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RECIP.NAME RECIPIENT AFFILIATION
KNIGHTON,G. Office of Nuclear Reactor Regulation, Director

SUBJECT: Forwards status update of human engineering discrepancies & audit findings resulting from detailed control room design review.Bookshelves installed in Unit 1 control room.Same type shelves incorporated into design for Units 2 & 3. 566 rpt

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Arizona Public Service Company
P.O. BOX 21666 • PHOENIX, ARIZONA 85036

March 14, 1984
ANPP-29066 - JWR/GAS

Director of Nuclear Reactor Regulation
Attention: Mr. George Knighton, Chief
Licensing Branch No. 3
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2 and 3
Docket Nos. STN-50-528/529/530
File: 84-056-026; G.1.01.10

Reference: (1) NRC Letter from Frank M. Miraglia, NRC, to E. E. Van Brunt, Jr., Dated May 11, 1983; Subject: Status Report of the Control Room Design Review of Palo Verde

(2) APS Letter from E. E. Van Brunt, Jr., APS to George Knighton, NRC, (ANPP-24212-ECS/GAS) dated June 30, 1983

(3) NRC Letter from E. A. Licitra, NRC to Arizona Public Service Company, dated November 7, 1983: Subject: Summary of meeting on Control Room Design Review for Palo Verde

Dear Mr. Knighton,

With this letter, Arizona Public Service Company (APS) is submitting the status update of those Human Engineering Discrepancies (HEDs) and Audit Findings which resulted from performing the PVNGS Detailed Control Room Design Review (DCRDR). In Reference (2) Attachment B, APS provided the staff with a status sheet of those HED and Audit Finding resolutions. At the time of the Reference (2) Attachment B transmittal, several of the HED and Audit Finding resolutions had not been completed. These incomplete items were indicated with an asterisk (*). Attachment A of this letter provides a status update of those HEDs and Audit Findings which were previously reported as not complete.

B001
1/1

On September 29, 1983 a meeting was held between the NRC Human Factors Engineering Branch (HFEB) and APS to discuss several of the Reference (2) Attachment B and C resolutions. During this meeting, the NRC/HFEB requested from APS further clarification on several of the Reference (2) Attachment B and C resolutions. Reference (3) submitted a summary of the meeting held on September 29, 1983 between APS and NRC. This included a list of additional information that APS committed to send to the NRC staff in order for the NRC to complete their review on HED and Audit Finding resolutions. Attachment B and C of this letter provides APS' formal response to those questions and comments which were requested by the NRC/HFEB during the Reference (3) meeting.

Reference (2) Attachment A submitted the PVNGS DCRDR Executive Summary Report Supplement 1. HEDs which resulted from this supplemental review, were documented in that attachment. With Attachment D of this letter, APS is providing the proposed corrective actions as also requested during the September 29, 1983 meeting.

Very truly yours,

E. E. Van Brunt

E. E. Van Brunt, Jr.
APS Vice President, Nuclear
ANPP Project Director

EEVB/GAS/sls
Attachments

cc: A. C. Gehr (w/attachments)
E. Licitra (w/attachments)
A. Ramey-Smith (w/attachments)
D. Tond (w/attachments)

March 14, 1984
ANPP-29066 - JWR/GAS

STATE OF ARIZONA)
) ss.
COUNTY OF MARICOPA)

I, Edwin E. Van Brunt, Jr., represent that I am Vice President, Nuclear, of Arizona Public Service Company, that the foregoing document has been signed by me on behalf of Arizona Public Service Company with full authority to do so, that I have read such document and know its contents, and that to the best of my knowledge and belief, the statements made therein are true.

Edwin E. Van Brunt

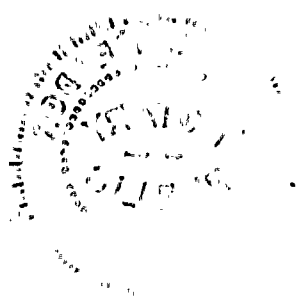
Edwin E. Van Brunt, Jr.

Sworn to before me this 14th day of March, 1984.

Nora E. Meador
Notary Public

My Commission Expires:

My Commission Expires April 6, 1987



ATTACHMENT A

For all those installation dates being given in this attachment, APS is proceeding in good faith to complete them as scheduled.

A-1.0 CONTROL ROOM WORKSPACE

1. The control room bookshelves are inadequate (1.1) (056C).

APS Response

Suitable bookshelves have been purchased by PVNGS Operations. Prior to installation in the control room, the bookshelves will require slight modifications. The bookshelves will be installed in the control room prior to loading fuel.

Current Status

Bookshelves have been installed in the Unit 1 control room. The same type of bookshelves have been incorporated into the PVNGS design for Units 2 and 3.

2. Glare is a problem for most displays on all of the panels. It is worse on the "C" surfaces, depending on viewing angle. (1.2)(049C)(064C)(100B)

APS Response

Since reporting the suggested resolution to this HED, APS has performed additional evaluation on the proper disposition of this item. At this time, APS is reviewing the control room lighting to determine if the lighting levels in the control room can be reduced by modifying the lighting circuits or changing overhead lighting fixtures. This review will be completed by July 31, 1983 at which time APS will provide the required corrective action to be performed and the implementation date.

Current Status

Due to equipment purchase lead times, APS was not able to perform the control room lighting review until November 19, 1983. As a result of this preliminary review, APS is currently in the process of performing a follow-up lighting review in the control room by installing non-glare fluorescent bulbs. This work will be completed prior to exceeding 5% power. Our present schedule is to complete this follow-up lighting review by April, 1984.

5. Glare on CMC switch surfaces hinders "light-on" determination. This is more apparent on the "C" surfaces. A matte surface might not be as effective a solution as brighter lights.

   Example: (Panel B02)
   a.) ESF SWGRA/EQPT Room Switch (1.3)(098C)

APS Response

Since reporting the suggested resolution to this HED, APS has re-evaluated this item for proper disposition. At this time, APS is reviewing the control room lighting to determine if adjusting ambient lighting levels will correct this discrepancy. APS will complete this review by July 31, 1983 at which time the NRC will be advised of APS' corrective action and implementation date.

Current Status

Due to equipment purchase lead times, APS was not able to perform the control room lighting review until November 19, 1983. As a result of this preliminary review, APS is currently in the process of performing a follow-up lighting review in the control room by installing non-glare fluorescent bulbs. This work will be completed prior to exceeding 5% power. APS' present schedule is to complete this follow-up lighting review by April, 1984.

A-3.0 ANNUNCIATOR WARNING SYSTEMS

8. Annunciator panels are not identified by labels above the panels (3.13).

APS Response

Annunciator panel labels will be placed on the control boards in accordance with the Demarcation Study.

Current Status

Labels in accordance with the Demarcation Study have been placed on the Unit 1 control room annunciator panels. These labels have also been incorporated into the PVNGS design for Units 2 and 3. This item was resolved during the meeting held between the NRC/HFEB and APS on September 29, 1983. (see Attachment B, Item A-3.8).

10. The vertical and horizontal axis of annunciator panels are not labeled with alphanumerics for easy coordinate designation of a particular visual tile (3.17).

APS Response

Bezels with alphanumerics will be added to the annunciator panels in the control room.

Current Status

Bezels with alphanumeric have been added to the annunciator panels in the Unit 1 control room. The alphanumeric bezels have been incorporated into the PNVGS design for Units 2 and 3.

13. Inconsistent abbreviations are used on alarm legends.

Example: (Panel B06)
a.) COND vs. CNDS
(3.22)(090C)

APS Response

Review of this discrepancy has revealed that the abbreviations used on the window legends on Panel B06 window box 6A windows 16B and 16D are correct (i.e., CNDS is condensate and COND is condenser). A discrepancy in the description for window box 6A window 16B as been identified. This window should indicate "Steam Bypass Control System Condenser Interlock". APS will change the window 16B legend to reflect the correct description.

Current Status

This work will be completed in Unit 1 prior to exceeding 5% power. APS present schedule is to complete this work by April, 1984. The correct abbreviations have been incorporated into the PVNGS design for Units 2 and 3.

A-4.0 CONTROLS

1. The manual activation circuitry for the Panel B05 ESFAS system is based on selected two out of four logic which is different from the AUTO-ESFAS which operates on ANY two out of four logic (4.1).

APS Response

APS will provide a label which reads "FOR MANUAL ESFAS ACTUATION - ACTIVATE ALL CHANNEL SWITCHES.

Current Status

This label has been incorporated into the PVNGS design for Units 2 and 3. Installation of these labels in the Unit 1 control room is complete. The labels will read "FOR MAN ESFAS ACTIVATION - ACTIVATE ALL CHANNEL SWITCHES".

4. On Panels B03, B04, B06 and B07, several controls are too close to the panel edge, increasing the likelihood of accidental activation (4.5) (025A).

APS Response

APS will add a guard rail on all the unit's control boards to protect all controls that are too close to the panel edge from being accidently activated.

Current Status

The guard rail on the Unit 1 control boards has been installed. The guard rail for Units 2 and 3 has been incorporated into the PVNGS design.

5. There is an inconsistency in the use of black and amber bezel color coding on CMC switches (4.7).

Examples: (Panel B03)
a.) Reactor Drain Tank Outlet Isolation Valve
b.) Makeup Supply to Reactor Drain Tank Valve

APS Response

Bezel color coding on the CMC switches has been checked and corrected for consistency. The bezel for CHN-HS-231P (Item 117) on Panel B03 was found to be inconsistent and will have its' bezel changed from black to amber.

Current Status

In the Unit 1 control room APS has changed the bezel for CHN-HS-231P (Item 117) on Panel B03 from black to amber. This change has been incorporated into the PVNGS design for Units 2 and 3.

10. On Panel B01 all keys for key-operated switches are inserted with the teeth pointing down (none)(CLD 4.004).

APS Response

This discrepancy has been addressed consistently with all key-operated switches in the control room and keyteeths have been oriented pointing down with the exception of key-operated switches 1E-PBB-SS-S04L (Item 256) and 1E-NBN-SS-S02A (Item 360) on Panel B01. APS will orient these two key-operated switch teeth to point down.

Current Status

In the Unit 1 control room APS has oriented key-operated switches, 1E-PBB-SS-S04L (Item 256) and 1E-NBN-SS-S02A (Item 360) on Panel B01 such that switch teeth point down. The "switch teeth to point down" criteria will also be incorporated for Units 2 and 3.

11. On Panel B02, there is too strong a resistance for key-operated switches requiring activation for long periods. These keys have small key heads, aggravated the situation (4.11)(113C).

APS Response

APS will install plastic key heads on all key-operated switch keys in the control room. The plastic key heads have been purchased by APS Operations.

Current Status

APS has installed plastic key heads on the key-operated switch keys in the Unit 1 control room. The same type of plastic key heads will be used in Units 2 and 3.

A-5.0 DISPLAYS

1. There is no valve position indication for the Demineralizer Differential Pressure Control Bypass Valve on Panel B05 (5.1) (031C).

APS Response

Valve position indication will be added to the Demineralizer Water Feed Condensate Service Header Valve CDN-HS-275 (Item 167) on Panel B05.

Current Status

Reference to the Demineralizer Water Feed Condensate Service Header Valve CDN-HS-275 (Item 167) on Panel B05 is in error for Demineralizer Bypass Valve position. Demineralizer Differential Pressure Control Bypass Valve position should refer to J-CDN-PDIC-195 (Item 149) on Panel B05.

APS has added the position indicator J-CDN-ZI-195 for J-CDN-PDIC-195 in the Unit 1 control room. Position indication has been incorporated into the Units 2 and 3 design.

2. On Panel B05, Channels A, B, C and D have Calculator Select controls for CEAC. However, this capability exists only on Channels B and C (5.2).

APS Response

APS will provide a label that reads "CEAC NOT ACTIVE ON THIS CHANNEL" to Channel A and D of the Calculator Select Controls on Panel B05.

Current Status

This label has been incorporated into the PVNGS design for Units 2 and 3. The labels have been installed in the Unit 1 control room by April, 1984. The label will read "CEAC INACTIVE".

9. A large number of Foxboro meters and recorders have a 0 - 100 (i.e., %) scale instead of an engineering units scale.

   Example: (Panel B05)
   a.) The SG level indicators are scaled 0-100% for both the narrow and wide range. (5.13)(083B)

APS Response

APS has changed the narrow range scales to read 60-100%. Other scales have been corrected to indicate in proper engineering units.

Current Status

Since reporting the suggested resolution, APS has further reviewed the justification for the proposed modification to the narrow range Steam Generator (S/G) level indicator scales on Panel B05 which currently show on 0-100% for both the narrow and wide range indicators and has found modification to be inappropriate.

First it has been determined that the narrow and wide range parameters are not the same, in use or value. The wide range S/G Level indicator is intended for use when filling the steam generator. This wide range indicator is calibrated to "COLD" S/G conditions.

The narrow range S/G level indicator is intended for use when the reactor is at normal power levels. This narrow range indicator is calibrated to "HOT" S/G Conditions.

Since the narrow range S/G level indicator, is not a portion of the wide range S/G level indicator, changing the narrow range scales would provide the potential of confusing the operator. Therefore, no change is deemed to be required to be made to the narrow range S/G level indicator.

12. The Core Protection Calculator indicator lights on Panel B05 have incorrect color coding (5.23)(116C).

APS Response

The Core Protection Calculator yellow indicator lights above the four selector switches (CPC CEAS selector switch, trip-bypass keyswitch, memory-protect keyswitch and change enable valve keyswitch will be changed to blue lights.

Current Status

This item has been incorporated into the PVNGS design for Units 2 and 3. This item has been installed in the Unit 1 control room.

13. The Plant Protection System relay status lights on Panel B05 are incorrectly colored (5.24)(087B).

APS Response

The Plant Protection System red relay status lights lenses on Panel B05 will be changed to blue lenses.

Current Status

This item has been incorporated into the PVNGS design for Units 2 and 3. This item has been installed in the Unit 1 control room.

16. Green light intensity is used to distinguish faulted from normal status on the Electric Bus Panel on Panel B01. However, the two intensities are not discernable unless one witnesses the change in intensity as it happens (5.33)(072C).

APS Response

This green light intensity used to distinguish faulted from normal status on Panel B01 is adjustable. APS will perform necessary adjustment.

Current Status

APS is reviewing the alternatives available to perform the necessary adjustments required to allow for distinguishing the green light intensity on Panel B01. Necessary adjustments will be made prior to exceeding 5% power.

A-6.0 LABELS AND LOCATION AIDS

1. The logic for selecting the correct pairs of the manual reactor trip controls on Panel B05 is not clearly indicated on the board.

APS Response

APS will add mimic to Panel B05 to clearly indicate the correct manual selection of reactor trip controls (items 35, 73, 103 and 133 on Panel B05).

Current Status

This item has been incorporated into the PVNGS design for Units 2 and 3. This label has been installed in the Unit 1 control room by April, 1984.

7. There are no labels on the pushbuttons on Panel B06 (6.7).

APS Response

Labels will be added to the pushbutton on Panel B06.

Current Status

These labels have been incorporated into the PVNGS design for Units 2 and 3. Installation in Unit 1 will be complete prior to exceeding 5% power. APS present schedule is to complete this work by April, 1984.

8. There are no labels on the indicator lights on Panel B07 (6.8).

APS Response

Labels will be added to indicator lights on Panel B07.

Current Status

These labels have been incorporated into the PVNGS design for Units 2 and 3. Installation in the Unit 1 control room is complete.

10. None of the panels/consoles in the main control room use a heirarchical labeling scheme. All labeling is at individual component level, except for subpanels for some systems (e.g., SESS, Plant Protection System, etc.)(6.10).

APS Response

Heirarchical labeling per the Demarcation Study will be provided in the control room.

Current Status

This has been incorporated into the PVNGS design for Units 2 and 3. Installation is complete in the Unit 1 control room.

12. Some component labels are not placed above or in the best proximity to the equipment they identify. In general, display labels appear below the displays, while control labels are above (6.12).

APS Response

Labels will be moved to the best proximity to the instrument they identify.

Current Status

The relocation of required labels to eliminate visual interference is complete in the Unit 1 control room. Relocation of Units 2 and 3 labels has been incorporated into the PVNGS design.

14. On the vertical panel, the Foxboro displays obscure their own labeling (6.14)(104A).

APS Response

Affected nameplates are being installed on 3/4 inch thick spacer blocks which will eliminate the visual interference problem.

Current Status

The relocation of required labels to eliminate visual interference is complete in the Unit 1 control room. Relocation of Units 2 and 3 labels has been incorporated into the PVNGS design.

16. On Panel B02 there is an improper label on TT 351X which reads: "LPSI PUMP DISCHARGE TO HX". It should read: "HX INLET TEMP FROM LPSI PUMP" (None)(CLD 13.208).

APS Response

Label will be changed to read" "HX IN FRM LPSI TT-351X, HX TO LOOPS TT-351Y, SIA-TR-351".

Current Status

This label has been installed in the Unit 1 control room. The label has been incorporated into the PVNGS design for Units 2 and 3.

17. Ambiguous labeling appears on all dual-indicator Foxboro displays. Displays have side-by-side vertical scales, while the labels are placed one above the other. Plant convention is, the upper label refers to the left-hand scale while the lower label refers to the right-hand scale (6.17)(104A).

APS Response

Labels will be made unambiguous for displays which have side-by-side vertical scales by following the plant convention of using the upper label to refer to the left-hand scale while the lower label will refer to the right-hand scale. In addition, 3/4 inch thick paper spacer blocks will be added to those affected nameplates to eliminate visual interference problem.

Current Status

The above label defined criteria for side-by-side vertical scales has been incorporated to the PVNGS design for Units 2 and 3. Installation of these labels in the Unit 1 control room has been completed. Visual interference has been resolved by relocating labels.

21. On Panel B06, trend records are not labeled as being designatable (6.21).

APS Response

Trend recorders RJN-UJR-16A (Item 42) and RJN-UJR-16B (Item 7) on Panel B06 will be labeled as being selective (i.e., TREND RECORDER, SELECTIVE, RJN-UJR-16A).

Current Status

The description of these labels has been incorporated into the PVNGS design for Units 2 and 3. These labels are installed in the Unit 1 control room.

22. On Panel B04, labels for Reactor Coolant Pump seal pressure and temperature are inconsistent and do not provide adequate information. They do not indicate "pressure" and "temperature" as applicable, and whether they are inlet or outlet sampling points (6.23).

APS Response

Reactor coolant pump seal pressure and temperature indicators will be relabeled (Items 35, 36, 43, 63, 67, 68, 84, 91, 111, 115, 116 and 117 on Panel B04).

Current Status

The description of these labels has been incorporated into the PVNGS design for Units 2 and 3. These labels have been installed in the Unit 1 control room.

23. On Panel B02, the SESS Panel and related board items have inconsistent labeling (6.24)(076A).

APS Response

The inconsistent labels will be changed by APS.

Current Status

The inconsistent labels have been changed in the Unit 1 control room. The description of these labels has been incorporated into the PVNGS design for Units 2 and 3.

26. Inconsistent abbreviations are used in some locations (6.28).

Examples: a.) COND = Condenser
COND = Condensate
b.) COND POLISHING DEM OUTLT VLV
CONDENSATE POLISHING DEMIN INLT VLV
CONDENSATE POLISHING DEMIN DIFF PRESS CONT

APS Response

Nameplate abbreviations have been checked and made to conform to standard abbreviation used in the Annunciator Prioritization Study. APS will implement necessary changes to conform to standard abbreviations.

Current Status

Implementation of necessary changes to conform with the PVNGS design nameplate list have been completed in the Unit 1 control room. The same changes have been incorporated into the PVNGS design for Units 2 and 3.

27. There is a general problem with the selection and usage of abbreviations in the labeling throughout the control room. Abbreviations are not consistently applied and are sometimes not clear in their meaning.

Example: a.) The use of COND for Condenser and CNDS for Condensate. These choices do no uniquely identify the names involved (6.29).

APS Response

Nameplate abbreviations have been checked and made to conform to standard abbreviations used in the Annuniciator Prioritization Study. APS will implement necessary changes to conform to standard abbreviations.

Current Status

Implementation of necessary changes to conform with the PVNGS design nameplate list are completed in the Unit 1 control room. The same changes have been incorporated into the PVNGS design for Units 2 and 3.

28. There are inconsistent abbreviations on the component label and the switch legend for the Pre-Holdup Iox Inlet Bypass Selector on Panel B03 (6.30).

APS Response

Switch labels for CHN-HS-565 (Item 29) on Panel B03 have been changed to read "PRE-HU IOX INLT (Auto)/, Bypass Selector UV-565, CHN-HS-565. The escutcheon engraving for this switch reads ION X, AUTO, By-Pass.

Current Status

This item has been completed in the Unit 1 control room. This item has been incorporated into the Units 2 and 3 control room board design.

29. The Audio Range Selector on Panel B04 has no position labeling to indicate the multiplication factor being chosen (6.31).

APS Response

New labels are being provided to show switch position and multiplcation factors for panel items 145, 146, 147 and 148 on Panel B04.

Current Status

New labels to show switch position and multiplication factors have been added to Panel B04 in the Unit 1 control room. These labels have been incorporated into the PVNGS design for Units 2 and 3.

30. The position labeling on some keyswitches is misleading (6.32).

Examples: a.) The position label "LOCKED NORMAL" refers to the normal position of the key and has no meaning with respect to the equipment being controlled.

b.) When key is in "LOCKED" position, operator does not know whether it is locked open or locked closed.

APS Response

The keyswitch label positions on escutcheon for B02, B03 and B04 will be revised to delete the word "LOCKED".

Current Status

This item has been completed in the Unit 1 control room. This item has been incorporated into the PVNGS design for Units 2 and 3.

31. NORMAL position labels are missing on all jog keyswitches (none) (060B).

APS Response

The keyswitch label positions on escutcheon for B02, B03 and B04 have been checked and will be revised as necessary to add the word "NORMAL".

Current Status

This item has been completed in the Unit 1 control room. This item has been incorporated into the PVNGS design for Units 2 and 3.

32. There is an illegible label for the CWP/Bypass switch on Panel B04 (6.36)(066A).

APS Response

The CWP/Bypass switch on Panel B04 will be changed to white letters in red background.

Current Status

This label has been incorporated into the PVNGS design for Unit 2 and 3. Installation in the Unit 1 control room is complete.

34. On Panel B03, the mimic line to the charging pumps used during loss of power is missing from the CVCS mimic (6.38)(079A).

APS Response

Mimic line to the charging pumps used during loss of power will be added to the CVCS mimic.

Current Status

This mimic has been incorporated into the PVNGS design for Units 2 and 3. Its installation in the Unit 1 control room has been completed.

37. On Panel B03, there is no clear mimic indication where the flow to and from the reactor occurs. Basically, there is a need for a clear mimic terminator (6.42)(020C).

APS Response

Mimic will be added to indicate where the flow to and from the reactor occurs.

Current Status

This mimic has been incorporated into the PVNGS design for Units 2 and 3. Its installation in the Unit 1 control room has been completed.

38. There are missing mimic lines on the Electric Bus mimic on Panel B01 (6.43)(115C).

APS Response

Electric mimic on Panel B01 has been redesigned. APS will have mimics added to the Electric Bus mimic on Panel B01.

Current Status

This mimic has been incorporated into the PVNGS design for Units 2 and 3. Its installation in the Unit 1 control room has been completed.

39. Directional arrows are missing from some mimics (the absence of arrows from the Electric Bus mimic is acceptable) (6.45).

APS Response

Missing arrows will be added to the mimic on Panel B03.

Current Status

The PVNGS design drawings indicate all the required arrows. The mimic on Panel B03 in the control room has been verified to ensure that all arrows are on mimics.

40. On Panel B01, the Circuit Breaker control switch is not labeled to identify the breaker and is located in the mimic as though it is part of the white-bus when it is not. (6.42) (20C)

APS Response

New mimic has been designed for Panel B01. Mimics will be added to the Electrical Bus mimic on Panel B01.

Current Status

This mimic has been incorporated into the PVNGS design for Units 2 and 3. Its installation in the Unit 1 control room has been completed.

41. There are several breakers on Panel B01 which are not incorporated into a mimic (6.48).

APS Response

Mimics will be added to the Electrical Bus mimic on Panel B01.

Current Status

This mimic has been incorporated into the PVNGS design for Units 2 and 3. Its installation has been completed in the Unit 1 control room.

A-7.0 PROCESS COMPUTERS

3. There is excessive CRT brightness from the lighting (7.7)(065C).

APS Response

APS is reviewing the control room lighting to determine if adjusting ambient lighting levels will correct this discrepancy. APS will complete this review by July 31, 1983, at which time the NRC will be advised of the corrective actions and implementation date. In addition, APS will allow at operator discretion to set room lighting level.

Current Status

Due to equipment purchase lead times, APS was not able to perform the control room lighting review until November 19, 1983. As a result of this preliminary review, APS is currently in the process of performing a follow-up lighting review in the control room by installing non-glare fluorescent bulbs. This work will be completed prior to exceeding 5% power. APS present schedule is to complete the lighting modification by April, 1984.

A-9.0 CONTROL-DISPLAY INTEGRATION

1. On Panel B04, the five automatic reactor regulation control rod motion demand indicators can be lit in conflict with a manual mode of operation that the operator has selected (9.2).

APS Response

Label will be revised (i.e., nameplate NP-5 will be added on Panel B04).

Current Status

This label has been installed in the Unit 1 control room. The label has been incorporated into the PVNGS design for Units 2 and 3.

It should be noted that the operation of the automatic indicating lights is analogous to an auto-manual controller. When the controller is in the manual mode, the auto feedback signal will still track and indicate the signal position on the controller. Similarly, when the control rods are being normally positioned, the automatic positioning function is still being indicated on the control board.

B-4.0 CONTROLS

1. Some CMC switch position indicators point between switch positions. Example:

   (Panel B03)
   Pre-Holdup Iox Inlet Bypass Selector (4.12)

APS Response

The escutcheons engraving for CHN-HS-566 (Item 25) and CHN-HS-565 (Item 29) on B03 has been changed to depict the flow paths in relation to the switch positions.

Current Status

This item has been completed in the Unit 1 control room. It should be noted that several of these CMC switch position indicators still point between switch positions; this is due to the fact that these switches are spring return to normal. This item has been incorporated into the PVNGS for Units 2 and 3.

B-5.0 Displays

3. The blue switch position indicator lights, on CMC switches, are not clearly visible in the ambient control room light. Example: (Panel B07)
   a) Containment Purge Mode Selector (5.15)

APS Response

APS is reviewing the control room lighting to determine if adjusting ambient lighting levels will correct this discrepancy. APS will complete this review by July 31, 1983, at which time the NRC will be advised of APS' corrective action and implementation date.

Current Status

Due to equipment purchase lead times, APS was not able to perform the control room lighting until November 19, 1983. As a result of this preliminary review, APS is currently in the process of performing a follow-up lighting review in the control room by installing non-glare fluorescent bulbs. This work will be completed prior to exceeding 5% power. APS' present schedule is to complete this follow-up lighting review by April, 1984.

APPENDIX F

B-4.0 CONTROLS

1. Control position is not visible during use of the Nuclear Cooling Water HX control on Panel B07. The pointer on the knob will be covered by the operator's hand. Also, position indications are obscured by the knob (4.13)(CLD-4.024).

APS Response

APS will change the knob prior to loading fuel.

Current Status

This knob has been incorporated into the PVNGS design for Units 2 and 3. The Unit 1 change will be completed prior to exceeding 5% power. APS present schedule is to complete this modification in the control room by February, 1984.

2. On Panel B06, 525 KV GENERATOR BKR, MAN-SSO-918 and 915 switches, the knobs cover switch position nomenclature: the selectable switch position are opposite to each other and the pointers are not highlighted to indicate to which position the knob is pointing (none)(CLD 5.002).

APS Response

APS will highlight the pointer (white arrow) and add switch position nomenclature 1/2" from existing nomenclature to MAN-SS0918 (Item 11) and MAN-SS0915 (Item 15) on Panel B06 prior to loading fuel.

Current Status

This item has been incorporated into the PVNGS design for Units 2 and 3. This work will be completed in Unit 1 prior to exceeding 5% power. APS present schedule is to complete installation in the Unit 1 control room by February, 1984.

Reference (3) submitted a summary of the meeting held on September 29, 1983 between APS and NRC/HFEB. This attachment provides APS response to those questions and comments requested by the NRC/HFEB during the September 29, 1983 meeting.

APPENDIX A

A-1.0 CONTROL ROOM WORKSPACE

A-1.3 There is varying specular glare on Foxboro displays which have flexible surfaces (1.2) (101B).

APS Response

No Foxboro 250 series controllers or indicators were found to exhibit a varying specular glare from their surfaces during the human factors review of the Foxboro 250 series controllers and indicators. This HED has been corrected and is documented in the Executive Summary Report Supplement 1.

NRC Question/Comment

A-1.3 APS response should indicate that previously installed Foxboro controllers and indicators have been replaced with Foxboro 250 series controllers and indicators, if that is the case.

APS Response to NRC Question/Comment

The previously installed Foxboro 270 series controllers and indicators have been replaced with Foxboro 250 series controllers and indicators.

A-1.4 There is low light intensity on the scales of Foxboro controllers (1.2) (103C).

APS Response

The Foxboro 250 series controllers and indicators were found to contain clear lenses which provided adequate background illumination and contrast during the human factors review of the Foxboro 250 series controllers and indicators. This HED has been corrected and is documented in the Executive Summary Report Supplement 1.

NRC Question/Comment

A-1.4 Same comment as A-1.3

APS Response to NRC Question/Comment

Same as A-1.3.

A-1.6 The concrete control room floor is not carpeted, which will lead to earlier fatigue during long periods of standing by the operators. (1.4) (068B)

APS Response

The Reference (3) letter states that the carpeting in the control room floor will not be installed until after Power Ascension Testing is completed November, 1983.

NRC Question/Comment

A-1.6 A more specific implementation date is needed. Current commitment is that carpeting will be installed after Power Ascension Testing, but does not indicate how long after.

APS Response to NRC Question/Comment

The carpet in the Unit 1 control room has been installed. Installation in Units 2 and 3 will be accomplished prior to their respective fuel load dates.

A-3.0 ANNUNCIATOR WARNING SYSTEMS

A-3.1 The nature of the annunciator auditory signals could, in some cases, cause irritation or a startled reaction. (3.6)

APS Response

The Reference (3) letter states that completion of the noise survey will be delayed until after Power Ascension Testing is complete, November, 1983. Suitable tones and volume will be set as a result of the noise survey.

NRC Question/Comment

A-3.1 A more specific implementation date is needed. (See A-1.6)

APS Response to NRC Question/Comment

APS will complete the noise survey and will submit a report of proposed corrective actions for the NRC review prior to plant exceeding 5% power. APS present schedule is to complete this study by April, 1984.

A-3.8 Annunciator panels are not identified by labels above the panels. (3.13)

APS Response

Annunciator panel labels will be placed on the control boards in accordance with the Demarcation Study.

NRC Question/Comment

A-3.8 The specific resolution to be implemented for this item should be described.

APS Response to NRC Question/Comment

The Review Team for the Annunciator Prioritization Study concluded that it is not necessary to label each annunciator panel since (1) unnecessary labeling adds to the confusion of providing too much information; (2) each window when illuminated in association with its location above the corresponding controls and displays provides the operator with the overall system type information; and (3) other panel hierarchical labeling recommended by the Demarcation Study is more appropriate.

Therefore labels in accordance with the Demarcation Study have been placed on the annunciator panels for Units 1, 2 and 3.

A-3.9 Reaching annunciators to replace lamps poses a safety problem. (3.15) (004A)

APS Response

PVNGS Operations has purchased a stepladder to be used in the Unit 1 control room to replace annunciator lamps. The same changes will be implemented on Units 2 and 3.

NRC Question/Comment

A-3.9 APS had previously committed to provide a stepladder for the control room of suitable construction to prevent board contact. Is the stepladder that has been purchased of such construction?

APS Response to NRC Question/Comment

A stepladder of suitable construction has been purchased for use in the PVNGS Unit 1 control room. This metal ladder with its handrails and platform provides the operator with a stable area to stand on while replacing the annunciator lamps and at the same time preventing board contact.

Stepladders of this same construction will be provided in Units 2 and 3 control rooms prior to their respective fuel load dates.

A-3.15 On Panel B04, the annunciator legend is incorrect for T-AVG and T-REF temperature deviation and for RC SYS TRBL. (3.24) (081A).

APS Response

Since reporting the suggested resolution to this HED, APS has performed the Annunciator Prioritization Study. The study indicates that on Panel B04, annunciator window box 4A window 8B "T AVG-T REF HI-LO" is not required to be changed to read "T AVG-T REF DEVIATION". Annunciator window box 4A window 6A on Panel B04 has been changed to read "RC Loops Temp Hi" versus "RC SYS TRBL" as a result of the Annunciator Prioritization Study.

NRC Question/Comment

A-3.15 Provide technical rationale for changed commitment concerning "T AVG-T REF HI-LO" annunciator legend.

APS Response to NRC Question/Comment

The review team for the Annunciator Prioritization Study recommended leaving window as "T AVG-T REF HI-LO" as a result of further evaluation which noted that the two inputs into this window are (1) T AVG-T REF HI and (2) T AVG-T REF LO. The operator will determine if its' a HI or LO by the use of the plant monitoring computer.

A-3.16 Inconsistent terminology exists between H_2 Train alarms and associated control labels on Panel B02. (3.25) (073C)

APS Response

Since reporting . the suggested resolution to this HED, APS performed the Annunciator Prioritization Study. It showed that on Panel B02, annunciator window box 2A windows 4A, 5A, 6A, 4B. 5B, and 6B are satisfactory.

NRC Question/Comment

A-3.16 .Provide technical rationale for changed commitment.

APS Response to NRC Question/Comment

Panel B02 window box 2A annunciator windows 6A and 6B "H_2 RECOMB SYS A TRBL" and "H_2 RECOMB SYS B TRBL" are satisfactory because they each refer to one of two hydrogen recombiner systems. At no time do these windows provide any indication or sensing function.

Annunciator 4A and 4B remained as "H_2 ANAL CH A TRBL" and "H_2 ANAL CH B TRBL" since these two function as primary elements (sensors) to analyze and indicate that hydrogen concentrations in the containment has exceeded a prescribed value.

Palo Verde Criteria has been to assign a channel nomenclature only to that equipment which is used as a sensing source or indication media. Therefore, the existing nomenclature is consistent with PVNGS equipment naming standards and no changes are required.

A-3.17 On Panel B06, inconsistent terminology exists on the alarm window for Header Pressure, (i.e. , the word "system" in "Condensate Pump Hdr Press Syst Trouble" should be deleted). (3.26) (047C)

APS Response

The inconsistent terminology for alarm windows on Panel B06 has been checked. Currently, this inconsistent terminology does not exist on Panel B06.

NRC Question/Comment

A-3.17 Was the inconsistent terminology corrected?

APS Response to NRC Question/Comment

The inconsistency has been corrected on window box 5B window 14B on panel B05. This window has been changed to read: "CNDS PMPS, DSCH HDR, PRESS, TRBL".

A-5.0 DISPLAYS

A-5.4 Foxboro recorders do not provide good resolution over a short time range because of a slow recording speed. (5.6) (106B)

APS Response

Since reporting the suggested resolution to this HED, APS has re-evaluated this item and results indicate that the Foxboro Model 226/227 recorders do not have multi-speed capability since the size of the existing recorder precludes changing to multi-speed units. This item will not be done since it is not currently feasible.

NRC Question/Comment

A-5.4 Based on task analysis data relative to information requirements, describe how the control room operators can perform their duties under emergency conditions without the benefit of faster recording speeds on the applicable recorders.

APS Response to NRC Question/Comment

The recorders identified by this HED have been provided to meet post-accident monitoring requirements. They are not intended nor are they required by the operator during an accident for trending. If trending under emergency conditions ever became necessary, the control room operators have at this disposal the plant computer which provides video trend capabilities to the control room operators on his request. Through the use of the plant computer operators console, which is located in the control room, the control room operator has the means of interfacing with the plant computer to obtain the video trend function. The video trend is displayed on video trend Cathode Ray Tube (CRTs) on control board Panels B04 and B06.

The video trend function displayed on the CRTs provides a video output which displays data in a format similar to that of a strip chart recorder.

This data is displayed on one of four tracks along with a horizontal time line per position and automatically advances from top to bottom as each new data value is received. Each trend is assigned a unique color. Data points can be assigned to any one of the four positions and up to 15 groups of four points each may be defined.

Each group has a predefined interval for collection of data. The last one hundred values for each point is constantly maintained in a buffer for the purpose of a historical trend. The data is collected at the interval specified from whatever point value information is available due to each points normal scan rate. Each group has the option of displaying or not displaying the time lines. The interval and time line parameters are defined initially when the first point is added to a group and can be changed at any time. Two types of trends are available for each group:

a. One second output trend of instantaneous values without historical data.

b. Five to 60-second output trend in five second increments with 100 historical values per point.

Timelines (if selected) are displayed from the left limit to the right limit for each position and automatically move with each new data value so that the time reference is always correct.

Each position has a predefined data point assigned to it, lower and upper scale values, a graph origin value, and lower and upper limits. These parameters are defined initially as each point is assigned to a position and can be changed with any time. The lower and upper scale values define the left and right boundaries for the track. The graph origin value provides a baseline for a waveform to appear, shaded (at reduced intensity) between the baseline and the data value. Also, the space between the defined limits and the data value are shaded in red whenever a limit is exceeded.

A-5.6 On Panel B05, there is inadequate indication of safety system status (i.e. SIAS, MSIS, CIAS, etc.) (5.8) (029A)

APS Response

APS has installed annunciator RKN-UA-5C (Item 143) to Panel B05 for proper indication of safety system status.

NRC Question/Comment

A-5.6 Is "annunciator RKN-UA-5C (Item 143)" equivalent to "a master indicator panel" which APS had previously committed to add?

APS Response to NRC Question/Comment

Annunciator RKN-UA-5C (Item 143 on Panel B05) is equivalent to the master indicator panel APS had previously committed to add.

A-5.10 The Foxboro recorder paper lacks printed parameter units. (5.13) (111C)

APS Response

APS, at this time, will not be using paper pre-printed with the proper units for the Foxboro recorders. Since reporting the suggested resolution to this HED, APS has re-evaluated this item. Results indicate that the use of pre-printed paper would only create potential errors if the wrong preprinted paper was used in the wrong recorder. APS will appropriately mark the recorder chart paper as per Administrative Control Procedure 40AC-9ZZ02 "Conduct of Shift Operations".

NRC Question/Comment

A-5.10 APS indicates that it "will not be using paper preprinted with the proper units for the Foxboro recorders", but rather "will appropriately mark the recorder chart paper at the change of the day." The concern stated is that "preprinted paper would only create potential errors if the wrong preprinted paper was used in the wrong recorder." From a human factors point of view, the proposed resolution is far from optimal. Recorders used by the operating crew for monitoring the status (particularly safety status) of the plant should be provided with preprinted properly scaled chart paper, or further justification should be provided.

APS Response to NRC Question/Comment

The paper used in the Foxboro recorders is preprinted with the proper range and graduations; only the engineering units are not included.

When an operator is using the chart to determine safety status, he will be looking at the recorder which is labeled with the proper engineering units. There is little chance that the operator could be confused. For purposes of historical review, the chart is marked with the name of recorder from which it was removed. This information can then be used to determine what the engineering units are.

A-5.11 On all Foxboro displays in the control room, the engineering units of parameters being measured are not given. (5.17) (007A)

APS Response

During the human factors review of the Foxboro 250 Series controllers and indicators, no Foxboro 250 series indicators were found not having the units of the measured parameter being displayed. This HED has been corrected by the use of the Foxboro 250 series and is documented in the Executive Summary Report Supplement 1.

NRC Question/Comment

A-5.11 Same comment as A-1.3

APS Response to NRC Question/Comment

Same as A-1.3.

A-5.15 Lamp removal must be done from the back of the Generrex panel on Panel B06. (5.32) (033C)

APS Response

Since reporting the suggested resolution to this HED, APS has further investigated this item and discovered that redesign of the Generrex Panel on B06 for lamp removal from the front of the panel is not necessary.

The mini lamps are Light Emitting Diodes (LEDs) which have a long Mean Time Between Failure (MTBF). APS feels it is suitable to replace lamps from the rear.

NRC Question/Comment

A-5.15 During lamp replacement from the back of the Generrex panel, will the use of instrumentation on Panel B06 be adversely affected?

APS Response to NRC Question/Comment

The Generrex Excitation System mimic bus Light Emitting Diodes (LEDs) are not expected to fail during the life of the plant since LEDs have a long Mean Time Between Failure (MTBF). If any of these LEDs do fail, the instrumentation on Panel B06 will not be affected during LED replacement.

A-6.0 LABELS AND LOCATION AIDS

A-6.4 Labels are either missing or nondescriptive on the FW and SG Systems Board on Panel B06. (6.4) (040B)

APS Response

Labels and descriptions have been added per the Control Board Nameplate List for the FW and SG System Boards in Panel B06 (i.e., Items 60, 61, 66, 69, 70, 75, 149, 150, 156, 159, 160, 165, 29, 30, 31, 32, 43, 44, 45, 46, 103, and 106).

NRC Question/Comment

A-6.4 This response is unclear. Were missing or nondescriptive labels replaced?

APS Response to NRC Question/Comment

Non-descriptive labels for items 29, 30, 31, 32, 43, 44, 45, 46, 103, 106, 60, 61, 66, 69, 70, 75, 149, 150, 156, 159, 160, and 165 have been made descriptive and added to Panel B06 in Unit 1. The same type of label description has been incorporated in the Unit 2 and 3 design.

A-6.16 On Panel B02 there is an improper label on TT 351X which reads: "LPSI PUMP DISCHARGE TO HX". It shoud read: "HX INLET TEMP FROM LPSI PUMP". (None) (CLD 13.208)

APS Response

Label will be changed to read: "HX IN FRM LPSI TT-351X, HX TO LOOPS TT-351Y, SIA-TR-351".

NRC Question/Comment

A-6.16 The label wording is unclear. Is this a dual indicator, i.e., of HX inlet and outlet temperature?

APS Response to NRC Question/Comment

Recorder SIA-TR-351 is a dual pen temperature recorder which records (1) the temperature into the HX (SIA-E01) from the LPSI pump (SIA-P01) through temperature transmitter TT-351X; and (2) temperature from the HX (SIA-E01) to the reactor cooling loops 1A and 1B through temperature transmitter TT-351Y. Therefore, label has been changed to read "HX IN FRM LPSI TT 351X, HX TO LOOPS TT-351Y, SIA-TR-351. This label has been installed in Unit 1. The same type of label description has been incorporated in the Unit 2 and 3 design.

A-6.30 The position labeling on some keyswitches is misleading. Examples:

a. The position label "LOCKED NORMAL" refers to the normal position of the key and has no meaning with respect to the equipment being controlled.

b. When key is in "LOCKED" position, operator does not know whether it is locked open or locked closed. (6.32)

APS Response

The keyswitch labels positions on escutcheon for B02, B03, and B04 will be revised to delete the word "LOCKED".

NRC Question/Comment

A-6.30 Are the keyswitch positions and associated labels indicative of equipment position or state? For example, what does "NORMAL" mean with respect to the plant equipment? Are these "return-to-center" keyswitches?

APS Response to NRC Question/Comment

The keyswitch position label "NORMAL" is indicative of the switch normal state. All these switches are "spring return to normal" switches.

A-7.0 PROCESS COMPUTERS

A-7.1 Computer system operating procedures and contingency procedures have not been developed. (7.5)

APS Response

Engineering and Technical Services Nuclear Procedures 720P-9RJ03 "PMS Users" Manual, 720P-9SB02 "CPC/CEAC Operation" and 72ST-9RX03 DNBR/LHR/AZITILT/ASI with COLSS" have been developed.

NRC Question/Comment

A-7.1 Do procedures need to be developed for the operators' use of CRT displays or for operator-generated logs, etc.

APS Response to NRC Question/Comment

Procedure 720P-9RJ03, PMS Users Manual, adequately addresses instructions for calling up CRT displays and printed logs. Information on CRT displays and logs has been covered with the operators during simulator training.

A-7.3 There is excessive CRT brightness from room lighting. (7.7) (065C)

APS Response

APS is reviewing the control room lighting to determine if adjusting ambient lighting levels will correct this discrepancy. APS will complete this review by July 31, 1983, at which time the NRC will be advised of the corrective actions and implementation date. In addition, APS will allow at operator discretion to set room lighting level.

NRC Question/Comment

A-7.3 Shouldn't this item have an asterisk indicating completion prior to fuel load?

APS Response to NRC Question/Comment

Due to equipment purchase lead times, APS was not able to perform the control room lighting review until November 19, 1983. As a result of this preliminary review, APS is currently in the process of performing a follow-up control room lighting review by installing non-glare fluorescent bulbs.

This item will be completed prior to exceeding 5% power. APS present schedule is to complete this follow-up lighting review by April, 1984.

A-7.4 Disturbing flicker is evident on the CRT on Panel B01. (7.8)

APS Response

The flicker was caused by the control room simulator enhancements that were being performed at the time of the audit; this has been identified and should not occur in the control room.

NRC Question/Comment

A-7.4 APS states that this discrepancy "should not occur in the control room." Have the CRTs in the control room been checked for flicker?

APS Response to NRC Question/Comment

The CRTs in the control room have been checked for this flicker and no problem has been noted.

A-8.0 PANEL LAYOUT

A-8.7 On Panel B04, the RV-Seal Drain and Pressure System is not functionally related to other systems on this board. (None) (CLD 13.408)

APS Response

The RV-Seal Drain and Pressure System was not required to be moved to Panel B07 as determined by the Demarcation Study.

NRC Question/Comment

A-8.7 Based on the APS Demarcation Study and task analysis data, provide justification for changed commitment.

APS Response to NRC Question/Comment

The RV-Seal Drain and Pressure System was not required to be moved to Panel B07, since the RV-Seal Drain and Pressure System deal with the primary reactor vessel. Therefore, it was determined that the most appropriate location for these controls was Panel B04.

A-8.8 On Panel B05, the overboard valve switches are poorly located. (None) (CLD 13.504)

APS Response

On Panel B05, the overboard valve switches were not required to be moved as determined by the Demarcation Study.

NRC Question/Comment

A-8.8 Same comment as A-8.7.

APS Response to NRC Question/Comment

The Demarcation Study did not recommend relocating the overboard valve switches because these components are segregated into their respective functional group. Even though these switches consist of identical CMC switches mounted horizontally in line, their relocation was not warranted because their functional grouping is acceptable in the context that the discharge pressure indicator, discharge valve switch and condensate pump for their respective group are lined up vertically.

Also, further analysis following identification of the CLD, has determined that in the unlikely event that these (normally closed) valves are inadvertently opened, the only effects is reduced plant efficiency.

B-3.0 ANNUNCIATOR WARNING SYSTEMS

B-3.3 Some tile legends do not address specific conditions. For example, one alarm is used for Hi-Low and Temperature-Pressure. (3.28)

APS Response

Tile legends have been made to conform to the recommendations of the Control Board Annunciator Prioritization Study.

NRC Question/Comment

B-3.3 What were the recommendations (and associated rationale) of the Control Board Annunciator Prioritization Study?

APS Response to NRC Question/Comment

In the process of examining the control room annunciators at the Palo Verde Nuclear Generating Station (PVNGS) during the PVNGS DCRDR, the System Factors, Operator Preparedness and Human Factors Task groups independently concluded that operator performance could be enhanced by a prioritization study of the annunciator system.

The Control Board Annunciator Prioritization Study was conducted to review the PVNGS annunciator system with the objective of providing recommended changes to effect the prioritization of the system alarm message. The following criteria was established for gathering data during the study:

- Annunciators would be reviewed on a plant systems basis.
- Review teams would be assembled according to the skills required to review individual systems.
- Review criteria would be established and updated if necessary prior to each review.
- Document 01-J-RSK-001 would be used for engraving and signal inputs for each window.
- The prioritization process would be based on the priority categorizing of each input to a window.
- The categorizing of a window may require creating new windows or transferring inputs to other windows in order to insure that a single window does not contain inputs of more than one category.
- The prioritization process would allow for the elimination of windows by combining alarm signals that could be better handled as an input to an existing window blanketing that signal. This would be particularly true for lower priority windows.

- Human factors considerations would be reviewed with McDonnell Douglas.

- The review process would stress consistency in the assignment of inputs to windows, in abbreviations and in assignments to window boxes for systems-oriented location of displays.

- First our annunciator would not be included in this review since they are considered to provide after-the-fact diagnostic information.

- All results and recommendations would be reviewed by APS plant operators, other than those who participated on the review teams.

The actual actual study was conducted using the System Factor Team review process. The following is a list of questions developed by the Systems Factors Team, prior to the detailed annunciator review. The questions were developed to provide a uniform base for questioning the cognizant annunciator systems engineers.

1. How does the annunciator relate to "demarcated system"?

2. Is the annunciator really required?

3. Can the operator take a direct action based on the annunciator information?

4. Are there sufficient alarms?

5. Are there alarms that are excessive?

6. Is there a key operating parameter association with the alarm?

7. Are there key alarm parameters for the abnormal operation?

The recommendation of the Control Board Annunciator Prioritization Study were: (1) prioritize windows so that operators can take direct action based on the annunciator information; (2) window box window arrangement and engraving to group related annunciator windows above their respective controls and indicators, and engraving to standardize all abbreviations in the control room; and (3) modify auditory alert signal system to provide sufficient auditory alert signal. (3 directional alarms).

B-5.0 DISPLAYS

B-5.2 The plastic faces of the Foxboro displays seem to scratch and become obscure easily. They also produce excessive glare. (5.14)

APS Response

The plastic faces of the Foxboro 250 Series controllers and indicators were found to be of a hard material and adequately scratch resistant during the human factors review of the Foxboro 250 Series controllers and indicators. The HED has been corrected and is documented in the Executive Summary Report Supplement 1.

NRC Question/Comment:

B-5.2 Same comment as A-1.3.

APS Response to NRC Question/Comment

Same as A-1.3.

B-5.3 The blue switch position indicator lights, on CMC switches, are not clearly visible in the ambient control room light. Example: (Panel B07)

a) Containment Purge Mode Selector
(5.15)

APS Response

APS is reviewing the control room lighting to determine if adjusting ambient lighting levels will correct this discrepancy. APS will complete this review by July 31, 1983, at which time the NRC will be advised of 'APS' corrective action and implementation date.

NRC Question/Comments

B-5.3 Shouldn't this item have an asterisk to indicate completion prior to fuel load?

APS Response to NRC Questions/Comment

Due to equipment purchase lead times, APS was not able to perform the control room lighting review until November 19, 1983. As a result of this preliminary review, APS is currently in the process of performing a follow-up control room lighting review by installing non-glare fluorescent bulbs. This work will be completed prior to exceeding 5% power. Our present schedule is to complete this follow-up lighting review by April, 1984.

B-5.4 Some Foxboro display scales incorporate leading decimals which are difficult to notice, leading to possible misreading of the scale numerals. (5.16)

APS Response

No Foxboro 250 Series controllers and indicators were found to be without adequate space on the scale for the use of decimals during the human factors review of the Foxboro 250 Series controllers and indicators. This HED has been corrected and is documented in the Executive Summary Report Supplement 1.

NRC Question/Comment

B-5.4 Are decimal points readily noticeable?

APS Response to NRC Question/Comment

The decimal points on the Foxboro 250 Series indicators and controllers scales are readily noticeable.

B-5.5 Foxboro meters having major, intermediate, and minor graduations do not differentiate intermediate and minor by using different index lengths. Instead, index mark thickness is used, and is difficult to discriminate. (5.19)

APS Response

The scales of the Foxboro 250 Series controllers and indicators were found to contain adequate length differential between intermediate and minor indexes during the human factors review of the Foxboro 250 Series controllers and indicators. This HED has been corrected and is documented in the Executive Summary Report Supplement 1.

NRC Question/Comment

B-5.5 Same comment as A-1.3.

APS Response to NRC Question/Comment

Same as A-1.3.

B-5.6 There is a poor scale progression on some meters. Examples:
a. LOOP 1A T-HOT / LOOP 2A T-HOT
b. LOOP 1A T-COLD / LOOP 2A T-COLD
(5.20)

APS Response

No Foxboro 250 Series controllers and indicators were found with poor scale progression during the human factors review of the Foxboro 250 Series controllers and indicators. This HED has been corrected and is documented in the Executive Summary Report Supplement 1.

NRC Question/Comment

B-5.6 Same comment as A-1.3.

APS Response to NRC Question/Comment

Same as A-1.3.

B-5.9 Zone markings have not been used on meters to show the operational implications of various reading (e.g., "Danger Range"). (5.26)

APS Response

PVNGS Operations will monitor and collect data on control board meters during initial operation of Palo Verde. On the first refueling outage, Operations and Engineering will evaluate and provide corrective measures if required.

NRC Question/Comment

B-5.9 APS will be expected to provide appropriate zone markings on displays and instrumentation important to safety prior to restart from the first refueling outage.

APS Response to NRC Question/Comment

APS will provide the required zone markings on displays and instrumentation important to safety using the data collected during initial operation of PVNGS. Appropriate zone marking will be provided in each unit prior to restart from the first refueling outage.

B-5.11 There is a lack of lamp redundancy in the CMC switches. (5.28) (002C)

APS Response

APS evaluations have shown there are no apparent suitable resolutions because of the following: 1) Dual element bulbs are not available; 2) implementation of lamp test circuits could provide potential inadvertent actuation through "sneak" circuits. APS will continue lamp surveillance on each shift as the resolution.

NRC Question/Comment

B-5.11 The response is acceptable for licensing; however, lamp test circuits without "sneak" circuits should be pursued further in the DCRDR.

APS Response to NRC Question/Comment

As a result of performing the PVNGS DCRDR, APS pursued evaluating lamp redundancy in the CMC switches. The evaluation showed that there are no apparent suitable resolutions because of the following: (1) dual element bulbs are not available, and (2) the implementation of lamp test curcuits for CMC switch lamp testing will provide the potential of introducing "sneak circuits" which could actuate systems during lamp testing. In order to avoid the actuation of systems through "sneak circuits", an individual lamp test switch could be provided for each CMC switch, but this would only provide a potential means of confusing the operators.

Therefore, APS will continue to perform lamp surveillance of each shift as stated on Administrative Control Procedure 40AC-9ZZ02, "Conduct of Shift Operations". This procedure states that the oncoming operator shall review the status of control board switches and indicators.

B-5.12 There is a lack of lamp redundancy on the Generrex panel on Panel B06. (5.29 (032C)

APS Response

APS evaluation has shown there are no apparent suitable resolutions because of the following: 1) Dual element bulbs are not available; 2) implementation of lamp test circuits could provide potential inadvertent actuation through "sneak" circuits. APS will continue lamp surveillance on each shift as the resolution.

NRC Question/Comment

B-5.12 Same comment as B-5.11.

APS Response to NRC Question/Comment

The Generrex Excitation System mimic bus Light Emitting Diodes (LEDs) are not expected to fail during the life of the plant since LEDs have a long Mean Time Between Failures (MTBF). If any of these LEDs do fail, their failure is not critical to the safe operation of the plant. These LEDs are on a non-safety system.

B-5.13 There is little distinction between lamp failure and status change of CMC switches. There are possible conditions when no light will be on or when more than one should be on. (5.30) (001C)

APS Response

APS evaluation has shown there are no apparent suitable resolution because of the following: 1) Dual element bulbs are not available; 2) implementation of lamp test circuits could provide potential inadvertent actuation through "sneak" circuits. APS will continue lamp surveillance on each shift as the resolution.

NRC Question/Comment

B-5.13 Same comment as B-5.11.

APS Response to NRC Question/Comment

Same as B-5.11.

B-5.14 There is no lamp test capability on CMC switches. (5.31) (003C)

APS Response

APS evaluation has shown there are no apparent suitable resolution because of the following: 1) Dual element bulbs are not available; 2) implementation of lamp test circuits could provide potential inadvertent actuation through "sneak" circuits. APS will continue lamp surveillance on each shift.

NRC Question/Comment

B-5.14 Same comment as B-5.11.

APS Response to NRC Question/Comment

Same as B-5.11.

B-5.17 Foxboro recorders are marginally adequate for recording and monitoring purposes, but inadequate for control purposes because of the position of pens and readability. The chart records are difficult to access; exposed chart in normal position is limited and inadequate for operations such as start-up. The chart exposed to view is small, leading to slow recorder speeds for long record time so that details are lost. (None) CLD 13.005)

APS Response

Models 226/227 are the only Foxboro recorder presently available which is environmentally and seismically qualified to date which is sized to meet Palo Verde control panel requirements. APS will not pursue this item change until future recorder development becomes available.

NRC Question/Comment

B-5.17 Based on task analysis data relative to information requirements, does the operator need information from the recorders that the present recorders do not provide?

APS Response to NRC Question/Comment

The control room operators will be allowed to perform their duties under normal and emergency conditions without the benefit of faster recording speeds on the Foxboro recorders by using the plant computer video trend capabilities. Through the use of the plant computer operators console, which is located in the control room, the control room operator has the means of interfacing with the plant computer to obtain the video trend function. The video trend is displayed on video trend Cathode Ray Tube (CRTs) on control board Panels B04 and B06.

The video trend function displayed on the CRTs provides a video output which displays data in a format similar to that of a strip chart recorder.

This data is displayed on one of four tracks along with a horizontal time line per position and automatically advances from top to bottom as each new data value is received. Each trend is assigned a unique color. Data points can be assigned to any one of the four positions and up to 15 groups of four points each may be defined.

Each group has a predefined interval for collection of data. The last one hundred values for each point is constantly maintained in a buffer for the purpose of a historical trend. The data is collected at the interval specified from whatever point value information is available due to each points normal scan rate. Each group has the option of displaying or not displaying the time lines. The interval and time line parameters are defined initially when the first point is added to a group and can be changed at any time. Two types of trends are available for each group:

a. One second output trend of instantaneous values without historical data.

b. Five to 60-second output trend in five second increments with 100 historical values per point.

Timelines (if selected) are displayed from the left limit to the right limit for each position and automatically move with each new data value so that the time reference is always correct.

Each position has a predefined data point assigned to it, lower and upper scale values, a graph origin value, and lower and upper limits. These parameters are defined initially as each point is assigned to a position and can be changed with any time. The lower and upper scale values define the left and right boundaries for the track. The graph origin value provides a baseline for a waveform to appear, shaded (at reduced intensity) between the baseline and the data value. Also, the space between the defined limits and the data value are shaded in red whenever a limit is exceeded.

B-7.0 PROCESS COMPUTERS

B-7.3 There is glare on the CRT screens. (7.7) (053C)

APS Response

This item will be addressed during the lighting survey which has been delayed until after Power Ascension Testing per the Reference (3) letter.

NRC Question/Comment

B-7.3 A more specific implementation date is needed. (See A-1.6 and A-3.1)

APS Response to NRC Question/Comment

Due to equipment purchase lead times, APS was not able to perform the control room lighting review until November 19, 1983. As a result of this review, APS is currently in the process of performing a follow-up control room lighting review by installing non-glare fluorescent bulbs. This work will be completed prior to exceeding 5% power. Our present schedule is to complete this follow-up review by April, 1984.

B-7.9 Printers do not have a printing capability of at least 300 lines per minute. (7.16)

APS Response

High speed alarm printers have been purchased for the Palo Verde units. The printer has printing capability of up to 340 lines per minute. This printer will be operational by July 31, 1983.

NRC Question/Comment

B-7.9 Does the computer output to the printer at a speed sufficient for the printer to actually print at a speed of 300 lines per minute?

APS Response to NRC Question/Comment

The computer outputs to the printer at 480 characters per second. This is the maximum rate that the plant monitoring system can output alarm messages based on testing performed by Honeywell. This is equivalent to approximately 200 lines per minute and represents a four fold increase in speed.

The computer has been evaluated by APS and has been determined that its output alarm message capability is fast enough such as to prevent the loss of output messages.

APPENDIX G

B-5.0 DISPLAYS

B-5.1 The scales in the Foxboro displays are loosely fitted, allowing incorrect positioning. (5.27) 102C)

APS Response

The scales of the Foxboro 250 Series controller and indicators were not found to be movable during the human factors review of Foxboro 250 Series indicators and controllers. This discrepancy has been corrected and is reported on the Executive Summary Report Supplement 1.

NRC Question/Comment

B-5.1 Same comment as A-1.3.

APS Response to NRC Question/Comment

Same as A-1.3.

Reference (3) submitted a summary of the meeting held on September 29, 1983 between APS and NRC/HFEB. This attachment provides APS response to those questions and comments requested by the NRC/HFEB during the September 1983 meeting between APS and NRC/HFEB.

SER Item #1 - A comparison of the simulator with the Unit 1 control room could not be performed to identify all differences that might exist.

APS Response

APS has completed the comparison of the configuration of the Unit 1 control boards to the simulator control boards. The configuration of these boards at the time of the PVNGS DCRDR was used to identify differences.

Documents which represent the configuration of the Unit 1 control boards at the time of the DCRDR consist of the following:

(1) Annunciator Window Layouts in the Annunciator list Drawing No. 01-J-RKS-001; Rev. 4;

(2) Control Board Nameplate Book, Rev. 0; and

(3) Main Control Board Layout Drawings for the period between December, 1979 and January 1, 1980.

Photographs of the PVNGS control room simulator taken during the PVNGS DCRDR were used to represent th simulator boards configuration.

The comparison was made with respect to differences in the following areas:

(1) Instrument physical location

(2) annunciator window box layout, physical location and window description

(3) mimic physical location and color coding

(4) random check of the tag's physical location

(5) random check of the tag nomenclature and color

Data was collected by APS during the comparison of the documents. All observations which deviated from the five areas listed above were recorded.

Evaluation of the recorded observations was done to determine the differences that existed between the simulator and the Unit 1 control boards. The differences which resulted from this evaluation are shown below.

Instrument Physical Locations

Electric Distribution Panel (B01):

(1) On the simulator control board, instruments PGB-HS-S04H (Item #268) and PGB-11-S04H (Item #269) are in the position, on the control board of instruments PGB-HS-S04J (Item #212) and PGB-11-S04J (Item #213), and likewise, instruments PGB-11-S04J (Item #212) and PGB-HS-S04J (Item #213) are in the position of instruments PGB-HS-S04H (Item #268) and PGB-11-S04H (Item #269).

(2) The simulator control boards instruments PGB-HS-L34B2 (Item #270) and PGB-EI-L34 (Item #271) are in the position, on the unit control board, of instruments PGB-HS-L32B2 (Item #214) and PGB-EI-L32 (Item #215), respectively, and likewise, instruments PGB-HS-L32B2 (Item #214) and PGB-EI-L32 (Item #215) are in the position of instruments PGB-HS-L34B2 (Item #270) and PGB-EI-L32 (Item #215), respectively.

Engineered Safety Features Panel (B02):

(1) Instruments HPA-UCI-9 (Item #110) and HPB-UCI-10 (Item 111) were not installed in the simulator at the time of the PVNGS DCRDR.

(2) Annunciators RKA-UA-2C (Item 184) and RKA-UA-2D (Item 185) were not yet installed on the simulator.

Reactor System Panel (B04):

(1) Annunciator RKA-UA-4D (Item #184) and RKB-UA-4E (Item #185) had not been installed on the simulator.

(2) The Channel A (Item #186) and Channel B (Item #187) annunciator switches had not been installed in the simulator.

Miscellaneous and HVAC Panel (B07)

(1) On the simulator control board instrument WCN-HS-70 (Item #14) is in the position, on the unit control board, of instrument WCN-HS-2A (Item #15), and likewise, instrument WCN-HS-2A (Item #15) in the position of instrument WCN-HS-70 (Item #14).

Instrument Nameplate Physical Location and Legend Description/ Color

(1) Exact nameplate legends varied from minor abbreviation differences to omitting instrument number and complete tags. The majority of the tags in the simulator contained the most important identifying factors (i.e., instrument number).

(2) Several tags in the simulator were positioned in other locations than shown on the contol board drawing.

(3) Red/Green color coding on the Generrex Field Excitation pushbuttons on Panel B06.

(4) Missing labels on Electric Bus Mimic on Panel B01 reversed in similarities in simulator.

(5) Incorrect label on RCP 1B control in the simulator.

Annunciator Window Box Layout Physical Location/Window Legend Description

(1) Addition or ommission of window legend descriptions was a minor difference since most cases usually involved a missing letter or word

Mimic Physical Location/Color Coding

(1) No material color, location, direction of flow (arrows) observations or violations were discovered.

NRC Question/Comment

1. What is the resolution of the differences between the control room and the simulator? Were differences surveyed in the control room for HED's that could not be identified in a survey of the simulator?

APS Response to NRC Question/Comment

1. The resolution of the differences between the control room and the simulator were not significant to impact the PVNGS DCRDR. In support of this statement, please note that the simulator and control room were compared in the following areas: (1) instrument physical location, (2) annunciator window box layout, physical location and window description (3) mimic physical location and color coding (4) random check of the tags physical location and (5) random check of tag nomenclature and color.

   In the area of physical instrument location only two major differences existed: (1) missing in the simulator were the Class IE annunciators RKN-UA-2C and 2D on Panel B02; and RKN-UA-4D and 4E on Panel B04; (2) missing in the simulator were the instruments on the Containment Hydrogen Analyzer panels HPA-UCI-9 and HPB-UIC-10.

The missing Class IE annunciator window boxes in the simulator were included in the review held during the Annunciator Prioritization Study.

The missing instruments on the Containment Hydrogen Analyzer panels consist of six red indicating lights, three handswitches and one pushbutton. Even though the instruments were not installed on the panels at the time of the review, the instrument cutout existed on the panels showing the exact location of the missing instruments.

The annunciator window box layout physical location/window legend descriptions differences between the simulator and control room were minor since most cases involved a missing letter or word. These differences were resolved by implementing the recommendations of the Annunciator Prioritization Study.

The differences noted when comparing the instrument nameplates physical location legend description and color between the simulator and control room impacted the review by initiating a program to review all the legend descriptions and color in the Control Board Nameplate List and to place correctly and consistently all required nameplates on the control boards.

SER Item 2 - GENERAL LAYOUT

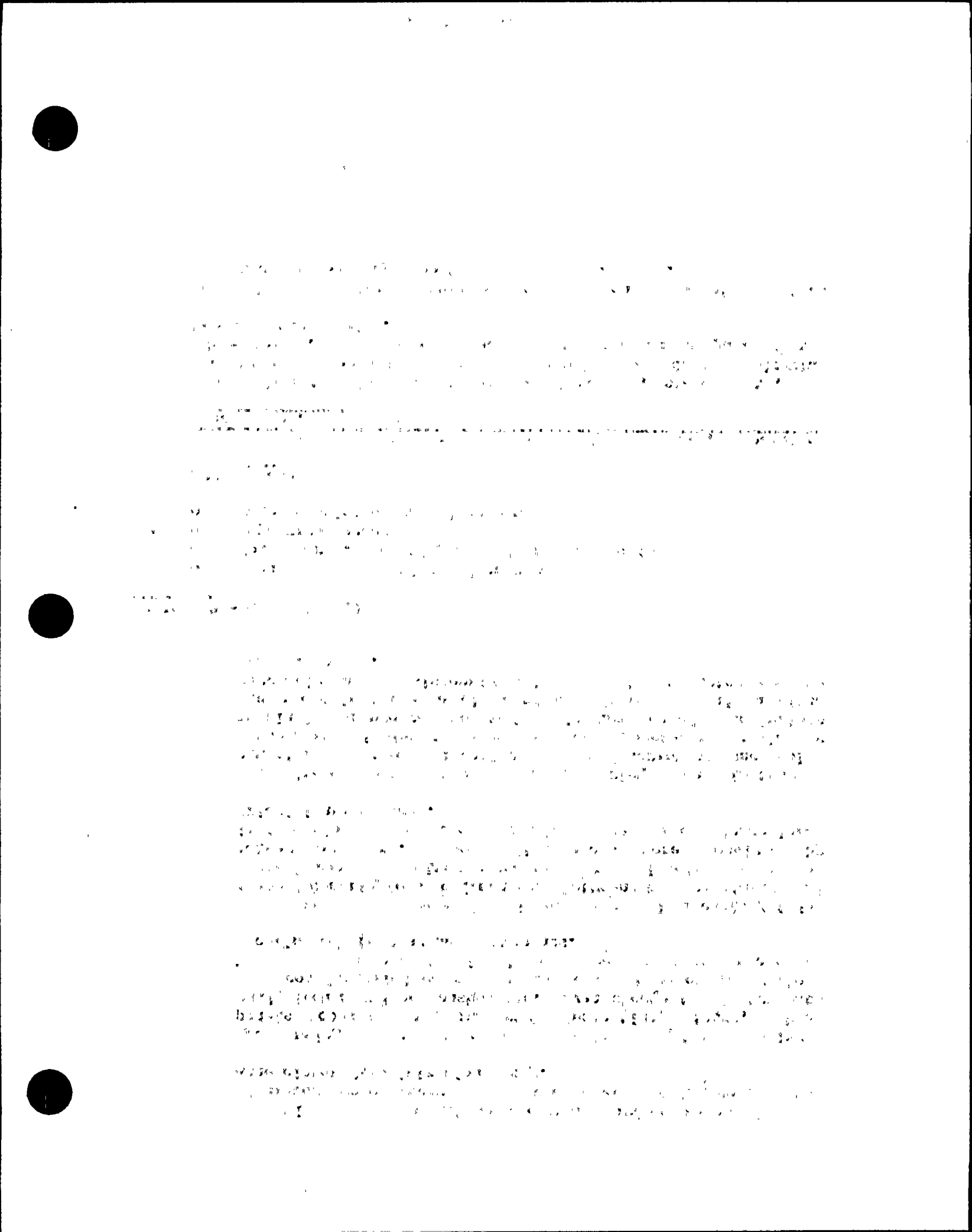
- Document organization and storage
- Spare parts, operating expendables and tools
- Supervisor access
- Non-essential personnel access

APS Response

Document Organization and Storage; Spare Parts, Operating Expendables, and Tools

Space allocated for the storage of documents, spare parts, and operating expendables is documented on design drawing 13-J-ZJL-304. This design drawing was evaluated as part of the human factors review.

The TPT human factors review is documented on the Supplement 1 to the Executive Summary Report which is Attachment A.



Supervisor Access

The PVNGS control room design has located the shift supervisor's office within the control room isolation boundary. This design will permit prompt supervisor access to the control room under all conditions, including control room isolation. The design also permits good visual and voice contact between the primary operational area and the Shift Supervisor.

Design of the PVNGS Supervisor's Access is in compliance with the guidelines set in NUREG-0700, Section 6.1.1.1 "Supervisor Access".

Non-Essential Personnel Access

Provisions to limit the access and movement of non-essential, but authorized personnel within prescribed areas of the PVNGS Control Room have been established by Administrative Control Procedure No. 20AC-0ZZ04, Section 5.4, "Personnel Access within the Protected/Vital Areas".

This administrative procedure states that access is limited to each individual based on job-related need. Access will be controlled at various locations by the Plant Security System. Personnel will only be permitted to access through the use of prioritized card keys.

In addition, Section 5.4.5 of the administrative procedure clearly and explicitly states the following, "It shall be within the authority of the Operations Shift Supervisor or designee to limit personnel access to the control room".

Design of non-essential personnel access is in compliance with NUREG-0700.

NRC Question/Comments

2. (Document Organization and Storage.) The results of the evaluation should be summarized here. Any HED's found should be described and corrective actions proposed. The reference to Attachment A is too vague.

APS Response to NRC Question/Comment

2. As a result of evaluating the control room equipment organization and storage, the locations and spaces identified in the Equipment Location Plan (13-P-ZJL-304) were assessed as being adequate to store and house the following equipment:

   - 10 SCBA kits
   - 56 Air bottles
   - Operating expendables (charts, ink, pens, paper)

- Document Storage (prints, manuals)
- Emergency Rescue Kit
- Tools and rain gear.

Also the proximity of these locations to the control room was found to be satisfactory.

A checklist observation was prepared regarding the development of operational procedures to permit acquisition of kits and the exchange of empty for full air. Included in this checklist was the development of a technique for positive identification of "full-empty" tanks.

The review of the checklist observation associated with the organization and storage of equipment in the control room resulted in assigning an HED number to this observation. This HED is as follows:

	HED
145A	SCBA air bottle replenishment, exchange and status inadequate.

SER Item 3 - Emergency Equipment

- Operator protective equipments
- Fire, radiation and rescue equipment
- Emergency equipment storage

APS Response

Emergency Equipment Storage

The space allocated for the storage of this emergency equipment is documented on design drawing 13-J-ZJL-304. This drawing was evaluated as part of the human factors review.

This evaluation was accomplished using a checklist developed as part of the human factors review which included guidelines from NUREG-0700 that were applicable to the design drawing review.

The TPT review of the design drawing for locating and storing protective and emergency equipment identified one Human Engineering Discrepancy (HED). This HED has been documented in the Supplement 1 to the Executive Summary Report which is Attachment A.

NRC Question/Comment

SER Item 3 - Same comment at #2 above.

APS Response to NRC Question/Comment

Same as #2 above.

SER Item 4 - Environment

- Temperature and humidity
- Ventilation
- Emergency lighting
- Auditory
- Personal Storage
- Ambience and comfort

APS Response

APS will complete review of the above items per Reference (3) prior to plant operation exceeding 5% power.

NRC Question/Comment

SER Item 4 - APS will be expected to submit a report of the evaluation proposed corrective actions for NRC review and approval prior to plant operation exceeding 5 percent power.

APS Response to NRC Question/Comment

APS will complete the Control Room Environmental Study and provide a report of proposed corrective actions for NRC review prior to plant exceeding 5% power. APS present schedule is to complete this study by April, 1984.

SER Item 5 - The absence of documents made it impossible to evaluate consistency of procedure terminology with labels, displays, abbreviations, or document indexing and cross-referencing.

APS Response

Five operating procedures were randomly selected in order to evaluate the consistency of procedure terminology with labels, displays and abbreviations used in the control room. The five operating procedures chosen were:

410P-1HC01	HVAC CONTAINMENT (HC)
410P-1SI01	SHUTDOWN COOLING INITIATION
410P-1CH01	CVCS NORMAL OPERATION
410P-1CW03	COOLING TOWER OPERATION
410P-1SG03	OPERATING THE STEAM GENERATOR BLOWDOWN SYSTEM

Two safety-related operating procedures are in this group.

The following design documents were used to conduct this evaluation: 1) the Control Board Panel Layout Equipment List for Control Boards B01 through B07; 2) the Control Boards Nameplate List; and 3) the Annunciator Window Layout.

The methodology applied in determining the consistency of procedure terminology to labels, displays, and abbreviations used in the control room is described below.

The instrument (display) number and control board number in the procedure being analyzed were first reviewed against the Main Control Board Layout Equipment List for determining the board item number associated with the instrument (display) number. Once the board item number was obtained from the Equipment List, the item number was reviewed against the Control Board Nameplate List. The use of this routine made it possible to determine the exact level description for the instrument (display) used in the procedure and evaluation of consistent abbreviations used in the control room.

The results obtained from performing the above routine varied, depending on the procedure being analyzed. The results of the review are sumarized below.

It was noted that four of the five procedures did not use instrument (display) numbers or display labels in the text of the procedure. Instead the action required (i.e., open/closed) at the final element was given. The instrument number for this final element was the only description given. Since no display numbers and labels descriptions were given in the procedures, no inconsistencies could be determined between the procedure terminology and labels, displays, and abbreviations used in the display labels.

The text of operating procedure 410P-1HC01 "HVAC CONTAINMENT" (HC) did contain instrument (display) and control board numbers. The routine discussed above was applied. Results indicated that overall the procedure terminology was consistent with the labels, displays, and abbreviations used in the control room. In all cases, the instrument (display) number on the boards was found to be consistent with the procedure instrument number. The following exceptions were noted:

- In a few cases either a word (abbreviation) was added or ommitted from the label or the procedure text.
- A label description was left out and only the instrument (display) number given.

NRC Question/Comment

SER Item 5 - The resolution of the terminology differences between the procedures and the control room will be left to PSRB for its review.

APS Response to NRC Question/Comment

No response required.

SER Item 6 - Due to the existing state of the system, it was not possible to adequately evaluate all of the CRT displays for content and data presentation.

APS Response

The Emergency Response Facilities and Data Acquisition System (ERFDADS) CRT display was identified as being the only CRT display which was not evaluated during the PVNGS DCRDR due to its incomplete state of readiness at that time.

This CRT display was reviewed against NUREG-0700, Section 6.7.2, Cathode Ray Tube (CRT) Displays, for content and data presentation. In conjunction with NUREG-0700, on additional CRT display checklist was developed which was utilized in interviewing Operation personnel.

Several discrepancies were identified, and the results have been made part of the Supplement 1 to the Executive Summary Report which is Attachment A.

NRC Question/Comment

SER Item 6 - Same comment as #2 above.

APS Response to NRC Question/Comment

A human factors review of the ERFDADS terminal CRT display was performed by the Human Factors Evaluator while observing the equipment operation at the PVNGS Unit 1 Control Room, PVNGS Technical Support Center (TSC) and PVNGS Control Room Simulator.

The review resulted in 7 checklist observations associated with the ERFDADS terminal CRT display. Of the 7 checklist observations, 6 were assigned HED numbers. These HEDs are as follows:

	HED
139B	Lack of consistent abbreviations among CRT, panels and procedures.
53C	Specular glare is present on CRT surfaces produced by terminal and overhead light locations.
140C	Improper use of punctuation in statements on CRT displays (ERFDADS CRT).
141C	Parameter time history display on CRT's reads opposite to normal reading pattern of left to right (ERFDADS CRT).
142C	Page designation on CRT display not in accordance with station policy (ERFDADS CRT).
143C	Lack of 'standby' indication on CRT display (ERFDADS CRT).

SER Item 8 - The actual discernability and reliability of audio signals above ambient noise could not be measured.

APS Response

APS will complete per Reference (3) prior to plant operation exceeding 5% power.

NRC Question/Comment

SER Item 8 - Same comment as #4 above.

APS Response to NRC Question/Comment

APS will complete the noise survey and provide a report of proposed corrective action for NRC review prior to plant exceeding 5% power. APS present schedule is to complete this study by April, 1984.

SER Item 9 - The capability of complete internal and external communications during emergencies (i.e., paging at the remote shutdown panel and/or direct communication with back panels Shift Supervisor's Office, etc.) could not be evaluated.

APS Response

APS will delay and complete per Reference (3) prior to plant operation exceeding 5% power.

NRC Question/Comment

SER Item 9 - Same comment as #4 above.

APS Response to NRC Question/Comment

APS will complete the noise survey and provide a report of proposed corrective action for NRC review prior to plant exceeding 5% power. APS present schedule is to complete this study by April, 1984.

SER Item 10 - Since only Panel B06 had color-shaded background panel sections, it was not possible to evaluate the effectiveness throughout the entire control room of the use of shading colors to identify groups of functionally related control and displays.

APS Response

During the PVNGS DCRDR, both B01 and B03 were cited as being excellent examples of the use of electro-mechanical mimics. Additionally, B05 was cited as being an excellent example of subsystem segregation by demarcation. Therefore, B02, B04, B06 and B07 were only considered in the Demarcation Study.

Results of the study have caused demarcation of control room panel boards B02, B04, B06, and B07 in order to achieve functional groupings.

APS has found no discrepancies in the demarcation fixes implemented in the remainder of the DCRDR as documented in the Supplement 1 of the Executive Summary Report.

NRC Question/Comment

SER Item 10 - The last paragraph of the APS response is unclear.

APS Response to NRC Question/Comment

APS was emphasizing in this paragraph that the fixes implemented as a result of the Demarcation Study did not bring about new problems since no problems were documented in the DCRDR Supplement 1.

SER Item 11 - The proposed Plant Protection System logic alarm box on panel B05 could not be evaluated because it is not yet installed.

APS Response

The Plant Protection System logic alarm box on Panel B05 (ESFAS Annunciator Window Box, 1-J-RKN-5C) was evaluated in the control room.

The evaluation consisted of reviewing the Unit 1 control room ESFAS Annunciator Window Box to guidelines provided in NUREG-0700. A checklist was developed and used to obtain information related to the ESFAS Window Box (1-J-RKN-5C).

One Human Engineering Discrepancy (HED) was revealed during the review and has been documented in the Supplement 1 to the Executive Summary Report.

NRC Question/Comment

SER Item 11 - Same comment as #2 above.

APS Response to NRC Question/Comment

The Human Factors Review of the ESFAS Annunciator Window Box (1-J-RKN-5C) was performed by the Human Factors Evaluator while observing the equipment at the PVNGS control room.

The review resulted in one checklist discrepancy associated with the ESFAS annunciator. This checklist discrepancy was assigned an HED number as follows:

HED	
144C	Letter size too small on panel label for ESFAS Annunciator (B05)

It should be noted that this HED is of the same type as Audit Finding 3.13 and will be resolved in the same manner as Audit Finding 3.13.

SER Item 13 - The following instrumentation system which HFEB typically reviews were not available:

a. In-core thermocouple instrumentation displays, and

b. Sub-cooling monitor instrumentation displays.

APS Response

APS will complete per Reference (3) prior to plant operation exceeding 5% power.

NRC Question/Comment

SER Item 13 - Same comment as #4 above.

APS Response to NRC Question/Comment

This task will be completed prior to exceeding 5% power and a report of proposed corrective actions for NRC review will be provided prior to exceeding 5% power.

Corrective actions that will be implemented by APS to resolve those HEDs which resulted from the PVNGS DCRDR Executive Summary Report Supplement 1.

CATEGORY "A" HED
(Safety; Mandatory Implementation
Prior to Fuel Loading)

HED25; (CLD14.25) The J-handle pump controls too close to panel edge and are positioned such that accidental tripping can occur easily.

APS Response

APS has addded a guard rail on all the units' control boards to protect all controls that are too close to the panel edge from being accidentally activated.

HED128; CLD14.13 Difficult to discriminate between red and amber and to identify flashing green on annunciator windows.

APS Response

APS performed a hue saturation survey in the control room simulator environment to select optimum hue saturation such to insure discrimination greater than 95%. As a result of this survey APS will change the existing chartpak annunciator lenses to colored annunciator lenses.

HED 129; (CLD 14.15) The only way an operator discriminates between the MSIV and FWIV controls is by control number.

APS Response

APS is providing two new nameplates on Panel B06 for the FWIV switch group and two nameplates for the MSIV switch group.

HED 134; (CLD 14.21) Lack priority (color) alarm system information.

APS Response

APS will provide training on the color coding of the annunciator system.

HED 137; (CLD 14.30) Labels are missing and inconsistently placed on several boards.

APS Response

APS will prepare labels for those missing on instruments and relocate labels per design. The installation of the correct labels and their relocation has been completed in the Unit 1 Control Room. The design for Unit 2 and 3 have been modified to reflect the correct labels and their location.

HED 145; (CLD 18.01) The acquisition of SCBA kits and replacement of empty with full tanks can be confusing. Further without some positive indication of whether a tank is full could pose a serious situation.

APS Response

The acquisition of SCBA kits and replacement of empty tank during actual use of those equipment will be at the discretion of the shift supervisor. APS will provide a sign on the air bottle racks to instruct personnel to turn bottles upside down in rack to indicate empty bottles.

HED 122; (CLD 14.23) The jog switch controls are too small and the spring tension too strong causing operator discomfort. Problem complicated when response to an annunciator is required and valve not fully seated.

APS Response

APS will combine this HED with HED 122 previously addressed in the PVNGS DCRDR.

CATEGORY "B" HED
(Reliability - 90% Availability Criterion, Mandatory Implementation Prior to or at First Refueling)

HED 123; (CLD 14.01) Control room operators are unable to reach or hear the auxiliary operators, via radio, in certain parts of the auxiliary building and containment building.

APS Response

APS will install repeaters or provide a back-up system.

HED 130; (CLD 14.16) Mimic on Panel B-01 is confusing. Operators have difficulty discriminating controls for buses associated with Units 2 and 3.

APS Response

APS has redesigned the mimic on Panel B-01.

HED 135; (CLD 14.27) No indication to operator at which of two control positions clearing action was taken or who is taking the action.

APS Response

APS will provide training on the annunciator controls.

HED 139; (CLD 15.01) Abbreviation terms used on the CRT differ from those used on the panels and in the procedures.

APS Response

APS will use the same set of accepted abbreviations on the ERFDADS CRT terminal as those on the annunciator and control board panel labels.

CATEGORY "C" HED
(Reliability - Enhancement; Mandatory Implementation at Convenient Outage)

HED 53; (CLD 15.02) Specular glare is present on CRT surfaces produced by terminal and overhead light locations.

APS Response

This item will be readdressed during the Control Room lighting survey which has been delayed until after power ascension testing.

HED 63; (CLD 14.24) Operator is unable to differentiate between a push-button control and an indicator light.

APS Response

APS has performed an evaluation on this item during the DCRDR. Results indicate that distinguishing markings on the switches and displays will only create more confusion than help the operator if implemented. Instead, the PVNGS Training Department has begun training operators to distinguish between legend lights (indirect lamps) and back-lit switches (pushbutton) as part of the control room simulator training.

HED 124; (CLD 14.04) Mimic lines are falling off panels (B-01).

APS Response

APS has secured mimic lines.

HED 125; (CLD 14.06) TRACOR Westronic controls located too high.

APS Response

APS will add a trend line selector control if warranted by operational experience.

HED 126; (CLD 14.07) Foxboro indicators that are not placed in direct line of operator sight (too high, low or distant from operating position) causing parallax.

APS Response

APS will provide training to minimize problem.

HED 127; (CLD 14.10) HVAC controls for auxiliary building difficult to discriminate from control building and fuel building.

APS Response

APS will examine labeling techniques to provide operator aid.

HED 131; (CLD 14.17) Circuit breaker indication remains in last placed operating position (switchyard and cooling tower fans) when plant multiplexer fails. No indication alarm provided to indicate failure.

APS Response

APS will provide an alarm to warn the operator when the plant multiplexer has failed.

HED 132; (CLD 14.18) The Foxboro 250 uses different parameter units, i.e., PSIG and PSIA to measure pressure. NUREG-0700 Guideline (Checklist) 6.5.1.4(e).

APS Response

APS will review the functional necessity for consistent units. If consistent units are required. APS will relabel and recalibrate parameter units.

HED 138; (CLD 14.31) The overhead lighting produces a glare on the Foxboro 250 indicators making accurate reading difficult.

APS Response

APS will study the use of eggcrate or diffuser shields on the overhead lights, primarily on the fixtures directly in front of the panels.

HED 140; (CLD 15.05) Period not used after item selection designators and at the end of statements.

APS Response

APS will program the ERFDADS CRT displays to end item or statement with a period (or proper punctuation).

HED 141; (CLD 15.07) Time history display reads right to left. This is opposite to our normal reading pattern.

APS Response

APS will reverse the time history line to show current time moving to right.

HED 142; (CLD 15.08) Page designation is not in accordance with station policy, i.e., page numbers and total number of pages.

APS Response

APS will reprogram page designation to be consistent with station policy.

HED 143; (CLD 15.09) Operator does not receive indication to "stand by".

APS Response

APS will provide a visual indication to the operator to "standby" when display is delayed beyond two seconds.

HED 144; (CLD 16.01) Panel identifier letter size too small to read at normal viewing distances.

APS Response

The Review Team for the Annunciator Prioritization Study concluded that it is not necessary to label each annunciator panel since (1) unnecessary labeling adds to the confusion of providing too much information; (2) each window when illuminated in association with its location above the corresponding controls and display provides the operator with the overall system type information; (3) other panel hierarchical labeling recommended by the Demarcation Study is more appropriate.

HED 146; (CLD 17.01) In performing the task of isolating the shutdown cooling loops during plant startup the operator had difficulty in locating SIA-HS-638 (see Figure 17.01-1, step 1.45) and excessive operator movement @ Panel B-02 was required to verify flow on SIA-FI-306 after opening valve with SIA-HS-648 (see steps 1.47, 1.48).

APS Response

APS will review design and procedure for proper method to accomplish task. Upon completion of review, APS will make appropriate revision to either procedure or design.

HED 147; (CLD 17.02) While monitoring reactor status during the LOCA, the operator made 18 trips between Panel B-04 (pressurizer pressure and level) and Panel B-05 (loop Delta T).

APS Response

APS will provide training to insure operator efficiency will resolve this discrepancy, since plant design includes adequate instrumentation for the operator to efficiently peform this function.

HED 148; (CLD 17.03) While monitoring SEAS status and SI flows during the LOCA, the operator made nine (9) trips between B-02 (SI flow) and B-04 (pressurizer pressure and level).

APS Response

APS will provide training to insure operator efficiency will resolve this discrepancy, since plant design includes adequate instrumentation for the operator to efficiently perform this function.

HED 149; (CLD 14.02) Operator must mentally compute T from T_c and T_h because operator scales measuring units differ.

APS Response

An optim to provide a "Delta-T" readout on Panel B04 will be evaluated. A readout on Panel B-02 exists for T_h and T_c (PAM trend recorder).