



Tennessee Valley Authority, Post Office Box 2000, Decatur, Alabama 35609

February 9, 1996

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

In the Matter of)
Tennessee Valley Authority)

Docket Nos. 50-296

**BROWNS FERRY NUCLEAR PLANT (BFN) - COMPLETION OF NUREG-0737
(TMI ACTION PLAN), ITEM I.D.1, CONTROL ROOM DESIGN REVIEWS
(CRDR) FOR UNIT 3**

This letter provides notification of the completion of the safety related portion of NUREG-0737, Item I.D.1, Control Room Design Reviews (CRDR), for BFN Unit 3. The design has been finalized, equipment installed, procedures issued, and the necessary training completed.

TVA's corrective action plan for the resolution of each safety significant CRDR Human Engineering Discrepancy (HED) was provided in References 1 and 2. Since the issuance of References 1 and 2, significant refinements have been made in the designs used to correct the CRDR HEDs. The enclosure lists the original corrective actions and the implemented actions for the safety significant HEDs.

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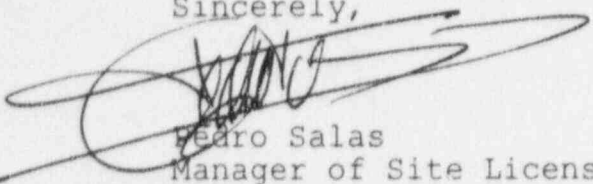
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U.S. Nuclear Regulatory Commission
Page 2
February 9, 1996

There are no commitments contained in this correspondence.
If you have any questions, please contact me at
(205) 729-2636.

Sincerely,



Pedro Salas
Manager of Site Licensing

Enclosure
cc: See page 4

U.S. Nuclear Regulatory Commission
Page 3
February 9, 1996

- References:
1. TVA letter to NRC, dated December 30, 1986,
Detailed Control Room Design Review (DCRDR) -
NUREG-0737, Item I.D.1
 2. TVA letter to NRC, dated November 9, 1988,
Response to NRC Safety Evaluation for the BFN
Detailed Control Room Design Review (DCRDR)

U.S. Nuclear Regulatory Commission
Page 4
February 9, 1996

Enclosure

cc (Enclosure):

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ENCLOSURE

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNIT 3

CONTROL ROOM DESIGN REVIEW (CRDR)

Pursuant to NUREG-0737 (TMI Action Plan) and Supplement 1, TVA provided its CRDR corrective action plan and commitments to NRC by letter dated December 30, 1986 and supplemented by letter dated November 9, 1988. Since the issuance of these corrective action plans, significant refinements have been made in the designs used to correct the CRDR Human Engineering Discrepancies (HED). The original corrective actions and the implemented corrective actions for the safety significant HEDs are provided below. The corrective actions were excerpted from Appendices A and B of TVA's December 30, 1986 letter to NRC, except for HEDs 300 through 311 which were excerpted from TVA's November 9, 1988 letter to NRC.

HED 003 - Insufficient Shift Coverage

Correction: Operating crew will be increased from current level.

Implementation: The "current level" referenced in the corrective action was one operator per unit. Restart shift manning for Unit 3 provides for two licensed Reactor Operators and two licensed Senior Reactor Operators. Additionally, the daily shift manning schedule assigns one licensed operator for relief and tagging duties and an outside main control room Assistant Shift Operations Supervisor for additional operational support and/or relief.

HED 004 - Disconnected I&C no Longer in Use

Correction: Components that are identified in the Human Engineering Concerns (HEC) as disconnected and no longer in use will be removed and their holes will be covered.

Implementation: The Unit 3 components that were identified in the HECs as disconnected and no longer in use were removed and their holes covered. This included covering the hole for the old clock in Panel 3-9-5 and replacing an alarm window on annunciator bank XA-55-3C with a blank.

HED 007 - Insufficient Separation Between Panel 9-53 and Back of 9-54 and 9-55 (Units 1 and 2)

Correction: Procedural control will be implemented to require caution for working in back of Panel 9-54/9-55 to avoid bumping into Panel 9-53.

Implementation: Site Standard Practice 12.1, "Conduct of Operations," restricts control room access and access to the red carpet areas (around the bench boards and between 3-9-14 and 3-9-54/55) to the on shift Unit Operators unless permission is obtained to enter these areas. The Operator Ownership Philosophy further requires that the operator be aware of activities taking place in the control room. Additionally, workers must obtain permission to enter the control room.

HED 012 - Safety Relief Valve Acoustical Monitors and Temperature Recorder not Located in Horseshoe Area

Correction: TR-1-1 and PX-1-4 will be relocated to Panel 9-4.

Implementation: Safety relief valve acoustical monitor PX-1-4 was moved to Panel 9-3. The temperature recorder was not moved; however, it has been changed to a micro-processor based unit with digital display functions with inputs to the Integrated Computer System. Therefore, the information is now available in the main operating area.

HED 015 - Main Control Room Prints Illegible and Easily Worn/Torn

Correction: Main control room prints will be reviewed periodically. Poor quality or worn prints will be replaced. Main control room prints will be updated (i.e., red lined) after an engineering change notice (ECN) is field completed and system is turned back over to Operations.

Implementation: Red lining of main control room prints is no longer performed. Primary and critical drawings affected by the design change process must be filed in the main control room prior to closure review. Main control room prints are periodically reviewed by Document Control for legibility.

HED 017 - Control Room Supplies are Often Unavailable

Correction: A control room supplies list will be developed. Inventory level will be established and a supplies cabinet will be put within main control room.

Implementation: Supplies for operational needs are available 24 hours a day at the Customer Service Center located within the plant. Minimum inventory levels are maintained by automated reordering. Chart paper is stored in a locker in the main control room. Fuses are stored in the relay room fuse cabinet.

**HED 041 - Diesel Generator Controls/Lights too Deep in Panel 9-23
(Units 1 and 2)**

Correction: Diesel Generator start switches, governor control, voltage regulator switches, and associated lights will be relocated to lower portion of the panel to within depth criteria.

Implementation: No implementation was required for Unit 3. This HED applies to Units 1 and 2 only.

HED 059 - Panel 9-25 Standby Gas Treatment Gauges Located too High

Correction: Gauges will be relocated as per HED 251 correction to a lower position to facilitate operator viewing.

Implementation: Standby gas treatment system instruments discussed in this HED were relocated to be within proper viewing acceptance criteria.

HED 072 - Inadvertent Controls Actuation

Correction: Guardrails will be installed on bench board Panels 9-3, 9-4, partially on 9-5, 9-6, 9-7 and 9-8 for all three units and on Panel 9-23 for Unit 1/Unit 2.

Implementation: Guardrails were installed on Unit 3 benchboard Panels 3-9-3, 3-9-4, 3-9-5 (partial), 3-9-6, 3-9-7, and 3-9-8.

**HED 075 - Panel 9-6 Drywell Pressure and Drywell/Torus
Delta-pressure Gauges Located too High**

Correction: These indicators will be relocated to Panel 9-3 as per HED 241 correction. This new location will meet height criteria.

Implementation: The drywell pressure and drywell/torus differential pressure gauges were relocated to Panel 9-3. These new locations are within the height criteria.

**HED 076 - Diesel Generator Control/Lights, Shutdown Board
Backfeed and Voltmeter Switches too Deep**

Correction: Same as HED 41 correction. The shutdown board backfeed switches and the voltmeter selector switches will be relocated to the holes vacated by the diesel generator controls. The relocation of the shutdown board backfeed switches and voltmeter switches will improve the current condition but will not bring them to within the depth criteria.

Implementation: No implementation was required for Unit 3. This HED applies to Units 1 and 2 only.

**HED 081 - Standby Gas Treatment Controls/Indicators not
Completely Available in all Control Rooms**

Correction: Standby gas treatment fan status and outlet flow indicators will be installed in Unit 1 and Unit 3.

Implementation: Standby gas treatment fan status (trains A, B, and C) and outlet flow indicators have been added to Unit 3 Panel 9-20.

HED 084 - Operator Protective Equipment Accessibility/Use

Correction: Emergency equipment (e.g., respirators, self-contained breathing apparatus, etc.) will be stored in the Technical Support Center. Their use and control will be integrated into the Radiological Emergency Plan implementing procedures. BFN will evaluate available communication features/design for face masks and provide them as required.

Implementation: Emergency Plan Implementing Procedure 17, "Emergency Equipment and Supplies," provides instructions for required periodic inspections/inventories and maintenance of emergency equipment and supplies.

HED 094 - Operator Rest Room Accessibility

Correction: The additional manning as per HED 3 correction satisfactorily addresses this HED.

Implementation: Refer to HED 003.

HED 104 - Paging System Problems

Correction: A plant communication system study including the paging system is being performed by Acoustical Technology, Inc. Their recommendations will be evaluated and implemented as required.

Implementation: A plant communications study was performed. Communication upgrades were installed, including the addition of loud speakers, horns, bells, and sirens. In addition, plant operators routinely carry vibrating pagers and two way radios to improve communications.

HED 107 - Annunciators that are no Longer in Use

Correction: Alarms not in use as referenced in the HECs will be disconnected and blank windows will be installed.

Implementation: Alarms no longer in use were disconnected and blank windows were installed (PA-1-4, Auto Blowdown Relief Valves Bellows Leak, and XA-47-84, ADS Emergency Assist).

HED 108 - Annunciators Label Inadequacies

Correction: Incorrect or ambiguous legends will be revised. Temporary labels will be removed. Labeling of annunciator windows will be revised to adhere to the pending BFN labeling guidelines.

Implementation: Control room annunciators were reviewed and incorrect and/or ambiguous legends were revised. The abbreviations are in accordance with Site Standard Practice 2.2, "Writing Procedures." Temporary labels were removed in accordance with Site Standard Practice 12.53, "Component Labeling, Signs, Operator Aids, and Permanent Information Postings." Engraved window numbers were added. In addition, annunciator response procedures were issued to aid the operator in determining the proper response to alarm conditions.

HED 109 - Difficulty in Changing Annunciator Light Bulbs due to Panel Design

Correction: Annunciator panels will be modified to allow the light panel to be secured to the annunciator box so that only the legend panel swings down when changing light bulbs.

Implementation: Annunciator power buss bars were insulated to prevent shock.

HED 111 - Lack of Effective Prioritization System for Annunciators

Correction: An annunciator priority coding system by colors will be implemented.

Implementation: An annunciator priority coding system by colors was implemented:

Red - Critical
Amber - Urgent
White - Operational
Magenta - Process Radiation Monitoring

HED 113 - Annunciator with Multiple Input and no Reflash; Annunciators with Non-specific Legends

Correction: An annunciator study will be performed to identify required specific changes to annunciator window legends to eliminate ambiguous wording/descriptions. New window tiles will be generated with acronyms and abbreviations and component descriptions that are consistent with the labeling program results. The annunciator study will also provide the most cost-effective means to correct the reflash capability concerns.

Implementation: Annunciator window legends were reviewed and revised as necessary to correct ambiguous wording, descriptions, acronyms, and abbreviations. An annunciator study was performed to identify multiple input alarms that require reflash capability. The alarms were upgraded based on this study.

HED 117 - Annunciator System Controls

Correction: An annunciator study will be performed to evaluate feasibility and cost-effectiveness of adding control features such as reflash, ringback, separate silence/acknowledge/reset/test controls, directional horns, etc.

Implementation: An annunciator study was performed to address the feasibility and cost effectiveness of adding control features such as reflash, ringback, and separate silence, acknowledge, reset, and test controls. As a result, separate control of alarm silence, acknowledge, reset, and test controls were provided for Panels 9-3, 9-4, 9-5, 9-6, 9-7, 9-20, and 9-53. It was determined that separate controls would not be feasible for Panels 9-8 and 9-23. It was also determined that directional horns would not be added since this revision would not provide a sufficient cost/benefit.

HED 119 - Nuisance Alarms

Correction: Nuisance alarms referenced in the HECs will be evaluated and corrected either by setpoint changes or by removal of the nuisance alarms, if required.

Implementation: "Nuisance" and "Darkboard" alarm studies were performed to evaluate the identified alarms and to evaluate other potential nuisance alarms. Problems were corrected and setpoints were changed. In addition, 0-OI-55, "Annunciator System," provides instructions for disabling and tracking nuisance alarms until the condition clears or other corrections are made.

HED 141 - EOI Procedure Clarification

Correction: Caution step will be added to the Emergency Operating Instruction's (EOI) warning that activities carried out in the plant during an emergency be in accordance with the controls specified in the Radiological Emergency Plan Implementing Procedure.

Implementation: Emergency Plan Implementing Procedure 14, "Radiological Control Procedures," states that a Radcon Technician will accompany any personnel dispatched into areas of potential radiological hazard. It was determined that any additional cautions/step in the EOI flow chart/appendices would be redundant.

HED 144 - Chlorine Storage Leak Annunciator no Longer in Use

Correction: Alarms will be disconnected and engraved windows replaced with blank white lens.

Implementation: The chlorine tank alarm has been disconnected and the annunciator window blanked.

HED 145 - Condensate Storage Tank Alarms are Only Available on Unit 1

Correction: Condensate storage tank level alarms will be installed in Units 2 and 3 to alert the unit operator of condensate storage tank conditions that affect their unit.

Implementation: Unit 3 condensate storage tank level alarms were added to Unit 3 Panel 9-6 corresponding to the alarms provided on Unit 1 Panel 9-20.

HED 146 - Offgas System Adsorber Vault Radiation Alarms in Unit 1 Only

Correction: The two identified alarms have been determined as not needed for system operation by an earlier evaluation independent of CRDR. These alarms will be disconnected and removed from Unit 1.

Implementation: No implementation was required for Unit 3. This HED applies to Unit 1 only.

HED 147 - Lacking EECW Alarms for Units 2 and 3

Correction: The North emergency equipment cooling water (EECW) header Low Level Alarm will be installed in Units 2 and 3.

Implementation: The EECW system is common to Units 1, 2, and 3. The north header level alarm is provided to warn the operator of excess air or gases in the north header. It was subsequently determined that EECW north header low level alarm was not required in Unit 3 for the following reasons:

1. The system is now operated using a vacuum priming system. One EECW pump per header is in continuous operation to insure that the north and south headers are charged.
2. Each control room has north and south header pressure and flow alarms and system status indications.
3. Designated system pumps are aligned and automatically start on low system pressure to preclude system voids.
4. The Unit 1 control room is continuously manned and the alarm response is adequate to insure the headers stay full and charged. Therefore, duplication of this alarm on Units 2 and 3 is not needed.

HED 148 - Generic Labeling Concerns (Switches, etc.)

Correction: Labels will be revised per the pending BFN labeling guidelines to improve contrast and consistency of abbreviations and acronyms.

Implementation: Labeling guidelines were incorporated into TVA design drawing and Site Standard Practice 12.53, "Component Labeling, Signs, Operator Aids, and Permanent Information Postings." Guidance regarding the consistent use of abbreviations and acronyms was incorporated into Site Standard Practice 2.2, "Writing Procedures." Control room low contrast labels were replaced with labels of higher contrast. Control room nomenclature was revised to ensure consistency in the use of abbreviation and acronyms. Low torque switch plates were replaced with plates that are easier to read.

HED 150 - Keylock Switch Convention Inconsistency

Correction: Keylock switches will be modified to establish the following convention: KEY INSERTED - TEETH DOWN; KEY VERTICAL - OFF OR SAFE.

Implementation: Key locks were changed so that the teeth must be down for key insertion. Key positions are 135°, 90°, and 45° for three position switches and 135° and 45° for two position switches. These positions are consistent with other switch types in the control room and are adequate for control position distinction.

HED 151 - Keys for Keylock Switches not Always Available

Correction: A comprehensive plant key control program is under development. This program will address the control of keylock switch keys.

Implementation: Operations Section Instruction Letter 16, "Keys," identifies and controls radiation area, security area, and miscellaneous keys maintained by the Shift Operations Supervisor. Keys needed for quick access during transients are tagged and mounted on the control panel near the associated switch. Other keys are maintained in key cabinets mounted on the Shift Operations Supervisor and Unit Operator work stations.

HED 152 - Lack of Switch Handle Shape Coding

Correction: Switch handles will be shaped coded to the extent practical as follows: Oval shape for pumps/fans/motors; Pistol grip handles for throttle valves will be labeled "throttle" and will have a white band around the handle. Extent of shape coding depends on availability of replacement handles for existing switches. Intent of this correction is to aid the operator in locating devices.

Implementation: Switch handles were shape coded to the extent practical using the following convention:

Prime movers (e.g., pumps, fans, etc.) use the large, high torque J handle.

Valves use the small, low torque J handle.

Select switches use knob or knurled handles.

Throttle valves have tactile coding.

The remote shutdown panels will also use egg shaped handles for disconnect switches and oval shaped handles for transfer switches.

HED 153 - Control Switch Movement Convention Inconsistency

Correction: The following switch movement convention will be implemented: Clockwise - Increase/Meter movement to right; Counterclockwise - Decrease/Meter movement to left.

Implementation: Switch position, movement, or associated indicator lights were replaced or moved and labeled, as appropriate, to make switch movements meet convention or match indicator light positions.

HED 155 - Outboard MSIV Handswitch Location may Cause Misoperation

Correction: The system will be demarcated and hierarchically labeled. In addition, the main steam isolation valve (MSIV) handswitches will be color coded "Red".

Implementation: MSIV switches were demarcated with color patching and hierarchical labels added. The switch handles were changed to red.

HED 156 - Drywell Compressor/Air System Lights and Switches not Grouped

Correction: Switches and indicators will be relocated from Panel 9-20 and Panel 9-6 to Panel 9-3 for functional grouping.

Implementation: Switches and indicators were relocated from Panel 9-20 and Panel 9-6 to Panel 9-3 for functional grouping.

HED 157 - Potential Inadvertent Controls Actuation on Panel 9-23 Due to Unit 3 Personnel Access

Correction: Traffic will be routed away from Panel 9-23 (Unit 3) via the use of a physical barrier (i.e., chains).

Implementation: A gate was added to the entrance to the main control room to steer personnel away from Panel 9-23.

HED 158 - Legend Push Buttons are not Distinguished from Legend Indicators

Correction: Legend status lights will be coded per the BFN Labeling standard to differentiate them from legend push buttons.

Implementation: The identified legend status lights were coded using cross-hatched transparencies behind the legend push button lens.

HED 159 - Lack of Operating Band Identification on Instruments

Correction: Evaluation of control room indicators will be performed to determine the need for banding on a case-by-case basis. Color coding of operational bands will be used. Typical color coding is as follows: Green-normal; Yellow-Caution; Red-Danger; and Blue-Setpoints for auto-initiation.

Implementation: Color banding was performed on selected meters, typically using the following convention:

- Green - Normal operating range
- Yellow - Caution (starting at an alarm setpoint or operational limit)
- Red - Danger (starting at an initiation setpoint)

Unit 3 recorders were replaced with microprocessor based units having digital display and bargraph meters that do not support color banding.

HED 160 - Generic Labeling Concerns (Displays and Status Panels)

Correction: Labels will be revised per the pending BFN Labeling guidelines to improve contrast and consistency of abbreviations and acronyms.

Implementation: Guidelines were developed for labeling issues, such as color contrast, letter size, abbreviations and acronyms, label content (functional descriptions and information), label location, and meter/recorder scales. These guidelines were incorporated into design documents and plant procedures. Control room labels for status panels and displays were revised or added, as practical, to correct partial, missing or incorrect labels.

HED 161 - Missing/Unclear Labeling for Displays

Correction: Revision will be made to difficult-to-read or ambiguous meter/recorder scales and labels, and missing scales and labels will be added.

Implementation: Guidelines were developed for labeling issues, such as color contrast, letter size, abbreviations and acronyms, label content (functional descriptions and information), label location, and meter/recorder scales. These guidelines were incorporated into design documents and plant procedures. Difficult to read, missing and ambiguous scales were replaced, added, or instruments were changed to correct these deficiencies.

HED 162 - Misleading Labels for Controllers

Correction: Labeling will be revised to correct misleading labels.

Implementation: Controller labels were reviewed for possible misleading labels and corrections were implemented.

HED 165 - Main Control Room Control Bay HVAC Concerns

Correction: Heating, ventilation, and air conditioning (HVAC) capacity will be evaluated and increased as required. ECN P0697 is being implemented for that purpose. Auto controls will be provided and adjusted such that a balanced, comfortable environment will result.

Implementation: The adequacy of the control bay HVAC system was evaluated for both normal and post-Loss of Coolant Accident conditions. The capacity of the system, associated ducting, and its controls were upgraded. The system is now designed to automatically maintain control bay areas with comfort limits during normal operations and within design limits during off-normal events.

HED 173 - Multipoint Recorder Deficiencies

Correction: Ineffective multipoint recorders will be replaced with recorders having the following desired features: easy identification of point being scanned; improved printing; capability to delete disabled or invalid points from scan; and auto tracking (lock in) of point(s) in alarm. Selection of commercially available multipoint recorders as replacements will be based on the above criteria. Priority for replacement will be based on each recorder's function.

Implementation: Multipoint recorders were replaced with microprocessor based units. The new recorders provide, or can be programmed to provide, easy identification of the point being scanned, improved printing, the capability to delete or skip disabled or invalid points, and the ability to lock-in points in alarm.

HED 179 - Inconsistent Indicator/Status Light Color Code

Correction: Replace indicator and status light bulbs, lens, caps as needed to conform to established convention for color coding.

Implementation: A guideline for color coding was established. Indicators and status light lens covers were replaced, as required.

HED 180 - Ineffective Use of Color Coding of Switch Handles for System Demarcation Purposes

Correction: Switch handle color will be made black in general. System demarcation by permanent demarcation lines will be used. Use of color switch handles will be on a selected basis when system demarcation and functional grouping by themselves do not provide sufficient/effective distinction.

Implementation: Switch handles have been changed to black, with the exception of the main steam isolation valves, which are red (Refer to HED 155).

HED 182 - Inconsistency of Recorder Pen Color Assignments

Correction: Convention will be established and implemented for assignment of color pens.

Implementation: Small case recorders were changed to a micro processor based recorder with digital and LED bar graph displays. The replacement recorder color for Channel A is red and Channel B is green.

HED 184 - Reactor Vessel Temperature Recorder Precision Concerns

Correction: Recorder precision required for performance of procedure can be satisfied by the use of trend recorder and process computer console digital indicator. Operations will be trained on this aspect.

Implementation: Reactor vessel temperature recorders 3-TR-68-2 and 3-TR-68-37 have been replaced with recorders that have digital value displays, enabling the operator to have adequate precision for his procedural requirements.

HED 185 - Diesel Generator Cooling Water Temperature Indicator Lights Used as Annunciators

Correction: Annunciator window with reflash capability will be added to 9-20 on Unit 3. This annunciator in conjunction with the status lights will alert operator to cooling water or diesel generator cooling problems.

Implementation: Indicator lights were incorporated into the annunciator window on Panel 9-20.

HED 188 - Panel 9-47 Recorders Location Concerns

Correction: Critical points presently recorded on Panel 9-47 recorders will be input to the new plant computer. A format for suitable display of information (i.e., alarms, trending, etc.) to the operator will be developed on the new process computer.

Implementation: Points recorded, on Panel 9-47 recorders, are input to the new plant computer and suitably displayed.

HED 189 - PCIS Status Difficult for Operator to Determine

Correction: Primary containment isolation system (PCIS) group status lights will be installed on Panel 9-3. EOI Appendix will include tabulation of PCIS groups/valves. Label will be added to Panel 9-3 containment mimic tabulating PCIS groups. All PCIS control valves on control panels will be provided with unique labels. Containment mimic labels will identify PCIS groups.

Implementation: A new containment isolation status system was added to Panel 9-4. Panel 9-3 was not used due to a lack of space. The containment mimic valve symbols contain the associated group number on each valve symbol.

Revision 3 of the EOIs included a tabulation of PCIS valves as an appendix. This appendix was deleted as part of Revision 4 since the number of verifications was reduced to Groups 1, 2 and 3. These verifications can be performed using the new status system.

HED 190 - Group 6 Primary Containment Isolation Status on Panels 9-54 and 9-55 is not Based on Actual Valve Status

Correction: Present PCIS Group 6 valves indications on Panel 9-54 and 9-55 are valve power supply lights. They will be evaluated for adequacy to provide indirect indication of PCIS Group 6 status. Direct valve position will be provided for these valves in the main control room if dictated by engineering evaluation results.

Implementation: The issue of primary containment isolation valve position indication was addressed under Regulatory Guide 1.97. TVA's justification for not providing containment isolation valve position indication for the H₂O₂ monitoring system was submitted by TVA letter to NRC dated May 7, 1985. NRC approved this deviation in its February 8, 1990 letter.

HED 191 - Inadequate Standby Gas Treatment and Reactor Building Ventilation Indications on Front Panels

Correction: Standby gas treatment fan status and outlet flow indicators will be installed in Unit 1 (visible to Unit 1 and Unit 2 Reactor Operator) and Unit 3.

Implementation: Standby gas treatment fan status (Trains A, B, and C) and outlet flow indications were added to Unit 3, Panel 9-20.

HED 192 - EOI-Related Reactor Level Instruments Concerns

Correction: A hot-calibrated and a cold-calibrated digital, wide-range reactor water level instrument will be installed. Yarway gauges on Panels 9-3 and 9-5 have been replaced by gauges with better precision.

Implementation: In response to NUREG-0737 (TMI Action Plan), Item II.F.2 - "Instrumentation for Detection of Inadequate Core Cooling," and Generic Letter 84-23, "Inadequate Core Cooling Instrumentation," TVA previously rerouted the reactor water level reference legs to minimize the routing of the reference legs inside the drywell. This eliminated the need for both hot and cold calibrated reactor water level nomenclature. Two new digital level indicators were added to Panel 9-5.

HED 193 - EOI-Related Reactor Level Instrument Concerns

Correction: Same as HED 192.

Implementation: Same as HED 192.

HED 194 - EOI-Related Reactor Pressure Instruments Concerns

Correction: A digital pressure instrument will be installed.

Implementation: A wide range digital meter was installed to monitor reactor pressure.

HED 196 - H₂O₂ Sample Valve Handswitch Position not Precisely Labeled

Correction: Handswitches with switch position labeled "Normal" will be evaluated to determine the meaning of "Normal". Where "Normal" means on/off, open/closed, the label will be revised to reflect the actual meaning. Where "Normal" means there is an automatic system function associated with the component, a label of "Auto" will be added.

Implementation: The H₂O₂ Sample Valves handswitch plates were labeled "CLOSE" instead of "NORMAL". Other switch plates were changed to ensure consistent use for "NORMAL" position. Normal is no longer used to denote open, close, or automatic system function.

HED 199 - EOI-Related Torus Level Instrument Concerns

Correction: Requirement to read torus level at .25" increments will be evaluated. Procedure or instrument will be changed accordingly. LI-64-54A and LI-64-66 will be provided identical scales.

Implementation: The EOIs were revised to reflect controlling suppression pool level between -1 and -6 inches, which is easily determined from LI-64-54A and LI-64-66. LI-64-54A and LI-64-66 were replaced with new meters with duplicate scales.

HED 200 - Lack of Automatic Depressurization System Logic Inhibit Feature in Main Control Room

Correction: Automatic depressurization system logic inhibit switches will be installed.

Implementation: Automatic depressurization system logic inhibit switches were installed in response to TMI Action Item II.K.3.18.

HED 201 - EOI-Related Drywell Pressure Instrument Concerns

Correction: Required torus pressure instruments will be expanded to 0-60 psig range. Psia gauges will be converted to psig gauges. Scales will be revised or marked to enable the operator to read 2.45 psig.

Implementation: The drywell pressure gauge has been changed from a 0 - 40 psig range to a 0 - 60 psig range. The remaining drywell pressure gauges were converted from psia to psig and the scales revised to enable the operator to read 2.45 psig.

HED 202 - EOI Procedure Concerns (Clarification, Training)

Correction: Specific identified concerns will be corrected, if required. Enhanced EOI training will be provided to operators to facilitate their understanding of procedure basis.

Implementation: The EOIs have been upgraded to meet NRC requirements.

HED 203 - EOI-Related Drywell Temperature Instrument Concerns

Correction: Procedures have been changed to address the precision concern.

Implementation: Requirements in the EOIs to read 212°F and 281°F were changed to 200°F and 280°F, respectively.

HED 204 - EOI Training - Reactor Water Cleanup System

Correction: This was determined to be an invalid HED during the corrective action development phase. No correction is required.

Implementation: In addition, it was determined that Operating Instruction 3-OI-69, "Reactor Water Cleanup System," provides for the return to service of the Reactor Water Cleanup System following an isolation. In addition, EOI Appendix 11E, "Alternate RPV Pressure Control Systems RWCU System Recirc/Blowdown Mode," addresses placing the reactor water cleanup system in the recirculation mode for alternate reactor pressure vessel pressure control.

HED 205 - Inconsistent Instrumentation between Units

Correction: The reason for the inconsistency (i.e., PI-64-39 in Unit 1 only) will be determined and the units will be made consistent.

Implementation: Drywell pressure information is adequately provided on Unit 3 and no additional Unit 3 action was required.

HED 206 - EOI-Related Torus Level Instrument Concerns

Correction: EOIs have been changed to address the torus level instrument precision concern.

Implementation: A requirement for suppression pool level in EOI-2, "Primary Containment Control," was revised from 17 feet 2 inches to 18 feet, which is more readily determined from LI-64-159A. Another requirement for suppression pool level in EOI-2 was revised from 20 feet to at or above 18 feet. Additionally, EOI Appendix 9, "Primary Containment Water Level Monitoring and Equipment Control," provides alternate means for determining suppression pool level when the level exceeds 18 feet.

HED 207 - EOI-Related Drywell Temperature Instrument Range Concerns

Correction: EOIs have been changed to address instrument precision concern.

Implementation: The concern was that the "RX SATURATION TEMP" chart had a temperature axis of 200 - 550 °F while the range of the instrument used to measure this value was 0 - 400 °F. The name for this chart was changed to "RPV SATURATION TEMP" and the axis was changed to 200 - 400 °F.

HED 208 - Hot Rod Scrams

Correction: Control rod pull sheet will be redesigned to provide a consistent method of identifying hot rods for both Engineering and Operations.

Implementation: "Hot rods" are no longer used in the same manner for changes in criticality. The current startup procedures incorporate the Reduced Notch Worth Procedure (RNWP) and Banked Position Withdrawal Sequence (BPWS) recommended by General Electric in Service Information Letter 316. The BPWS prevents excessive fuel pellet enthalpy during the worst case control rod drop accident. The RNWP is used during startup to prevent high notch worth that might result in short period scrams.

HED 209 - DC Lighting Concern

Correction: A DC lighting survey will be performed to evaluate lighting condition. Correction to lighting system will be made to ensure minimum light levels are obtained and shadows are not a problem due to placement of lamps behind operator.

Implementation: DC light illumination levels were evaluated and approved. Lights are now directed toward control panels instead of across the room (behind the operator). This reduces the effects of shadows.

HED 210 - Lack of Offgas Isolation Indication within Horseshoe Area

Correction: An offgas isolation valve closure annunciator will be installed on Panel 9-8 or 9-53.

Implementation: An offgas isolation valve (FCV-66-28) "closed" alarm was installed on Panel 9-7.

HED 213 - Placement of Labels

Correction: Use of hierarchical labeling and label placement will be implemented per the pending BFN labeling guidelines to facilitate easier viewing.

Implementation: Guidelines were developed for labeling issues, such as color contrast, letter size, abbreviations and acronyms, label content (functional descriptions and information), label location, and meter/recorder scales. These guidelines were incorporated into design documents and plant procedures. Label changes were implemented.

HED 214 - Labels - Letter Sizes

Correction: Labels will be revised or added to obtain consistent abbreviations and acronyms, label size, contrast and font as per the pending BFN labeling guidelines.

Implementation: Guidelines were developed for labeling issues, such as color contrast, letter size, abbreviations and acronyms, label content (functional descriptions and information), label location, and meter/recorder scales. These guidelines were incorporated into design documents and plant procedures. Label changes were implemented.

HED 215 - Labels - Functional Description

Correction: Functional descriptions on labels will be verified. Labels will be revised as required to obtain consistent abbreviations or acronyms.

Implementation: Guidelines were developed for labeling issues, such as color contrast, letter size, abbreviations and acronyms, label content (functional descriptions and information), label location, and meter/recorder scales. These guidelines were incorporated into design documents and plant procedures. Label functional descriptions and consistency in abbreviations and acronyms were implemented.

HED 216 - Temporary Labels

Correction: All existing temporary labels will be removed. Administrative controls will be initiated to control use, removal, and installation of temporary labels.

Implementation: The temporary labels were removed from the control room panels and the backup control room panel. Site Standard Practice 12.53, "Component Labeling, Signs, Operator Aids, and Permanent Information Postings," was implemented to control placement and quality of labels, signs, and operator aids.

HED 218 - Mimic and Demarcation Convention

Correction: Permanent demarcation and mimic lines will be installed on control boards. Characteristics for demarcation and mimic lines will be as described by the pending BFN labeling guidelines.

Implementation: Demarcation and mimic lines were installed on the main control room panels and backup control panel. Characteristics for demarcation and mimic lines are described in the panel layout drawings.

HED 220 - Operator/Computer Dialogue

Correction: Abbreviations and descriptions used by computer will be revised to be consistent with BFN standard abbreviations and acronyms.

Implementation: The new Integrated Computer System uses the standard acronyms and abbreviations specified in Appendix H of Site Standard Practice 2.2, "Writing Procedures."

HED 225 - Panel 9-5 Poor Reactor Level Gauge Location

Correction: Digital level and pressure indicators will be installed on Panel 9-5.

Implementation: Digital level and pressure indicators were installed on Panel 9-5.

HED 237 - Fire Protection Controls not Grouped

Correction: HS-26-98 and HS-26-104 (sprinkler switches) will be moved to Panel 9-20 from 9-2 (Unit 1 only) and grouped with other fire protection controls.

Implementation: No implementation was required for Unit 3. This HED applies to Unit 1 only.

HED 238 - Lack of Functional Grouping, Demarcation, Color Coding - Panel 9-3

Correction: Switches for the high pressure coolant injection (HPCI), reactor core isolation cooling (RCIC), core spray (CS), residual heat removal (RHR), RHR service water (RHRSW), containment, and main steam (MS) drain systems will be rearranged to enhance functional grouping and reduce the complexity of flow path mimics. Flow paths will generally be top to bottom and left to right. Hierarchical labeling and system demarcation will be implemented.

Implementation: The switches for the HPCI, RCIC, CS, RHR, RHRSW, containment ventilation, and MS drain systems were functionally grouped, demarcated, and labeled. Reducing the complexity of flow path mimics took precedence over the top to bottom and left to right convention.

HED 239 - Panel 9-4 Layout Confusing

Correction: Switches for fuel pool cooling, reactor water cleanup, and drywell sump systems will be rearranged to provide functional grouping and to conform to left-right and top-down flow conventions as much as possible. System and subsystems will be demarcated and hierarchically labeled.

Implementation: Switches for fuel pool cooling, reactor water cleanup, and drywell sump systems were rearranged to provide functional grouping and to conform to left-right and top-down flow conventions, as much as practical. System and subsystems were demarcated and hierarchically labeled.

HED 240 - Panel 9-5 Lack of Demarcation

Correction: Switches for control rod drive (CRD) system will be rearranged to conform to left-right and top-down flow conventions as much as possible. Systems and subsystems will be demarcated and hierarchically labeled.

Implementation: Switches for the CRD system were rearranged to improve system grouping and conform to left-right and top-down flow conventions, as much as practical. Systems and subsystems were demarcated and hierarchically labeled.

HED 241 - Panel 9-6 Layout Confusing

Correction: Switches for feedwater, condensate, and extraction steam systems will be rearranged to provide functional grouping and to conform to left-right and top-down flow conventions as much as possible. Systems and subsystems will be demarcated and hierarchically labeled. Drywell pressure control switches and indicators will be moved to 9-3 (same as HED 156 correction).

Implementation: Switches for the feedwater, condensate, and extraction steam systems were rearranged to provide functional grouping and to conform to left-right and top-down flow conventions, as much as practical. Systems and subsystems were demarcated and hierarchically labeled. Drywell pressure control switches and indicators were moved to Panel 9-3.

HED 242 - Panel 9-7 Layout Confusing

Correction: Switches for main steam, heater drains/vents, and electrohydraulic control systems will be rearranged to conform to left-right and top-down flow conventions as much as possible. Systems and subsystems will be demarcated and hierarchically labeled.

Implementation: Switches for the main steam, heater drains/vents, and electrohydraulic control systems were rearranged to conform to left-right and top-down flow conventions, as much as practical. Systems and subsystems were demarcated and hierarchically labeled.

HED 243 - Panel 9-8 Layout Confusing

Correction: Offgas system switches will be rearranged to conform to left-right and top-down flow conventions as much as possible. Systems and subsystems will be demarcated and hierarchically labeled.

Implementation: Offgas system switches were rearranged to conform to left-right and top-down flow conventions, as much as practical. Systems and subsystems were demarcated and hierarchically labeled.

HED 248 - Panel 9-20 - Poor Grouping, Demarcation, Confusing Layout

Correction: Condensate storage tank controls and indications will be relocated to the blank panel next to 9-20 (Unit 1) to alleviate congestion on 9-20. With additional space made available, switches for closed cooling water (CCW), raw cooling water (RCW), EECW, service water, fire protection systems will be rearranged to enhance functional grouping. Hierarchical labeling and system demarcation will be implemented.

Implementation: Unit 3 condensate storage tank indications were added to Panel 9-6. Controls and indications for the CCW, RCW, EECW, service water, control air, and fire protection systems were relocated to enhance functional grouping.

HED 250 - Electrical Board (9-23) Mimic Lines Confusing; Diesel Generator Displays not Demarcated

Correction: Hierarchical labeling and functional demarcation will be used. Additional synchroscope(s) will be added for Unit 3 diesel generators or the existing one will be mounted on a swivel base to facilitate operator viewing.

Implementation: The diesel generator panel was revised to improve display and control layout, functional demarcation, and labeling. A synchroscope was added to Panel 9-23C.

HED 251 - Panel 9-25 Layout Confusing

Correction: Switches for reactor building ventilation and drywell ventilation system and standby gas treatment instruments will be rearranged to conform to left-right and top-down flow conventions as much as possible. Systems and subsystems will be demarcated and hierarchically labeled.

Implementation: Switches for the reactor building and drywell ventilation systems and the standby gas treatment instruments were rearranged to conform to flow conventions. The systems and subsystems were demarcated and hierarchically labeled.

HED 253 - Offgas System (Panel 9-53) Layout and Mimic Confusing

Correction: System switches will be rearranged to conform to left-right and top-down flow conventions as much as possible and to enhance the ease of mimic. Subsystems will be demarcated and hierarchically labeled.

Implementation: System switches were rearranged to conform to left-right and top-down flow conventions. Improved mimics, demarcations and hierarchical labels were added to enhance system comprehension.

HED 259 - Drywell and Torus Displays and Controls not Functionally Grouped

Correction: Affected control and indicators will be rearranged on Panel 9-3 for functional grouping. Affected switches and displays from 9-6 will be moved to 9-3 (this is also addressed by HED 156 correction).

Implementation: The affected control and indicators were rearranged on Panel 9-3 for functional grouping. Drywell compressor switches and drywell pressure instrumentation were moved from Panel 9-6 to Panel 9-3.

HED 267 - Cooling Tower Temperature Monitoring System not Used

Correction: Instrument will be removed from panel and cover provided over the hole.

Implementation: This HED does not apply to Unit 3.

HED 268 - Suppression Chamber Water Temperature Transfer Switch no Longer Being Used

Correction: Suppression chamber water temperature transfer switch will be removed from Unit 2, Panel 25-32 and cover provided over the hole.

Implementation: The suppression chamber water temperature transfer switch was removed from the panel and a flush surface repair was completed for the hole.

HED 271 - Procedure Concerns

Correction: Operator training of EOIs will include understanding the basis of the EOIs.

Implementation: The bases for the EOIs are taught in initial and requalification training.

Correction: The present system of using required monthly operator reading as the mechanism to convey procedure revision information will be evaluated and changed as required to increase the effectiveness of conveying procedure revision information to the operator.

Implementation: Browns Ferry Training Instruction 410.01, "Operator Required Reading Program," addresses the timely review of procedure changes. Classroom time is scheduled during requalification training to review these changes.

Correction: An index will be provided in each volume (book) located in the main control room.

Implementation: Operating Instructions were separated into one volume per instruction to eliminate confusion as to which procedures were in what volume. For other plant procedures, the first volume in the series contains the index. Each volume in the series has information in the spine relating to the type of procedure and which procedures are contained in that volume.

HED 272 - Procedure Revisions/Plant Modification Training Concerns

Correction: BFN Standard Practice 8.3 will be implemented. Per this standard practice, Training is notified of all modifications and will identify training requirements. Procedure revision training is accomplished via the required reading training mechanism.

Implementation: Site Standard Practice 9.3, "Plant Modifications," prescribes the review and evaluation of modifications for impact on procedures and training. Site Standard Practice 12.1, "Conduct of Operations," describes the requirements and responsibilities for required reading. Selected plant modifications are included as part of operator requalification classroom training and on the simulator, where applicable.

HED 273 - PCIS Reset Status

Correction: A caution step will be provided in Surveillance Instruction 4.1.A-10 to warn operators of possible consequences if MSIV power available lights in Auxiliary Instrument Room are not checked during surveillance test.

Implementation: A caution statement is no longer needed. These radiation monitors no longer initiate a reactor scram and this function was removed from the Unit 3 Technical Specification in Amendment 185 (TS 322). The main steam line radiation monitor channel alignment and function test are performed under Special Instrument Instructions.

HED 275 - No Visual Relief from Arrays of Instrumentation

Correction: No specific fix. Individual demarcation fixes for all control room panels will alleviate the concern of this HED.

Implementation: Demarcation and color patching was provided for the control room panels. The changes implemented for each panel relocated components provided additional visual relief from arrays of instrumentation.

HED 280 - Diesel Generator Trip due to Misalignment of Mode Switch

Correction: Cautionary label will be added.

Implementation: Instead of a cautionary label, Operating Instruction 0-OI-82, "Standby Diesel Generator System," was revised to include the following caution statement:

Failure of the PARALLEL WITH SYSTEM light to illuminate in the following step could indicate that the DG is still in SINGLE UNIT operation and result in overload when the DG output breaker is closed.

HED 282 - Steam Packing Exhauster Blower and Discharge Valve do not Operate per Drawings

Correction: Maintenance will investigate discrepancy. The functional design of controls will be incorporated into the operator training program.

Implementation: No discrepancies between system function and logic were identified. Operating Instruction 3-OI-47C, "Seal Steam System," was revised to include operational instructions.

HED 283 - Different Zero References for Reactor Vessel Level Instruments

Correction: Reactor level instruments will be rescaled or modified to have a consistent zero inch reference. This effort will be coordinated with the planned modification for level instrumentation reference legs.

Implementation: LI-3-52 and LR-3-62 were rescaled to have zero inches represent instrument zero (150" above active fuel) to be consistent with other reactor vessel instruments.

HED 284 - Control Bay Ventilation Annunciator that Affects all Units but only Alarms in Unit 1

Correction: Annunciator for control ventilation isolation will be installed on Unit 2 and Unit 3.

Implementation: Control room high radiation isolation and control room isolation radiation monitor downscale or inoperable alarms were added to Panel 9-6B in the control room.

HED 287 - Emergency AC Lighting

Correction: Main control room/auxiliary control room emergency AC lighting will be enhanced to reach minimum design level of 10 foot-candles.

Implementation: Emergency AC lighting in the Unit 3 control room was upgraded. Evaluations were performed for all areas that did not meet the 10 foot-candles level to insure operator tasks could be performed without adverse impact due to lighting.

HED 288 - EOI-Related Reactor Water Level Instrument Concerns

Correction: This issue is covered by HEDs 192, 296, and 297.

Implementation: Two digital reactor water level instruments were provided on Panel 9-5. These digital level indicators parallel the emergency range indicators and have a range of -155 to +60 inches with a resolution of 0.1 inches.

HED 289 - EOI-Related Steam Tunnel Temperature Instrument Concerns

Correction: The instrument setpoint will be marked on the meter.

Implementation: The steam tunnel temperature indicator was replaced with an indicator that alarms when the high temperature setpoint is exceeded. The temperature is indicated in both analog and digital format.

HED 290 - EOI-Related Steam Line Flow Instrument Concern

Correction: Alternate means will be specified in the EOIs to allow the operator to recognize the condition of greater than 4.68 million lb/hr steam flow rate.

Implementation: This requirement is no longer applicable to the EOIs.

HED 291 - Main Steam Acoustic Monitor Power Indication is not Clearly Labeled

Correction: The power switch positions will be clearly labeled.

Implementation: The power switch positions were labeled "ON" and "OFF".

HED 292 - EOI Clarity and Useability Concerns

Correction: Specific identified concerns will be corrected, if required.

Implementation: Unit 3 EOIs have been upgraded to encompass the corrections needed for these concerns.

HED 293 - Drywell Temperature and Pressure Recorder has Poor Scales for Readability

Correction: Scales will be replaced with ones that have conventional divisions and markings. Psig will be used instead of psia for pressure.

Implementation: The drywell temperature and pressure recorders were replaced with recorders that have digital displays. The units for the pressure indicator were changed from 0 - 80 psia to -15 to +65 psig. The change in units was approved in Technical Specification Amendment 168 (TS 327).

HED 296 - EOI/Regulatory Guide 1.97 Integration Concerns

Correction: This is outside the scope of Detailed Control Room Design Review (DCRDR). TVA will evaluate and implement additional integration, if required.

Implementation: TVA's August 22, 1991 described the formal process for coordinating the CRDR program with the Safety Parameter Display System and Regulatory Guide 1.97 modifications. The NRC closed this CRDR program requirement in their October 29, 1991 Safety Evaluation. The EOI Program Manual states that qualified post-accident monitoring instruments should be utilized as much as practical and that the operator should observe as many of the multiple readouts as practical for verification of the values being observed.

HED 297 - Integration of DCRDR with Control Room Modifications

Correction: This is outside the scope of DCRDR. TVA will evaluate and implement additional integration, if required.

Implementation: TVA's August 22, 1991 described the formal process for coordinating the CRDR program with the Safety Parameter Display System and Regulatory Guide 1.97 modifications. The NRC closed this CRDR program requirement in their October 29, 1991 Safety Evaluation. Design Procedure PI 89-06, "Design Change Control," requires a human factors review of designs that could impact the control room operator. Site Standard Practice 9.3, "Plant Modifications and Design Change Control," requires operations and training departmental coordination during each phase of design package development.

HED 300 - EOI-3 Procedure Entry Condition

Correction: The EOI entry condition will be evaluated. If valid, indication and alarm will be added to main control room, if not the procedure will be revised.

Implementation: A reactor zone differential pressure alarm was added to each control room.

HED 302 - EOI-3 Procedure Entry Condition

Correction: The difference between setpoints and procedure values will be analyzed. Setpoints or procedure will be revised to correct problem as needed.

Implementation: The entry conditions for EOI-3, "Secondary Containment Control," from secondary containment area temperatures exceeding maximum normal values has been established at the alarm setpoints.

HED 305 - EOI-3 Tabulation of Area Radiation Levels

Correction: The difference between normal and safe setpoints will be evaluated. Procedures will be revised to correct problem.

Implementation: The maximum normal value for the transversing in-core probe room was revised to match the alarm setpoint. Conditions that may cause entry into EOI-3, "Secondary Containment Control," must be evaluated by the Senior Reactor Operator on a case by case basis. Entry and exit from EOI-3 are based on the actual unit conditions.

HED 306 - Tabulation of Maximum Safe Operating Water Levels (EOI-3)

Correction: Permanent markings will be provided locally to indicate maximum safe operating water levels.

Implementation: Permanent scales were painted on reactor building walls, at Elevation 519, to indicate the maximum safe operating water levels. These markings are viewable from the stairwells.

HED 308 - TI-75-69B Scale Range does not Support EOI-3 Parameters

Correction: The difference between setpoint and procedure value will be evaluated. Deficiency will be corrected by instrument modification and/or procedure revision.

Implementation: The table in EOI-3, "Secondary Containment Control," which contains the maximum normal operating temperatures for secondary containment temperatures, now corresponds to the scale provided for the applicable temperature instruments.

HED 311 - EOI-1, Appendix 12 Procedure Clarification

Correction: The EOI setpoint will be evaluated. If valid, indication will be added to the main control room, if not, the procedure will be revised.

Implementation: The setpoint was evaluated and it was determined that the caution for monitoring the reactor building closed cooling water system outlet temperature could be removed. Operating Instruction 3-OI-69, "Reactor Water Cleanup System," and EOI Appendix 12 (currently Appendix 11E) were revised to remove this caution.