status	-	Yes	yes
Containment Isolation Valve Status (2)	-	Yes	
Containment Area High-Range Radiation Level	-	Yes	yes
Containment Pressure (Extended Range)	-	Yes	
Containment Hydrogen Concentration	-	Yes	
Manual Reactor Trip	Yes	-	
Manual Safeguards Actuation	Yes	-	
Manual Core Makeup Tank Actuation	Yes	-	

Note: Dash (-) indicates not applicable.

Insert 1 and 2

Insert 3, 4 and 5

Insert 6

Insert 7

Insert 8

Remotely Operated

Insert 9

Insert 10

		Control	Display	Alarm (1)
Insert ①:	Neutron Flux Doubling			yes
Insert ②:	Startup Rate		yes	yes
Insert ③:	RCS Cooldown Rate Compared to the limit Based on RCS Pressure		yes	yes
Insert ④:	change of RCS temperature by more than 5°F in the last 10 minutes			yes
Insert ⑥:	Pressurizer Water Level Trend		yes	
Insert ⑦:	Reactor Vessel – Hot Leg Water level		yes	yes
Insert ⑧:	RCS Cold Overpressure Limit		yes	yes
Insert ⑨:	CMT Level		yes	
Insert ⑩:	Manual main control room emergency habitability system actuation	yes		
Insert ⑤	Wide-Range Cold Leg Temperature Compared to the limit Based on RCS Pressure		yes	yes

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Table 2.5.2-5 (cont)
Minimum Inventory of Displays and Fixed Position Controls

Description	Control	Display	Alert (1)
Automatic Depressurization System (ADS) Stages 1, 2, and 3 Initiation	Yes	-	
ADS Stage 4 Initiation	Yes	-	
Manual PRHR Actuation	Yes	-	
Manual Containment Cooling Actuation	Yes	-	
Manual IRWST Injection Actuation	Yes	-	
Manual Containment Recirculation Actuation	Yes	-	
Manual Containment Isolation ~~(Selected)~~ (2)	Yes	-	
Manual Main Steam Line Isolation	Yes	-	
Manual Feedwater Isolation	Yes	-	
Manual Containment Hydrogen Igniter (Nonsafety-Related)	Yes	-	

Note: Dash (-) indicates not applicable.

(1) These parameters are used to generate visual alerts that identify challenges to the critical safety functions.

(2) These instruments are not required after 24 hours.