

UNITED STATES NUCLEAR REGULATORY COMMISSION WASHINGTON, D. C. 20555

MAY 2 1 1981

Docket Nos.: 50-445 and 50-446

> Mr. R. J. Gary Executive Vice President and General Manager Texas Utilities Generating Company 2001 Bryan Tower Dallas. Texas 75201



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Dear Mr. Gary:

Subject: Control Room Design Review Audit Report - Comanche Peak, Unit 1

The enclosed report, "Human Factors Engineering Control Room Design Review/ Audit, Comanche Peak Unit 1," is provided for your review and action. This report is the product of the human factors engineering design review/audit of the Comanche Peak Unit 1 control room performed by the NRC Human Factors Engineering Branch (HFEB) review team during the week of December 8-12. 1980.

The HFEB review team responsible for the Comanche Peak control room review consisted of J. P. Joyce, S. N. Saba, R. W. Froelich, and M. Greenberg of the NRC staff. The HFEB review team was assisted by consultants H. Price, B. Paramore, and J. DeBor of BioTechnology, Inc.; and R. Peterson, J. Savage, and J. Preston-Smith of Lawrence Livermore National Laboratory.

The review team concluded that its design review/audit was premature by nine months to a year due to the construction status of the control room. As a result of this state of unreadiness the review team could not complete its evaluation of the control room with respect to the NRC's Human Factors Engineering Guidelines. Nevertheless, the enclosed report summarizes the review team's observations of the control room design and layout, and the interface of the control room operator and that environment. This report lists a number of open items and deficiencies which should be considered prior to fuel loading and in the longterm human factors review of the control room.

If the schedule permits, your staff may respond to these open issues and deficiencies in the Detailed Control Room Design Review (DCRDR) to be performed in response to Item I.D.1 of NUREG-0737. That review, which will require about one year to complete, will be conducted in accordance with NUREG-0700 which the staff expects to issue this summer. Your staff believes the issue date

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Mr. R. J. Gary

of NUREG-0700 and the time required for the DCRDR are compatable with the fuel load date. We find it acceptable to resolve open items and deficiencies either in the DCRDR or a separate preliminary assessment proposing a plan for correcting the deficiencies identified in the audit report.

We will require Comanche Peak to do the following:

- Factor into the DCRDR the deficiencies and observations identified in our audit report.
- (2) Correct all Category 1 and 2 items prior to fuel loading.
- (3) Submit to NRC a report, 120 days prior to fuel loading, describing how the deficiencies are being corrected, or
- (4) Submit to the NRC by June 1, 1981, a proposed program for implementing actions to correct the deficiencies identified in our audit report.

Should you have questions concerning this matter, please contact us.

Sincerely,

VEQESCI

Robert L. Tedesco, Assistant Director for Licensing Division of Licensing

Enclosure: As stated

cc w/encl.: See next page

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ENCLOSURE

HUMAN FACTORS ENGINEERING CONTROL ROOM DESIGN REVIEW/AUDIT COMANCHE PEAK UNIT 1 TEXAS UTILITIES GENERATING COMPANY

SECTION 1

INTRODUCTION

A human factors engineering design review/audit of the Comanche Peak Unit 1 control room was performed during the week of December 8-12, 1980. This design review was carried out by a team from the Human Factors Engineering Branch, Division of Human Factors Safety. The review team was assisted by human factors consultants from BioTechnology, Inc. (Falls Church, Virginia) and from Lawrence Livermore National Laboratory (University of California, Livermore, California).

The review team concluded that our CRDR was premature by nine months to a year. As a result of this we could not complete our evaluation of the control room with respect to the Human Factors Engineering Guidelines/Checklist.

The applicant expects to resolve the open items and deficiencies in the Detailed Control Room Design Review in accordance with Item I.D.1 of NUREG-0737. The review, which will require about one year to complete, will be conducted in accordance with NUREG-0700 which the staff expects to issue this summer. The applicant believes the issue date of NUREG-0700 and the time required for the Detailed Control Room design review are compatable with the fuel load date. We find it acceptable to resolve open items and deficiencies either in the one year Detailed Control Room Review (NUREG-0700) or a separate submittal proposing a plan for correcting the deficiencies identified in the audit report.

We will require Comanche Peak to do the following:

 Factor into their DCRDR the deficiencies and observations identified in our audit report.

- (2) Correct all Category 1 and 2 items prior to fuel loading.
- (3) Submit to NRC a report, 120 days prior to fuel loading, describing how the deficiencies are being corrected, or
- (4) Submit to NRC by June 1, 1981, a proposed program for implementing actions to correct the deficiencies identified in our audit report.

Observed human factor design deficiencies were given a priority rating of one to three, (high, moderate, low), based on the increased potential for operator error and the possible consequences of that error.

A number of observations could not be evaluated for acceptability due to the lack of completeness of the control room. These items are "open Items" and are rated as Category 1, marked with an asterisk *, until reviewed by the NRC.

The following sections summarize the team's observations of the control room design and layout and of the interface of the control room operator and that environment.

SECTION 2 - CONTROLS

- a. Direction of movement is generally correct with some exceptions:
 - (1) Hagen flow controllers are "open" left and "closed" right. (Category 2) F-1
 - (2) Reactor trip J-handle moves CCW for trip, whereas other emergency J-handle controls move CW for actuation. (Category 2) F-2
- b. Displacement and resistance of controls is generally adequate for positive response and feedback. However, CMC switches have certain limitations:
 - Discrete selector CMC switches can be stopped between positions (e.g., SI pump discharge to HL-VLV on CB-02). (Category 3)
 - (2) Momentary contact CMC switches are uncomfortable and could be fatiguing if they have to be held in contact position for a long time. (Category 2)

- c. No control coding is currently being used:
 - Controls for mechanical valves, mechanical pumps, breakers, motors, etc., are not distinguishable by shape or color coding. (Category 1)
 - (2) Throttle valve controls are not distinguishable from other valve controls. (Category 1)
 - (3) Emergency or critical controls are not distinct from others. (Category 1)
- d. Control labeling is inadequate because:
 - (1) Abbreviations and nomenclature are not consistent. (Category 1)
 - (2) Train A and B labels are not always correct. (Category 1)
 - (3) Illuminated legends integrated with controls have not been engraved or have color-filters added. (Category 1)
- e. Pointer indicators on J-handles and star handles (VVS-1A) are not obvious because of poor contrast. The position that the control is turned to is not always apparent. (Category 1) F-3
- f. J-handle flag colors are not readily detectable. (Category 2)
- g. There are clusters of controls which have no coding or demarcation (Category 2)
- h. Some emergency or critical controls are neither coded or guarded (e.g., turbine trip push buttons - rod control startup pushbutton). (Category 1) F-12
- i. The E-60 Cutler Hammer switches (6 of them) for feedwater pump drain pots (CB-0) are either mislabeled or not arranged in sequence. The common controls for pumps A & B are in the upper left for the Hi pressure series, and a common A & B are in the lower right of group for Lo pressure series. (Category 2) F-4
- j. The Heating System to MSR controller is an Allis Chalmers component with "symbols" labeling. The meaning is not obvious and operators were not sure what the symbols meant. (Category 2) F-5
- k. Hagan flow controllers (1-HIC-607) have inconsistent relationship between control effects and indicator: Open is indicated by 0% and Close 100%. (Category 2) I-1
- Star handle selector switches have position labels missing 1-AS-Wc. (Category 1) I-1
- m. There are incorrect or missing labels on certain controls, [e.g., the Auxiliary Feedwater pump turbine trip is labeled "Turbine Trip" (1-HS-2452)]. This could be confused with main turbine trip. (Category 1) I-7

- n. Annunciator pushbuttons on CB-12 are too small, too close together, and the labels on buttons are difficult to read. (Category 3) I-8
- Some control indicator lights are not labeled, (e.g., X-HS-3452, 1-HS-3450). (Category 2) I-4
- p. The function of certain split indicator lights on J-handle control switches are not clear and are not labeled, (e.g., 1-HS-3450, X-HS-3264). (Category 2)
- q. Reactor trip switch should be a single actuation motion, single function, momentary contact switch to perform the unique trip function. It is a three position J-switch CCW trip, neutral, CW close. (Category 3) F-2
- r. There exists no functional demarcation of controls. (Category 2)
- S. On containment isolation panel CB-03 there is a single control for Phase "A" Isolation and a dual control for Phase "B". To initiate Phase "B" the operator must have initiated Phase "A" and then operate both controls for Phase "B" simutaneously. Labels to that effect are not provided on the panel. (Category 2)

SECTION 3 - DISPLAYS

- a. Display location readability from normal viewing distance is generally adequate. The top-most rows of vertical meters have some parallax when reading the upper portions of the scale. (Category 3)
- Some Monitor Light Boxes (MLB) status lights have top line of 'egend obscured. (Category 2)
- c. MLB status lights were not activated and could not be observed. However it appears that they would generate abstract patterns in some cases which would be difficult to recognize. (Category 1)*
- Color coding of most indicators was not complete and could not be evaluated. (Category 1)*
- e. There are no normal operating range or setpoint values marked on meter faces. (Category 1)
- f. There are clusters of displays (more than 5) on the electrical panel which increases search time for identification of a specific display. (Category 3)
- g. Post accident monitor (PAM) displays should be distinctly coded. (Category 1)
- h. There are many groups of red-green indicator lights with labels below each pair of lights, and these indicator light groups have several problems:
 - The labels butt up against the bottom of the top pair of lights. In long columns this can be confusing. (Category 2)

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- (2) Some of the color covers were missing. There are many series which are not in sequential or logical order. These include: (Category 1)*
 - (a) Circulating water traveling screens. Five are in one column and the sixth is in the middle of another column. (Category 2) F-9, F-27, G-8, and G-7
 - (b) Heater Level Hi-Hi (4 indicators) is 6A 5A on top and 6B 5B on bottom. (Category 2)
 - (c) FWP Turb HP S/VLV (8 of these). Four are in one group and four in another. (Category 2) F-26
- The indicator lights on CB-08 for status of FWP Turb SP S/VLV are 6 or 8 feet away from the controls. (Category 2) F-26
- j. The indicator lights for RHR pump (1 & 2) SMP ISOL VLV (CB-04) are white instead of red for open. (Category 1) F-11
- k. There are trip bistable lights on the RHR panel (CB-04D) which indicate the status relative to reactor trip on panel (CB-06). Displays should be located in close proximity to the control its monitors. (Category 2)
- 1. There are some inconsistencies in labeling on meter scales which may be confusing, i.e., on the pump sealwater injector pressure meters the scales are marked variously PSID and PSI, P, while the associated annunciator tiles are D/P HI, LO. (Category 2) G-10
- m. Inconsistent/incomplete/misleading labeling is used on the RC flow meters on CB-058 (RCP V LOOPS). It is not clear what is being measured. (Category 1) B-11
- n. The operator cannot read the pressurizer pressure and level meters on CB-05C while operating the reactor startup controls on CB-06. (Category 1)
- On service water panel CB-O1, containment sump controls 2, 3, and 4 and their associated run time meters are installed in reverse order. (Category 2) G-15 & 16

SECTION 4 - LABELING AND CODING

- There is no hiera: chial structure of labeling (e.g., from System, Subsystem to the component label). (Category 1)
- b. On CB-08 and 09 the J-handle controls have a second label on the left/right corners below the control switch. When operating these switches the operators' hand will obscure the label. (Category 3)
- c. Labels are obscured by the bezel of displays. (Category 2) B-5

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- d. Some displays have inconsistent labeling on the scales, e.g., (Category 1) B-11
 - (1) 70 Full Power
 - (2) LP 2 Overpower AT
 - (3) LP 3 Overpower AT
 - (4) Turbine Impulse Pressure
- e. Labels are not consistently positioned on the panels. (Category 1) J-1 & 2
- f. Some labels are missing. (Category 1* B-8
- g. Some displays have two labels on the scale, one under and one above the meter, and both are inconsistent in their description e.g., (Category 1)
 - (1) PWP A Suction Flow on the scale, COND To FWP 1-A Turbine Flow on the label below the suction.
 - (2) Main F.P. "B" DISCH HDR PRESS engraved on the meter and, FWP 1-B TURB DISCH HDR PRESS on the label. This is to be compared to FWP A DISCH HDR PRESS on the meter and FWP 1-H TURB DISCH HDR PRESS on the label.
- Temporary labels are used in the control room, (e.g., sequence of events recorder). (Category 1)*
- No demarcation techniques are used. Additional demarcation is needed (and planned) but cannot be evaluated at this time. (Category 1)* B-6 & B-7
- j. Except for the electrical distribution panel (CB-11), there is no mimicking on the control panels to help the operators. (Category 2) B-7
- k. There is no use of color coding on the control panels except for Trains A & B (orange and green). (Category 3)
- Some switches have two labels (one orange, one green) with identical nomenclature. Unsatisfactory explanation was given for this type of labeling on CB-07. (Category 1) B-4

SECTION 5 - COMPUTER

- a. There is no CRT graphic display capability. (Category 3)
- b. No color coding is used on CFT display. (Category 3)
- c. Glare on the CRT display causes degradation in readability. (Category 2)
- d. The operators did not receive formal training on the use of the process computer. (Category 1)

e. There are no operating procedures for operator use on total loss of the process computer system. (Category 1)

SECTION 6 - CONTROL ROOM WORKSPACE AND ENVIRONMENT

- a. Storage of essential material (emergency operating procedures) is undefined. (Category 1)*
- b. There is no operator protective equipment, fire equipment, or first aid equipment in the control room. (Category 1)*
- c. Heating/ventilation/air condition equipment (HAVC) was not installed. (Category 1)*
- d. Controls located on the transition section between the benchboard panel and vertical panel present a reach problem for fifth percentile operators, (e.g., CB-06 and CB-8). (Category 2) C-1 & 2
- e. HVAC panel may present reading/actuation problems: (Category 3)
 - (1) Kighest annunciator tiles are 86" from floor, C22
 - (2) Highest meters are 74" from floor, C23
 - (3) J-handle controls are 69" from floor, C24
- f. Incore flux monitoring panel has selection controls 81" above floor. Same panel has temperature control switches only 15" above the floor. (Category 2) C25 & C26
- g. General control room maintenance/housekeeping was not evaluated because of the CR construction status. (Category 1)*
- Position indicator lamp holders are difficult to remove. A special tool should be provided. (Category 2)
- i. Page phone cords present a potential tripping hazard. (Category 2) C-17
- j. Thru-floor penetration next to the operator's desk and the computer console presents a tripping hazard. (Category 2) C-18, 19 & 20
- k. Illumination
 - (1) The emergency AC and DC lighting systems were not operable. (Category 1)*
 - (2) Lighting from some areas (e.g., CB-13, 14 & 15) was not installed, and lighting surveys were not completed. (Category 1)*
 - (3) Minor glare problems exist on benchboard indicators that reflect light not diffused by the ceiling grids, (e.g., CB-07 step counters, CB-8, 9, and 10 controllers). (Category 3) C-4, 5, and 10)

- (4) Labels located beneath recorders on CB-07 are shaded and difficult to read. (Category 3) C-27
- 1. Noise
 - NOTE: Control room construction status is such that conclusive sound level surveys cannot be made. The permanent HVAC system is not in operation and construction activities interface with the measurement for control room environment and alarm levels. (Category 1)*
- m. Communications
 - Presently there is only one outside phone in the Control Room. (Category 1)
 - (2) There is no dedicated phone for NRC hotline, State or Local Authorities or NRC Operations Center. (Category 1)*
 - (3) Presently incoming night calls are being transferred to the control room. (Category 1)
 - (4) There are no direct communications from the control room to: (a) the HVAC panel: (b) the in-core thermocouple panel; and (c) the Remote Shutdown panel.
 - NOTE: All of these stations do have cut-outs in the panels for future sound-powered jacks and possibly hand sets. (Category 1)*
 - (5) There are sixteen (16) sound-powered jacks scattered around the control room consoles, with at least one at each panel. However, the jacks are not labeled, and no sound-powered head sets are located in the control room. No decision has yet been made on how many there will be or where they will be located. (Category 1)*
 - (6) Presently there is no communication system planned between the control room and their Technical Support Center. They will decide at a later date. (Category 1)
 - (7) There was no loud speaker located at the Remote Shutdown Cabinet (Category 1)
 - (8) There is no procedure for handling communications during an emergency (Category 1)*
- n. Lamp Test

There is no lamp test provision to test the indicating lights associated with control switches. (Category 1)

SECTION 7 - REMOTE SHUTDOWN PANEL

 The applicant is presently in the process of re-designing the complete shutdown panel. (Category 1)*

SECTION 8 - RECORDERS

- a. Only a few recorders had chart paper. (Category 1)*
- b. Of those that had chart paper, the scales on the paper did not agree with the scale indicators, (i.e., different divisions or different dimensions). (Category 1)
- c. Some recorders did not have pens or scales installed. (Category 1)*
- d. Some recorders had two and three pens, however, the pens overlapped thus obscuring the bottom pens and possibly the trace of the bottom pen. Also it would be very difficult to read the pen pointer on the scale indicator because pointer was too far away. (Category 1)
- e. Some recorders had three scale indicators but were difficult to read. One of the scale indicators was obscured by one of the other scale indicators and the third scale obscures the recorder pen traces for an undetermined time until the track appears below the scale. (Category 2)
- f. Several of the recorders had a second "home made" scale pasted under the glass of the recorder. (Category 1)
- g. Some recorders had clear glass on the door while a few had diffused. The clear glass had high reflected glare, while the diffused glass made it difficult to read the scale indicators when standing to either side of the recorder. (Category 2)

SECTION 9 - CONTROL/DISPLAY RELATIONSHIP

- a. Service Water/Reactor Makeup Water CB-01
 - NOTE: Could not evaluate the relationships between the intergrated displays/controls due to the lack of final label engraving and/or color-coding.
 - Demarcation labeling of this control board would significantly improve operator perception of functional groupings. (Category 2)
 - (2) Abbreviations on labels, annunciators, etc., are not consistent. (Category 1)
 - (3) Labels are not high enough in contrast to be easily read (particularly the white on orange - Train A). (Category 1)

- (4) The two status indicator panels on CB-01 should be relocated with the other status indicator panels on CB-02. (Category 3)
- (5) Labels are numbered inconsistently for SERVICE WTR RMPHSE VENT EXH FAN NO. . [Orange Train A: #2, 3, 6, 7; Green Train B: #4, 5, 8, 9] (Category 2)
- b. Containment Spray/Safety Injection CB-02
 - NOTE: We could not evaluate the relationships between the integrated displays/controls due to the lack of final label engraving and/or color-coding.
 - (1) It appears that switch 1/1-C1 PBAZA (SPACTCONTISOL CONT ISOL PHASE B SWITCH) should be green instead of orange. The same is true for switch 1/1-8814B (SI PMPZ MINI FLOW). (Category 2) F-14 & 20
 - (2) On CMC switches one cannot distinguish momentary contact switches (hold to activate) from discrete (on/off) position switches. (Category 2)
 - (3) Annunciators are not logically located over related controls. (Category 2)
 - (4) The pressure and flow indicators for each SI Pump should be located side-by-side (rather than vertically) so they can be read together. (Category 2) F-19
 - (5) Meters associated with color labeled controls should have housing colored to match. (Category 3) F-19 & F-20.
 - (6) Controls in region including 1/1-8823, 1/1-8881, and 1/1-8825 seem to have no functional grouping pattern. (Category 2) F-21
 - (7) The top line of the status panel legends are obscured by the edge of the clear plastic bottom cover. (Category 2)
- c. Containment Isolation/Component Cooling Water CB-03
 - NOTE: Could not evaluate the relationships between the integrated displays/controls due to the lack of final label engraving and/or color-coding.
 - Containment hi pressure annunciator tile should be located above the meter (containment pressure) located on CB-03 instead of CB-02. (Category 2)
- d. RHR/Boron Injection/Safeguards Chilled Water CB-04
 - NOTE: Could not evaluate the relationships between the integrated displays/controls due to the lack of final label engraving and/or color-coding.

- Indicator lights (trip bistable lights) are located on the vertical portion above RHR controls. These lights would be more appropriately located on the reactor panel CB-06. (Category 2)
- (2) The presence of annunciator tiles for ventilation system chillwater above the nuclear system controls and displays creates confusion. There is no indication that the annunciator is for nuclear system chillwater and/or vent chillwater system. (Category 2) I-11
- (3) Chilled water annunciator tiles are clustered at far right of annunciator panel except for two which are mixed in with condensor tiles in the center. (Category 2)
- (4) Chilled water recirculation pumps are labeled PMP 4 and PMP 5. There are two others, for ventilation systems, not on the boards, (i.e., pump numbering does not make sense in context of this board). (Category 2)
- (5) Annunciator panel (1-ALB-4B) over accumulator controls and displays contains mostly irrelevant tiles, while the ACC ISOL tiles are displaced next to panel on right (1-ALB-4C), over RHR controls. Of the tiles on 1-A.B-4B, only the RHR tiles (3) are needed. The rest go with ECCS valve controls, which are distributed around the control room. (Category 2) G-11
- (6) The label for control CHG PUMP LIN ISOL VLV 1/1-8843 shows it as a three position switch. This control should be labeled as a two position switch just like CHG PM' LINE ISOL VLV 1/1-882. (Category 2) I-12
- (7) Labeling on pump seal water inj. pressure scales is inconsistent across scales and also inconsistent with annunciator markings (PSID vs PSI, P on meters D/P, HI, LO used on annunciators). (Category 2) G-10
- (&) Inconsistent and unclear meter labeling (RC T COLD, RC OT, RC OP) do not reflect what is being measured. (Category 1) B-11
- e. Pressurizer/Reactor Coolant CB-05
 - MOTE: Could not evaluate the relationships between the integrated displays/controls due to lack of final label engraving and/or color-coding.
 - Labeling of pressurizer selector switch and of selector switch position is confusing and incomplete (i.e., 1/1-P-4556, 1/1-PS-458F, 1/1-LS-459D, 1/1-LS-459E). (Category 1) G-10
 - (2) Pressurizer pressure and level meters are on panel CB-05C and cannot be read accurately from operator station on panel CB-06 during startup, (Category 1)

- Chemical Volume Control System CB 06
 - NOTE: Could not evaluate the relationships between the integrated displays/ controls due to the lack of final label engraving and/or color coding.
 - (1) "Reverse Convention" is used for thermal regeneration system bypass flow controller. Also there is no direct display to indicate percent flow bypassed requiring the operator to compare letdown flow with CVCS return flow. These two indicators have different scales and are not adjacent to each other. (Category 1) C-6
 - (2) "Paper" labels on controllers do not correlate with engraved labels below controllers and some labels are missing. (Category 1)* C-8
 - (3) Charing pump is mislabeled. One train shows "CLOSED AUTO OPEN," the others show "RESET BLOCK." (Category 1) J-7
 - (4) During charging and letdown the flow indicators need to be compared, but the indicators are not side-by-side. (Category 2) C-3
- g. NIS and Rod Control CB-07
 - NOTE: Could not evaluate the relationships between the integrated displays/ controls due to the lack of final label engraving and/or color-coding.
 - Pressurizer pressure and level indicators are not available for operator use during startup. (Category 2)
 - (2) There are no safe operating limit color bands on meters. (Category 1)
 - (3) The permissive status lights on CB-05 can not be read from CB-07 (control interlocks, etc.) (Category 1)
 - (4) There is no first out board. (Category 2)
 - (5) The direction on the actuation for Full Length Rod Mution Control (1/1-FLRM) is reversed. It should be in=down, out=up. (Category 2) F-15
 - (6) The annunciator control box (Annun Lt. Box 1-CS-ALB6AB) should be on CB-06 since it controls the banks of annunciators on CB-06. (Category 2)
 - (7) Digital time clock should be located on top of the control board, not at the bottom. (Category 3)

h. Turbine CB-10

- NOTE: Could not evaluate the relationships between the integrated displays/ controls due to the lack of final label engraving and/or color-coding.
- Split indicator lights on circulating water pumps are not labeled. (Category 1)* J-9, C-7

- i. Electrical Distribution
 - The ammeter display associated with the generator breaker is inconsistent with the selector switch. (Category 2)
- j. HVAC AB-12
 - NOTE: Could not evaluate the relationships between the integrated displays/ controls due to the lack of final label engraving and/or color-coding.
 - Panels appear to be reasonably well laid out, but lack demarcation and hierarchial labels to identify specific subsytstems. (Category 1)
 - (2) There are a number of significant changes to be made to this panel. Control/display evaluation could not be completed. (Category 1)*
- k. Radiation Monitoring System (RMS) Console (AB-05
 - Interactive CRT displays are installed in racks but not hooked up. The team was unable to operate and evaluate the installation. (Category 1)*
- 1. Meteorological Panel AB-06
 - The equipment was not installed. (Category 1)*
- m. Radiation Monitoring System (RMS) AB-07
 - Two strip chart displays with associated controls are arranged in vertical mirror image layout. Controls for upper strip chart are above the strip chart recorder. Controls for lower strip chart are below the strip chart recorder. (Category 2)
 - (2) The installed height of both controls and strip chart recorder are inconvenient for operation and viewing (i.e., recorders low for good viewing, controls too high). (Category 3)
- n. Nuclear Instrumentation System (NIS) Ab-08
 - The equipment was not installed. (Category 1)*

This equipment will be a standard Westinghouse installation.

SECTION 10 - OTHER OBSERVATIONS

- a. Subcooling Meter
 - (1) The proposed subcooling monitor will be integrated with the SPDS computer system. At this time, equipment is not designed or the computer procured. A decision has not been made on whether the system will be integrated into the control board or be freestanding, but a CRT-based system is proposed. (Category 1)*

- b. Reactor Vessel Level Indication
 - At this time the applicant has not decided what sort of system they will purchase. (Category 1)*
- c. Incore Thermocouples (Category 1)*
 - All 50 thermocouples are monitored by the process computer and the computer can provide long- and short-term MAPS and Data on the trend typewriter and line printer.
 - (2) The Incore Thermocouple readout display is limited to 700. F. (K-1)
 - (3) The Incore Thermocouple can be read in 3 locations: (a) Incore Thermocouple Panel; (b) Control Board CRT; (c) Process Computer CRT.

REFERENCES

- 1. NUREG-0737, November 1980, Clarification of TMI Action Plan Requirements.
- 2. NUREG-0700, Control Room Human Engineering Design Review Process.