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 AUTH. NAME: AUTHOR AFFILIATION
 CUTTER, A. B. Carolina Power & Light Co.
 RECIP. NAME: RECIPIENT AFFILIATION
 VARGA, S. A. Operating Reactors Branch 1

SUBJECT: Responds to Generic Ltr 82-33 re Suppl 1 to NUREG-0737
 concerning requirements for emergency response capability.
 Control room mod, providing well defined work areas for shift
 members & improved lighting levels, completed.

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Director of Nuclear Reactor Regulation
Attention: Mr. Steven A. Varga, Chief
Operating Reactors Branch No. 1
Division of Licensing
United States Nuclear Regulatory Commission
Washington, DC 20555

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261/LICENSE NO. DPR-23
SUPPLEMENT TO GENERIC LETTER 82-33 RESPONSE
REQUIREMENTS FOR EMERGENCY RESPONSE CAPABILITY

Dear Mr. Varga:

SUMMARY

As stated in our August 24, 1983 supplemental response to Generic Letter 82-33 (GL 82-33), Carolina Power & Light Company (CP&L) is hereby providing you with a summary description of the H. B. Robinson Steam Electric Plant Unit No. 2 (HBR2) Control Room review, "Essex Detailed Control Room Design Review (DCRDR)."

BACKGROUND

On December 30, 1982, CP&L received GL 82-33, Supplement 1 to NUREG-0737, Requirements for Emergency Response Capability. Subsequently, CP&L provided responses to GL 82-33 by letters dated April 15, 1983 and August 24, 1983. This additional response to GL 82-33 provides a summary description of the Essex DCRDR which has already been conducted at HBR2.

DISCUSSION

A human factors engineering evaluation review was conducted for the HBR2 control room from June, 1980 to March, 1981. Initial phases performed in June included preliminary site visits and a photographic survey of the control board. For the period from July, 1980 to March, 1981, on-site data collection, data reduction and analysis, and evaluation report writing were accomplished.

The evaluation team was composed of four Essex Corporation employees and two CP&L employees. In addition, five Essex research associates assisted in collecting data at the Plant. The Essex staff were human factors specialists

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made up of two research scientists and three research associates. Carolina Power & Light Company personnel functioned as contract administrators, operations specialists, Plant liaison, and evaluation process expeditors.

A senior research scientist on the Essex staff acted as the administrative manager/supervisor for all Essex personnel. Essex headquarters furnished instrumentation, senior research scientists, and research associate support during the course of the evaluation.

The evaluation process consisted of a preparation phase, data collection phase, and analysis phase. The preparation phase consisted of:

- Preparing a photographic mockup of the HBR2 control board
- Preparing checklists, interview forms, and data collection forms
- Planning the schedule for all evaluation phases
- Collecting all materials, equipment, and supplies for the data collection phase
- Planning each survey to be conducted during the data collection phase

The data collection phase consisted of obtaining copies of the Plant procedures for the procedure review and an on-site visit to collect all other data. The three-week, on-site visit to the HBR2 control room consisted of data collection for the following surveys:

- Ambient lighting
- Ambient sound
- Workspace
- System operations analysis
- Conventions
- Component confusion
- Emergency equipment
- Component-level
- Annunciator review
- Emergency operating procedures

The analysis phase consisted of data reduction and analysis, Human Engineering Discrepancy (HED) report preparation, evaluation record file preparation, and evaluation report writing. The data collected in the various surveys was compared to the criteria contained in draft NUREG/CR-1580.

The following provides a brief summary of each of the areas surveyed. Areas where the surveys did not meet the criteria contained in draft NUREG/CR-1580 were identified and recorded on HED reports. Overall, the ESSEX DCRDR did not identify any major areas of concern.

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Ambient Lighting Survey

The ambient lighting survey dealt with the following concerns:

- Illumination levels at the control boards and other work areas such as tables and desks
- The evenness of the distribution of light in the control room
- Undesirable reflections, shadows, and glare

The ambient lighting in the HBR2 control room was measured at 42 positions. All equipment within the control room was visually examined for the presence of glare, shadows, or reflections that might induce operator error.

Ambient Sound Survey

Ambient sound levels were measured at ten (10) different locations to determine the effect that sound levels had on operator communications. Three samples were taken at each location over a 24-hour period. When measurements were made during transient sound peaks, the sources were identified and recorded. Operator interviews were also conducted concerning the control room noise levels.

Workspace Survey

Workspace dimensions were evaluated for adequate reach and viewing ranges and unobstructed personnel movement within the control room. This survey was conducted with the Component-Level Survey. Prior to conducting these two surveys, the maximum reach and viewing distance criteria from draft NUREG/CR-1580 were determined.

System Operations Analysis Survey

Using CP&L HBR2 operators as subjects and an operations specialist with HBR2 experience as a narrator, walk-throughs of Emergency Operating Procedures (EOPs) and selected Abnormal Operating Procedures (AOPs) were videotaped. In addition, a live start-up from hot shutdown to critical was also videotaped. System operations were analyzed to evaluate the degree of compatibility of the control board component arrangement to the emergency procedures and selected samples of abnormal and normal procedures.

The videotapes, copies of the EOPs, AOPs, and a copy of the start-up procedure were analyzed by using traditional task analysis methods and procedures. All occurrences of control board component location problems and/or procedural discrepancies were documented. Preliminary documentation of potential component location problems was submitted to HBR2 operations for review and comment. After incorporating all returned review comments, final analyses were completed.

The control board was visually surveyed for effective controller orientation which aids operator performance, including the use of demarcation lines, summary labels, mimics, or other permanently placed job performance aids.

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Convention Surveys

The convention surveys conducted at HBR2 were primarily concerned with the meanings attached to various colors, particularly for indicator lights, and the direction/movement conventions for controls. An initial survey was conducted to determine the various meanings attached to different colors. After this initial survey, frequency counts were made to determine if there was a predominant color-meaning association established for a given color. Inconsistencies with established conventions were noted during the component-level survey. Direction-of-movement conventions were checked for each rotary control, toggle switch, and meter during the component-level survey.

Component Confusion Survey

Confusion surveys were conducted to identify any occurrences where look-alike components could be easily confused. Of primary interest were strings of five or more meters and dissimilar functional components which are physically similar, such as legend lights and legend pushbuttons. A visual survey was conducted to determine all categories of components which could cause confusion either within the same component type or across different component types.

Emergency Equipment Survey

A survey of the emergency garments and breathing apparatus was conducted to identify any significant human factors problems associated with their use.

Component-Level Survey

A component-level survey was conducted to determine the extent to which individual components on the control board met or exceeded good human factors engineering criteria. A set of comprehensive checklists developed from the draft NUREG/CR-1580 guidelines, Volume II, was revised and tailored for application in the HBR2 control room. Each checklist item was checked against each applicable component on the control board.

Annunciator Review Survey

An annunciator survey was conducted to determine the extent to which individual annunciator windows met various readability criteria and to what extent related annunciators were grouped together and located over their related controls and displays. During the component level survey, each annunciator window was compared to readability criteria. Annunciator window groupings and message content accuracy were also evaluated by using operator interview techniques at the control board.

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Emergency Operating Procedures Survey

The HBR2 emergency operating procedures in effect at the time of the study were reviewed. However, the emergency operating procedures (EOPs) are currently being rewritten. The EOPs are being based on the Westinghouse Owners' Group (WOG) Emergency Response Guidelines, Rev. 1. Upon completion of the new EOPs, the Emergency Operating Procedures Survey will be reviewed and revised as necessary.

CONCLUSION

The Essex DCRDR study, including the HED reports, has been completed, and no major areas of concern were identified. However, a number of individual small items was identified on HED reports which are currently being reviewed and closed out. A major modification of the HBR2 control room that provided well defined work areas for the shift members and significantly improved lighting levels has been completed. A major relabeling program is in progress on the HBR2 control board to better demarcate the controls and indications. Of the original 213 HEDs, all have been reviewed, 41 have been completed, 57 will be resolved upon the completion of control room modifications, 101 will be justified as not requiring changes based on existing practices, and the remaining 14 are still under review.

Since the Essex DCRDR was conducted using the draft NUREG/CR-1580 for DCRDRs, CP&L is in the process of obtaining a contractor to review the Essex study against the final NUREG. A final program plan to meet GL 82-33 requirements will be submitted in December, 1984, which complies with the recently received order confirming Licensee commitments on Emergency Response Capability dated February 21, 1984. In this final program plan, CP&L will establish and provide you with a schedule for submittal of the final summary report and final implementation schedule for the modifications resulting from the DCRDR.

If you have any further questions on this subject, please contact a member of the Nuclear Licensing Staff.

Yours very truly,



A. B. Cutter, Vice President
Nuclear Engineering & Licensing

ONH/cfr (9764ONH)

cc: Mr. J. P. O'Reilly (NRC-RII)
Mr. G. Requa (NRC)
Mr. Steve Weise (NRC-HBR)