

AUDIT REPORT

HUMAN FACTORS ENGINEERING  
PRELIMINARY DESIGN ASSESSMENT AUDIT

WASHINGTON PUBLIC POWER SUPPLY SYSTEM  
NUCLEAR PROJECT NO. 2 (WNP-2) 388

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Richard W. Froelich  
Jack W. Savage  
Kenneth O. Harmon  
L. Rolf Peterson

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## AUDIT REPORT

### HUMAN FACTORS ENGINEERING CONTROL ROOM PRELIMINARY DESIGN ASSESSMENT AUDIT

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

#### Introduction

A human factors engineering in-progress audit of the WNP-2 control room was performed at the WNP-2 site on June 6 through June 9, 1983. The audit was carried out by a team from the Human Factors Engineering Branch, (HFEB), Division of Human Factors Safety, assisted by consultants from Lawrence Livermore National Laboratory (University of California), Livermore, California. The audit was based on the applicant's Control Room Design Review (CRDR) Preliminary Report dated April 1983.

This report presents the results of the HFEB/consultant review of the applicant's Preliminary Report and of our independent assessment of the WNP-2 control room. Parts B, C, E, and F are based on the applicant's Control Room Design Review Preliminary Report dated April 1983. Parts A and D are based on the review team's independent assessment of the WNP-2 control room. In each part, the finding numbers are referenced to the guideline sections of NUREG-0700: i.e., findings beginning with 1.-- address Control Room Workspace human engineering discrepancies (HEDs), findings beginning with 2.-- address Communications HEDs, etc. WNP-2 numbers in parentheses refer to the identification system of their Preliminary Report of April 1983.

Part A describes those control room features or components that could not be evaluated by the review team. These items must be reviewed and evaluated by the applicant. Any identified HEDs must be reported to the NRC. Discrepancies should be corrected prior to licencing <sup>or</sup> on a schedule approved by NRC.

Part B is a list of those HEDs identified by the applicant which the review team determined not to be discrepancies or for which no further applicant or NRC action is required.

Part C is a list of those HEDs identified by the applicant for which the proposed resolution was satisfactory but corrective actions had not been implemented at the time of the site visit. Unless otherwise specified, review and verification of these improvements must be completed prior to licensing.

Part D describes those HEDs which were identified by the review team during the site visit. These HEDs must be reviewed by the applicant. Proposed resolutions and implementation schedules must be submitted to the NRC.

Part E describes those HEDs identified by the applicant for which the review team does not agree with the applicant's proposed resolution or the applicant's decision to make no correction.

Part F describes those HEDs identified by the applicant for which the proposed resolution is satisfactory, but where implementation should be accomplished sooner than proposed by the applicant.

Part G indexes the NRC finding numbers and WNP-2 HED numbers to Parts A through F.

AUDIT REPORT  
PART A

HUMAN FACTORS ENGINEERING  
CONTROL ROOM PDA AUDIT

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

Part A

The following control room features or components could not be reviewed during the June 6-9 site visit. These features and components must be reviewed and evaluated by the applicant. Any identified HEDs must be reported to the NRC. Discrepancies should be corrected prior to licensing on a schedule approved by the NRC.

1.0 CONTROL ROOM WORKSPACE

FINDING

- 1.1 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. (4.1)\*
- 1.2 Portions of Panel P-813 were under construction and could not be evaluated.
- 1.3 Control room sound levels could not be reviewed. (19.1.2)
- 1.17 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. (20.3.1)
- 1.18 Radiation monitoring equipment was not available in the control room. (20.3.2)
- 1.20 Accommodations were not provided for the storage of protective gear, spare parts, and personal belongings. (19.3.3)
- 1.31 Document organization and storage provisions in the control room and at the remote shutdown panel were not in final form.

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\* Numbers in parenthesis refer to the WNP-2 Preliminary Report HEDs.

### 3.0 ANNUNCIATOR WARNING SYSTEMS

#### FINDING

- 3.4 Audio alarm signal detection and intensity levels could not be reviewed. (14.5.3.1)
- 3.5 "Reflash" capability for annunciation of a second input from a multiple input alarm could not be reviewed. (14.3.19, 14.5.2.1.b, 14.3.11)

### 5.0 DISPLAYS

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

### 7.0 PROCESS COMPUTERS

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

AUDIT REPORT  
PART B

HUMAN FACTORS ENGINEERING  
CONTROL ROOM PDA AUDIT

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

Part B

This part lists those HEDs identified by the applicant (by finding number and by WNP-2 Preliminary Report HED number) for which corrections have been made and verified or where no further action by the applicant is needed.

<u>FINDING</u>	<u>WNP-2 HED</u>	<u>FINDING</u>	<u>WNP-2 HED</u>
1.4	3.3.3	3.21	18.3.2
1.5	3.3.1.c	3.23	14.5.4.1
1.6	3.3.1.e	3.24	14.5.2.4.b
1.7	3.3.1.b	3.25	14.5.4.2
1.8	3.3.2.a	3.26	14.3.3
1.9	3.3.2.c	3.27	14.5.4.5
1.10	3.3.2.e	3.28	14.5.4.6
1.11	3.3.2.g	3.35	14.3.8.f
1.12	3.3.1.f	3.36	14.3.8.g
1.35	19.3.2	3.37	14.3.8.h
		3.48	15.5.5.1.c
2.1	17.3.1	3.49	14.5.5.1.d
		3.50	14.5.5.1.e
3.8	24.3.4	3.69	14.3.17
3.9	24.3.5	3.75	14.5.4.4
3.10	24.3.6		
3.11	24.3.7		
3.17	14.5.2.2, 14.3.18		
3.20	14.5.2.3		

<u>FINDING</u>	<u>WNP-2 HED</u>	<u>FINDING</u>	<u>WNP-2 HED</u>
4.1	13.3.20	6.46	7.3.12
4.2	24.6.32	6.72	24.7.3
4.3	13.3.9	6.75	5.3.7
4.4	24.6.35	6.78	5.3.9
4.5	13.3.12	6.82	7.3.29
4.6	24.6.34	6.83	7.3.30
4.7	13.3.18	6.86	6.3.5
4.8	13.3.14a	7.1	15.3.1
5.1	24.5.4	8.2	24.5.7
5.3	10.3.14	8.3	24.5.9
5.4	10.3.8	8.6	5.3.16
5.6	11.3.4	8.11	9.3.2
5.7	11.3.5	9.1	5.3.23
5.15	24.4.11		
5.74	12.3.1		

AUDIT REPORT  
PART C

HUMAN FACTORS ENGINEERING  
CONTROL ROOM PDA AUDIT

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

Part C

This part lists those HEDs identified by the applicant (by finding number and WNP-2 Preliminary Report HED number) for which the proposed correction was satisfactory but the corrective action had not been implemented at the time of the June site visit. Unless otherwise noted, NRC verification of these corrections should be completed prior to licensing. Staff comments associated with some of these HEDs are identified by a parenthetical number following the finding number. These staff comments are listed at the end of this part.

<u>FINDING</u>	<u>WNP-2 HED</u>	<u>FINDING</u>	<u>WNP-2 HED</u>
1.13	24.5.1	3.31	14.3.8.b
1.14	21.3.2	3.32	14.3.8.c
1.15 (1)	3.3.1.d	3.33	14.3.8.d
1.16 (2)	24.5.10	3.34	14.3.8.e
1.19 (3)	19.3.1	3.38	14.3.8.i
		3.39	14.3.8.j
		3.40	14.3.8.k
3.1	24.3.1	3.41	14.3.8.l
3.2	24.3.2	3.42	24.3.9.a
3.3	24.3.3	3.43	24.3.9.b
3.6	14.3.20	3.44	24.3.9.c
3.7	14.3.9	3.45	24.3.9.d
3.12	24.3.8	3.46	14.3.10
3.13 (4)	14.5.2.1.a	3.47	14.3.5
3.19 (5)	18.3.1	3.51	14.5.5.2.c
3.22	14.5.3.3	3.52 (5)	14.5.3.2
3.29	14.3.4	3.53	14.5.4.3
3.30 (6)	14.3.8.a	3.54	14.3.12



<u>FINDING</u>	<u>WNP-2 HED</u>
4.9	13.3.7.c
4.10	13.3.13
4.11	3.3.2.b
4.12	13.3.1.a
4.13	13.3.1.c
4.14	13.3.3
4.15	13.3.2
4.17	13.3.16
4.16	13.3.15
4.18	24.6.33
5.2	10.3.6
5.5	11.3.2
5.9	24.7.2
5.10	24.4.3
5.12	24.4.2
5.13	10.3.5
5.14	24.6.13
5.18	10.3.16
5.19	24.4.6
5.20	24.4.7
5.21	24.4.8
5.23	24.6.25
5.24	10.3.13
5.25	10.3.15
5.26	6.3.2
5.27	24.4.4
5.28	24.6.3
5.29	24.6.22
5.30 (7)	11.3.7
5.64 (8)	12.3.2
5.65 (8)	12.3.3

<u>FINDING</u>	<u>WNP-2 HED</u>
6.1	7.3.1
6.2	6.3.8
6.3	7.3.2
6.4	7.3.4
6.5	7.3.7
6.6	7.3.9
6.7	11.3.6
6.8	24.6.8
6.9	24.6.9
6.10	7.3.10
6.11	7.3.3.2
6.12	7.3.43
6.13	7.3.40.a
6.14	7.3.40.b
6.15	7.3.40.c
6.16	7.3.40.d
6.17	7.3.40.e
6.18 (9)	7.3.41
6.19	7.3.42
6.20	24.6.21
6.21	5.3.4
6.22	7.3.33
6.23	7.3.34
6.24	7.3.8
6.25	7.3.35
6.26	7.3.36
6.27	7.3.37
6.28	13.3.17
6.29	24.6.7
6.30	24.6.14
6.31	24.6.16

<u>FINDING</u>	<u>WNP-2 HED</u>
6.32	24.6.17
6.33	24.6.18
6.34	24.6.19
6.35	5.3.14
6.36	7.3.3
6.37	7.3.6
6.38	7.3.38
6.39	7.3.39
6.40	11.3.8
6.41	11.3.9
6.42	11.3.10
6.43	7.3.15
6.44	7.3.16
6.45	7.3.25
6.47	7.3.17
6.48	7.3.18
6.49	7.3.19
6.50	24.6.10
6.51	24.6.11
6.52	7.3.13
6.54	7.3.21
6.55	7.3.22
6.56	7.3.23
6.57	7.3.24
6.58	7.3.26
6.59	7.3.27
6.60	24.6.12
6.61	24.6.15
6.62	24.6.20
6.63	13.3.4
6.64 (10)	7.3.28
6.65	7.3.5

<u>FINDING</u>	<u>WNP-2 HED</u>
6.66	7.3.11
6.67	13.3.5
6.68	21.3.5
6.69	10.3.7
6.70	5.3.1
6.71	5.3.2
6.73	24.6.1
6.74	6.3.4
6.75	5.3.3
6.77	5.3.8
6.79	24.6.3
6.80	5.3.5
6.81	5.3.6
6.84 (11)	5.3.13
6.85 (11)	24.6.1
7.2	15.3.2
8.1	5.3.16.h
8.4	12.3.4.d
8.5	24.5.6
8.7 (11)	5.3.16.i
8.8	5.3.16.j
8.9 (11)	5.3.16.l
8.10	24.5.8
8.12	13.3.10
8.13	12.3.4.a
8.14	23.3.4.b
8.15	23.3.4.c
8.16	5.3.16.d
8.17	5.3.16.f

<u>FINDING</u>	<u>WNP-2 HED</u>	<u>FINDING</u>	<u>WNP-2 HED</u>
8.18	5.3.16.g	8.27	5.3.19
8.19	24.6.5	8.28	24.6.6
8.20	24.7.5	8.29	5.3.18
8.21	5.3.10	8.30	5.3.12
8.22	5.3.11	8.49	5.3.16.b
8.23	5.3.20		
8.24	5.3.22	9.2 (11)	24.5.5
8.25	24.5.2		

NOTES

- (1) Legibility of illuminated status indicators should be reviewed and verified prior to licensing.
- (2) Glare and parallax should be reviewed and verified to be acceptable prior to licensing.
- (3) See finding 1.36. Diffusers for remote shutdown panel light fixtures should be installed prior to licensing.
- (4) To be verified during DCRDR.
- (5) Review in conjunction with finding 3.22.
- (6) Applies to findings 3.30 through 3.34, and 3.38 through 3.40: The wording of these alarm panels does not clearly define the meaning of the alarm.
- (7) Pen color parameter should be noted on all recorders.
- (8) Shift turnover procedures should be reviewed and verified by the NRC prior to licensing. A detailed review of the single indicating light problem and potential design solutions should be made part of the DCRDR.
- (9) Verification that an administrative procedure controlling the use of temporary labels should be provided prior to licensing.
- (10) See finding 6.108 concerning label with too narrow stroke width.
- (11) To be resolved in the DCRDR.

AUDIT REPORT  
PART D

HUMAN FACTORS ENGINEERING  
CONTROL ROOM PDA AUDIT

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

Part D - This part contains Human Engineering Discrepancies (HEDs) identified by the review team during the site visit. These HEDs must be reviewed by the applicant. Acceptable corrections and implementation schedules shall be reported to NRC.

1.0 CONTROL ROOM WORKSPACE

FINDING

- 1.21 P-601 - The unlabeled, blank controllers on this panel should be removed to reduce visual noise. (B314)
- 1.22 P-601 - The Square Root Extractor provides no operator information. (B324)
- 1.23 P-001, P-100 - No procedures, nor facilities for storing procedures, are available at the RSP. (B608)
- 1.24 P-830 - Some controls and mimics on P-830 and controls on P-831 are below the anthropometric height limits. (B504)
- 1.25 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). (B113)
- 1.26 All main panels - The top row of annunciator panels are 85" from floor and are vertical; not tilted forward to provide better visibility. (B301)
- 1.27 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)

AUDIT REPORT  
WNP-2  
PART D

FINDING

- 1.28 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. (B127)
- 1.29 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. (B223)
- 1.30 P-001 - Glare on meters makes reading difficult. (B604)

2.0 COMMUNICATIONS

FINDING

- 2.2 SRO Desk - Communications to kitchen and restroom are inadequate. The telephone currently provided in the kitchen is not sufficient. (B129)

3.0 ANNUNCIATOR WARNING SYSTEMS

FINDING

- 3.55 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. (B120)
- 3.56 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). (B329)
- 3.57 P-840, P-820, P-800 - Split screen tiles result in 70 tiles on 8 panels and 60 tiles on 5 panels. (B302)
- 3.58 P-603 - Nomenclature for Control Rod Drive System on annunciators is inconsistent: CRD System, Control Rod Drive System, Rod Drive Control System. (B330)

AUDIT REPORT  
WNP-2  
PART D

FINDING

- 3.59 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.). (B303)
- 3.60 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. (B106)
- 3.61 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)
- 3.62 On all annunciator panels - Character height will be: .187, .215, .250 inches. Character heights should be consistent and meet readability guidelines.
- 3.63 P-820 - Some annunciator controls are out of easy reach. Only one properly placed annunciator control would be adequate for all of panel 820. (B118)
- 3.64 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. (B306)

4.0 CONTROLS

FINDING

- 4.19 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). (B207) Also see Finding 7.11. (B-206)
- 4.20 P-840 - Unneeded controllers are present (e.g., RHR heat exchanger A and B cooling water pressure). (B213)

AUDIT REPORT  
WNP-2  
PART D

FINDING

- 4.21 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). (B116)
- 4.22 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. (B514)
- 4.23 P-603 - Some Bailey Controllers have small flush pushbuttons which are hard to operate (e.g, P-603). (B515)
- 4.24 P-603 - There are several broken pushbuttons on this panel. (B510)
- 4.25 P-603 - Different color buttons are used for IRM range controls-2 red knobs (upper), 2 black knobs (lower). (B401).
- 4.26 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) (B507)

5.0 VISUAL DISPLAYS

FINDING

- 5.32 P-601 - Heat Exchanger Vent valve controls do not have indicators to tell if valves are open or closed. Operators feel they are needed. (B312)
- 5.33 P-602 - Flow Controllers, Flux Controllers, and Master Controller deviation meters do not have (+) and (-) indications shown on scale. (B327)
- 5.34 P-601 - There are two sets of seven red indicator lights with no apparent function. (B316)
- 5.35 P-001 - The Square Root Extractor on the front panel is not needed by the operator. (B601)

AUDIT REPORT

WNP-2

PART D

FINDING

- 5.36 P-840 - Numbers on the controller (0-100) have no units (e.g., % open). Operators "think" that 0 is closed, 100 is open. (B105)
- 5.37 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. (B112)
- 5.38 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 (B511)
- 5.39 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)
- 5.40 P-601 - The meter scale on the Fuel Zone Monitor indicator is labeled in increments of 40 inches. (B313)
- 5.41 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 (B326)
- 5.42 All panels - Normal/abnormal operating ranges are not available on indicators, and ranges that are installed are temporary. (B128)
- 5.43 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)
- 5.44 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)



AUDIT REPORT  
WNP-2  
PART D

FINDING

- 5.45 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. (B119)
- 5.46 P-603 - There is no way to tell push buttons vs. indicator lights on Rod Worth Minimizer and Rod Monitor control subpanels. (B328)
- 5.47 P-672 - Two dissimilar scales on recorder OG-FR620 are log scales, and the paper does not match either scale. (B121)
- 5.48 P-672 and other back panels have unlabeled recorders, dual pen recorders with pens not identified, and recorder paper not matching recorder scales. (B122)
- 5.49 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)
- 5.50 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)

6.0 LABELS AND LOCATION AIDS

FINDING

- 6.87 P-821 - There are labels missing and incorrect on both A and B MS line pressure, MSIV leakage, and line heater temperature. (B219)
- 6.88 P-601 - There are two sets of four unlabeled recorders. (B315)
- 6.89 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). (B-516)

AUDIT REPORT  
WNP-2  
PART D

FINDING

- 6.90 P-001 - There are missing, extraneous and temporary labels and mimics on RSP. (B603)
- 6.91 P-100 - The Spray Pond B level indicator has two unidentified elevation markings on the face. (B606)
- 6.92 P-832 - There are large matrices of switches which do not have an alphanumeric location identification system. (B801)
- 6.93 P-820 - MS bypass valves A, B, C, and D and STR Blowdown valve need a system label. (B215)
- 6.94 P-601 - The ADS System label is in the wrong location. (B318)
- 6.95 P-601 - The label on the HPCS Pump indicator says Pressure/Flow while meters are oriented Flow/Pressure. (B308)
- 6.96 P-821 - Meters of the Main Steam Leakage Control system are mislabeled. (B124)
- 6.97 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)
- 6.98 P-601 - The ADS Manual Initiation Switch Armed annunciators do not identify divisions I and II. (B321)
- 6.99 P-601 - RHR System I Actuated annunciator should be RHR Division I Actuated; the same HED applies to RHR Division II. (B323)
- 6.100 P-601 - Labelling on the Local/Remote Mode switch is unclear: Local means panel in diesel generator room. Remote means control room. (B307)
- 6.101 P-601 - The Isolation Control label does not identify what isolation is being reset. Poor labeling. (B320)

AUDIT REPORT  
WNP-2  
PART D

FINDING

- 6.102 P-001 - The RPV level meter has an incorrect label. (B607)
- 6.103 P-840 - Label is misspelled.--"Grand" should be "Gland." (B111)
- 6.104 P-820, P-840 - Component labels for the Containment Instrument Air systems A and B are not identical. (B114)
- 6.105 P-603 - The position letters on the joy stick labels are not placed consistently. (B402)
- 6.106 P-603 - The IRM Range Bypass joy sticks are not placed consistently. (B403)
- 6.107 P-601 - ADS Division nomenclature uses both Arabic and Roman numerals. Roman numerals should be avoided. (B317)
- 6.108 All panels - Subsystem/functional grouping labels have line width to character height ratio greater than 1:10. (B406)
- 6.109 P-100 - There is no demarcation or color padding around annunciator controls.. (B605)
- 6.110 P-001 - Transfer switches are not included within the demarcation lines of associated controls. (B602)
- 6.111 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. (B408)
- 6.112 P-601 - There are no arrows on RHR-B mimics to show direction of flow. (B311)

7.0 PROCESS COMPUTERS

FINDING

- 7.3 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)

AUDIT REPORT

WNP-2

PART D

FINDING

- 7.4 CRT brightness and contrast controls are in a locked compartment and not available to operators. (B210)
- 
- 7.6 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. (B102)
- 7.7 No page total is entered on each page of multipage alarm CRT display. (B205)
- 7.8 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. (B103)
- 7.9 No instructions for reloading paper and ribbon are attached to printers. (B211)
- 7.10 Printout on demand typer is illegible. (B101)
- 7.11 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 linfeed key to space up the paper in order to see. (B206)
- 7.12 Not all annunciator alarms are included in process computer alarm printout. (B209)
- 7.13 There is no provision for alarm printout by alarm group by operator request. (B208)
- 7.14 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)

AUDIT REPORT  
WNP-2  
PART D

D8.0 PANEL LAYOUT

FINDING

- 8.31 P-840 - Uncertainty exists in the operator's mind as to whether label "RFB TURB A DISCH delta P" refers to only Turbine A or to both turbines. There is no Turbine B Disch delta P display. (B109)
- 8.32 P-601 - Safety Relief Valve Controls have no logical functional arrangement (e.g., relief setting level or valve type). (B322)
- 8.33 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. (B115)
- 8.34 P-820 - The benchboard needs demarcation. (B212)
- 8.35 P-820 - This panel needs demarcation. (B214)
- 8.36 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)
- 8.37 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)
- 8.38 P-840 - The lower level on vertical meters for System A is not identical with RFB system B meters. The System A meters should be identical with the System B meters. (B108)
- 8.39 P-603 - There is mirror imaging of SRM and IRM detector position. (B405)
- 8.40 P-811, P-827 - There are sets of 6 meters in a row without space or demarcation. (B501)

AUDIT REPORT  
WNP-2  
PART D

FINDING

- 8.41 P-811, P-827 - There are sets of 7 Bailey controllers in a row without space or demarcation. (These will be re-arranged when H<sub>2</sub> level and O<sub>2</sub> level recorders are installed to replace 2 that are not used). (B502)
- 8.42 P-814 - There are 2 rows of 13 meters each without space or demarcation. (B503)
- 8.43 P-800 - This panel has more than 5 diesel generator meters in a column without a space or demarcation. (B216)
- 8.44 P-820 - There are more than 5 meters in a row on panel without spacing or demarcation. (B217)
- 8.45 P-826 - There is mirror imaging of control room HVAC and Critical SWGR/HVAC controls on this panel. (B123)

9.0 CONTROL-DISPLAY INTEGRATION

FINDING

- 9.4 P-832 - There are many throttling type valve controls for which there is no indication of valve position. (B506)
- 9.5 P-840 - There is a confusing discrepancy between controller scale and meter scales on the CW Inlet Plenum Level Indicator and Controller. (B509)
- 9.6 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. (B319)
- 9.7 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. (B110)
- 9.8 P-603 - Controls and displays are criss-crossed for APRM BYPASS and FLOW UNIT BYPASS systems A and C. (B404)

AUDIT REPORT  
PART E

HUMAN FACTORS ENGINEERING  
CONTROL ROOM PDA AUDIT

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

Part E - This part contains a list of items for which the proposed resolution is unsatisfactory. The applicant must propose a satisfactory resolution with implementation schedule. Any completion date deferred beyond loading fuel must be justified and an acceptable interim correction and implementation schedule proposed.

1.0 CONTROL ROOM WORKSPACE

FINDING

1.32 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.

AUDIT REPORT  
WNP-2  
PART E

FINDING

1.32  
Cont'd

- 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.

- 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.

1.33

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.



AUDIT REPORT  
WNP-2  
PART E

FINDING

1.34

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. ---

3.0 ANNUNCIATOR WARNING SYSTEMS

FINDING

3.65

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.

AUDIT REPORT  
WNP-2  
PART E

FINDING

3.66 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.

3.67 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.

AUDIT REPORT  
WNP-2  
PART E

FINDING

3.68

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.

3.70

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.

FINDING3.70  
Cont'd

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.

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.

AUDIT REPORT  
WNP-2  
PART E

FINDING

3.70  
Cont'd

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.

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.

AUDIT REPORT  
WNP-2  
PART E

FINDING

3.71

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 pushbuttons 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.

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.

4.0 CONTROLS

FINDING

4.27 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.

4.28 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.

AUDIT REPORT  
WNP-2  
PART E

FINDING

4.28  
Cont'd

- 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.

4.29

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.

4.30

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.

Comment: See Comment 4-29 above.

4.31

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.



AUDIT REPORT  
WNP-2  
PART E

FINDING

4.31  
Cont'd

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.

5.0 VISUAL DISPLAY

FINDING

5.8

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 (i.e., operator direction to use the RSCS display).

5.11

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.

5.51

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).

AUDIT REPORT  
WNP-2  
PART E

FINDING

5.51  
Cont'd

- c. LPRM indicators in the four rod display on panel 603 are scaled in "% heat flux." Usually, these indicators are actually scaled in watts/cm<sup>2</sup>.
- 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 H<sub>2</sub>O."
- 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.

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.

5.52

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.

5.53

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)

AUDIT REPORT  
WNP-2  
PART E

FINDING

5.53  
Cont'd

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.

5.54

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.

5.55

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.

5.56

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.

AUDIT REPORT

WNP-2

PART E

FINDING

- 5.57 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.

- 5.58 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.

- 5.59 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.

- 5.61 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

AUDIT REPORT  
WNP-2  
PART E

FINDING

5.61  
Cont'd

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

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.

5.62

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.

AUDIT REPORT  
WNP-2  
PART E

FINDING

5.63 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.

5.66 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.

5.67 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.

5.69 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)

AUDIT REPORT  
WNP-2  
PART E

FINDING

5.69  
Cont'd

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.

5.70

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 HPQS 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.

6.0 LABELS AND LOCATION AIDS

FINDING

6.53

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 BLG" on panel 825.

AUDIT REPORT  
WNP-2  
PART E

FINDING

6.53 Scram Discharge Volume, variously abbreviated as "SDV," "SCRAM  
Cont'd 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.

6.113 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.

8.0 PANEL LAYOUT

FINDING

8.46 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.



AUDIT REPORT  
WNP-2  
PART E

FINDING

8.47

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).

AUDIT REPORT  
PART F

HUMAN FACTORS ENGINEERING  
CONTROL ROOM PDA AUDIT

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

Part F - This part contains a list of items for which the proposed resolution is satisfactory, but the implementation schedule is not satisfactory. The resolution must be implemented prior to licensing.

1.0 CONTROL ROOM WORKSPACE

FINDING

1.36 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.

3.0 ANNUNCIATOR WARNING SYSTEMS

FINDING

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

AUDIT REPORT  
WNP-2  
PART F

FINDING

3.18  
Cont'd

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.

3.72 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.

3.74

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.

3.76

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.

AUDIT REPORT  
WNP-2  
PART F

FINDING

3.77

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.

3.79

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.

3.80

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.

AUDIT REPORT  
WNP-2  
PART F

FINDING

3.80  
Cont'd

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.

4.0 CONTROLS

FINDING

4.32

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.

4.34

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.

4.35

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.

AUDIT REPORT  
WNP-2  
PART F

FINDING

4.35      Comment: Design solution and implementation schedules should be  
Cont'd      prepared and approved prior to licensing.

4.36      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.

4.37      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.

5.0 VISUAL DISPLAYS

FINDING

5.16      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.

Comment: Scale references should be corrected prior to licensing.

AUDIT REPORT  
WNP-2  
PART F

FINDING

5.60 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.

5.68 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.

5.71 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.

5.72 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.

5.73 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)

AUDIT REPORT  
WNP-2  
PART F

FINDING

5.73  
Cont'd

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.

5.75

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.

5.76

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.

6.0 LABELS AND LOCATION AIDS

FINDING

6.114

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.



AUDIT REPORT  
WNP-2  
PART F

FINDING

6.115 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.

6.116 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.

6.117 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.

8.0 PANEL LAYOUT

FINDING

8.48 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.)

AUDIT REPORT  
WNP-2  
PART F

FINDING

8.50 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.

8.51 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.

8.52 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.

AUDIT REPORT  
WNP-2  
PART F

FINDING

8.52  
Cont'd

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.
- 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.

AUDIT REPORT  
PART G

HUMAN FACTORS ENGINEERING  
CONTROL ROOM PDA AUDIT

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

Cross Index by FINDING

<u>**FINDING**</u>	<u>PART</u>	<u>WNP-2</u>	<u>**FINDING**</u>	<u>PART</u>	<u>WNP-2</u>
1. 1	A	4.1	1.26	D	----
1. 2	A	----	1.27	D	----
1. 3	A	19.1.2	1.28	D	----
1. 4	B	3.3.3	1.29	D	----
1. 5	B	3.3. 1.c	1.30	D	----
1. 6	B	3.3. 1.e	1.31	-	----
1. 7	B	3.3. 1 b	1.32	E	16.3. 1
1. 8	B	3.3. 2.a	1.33	E	3.3. 1.a
1. 9	B	3.3. 2.c	1.34	E	3.3. 2.f
1.10	B	3.3. 2.e	1.35	B	19.3. 2
1.11	B	3.3. 2.g	1.36	F	10.3. 2
1.12	B	3.3. 1.f	2. 1	B	17.3. 1
1.13	C	24.5. 1	2.2	D	----
1.14	C	21.3. 2	3. 1	C	24.3. 1
1.15	C	3.3. 1.d	3. 2	C	24.3. 2
1.16	C	24.5.10	3. 3	C	24.3. 3
1.17	A	20.3. 1	3. 4	A	14.5. 3.1
1.18	A	20.3. 2	3. 5	A	14.3.19
1.19	C	19.3. 1	3. 6	C	14.3.20
1.20	A	19.3. 3	3. 7	C	14.3. 9
1.21	D	----	3. 8	B	24.3. 4
1.22	D	----	3. 9	B	24.3. 5
1.23	D	----	3.10	B	24.3. 6
1.24	D	----	3.11	B	24.3. 7
1.25	D	----	3.12	C	24.3. 8

AUDIT REPORT  
WNP-2  
PART G

<u>**FINDING**</u>	<u>PART</u>	<u>WNP-2</u>	<u>**FINDING**</u>	<u>PART</u>	<u>WNP-2</u>
3.13	C	14.5. 2.1.a	3.45	C	24.3. 9.d
3.14	NA	----	3.46	C	14.3.10
3.15	NA	----	3.47	C	14.3. 5
3.16	NA	----	3.48	B	14.5. 5.1.c
3.17	B	14.5. 2.2	3.49	B	14.5. 5.1.d
3.18	F	14.5. 2.4.a	3.50	B	14.5. 5.1.e
3.19	C	18.3. 1	3.51	C	14.5. 5.2.c
3.20	B	14.5. 2.3	3.52	C	14.5. 3.2
3.21	B	14.5. 3.3	3.53	C	14.5. 4.3
3.22	C	18.3. 2	3.54	C	14.3.12
3.23	B	14.5. 4.1	3.55	D	----
3.24	B	14.5. 2.4.b	3.56	D	----
3.25	B	14.5. 4.2	3.57	D	----
3.26	B	14.3. 3	3.58	D	----
3.27	B	14.5. 4.5	3.59	D	----
3.28	B	14.5. 4.6	3.60	D	----
3.29	C	14.3. 4	3.61	D	----
3.30	C	14.3. 8.a	3.62	D	----
3.31	C	14.3. 8.b	3.63	D	----
3.32	C	14.3. 8.c	3.64	D	----
3.33	C	14.3. 8.d	3.65	E	14.3.14
3.34	C	14.3. 8.e	3.66	E	14.3. 1
3.35	B	14.3. 8.f	3.67	E	14.3. 2
3.36	B	14.3. 8.g	3.68	E	14.3. 6
3.37	B	14.3. 8.h	3.69	B	14.3.17
3.38	C	14.3. 8.i	3.70	E	14.5. 5.2.a
3.39	C	14.3. 8.j	3.71	E	14.5. 5.2.b
3.40	C	14.3. 8.k	3.72	F	16.3. 5.a
3.41	C	14.3. 8.l	3.73	NA	----
3.42	C	24.3. 9	3.74	F	14.3.13
3.43	C	24.3. 9.b	3.75	B	14.5.4.4
3.44	C	24.3. 9.c			

AUDIT REPORT  
WNP-2  
PART G

<u>**FINDING**</u>	<u>PART</u>	<u>WNP-2</u>	<u>**FINDING**</u>	<u>PART</u>	<u>WNP-2</u>
3.76	F	14.3. 7	4.28	E	13.3. 6
3.77	F	14.5. 4.7	4.29	E	13.3. 1.b
3.78	NA	----	4.30	E	13.3. 1.d
3.79	F	14.5. 5.1.a	4.31	E	13.3.14.b
3.80	F	14.5. 5.1.b	4.32	F	13.3. 7.a
4. 1	B	13.3.20	4.33	NA	----
4. 2	B	24.6.32	4.34	F	10.3.12
4. 3	B	13.3. 9	4.35	F	13.3.11
4. 4	B	24.6.35	4.36	F	13.3.19
4. 5	B	13.3.12	4.37	F	13.3.14.c
4. 6	B	24.6.34	4.38	NA	----
4. 7	B	13.3.18	5. 1	B	24.5. 4
4. 8	B	13.3.14.a	5. 2	C	10.3. 6
4. 9	C	13.3. 7.c	5. 3	B	10.3.14
4.10	C	13.3.13	5. 4	B	10.3. 8
4.11	C	3.3. 2.b	5. 5	C	11.3. 2
4.12	C	13.3. 1.a	5. 6	B	11.3. 4
4.13	C	13.3. 1.c	5. 7	B	11.3. 5
4.14	C	13.3. 3	5. 8	E	24.7. 1
4.15	C	13.3. 2	5. 9	C	24.7. 2
4.16	C	13.3.15	5.10	C	24.4. 3
4.17	C	13.3.16	5.11	E	24.4. 5
4.18	C	24.6.33	5.12	C	24.4. 2
4.19	D	----	5.13	C	10.3. 5
4.20	D	----	5.14	C	24.6.13
4.21	D	----	5.15	B	24.4.11
4.22	D	----	5.16	F	24.4.12
4.23	D	----	5.17	A	----
4.24	D	----	5.18	C	10.3.16
4.25	D	----	5.19	C	24.4. 6
4.26	D	----	5.20	C	24.4. 7
4.27	E	13.3. 8	5.21	C	24.4. 8

AUDIT REPORT  
WNP-2  
PART G

<u>**FINDING**</u>	<u>PART</u>	<u>WNP-2</u>	<u>**FINDING**</u>	<u>PART</u>	<u>WNP-2</u>
5.22	NA	----	5.54	E	10.3. 9
5.23	C	24.6.25	5.55	E	10.3.18
5.24	C	10.3.13	5.56	E	10.3.17
5.25	C	10.3.15	5.57	E	24.6.28
5.26	C	6.3. 2	5.58	E	10.3.19
5.27	C	24.4. 4	5.59	E	10.3. 3
5.28	C	24.6.30	5.60	F	10.3.10
5.29	C	24.6.22	5.61	E	10.3.11
5.30	C	11.3. 7	5.62	E	10.3. 1
5.31	NA	----	5.63	E	11.3. 3
5.32	D	----	5.64	C	12.3. 2
5.33	D	----	5.65	C	12.3. 3
5.34	D	----	5.66	E	24.6.29
5.35	D	----	5.67	E	24.7. 7
5.36	D	----	5.68	F	24.6.24
5.37	D	----	5.69	E	24.4. 9
5.38	D	----	5.70	E	24.4.10
5.39	D	----	5.71	F	24.6.27
5.40	D	----	5.72	F	6.3. 1
5.41	D	----	5.73	F	6.3. 3
5.42	D	----	5.74	B	12.3. 1
5.43	D	----	5.75	F	11.3. 1
5.44	D	----	5.76	F	10.3. 5
5.45	D	----	6. 1	C	6.3. 8
5.46	D	----	6. 2	C	7.3. 1
5.47	D	----	6. 3	C	7.3. 2
5.48	D	----	6. 4	C	7.3. 4
5.49	D	----	6. 5	C	7.3. 7
5.50	D	----	6. 6	C	7.3. 9
5.51	E	10.3. 4	6. 7	C	11.3. 6
5.52	E	24.4. 1.b	6. 8	C	24.6. 8
5.53	E	24.7. 6	6. 9	C	24.6. 9

AUDIT REPORT  
WNP-2  
PART G

<u>**FINDING**</u>	<u>PART</u>	<u>WNP-2</u>	<u>**FINDING**</u>	<u>PART</u>	<u>WNP-2</u>
6.10	C	7.3.10	6.42	C	11.3.10
6.11	C	7.3.32	6.43	C	7.3.15
6.12	C	7.3.43	6.44	C	7.3.16
6.13	C	7.3.40.a	6.45	C	7.3.25
6.14	C	7.3.40.b	6.46	B	7.3.12
6.15	C	7.3.40.c	6.47	C	7.3.17
6.16	C	7.3.40.d	6.48	C	7.3.18
6.17	C	7.3.40.e	6.49	C	7.3.19
6.18	C	7.3.41	6.50	C	24.6.10
6.19	C	7.3.42	6.51	C	24.6.11
6.20	C	24.6.21	6.52	C	7.3.13
6.21	C	5.3. 4	6.53	E	7.3.14
6.22	C	7.3.33	6.54	C	7.3.21
6.23	C	7.3.34	6.55	C	7.3.22
6.24	C	7.3. 8	6.56	C	7.3.23
6.25	C	7.3.35	6.57	C	7.3.24
6.26	C	7.3.36	6.58	C	7.3.26
6.27	C	7.3.37	6.59	C	7.3.27
6.28	C	13.3.17	6.60	C	24.6.12
6.29	C	24.6. 7	6.61	C	24.6.15
6.30	C	24.6.14	6.62	C	7.3.20
6.31	C	24.6.16	6.63	C	13.3. 4
6.32	C	24.6.17	6.64	C	7.3.28
6.33	C	24.6.18	6.65	C	7.3. 5
6.34	C	24.6.19	6.66	C	7.3.11
6.35	C	5.3.14	6.67	C	13.3. 5
6.36	C	7.3. 3	6.68	C	21.3. 1
6.37	C	7.3. 6	6.69	C	10.3. 7
6.38	C	7.3.38	6.70	C	5.3. 1
6.39	C	7.3.39	6.71	C	5.3. 2
6.40	C	11.3. 8	6.72	B	24.7. 3
6.41	C	11.3. 9	6.73	C	24.6. 1



AUDIT REPORT  
WNP-2  
PART G

<u>**FINDING**</u>	<u>PART</u>	<u>WNP-2</u>	<u>**FINDING**</u>	<u>PART</u>	<u>WNP-2</u>
6.74	C	6.3. 4	6.106	D	----
6.75	C	5.3. 3	6.107	D	----
6.76	B	5.3. 7	6.108	D	----
6.77	C	5.3. 8	6.109	D	----
6.78	B	5.3. 9	6.110	D	----
6.79	C	24.6. 3	6.111	D	----
6.80	C	5.3. 5	6.112	D	----
6.81	C	5.3. 6	6.113	E	24.7. 4
6.82	B	7.3.29	6.114	F	24.6.20
6.83	B	7.3.30	6.115	F	7.3.31
6.84	C	5.3.13	6.116	F	6.3. 6
6.85	C	24.6. 4	6.117	F	6.3. 7
6.86	B	6.3. 5	7. 1	B	15.3. 1
6.87	J	----	7. 2	C	15.3. 2
6.88	D	----	7. 3	D	----
6.89	D	----	7. 4	D	----
6.90	D	----	7. 5	NA	----
6.91	D	----	7. 6	D	----
6.92	D	----	7. 7	D	----
6.93	D	----	7. 8	D	----
6.94	D	----	7. 9	D	----
6.95	D	----	7.10	D	----
6.96	D	----	7.11	D	----
6.97	D	----	7.12	D	----
6.98	D	----	7.13	D	----
6.99	D	----	7.14	D	----
6.100	D	----	7.15	A	----
6.101	D	----	8. 1	C	5.3.16.h
6.102	D	----	8. 2	B	24.5. 7
6.103	D	----	8. 3	B	24.5. 9
6.104	D	----	8. 4	C	12.3. 4.d
6.105	D	----	8. 5	C	24.5. 6

AUDIT REPORT  
WNP-2  
PART G

<u>**FINDING**</u>	<u>PART</u>	<u>WNP-2</u>	<u>**FINDING**</u>	<u>PART</u>	<u>WNP-2</u>
8. 6	B	5.3.16.c	8.38	D	----
8. 7	C	5.3.16.i	8.39	D	----
8. 8	C	5.3.16.j	8.40	D	----
8. 9	C	5.3.16.l	8.41	D	----
8.10	C	24.5. 8	8.42	D	----
8.11	B	9.3. 2	8.43	D	----
8.12	C	13.3.10	8.44	D	----
8.13	C	12.3. 4.a	8.45	D	----
8.14	C	12.3. 4.b	8.46	E	5.3.15
8.15	C	12.3. 4.c	8.47	E	5.3.16.e
8.16	C	5.3.16.d	8.48	F	5.3.16.a
8.17	C	5.3.16.f	8.49	C	5.3.16.b
8.18	C	5.3.16.g	8.50	F	5.3.16.k
8.19	C	24.6. 5	8.51	F	5.3.17
8.20	C	24.7. 5	8.52	F	5.3.21
8.21	C	5.3.10	9. 1	B	5.3.23
8.22	C	5.3.11	9. 2	C	24.5. 3
8.23	C	5.3.20	9. 3	NA	----
8.24	C	5.3.22	9.4	D	----
8.25	C	24.5. 2	9.5	D	----
8.26	NA	----	9.6	D	----
8.27	C	5.3.19	9.7	D	----
8.28	C	24.6. 6	9.8	D	----
8.29	C	5.3.18			
8.30	C	5.3.12			
8.31	D	----			
8.32	D	----			
8.33	D	----			
8.34	D	----			
8.35	D	----			
8.36	D	----			
8.37	D	----			

AUDIT REPORT  
PART H

HUMAN FACTORS ENGINEERING  
CONTROL ROOM PDA AUDIT

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

Cross Index by WNP-2

<u>FINDING</u>	<u>PART</u>	<u>**WNP-2**</u>
1.23	D	----
1.21	D	----
1.22	D	----
1.24	D	----
1.25	D	----
1.26	D	----
1.27	D	----
1.28	D	----
1.29	D	----
1.30	D	----
2.2	D	----
3.55	D	----
3.56	D	----
3.57	D	----
3.58	D	----
3.59	D	----
3.60	D	----
3.61	D	----
3.62	D	----
3.63	D	----
3.64	D	----
4.19	D	----
4.20	D	----
4.21	D	----
4.22	D	----
4.23	D	----

AUDIT REPORT  
PART G

HUMAN FACTORS ENGINEERING  
CONTROL ROOM PDA AUDIT

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

Cross Index by WNP-2

<u>FINDING</u>	<u>PART</u>	<u>**WNP-2**</u>	<u>FINDING</u>	<u>PART</u>	<u>**WNP-2**</u>
1.23	D	----	4.24	D	----
1.21	D	----	4.25	D	----
1.22	D	----	4.26	D	----
1.24	D	----	5.33	D	----
1.25	D	----	5.32	D	----
1.26	D	----	5.35	D	----
1.27	D	----	5.34	D	----
1.28	D	----	5.37	D	----
1.29	D	----	5.36	D	----
1.30	D	----	5.38	D	----
2.2	D	----	5.39	D	----
3.55	D	----	5.40	D	----
3.56	D	----	5.41	D	----
3.57	D	----	5.42	D	----
3.58	D	----	5.43	D	----
3.59	D	----	5.44	D	----
3.60	D	----	5.45	D	----
3.61	D	----	5.46	D	----
3.62	D	----	5.47	D	----
3.63	D	----	5.48	D	----
3.64	D	----	5.49	D	----
4.19	D	----	5.50	D	----
4.20	D	----	6.89	D	----
4.21	D	----	6.92	D	----
4.22	D	----	6.91	D	----
4.23	D	----	6.90	D	----

AUDIT REPORT

WNP-2

PART G

<u>FINDING</u>	<u>PART</u>	<u>**WNP-2**</u>	<u>FINDING</u>	<u>PART</u>	<u>**WNP-2**</u>
6.87	D	----	7.10	D	----
6.88	D	----	7.11	D	----
6.93	D	----	7.12	D	----
6.94	D	----	7.13	D	----
6.95	D	----	7.14	D	----
6.96	D	----	8.31	D	----
6.97	D	----	8.32	D	----
6.98	D	----	8.33	D	----
6.99	D	----	8.35	D	----
6.102	D	----	8.34	D	----
6.100	D	----	8.37	D	----
6.101	D	----	8.36	D	----
6.103	D	----	8.38	D	----
6.104	D	----	8.39	D	----
6.105	D	----	8.40	D	----
6.106	D	----	8.41	D	----
6.107	D	----	8.42	D	----
6.108	D	----	8.43	D	----
6.109	D	----	8.44	D	----
6.110	D	----	8.45	D	----
6.111	D	----	9.5	D	----
6.112	D	----	9.4	D	----
7.3	D	----	9.6	D	----
7.4	D	----	9.7	D	----
7.5	D	----	9.8	D	----
7.6	D	----	1.33	E	3.3. 1.a
7.7	D	----	1. 7	B	3.3. 1.b
7.8	D	----	1. 5	B	3.3. 1.c
7.9	D	----	1.15	C	3.3. 1.d

AUDIT REPORT

WNP-2

PART G

<u>FINDING</u>	<u>PART</u>	<u>**WNP-2**</u>	<u>FINDING</u>	<u>PART</u>	<u>**WNP-2**</u>
1. 6	B	3.3. 1.e	8. 6	B	5.3.16.c
1.12	B	3.3. 1.f	8.16	C	5.3.16.d
1. 8	B	3.3. 2.a	8.47	E	5.3.16.e
4.11	C	3.3. 2.b	8.17	C	5.3.16.f
1. 9	B	3.3. 2.c	8.18	C	5.3.16.g
1. 2	A	3.3. 2.d	8. 1	C	5.3.16.h
1.10	B	3.3. 2.e	8. 7	C	5.3.16.i
1.34	E	3.3. 2.f	8. 8	C	5.3.16.j
1.11	B	3.3. 2.g	8.50	F	5.3.16.k
1. 4	B	3.3. 3	8. 9	C	5.3.16.l
1. 1	A	4.1	8.51	F	5.3.17
1.31	A	4.2	8.29	C	5.3.18
6.70	C	5.3. 1	8.27	C	5.3.19
6.71	C	5.3. 2	8.23	C	5.3.20
6.75	C	5.3. 3	8.52	F	5.3.21
6.21	C	5.3. 4	8.24	C	5.3.22
6.80	C	5.3. 5	9. 1	B	5.3.23
6.81	C	5.3. 6	5.72	F	6.3. 1
6.76	B	5.3. 7	5.26	C	6.3. 2
6.77	C	5.3. 8	5.73	F	6.3. 3
6.78	B	5.3. 9	6.74	C	6.3. 4
8.21	C	5.3.10	6.86	B	6.3. 5
8.22	C	5.3.11	6.116	F	6.3. 6
8.30	C	5.3.12	6.117	F	6.3. 7
6.84	C	5.3.13	6. 1	C	6.3. 8
6.35	C	5.3.14	6. 2	C	7.3. 1
8.46	E	5.3.15	6. 3	C	7.3. 2
8.48	F	5.3.16.a	6.36	C	7.3. 3
8.49	C	5.3.16.b	6. 4	C	7.3. 4

AUDIT REPORT

WNP-2

PART G

<u>FINDING</u>	<u>PART</u>	<u>**WNP-2**</u>	<u>FINDING</u>	<u>PART</u>	<u>**WNP-2**</u>
6.65	C	7.3. 5	6.23	C	7.3.34
6.37	C	7.3. 6	6.25	C	7.3.35
6. 5	C	7.3. 7	6.26	C	7.3.36
6.24	C	7.3. 8	6.27	C	7.3.37
6. 6	C	7.3. 9	6.38	C	7.3.38
6.10	C	7.3.10	6.39	C	7.3.39
6.66	C	7.3.11	6.13	C	7.3.40.a
6.46	B	7.3.12	6.14	C	7.3.40.b
6.52	C	7.3.13	6.15	C	7.3.40.c
6.53	E	7.3.14	6.16	C	7.3.40.d
6.43	C	7.3.15	6.17	C	7.3.40.e
6.44	C	7.3.16	6.18	C	7.3.41
6.47	C	7.3.17	6.19	C	7.3.42
6.48	C	7.3.18	6.12	C	7.3.43
6.49	C	7.3.19	1. 3	NA	----
6.62	C	7.3.20	8.11	B	9.3. 2
6.54	C	7.3.21	5.62	E	10.3. 1
6.55	C	7.3.22	1.36	F	10.3. 2
6.56	C	7.3.23	5.59	E	10.3. 3
6.57	C	7.3.24	5.51	E	10.3. 4
6.45	C	7.3.25	5.13	C	10.3. 5
6.58	C	7.3.26	5.76	F	10.3. 5
6.59	C	7.3.27	5. 2	C	10.3. 6
6.64	C	7.3.28	6.69	C	10.3. 7
6.82	B	7.3.29	5. 4	B	10.3. 8
6.83	B	7.3.30	5.54	E	10.3. 9
6.115	F	7.3.31	5.60	F	10.3.10
6.11	C	7.3.32	5.61	E	10.3.11
6.22	C	7.3.33	4.34	F	10.3.12

AUDIT REPORT

WNP-2

PART G

<u>FINDING</u>	<u>PART</u>	<u>**WNP-2**</u>	<u>FINDING</u>	<u>PART</u>	<u>**WNP-2**</u>
5.24	C	10.3.13	4.14	C	13.3. 3
5. 3	B	10.3.14	6.63	C	13.3. 4
5.25	C	10.3.15	6.67	C	13.3. 5
5.18	C	10.3.16	4.28	E	13.3. 6
5.56	E	10.3.17	4.32	F	13.3. 7.a
5.55	E	10.3.18	4.33	NA	----
5.58	E	10.3.19	4. 9	C	13.3. 7.c
5.75	F	11.3. 1	4.27	E	13.3. 8
5. 5	C	11.3. 2	4. 3	B	13.3. 9
5.63	E	11.3. 3	8.12	C	13.3.10
5. 6	B	11.3. 4	4.35	F	13.3.11
5. 7	B	11.3. 5	4. 5	B	13.3.12
6. 7	C	11.3. 6	4.10	C	13.3.13
5.30	C	11.3. 7	4. 8	B	13.3.14.a
6.40	C	11.3. 8	4.31	E	13.3.14.b
6.41	C	11.3. 9	4.37	F	13.3.14.c
6.42	C	11.3.10	4.38	NA	----
5.74	B	12.3. 1	4.16	C	13.3.15
5.64	C	12.3. 2	4.17	C	13.3.16
5.65	C	12.3. 3	6.28	C	13.3.17
8.13	C	12.3. 4.a	4. 7	B	13.3.18
8.14	C	12.3. 4.b	4.36	F	13.3.19
8.15	C	12.3. 4.c	4. 1	B	13.3.20
8. 4	C	12.3. 4.d	3.66	E	14.3. 1
4.12	C	13.3. 1.a	3.67	E	14.3. 2
4.29	E	13.3. 1.b	3.26	B	14.3. 3
4.13	C	13.3. 1.c	3.29	C	14.3. 4
4.30	E	13.3. 1.d	3.47	C	14.3. 5
4.15	C	13.3. 2	3.68	E	14.3. 6



AUDIT REPORT

WNP-2

PART G

<u>FINDING</u>	<u>PART</u>	<u>**WNP-2**</u>	<u>FINDING</u>	<u>PART</u>	<u>**WNP-2**</u>
3.76	F	14.3. 7	3.18	F	14.5. 2.4. a
3.30	C	14.3. 8.a	3.24	B	14.5. 2.4. b
3.31	C	14.3. 8.b	3. 4	A	14.5. 3.1
3.32	C	14.3. 8.c	3.52	C	14.5. 3.2
3.33	C	14.3. 8.d	3.21	B	14.5. 3.3
3.34	C	14.3. 8.e	3.23	B	14.5. 4.1
3.35	B	14.3. 8.f	3.25	B	14.5. 4.2
3.36	B	14.3. 8.g	3.53	C	14.5. 4.3
3.37	B	14.3. 8.h	3.75	B	14.5. 4.4
3.38	C	14.3. 8.i	3.27	B	14.5. 4.5
3.39	C	14.3. 8.j	3.28	B	14.5. 4.6
3.40	C	14.3. 8.k	3.77	F	14.5. 4.7
3.41	C	14.3. 8.l	3.79	F	14.5. 5.1. a
3. 7	C	14.3. 9	3.80	F	14.5. 5.1. b
3.46	C	14.3.10	3.48	B	14.5. 5.1. c
3.15	NA	----	3.49	B	14.5. 5.1. d
3.54	C	14.3.12	3.50	B	14.5. 5.1. e
3.74	F	14.3.13	3.70	E	14.5. 5.2. a
3.65	E	14.3.14	3.71	E	14.5. 5.2. b
3.73	F	14.3.15	3.51	C	14.5. 5.2. c
3.78	NA	----	7. 1	B	15.3. 1
3.69	B	14.3.17	7. 2	C	15.3. 2
3.16	NA	----	1.32	E	16.3. 1
3. 5	A	14.3.19	3.72	F	16.3. 5. a
3. 6	C	14.3.20	2. 1	B	17.3. 1
3.13	C	14.5. 2. .a	3.19	C	18.3. 1
3.14	NA	----	3.22	C	18.3. 2
3.17	B	14.5. 2.2	1.3	A	19.1.2
3.20	B	14.5. 2.3	1.19	C	19.3. 1

AUDIT REPORT

WNP-2

PART G

<u>FINDING</u>	<u>PART</u>	<u>**WNP-2**</u>	<u>FINDING</u>	<u>PART</u>	<u>**WNP-2**</u>
1.35	B	19.3. 2	1.13	C	24.5. 1
1.20	A	19.3. 3	8.25	C	24.5. 2
1.17	A	20.3. 1	9. 2	C	24.5. 3
1.18	A	20.3. 2	5. 1	B	24.5. 4
6.68	C	21.3. 1	9. 3	NA	----
1.14	C	21.3. 2	8. 5	C	24.5. 6
3. 1	C	24.3. 1	8. 2	B	24.5. 7
3. 2	C	24.3. 2	3.10	C	24.5. 8
3. 3	C	24.3. 3	8. 3	B	24.5. 9
3. 8	B	24.3. 4	1.16	C	24.5.10
3. 9	B	24.3. 5	6.73	C	24.6. 1
3.10	B	24.3. 6	8.26	NA	----
3.11	B	24.3. 7	6.79	C	24.6. 3
3.12	C	24.3. 8	6.85	C	24.6. 4
3.42	C	24.3. 9	8.19	C	24.6. 5
3.43	C	24.3. 9.b	8.28	C	24.6. 6
3.44	C	24.3. 9.c	6.29	C	24.6. 7
3.45	C	24.3. 9.d	6. 8	C	24.6. 8
5.52	E	24.4. 1.b	6. 9	C	24.6. 9
5.12	C	24.4. 2	6.50	C	24.6.10
5.10	C	24.4. 3	6.51	C	24.6.11
5.27	C	24.4. 4	6.60	C	24.6.12
5.11	E	24.4. 5	5.14	C	24.6.13
5.19	C	24.4. 6	6.30	C	24.6.14
5.20	C	24.4. 7	6.61	C	24.6.15
5.21	C	24.4. 8	6.31	C	24.6.16
5.69	E	24.4. 9	6.32	C	24.6.17
5.70	E	24.4.10	6.33	C	24.6.18
5.15	B	24.4.11	6.34	C	24.6.19
5.16	F	24.4.12			

AUDIT REPORT

WNP-2

PART G

<u>FINDING</u>	<u>PART</u>	<u>**WNP-2**</u>
6.114	F	24.6.20
6.20	C	24.6.21
5.29	C	24.6.22
5.17	NA	----
5.68	F	24.6.24
5.23	C	24.6.25
5.22	NA	----
5.71	F	24.6.27
5.57	E	24.6.28
5.66	E	24.6.29
5.28	C	24.6.30
5.31	OMIT	24.6.31
4. 2	B	24.6.32
4.18	C	24.6.33
4. 6	B	24.6.34
4. 4	B	24.6.35
5. 8	E	24.7. 1
5. 9	C	24.7. 2
6.72	B	24.7. 3
6.113	E	24.7. 4
8.20	C	24.7. 5
5.53	E	24.7. 6
5.67	E	24.7. 7