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F. L. CLAYTON, JR.
Senior Vice President

Alabama Power
the southern electric system

June 10, 1980

Docket No. 50-364

Director, Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. A. Schwencer

Dear Sir:

As a result of discussions held with the NRC on May 12, 1980, Alabama Power Company (APCo) submits Enclosure (1) documenting the APCo Unit 2 Control Room Human Factors and Operations Review. Appropriate personnel will be available to accompany the NRC representatives during the subject review scheduled for June 16-20, 1980.

Yours very truly,

F. L. Clayton, Jr.

F. L. Clayton, Jr.

BDM:de

Attachment

cc: Mr. R. P. McDonald (w/attachment)
Mr. H. O. Thrash (w/attachment)
Mr. O. D. Kingsley (w/attachment)
Mr. W. G. Hairston (w/attachment)
Mr. K. W. McCracken (w/attachment)
Mr. D. N. Morey (w/attachment)
Mr. D. E. Mansfield (w/attachment)
Mr. B. D. McKinney (w/attachment)

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Enclosure 1

Joseph M. Farley Nuclear Plant - Unit 2
Control Room Evaluation

A human factors and operations review of the Joseph M. Farley Nuclear Plant, Unit No. 2 control room was conducted with personnel from Bechtel, Westinghouse and Alabama Power. Review team members are specified in Attachment one (1). The basis of the review was NUREG CR-1270 (i.e. the Essex Report) and Mil-Std. 1472B. The review of the control room design for human factors and operations centered on the following:

A) Labeling of control devices, meters and annunciators

B) Control functions

C) Displays

D) Communications

E) Emergency procedure walk-throughs including use of emergency air breathing devices

F) Noise, lighting and traffic control

The review identified some deficiencies; however, in general the control room was found to promote effective operator actions. The controls and displays are functionally grouped and generally well integrated. Each functional group will be clearly designated with labels of adequate readability. The first out annunciators provide information to assist the operators in rapid diagnosis of system conditions. There is a use of color coding in the control room and mimicking is employed for the emergency power board.

Favorable aspects of the Main Control Room not usually present in the design of the Farley vintage (1971 - 1973) plants which were found to be advantageous to the operation of the plant are as follows:

Two colored CRTs readouts are available to the operators, one at the computer control console and one in the center section of the MCB. The CRT displays available to the operator are numerous and can be selected by the operator. The CRTs also display alarm status. The operators have found the CRT displays to be very good operating aids especially during plant start-up and cooldowns.

System flow patterns have been followed and are consistent throughout the layout. All system patterns are layed out from top to bottom, left to right. System familiarization is greatly enchanced by this method of design.

The human factors recommended number of grouped indications (4 maximum) is strictly adhered to and those grouped together, (with the exception of a single backfit) have identical scale ranges. This type of design minimizes the possible operator misinterpretation of readings.

The following is a synposis of the items identified for human engineering improvements either in the short or long term. Short and long term improvements will be reviewed in accordance with the following:

1. NRC human engineering guidelines for the main control room.
2. Design feasibility
3. Material availability
4. Design availability

Upon completion of the above review, items which are practical to correct in the short term will be corrected before fuel load. Items identified for correction during the review but which are not practical for short term implementation will

be corrected based on design and material availability and feasibility and outage schedules.

A. Labels

Short Term

1. All temporary labels will be replaced with permanent labels.
2. Lettering size of annunciator panel group headings will be increased for easier identification. This has been implemented on Unit 1.
3. Lines of demarcation will be added around groups of related indications and controls for better system identification.
4. System color coding, although provided for in design, will be modified to provide for more distinctive colors for system controls. Also system identification name labels (CVCS, RHR, CCW) will be added on the vertical portion of the control board. System identification labels will be consistent with system color codings.
5. The pressurizer spray valve white position indicating light will be labeled to indicate spray valve position.
6. Steam generator 2C pressure indicator will be corrected. Label presently is marked 1C rather than 2C.
7. Hold tags will be modified so that the tag does not block the control (valve/pump) identification name.
8. Main feedwater pump and turbine driven auxiliary feedwater pump speed controls will be marked increase/decrease rather than open/close.
9. Steam generator level indicators that are cold calibrated will be so labeled.
10. Main turbine D.C. emergency oil pump switch indication will be labeled to indicate the upper red light denotes power available.

11. The reactor coolant pump bearing lift pump white indicating light will be labeled to indicate 600 psig.
12. The color coding for safety injection reset, phase A isolation reset, phase B isolation reset, containment ventilation isolation reset, and containment spray reset will be modified so that they are not similar and are visibly distinguishable.
13. The "B" train portion of the emergency power board mimic board will be changed to a color different than the "A" train mimic board.

Long Term

1. Auto/manual controllers supplied by Hagen Controls will be reviewed to determine the feasibility of modifying reverse operating controllers to direct acting controllers.

B. Controls

Short Term

1. A method of extending the horizontal portion of the control board to prevent inadvertent operation of controls will be implemented.

Long Term

1. The manual reactor trip switch requires counterclockwise rotation to actuate. Since clockwise rotation to actuate is the accepted direction, the manual reactor trip switch will be evaluated to determine the feasibility of modifying the switch for clockwise rotation to actuate.
2. Meter scales will be revised to indicate normal (green), alert (yellow) and alarmed (red) ranges.
3.. The auxiliary feedwater flow indicator scale is 1/4 inch from zero to 200 GPM. The control system will be evaluated to determine if the meter scale can be increased at the lower flow rates.

4. Hand switch control handles will be modified so that all pumps have one type of hand switch handle and all valves have a different type of hand switch handle.

C. Displays

Short Term

1. Meters with black scale markings and black pointers with white background will have the pointers painted a distinguishable color for more contrast.
2. Where two adjacent meter scales have different numerical progressions for the same parameter being monitored (1700-2500 vs 0.0-3.0 x 10^3), the scales will be modified so they are similar.
3. Meter labels identified in emergency procedures for operator monitoring will have their labels color coded in a similar manner. This has been implemented on Farley Unit 1.
4. Recorders with labels identifying parameters being recorded that block portions of the recorder will be modified so that the recorder trace is not blocked.

Long Term

1. Annunciator alarm tones will be revised as follows:
   a. Unit 2 main control board annunciator tones will be different from Unit 1 main control board annunciator tones. All main control room Unit 2 annunciator tones will be loud enough for the operator to hear from the "at controls" area.
   b. One tone for safety injection actuation.
   c. One tone for remaining main control board "at controls" area.
   d. One tone for the balance of plant panels.
   e. One tone for the emergency power board.

2. Relocating the accumulator test valves from the main control board to the balance of plant will be evaluated.
3. The subcooling meter will be converted from the pressure to saturation scale to degrees Fahrenheit. The feasibility of changing the location to the reactor panel will be reviewed. In addition, the failure mode of the meter will be reviewed.
4. Feasibility of increased computer trending capability will be studied.
5. The computer alarm typewriter will be evaluated to determine if a faster printer can be installed so that the operator can obtain information faster during and following plant transients and abnormal events. The alarm typewriter paper feed problem will be evaluated to determine a satisfactory solution.

6. The reactor trip first out annunciator panel will be evaluated to determine if the annunciator acknowledge/silence/reset system can be modified so that the event causing the reactor trip is not lost when the operator depresses the annunciator acknowledge pushbutton.

7. The annunciators will be evaluated to determine if any alarms can be categorized as safety alarms. This evaluation must ensure that any categorization will not mislead the operator. The smaller transients such as small break LOCAs, small feedwater breaks, and small steamline breaks will require analysis to determine their fault trees and how they differ between each other and the major accidents.

8. The safeguards systems status monitor light boxes will be reviewed to determine if lights required to be illuminated during the same condition can be located in the same monitor light box.

D. Communications

Short Term

1. The public address system for Units 1 and 2 will be interconnected by fuel load.

Long Term

1. A dedicated intercom system will be installed between the Technical Support Center, the Control Room, and the Operations Support Centers. This intercom system will be implemented as part of the Technical Support Center upgrade.

E. Emergency Procedure Walk Through

Short Term

1. The fence dividing the Unit 1 control room from the Unit 2 control room will be removed so that the Unit 2 control room operators can see the emergency power board.

2. Licensed personnel will receive additional training in the use of emergency air breathing equipment in the control room during emergencies. Items to be reviewed are:

   (a) Location and donning of equipment

   (b) Operator to operator, and operator to locations out of the control room communications

   (c) Emergency procedure walk-throughs with the emergency air breathing equipment donned

During the control room review, it was demonstrated that communications with existing air breathing equipment is adequate but additional personnel familiarization would be required.

Long Term

1. Re-arranging the control switches for the main steam isolation valves closed position so that both valves in each steam line are adjacent to each other will be evaluated.

2. The feasibility of locating the auxiliary feedwater controls in a more vertical arrangement will be evaluated.

3. The feasibility of locating the service water supply to turbine building valve controls in series will be evaluated.

4. The emergency power board megawatt meters will be evaluated to determine if they can be marked to more readily assist the operator in determining emergency procedure requirements.

F. Noise, Lighting and Traffic Control

Noise

Noise measurements were recorded with a B&K Type 2209 Precision Sound Level Meter. Noise from both Unit 1 (operating) and Unit 2 were recorded. The noise level in the Unit 2 control room was found to be acceptable when evaluated against Mil-Std 1472 B.

Lighting

The ceiling installation for Unit 2 has not been completed and some glare was found on meters located on the vertical section of the Unit 2 main control board. The Unit 2 lighting will be arranged similar to the Unit 1 lighting conditions by fuel load. Unit 1 lighting conditions were found to be acceptable with respect to human engineering considerations.

Traffic Control

The use of free standing partitions will be evaluated for means of better controlling traffic into and within the controls area of the main control room for both units.

BD McKinney

B. D. McKinney
Project Engineer
Alabama Power Company

Attachment 1

FNP UNIT 2 CONTROL ROOM REVIEW TEAM

B. D. McKinney, Jr. (Project Engineer with FNP Senior Reactor Operator's License)

H. G. Huff (Bechtel Control Systems Group Supervisor)

L. S. Williams (Training Supervisor with FNP Senior Reactor Operators License)

R. Wiggins (Training Instructor with FNP Senior Reactor Operators License)

J. Clark (Shift Supervisor with FNP Senior Reactor Operators License)

C. L. Werner (Westinghouse Engineering)

J. Geets (Westinghouse Engineering)

K. W. McCracken* (Technical Superintendent - Farley Nuclear Plant)

D. N. Morey* (Operations Superintendent with FNP Senior Reactors Operators License)

* Part time