

RESPONSE TO
NRC HUMAN FACTORS ENGINEERING
PRELIMINARY DESIGN ASSESSMENT AUDIT
REPORT OF AUGUST 26, 1983

WASHINGTON PUBLIC POWER SUPPLY SYSTEM
NUCLEAR PROJECT NO. 2 (WNP-2)

October 7, 1983

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INTRODUCTION

An audit of the WNP-2 Control Room Design Review (CRDR) Preliminary Report dated April 1983 and of the WNP-2 Control Room was conducted by the Nuclear Regulatory Commission (NRC) Human Factors Engineering Branch (HFEB), Division of Human Factors Safety, the week of June 6, 1983. Subsequently, an Audit Report dated August 26, 1983, was submitted to the Washington Public Power Supply System. This Response Report addresses the findings in the NRC's Audit Report.

The Audit Report contained Sections A through F. Sections A, D, E, and F are addressed in this Response Report. Section B are findings in which corrective actions were approved and verified as being complete during the June onsite audit. Section C are findings in which the corrective actions and schedule for corrections were approved but were not completed at the time of the June onsite audit. Sections B and C did not require a response but an internal review to ensure corrective actions have been completed in accordance to the approved schedule.

The Response Report is arranged by section and finding sequence as noted in the Audit Report. The top of each page identifies the response by the NRC finding number and, where applicable, the Supply System finding number.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. A-1.1

WPPSS NO. 4.1

REVIEWER:

RESPOND BY:

Control room furnishings and equipment were not completely installed. Adequacy of furnishings, obstacles to operator movement, and presence of unnecessary furnishings and equipment could not be evaluated.

RESPONSE: The control room primary operating area has been essentially arranged in its final configuration (see Figure 1). Two concerns were noted:

1. Access to print table (item 18) was poor for the senior RO and NSSS operator. The print files (item 17) and the print table were reversed in sequence. This provides improved access and also improved visibility for the BOP operator from his desk to Panel P851 (Board S).
2. The two black and white CRTs located between the senior RO and Panel P601 are at such a height that the senior RO's view is partially obstructed. See NRC Finding D-7.3 for response on this item.

With the above changes, furnishings appear adequate; operator movement is unobstructed within their areas of responsibility; communications is adequate at all work stations; procedures are readily accessible from a central location; operator visibility from their respective work stations to the panels is unobstructed, including from the shift manager's office; and access to emergency equipment and spare parts is adequate. In general, the arrangement provides a functional control room for both normal and abnormal operation.

The arrangement of the shift manager's office and the operator's lunch/study room has not been completed as yet. These areas will be in the proposed arrangement by fuel load. A functional review will be completed of these areas when the arrangement has been completed.

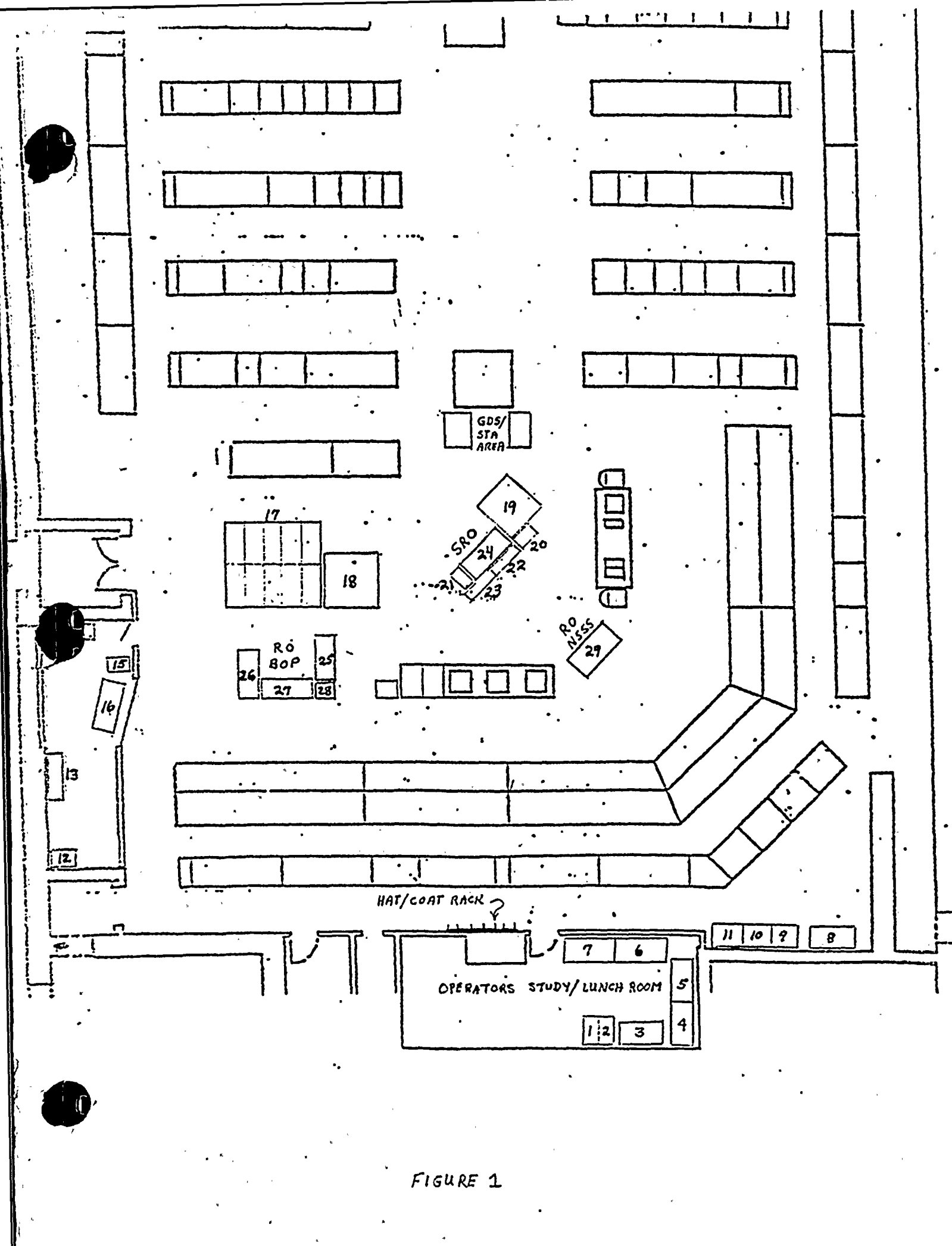


FIGURE 1

CONTROL ROOM EQUIPMENT IDENTIFICATION

1. 5-Drawer file cabinet (for protective gear, etc), A-1.20
2. 5-Drawer file cabinet (for tools, spare parts, etc.), C-1.14
3. 4-Shelf bookcase
4. & 5. 6-Shelf bookcases (2)
6. & 7. Tables (2)
8. Shelf unit (for Scott Air Packs)
9. 10. & 11. 2-Door, 4-shelf cabinets (3) (for charts, ink & recorder supplies, etc.)
A-1.20
12. 5-Drawer file cabinet
13. & 14. 4-Shelf bookcase
15. 2-Drawer file cabinet
16. Shift Manager's desk
17. Print file cabinets (10)
18. & 19. Print tables (2)
20. & 21. 1-Shelf bookcases (2)
22. & 23. 2-Shelf bookcases (2)
24. Control Room Supervisor's desk
25. & 26. Tables (2) (adjoining RO desk)
27. RO desk (BOP)
28. 2-Drawer file cabinet
29. RO desk (NSSS)

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. A-1.2

WPPSS NO.

REVIEWER:

RESPOND BY:

Portions of Panel P-813 were under construction and could not be evaluated.

RESPONSE: Panel P813 modifications have not been completed. A review will be performed prior to commercial operation .

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.	A-1.3	WPPSS NO.	19.1.2
REVIEWER:		RESPOND BY:	

Control room sound levels could not be reviewed.

RESPONSE: A sound survey was performed in the WNP-2 Control Room primary operating area and remote shutdown room on 9-20-83. Using a Bruel and Kjaer Type 2218 Precision Integrating Sound Level Meter, ambient noise measurements were taken at fourteen locations. The locations and their associated sound levels are listed below (all measures are in dB(A) units):

1.	P601 (left)	61
2.	P601 (right)	59
3.	P602	62
4.	P603	62
5.	P840	63
6.	P820	61
7.	P800 (left)	60
8.	P800 (right)	61
9.	NSSS Operator's desk	62
10.	BOP Operator's desk	59
11.	SR desk	63
12.	Remote Shutdown Panel (left)	62
13.	Remote Shutdown Panel (right)	61
14.	Remote Shutdown Panel (desk area)	62

All measurements were below the minimum recommended 65 dB(A). Average ambient noise was 61.28 dB(A).

These readings are considered typical for the normal control room environment with one exception. The access panels at the base of the benchboards were all removed during the data recordings. Thus, the actual control room ambient background noise is expected to be less than the above with the access panels in place.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. A-1.17

WPPSS NO. 20.3.1

REVIEWER:

RESPOND BY:

Operator protective equipment, emergency storage facilities, and compatibility of emergency gear with operators' needs to perform operations while wearing protective equipment could not be evaluated.

RESPONSE: Emergency protective equipment will be stored as noted in Figure 1. The only protective gear that operators in the control room will wear is Scott Air Packs. Communications capability and visual functional requirements will be reviewed prior to commercial operation. Protective clothing will be used only for exiting the control room if environmental conditions require it and will not be part of the evaluation.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. A-1.18

WPPSS NO. 20.3.2

REVIEWER:

RESPOND BY:

Radiation monitoring equipment was not available in the control room.

RESPONSE: FSAR, Section 12.5.2, requires portable radiation monitoring equipment to be stored in the control room prior to fuel load. Required equipment will be in place prior to fuel load and located as shown in Figure 1.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

A-1.20

WPPSS NO.

19.3.3

REVIEWER:

RESPOND BY:

Accommodations were not provided for the storage of protective gear, spare parts, and personal belongings.

RESPONSE: Accommodations will be provided prior to fuel load. See Figure 1 for arrangement details. All operators have lockers within the Service Building for personnel effects. Control room personnel effects should be minor; i.e., hats, coats, lunches, training material. A hat and coat rack will be located adjacent to the study/lunch room, and all other personnel effects should be within the study/lunch room area.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

A-1.31

WPPSS NO.

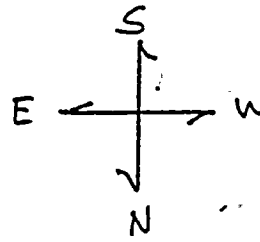
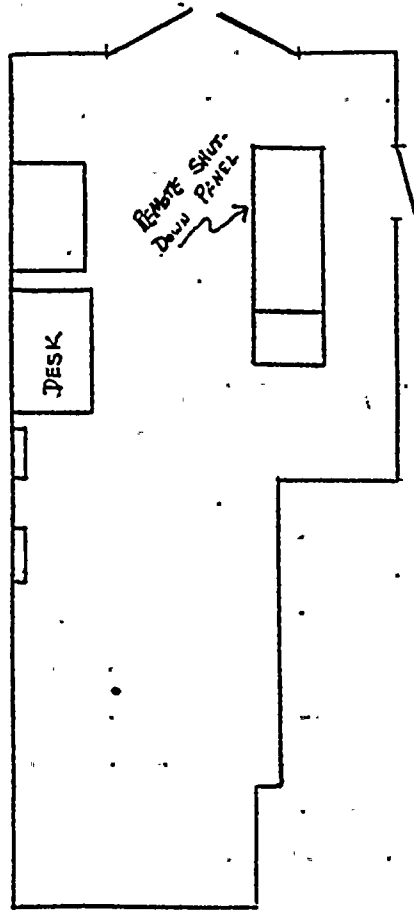
REVIEWER:

RESPOND BY:

Document organization and storage provisions in the control room and at the remote shutdown panel were not in final form.

RESPONSE: Document organization and storage provisions will be in their final form prior to fuel load. See Figures 1 and 2 for proposed layout. The desk located in the Remote Shutdown Room will contain required procedures, spare parts, and communications equipment. Document organization within the bookcases will be reviewed prior to fuel load.

REMOTE SHUT DOWN ROOM LAYOUT



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. A-3.4

WPPSS NO. 14.5.3.1

REVIEWER:

RESPOND BY:

Audio alarm signal detection and intensity levels could not be reviewed.

RESPONSE: Only two of the four alarm systems are presently operable. Detection and intensity level reviews were performed on these available systems. The alarm for P602/P603 system met the 10 db over ambient background as measured from the three operator work stations. The alarm for P800/P820/P840 was only 5 db over ambient background. The speaker was found bolted to the panel wall with its cone facing the panel. The speaker will be reversed so the speaker cone faces outward and the system re-evaluated. Signal detection and intensity reviews will be completed on all four systems prior to commercial operation.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. A-3.5

WPPSS NO. 14.3.19; 14.5.2.1.b; 14.3.11

REVIEWER:

RESPOND BY:

"Reflash" capability for annunciation of a second input from a multiple input alarm could not be reviewed.

RESPONSE: Reflash was not designed into the annunciator panel circuits. A "WNP-2 Annunciator System Multiple Input Alarm Standard" was prepared in November 1981. The standard provided guidance for determining the acceptability of annunciator alarms with multiple inputs and acceptable methods of corrective actions to resolve multiple input concerns. All multiple alarms were reviewed against the following criteria: priority of alarm, diverse operator or system response requirements, and available control room backup information. Seven alarms failed to meet the criteria. The number of alarms that would need "reflash" capability was considered minimal to warrant redesign of all annunciator panels. As an alternative, the individual alarm circuits were modified by splitting the alarms into discrete circuits meeting the multiple alarm standard requirements. These alarms have been corrected. Also, the NRC Audit Team reviewed the multiple alarm standard during their onsite June audit and noted no concerns with the standard. No further action required.

<u>Panel</u>	<u>Original Alarm</u>	<u>Revised Alarm</u>
P601-A2	(4-5) RHR B/C suction valve control switch closed.	Alarm split into two alarms; RHR B(2-5) and RHR C(4-5).
P601-A4	(4-4) RCIC water leg, condensate vacuum pump motor overload.	Alarm split into three alarms; water leg pump (4-4), condensate pump (2-7), and vacuum pump (2-6).
P602-A5	(4-7) RWCU Pump A/B cooling water temp high.	Alarm split into two alarms; Pump A(4-7) and Pump B(4-8).
P672-A9	(2-8) Off-gas condenser Level A high/low. (2-9) Off-gas condenser Level B high/low.	These are two level transmitters monitoring one condenser level. Alarm circuits were modified to make 2-8 high level only and 2-9 low level only.
P800-C1	(8-3) 125 VDC inverter IN-3 trouble.	Split into two alarms; general trouble (8-3) and loss of alternate power source (9-3).
P800-C5	(8-3) 125 VDC inverter IN-3 trouble.	Split into two alarms; general trouble (8-3) and loss of alternate power source (9-3).

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

A-5.17

WPPSS NO.

REVIEWER:

RESPOND BY:

System status panels were inoperative and could not be completely evaluated.

RESPONSE: A dynamic evaluation will be performed prior to commercial operation.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. A-7.15

WPPSS NO.

REVIEWER:

RESPOND BY:

The CTSO system was not operational and could not be completely evaluated. This includes the TDAS and GDS systems.

RESPONSE: *A dynamic evaluation will be performed prior to commercial operation.*

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-1.21

WPPSS NO.

REVIEWER:

RESPOND BY:

P-601 - The unlabeled, blank controllers on this panel should be removed to reduce visual noise. (8314)

RESPONSE: *The blank controller covers and supporting shelf unit will be removed by the 1st Fuel Outage.*

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-1.22

WPPSS NO.

REVIEWER:

RESPOND BY:

P-601 - The Square Root Extractor provides no operator information. (B324)

RESPONSE: *The Square Root Extractor will remain unless:*

- 1. The space is needed by an active device which requires operator manipulation.*
- 2. The need for the Square Root Extractor is eliminated.*

The location of the Square Root Extractor does not impede the operator or create a condition. This is not a congested area of the panel and contrast is minimum, such as not to cause operator distraction. No change is required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-1.23

WPPSS NO.

REVIEWER:

RESPOND BY:

P-001, P-100 - No procedures, nor facilities for storing procedures, are available at the RSP. (B608)

RESPONSE: A desk will be located across from the Remote Shutdown panels. The desk will store spare parts, communications equipment, and procedures required at the RSP. These will be installed prior to fuel load.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-1.24

WPPSS NO.

REVIEWER:

RESPOND BY:

P-830 - Some controls and mimics on P-830 and controls on P-831 are below the anthropometric height limits. (B504)

RESPONSE: Panel P830 does not exist at WNP-2. It is assumed that Panel P832 was the panel of concern rather than P830. Controls below height guidelines for P831 and P832 are responded to in NRC Audit Finding E-8.28.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-1.25

WPPSS NO.

REVIEWER:

RESPOND BY:

P-840 - The push-button status lights on the vertical panel are located too high (e.g., about 70-72 inches above floor level and 41" up on vertical board). (8113)

RESPONSE: These are nonprocess controls that function primarily as safety system subannunciator status panels. An annunciator alarm will focus the operator's attention to the specific status light panel. The operator will respond to the annunciator by use of the normal response controls at the panel edge. The status light will continue to flash until it is manually depressed by the operator. Once depressed, the light goes solid on. This is only an acknowledge response and the operators need not respond until time permits. Due to their height, a review was performed of all controls in the area for potential inadvertent operation. No switches or controllers exist which could be easily inadvertently operated (no J-handled controls, pushbuttons, or controllers). No changes are required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-1.26

WPPSS NO.

REVIEWER:

RESPOND BY:

All main panels - The top row of annunciator panels are 85" from floor and are vertical; not tilted forward to provide better visibility. (8301)

RESPONSE: NUREG-0700 guidelines for display height and orientation states the following:

- (a) All displays, including annunciator tiles, should be mounted so that they are within the upper limit of the visual field (75° above the horizontal line of sight) of the 5th percentile female.
- (b) In addition, all displays and annunciators should be mounted so that the angle from the line of sight to the face plane is 45° or greater. The 5th percentile female determines the upper limit. The 95th percentile male determines the lower limit.

Calculations on the annunciator panels in the primary area show that the visual field above the horizontal line of sight is about 44° and the angle from the line of sight to the face plane is 45.9° based on the 5th percentile female to the top of upper most alarm tile. This is less than the 75° limit and greater than the 45° limit noted above. Present vertical annunciator panel orientation and height meets the required guidelines. No action is required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-1.27

WPPSS NO.

REVIEWER:

RESPOND BY:

P-840, P-820, P-632, P-827, P-811, P-602 - Parallax is a problem. Problems are found on all meters located in the lowest position on the vertical boards of P-840 and P-820. Problems exist on P-632 because of an indicator that is too high (about 72" above floor). On P-827 and P-811 heater coil meters have problems because they are mounted too low (about 31" above floor). On P-602 RWCU is too far up on benchboard and RECIRC system is too low on vertical board. (B125)

RESPONSE: A review was performed on the meters in question. P820/P840 meter design is such that the pointers are located at the right hand edge of the scales directly in line with the edge of the scale face. There is no raised distance between the pointer and scale face. With this design, there is essentially no apparent displacement as seen from two different heights. Panel P632 is not considered an operating panel and has only one miniture meter monitoring floor sump leakage flow of 0-6 gpm. Alarm annunciators monitor for excess leakage. Operators would not normally use this panel or meter. The meter does not have the full curvature of the larger meters making the upper scale range readily readable and precision readouts are not required. Parallax is not a problem on P632. The meters on P811 and P827 are used as backup indication and for testing the heater circuits. The heater switches have circuit "on" lamps to identify energization. Precise readings are not required as values change depending on heater status and air flow parameters. Parallax is not a problem as these conform to the meter design noted above. No changes are required. Also see NRC Finding E-5.59 response.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-1.28

WPPSS NO.

REVIEWER:

RESPOND BY:

P-603 - There is glare and parallax on the RFW controllers, Feedwater Level Turbine Control and Feedwater Turbine A and B Flow Control from a normal standing position. The operator must bend over to avoid the problem. (8127)

RESPONSE: The controllers are normally not operated from a standing position. The controllers are located on the rear half of the horizontal section of the benchboard. From this location, an operator must lean into the controllers to adjust them. By leaning into the controllers, glare and parallax are minimal or nonexistent. The controllers are located in a noncongested area of the panel. Hand room is available if the operator wants support while adjusting the controllers, and there are no adjacent controls that can be easily inadvertently operated or whose operation would affect the plant. Also, the operators use the RPV level and feedwater flow indicators on the vertical section of P603 to monitor setpoint changes and plant performance. No glare or parallax exist on these indicators. No changes are required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-1.29

WPPSS NO.

REVIEWER:

RESPOND BY:

P-602, P-603 - Controls requiring continuous actuation are too low; operating position is very uncomfortable. These are the continuous insert and withdrawal rod controls on P-603 and the recirculation loop A and B flow controls on P-602. (8223)

RESPONSE: During reactor startup, two operators are seated at the rod control console. The rods are withdrawn to full power rod configuration from a seated position in front of P603. Minor rod adjustments subsequent to that are up to the operator to stand or sit. The recirculation flow controls have pushbutton raise/lower switches for ease of extended reach. During specific stages of rod pull, recirculation flow will be adjusted by the same two operators noted above, either from the master controller on P603 or from the two individual flow controllers on P602. Valve opening times are about 10% power per second. This only momentary activations is required, not continuous. Most manipulations will be from a seated position. Subsequent adjustments will be minor. No changes are required.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-1.30

WPPSS NO.

REVIEWER:

RESPOND BY:

P-001 - Glare on meters makes reading difficult. (8604)

RESPONSE: NRC Audit Report item F-1.36 responds to Supply System Finding 10.3.2, Glare on P-001 Meters. Diffusers will be installed on the overhead lamps to reduce the glare on the upper row of meters. Pending availability and procurement, diffusers will be installed prior to commercial operations. Glare will be re-evaluated after diffuser installation.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-2:2

WPPSS NO.

REVIEWER:

RESPOND BY:

SRO Desk - Communications to kitchen and restroom are inadequate. The telephone currently provided in the kitchen is not sufficient. (8129)

RESPONSE: An audio and/or visual device activated from the SRO desk, either by a simple pushbutton or switch, will be installed in the kitchen and restroom areas prior to commercial operation.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-3.55

WPPSS NO.

REVIEWER:

RESPOND BY:

FP-1, FP-2, FP-3 - Annunciator tiles are not laid out in a consistent manner, principally between these three boards. There are also some inconsistent layouts within panels. (8120)

RESPONSE: *The fire control annunciator panels alarm are arranged by subsystem; namely:*

- . Standard (FP-1) The Standard alarms are fire alarms which monitor areas which are not specifically protected by a suppression system.*
- . Functional (FP-2) The Functional alarms are fire alarms which monitor areas which are specifically protected by a suppression system.*
- . Supervisory (FP-3) The Supervisory alarms monitor the overall suppression systems and equipment status.*

Each annunciator panel is laid out with respect to building area. No changes are required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-3.56

WPPSS NO.

REVIEWER:

RESPOND BY:

P-603 - Annunciator tiles appear to have no logical organization within each panel and system/subsystem groups are not always grouped together (e.g., CRD system on P-603). (8329)

RESPONSE: Panel P603 annunciator panels were rearranged to group annunciator alarms by system. All RPS-A alarms are located to the left of alarm panel A7 and RPS-B alarms to the left of alarm panel A8. The neutron monitoring system alarms are located in the center of both panels, panel A7 containing the SRM and IRM alarms, and panel A8 containing the LPRM, RBM, and APRM alarms. The right side of each alarm panel is arranged by support systems; A7 has the CRD and SLC division 1 alarms, each separately grouped; A8 has the RFW and SLC division 2 alarms, each separately grouped. Both the SLC divisional groups are located to the far right for consistency.

The alarms for SLC Divisions 1 and 2 are all different; therefore, layout consistency is meaningless, except that they are all grouped to the right of the panels.

The RPS-A and B arrangements are identical to the extent possible. The 17 relatable alarms in each panel are located in similar positions on each panel. All other RPS alarms are sufficiently different that similar arrangement is unnecessary.

No further action required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-3.57

WPPSS NO.

REVIEWER:

RESPOND BY:

P-840, P-820, P-800 - Split screen tiles result in 70 tiles on 8 panels and 60 tiles on 5 panels. (8302)

RESPONSE: A review of each alarm panel on P840, P820, and P800 shows only seven alarm panels that actually have more than 50 alarms total. Each panel was reviewed for the following areas:

1. Grouping of alarms by system/function
2. Wording clarity, consistency, accuracy
3. Readability from a distance
4. Prioritization visibility

Modifications have been made over the last two years to improve the operator's ability to clearly identify and respond to the alarms. These changes have significantly reduced the effect of the large number of alarms in these panels to an acceptable level. Alarms have been well grouped by system or function within each alarm panel; the character heights have been improved from 0.187" to 0.218" and their height-to-width ratios have been brought into conformance with NUREG-0700 requirements; alarm window wording has been revised for clarity, consistency, and abbreviations, and in many cases shortened to reduce congestion; a divider bar has been engraved to provide separation contrast between upper and lower window halves on all alarm windows; and a review of each alarm window based on the WNP-2 annunciator color code prioritization standard indicated that only nine alarms are of high priority (red). These have been color coded and are all located on the top row of each panel where their importance is readily discernable.

With the significant improvements noted above, with the dark board concept employed and that these panels do not monitor NSSS system, the deviation from NUREG-0700 guidelines is considered minimal. The panels are acceptable. No changes are required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-3.58

WPPSS NO.

REVIEWER:

RESPOND BY:

P-603 - Nomenclature for Control Rod Drive System on annunciators is inconsistent: CRD System, Control Rod Drive System, Rod Drive Control System. (8330)

RESPONSE: The above nomenclature was based on the original annunciator window wording. A new set of windows have been installed. A review of the CRD terminology usage on the new windows indicates the following:

- CRD is only used where reference is made to an alarm affecting the overall system; i.e., CRD Pump A Suction Press Low. CRD is consistently abbreviated and not spelled out.
- ROD is only used where specific attention needs to be drawn to that part of the CRD system only.

Of the items noted in D-3.58:

- CRD system now reads consistently CRD.
- Control Rod Drive System is not spelled out anywhere.
- Rod Drive Control System Inop is valid to emphasize the Rod component.

No further action required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-3.59

WPPSS NO.

REVIEWER:

RESPOND BY:

On all panels - The abbreviation list (combined Standard and Limited Use) has some dual and triple meanings. It is poor HF practice to have separate "limited use" abbreviations which may duplicate "standard" abbreviations. This requires a memory process which gets very little practice and is therefore prone to error. Abbreviations are not used consistently throughout all control room applications (e.g., annunciators, computer printer, procedures, labels, meter faces, etc.). (8303)

RESPONSE: One master abbreviation list will be administratively controlled by use of a plant "Technical Directive."

A review of the limited use abbreviation section indicates that 20 of the 37 abbreviated words have no counterpart listed in the standard listing. These will be incorporated into the standard listing. Seven limited use abbreviations are not duplicates of any existing abbreviation in the standard listing and are similar to the existing abbreviations; i.e., sync vs synch for synchronizing. These seven limited deviations do not reduce readability or add to the operator's memory requirements. The minimum benefit derived does not warrant the cost of special procurement lenses and drawing changes. These will be deleted from the list to prevent further propagation. The use of 5 abbreviations will be deleted by commercial operation; the abbreviations "DN, BY, UP" have been deleted from P608; the abbreviation "SW" will be spelled out in P634; and the abbreviation "TRANSF" on P842 will be corrected.

The remaining limited use abbreviations are:

- . TRANS (transfer) varies considerably from (XFR).
- . LO (low) is a duplicate of lockout (LO).
- . COMP (computer) is a duplicate of compressor (COMP).
- . CONT (control) is a duplicate of containment (CONT).
- . OPN (operate) is a duplicate of open (OPN).

These are special order lenses. Procurement will be initiated and new lenses installed based on availability of lenses. The existing locations are such that no duplicate abbreviations presently exist, and their functional use is readily recognizable by the operator. Thus, temporary labels are not required.

Since the June NRC Audit, all annunciator windows have been replaced, and new label plates are being installed on all operating panels. These are consistent with the revised abbreviation standard. All meter faces are presently consistent. Procedures are being updated on a continual basis. Where procedures have nonstandard abbreviations, they will be brought into agreement during their routine review cycle. As is; most procedures are in conformance. Computer programs will be reviewed and brought into conformance to the extent practical by the first refueling outage.

Cont'd next page.....

With the above corrections, only four dual use abbreviations are defined in the standard abbreviation listing. These are permitted due to their readily recognizable use by the operator and physical separation between devices requiring their use; i.e., "SW" for service water and southwest. Southwest is only used on the meteorological back vertical panel which is not located near service water controls. Each of these abbreviations have attached notes in the abbreviation standard that specify the abbreviation is not to be used near its counterpart.

The standard will be revised in accordance to the above prior to commercial operation.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-3.60

WPPSS NO.

REVIEWER:

RESPOND BY:

P-840 - Annunciators at the left-hand side of the panel cannot be read from the annunciator control station at the right-hand side of panel. (8106)

RESPONSE: See Supply System response to NRC Finding E-3.70. A redundant set of response controls will be installed on the left side of the panel at the first refueling outage.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-3.61

WPPSS NO.

REVIEWER:

RESPOND BY:

P-840 - It is too far from annunciator controls to all annunciator panels--operators express concern that an unidentified alarm can be acknowledged in the process of acknowledging another alarm on this panel. Operators also want capability to silence without acknowledging an alarm. (B107)

RESPONSE: See NRC Finding D-3.60 for annunciator response control location resolution. The resolution as to a separate silence control is addressed in Supply System response to NRC Finding E-3.70.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-3.62

WPPSS NO.

REVIEWER:

RESPOND BY:

On all annunciator panels - Character height will be: .187,
.215, .250 inches. (B304)

RESPONSE: The above NRC Finding does not specify a concern. However, all panels have been upgraded to the new character heights specified above. Single windows (NSSS panels) use 0.250 inch. BOP benchboards use 0.215 inch. Vertical panels use 0.187 inch.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-3.63

WPPSS NO.

REVIEWER:

RESPOND BY:

P-820 - Some annunciator controls are out of easy reach. Only one properly placed annunciator control would be adequate for all of panel 820. (8118)

RESPONSE: The response controls will be moved to the center of the board and will be completed by the end of the 1st Fuel Outage. Also, see Supply System response to NRC Finding E-3.70.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-3.64

WPPSS NO.

REVIEWER:

RESPOND BY:

On all panels - Annunciator procedures are not currently consistent with annunciator tiles. Tiles have been updated, procedures have not. Procedures are indexed by panel ID but the panel does not currently display IDs. (8306)

RESPONSE: Annunciator procedures will be revised prior to fuel load per Supply System response to NRC Finding F-3.72. Panel label plates have been ordered and will be installed by fuel load. Panel ID nomenclature will be consistent between the panel labels and procedures.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-4.19

WPPSS NO.

REVIEWER:

RESPOND BY:

Process computer printer keyboards are not used (except for the linefeed key which can be used to space up paper to read last line printed). (8207) Also see Finding 7.11. (8-206)

RESPONSE: All printers have keyboards to afford capability of swapping devices upon failure of I/O devices.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-4.20

WPPSS NO.

REVIEWER:

RESPOND BY:

P-840 - Unneeded controllers are present (e.g., RHR heat exchanger A and B cooling water pressure). (B213)

RESPONSE: RHR A Heat Exchanger pressure controller on P840 and RHR B Heat Exchanger pressure controller on P820 and legend plates have also been deleted. Action has been completed.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-4.21

WPPSS NO.

REVIEWER:

RESPOND BY:

P-820 - Valves marked CLOSE-NORM-OPEN are of two different kinds - some are spring return to center (e.g., MAIN STM 24 INCH HDR ISOLATION VALVE) while some appear to be in AUTO in the NORM position (e.g., EXHAUST HOOD A SPRAY WTG BYPASS COND). (8116)

RESPONSE: On P820, all switches which have escutcheons marked "close-norm-open" or "close-auto-open" are physically the same switch. The difference between the two applications is whether the contact 5/6 (contact is closed in the norm or auto position) is being used. Those applications using the contact have the "auto" escutcheon; whereas, those not using it have the "norm" escutcheon. A review of P820 indicates that all switch escutcheons using "auto" or "norm" are correctly labeled. No changes are required.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-4.25

WPPSS NO.

REVIEWER:

RESPOND BY:

P-603 - Different color buttons are used for IRM range controls-2 red knobs (upper), 2 black knobs (lower). (B401) .

RESPONSE: Use of IRM range controls during startup requires particular attention by the operator. The system has been designed by the Nuclear Steam Supplier to enhance the operator's ability to properly select the correct control and monitor its response on recorders. The red knobs relate to the red pens on the IRM recorders, and the black knob to the black recorder pens. No changes are required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-4.26

WPPSS NO.

REVIEWER:

RESPOND BY:

P-832 - It is possible to close both the "open" and "close" push buttons on this type of throttle valve on P-832. (Control Drawing reference WO-2808, E-519) (8507)

RESPONSE: The switch concerned is a maintained contact type which is mechanically released when the "off" button is depressed. The following sequence of events take place if both the "open" and "closed" buttons are depressed simultaneously:

Valve fully closed:

- Valve will travel open if the "open" contact made up first with respect to the close contact.
- Valve won't do anything if the "close" contact closes first.

Valve fully open:

- Valve will travel close if the "close" contact closes first.
- Valve won't do anything if the "open" contact closes first.

Valve in between full open or full close:

- Valve will travel to the position called for by the first contact to close. Operator will know the ultimate position by observing the indicating lights. If the valve traveled to the opposite position than desired, then he would make necessary corrections by depressing the correct button.

No adverse condition exists due to this condition. No further action required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-5.32

WPPSS NO.

REVIEWER:

RESPOND BY:

P-601 - Heat Exchanger Vent valve controls do not have indicators to tell if valves are open or closed. Operators feel they are needed. (8312)

RESPONSE: *Position indicating lamps are not required. Valves are equipped with analog position meter indications located directly above the valve controls.*

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-5.33

WPPSS NO.

REVIEWER:

RESPOND BY:

P-602 - Flow Controllers, Flux Controllers, and Master
Controller deviation meters do not have (+) and (-) indications
shown on scale. (8327)

RESPONSE: Plus and minus indications are not appropriate for these meters.
More appropriate terms would be "open" and "close" signal deviation.
Appropriate termed decals will be installed on the deviation meter covers
or adjacent to the meters prior to fuel load.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-5.34

WPPSS NO.

REVIEWER:

RESPOND BY:

P-601 - There are two sets of seven red indicator lights with no apparent function. (8316)

RESPONSE:- The two sets of lights monitor the status of ADS systems 1 and 2. When an initiation signal is originated, either by automatic circuitry or manual initiation, the seven lights indicate that each of the seven ADS valve circuits have been energized. Demarcation lines have been applied around the two ADS system control groups, including their respective grouping of seven lights. The ADS lights have labels installed identifying each light to its respective ADV valve circuit. No further changes are required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-5.35

WPPSS NO.

REVIEWER:

RESPOND BY:

P-001 - The Square Root Extractor on the front panel is not needed by the operator. (8601)

RESPONSE: The Square Root Extractor will be moved if the flow loop is eliminated or additional space is needed on the panel. The location of the Square Root Extractor does not impede the operator or create a condition; whereas, operator error may result due to its location. No action required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-5.36

WPPSS NO.

REVIEWER:

RESPOND BY:

P-840 - Numbers on the controller (0-100) have no units (e.g., % open). Operators "think" that 0 is closed, 100 is open. (8105)

RESPONSE: Controller COND-RMC-32B will have a tag attached prior to fuel load stating:

% OPEN
COND-V-32B

The term "% OPEN" and valve identification will provide the operator.. adequate information. No further action is required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-5.37

WPPSS NO.

REVIEWER:

RESPOND BY:

P-840 - A temporary label indicates this is a valve position controller. The scale (0-100) is unmarked, and the thumbwheel is not labeled raise/lower, increase/decrease, open/close, etc. (8112)

RESPONSE: A permanent label will be attached prior to fuel load: Controller COND-RMC-32B as noted in NRC Finding D-5.36. This will resolve the 0-100% scale concern and identify it as valve position controller more accurately. The addition of a thumbwheel rotation marker is not required as all controller thumbwheels in the control room conform to NUREG-0700 guidelines. To raise the set-point (open valve), the direction of rotation is a forward hand movement.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-5.38

WPPSS NO.

REVIEWER:

RESPOND BY:

There are many meters with non-recommended major scale divisions, such as:

0-30, 60, 90, 120

0-40, 80, 120, 160

0-25, 50, 75, 100, 125 (8511)

RESPONSE: All scales will be brought into conformance with NUREG-0700 guidelines by the first refueling outage.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-5.39

WPPSS NO.

REVIEWER:

RESPOND BY:

There are many meters with non-recommended minor unmarked scale subdivisions, such as:

12.5, 2.5

0.5 minor marks when major marks are 0, 1.5, 3.0, and 4.5
(B512)

RESPONSE: All meter scales will be brought into conformance with NUREG-0700 guidelines by the first refueling outage.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-5.40

WPPSS NO.

REVIEWER:

RESPOND BY:

P-601 - The meter scale on the Fuel Zone Monitor indicator is labeled in increments of 40 inches. (8313)

RESPONSE: The meter is labeled with major increments of 40 inches and seven minors per major increment. A new scale will be installed both on the fuel zone indicator MS-LT-610 and recorder MS-LR-615 for consistency. Majors will be in 50-inch multiples with 4 minors between majors. New scales will be installed prior to commercial operation.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-5.41

WPPSS NO. .

REVIEWER:

RESPOND BY:

P-602 - Recirc. Pump Recorders use red and black pens
inconsistently:

Temp - Red	Pump A
- Black	Pump B
Flow - Red	Loop B
- Black	Pump A. (8326)

RESPONSE: This has been corrected. Loop A parameters are both red and loop B parameters are both black. The recorder pen color/description plate has been corrected to reflect the change. Action has been completed.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-5.42

WPPSS NO.

REVIEWER:

RESPOND BY:

All panels - Normal/abnormal operating ranges are not available on indicators, and ranges that are installed are temporary.
(B128)

RESPONSE: See Supply System response to NRC Finding E-5.62.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-5.43

WPPSS NO.

REVIEWER:

RESPOND BY:

P-602 - Inconsistent indicator type and color coding exists for Flow Control Valve motion inhibit interlock indicator lights - A is amber, B is white "Sealed In". Other "Sealed In" lights are amber. (B325)

RESPONSE: P602 panel was reviewed against design requirements. All seal-in lights are to be amber. The white "B" seal-in light has been changed to amber. A walkdown was performed on all lamps to ensure wording and color conform to design requirements. No other exceptions were found. Action complete.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-5.44

WPPSS NO.

REVIEWER:

RESPOND BY:

P-820 - There is no difference between push button/non-push button status lights (e.g., SW system push button status lights, non-push button status lights on condenser vacuum control benchboard.) (B117)

RESPONSE: Special indication for pushbuttons vs nonpushbuttons is not required as these controls are operated only by persons fully qualified and knowledgeable in the operation of the affected systems. Also, see Supply System response to NRC Finding F-4.35.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-5.45

WPPSS NO.

REVIEWER:

RESPOND BY:

P-851 - This panel is incomplete; status panels are not identified.

Confusion exists as to what is monitored. Panel labels suggest that only instrument lines are monitored, but operators believe that this panel will monitor all containment penetrations.
(8119)

RESPONSE: These matrix status lights monitor instrument line excess flow check valve position. Individual engraved lenses have now been installed and conform to NUREG-0700 engraving requirements. The three status light matrix panels will have new panel labels prior to fuel load specifying:

DIV 1 (2 or 3)
INSTRUMENT LINES
ISOLATION STATUS

No confusion should exist prior to fuel load with the new panel labels and existing lense engravings. No further action required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-5.46

WPPSS NO.

REVIEWER:

RESPOND BY:

P-603 - There is no way to tell push buttons vs. indicator lights on Rod Worth Minimizer and Rod Monitor control subpanels. (8328)

RESPONSE: See Supply System response to NRC Finding F-4.35.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-5.47

WPPSS NO.

REVIEWER:

RESPOND BY:

P-672 - Two dissimilar scales on recorder OG-FR620 are log scales, and the paper does not match either scale. (8121)

RESPONSE: *New change paper has been ordered and will be installed upon delivery.*

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-5.48

WPPSS NO.

REVIEWER:

RESPOND BY:

P-672 and other back panels have unlabeled recorders, dual pen recorders with pens not identified, and recorder paper not matching recorder scales. (8122)

RESPONSE: The new labeling scheme requires both the recorder device number and description on a label plate for each recorder. Also, all single, dual, and three-pen recorders will have descriptive plates in the lower window area to define pen parameters, color, and units of measurement. All labels have been ordered. All permanent labels should be installed by fuel load. Temporary labels will be installed at fuel load for those recorders whose permanent labels have not yet been delivered. Chart paper to match recorder scales for all recorders has been ordered and will be installed upon delivery.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-5.49

WPPSS NO.

REVIEWER:

RESPOND BY:

P-820 - The Generator Monitor Temp recorder (GEN TR-144) has two scales: 0-300 T/TC and 0-300 RTD. Each has 50, 100, 150, 200, 250 subdivisions. One is non-linear and does not match the other. Paper is printed to match only one. (B508)

RESPONSE: Chart paper has been ordered to match the dual existing scales and will be installed upon delivery.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-5.50

WPPSS NO.

REVIEWER:

RESPOND BY:

There are many recorders which do not have units printed on the recorder scales, such as: RPV Monitor recorders A and B; Recirc. Pump Suction Temp and Flow. (B513)

RESPONSE: A review was completed of all recorders in the control room (none exist in the remote shutdown room). All multipoint recorders have units printed directly on their scale; all one, two, and three-pen recorders have units printed on their pen color/description labels except recorder MS-LR-615. A new per color/description label will be ordered and installed on this recorder prior to fuel load. Applying units to the labels on the smaller recorders provides for improved visibility and puts all the recorder variables in one place. No further action is required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-6.87

WPPSS NO.

REVIEWER:

RESPOND BY:

P-821 - There are labels missing and incorrect on both A and B MS line pressure, MSIV leakage, and line heater temperature.
(B219)

RESPONSE: New labels have been ordered for P821 and will be installed prior to fuel load.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-6.88

WPPSS NO.

REVIEWER:

RESPOND BY:

P-601 - There are two sets of four unlabeled recorders. (8315)

RESPONSE: These recorders were in the process of being installed during the NRC Audit Review. Recorders CMS-PR-2,8,7,1

CMS-LR-4,3

CMS LR/PR-4A,3A

now have labels installed.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-6.89

WPPSS NO.

REVIEWER:

RESPOND BY:

There are many unlabeled panels of Out of Service status indicators with labeled tiles. Letter size is 1/16 x 1/8", readable at up to 4' to 5'. Stroke width is less than 1/32". These are located on main board and back panels. (None are found on panels on P-602, P-825, P-831, P-832, and P-812). (8-516)

RESPONSE: Out of service status indications are designed for monitoring safety systems only. Labels have been attached to each status matrix to identify the functions of the box and the related safety system. Each status box is located above its respective system. A sample label is:

RHR B
BYPASS AND INOPERABLE
STATUS DISPLAY

All labels are consistent in format and wording.

Even though the stroke width of the engraved windows in each status box is less than what the NUREG-0700 guidelines identify, readability is still good. These status displays are for closeup monitoring only. For distance and attention, each panel has an annunciator alarm to alert the operator when a status panel is tripped. The operator then goes to the status panel for identifying the specific trip input. No action is required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-6.90

WPPSS NO.

REVIEWER:

RESPOND BY:

P-001 - There are missing, extraneous and temporary labels and mimics on RSP. (8603)

RESPONSE: New labels have been ordered and will be installed prior to fuel load. Temporary labels will be removed upon installation of the above permanent labels. Mimics on RSP are temporary tape mockups. Permanent mimic lines will be installed prior to fuel load.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-6.91

WPPSS NO.

REVIEWER:

RESPOND BY:

P-100 - The Spray Pond B level indicator has two unidentified elevation markings on the face. (8606)

RESPONSE: The two elevation markings represent the elevation at which the spray pond will overflow and the elevation of the spray pond floor (which is above the pump pit bottom). These have been applied as additional operator aids to monitor spray pond status and to help cross-correlate water supply availability with the circulating water pump and basin. All spray pond level indicators (A and B) in the control room and remote shutdown room are marked similarly. No changes are required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-6.92

WPPSS NO.

REVIEWER:

RESPOND BY:

P-832 - There are large matrices of switches which do not have an alphanumeric location identification system. (8801)

RESPONSE: Panel P832 contains two matrices of switches containing 16 and 18 switches. These switches monitor miscellaneous steam trap station levels and their respective bypass valve positions throughout the plant. Each label is specific in identifying the control by trap station number, then valve number.

STATION 2
MS-V-120B

A hierarchy label plate identifies each matrix group as "TRAP STATION BYPASS VALVES."

Normally, all valves are closed. When a high level trap station alarm is received, a backlighted section on the specific switch lights. The section is red and is engraved "HIGH LEVEL." The operator only needs to scan for the red trip light to select the proper bypass valve. There is no operational sequencing or procedures which requires selective manipulation of the controls. A coordinate identification system is not warranted as station identification numbers and trip lights provide adequate selection and directivity.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-6.93

WPPSS NO.

REVIEWER:

RESPOND BY:

P-820 - MS bypass valves A, B, C, and D and STR Blowdown valve
need a system label. (8215)

RESPONSE: A hierarchy label has been installed above the bypass strainer blowdown
valve controls. The label reads:

TURBINE BYPASS LINE
STRAINER BLOWDOWNS

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-6.94

WPPSS NO.

REVIEWER:

RESPOND BY:

P-601 - The ADS System label is in the wrong location. (8318)

RESPONSE: New labels have been installed on panel P601 since the June NRC Audit. A visual check verified that the new hierarchy labels for ADS systems 1 and 2 are located in their appropriate location. No further action required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-6.95

WPPSS NO.

REVIEWER:

RESPOND BY:

P-601 - The label on the HPCS Pump indicator says Pressure/Flow while meters are oriented Flow/Pressure. (8308)

RESPONSE: A new label has been installed and now reads the correct sequence.

FLOW	PRESSURE
HPCS-P-1	

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-6.96

WPPSS NO.

REVIEWER:

RESPOND BY:

P-821 - Meters of the Main Steam Leakage Control system are mislabeled. (8124)

RESPONSE: See Audit Finding Report item D-6.87 for Supply System response.
New labels will be installed prior to fuel load.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-6.97

WPPSS NO.

REVIEWER:

RESPOND BY:

The description of function 11 on process computer operation matrix is incorrect. Says: EDIT CORE ANALYSIS LOG. Should describe: [Fuel] "Preconditioning Interim Operating Management Recommendations". (B202)

RESPONSE: Immediate changeout of the function 11 label is not required as operators do not use this program. The program is used by the plant technical staff with specific procedures. The label will be upgraded by the first refueling outage as this is a special procurement item. The whole labeling matrix will need to be re-engraved to correct the function 11 description.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-6.98

WPPSS NO.

REVIEWER:

RESPOND BY:

P-601 - The ADS Manual Initiation Switch Armed annunciators do not identify divisions I and II. (8321)

RESPONSE: Division nomenclature is divisions 1 and 2. ADS Manual Initiation Switch Armed Annunciators are located over their associated switches. These are on two separate alarm panels located approximately six feet apart. Each is grouped with its respective divisional alarms and with the RG 1.47 out-of-service status lights for ADS 1 and 2. These are well labeled as Divisions 1 and 2. The prospect of confusing the ADS alarms for each other is considered negligible due to their physical separation and associated alarms and displays. No action is required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-6.99

WPPSS NO.

REVIEWER:

RESPOND BY:

P-601 - RHR System I Actuated annunciator should be RHR Division I Actuated; the same HED applies to RHR Division II. (8323)

RESPONSE: The annunciator alarms noted above, A2.1-C and A4.1-2, have been reworded to be more definitive to the operator. New wording reads:

LPCI B/C
ACTUATED

and

LPCI A
ACTUATED

(old Div. 2)

(old Div. 1)

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-6.100

WPPSS NO.

REVIEWER:

RESPOND BY:

P-601 - Labelling on the Local/Remote Mode switch is unclear:
Local means panel in diesel generator room. Remote means
control room. (8307)

*RESPONSE: Panel switches on P601 (1 switch), P800 (2 switches), P811
(1 switch), and P827 (1 switch) use the terms remote/local on their
escutcheons. Temporary labels specifying control room will be applied.
Permanent escutcheon will be installed by the first refueling outage.*

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-6.101

WPPSS NO.

REVIEWER:

RESPOND BY:

P-601 - The Isolation Control label does not identify what isolation is being reset. Poor labeling. (8320)

RESPONSE: New Reset pushbutton labels have been installed which read "Isolation Logic A and B" and "Isolation Logic C and D" instead of simply "Isolation." This wording corresponds to the four isolation trip switches; i.e., "Manual Isolation Logic A (B, C or D)." The label term "Manual" will be changed to "MSIV" by use of temporary labels prior to fuel load. Permanent labels will be installed on the trip switches prior to commercial operation.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-6.102

WPPSS NO.

REVIEWER:

RESPOND BY:

P-001 - The RPV level meter has an incorrect label. (8607)

RESPONSE: A new label has been installed which reads "RPV LEVEL" rather than the original "NUC BCR LEVEL." The new label is consistent in terminology with its respective label in the control room.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-6.103

WPPSS NO.

REVIEWER:

RESPOND BY:

P-840 - Label is misspelled.--"Grand" should be "Gland." (B111)

RESPONSE: A new label has been installed to correct the above misspelling.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-6.104

WPPSS NO.

REVIEWER:

RESPOND BY:

P-820, P-840 - Component labels for the Containment Instrument
Air systems A and B are not identical. (8114)

RESPONSE: *New labels have been installed on all components. Wording and
description layouts are now identical.*

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-6.105

WPPSS NO.

REVIEWER:

RESPOND BY:

P-603 - The position letters on the joy stick labels are not placed consistently. (B402)

RESPONSE: The sequence of positions is not unique to the WNP-2 plant. The same sequence and type of switch are found on a number of GE-BWR plants. This is a nuclear steam supplier design; therefore, this change if made should be a generic change by the supplier. A letter from the Supply System to GE has been processed requesting GE to investigate this issue. Resolution, if required, and schedule for correction will be noted in the Supply System's final report.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-8.36

WPPSS NO.

REVIEWER:

RESPOND BY:

P-601 - There is an inconsistent left/right, top/bottom arrangement. RHR-C is on the left, RHR-B is on the right. RHR pump overload, annunciators are reversed with B left and C right. RHR pump trip, annunciators have B on top and C on bottom. RHR system label says RHR B/C System, but C group is on the left and B group is on the right. (B309)

RESPONSE: A new nameplate (RHR C/B SYSTEM) is being ordered and will be installed upon receipt. The RHR annunciator drops will not be changed per rationale given in E-3.67. The arrangement of RHR-C, B and A systems must be reviewed as a whole. Electrical divisional separation design requirements places RHR-A on the right side of P601 and RHR-B and C to the left side of P601. The present arrangement of RHR-C, B, A is a reverse sequence, but better than mixed as B, C, A. RHR-C and RHR-B have been individually demarcated and subhierarchy labels applied to separate the two systems. The hierarchy label will be changed prior to fuel load from RHR-B/C to read RHR-C/B, consistent with the control and display layout arrangement. Rearrangement of the annunciator alarms would not improve operator response to any meaningful existent. The two alarms are located adjacent to each other, are descriptively well labeled as either RHR-B or C, and are not presently intermixed with other RHR-B or C alarms. The operator is trained to respond to and read an illuminated alarm. The exact placement of the alarm in this illuminated state is irrespective of his response. Swapping of the two annunciator alarms is not required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-8.37

WPPSS NO.

REVIEWER:

RESPOND BY:

P-820 - In the proposed arrangement of annunciator board B1, RCC water annunciators for System A are above those for B and spray pond A annunciators are to the left of those for B, which is inconsistent. (B221)

RESPONSE: Two separate systems are referred to in the above NRC comment. The RCC alarms are all one system with subcomponents (a, b, c). These are all located in the first vertical column of alarm panel B1. The Service Water (SW) alarms all belong to one system, SW-B system. The SW-B alarms are all located in the second and third vertical columns of alarm Panel B1. Plant design requirements specify redundant monitoring of both spray ponds (A and B), division 1 alarms for SW-A system on Panel P840 and division 2 alarms for SW-B system on Panel P820. The annunciator alarm arrangement for the two service water systems are identical. As is, alarm Panel B1 provides excellent alarm grouping by system and is identical in arrangement to alarm Panel A5 or P840 for SW-A alarms. The arrangement is consistent. Relignment of either of the two systems is not required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-8.38

WPPSS NO.

REVIEWER:

RESPOND BY:

P-840 - The lower level on vertical meters for System A is not identical with RFW system B meters. The System A meters should be identical with the System B meters. (8108)

RESPONSE: A project design change has been initiated to regroup the meters into two grouping of three and five meters, respectively, for each system. The three meters will contain turbine steam parameters, the five meters will contain turbine oil system parameters. In addition, the five-meter grouping was divided into two subgrouped, turbine oil and oil filter parameters, by group labeling techniques. The rearrangement and new legend plates will be completed and installed before commercial operation.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-8.39

WPPSS NO.

REVIEWER:

RESPOND BY:

P-603 - There is mirror imaging of SRM and IRM detector position. (B405)

RESPONSE: The SRM and IRM detector position control is used during reactor startup and at shutdown. Above about 5% power, all detectors are "out" and the power is turned off to the positioner controls. The positioner panel is functionally used from top-to-bottom, not side-to-side. During startup, the four SRMs (top four controls) are first withdrawn, then followed by the IRMs. These can be withdrawn individually or as a block dependent on the operators discretion. Normally, the SRMs will be withdrawn as a block. The left-to-right mirror image has little affect on the functional use of these controls. Also, the center two rows are status lights only and will not initiate or defeat any action if inadvertently depressed. No action is required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-8.40

WPPSS NO.

REVIEWER:

RESPOND BY:

P-811, P-827 - There are sets of 6 meters in a row without space or demarcation. (8501)

RESPONSE: These meters monitor specific parameters of the SGT filter units: filter Unit A on Panel P827 and filter Unit B on P811. Each set of six meters monitor a specific parameter within the same filter unit. The meters have been rearranged to place them in sequence from filter unit inlet to filter unit outlet to improve the operator's recognition of the filter units design and layout. The legend plates were grouped to provide visibility as to relationship between displays and to form four subgroups by combining several similar plates into one.

Keeping the meters grouped facilitates the operator's ability to review the filter as a whole unit and to recognize potential problems within the unit. With subgrouping created by use of combining label plates, no further change is warranted.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-8.41

WPPSS NO.

REVIEWER:

RESPOND BY:

P-811, P-827 - There are sets of 7 Bailey controllers in a row without space or demarcation. (These will be re-arranged when H₂ level and O₂ level recorders are installed to replace 2 that are not used). (8502)

RESPONSE: Four controllers on each panel has been deleted. The remaining controllers have been separated to align them with their respective displays (meter and recorders). No further action required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-8.42

WPPSS NO.

REVIEWER:

RESPOND BY: _____

P-814 - There are 2 rows of 13 meters each without space or demarcation. (B503)

RESPONSE: These meters monitor drywell temperature at various locations and elevations. The meters have been resequenced to arrange them by drywell elevation from top (left) to bottom (right).

All meters have the same scale, thus the operators can now visually scan across them to obtain a temperature profile and spot excessive temperature areas. They were also subgrouped by drywell location. Rather than separate legend plates for each meter, subgrouping of the meters into six subgroups was provided by combining legend plates to common areas. Drywell temperature information on P814 is used in conjunction with the adjacent Panel P813 for drywell recirculation and cooling control. With the above changes and usefulness of the temperature profile information for drywell cooling control, no further action is required.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-8.43

WPPSS NO.

REVIEWER:

RESPOND BY:

P-800 - This panel has more than 5 diesel generator meters in a column without a space or demarcation. (8216)

RESPONSE: Vertical legend plates will be attached to subgroup the vertical string of meters into two groupings: voltage/ampereage displays and miscellaneous displays. New plates will be installed prior to commercial operation.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-8.44

WPPSS NO.

REVIEWER:

RESPOND BY:

P-820 - There are more than 5 meters in a row on panel without spacing or demarcation. (8217)

RESPONSE: Two sections of Panel P820 have eight and six meters grouped together. These have been subgrouped by use of demarcation lines and by combining similar legend plates. See attached drawing. Permanent demarcation and legend plates have been installed. No further action is required.



[433]

[435]

PD/SGV

PD/RX

PD/VBI

PD/VB2

(504) 133
712

(506) 133
714

(507) 133
715

(508) 133
716

[446]

[447]

[448]

[449]

[680][681][682][683][684][685][686][687]

BS-PI-18A	BS-PI-18B	MS-PI-6A1	MS-PI-6B1	MS-PI-6A2	MS-PI-6B2	MS-PI-6A3	MS-PI-6B3
(227)	(228)	(219)	(220)	(221)	(222)	(223)	(224)
18	18	18	18	18	18	18	18

STM EVAP

LP-1

LP-2

LP-2

460

462

464

465

MS-TC-115

G	G	G	G
R	R	R	R

MS-TCV-115 A,B,C,D

(523) 708

G	G	G	G
R	R	R	R

MS-TCV 116 A,B,C,D

[688]

BS-PI-29
(229)
27

468

[698][699][700][701][702][703]

MS-PI-19A	MS-PI-11A	MS-FI-25A	MS-PI-19B	MS-PI-11B	MS-FI-25B
(225)	(230)	(237)	(226)	(231)	(238)
28	63	29	28	63	29

SJAE A

SJAE B

469

470

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-8.45

WPPSS NO.

REVIEWER:

RESPOND BY:

P-826 - There is mirror imaging of control room HVAC and Critical SWGR/HVAC controls on this panel. (B123)

RESPONSE: The control room HVAC area has four switches that are mirror imaged. Two distinctly different style switches are used (J-handled and small rotary styles), one of each on a side. Reorientation would require panel structural changes. As is, the controls are readily discernable due to the different styles and each two relatable controls use the same style of switch. Also, the system has been mimicked to improve visibility. No change is required.

The critical SWGR/HVAC controls are miscellaneous HVAC controls that have been demarcated so as not to distract the operator from the control room HVAC system area of the panel. It has six switch (four J-handle and two small rotary styles). Reorientation would require panel structural changes. As is, the four fans use J-handles and the two dampers use small rotary controls. With the distinctly different controls and demarcation lines applied to provide contrast separation from the control room HVAC controls, the potential effect of the mirror image is minimal. No change is required.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-9.4

WPPSS NO.

REVIEWER:

RESPOND BY:

P-832 - There are many throttling type valve controls for which there is no indication of valve position. (8506)

RESPONSE: The controls operate heat exchange startup vents. The controls throttling capability is not used or required for these valves. The vents are opened at startup during heat exchanger warmup and then closed. The valves require only a few seconds to open or close. As is, the controls are nonsafety related, take a direct action by the operator to throttle (pressing of the OFF button), valve position lights are available to identify proper valve position to the operator, and partial opening or closure will not degrade the system. Replacement of the switches would require circuit modifications and possibly panel structural modifications. Replacement of the switches is not recommended.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-9.5

WPPSS NO.

REVIEWER:

RESPOND BY:

P-840 - There is a confusing discrepancy between controller scale and meter scales on the CW Inlet Plenum Level Indicator and Controller. (8509)

RESPONSE: New scales for the two CW inlet plenum level indicators and the level controller were ordered and will be installed upon delivery. The new scales will be the same to provide for cross referencing and consistency and will be in inches above plenum bottom rather than sea level elevation.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-9.6

WPPSS NO.

REVIEWER:

RESPOND BY:

P-601 - RCIC Isolation Valve (F063) Annunciator, Warmup Valve (F076) Annunciator, Isol Valve Vac Break (F086) Annunciator are more than 10' to the left of valve controls. (8319)

RESPONSE: Electrical system design requirements specify separation of division 1 and 2 signals. The above alarms are all RCIC division 2 alarms and were located on the closest division 2 alarm panel to the RCIC system. A review was performed on the above alarms to ascertain their operational use.

- Warmup valve (F067) - Annunciator procedures state that this is an "Informational Alarm, no action required." The operator may choose to leave the valve as is or to close it, depending on system status.
- Isolation valve (F063) was deleted as an annunciator alarm and incorporated into the RCIC division 2 system status monitoring subpanel as required by RG-1.47. This is an informational display only.
- Isolation valve vacuum breaker (F086) alarms when automatic closure of the valve is initiated. The operator action is to verify that the valve is closed.

The two remaining alarms (F067 and F086) are color prioritized as white. These are not high priority alarms (red or amber). Since the above alarms are informational, of low priority and require no direct operator response, the present locations are acceptable.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-9.7

WPPSS NO.

REVIEWER:

RESPOND BY:

P-840 - A string of 2-2-3-3-3 meters--all labeled Heater Shell Pressures--have no apparent use to operators. Controls for these heaters are on back panel T(P-832). Also see Finding 8.47, which noted that the numerical sequence for these heaters is right to left. (8110)

RESPONSE: Heater shell pressure indicators are used by the operators to monitor the performance of the feedwater/condensate system. By monitoring heater pressure, extraction steam problems, misvalving, and tube leaks concerns can be discerned prior to degradation of the heaters. The pressure indicators are also used as a measure to balance heater outlet temperatures. The "apparent use to operators" is based on the need to routinely monitor these indicators without leaving the primary area of the control room. As is, the indicators are located adjacent to the feedwater and condensate system controls. No change is required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-9.8

WPPSS NO.

REVIEWER:

RESPOND BY:

P-603 - Controls and displays are criss-crossed for APRM BYPASS and FLOW UNIT BYPASS systems A and C. (8404)

RESPONSE: The joy sticks (FLOW-APRM-IRM) are physically located in a mirror image fashion. The operator is located at the center of the panel, thus lending his particular operation toward the mirror image fashion as compared to left-right concept. This arrangement is also a generic design on GE-BWR type plants; therefore, any change if made should be a generic type by the nuclear steam supplier. A letter from the Supply System to GE has been processed requesting GE to investigate this issue. Resolution, if required, and schedule for correction will be noted in the Supply System's final report.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-1.32

WPPSS NO. 16.3.1

REVIEWER:

RESPOND BY:

Procedure Storage, Availability, and Identification (16.3.1)

- a. Procedure binders could be more explicitly labeled, specifying the constituent procedures by number.

Response: Binders are presently labeled by volume number and function (i.e., Administrative Procedures, Abnormal Procedures, Emergency Procedures, etc.). The need for additional labeling will be based on operational experience. No action required.

Comment: This should be addressed in the DCRDR.

- b. A table of contents is provided only in the first book of each volume of procedures.

Response: A controlled procedure index is available separate from the Plant Procedures Manual for operator access. The inclusion of a table of contents for the first book of each volume is an additional operator aid. Expansion to each book is not necessary. No action required.

Comment: HED correction or additional justification should be provided prior to licensing.

- c. Distinctive coloring or labeling should be considered for the emergency, abnormal, and annunciator response procedure binders.

Response: Resolution will be based on operational experience and noted in the Final Report.

Comment: Resolution should be provided prior to licensing.

Cont'd next page.



- d. Annunciator response procedures are not in a separate binder.

Response: Resolution will be based on operational experience and noted in the Final Report.

Comment: Resolution and correction should be provided prior to licensing.

RESPONSE:

- a. A uniform approach to the identification of binders for procedures to the the control room has not identified any shortcomings; therefore, no change is anticipated.
- b. A table of contents appears in the first binder for each volume (14 volumes). An overall procedure index, called the Procedure Tracking System, is present in the control room and is segregated by volumes for each kind of procedure. Two indices now exist in the control room for each volume of the PPM. Therefore, no change is anticipated.
- c. Distinctive labeling for Volumes 4 and 5, (adnormal , annunciator, and emergency procedures) will be accomplished for the control room to conform to the recommendations identified prior to fuel load. The binder end inserts will be replaced with inserts having larger letters and of a different color from the other manuals.
- d. Annunciator response procedures will be separated in the control room to conform to the recommendation identified prior to fuel load.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-1.33

WPPSS NO. 3.3.1.a

REVIEWER:

RESPOND BY:

The main control benchboards deviate from anthropometric standards in the following respects:

The depth of the apron section is 1.5 inches greater than the recommended maximum of twenty-eight inches. (3.3.1.a)

Response: No controls are located within the last one and one-half inches of the horizontal portion of the benchboard. For those controls on the vertical portion, an anthropometric review was completed. The lowest vertical section requires a slight lean by the 95th percentile man to operate controls. For the 5th percentile woman, the whole vertical section requires a slight lean or reach to operate controls. A 5th percentile woman was located and the degree of comfort and accessibility was judged adequate. The individual had no difficulty operating controls and was comfortable in her reaching. A review of the controls on the vertical panel sections indicated none of the controls required frequent operator use. Also, for trip switches, the extra apron distance provides some added protection from inadvertent operation. No action required.

Comment: All vertical panels associated with benchboards should be reviewed with operators having a fifth percentile female reach to verify control operability and to evaluate the potential for inadvertent actuation of benchboard-mounted controls. Photographs should be provided.

RESPONSE: A review for potential areas of inadvertent control operation was performed per Supply System Finding 13.3.7. This review was performed with one of the concerns being the affect of an operator leaning over the panels edge to reach controls. Resolution and correction schedule were noted for item "C" in the Supply System April 1983 report and for items A and B under NRC Finding F-4.32 in this report.

No 5th percentile female operator is presently employed at WNP-2. The shortest operator is 5'7", and his functional reach is greater than that of the 5th percentile female. Attached are photographs of a 5th percentile female at the bench boards as additional verification of the Supply System's previous response. Height 5'0" without shoes, functional reach 25-1/2". No further action required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-6.106

WPPSS NO.

REVIEWER:

RESPOND BY:

P-603 - The IRM Range Bypass joy sticks are not placed consistently. (8403)

RESPONSE: The IRM bypass joy sticks are placed in a mirror image fashion as the operator will be located at the center between the Div. 1 and Div. 2 controls. This operation mode lends itself toward the mirror image rather than the left-right configuration as the operator will usually be seated at the center of the panel while manipulating the controls during power ascension. No adverse conditions exist due to this configuration. No action required.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-6.107

WPPSS NO.

REVIEWER:

RESPOND BY:

P-601 - ADS Division nomenclature uses both Arabic and Roman numerals. Roman numerals should be avoided. (8317)

RESPONSE: During the upgrade of control room annunciators and legend plates, numerical numbers were consistently used in place of Roman numerals. A walk-down of the control room panels were completed and no Roman numerals were found.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-6.108

WPPSS NO.

REVIEWER:

RESPOND BY:

All panels - Subsystem/functional grouping labels have line width to character height ratio greater than 1:10. (8406)

RESPONSE: The new permanent subsystem function hierarchy labels have a character height to width ratio of 1:6 in conformance to the plant engraving standard and NUREG-0700. Installation of these labels will be completed by fuel load.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-6.109

WPPSS NO.

REVIEWER:

RESPOND BY:

P-100 - There is no demarcation or color padding around annunciator controls. (8605)

RESPONSE: Color padding has been installed on panel P100 identical to that installed on control room panels. Demarcation lines were not used either in the control room or panel P100 around annunciator response controls as color padding provided good contrast and natural demarcation.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-6.110

WPPSS NO.

REVIEWER:

RESPOND BY:

P-001 - Transfer switches are not included within the demarcation lines of associated controls. (8602)

RESPONSE: Demarcation lines are used in four areas of P001 panel. Demarcation lines were revised for three of the areas to encompass the controls associated transfer switches. The transfer switch for the fourth area, control switch RCIC-V-68, was not encompassed. The transfer switch performs a dual function for both the RHR system and RCIC system. Encompassing it with the RCIC control could be misleading to the operator. The prime purpose of the RCIC-V-68 control demarcation was to provide contrast from surrounding RHR controls. The existing demarcation line adequately provides this contrast. No further changes are required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-6.111

WPPSS NO.

REVIEWER:

RESPOND BY:

On all panels - Mimic color coding appears to be inconsistent:
 Red--emergency power and emergency flow path Green--normal
 power, but secondary flow path Blue--power distribution, but
 normal fluid and air flow path. (8408)

RESPONSE: A review of the plant color code standard was completed for consistency. The use of green for normal power is only used from the Main Generator to the primary plant buses. The use of green for internal power distribution and secondary flow paths was found inconsistent and was revised as follows:

- Plant Internal Power Distribution changed from green to dark blue to be consistent with the use of dark blue for primary flow paths.
- Secondary Flow Paths changed from green to light blue to provide contrast from dark blue main flow paths.

The term "normal power" is a specific component terminology to reflect TG power. Engineering drawings use this component description and labeling on drawings and documents as a formal title; i.e., NORMAL TRANSFORMER TR-N1. The term normal is not used in a general sense. The color coding has been revised to reflect this change as noted above. Mimicking will be revised prior to fuel load.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-6.112

WPPSS NO.

REVIEWER:

RESPOND BY:

P-601 - There are no arrows on RHR-8 mimics to show direction of flow. (8311)

RESPONSE: The WNP-2 Mimic Standard specifies directional arrows on mimic lines. The lines on P601 are temporary tape for operator review and feedback. Permanent mimicking will be installed, with directional arrows, prior to fuel load.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-7.3

WPPSS NO.

REVIEWER:

RESPOND BY:

Moderate glare is present on CRTs. Lowering CRTs as proposed will probably make this worse because standing or even sitting operators may need to tilt CRT back for convenient viewing.
(B203)

RESPONSE: Lowering of the CRTs will not be implemented. A review of the two black-and-white CRTs for glare indicate that readability is still adequate for temporary functional use of the devices where presently located. Also, backup typers are located adjacent to the CRTs. Permanent positioning of these CRTs has been postponed until the first refueling outage. Presently, the preferred location is above Panel P603 angled downward about 30°. This would provide excellent orientation and visibility for the NSSS operator either from the work location (desk) or from the P603 control manipulation area. Siesmic and structural evaluations are presently under way. Any deviations from the above will be reported in the Supply System's final report.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-7.4

WPPSS NO.

REVIEWER:

RESPOND BY:

CRT brightness and contrast controls are in a locked compartment and not available to operators. (8210)

RESPONSE: The key is to be administratively controlled by the Shift Manager. It will be available in the control room key locker for operator availability.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-7.5

WPPSS NO.

REVIEWER:

RESPOND BY:

Characters on CRT displays are produced by 5 x 7 dot matrix, but readability is still good as only capital letters are used.
(8204)

RESPONSE: NRC comment does not require a response.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-7.6

WPPSS NO.

REVIEWER:

RESPOND BY:

CRT displays are on moveable mounts. Present height is satisfactory for stand-up operation but requires about a 90 degree turn from console to view CRTs. CRTs also block STA line-of-sight to boards. Lowering CRTs will result in a readability problem. Major problem is that alarm CRT be visible from P-603 operating position--this is a greater than 90 degree turn for the operator. (8102)

RESPONSE: See Supply System response to NRC Finding D-7.3.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-7.7

WPPSS NO.

REVIEWER:

RESPOND BY:

No page total is entered on each page of multipage alarm CRT display. (8205)

RESPONSE: The alarm display on the CRT is not a multipage program but consists of a two-page maximum display. The display is for monitoring recent alarms. Prior history is on the alarm typer. The CRT's format displays the page number as the first line of the CRT display and is readily visible to the operator. The operators can manually select either page, and either page will automatically be displayed if an alarm input is received or an alarm returns to normal. The addition of a total page number does not provide the operators any additional information for a two-page maximum format. No change is required.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-7.8

WPPSS NO.

REVIEWER:

RESPOND BY:

This CRT is/can be used to call up specific "operator logs" of up to 15 analog points each. However, a hard copy print of this CRT page cannot be obtained. (8103)

RESPONSE: The above comment is not correct. Hard copy prints of the "Operator Logs" are available with print special log function (operator demandable). No changes are required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-7.9

WPPSS NO.

REVIEWER:

RESPOND BY:

No instructions for reloading paper and ribbon are attached to printers. (8211)

RESPONSE: Paper and ribbon replacement is performed by I&C technicians who are trained on the equipment. Placement of additional procedures in the primary operating area that are not used by the operators is not recommended. No change is required.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-4.22

WPPSS NO.

REVIEWER:

RESPOND BY:

P-601 - There are about 50 throttle control valves with sharp edged handles and med-high spring tension that must be held "on" for as long as 2 minutes at a time. An extension handle is available to reduce effort. Operators think it would be good to have extension handle permanently attached. (8514)

RESPONSE: All throttle valve controls will have extension handles installed by commercial operation.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-4.23

WPPSS NO.

REVIEWER:

RESPOND BY:

P-603 - Some Bailey Controllers have small flush pushbuttons which are hard to operate (e.g, P-603). (8515)

RESPONSE: The pushbuttons are only used when transferring from manual to auto or visa versa. If the pushbuttons were raised up, this would cause a larger concern regarding inadvertent operation and resulting adverse effects than the operator having trouble pushing the buttons. In an emergency condition, the operator may want to switch the feedwater control to manual from auto, but it has been proven on other BWR plants that leaving the system in auto is more advantageous than switching to manual. Therefore, having flush pushbuttons is seen as more of a positive condition than a negative one requiring modifications. No action required.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-4.24

WPPSS NO.

REVIEWER:

RESPOND BY:

P-603 - There are several broken pushbuttons on this panel.
(8510)

RESPONSE: The rod insert and withdraw plastic pushbutton tops have broken at the edges. New switch tops have been ordered. The switches are useable as is, but operators have also been provided with temporary slipover control heads. New buttons will be installed upon delivery.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-7.10

WPPSS NO.

REVIEWER:

RESPOND BY:

Printout on demand typer is illegible. (8101)

RESPONSE: A review of the demand typer found a faulty ribbon installed. A new ribbon was installed and printout legibility is now acceptable.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-7.11

WPPSS NO.

REVIEWER:

RESPOND BY:

The print head covers the first part of the last printed line, which contains only the alarm time information. The operator can use the keyboard linefeed key to space up the paper in order to see. (B206)

RESPONSE: Operators use the keyboard line feed key as needed. No changes are required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-7.12

WPPSS NO.

REVIEWER:

RESPOND BY:

Not all annunciator alarms are included in process computer alarm printout. (8209)

RESPONSE: By design, only those annunciator alarms used for postanalysis of plant performance and plant abnormal transients are required to be available on the process computer and in the alarm printout. Annunciator alarms are used for operator immediate information and response; whereas, the computer is used for backup information and postanalysis. No changes are required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-7.13

WPPSS NO.

REVIEWER:

RESPOND BY:

There is no provision for alarm printout by alarm group by operator request. (8208)

RESPONSE: Operators can demand an alarm printout summary to obtain the status of present alarms. By selecting the first character of the point I.D., the operator can also categorize alarms. No changes are required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-7.14

WPPSS NO.

REVIEWER:

RESPOND BY:

Alarm typer/CRT messages do not appear to have one-to-one correlations with specific annunciator tiles nor contain the information presented in the illuminated annunciator tile.
(B104)

RESPONSE: The alarm typer/CRT messages and information content will be reviewed against their corresponding annunciator tiles and made consistent to the existent programming space allows. All revisions will be performed by the first refueling outage.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-8.31

WPPSS NO.

REVIEWER:

RESPOND BY:

P-840 - Uncertainty exists in the operator's mind as to whether label "RFW TURB A DISCH delta P" refers to only Turbine A or to both turbines. There is no Turbine B Disch delta P display. (8109)

RESPONSE: The indicator noted above does not relate to either RFW turbine A or B but is used to monitor the ΔP across the startup flow valve during plant startup. A new label was installed and reads as follows:

[MAIN
STARTUP
VALVE ΔP]

The new label description corresponds with the associated valve control label descriptions. No further change required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-8.32

WPPSS NO.

REVIEWER:

RESPOND BY:

P-601 - Safety Relief Valve Controls have no logical functional arrangement (e.g., relief setting level or valve type). (8322)

RESPONSE: See Supply System response to NRC Finding F-8.48.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-8.33

WPPSS NO.

REVIEWER:

RESPOND BY:

P-820 - Displays are not arranged logically as temperatures and pressures are intermixed. Some displays (main steam line temperatures A B C D) do not appear to be needed on this panel and probably belong on panel P-601 with the MSIV controls. The Turbine Differential Gap Test and Alarm Units are not used by operators. (8115)

RESPONSE: Displays are logically arranged and located adjacent to associated controls. During the NRC June Audit, much of the demarcation lines had been removed from P820 due to panel modifications. New demarcation has been installed. This, plus the new labeling, provides good display grouping and distinction between displays. See Supply System response to NRC Finding D-8.44.

As to the location of the Main Steam Line (MSL) temperature indicators, see Supply System response to NRC Finding E-8.46. The MSL indicators provide turbine inlet temperature information to the operator. P820, Turbine Control Panel, is the most appropriate place for such information. No change is required.

The turbine vibration and differential alarm units on P820 are used by operators. These units provide (1) specific alarm point identification; whereas, the associated annunciator alarms are a general trip alarm; (2) annunciator alarm and logic testing capability by use of "test" pushbuttons on each alarm unit; and (3) display readout selection capability by use of a toggle or rotary switch on the units to enable the operator to select specific points of information for monitoring on displays located above the alarm units. P820 is the only turbine control panel in the control room and is the most functional location for the alarm units. No change is required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. D-8.34

WPPSS NO.

REVIEWER:

RESPOND BY:

P-820 - The benchboard needs demarcation. (8212)

RESPONSE: Demarcation lines on P820 had been temporarily removed due to panel modifications. Installation of new demarcation lines has been completed.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

D-8.35

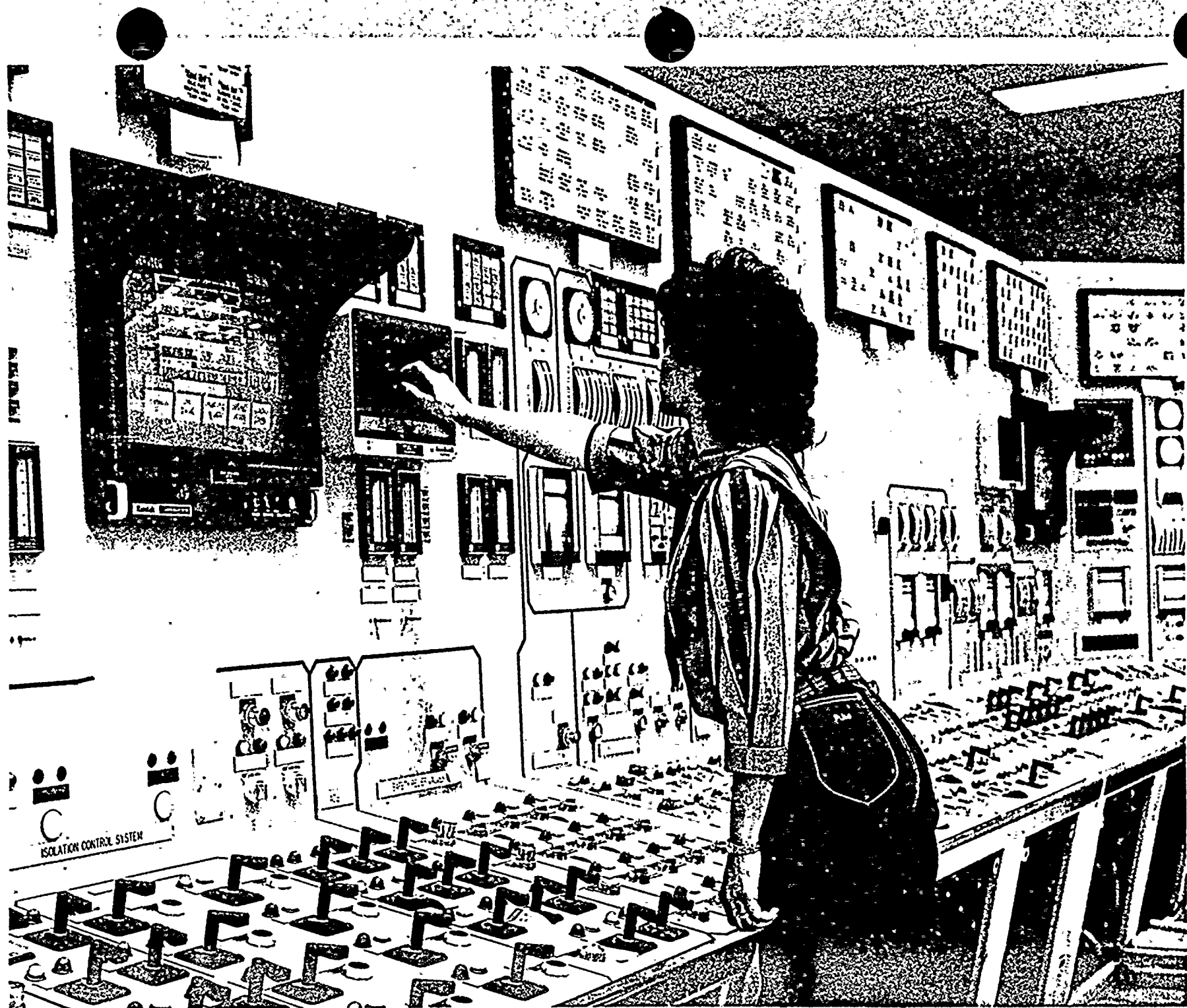
WPPSS NO.

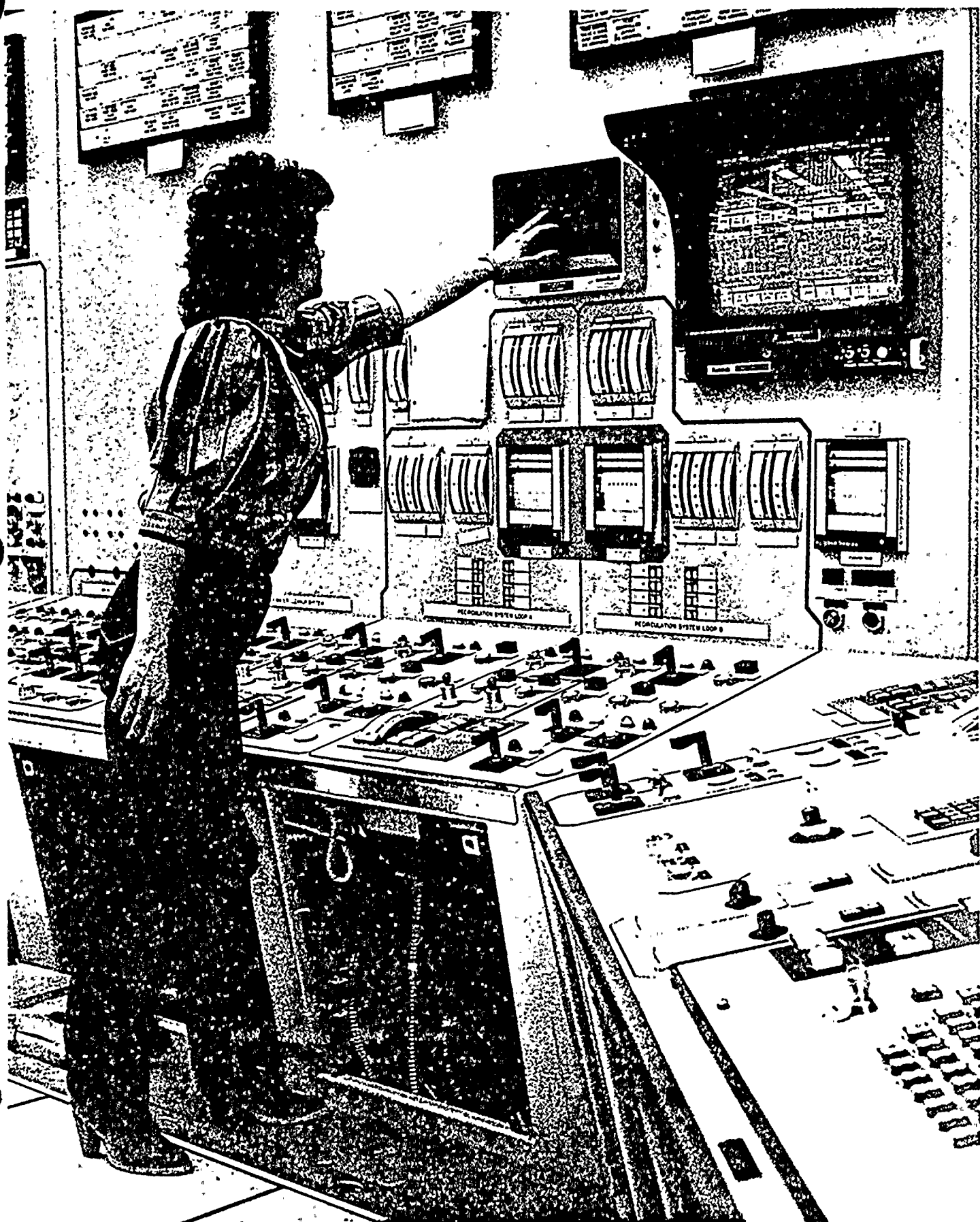
REVIEWER:

RESPOND BY:

P-820 - This panel needs demarcation. (B214)

RESPONSE: NRC Audit Finding D-8.34 specifies the same panel needs demarcation. However, installation of all demarcation lines have now been completed in the control room and remote shutdown room. No further action is required.





HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-1.34

WPPSS NO. 3.3.2.f

REVIEWER:

RESPOND BY:

Most vertical panels have both controls and indicators mounted outside of recommended height ranges (see Table 3-2). (3.3.2) Annunciator response controls are located below lower recommended height ranges. (3.3.2.f)

Response: Reviews of all vertical panels were performed based on frequency of operation, need for precision control and readout, and safety implication of the device. The following areas were found to be of concern:

Annunciator response controls make up the majority of the lower guideline concerns. These were reviewed with General Physics Corp. Human Factors personnel. Most panels have little available room to relocate the controls within anthropometric limits and, if done, would not be at a consistent height. Relocation would mix them within control areas, reducing their visibility and possibly adding to operator confusion. As they are, most are consistent in height and location. Color padding is planned for all annunciator response controls to improve visibility. No further action required. (3.3.2.f)

Comment: Control shapes and color padding should be identical to treatment planned for primary operating area annunciator controls.
See Finding 3.71.

RESPONSE: Color padding has been installed around all annunciator response controls in the control room and remote shutdown room. Mushroom heads will be installed on all main benchboards acknowledge controls prior to fuel load. Mushroom heads will be installed on all vertical panels and remote shutdown room panels by the first refueling outage.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-3.65

WPPSS NO. 14.3.14

REVIEWER:

RESPOND BY:

The divided alarm windows (previously mentioned as being difficult to read) are also too small to command attention in such a large control room. (14.3.14)

Response: Vertical panels alarm windows are split windows presently using 0.125-inch character heights with a maximum of six lines of description. New specifications call for a 0.187-inch character height using a maximum of four lines of description. P601, P602, and P603 benchboards windows are single windows using 0.187-inch character heights. These are being increased to a 0.25-inch character height. Potential for increasing the 0.187-inch character height for the split windows on P800, P820, and P840 benchboards is presently under review. New windows will be installed prior to fuel load. Along with improved wording and items 14.3.4 and 14.3.5, above, no further action is required.

Comment: The response does not answer the detectability criteria.

RESPONSE: Each split lense is 1.625 inches high by 3.00 inches wide. Based on these measurements, the detectability distance of the light alarm is 34 feet and 63 feet, respectively, based on the above dimensions. This is well within the range of the respective panels operator work station and the senior operator's work station. Also, the half-size lenses have half the alarm window area of the single-lense windows, yet the same number of installed lamps, two. The windows are, therefore, brighter and have higher contrast from surrounding unlight alarms, and the flashing alarm is visually distinctive from surrounding steady-state illuminated alarms. General Physics Corporation has reviewed the split alarms for contrast detectability and found no problem discriminating alarming, stead-on and steady-off annunciators. No changes are required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-3.66	WPPSS NO. 14.3.1
REVIEWER:	RESPOND BY:

The following aspects of annunciator window grouping could be improved: (14.3.1)

Panel 601 The division between the leak detection and RHR B/C alarms on box A2 could be more logically defined.

The leak detection Division II alarms are divided between boxes A2 and A12.

"RHR PUMP B ROOM WATER LEVEL HIGH" panel 601-A2 window 2-8 should be moved to a position adjacent to the other RHR B/C alarms.

RCIC alarms "RCIC TO RHR B STEAM TRAP HIGH LEVEL" and "RCIC TO RHR AB STEAM TRAP HIGH LEVEL," panel 601-A2 windows 5-3 and 6-3 should be moved with the other RCIC alarms. RCIC alarm 602-A4 window 4-1 is also out of place.

Response: Leak detection and RHR B/C alarms have been grouped by system to the extent panel configuration and space allowed. Further rearrangement would not enhance group recognition sufficiently to be cost effective. No action required.

System alarms, such as RHR, ADS, and LPCS, are of primary importance, and emphasis was placed on their location adjacent to related system controls. Leak detection alarms were considered secondary in importance and were grouped to the extent available space allowed. No action required.

Resolution as to the location for window A2-2.8 will be noted in the Final Report.

RCIC to RHR steam trap alarms were located on A2 and A4 per Operations request. These alarms could be grouped with either system, but operators related them to the steam condensing mode of RHR. No action required.

Comment: Resolution should be provided prior to licensing.

RESPONSE: Annunciator drop A2-2.8 will be moved from its present position to A2-2.7. The drop which presently resides at A2-2.7 will be moved to A2-2.8. This swap will be accomplished by the first fueling outage.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-3.67

WPPSS NO. 14.3.2

REVIEWER:

RESPOND BY:

The RHR alarms for system A are not located in a similar arrangement to those for system B. (14.3.2)

Response: RHR system A and systems B and C are powered by electrical Divisions 1 and 2, respectively. RHR systems B and C share some common trips and unique alarms, while RHR A system shares some common trips and alarms with the LPCS system. Differences between the systems make similar arrangements impossible. No action required.

Comment: Further analysis and possible resolution of this HED is needed prior to licensing.

RESPONSE: There are 40 alarms related to RHR systems A, B, and C. These alarms are grouped by systems in annunciator panels A4 (RHR-A system) and A2 (RHR-B/C systems). The two annunciator panels are not located adjacent to each other but physically separated about eight feet apart above each respective RHR system control area. Of the forty alarms:

- 7 are unique alarms with no cross correlation.
- 5 are common alarms for RHR-B/C systems only.
- 4 are common alarms for RHR-A/LPCS systems only
- 6 alarms are for RHR-C system only
- 8 alarms are for RHR-B system only
- 10 alarms are for RHR-A system only

Only six alarms in each system are common to all three systems for a total of 18 out of 40. Of the 18 alarms, six are presently similarly arranged. Rearrangement of the remaining 12 alarms would not improve the operator's response to warrant the cost of changing operating and surveillance procedures, engraving drawings, logic diagrams, wiring drawings, and wire line codes. As is, the alarms are functionally grouped on Panels A2 and A4. These panels are physically separated such that visibility is greater than the maximum 45° horizontal viewing angle from either control area. The usefulness of similar grouping is thus reduced. RHR-A system is operated independently of RHR-B or C system, and operator attention is drawn by the annunciator systems illumination design. Cross comparison between systems is not required. No change is required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-3.68

WPPSS NO. 14.3.6

REVIEWER:

RESPOND BY:

The annunciator windows installed at the time of the survey are difficult to read even when standing directly in front of the panel. The use of split windows (two annunciators per window) further compounds this problem. (14.3.6)

Response: Vertical panels alarm windows are split windows presently using 0.125-inch character heights with a maximum of six lines of description. New specifications call for a 0.187-inch character height using a maximum of four lines of description. P601, P602, and P603 benchboards windows are single windows using 0.187-inch character heights. These are being increased to a 0.25-inch character height. Potential for increasing the 0.187-inch character height for the split windows on P800, P820, and P840 benchboards is presently under review. New windows will be installed prior to fuel load. Along with improved wording and items 14.3.4 and 14.3.5, above, no further action is required.

Comment: Character height should subtend a minimum visual angle of 15 minutes, or $0.004 \times$ viewing distance. A 0.187 inch character height results in a maximum viewing distance (for legibility) of less than 4 feet. Viewing distances will be greater than that.

RESPONSE: Split windows are used in two areas of the control room, on vertical panels in back of the control room out of the primary operating area and on the balance of plant benchboards within the primary operating area. On vertical panels, existing aisle ways are five feet wide. Nominal viewing distances for operators is from midisle, or about 30 inches. 0.187-inch characters are used for all vertical panels which provide for a maximum viewing distance of 47 inches, more than the nominal distance requirements.

On benchboards P800, P820, and P840, a 0.218-inch character height is used for split windows which provides a maximum viewing distance of 55 inches. The distance from the panel edge to the annunciator is 30 inches. The operator exclusion area at these panels is 4 feet. A nominal operator position from the panels edge is midway or 24 inches. This plus the 30 inches noted above gives 54 inches, or within the guideline. In actuality, a visual check shows excellent readability from as far away as 10 feet. This is primarily due to the width-to-height ratio of 1:6 used for the engravings.

On benchboards with single-lense windows, a character height of 0.25 inches was used. This provides for a maximum viewing distance of about 63 inches. This is well above the nominal viewing distance of 54 inches noted above for the split window benchboard. A visual check shows excellent readability from as far away as 12 feet, again due to the 1:6 width-to-height ratio used on the engravings. No changes are required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-3.70

WPPSS NO. 14.5.5.2.a

REVIEWER:

RESPOND BY:

Control sets should have the same arrangement and relative location at different work stations. Deviations noted are: (14.5.5.2.a)

P601 Arranged on vertical section of benchboard rather than horizontal area along panel edge. Located on right side of panel rather than center.

P820 Located on left side of panel rather than center.

P840 Located on right side of panel rather than center, very close to P820 controls. Operators have responded erroneously to the opposite panel controls due to their closeness.

Fire Panels Sequence of controls for panels 1 and 2 is "ACK/Test/Reset" instead of "ACK/Reset/Test" as used throughout the control room. Panel 3 only has "ACK" and "Test" controls, no "Reset" control exists.

P851 System status monitoring panels SD-1, 2, and 3 are being deleted due to RG-1.47 redesign. The new SRV acoustic monitoring system subpanels will replace SD-1 and SD-2. This leaves the Division I and Division II annunciator panels and associated controls in a configuration that places the Division I Controls closer to the Division II Panel than the Division II Controls and separated by the new acoustic monitoring system subpanels.

Back Vertical Panels Control locations are generally below anthropometric limits and are not all consistent in location.

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ARC NO.

E-3.70

WPPSS NO.

14.5.5.2.a

Response:

P601 No horizontal room is available on the front panel edge to provide for location and arrangement consistency without affecting panel configuration and control symmetry. Vertical orientation was selected as the only plausible alternative without significant relocation changes.

The existing set was relocated to the horizontal portion of the panel and arranged in a vertical alignment with the Acknowledge Control at the edge of the panel to allow quick and easy operator access. No further action required.

A redundant set will be provided due to the length of the panel to improve visibility of the annunciator windows from the Acknowledge Control. See attached control location drawings. A second test control is not required. One test pushbutton per panel is considered adequate. Implementation will be after fuel load and based on resolution of item 14.5.5.1.a, above. Implementation schedule will be noted in the Final Report.

P820 The response controls will be relocated to the center of the panel, along with the panel edge for consistency. See attached layout drawing. Besides improving alarm visibility, controls for P820 and P840 were placed too close together confusing operators as to which set of response controls to initiate. The proposed relocation will improve both annunciator readability from the Acknowledge Control and avoid confusion with the P840 controls. Implementation will be after fuel load and based on resolution of item 14.5.5.1.a, above. Implementation schedule will be noted in the Final Report.

P840 A redundant set of response controls will be provided near the RFW systems to increase visibility of annunciator windows and to increase operator access and response to RFW alarms from P603 without having to leave the P603 area. See attached layout drawings. A second test control is not required. One test pushbutton per panel is considered adequate. Implementation will be after fuel load and based on resolution of item 14.5.5.1.a, above. Implementation schedule will be noted in the Final Report.

C NO.

E-3.70

WPPSS NO.

14.5.5.2.a

Fire
Panels

The controls for panels 1 and 2 will be resequenced to an "ACK/Reset/Test" sequence prior to fuel load.

Addition of a reset control for panel 3 is not required. Alarms are supervisory only and not "fire" alarm trips. Panel 3 presently has an automatic reset circuit design. Operational experience does not presently warrant the major circuit changes necessary to incorporate a manual reset control over the present automatic system. No action required.

P851

Response controls have been rearranged per the attached drawing. This provided contrast and grouping recognition between Division I and Division II annunciator panels and response controls. No further action required.

Back
Vertical
Panels

See item (3.3.2.f) for response. (Finding 1.34)
Most vertical panels have both controls and indicators mounted outside of recommended height ranges (see Table 3-2). (3.3.2)

Reviews of all vertical panels were performed based on frequency of operation, need for precision control and readout, and safety implication of the device.

See Finding

Comment:

- P601. Redundant set of controls should be installed prior to licensing.
- P820 and 840 should be resolved prior to licensing.
- The Fire Control Panels HED resolution is acceptable.
- P851 HED resolution is acceptable.
- Back vertical Panels - see Finding 1.34.

RESPONSE: *There have been numerous discussions among engineering, operations, and various personnel regarding key issues involving the annunciator system and associated control philosophy. The key issues being discussed are:*

- . Need for a silence pushbutton.*
- . Need for a "Master" silence pushbutton.*
- . Need for a capability of silencing an auditory alert signal from any set of controls within the control room.*
- . Degree of success related to the present design change of going to 4 annunciator tone groups.*

The present plan to resolve these issues is as follows:

- . The changes as outlined in E-3.70 will be implemented and completed by the end of the 1st fuel outage.*
- . Operating experience obtained from the power ascension phase and commercial operation to the 1st fuel outage will shed light on the key issues. It is felt that the operating experience attained during this period will allow us to make the correct change one time rather than vacillate between a number of alternatives.*
- . The change packages necessary will be in place by the 1st fuel outage so the complete job can be accomplished prior to the startup following the outage.*

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-3.71

WPPSS NO. 14.5.5.2.b

REVIEWER:

RESPOND BY:

Control coding techniques for easy recognition of controls should be used. Recommended techniques are color, color shading, demarcation, and shape. (14.5.5.2.b)

Controls are not distinguishable in shape.

Color coding is inconsistent.

- 24 controls have black bushbuttons with silver collars.
- 61 controls have silver pushbuttons with silver collars.
- One control has a silver pushbutton with a yellow collar.
- The fire control panels use "red" escutcheon plates for the "ACK" control rather than black, and the shutdown panel P100 has no escutcheon plates.

Response:

Shape: White mushroom heads will be installed prior to fuel load on Acknowledge Controls on the main benchboards. Placement of additional mushroom heads on vertical panels will be based on operational experience and noted in the Final Report.

Control Color: Silver pushbuttons will be used except for the Shutdown Panel P100, fire panels, and P851; these will use black. Locking ring and escutcheon colors will be consistent with other plant controls. Since the fire panels and P851 form one panel area (row) and all controls are consistently black and are about the only controls on these panels, no conflicts or confusion is expected. The same rationale applies to panel P100. These corrections will be completed after fuel load and noted in the Final Report.

Color Padding: To provide contrast and improved visibility, color padding will be applied around the annunciator response controls prior to fuel load.

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Comment:

Shape: The use of mushroom heads should be made consistent throughout the control room prior to licensing.

Control Color: Should be completed prior to licensing.

Color Padding: Acceptable - Should be reviewed and verified prior to licensing.

RESPONSE: *Mushroom heads will be installed on the main benchboards for acknowledge controls prior to fuel load. The benchboards were selected to reduce the potential of blind reaching over the horizontal area of the panels. Installation on the vertical panels was deferred until the first refueling outage as the affect on safety or reliability on the panels is considered minimal. Also, see NRC Finding E-1.34.*

Control Color - See Supply System response to item F-6.116. In review of the annunciator controls, the three black pushbuttons on Panel P821 and the one black pushbutton on P820 will be changed to silver prior to commercial operation. The black pushbutton on the Remote Shutdown panel, fire panels, and P851 are distinctively color padded, are the only pushbuttons on the panel, and are consistent within their functional area. No change is required on these panels.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO: E-4.27

WPPSS NO. 13.3.8

REVIEWER:

RESPOND BY:

The following switches are reportedly difficult to operate:
(13.3.8)

RPS reset switch, panel 603

Absorber train bypass valve control, panel 672

Response: An extension handle was installed on the RPS reset switch to improve leverage and grip. Changeout of the switch was not considered practical due to the special internal electrical separation design of the switch. No replacement is available. The absorber train bypass valve is a J-style handle keylocked switch. Its frequency of use is minimal and normally only during an outage. The valve has automatic interlocks to close the valve if required. The switch is considered acceptable as is. No further action required.

Comment: The extension handle was not on the RPS reset switch; resolve prior to licensing.

RESPONSE: Operators have used this extension handle for throttle valve controls throughout the control room. The RPS extension handle will be in place prior to commercial operation as a permanent fixture upon procurement of new extension handles per Supply System response to NRC Finding D-4.22.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-4.28

WPPSS NO. 13.3.6

REVIEWER:

RESPOND BY:

The lowest switches on panels 001, 100, 821, 831, and 832 were judged to be somewhat difficult to reach. (13.3.6)

Response: Reviews of all vertical panels were performed based on frequency of operation, need for precision control and readout, and safety implication of the device. The following areas were found to be of concern:

- a. Remote shutdown panel P001 displays and RCIC turbine controller were located at a height of eighty-one inches. Seismic criteria and internal panel congestion prevented lowering or tilting of the devices. An eight-inch platform was installed to provide an acceptable balance between the control/display upper guideline limit and lower control guideline limit. The lowest switches are now below normal guidelines, but these are nonprocess controls and, therefore, deemed as an acceptable tradeoff. One power supply toggle switch had a guard installed to prevent inadvertent operation. No further action required.
- b. One power supply switch on P100 will be raised to prevent inadvertent operation prior to fuel load. No further action required.

Comment: Switches on P821, 831, 832 are not mentioned in the response. A resolution and implementation schedule should be submitted prior to licensing.

RESPONSE: Each panel was reviewed based on frequency of operation, need for precision control and readout, and safety implication of the device.

Panel P821 provides controls for the functioning of the Main Steam Leakage Control System (MSLCS). The bottom two rows of switches (eight) are below the recommended guidelines, four at 22 inches and four at 28 inches. The system is normally in a standby mode. A master control switch is located within the recommended height guidelines and would be the normal switch required for activation of the MSLCS. The operator would only need to scan the position lamps of the individual switches as being all "red" to verify alignment. Access to individual controls would only be needed in case of "auto" mode failure or for testing of individual components. No readout displays are located below guideline limits and no readout displays are used in conjunction with the individual switches of concern. There is no space available to raise the switches higher except to place them four or more feet to the right. This would split the system into two separate groupings and would violate human factor guidelines of system grouping and sequential arrangement.



As they exist, the controls are well grouped and vertically aligned by bleed lines A, B, C, and D and demarcated to reinforce the vertical subsystem orientation. No change is required.

Panel P831 has four switches that are located 26 inches from the floor. These switches isolate trap station drip pots associated with the RHR systems. They normally function automatically and, except for maintenance or testing, are not required for any routine or sequential operation. They are required to be in the control room as a backup to their automatic isolation circuits. They are not used for precision control and have no associated readouts requiring monitoring. They are readily visible and are the only controls on the panel. The benefits of raising the controls versus their frequency of use and function is considered minimal. No change is required.

Panel P832 has 9 switches that are located 26 inches from the floor and 26 switches located 31 inches above the floor. These switches operate condensate system heat exchanger vent and drain valves. These are used during heat exchanger warmup during plant startup. Once warmed up, the valves are set to their operational position and left. They are not used during plant operation or during abnormal plant conditions. The panel is arranged such that each of the 16 heat exchangers has similar arrangements and grouping of controls. The panel is mimicked to provide flow path continuity through the condensate system and each exchanger. Relocating of the out-of-guideline controls would effectively disrupt similarity between heat exchanger and mimicking. Rearranging the whole panel would require major structural and rewiring modifications. Based on their frequency of use, safety important, and impact on the existing grouping similarity and mimicking, the benefits do not justify the potential costs. No change is required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-4.29

WPPSS NO. 13.3.1.b

REVIEWER:

RESPOND BY:

The sequence of positions of the following switches do not conform to population stereotypes:

IRM bypass switches, panel 603 (13.3.1.b)

Response: Item 13.3.1.b controls are unique and have distinctive joy-stick style handles. Normal conventions are difficult to apply due to switch design. Discussions with the operators have indicated no convention orientation concerns. No action required.

Comment: The explanation as to why the current design cannot be improved on is not satisfactory. A further review and discussion of this HED, including possible alternative solutions, should be provided prior to licensing.

RESPONSE: The sequence of positions is not unique to the WNP-2 plant. The same sequence and type of switch is found on a number of GE-BWR plants. This is a nuclear steam supplier design; therefore, this change if made should be a generic change by the supplier. A letter from the Supply System to GE has been processed requesting GE to investigate this issue. Resolution, if required, and schedule for correction will be noted in the Supply System's final report.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-4.30

WPPSS NO. 13.3.1.d

REVIEWER:

RESPOND BY:

The sequence of positions of the following switches do not conform to population stereotypes:

Switches for many valves on panel 832 (open pushbutton on top, close pushbutton on bottom) (13.3.1.d)

Response: Item 13.3.1.d uses rectangular style control switches with internal backlighted position indication. This is a nonsafety Feedwater Heater Vent and Drain panel, which requires only minor surveillance after startup. The existing sequence has no precedent with the control room as this switch style is not used elsewhere. Therefore, the arrangement is not inconsistent within the WNP-2 design. No action required.

RESPONSE: No NRC comment was noted against this Supply System response. However, as additional information, NUREG-0700 Section 6.4.2.1 states that an "UP" control action should be used for an "open" function and "DOWN" control action for a "close" function. A top (open) to bottom (close) switch arrangement is consistent with this guideline. No changes are required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-4.31

WPPSS NO. 13.3.14.b

REVIEWER:

RESPOND BY:

The handles of the following switches obscure the respective pointers or labels when viewed from a normal operating position:

Oval-handled switches on panels 603 and 820. (13.3.14.b)

Response: Items 13.3.14.a and b are oval-handled reset switches, single action, with spring return to normal. Reset lights to determine trip and reset condition are located above each switch. Switch handles are consistent and unique in shape to indicate that the switch is a reset control. No action required.

Comment: On P820, the response description does not match the switches on the panel and should be resolved prior to licensing. The oval-handled reset switches on P603 are acceptable.

RESPONSE: Only two oval handled switches exist on P820. These are the DEH Reservoir Low Fluid Level Lockout Reset switch and the Anti-Motoring Lockout Reset switch. Each has a Lockout Circuit available indicating lamp located above the switch to provide visual indication of reset status. The switches are identical to those noted for P603 in style and function. The earlier response description matches the oval handled reset switches. No corrective action is required for these switches.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-5.8

WPPSS NO. 24.7.1

REVIEWER:

RESPOND BY:

The operator is directed by the scram procedure to verify rod insertion using the RSCS display (not yet installed), which consists of a matrix of red indicating lights. It is conceivable that one or more rods not inserted might not be noticed in a time-critical, stressful situation if the operator must rely upon this display. (24.7.1)

Response: The Graphic Display System format provides for quick verification of rod insertion. A single Rod Insertion color-filled square will identify all rods in (green) or all rods not in (red). Also, computer printouts of rod position are available. No action required.

Comment: The response does not resolve the HED.

RESPONSE: The RSCS unit is now installed in Panel P603. A review of the red LED indicator lights with all LEDs light was performed. The LEDs have good illumination, and their bright red color has excellent contrast from the panels dark background. A slow scan of the LEDs takes about ten seconds. The scram procedure does not rely on the operator's ability to verify reactor shutdown by use of this one device. Verification of shutdown is specified by the procedure by use of diverse instrumentation; step 3 - verify that power level is decreasing by use of APRM monitors; and step 4 - verify that all rods are full in by use of the RSCS. The RSCS unit was specified, because it is a hard-wired device powered from an essential power source. Also, operators are trained not to rely on any one indication and to double-check alternate instrumentation. The use of the term "verify at the RSCS console" does not restrict the operator from using the GDS or computer printout as a double check to the RSCS unit. To preclude the concern, the scram procedure will be modified prior to fuel load to allow the operator to verify rod insertion by any of the three methods.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-5.11

WPPSS NO. 24.4.5

REVIEWER:

RESPOND BY:

Steps I.2 of PPM 5.1.3 and E.2 of PPM 5.3.1 direct the operator to prevent ADS actuation by repeatedly pressing the timer reset buttons. No indication is available to the operator by which he can verify that the logic has been reset. (24.4.5)

Response: Emergency procedures have been modified to read "reset every ninety seconds" to qualify the term "repeatedly." Need for further action will be based on operational training and simulator experience. No further action required at this time.

Comment: The response does not address the question of verification that reset has been accomplished.

RESPONSE: As the operators activate the "reset" pushbuttons, "ADS LOGIC A (B, C, D) INITIATED" annunciator alarms will clear. These four alarms (two for each reset control) are located above their respective ADS systems for clear visibility. During abnormal operation when inhibiting system activation is required, the alarms will clear as the "reset" control is activated then return to alert status as the "reset" control is released, providing the operator with reset indication.

As a long-term upgrade, ADS logic will be modified by or during the first refueling outage to include a bypass switch to enable the operator to inhibit ADS actuation. The need to verify timer reset is not of concern here, only the ability to prevent timer time out which would result in ADS actuation. The above modification will resolve this concern. ADS system logic reset prior to unbypassing the inhibit control can easily be checked by the operator verifying that the ADS trip annunciator alarms have returned to normal.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-5.51

WPPSS NO. 10.3.4

REVIEWER:

RESPOND BY:

Indicators and recorders should be scaled in units which directly relate to system operation. The following inconsistencies were noted: (10.3.4)

- a. The containment instrument air differential pressure indicator on panel 840 is scaled in psig rather than psid.
- b. The circulating water plenum level indicators on panel 840 are scaled in feet elevation (referenced to sea level). A level referenced to the bottom of the plenum would be preferred (as on the spray pond pit level indicators).
- c. LPRM indicators in the four rod display on panel 603 are scaled in "% heat flux." Usually, these indicators are actually scaled in watts/cm².
- d. The SLC tank "level" indicator on panel 603 is scaled in "gallons" (volume).
- e. Some feedwater heater shell pressure indicators on panel 840 are scaled in psig, while others are scaled to psia.
- f. The condenser vacuum indicators on panel 820 are scaled in "in. Hg absolute;" whereas, alarm points and action levels relative to condenser vacuum are normally specified in "in. Hg vacuum."
- g. The recombiner differential pressure indications on panel 672 are scaled in "inches." The labels should more correctly specify "inches H₂O."
- h. The tower makeup flow recorder on panel 824 is scaled in percent. Indication of the actual flow, in gallons per minute, may be more useful.

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NRC NO.

E-5.51

WPPSS NO.

10.3.4

Response: Item 10.3.4.a is a pressure display. The legend plate wording "P" is incorrect and will be corrected prior to fuel load. Items 10.3.4.b, f, g, and h will be corrected prior to fuel load. Item (5) is correct as is. Low and high pressure feedwater heaters have different pressure range requirements. The "PSIA" indicators are grouped apart from the "PSIG" indicators such that display conflict should be minimal. Resolution to items 10.3.4.c and d will be noted in the Final Report.

Comment: Items c and d should be resolved and corrected prior to licensing. Items a, b, e, f, g, h are acceptable but should be verified prior to licensing.

RESPONSE: Item c - The four-rod LPRM flux scales are identified as "% Heat Flux" with a 0-125 scale range. The use of watts/cm² suggests definitive values can be applied. In actuality, these meters are only used as a comparison of heat flux around a rod selected for movement. Specific values are not required by procedures nor is specific data recording performed. There are no specific actions or limits identified with these meters, and the use of watts/cm² as a specific value is highly dependent on frequent calibration. The use of the term "% Heat Flux" is more descriptive of the functional use of these indicators. No action required.

Item d - The use of gallons for the SLC storage tank enables the operator to quickly verify that adequate amounts of boron have been injected into the reactor during plant abnormal conditions and to monitor subsequent batches without conversion tables if required. The distinction between the use of gallons versus inches for level is inconsequential in this application. No changes are required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-5.52

WPPSS NO. 24.4.1

REVIEWER:

RESPOND BY:

RHR and LPCS pump discharge pressures are not instrumented.
(24.4.1)

Response: Emergency procedures for WNP-2 do not require RHR and LPCS pump discharge pressure displays. No action required.

Comment: This item should be addressed as part of the DCRDR Task Analysis.

RESPONSE: RHR and LPCS pump discharge pressures are indicated locally but not in the control room. This is consistent with the NSSS design and FSAR.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-5.53

WPPSS NO. 24.7.6

REVIEWER:

RESPOND BY:

There is currently no way of definitely determining when the RHR shutdown cooling interlock has cleared, other than attempting to line up the system. A permissive light may be useful in this application. (24.7.6)

Response: RPV pressure recorders, adjacent to the RHR systems on panel P601, are available to the operator to determine when pressure is below the interlock point. Addition of annunciator alarms or indicating light would not further enhance the operator's ability to perform. Possible addition of scale set point additions or color banding will be reviewed per item 10.3.1 response. (Finding 5.62) No action required.

Comment: This item should be addressed as part of the DCRDR task analysis.

RESPONSE: The RHR shutdown cooling interlock clears at 135 psig reactor pressure. The operators are directed by the latest scram procedure not to initiate RHR shutdown cooling mode until reactor pressure reduces to at least 75 psig. This is well below the interlock pressure setting. The interlock is for equipment protection and is not a specified pressure point for any automatic or manual action by systems or operators. Visual identification of interlock clearance is not required.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-5.54

WPPSS NO. 10.3.9

REVIEWER:

RESPOND BY:

Labels on recorder scales specifying units of measurement and labels on controller scales specifying scale multipliers are often small and difficult to read. (10.3.9)

Response: A review of indicator scales was completed for readability. In general, font size variations did not prove distracting and existing font size appeared adequate for visibility. No action required.

Comment: Font sizes should be checked against the readability guidelines of Section 6.5.1.3 of NUREG-0700.

RESPONSE: A nominal viewing distance of 30 inches will be used as the criteria for the review of font sizes. Based on NUREG-0700, this defines a required 0.125 character height minimum. Smaller recorders (one, two, and three pen) use pen color/description labels for noting the above parameters. See NRC Audit Finding D-5.50. These presently meet the above criteria. All scale unit of measurements and multipliers will be brought into conformance by the first refueling outage.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-5.55

WPPSS NO. 10.3.18

REVIEWER:

RESPOND BY:

Nonstandard numerical progressions were noted on many instruments. (10.3.18)

Response: A review was completed of all indicators and recorder scales in the control room. See item 10.3.17 finding 5.50 for response. Most of the remaining scales use major progression steps of three, with two submajor and twelve minor lines, or are nonlinear due to hardware design. Readability and extrapolation were found as adequate on these scales. No further action required.

Comment: The response does not justify the no further action decision.

RESPONSE: Except where specific application require nonstandard progressions (i.e., phase angle or wind direction are normally noted in 30° increments), all scales will be brought into conformance with NUREG-0700 guidelines by the first refueling outage.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-5.56

WPPSS NO. 10.3.17

REVIEWER:

RESPOND BY:

Many instruments are scaled with more than the recommended nine intermediate graduations between numbered divisions. (10.3.17)

Response: A review was completed of all indicator and recorder scales in the control room. Seventeen scales were found inadequate and require changeout, and four will be deleted prior to fuel load. Extrapolation capability and readability were found adequate on all other scales. No further action required.

Comment: The response does not justify the no further action decision.

RESPONSE: All scales will be brought into conformance with NUREG-0700 guidelines by the first refueling outage.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-5.57

WPPSS NO. 24.6.28

REVIEWER:

RESPOND BY:

The scales of the wide range and fuel zone RPV water level recorders have greater than the recommended number of graduations between numbered subdivisions. (24.6.28)

Response: A new fuel zone scale will be installed prior to fuel load. The wide-range scale is acceptable as is. No further action required.

Comment: The wide-range scale should be corrected prior to licensing.

RESPONSE: The existing wide range RPV level scale has its major multiples in 50-inch units, with four submajors between majors, and one minor between submajors, or a total of 9 graduations between majors. This conforms to NUREG-0700 guidelines. No change is required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-5.58

WPPSS NO. 10.3.19

REVIEWER:

RESPOND BY:

Color coding might be used to differentiate scales on dual-range recorders, such as the turbine-generator temperature recorders on panel 820. (10.3.19)

Response: Color banding and setpoint identification coding will be initiated after fuel load when sufficient operational experience has been obtained. Resolution will be noted in the Final Report.

Comment: The response does not appear to address the HED.

RESPONSE: Color coding is used at WNP-2 to differential scales only where scale differentiation is required for the safety and reliability of the plant due to the complexity of parameter control. The IRM/APRM recorder scales use red and black to identify narrow and wide band ranges. This is a very specific and controlled application. No other application is planned at WNP-2.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-5.59

WPPSS NO. 10.3.3

REVIEWER:

RESPOND BY:

Parallax was noted on the following indicators; (10.3.3)

RCIC controller, panel 001

Horizontal indicators on panel 800

Lowest row of indicators on panels 820 and 840

Response: An eight-inch platform was installed in front of P001 to provide the operator improved access and visibility to the displays and controller. Residual parallax on this panel is considered minimal. Color banding and setpoint additions, as noted in item 10.3.1 (Finding 5.62) response, above, will minimize the parallax on panels P800, P820, and P840. No further action required.

Comment: Parallax problems need a positive response. Color banding may not be visible on low-range indicators on P820, 840. Horizontal indicators on P800 are acceptable.

RESPONSE: A review was performed of the indicators located on P820 and P840. Indicator design is such that the pointers are located at the right hand edge of the scales directly in line with the edge of the scale face. There is no raised distance between the pointer and scale face. With this design, there is essentially no apparent displacement as seen from two different heights. No action is required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-5.61

WPPSS NO. 10.3.11

REVIEWER:

RESPOND BY:

Recorder scale numerals or graduation marks can be obscured by the recorder pointer in the following instruments: (10.3.11)

Post-accident monitors, panel 601

Recirculation flow recorder, panel 602

Computer trend recorders, panels 602 and 603

Core pressure drop and flow recorder, panel 603

Nuclear instrumentation recorders, panel 603

Hydrogen analyzer recorder, panel 672

Prefilter inlet temperature recorder, panel 672

Absorber outlet flow recorder, panel 672

Dessicant dryer temperature recorders, panel 672

Generator voltage, frequency, and megawatt recorders, panel 800

Differential pressure recorders, panel 812

Containment pressure, suppression chamber temperature, and suppression chamber level/pressure recorders, panel 814

Generator temperature recorder, panel 820

Tower makeup flow recorder, panel 824

Chlorine recorders, panel 826

Blowdown flow recorder, panel 840

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Response: A review was completed of the listed recorders. Those recorders considered essential (i.e., Post-Accident Monitors) have backup indicators for monitoring and process control. Quick response readability and/or exactness are not required for the other recorders. Readability is considered adequate on the above listed recorders. No action required.

Comment: Response does not justify no action decision.

RESPONSE: Only one recorder obscures scale numerals: the multipoint generator temperature recorder on P820. Graduation marks are all readily visible. The chart paper matches the scale and is readily readable. Also, this recorder is not used for process control but for noting deviations from normal trends. The operator focuses on the chart paper most often. The graduation marks are distinct as to major, submajor, and minor, and if needed, direct readings are readily discernable even if a number is covered. The pointer mechanically is linked at the top edge of the scale and points downward to both lower scales. Shortening the pointer would reduce readability between the pointer and the lower scale. Narrowing the pointer would not resolve the concern. Since the scales are readable as is, the correct chart paper is installed, and the prime use of the recorder is trending, the benefit of modifying the recorder is minimal as compared to the manpower and potential costs. No action is required on this recorder.

All other recorders noted have only their graduation marks obscured by the pointer. These are single, dual, and three-pen recorders with one pen per scale linked from the bottom of the scale pointing up. Pointers on these recorders will be modified to improve scale graduation visibility by lowering the pointers downward, raising the scales, or a combination thereof. These will be completed by commercial operation.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-5.62

WPPSS NO. 10.3.1

REVIEWER:

RESPOND BY:

- Indicator scales have generally not been marked or color coded to indicate normal and abnormal ranges. (10.3.1)

Response: Color banding and trip setpoint additions will be applied past fuel load when application guidelines and operational experience have been obtained. Resolutions will be noted in the Final Report.

Comment: Temporary markings should be in place prior to licensing, with permanent markings to be based on operational experience.

RESPONSE: Temporary markings are being installed on selected instrumentation where their addition is of value to the operator. Temporary markings will be verified based on operational experience and made permanent by the first refueling outage.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-5.63

WPPSS NO. 11.3.3

REVIEWER:

RESPOND BY:

Alarm points and operating limits are not identified on recorder scales. (11.3.3)

Response: See item 10.3.1 (Finding 5.62) for response.

Color banding and trip setpoint additions will be applied past fuel load when application guidelines and operational experience have been obtained. Resolutions will be noted in the Final Report.

Comment: See Finding 5.62 comment.

RESPONSE: See Supply System response to 5.62.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-5.66

WPPSS NO. 24.6.29

REVIEWER:

RESPOND BY:

The scale of the HPCS pressure indicator does not conform to recommended standards. (24.6.29)

Response: A review was completed of all indicator and recorder scales in the control room. Seventeen scales were found inadequate and require changeout, and four will be deleted prior to fuel load. Extrapolation capability and readability were found adequate on all other scales. No further action required. (10.3.17)

A review was completed of all indicators and recorder scales in the control room. See item 10.3.17 for response. Most of the remaining scales use major progression steps of three, with two submajor and twelve minor lines, or are nonlinear due to hardware design. Readability and extrapolation were found as adequate on these scales. No further action required. (10.3.18)

Comment: See findings 5.55 and 5.56.

RESPONSE: The scale progressions are in multiples of 300 with 14 minors between majors, or 20 psig per minor. This display is adequately readable as not to require immediate revision. However, the HPCS pressure indicator scale will be brought into conformance with NUREG-0700 by the first refueling outage per response to NRC Audit Finding E-5.55, E-5.56, and D-5.38.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-5.67

WPPSS NO. 24.7.7

REVIEWER:

RESPOND BY:

The IRM/APRM recorder selector switches incorporate a center "0" position (off) which appears to have no functional value. While its existence would not seem to be detrimental to plant operation, it remains an unnecessary provision. The utility should, therefore, consider deleting this function. (24.7.7)

Response: Resolution will be noted in the Final Report.

Comment: Resolution should be accomplished prior to licensing.

RESPONSE: The selector switches used do not have a break before make feature. Therefore, an intermediate position was created by the Nuclear Steam Supplier to ensure the IRM/APRM or IRM/RBM signals did not intermix whenever the recorder signal inputs were changed. This is a necessary provision to prevent erroneous recorder indications and potential instrument channel logic trips. Deletion of the center position is not required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-5.69

WPPSS NO. 24.4.9

REVIEWER:

RESPOND BY:

Several steps include a cautionary statement prescribing RPV depressurization below 57 psig unless certain conditions are satisfied. This value would be difficult to discern using existing hardwired instruments, since the wide range level recorders and indicator are scaled in graduations of 20 psig. (24.4.9)

Response: GDS displays and computer peripherals are available to the operator with the required accuracy. Need for further action will be based on operational training and simulator experience. No further action required at this time.

Comment: Response does not address the HED. GDS/Computer displays do not resolve problems of this type.

RESPONSE: Emergency Procedures will be revised to change the 57 psig limit for RPV depressurization to 60 psig. This is consistent with the 20 psig graduation markings on the indicator scale. The procedure will be revised prior to RPV pressurization by nuclear heating.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-5.70

WPPSS NO. 24.4.10

REVIEWER:

RESPOND BY:

The following parameter values identified in the task analyses would be difficult to discern using installed instrumentation, as the instrument scales cannot practically be read to the specified accuracy: (24.4.10)

1150 gpm HPCS flow (PPM 2.4.4, Step C.8)

200 gpm standby service water flow (PPM 2.4.5, Step D.2)

145 psig RPV pressure (PPM 5.3.4, Step B.1)

RPV pressure 76 psig above suppression chamber pressure (PPM 5.3.5, Step F.1)

RPV pressure 96 psig above suppression chamber pressure (PPM 5.3.5, Step F.2)

RPV pressure 238 psig above suppression chamber pressure (PPM 5.3.6, Step C.1)

8% reactor power (PPM 5.3.7, Note 1)

Response: GDS displays and computer peripherals are available to the operator with the required accuracy. Need for further action will be based on operational training and simulator experience. No further action required at this time.

Comment: Response does not address the HED. See finding 5.69.

RESPONSE: HPCS, PPM 2.4.4: A procedure revision provides actions for less than 7175 gpm or under/over 1250 gpm. These flow rates are engineered values for pump runout and minimum flow.

Procedural qualifiers such as "less than," "more than," or "not exceed" enables adequate operator response. Also, in the design operating mode (LOCA), it is not necessary for the operator to respond to indicated flows not now provided by the HPCS flow meter. No action is required.

SW, PPM 2.4.5: The procedure has been revised to specify 2000 gpm instead of 200 gpm: the meters at P601 have 200 gpm subdivisions. No change is required for the meter on P601. However, the service water flow meters at Board A read in % instead of gpm. These will be corrected prior to fuel load.

Vol. 5 Procedures, RPV Pressure: In all cases, the referenced procedures specify an action at a pressure above or below the specified pressure and specified pressures are engineered values. RPV pressure is scaled to 20 psig subdivisions and suppression chamber pressure to 2 psig subdivisions. In procedures 5.3.5 and 5.3.6, the operator is required to determine the difference between RPV pressure and suppression chamber pressure before applying the engineered procedural value. RPV pressure may be taken from the computer digital display or graphic display system if accident conditions demand more exact readings than obtainable from the pressure indicator.

Changing indicator scales is not practical; modifying pressure values in procedures is nonproductive as a result of the arithmetical requirement. The required actions are considered within the capabilities of the operator using existing equipment and procedures. Also, procedure revision may be a deviation from emergency procedure guidelines. No action is required.

8% Reactor Power PPM 5.3.7: Minor divisions on meters at P603 are 5%; on back panels, minor divisions are 1% power. This procedure requirement is "maintain power above 8% but as low as practicable." Front panel (P603) instruments permit the immediate requirement to be satisfied with finite control provided using back panel indicators. Revising the 8% value may be a deviation from emergency procedure guidelines. No action is required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-6.53

WPPSS NO. 7.3.14

REVIEWER:

RESPOND BY:

The WNP-2 standard list of abbreviations for control room labels does not include the following terms: (7.3.14)

Reactor Building, abbreviated as "REAC BLDG" and "RB" on panel 602, "REACTOR BLDG" and "REAC BLDG" on panel 812.

Radwaste Building, abbreviated as "RDWST BLDG" on panel 812 and "RBW BLDG" on panel 825.

Scram Discharge Volume, variously abbreviated as "SDV," "SCRAM DISCH VOL," and "DISCHARGE VOL" on panel 603.

Startup, abbreviated as "SU" on panel 800.

Tower makeup, abbreviated as "TMU" on panel 824.

Response: TMU (Tower Makeup System) and SDV have been added to the abbreviation standard. Others will be added as the need arises. No further action required.

Comment: Resolution of the balance of this HED needed prior to licensing.

RESPONSE: The abbreviation for Reactor Building was standardized as "RB." Note the term "Reactor Bldg" is not considered an abbreviation of the full term but only of the word building. The use of "RB" was applied only once, and then on the panel P813 in a location where "Reactor Bldg" was not used. "Reactor Bldg" has been consistently used throughout the control room.

Radwaste has been consistently abbreviated "RW" and building "BLDG." No abbreviation for "startup" exists in the control room or is required. A review of all annunciators, legend plates, etc., indicates conformance with the plant abbreviation standard. No further action required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-6.113

WPPSS NO. 24.7.4

REVIEWER:

RESPOND BY:

PPM 5.2.2 cautions the operator to question the validity of RPV level indications when elevated drywell temperatures exist in the vicinity of the level instrument reference legs. These temperatures are indicated on panel 814, sensed by four temperature elements referenced by number in the procedure. Some form of distinctive labeling might be beneficial here to facilitate the identification of the specified indications, as a total of 46 temperatures are instrumented on panel 814. (24.7.4)

Response: Resolution will be noted in the Final Report based on operational experience.

Comment: Consideration should be given to placing these indicators closer to the RPV level indicators.

RESPONSE: The elevated temperature concern is only applicable to RPV level instrumentation having reference legs with vertical runs within the drywell area. An engineering review of WNP-2 design reveals no vertical reference legs runs within the drywell area. The procedure has been revised to remove the drywell temperature monitoring references. Also, drywell temperature instrumentation has been relocated on panel P601, near ECCS controls and level instrumentation, as a part of human factors and RG-1.97 upgrade. No further changes required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-8.46

WPPSS NO. 5.3.15

REVIEWER:

RESPOND BY:

Main steam line temperature indications are not grouped together on panel 820. (5.3.15)

Response: New group legend plates will be installed prior to fuel load to improve visibility. Rearrangement of displays is not required as displays are nonessential for system operation. No further action required.

Comment: Indicators should be relocated to P601 above the MSIV controls.

RESPONSE: It is assumed that the concern is with inadvertent closure of an MSIV and the use of the temperature instrumentation to analyze the problem. The use of the Main Steam Line (MSL) temperature indicators is not the most direct instrumentation and would be misleading to the operator. Individual MSL flow indicators are located on P603 as part of the RPV level/feedwater control system. Flow is a more positive and faster indication than temperature for valve position problems. Also, the temperature sensors are physically located between the MSL 24" equalizing header and turbine stop and control valves. Thus, steam will feed back from the other main steam lines via the equalizing header past the temperature sensor to the turbine. The present placement of the temperature sensors negates its use for the purpose of MSIV closure diagnostics. The flow elements are located upstream of the MSIVs and are not affected by the equalizing header upon valve closure. Moving the MSL temperature indicators to P601 serves no purpose and is not required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. E-8.47

WPPSS NO. 5.3.16.e

REVIEWER:

RESPOND BY:

The feedwater heater pressure indicators on panel 840 are arranged in a right-to-left numerical sequence. (5.3.16.e)

Response: Feedwater heater arrangement is presently from high pressure heaters to low pressure heaters (left to right). This arrangement is preferred by operations. No action required.

Comment: (See Finding 9.7).

RESPONSE: Operators are trained to respond on this system from high pressure to low pressure stages and by the direction of the heater cascading drain flow system. This arrangement (left to right) is also in agreement with the orientation of heater vent and drain controls on P832 (top to bottom). Re-arrangement would be opposite the operators' normal way of relating to the system and would conflict with the orientation of controls on P832. No changes are required. Also, see NRC Finding D-9.7 for further Supply System response.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-1.36

WPPSS NO. 10.3.2

REVIEWER:

RESPOND BY:

Some glare was evident on the following indicators: (10.3.2)

Upper indicators on panels 001 and 100

Recirculation Controller Meters, panel 602

Top row of indicators on panel 800

Lowest row of indicators on panels 820 and 840

Vibration monitors, panel 840

Upper indicators and controllers on panel 813

Response: Diffusers will be installed on the lamp fixtures relative to panels P001 and P100 during the first refueling outage. Glare on the other panels is considered minimal. No further action required.

Comment: Diffusers at the remote shutdown panel should be installed prior to licensing.

RESPONSE: Diffusers will be installed prior to commercial operation. See NRC Finding D-1.30.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-3.18

WPPSS NO. 14.5.2.4.a

REVIEWER:

RESPOND BY:

Cleared alarm auditory signals should have a dedicated, distinctive, audible signal which should be of finite duration. (14.5.2.4.a)

Response: No duration control exists. To provide duration control for the "Clear" tone, the audio response circuits in each annunciator control card would need to be modified. This would be a major change and possibly schedule impacting. An alternative is to modify the Reset controls to allow the operator to silence the "Clear" tone from any set of response controls in the primary operating area. Resetting the flashing "Clear" light would only be allowed at the specific panel. Thus, the reset "Clear" circuit would be identical to the acknowledge "Alert" circuit noted in item 14.5.3, below. This would provide the operators the added advantage of consistency of control function and control over the audible "Clear" tone. Implementation will be after fuel load, and upon resolution of item 14.5.5.1.a, an Implementation Schedule will be noted in the Final Report.

Comment: See Finding 3.79 for further information.

RESPONSE: The "reset" pushbutton circuit modification noted in Supply System's response 14.5.2.4.a will be implemented during the first refueling outage.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-3.72

WPPSS NO. 16.3.5

REVIEWER:

RESPOND BY:

Annunciator Procedures (16.3.5)

- a. Nonstandard abbreviations are used in the text of annunciator procedures.
- b. Some nonmenclature inconsistencies are apparent in the annunciator procedures.
- c. Aspects of the content of annunciator procedures are not in compliance with recommended criteria.

Response: Resolution will be noted in the Final Report.

Comment: Procedures should be corrected prior to licensing.

RESPONSE: *Annunciator procedures will all be revised prior to fuel load. Abbreviations, terminology, administrative format, and technical content will be reviewed for consistency and accuracy to plant design and standards.*

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-3.74

WPPSS NO. 14.3.13

REVIEWER:

RESPOND BY:

Lit annunciator windows are distinguishable from extinguished ones, but the as-installed amber windows are virtually indistinguishable from white windows. (14.3.13)

Response: Amber and white windows do not have adequate contrast when lit. Color lamp boots and several types of colored film are being tried. Resolution will be noted in the Final Report.

Comment: This HED should be resolved prior to licensing.

RESPONSE: The original amber color was achieved by use of a yellow sticky back film behind the annunciator window. Sample color lamp boots, different shades of lense sticky back color film, and use of solid colored lenses were tested on control room panels. This included combinations of the above and use of several layers of color film during contrast reviews. The solid colored lenses were rejected as the red and amber colors were readily visible and could be distracting for the operators when focusing on surrounding alarms.

The use of colored boots did not improve the visibility even with the yellow film, and several layers of yellow film did not improve it. Several shades of film were used. Chartpack No. PF04 orange produced a good amber color and contrasted acceptably against the surrounding white plates.

All amber lenses have been modified with the new orange colored film. General Physics has reviewed the above and has concurred that the change now provides good contrast.

Red: Pantone by Letraset #206A Red

Orange: Chartpack Cat. No. PF04 Orange

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-3.76

WPPSS NO. 14.3.7

REVIEWER:

RESPOND BY:

The annunciator windows on the fire control panels (although not evaluated as part of this survey) are extremely difficult to read due to the small letter size and the low height of some of the windows. (14.3.7)

Response: Resolution will be provided in the Final Report.

Comment: This HED should be resolved prior to licensing.

RESPONSE: The lowest engraved alarm window is 46 inches above the floor. This is above the minimum display guideline height of 41 inches for vertical panels. It is also less than the 75° upper limit for the visual field of view. Based on a nominal viewing distance of 30 inches, the field of view is 38.2° for a 95th percentile male looking downward. A character height of 0.125" is used with a width-to-height ratio of about 1:8. This provides a viewing distance of 31 inches based on a 15-minute maximum visual angle. Windows use black letters on white lenses for good contrast. This panel is used for closeup viewing and is provided with a distinctive alarm tone and an illumination flashing system for detectability and directivity. No changes are required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-3.77

WPPSS NO. 14.5.4.7

REVIEWER:

RESPOND BY:

The operator should be able to read all the annunciator windows from the position at the work station where the acknowledge control is located. (14.5.4.7)

Response: Panels P601, P840, P820, and P800 are not in compliance. Addition and relocation changes of response controls noted in item 14.5.5.2, below, and changes in character heights noted in item 14.3.6 will minimize this concern. Implementation of these changes will be based on resolution of item 14.5.5.1.a and noted in the Final Report.

Comment: Viewing angle at some viewing distances is less than 45° on P800, 820, 840, 601, 603. Also see Finding 3.68.

RESPONSE: Addition and relocation of annunciator response controls noted in Finding E-3.70 will resolve the concerns at Panels P601, P820, and P840. See E-3.70 for resolution and implementation schedule.

Panel P603 is located directly in front of the NSSS operator's work station from which during steady state operation all alarm tiles are readable, even though outside the minimum viewing distance. See NRC Finding E-3.68 response. During most of the panels operational evaluations, two operators are seated at the panel center, where the horizontal line of sight is 45° or greater, within NUREG-0700 guidelines. However, the horizontal viewing angle from the annunciator acknowledge control is about 30°, outside the 45° minimum. This deviation from horizontal viewing angle is considered minimal at this panel based on its operational evolutions and visibility from the NSSS operator's work station.

Panel P800 has left and right horizontal viewing angles of about 22° and 41°. Operational evolutions on this board are not centralized, and not all alarm windows are readable from the BOP operator's desk. A redundant set of annunciator response controls will be installed on the left side of the panel during the first refueling outage. The 41° horizontal viewing angle is considered a minimal deviation from NUREG-0700 guidelines, and the present set will be left where they are.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-3.79

WPPSS NO. 14.5.5.1.a

REVIEWER:

RESPOND BY:

Controls should include a separate silence pushbutton for the "alert" auditory system. Separate alert tone silence controls do not exist. (14.5.5.1.a).

Response: Modifying the present control set design to add separate "silence" controls for the audible "alert" signals does not appear feasible on the main ECCS, RFW, and T-G panels where the feature may most be wanted.

Layout changes on these panels would be necessary to provide room, which would adversely affect system configuration control and layout. The addition of the silence control to other panels would cause inconsistency in design and layout and be of little added value without incorporation on the ECCS, T-G, and RFW panels.

To reduce the potential of inadvertent acknowledging of alarms while silencing the alert tone, the audio alarm system is being modified as noted in item 14.5.3. By splitting the audio tone groups into four areas (P601, P602/P603, P800/P820/P840, and back panels), the operator is less prone to be focusing outside the alarms audio group when silencing the alarm.

Resolution as to the adequacy of the existing response control arrangement, with the added directional tone grouping changes, will be noted in the Final Report after operational experience is obtained.

Comment: Resolution should be accomplished prior to licensing.

RESPONSE: See Supply System response to E-3.70.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-3.80

WPPSS NO. 14.5.5.1.b

REVIEWER:

RESPOND BY:

It should be possible to silence an auditory alert signal from any set of controls in the primary operating area. (14.5.5.1.b)

Present design does not comply. Only within the tone grouping for panels does this apply. Silencing between tone groupings does not exist within the primary operating area.

Response: The Acknowledge Controls will be modified after fuel load to enable the operator to silence any control room "alert" tone from any acknowledge control in the primary operating area. Acknowledging from any back vertical panel will only silence the back vertical panel audible alarm system and not a primary area alarm. The fire system and computer alarms are to remain separate and independent. Implementation schedule is based on the resolution of item 14.5.5.1.a, above, and will be noted in the Final Report.

Comment: Implementation schedules should be proposed and accepted prior to licensing.

RESPONSE: See Supply System response to E-3.70.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-4.32

WPPSS NO. 13.3.7

REVIEWER:

RESPOND BY:

Switches with projecting handles near the edges of the benchboard apron sections may be prone to inadvertent actuation. (13.3.7)

- a: Two MSIV valve controls on P601 would cause a reduction in plant output if a valve were closed.
- b: Two recirculation pump breaker controls on P602 would cause a reduction in plant output if a breaker were opened.

Response: Resolution to items 13.3.7.a and b will be deferred until the Final Report.

Comment: Resolution should be accomplished prior to licensing.

RESPONSE: A three-inch high handrail will be installed in front of the Isolation Control System (MSIV) area on Panel P601, and the handles on the two recirculation pump breaker switches on P602 will be changed from a J-style to an oval style. Installation will be completed prior to fuel load.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

F-4.34

WPPSS NO.

10.3.12

REVIEWER:

RESPOND BY:

The automatic setpoint scale in Bailey controllers moves up in response to a downward movement of the controller thumbwheel and vice versa. (10.3.12)

Response: Resolution will be noted in the Final Report.

Comment: HED should be corrected prior to licensing.

RESPONSE: A review of all controllers was completed. All setpoint scales move to an increasing scale value with an upward movement of the thumbwheel and visa versa. This conforms to NUREG-0700 guidelines. Scales are consistent in design to meter scales and NUREG-0700 as to lower values below and higher values above. The setpoint drum wheel must rotate downward to expose the high value number, because the pointer bar is fixed on the controller. All controllers conform to good human factor practices. No action required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-4.35

WPPSS NO. 13.3.11

REVIEWER:

RESPOND BY:

Rectangular indicating lights, some of which are also push button switches, are used on panel 820. No coding or identification method is provided to distinguish those which are switches from those which are simple indicating lights. (13.3.11)

-Response: A review of the vendor light status and control displays will be performed prior to fuel load. Resolution will be noted in the Final Report.

Comment: Design solution and implementation schedules should be prepared and approved prior to licensing.

RESPONSE: Providing a coding or identification method to distinguish between push-button and nonpushbutton indication lights is not necessary. Use of status/push-button lights is limited in the WNP-2 design to specific subpanels where operators have been fully trained on areas of DEH Control, Rod Worth Minimizer, Rod Sequence Controller, and SRM/IRM Positioner. Deviations from NUREG-0700 is considered to have minimal affect on safety and reliability. No changes are required.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-4.36

WPPSS NO. 13.3.19

REVIEWER:

RESPOND BY:

Keylock controls are used for the reactor mode switch and the scram discharge volume high level bypass switch on panel 603. Prompt activation of these controls may be required during plant operation, suggesting that keylocks may not be the most convenient protective measure in these applications. (13.3.19)

Response: Resolution will be noted in the Final Report.

Comment: Resolution and implementation schedules should be prepared and accepted prior to licensing.

RESPONSE: The mode switch is required by Plant Technical specifications to be locked in the shutdown position and the key removed. At all other times, the key will be in place for operator use. No change is required.

The Scram Discharge Volume Bypass switch has sufficient interlock circuits to void the need for a keylock switch in this application. This switch will be replaced during the first refueling outage. Meantime, the key will be left in the switch to provide quick accessibility.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-4.37

WPPSS NO. 13.3.14.c and d

REVIEWER:

RESPOND BY:

The handles of the following switches obscure the respective pointers or labels when viewed from a normal operating position: (13.3.14.c and d)

c: Main generator exciter field ground test switch, panel 800.

d: Main generator ground test, field breaker, and voltage regulator switches, panel 800.

Response: Items 13.3.14.c and d controls will be reviewed after operating experience is obtained. Resolution of these items will be noted in the Final Report.

Comment: Resolution should be accomplished prior to licensing.

RESPONSE: The switch legend plates located above the main generator exciter controls will have switch positions engraved along the bottom edge of their labels. The switch handles do not obscure the legend plates so switch positions will be readily visible. Labels will be temporarily marked prior to fuel load and permanent labels will be applied prior to commercial operation.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-5.16	WPPSS NO. 24.4.12
REVIEWER:	RESPOND BY:

Suppression pool water levels specified throughout the emergency procedures are referenced to the bottom of the suppression pool; whereas, the recorders to be installed on panel 601 will reportedly be referenced to the normal level and to sea level (narrow-range and wide-range instruments, respectively). This convention complicates the evaluation of plant conditions, as the expressed values must be arithmetically converted to a different reference. (24.4.12)

Response: The wide-range scale will reference to the bottom of the suppression pool. Sea level will not be used. No action required.

RESPONSE: No NRC comment was noted against Finding F-5.16. However, wide range suppression pool level instrumentation has been verified as reading from suppression pool bottom (0 to 60 feet). Sea level elevation reference is not used on this instrumentation.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-5.60

WPPSS NO. 10.3.10

REVIEWER:

RESPOND BY:

Scale numbers can be partially obscured by the pointers of the circular indications found on panels 601, 603, 800, and 820.
(10.3.10)

Response: A review was completed of circular indicators. These are nonprocess indicators and do not require exactness of reading for process control. Color banding, to be applied past fuel load, will enhance operator recognition of normal operating bands where required. No further action required.

Comment: Color banding should be applied prior to licensing See finding 5.62.

RESPONSE: Temporary color banding will be installed prior to fuel load. Permanent markings will be based on operational experience and installed by the first refueling outage.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-5.68

WPPSS NO. 24.6.24

REVIEWER:

RESPOND BY:

The condenser vacuum instruments are scaled in in. -Hg abs.; whereas, low vacuum trips and alarms are generally specified in in. -Hg vac. (24.6.24)

Response: Resolution will be noted in the Final Report.

Comment: Resolution and correction should be accomplished prior to licensing.

RESPONSE: The units of measurements on the condenser vacuum indicators on P820 has been changed from "in. -Hg abs" to "in/HG vacuum" per the HED finding. Action has been completed.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-5.71

WPPSS NO. 24.6.27

REVIEWER:

RESPOND BY:

The scale of the SBTG flow controllers does not correspond to that of the related flow indicators. (24.6.27)

Response: Resolution will be noted in the Final Report.

Comment: Resolution and proposed implementation schedule should be completed prior to licensing.

RESPONSE: The SGT flow indicators have been replaced with flow recorders having revised scales.

Controller scales: 0-600 ($\times 10$) CFM

Recorder scales: 0-60 ($\times 100$) CFM

Both scales are identical except for the multipliers. Each has seven majors and nine minors between majors. No further action required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-5.72

WPPSS NO. 6.3.1

REVIEWER:

RESPOND BY:

No standards are in effect governing the color coding of controls and demarcation lines. (6.3.1)

Response: A separate demarcation guideline has been completed. A switch color coding guideline will be prepared and reviewed against the control room prior to the Final Report.

Comment: Switch color coding guideline should be available and in use prior to licensing.

RESPONSE: A review of the control room indicates that application of switch color coding has been minimal. Red is used to highlight emergency trip controls, and white has been used to provide contrast to J-style control handles where needed. Except for the remote shutdown room, white has been used for two switches on Panel P602. The present use of color coding is minimal, and expansion of the above is not foreseen. A color standard is not presently needed.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-5.73

WPPSS NO. 6.3.3

REVIEWER:

RESPOND BY:

Unique indicating light color codes are utilized on several vendor-supplied modular panel inserts (Digital Electro Hydraulic (DEH), rod worth minimizer, reheater controller, and vibration monitors). These color conventions are sometimes at variance with those defined by the standard. (6.3.3)

Response: Color code review and upgrading of vendor status light modules were deferred until past fuel load. Resolution will be noted in the Final Report.

Comment: Review and resolution should be completed prior to Licensing.

RESPONSE: A review was performed of the vendor-supplied modular panels.

RWM uses amber in two locations to alert the operator to an error selection or out-of-sequence condition. Red is used to identify failure of the RWM unit and a rod block condition which results from three selection errors and prevents any further rod pulls. The above color coding by severity appear appropriate.

Red is also used to identify that the unit is either in manual or automatic mode. Auto mode should be white and manual mode amber.

RSC uses amber and red to define the LED display mode. The legend "Amber Display Control" is used with the amber colored switch to control the amber display LED lights for rod selection group status. The legend "Red Display Control" is used with the red colored switch to control the red display LED lights for rod position status. The color coding vs. LED light color display is well coordinated. The amber agrees with the color standard. The use of red here is appropriate as it relates to a primary monitoring point of information required during scrams (all rods are full in).

Vibration monitors on P840/P820 use amber LEDs for alert and red LEDs for Hi-Hi trips. These appear appropriate. Green LEDs are used for -18 volt and -20 volt power supply monitoring status. These should be white.

Reheater controller colors are a mixture of green, blue, red, and amber colors. Six pushbutton backlight switches are mode selector controls and should be white. The two groups of four red/green indication lamps are valve position lights. Their color code is consistent with the open/close color coding scheme for WNP-2. The six mode selector controls will be changed to white.

Correction of the red RWM lamp for auto and manual, green vibration unit lamps and the reheater controller lights to white will be completed by the first refueling outage as specialized lamp covers need to be procured.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

F-5.75

WPPSS NO.

11.3.1

REVIEWER:

RESPOND BY:

The printouts of multipoint recorders are difficult to read. The printed numerals are small, overlapping, and indistinct. (11.3.1)

Response: Multipoint recorders are not used for parameters requiring process control. Computer monitoring and/or annunciator alarms are available for points of concern. Upgrade or changeout of multipoint recorders is not considered cost effective based on the limited operating experience to date. These will be reassessed prior to the Final Report.

Comment: HED should be reassessed prior to licensing.

RESPONSE: Multipoint recorders are basically used for observation of trends or specific points which are showing peculiar characteristics. No changes are planned unless operating history dictates a change is necessary. In these cases, the specific application and operator needs will be evaluated. Reassessment at this time does not indicate that upgrading of the multipoint recorders is necessary.



HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO.

F-5.76

WPPSS NO.

10.3.5

REVIEWER:

RESPOND BY:

Units of measurement are not specified on the following instrument: (10.3.5) .

RCIC Controller, panel 001.

Response: Resolution as to the RCIC controller will be noted in the Final Report.

Comment: HED should be corrected prior to licensing.

RESPONSE: Units of measurements (GPM) has been placed at the base of the setpoint demand meter. This location provides constant visibility to the operator. No further action required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-6.114

WPPSS NO. 24.6.20

REVIEWER:

RESPOND BY:

The DEH valve controls are labeled "raise" and "lower" instead of the preferred "open" and "close." (24.6.20)

Response: This will be resolved prior to the Final Report.

Comment: Resolve prior to licensing.

RESPONSE: Turbine speed and generator load are controlled by either the throttle valves or governor valves, depending on the specific status of the plant. Raise and lower refer to speed and load conditions which are appropriate. The use of TV and GV refer to the specific valves which perform the function. Operators will be specifically trained on the DEH controls prior to startup. No change is necessary.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-6.115

WPPSS NO. 7.3.31

REVIEWER:

RESPOND BY:

The fonts used for switch escutcheon legends are not consistent.
(7.3.31)

Response: A review of escutcheon fonts was completed for readability. Baking ring-type escutcheons were found to be uniform. Control head style escutcheons varied on font size. Most of the control head escutcheons were easily readable. Changes will be made based on operational need and review after fuel load. Resolution will be noted in the Final Report.

Comment: Resolution should be accomplished prior to licensing.

RESPONSE: The font on control head style escutcheons will be improved to ensure easy readability. Small and/or nonbold characters will be corrected by re-engraving or escutcheon replacement. Temporary labels on escutcheons will be replaced with permanently correctly engraved escutcheons. The appropriate administrative procedure will be revised prior to fuel load to require periodic cleaning of escutcheon engravings. Re-engraving and/or replacement of escutcheons will be completed prior to commercial operation.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-6.116

WPPSS NO. 6.3.6

REVIEWER:

RESPOND BY:

Most "reset" buttons are silver, but the RCIC initiation logic reset button on panel 601 is black. (6.3.6)

Response: Resolution will be noted in the Final Report after a switch color standard has been prepared.

Comment: See Finding 5.72.

RESPONSE: A review of all pushbuttons in the control room indicate the following:

Test Controls:	16 black	17 silver
Reset Controls:	24 black	4 silver

Operators do not recognize or relate to pushbutton colors except where red is used. Color has no formal meaning, and the operators are not trained to respond to any black or silver color code. The colors have been grouped by function and location; i.e., all interlock resets are silver on P602, all MSIV test switches are black on P601. The present pushbutton switches are well identified as Reset or Test by their escutcheons and legend plates. As long as the controls are consistent in color within the area of functional grouping, the use of either black or silver is considered adequate. A review of each panel was performed for consistent color used by functional grouping. Only four pushbutton switches noted were of concern: the annunciator test button on P840 is black while the other two are silver; and P821 has three black annunciator pushbutton controls, while other pushbutton controls around them are silver. New color heads will be ordered and installed upon delivery.

As to NRC Audit Finding:

F-6.117 - This is the only test button on P820. The only other pushbuttons are two red turbine generator trip switches and the three silver annunciator control response controls. There is no inconsistency within this panel. No corrective action is required.

F-6.116 - The RCIC functional area on P601 has nine pushbuttons: three red initiation and trip pushbuttons, two silver test buttons, and four reset buttons (one black and three silver). This control is not consistent in color in this area. However, in this application, contrast is actually a Human Factor Enhancement. This particular switch resets the RCIC trip logic. It was specifically located between the RCIC Initiation and the Turbine trip switches to improve visibility and grouping of these switches. This section of the panel contains numerous silver colored controls. Being black, it affords the operator the ability to quickly respond to an inadvertent or unwanted RCIC trip by focusing in on the one black pushbutton in this functional area. No change is required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-6.117

WPPSS NO. 6.3.7

REVIEWER:

RESPOND BY:

Most "test" pushbuttons are black, but the standby DEH pump test button on panel 820 is silver. (6.3.7)

Response: Resolution will be noted in the Final Report after a switch color standard has been prepared.

Comment: See Finding 5.72.

RESPONSE: See response to F-6.116, above. No change is required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-8.48

WPPSS NO. 5.3.16.a

REVIEWER:

RESPOND BY:

SRV controls on panel 602 are arranged in columns rather than rows. Valves "U" and "V" are out of sequence on the vertical section of the panel. (5.3.16.a)

Response: Rearrangement of SRV controls has been deferred until past fuel load. Resolution will be based on operational and simulator experience and noted in the Final Report.

Comment: Resolution should be accomplished prior to licensing. In addition, the seven ADS valves should be distinctively coded. (e.g. demarcation, color padding.)

RESPONSE: Rearrangement of the SRV controls will not be implemented. The present arrangement conforms to emergency procedure requirements. The procedures call out sequential opening of the valves starting with MS-RV-5B and then 3D, 5C, 4D, 4B, 4A, and 4C. This sequence is left-to-right and top-to-bottom with the present arrangement. Rearrangement by alpha-numeric sequence would mix up the operational sequencing. No change is required.

The labels on all ADS valves have presently engraved the abbreviation ADS for visibility. A 1/8-inch red color strip running the full length of the top of the legend plate will be also installed on each ADS label prior to fuel load for distinctive coding.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-8.50

WPPSS NO. 5.3.16.k

REVIEWER:

RESPOND BY:

The spray pond "A" temperature indication is placed to the right of the "B" indication on panel 820. (5.3.16.k)

Response: Spray pond temperatures and levels will be resequenced. Schedule for correction will be noted in the Final Report.

Comment: Implementation schedule should be proposed and accepted prior to licensing.

RESPONSE: Panel P820 spray pond temperature and level indicators will be resequenced to locate spray pond A indicators to the left of spray pond B indicators by the first refueling outage.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-8.51

WPPSS NO. 5.3.17

REVIEWER:

RESPOND BY:

The relative positions of the "open" and "closed" valve position indicating lights on panel 832 (and some on panel 813) are the reverse of those on all other panels. (5.3.17)

Response: Indicating position lights on P813 will be corrected prior to fuel load.

P832 is a nonsafety panel (feedwater heater vent and drains). Correction of the indicating lamps has been deferred until the first refueling outage.

Comment: P832 should be corrected prior to licensing.

RESPONSE: The indicating lamps are color coded and labeled "close" or "open." The fact that the panel is a nonsafety panel, not frequently used, not required to mitigate an abnormal event, is properly color coded and has engraved open/close legends on the lenses and is a distinctive switch not used elsewhere in the control room, should minimize the effect of the reverse light sequence. No changes are required.

HUMAN ENGINEERING DEFICIENCY FINDING

NRC NO. F-8.52

WPPSS NO. 5.3.21

REVIEWER:

RESPOND BY:

Undifferentiated or only partially differentiated strings or matrices of components were noted in the following locations: (5.3.21)

Panel 601: HPCS indicators. SRV controls. Isolation valve controls.

Panel 603: Standby Liquid Control (SLC) system indicating lights.

Panel 800: Indicators on vertical section.

Panel 811/827: Indicators and controllers.

Panel 813: Containment vacuum breaker controls.

Panel 814: Drywell temperature indicators.

Panel 820: Turbine auxiliaries indicators. Steam Jet Air Ejector (SJAE) indicators. Turbine drain valve controls. Reheater controls. Evaporator controls.

Panel 832: Control Switches.

Panel 840: Reactor Feedwater Pump Turbine (RFPT) indicators.

Response:

Panel 601: Application of new labels, color padding, and demarcation as presently defined, and rearrangement of the SRVs as noted in item 5.3.16.a, above, will minimize the undifferentiated effect. No further action required.

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F-8.52

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5.3.21

- Panel 603: The placement of the new labels will be against their respective indicating lights, leaving a visual gap below them to provide adequate differentiation. No further action required.
- Panel 800: The new labels and demarcation lines minimize this effect. The only areas of concern are at the diesel generator displays, which are pending several design changes. Resolution in this area will be noted in the Final Report.
- Panel 811/827: A design review noted that four of the controllers on each panel has been made nonfunctional but not removed from the panels. These will be removed prior to fuel load. New group labeling for the indicators will be installed prior to fuel load to provide visual differentiation. No further action required.
- Panel 813: See item 5.3.16.h, (Finding 8.1) above, for response.
- Panel 814: New group labeling will be installed prior to fuel load. The displays were rearranged by drywell elevation and area (top-to-bottom, left-to-right) to allow application of group labels. No further action required.
- Panel 820: New group labeling and demarcation lines will be installed prior to fuel load. No further action required.
- Panel 832: New labels, demarcation, and improved mimicking will be installed prior to fuel load. No further action required.
- Panel 840: The string of eight RFPT displays will be separated (three turbine displays and five oil system displays) during the first refueling outage. No further action required.

Comment: All design corrections should be installed, reviewed, and reported prior to licensing.

NRC NO.

F-8.52

WPPSS NO.

6.3.21

RESPONSE: General Physics Corporation has reviewed these areas to ensure adequate differentiation now exists. Panel enhancements have resolved all items noted above.

- P601: The HPCS bus voltage meter and voltage selector switches were colored padded to improve visibility. No further differentiation required.
- SRV control switches do not lend themselves to differentiation. Legend plates were provided having the PSIG relief setpoints and identifying the ADS valves. Red color bands will be installed on the ADS control legend plates to improve visibility. No further differentiation required.
- The MSIV isolation valves have been demarcated and labeled with minor lines to differentiate them from the overall isolation valve grouping. No further differentiation required.
- P603: The top two lamps were replaced with square engraved lenses. The new labels were placed adjacent to their respective indicating lamps, leaving a visual gap below the plate to provide adequate differentiation. No further differentiation required.
- P800: Demarcation was applied around functional groupings of indicators: Startup Power, Backup Power, 480V Distribution, 4.16 KV Power, 6.9 KV Power, DG-1, DG-1, Bus SM-7 Power, Bus SM-8 Power, and Generator Yard switching. With the additional response noted in D-8.43, no further differential change is required.
- P811/P827: See responses to NRC Audit Findings D-8.41 and D-8.40.
- P813: The containment vacuum breaker controls were demarcated into two groupings: Reactor Building to Wetwell breakers and Wetwell to Drywell breakers. The latter group was also subdivided by Rear and Front breakers by a subdemarcation line. No further differentiation is required.
- P814: See response to NRC Audit Finding D-8.42.
- P820: See response to NRC Audit Finding D-8.44 for the indicators. The controls were functionally grouped by use of demarcation lines: Turbine Drain Valves, Evaporator Controls, Moisture Separator Reheater Controls, Steam Jet Air Ejectors, and Turbine Sprays. The Reheater and Steam Jet Air Ejector controls were further divided into A and B units with sub-demarcation lines. No further differentiation is required.
- P832: Demarcation will be applied around the matrix of trap station bypass controls. The rest of the panel is mimicked and further differentiation is not required. See also NRC Audit Finding D-6.92.
- P840: See response to NRC Audit Finding D-8.38.
- With the completion of NRC Audit Finding items D-8.40, D-8.41, D-8.43, and D-8.38 prior to fuel load, no further differentiation will be required.

