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

ENCLOSURE 1

SAFETY EVALUATION BY THE OFFICE OF SPECIAL PROJECTS

RELATING TO DETAILED CONTROL ROOM DESIGN REVIEW

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT, UNITS 1, 2 AND 3

DOCKET NOS. 50-259/260/296

1.0 POSITION

Item I.D.1, "Control Room Design Reviews," of Task I.D, "Control Room Design," of the Nuclear Regulatory Commission (NRC) Action Plan developed as a result of the Three Mile Island Unit 2 (TMI-2) accident (NUREG-0660) states that operating reactor licensees and applicants for operating licenses will be required to perform a Detailed Control Room Design Review (DCRDR) to identify and correct design discrepancies. The objective, as stated in NUREG-0660, is to improve the ability of nuclear power plant control room operators to prevent accidents or to cope with them, should they occur, by improving the information provided to them. Supplement 1 to NUREG-0737 confirmed and clarified the DCRDR requirement in NUREG-0660. In accordance with Supplement 1 to NUREG-0737, each applicant or licensee is required to conduct its DCRDR on a schedule negotiated with the NRC.

2.0 INTRODUCTION

By letter dated June 9, 1983, Tennessee Valley Authority (TVA) submitted its generic Program Plan for a Detailed Control Room Design Review (DCRDR) of all the TVA nuclear facilities. NRC sent a letter on November 19, 1984 requesting a meeting with TVA. The staff met with the licensee on December 4, 1984 to discuss the NRC comments on the TVA Program Plan.

TVA submitted a Summary Report for the Browns Ferry Nuclear Power Station DCRDR by letter dated December 30, 1986. The Summary Report was reviewed by Science Applications International Corporation (SAIC). The results of the staff and SAIC review of the licensee's Summary Report indicated a need for additional information and recommended that a pre-implementation audit be conducted to obtain this information and resolve several concerns.

The audit was conducted between February 22 and 26, 1988. In order to satisfy all nine requirements of Supplement 1 of NUREG-0737, TVA will be required to provide NRC with supplements to the Browns Ferry Summary Report. The supplements must confirm the modifications and schedule changes discussed in this Safety Evaluation. All of these modifications and schedule changes were discussed with the licensee during the audit.

3.0 EVALUATION

The NRC staff with the assistance of SAIC and Comex Corporation has reviewed the Browns Ferry Nuclear Power Plant Units 1, 2 and 3 DCRDRs. The purpose of the review was to evaluate whether the nine DCRDR requirements in NUREG-0737, Supplement 1, had been met. This safety evaluation is based on information to date and is arranged in the order of the DCRDR requirements identified in Supplement 1 to NUREG-0737. A copy of the SAIC Technical Evaluation Report (TER) is enclosed. The NRC agrees with the evaluations and conclusions as presented in the TER.

3.1 Establishment of a Qualified Multidisciplinary Review Team

The Browns Ferry DCRDR team consisted of a group from the areas of instrumentation and control engineering, nuclear systems engineering, and human factors engineering. Operations and additional human factors support was provided by Impell Corporation. The staff concludes that TVA established a qualified multidisciplinary review team and has, therefore, satisfied the requirements of Supplement 1 to NUREG-0737.

3.2 Function and Task Analyses to Identify Control Room Operators Tasks and Information and Control Requirements During Emergency Operations

A task analysis was conducted based on the upgraded Browns Ferry Emergency Operating Instructions (EOIs) which were developed from the Boiling Water Reactor Owners Group (BWROG) Emergency Procedures Guidelines (EPGs), Revision 3, with the exclusion of Secondary Containment Control and Radiation Release Control. During the task analysis the procedures were revised in order to include steps related to Anticipated Transients Without Scram (ATWS) events. The licensee conducted an additional task analysis to identify the information and control requirements relating to these steps. Operator information and control requirements were identified independent of the control room using plant drawings, and were documented on task analysis worksheets.

Based upon the review, the staff finds that the licensee has partially met the NUREG-0737, Supplement 1 requirement for a function and task analysis to identify control room operator tasks and information and control requirements during emergency operations. In order for this requirement to be fully met, the licensee needs to conduct a function and task analysis for Secondary Containment Control and Radiation Release Control and to document these activities in a Supplemental Summary Report prior to restart.

3.3 Comparison of Display and Control Requirements with a Control Room Inventory

The operator information and control requirements identified during the task analysis were compared to the actual control room to determine the availability and suitability of controls and displays. The licensee documented the availability and suitability of the displays and controls on the task analysis worksheets. A human engineering concern (HEC) was written for any display or control which was determined to be unavailable or unsuitable.

The staff finds that the licensee has partially met the NUREG-0737, Supplement 1 requirement for a comparison of display and control requirements with a control room inventory. In order for this requirement to be fully met, the licensee needs to compare the operator information and control requirements identified during the task analysis of Secondary Containment Control and Radiation Release Control to the control room in order to verify the availability and suitability of the required instruments. The results of this comparison should be documented in the Supplemental Summary Report prior to restart.

3.4 Control Room Survey

A control room survey was conducted utilizing the criteria from NUREG-0700, Section 6. Each control room panel, for each unit, was reviewed against the survey criteria. Any criteria which were not in conformance were documented as a HEC.

However, generic HECs were written for labeling, color coding, switch handle conventions and banding concerns. Thus, individual HECs were not identified by the DCRDR team during the survey process.

The review team found that the licensee has a program in place to complete the additional survey activities. The program outlines detailed guidelines for the control of the work to identify all HECs related to generic issues. It also includes provision for human factors training of additional contractor personnel to conduct these activities.

The staff finds that the licensee has partially met the NUREG-0737, Supplement 1 requirement for a control room survey to identify deviations from human factors principles. In order for this requirement to be fully met, the licensee needs to complete the survey activities and document the completion of labeling, color coding, switch handle conventions, and meter banding in a Supplemental Summary Report. This does not have to be submitted prior to restart but must be completed three months after restart.

3.5 Assessment of Human Engineering Discrepancies (HED) to Determine Which Are Significant and Should be Corrected

The Browns Ferry DCRDR assessment process included a categorization of HEDs. Cumulative effects of HEDs were evaluated. Based on the results of the audit, the staff finds that TVA has conducted an assessment activity using an acceptable methodology that meets the Supplement 1 to NUREG-0737 requirement for an assessment of human engineering discrepancies.

3.6 Selection of Design Improvements

Based on the results of the audit, which are discussed in Section 2.6 of the TER, the staff finds that TVA has conducted an appropriate program for selection of design improvements. However, in order for TVA to meet the

Supplement 1 to NUREG-09737 requirement, it will be necessary for TVA to provide NRC with a revised implementation schedule that will demonstrate that all safety significant HEDs are corrected before the completion of the second refueling outage after restart. The revised schedule needs to be documented in a Supplemental Summary Report.

3.7 Verification that Selected Improvements Will Provide the Necessary Correction

The staff finds that the licensee has met the NUREG-0737, Supplement 1 requirement for verification that selected improvements will provide the necessary correction.

3.8 Verification that Selected Design Improvements Will Not Introduce New HEDs

The staff finds that that licensee has met the NUREG-0737, Supplement 1 requirement for verification that selected improvements will not introduce new HEDs.

3.9 Coordination of Control Room Improvements with Changes from Other Programs, Such as the Safety Parameters Display System, Operator Training, Regulatory Guide 1.97 Instrumentation, and Upgraded Emergency Operating Procedures

3.9.1 Safety Parameter Display Systems

The review team found no documented evidence of coordination of control room improvements with the SPDS. The licensee stated that the lack of integration was due to the fact that no SPDS was in place when the DCRDR activities took place. The lack of documentation was found unacceptable by the review team. The licensee needs to provide documentation of either integration of the programs or justification for the lack of coordination.

3.9.2 Operator Training

The review team found satisfactory coordination of control room improvements with training. Coordination with training included consideration of staffing requirements and changes in the development of HED corrective actions. Training personnel were informed of DCRDR proposed correction actions and modifications.

3.9.3 Regulatory Guide 1.97

The review team found no documented evidence of coordination of control room improvements with Regulatory Guide 1.97 instruments. The lack of coordination was evident in the review team's finding of the installation of rector vessel level instrumentation on Panel 9-3, Unit 2, which did not meet the requirements for an operating procedure. Due to the engineering change procedure, as described in Section 2.6 of the TER, the review of this instrumentation had

not been incorporated as part of the DCRDR activities. The review team found the lack of documentation unacceptable. The licensee needs to provide documentation of either the integration of these programs or justification for the lack of coordination.

3.9.4 Upgraded Emergency Operating Procedures

Satisfactory coordination of upgraded EOP development was accomplished during the task analysis. An update of the original task analysis results was performed based on the revised EOIs. In addition, during the evaluation of HEDs the review team noted that suggested resolutions to several HEDs included changes to the procedures.

The staff finds that the licensee has partially met the NUREG-0737, Supplement 1 requirement for coordination of control room improvements with changes from other programs such as the SPDS, operator training, Regulatory Guide 1.97 instrumentation, and upgraded EOPs. In order to fully meet this requirement the licensee needs to document the coordination of control room improvements with changes from the SPDS and Regulatory Guide 1.97 instrumentation programs or the justification for the lack of coordination. This submittal must be completed three months after restart.

4.0 CONCLUSION

In summary, the staff concludes that the DCRDR activities for Browns Ferry Nuclear Power Plant, Units 1, 2 and 3, of TVA will meet all the requirements of Supplement 1 to NUREG-0737 when TVA provides NRC with (1) a submittal which documents the completion of the function and task analysis and control room inventory as discussed in Sections 3.2 and 3.3 prior to restart and (2) a submittal which documents the completion of the control room survey, revises the schedule, and describes a coordination program as discussed in Sections 3.4, 3.6 and 3.9 within three months after restart.

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