



UNITED STATES
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ENCLOSURE

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

CONCERNING THE DETAILED CONTROL ROOM DESIGN REVIEW

WATTS BAR NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NOS. 50-390/391

1.0 INTRODUCTION

As a result of the Three Mile Island Unit 2 accident, the Nuclear Regulatory Commission (NRC) developed an action plan (NUREG-0660) to minimize the possibility of recurrence of an accident at commercial nuclear power plants. Item I.D.1, "Control Room Design Reviews," of NUREG-0660 requires operating reactor licensees and applicants for licenses to perform a Detailed Control Room Design Review (DCRDR) to identify and correct design discrepancies. The goal of the DCRDR, 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, "Requirements for Emergency Response Capability," confirmed and clarified the DCRDR requirement of NUREG-0660.

Following completion of the Watts Bar Nuclear Plant (WBN) DCRDR, TVA submitted a Summary Report to the NRC on October 2, 1987. The Summary Report was reviewed by the cognizant NRC staff and by Science Applications International Corporation (SAIC). The results of the staff and SAIC review of the TVA Summary Report indicated a need for additional information. A pre-implementation audit was scheduled in order to obtain this information and to resolve several concerns.

The audit was conducted at WBN between November 11 and 18, 1988. The audit team evaluated the WBN DCRDR in accordance with NUREG-0700, "Guidelines for Control Room Design Reviews," and the nine DCRDR requirements contained in NUREG-0737, Supplement 1. A summary evaluation of the results of the audit are discussed in the following paragraphs, while the attached Technical Evaluation Report (TER) provides a detailed discussion of the audit activity.

2.0 EVALUATION

The pre-implementation audit was conducted by NRC staff with the assistance of SAIC and COMEX Corporation personnel, who provided expertise in Human Factors Engineering and Reactor Operations, respectively. The purpose of the audit was to evaluate whether TVA had met the nine DCRDR requirements in NUREG-0737, Supplement 1. This SE is based on the review of the WBN DCRDR Summary Report and the results of the audit. The assessment which follows is arranged in order of the nine NUREG-0737, Supplement 1, DCRDR requirements.

2.1 Establishment of a Qualified Multidisciplinary Review Team

The WBN DCRDR team consisted of an appropriate mix of specialists in the fields of human factors engineering, nuclear engineering, instrumentation and controls, and reactor operations. It is the staff's judgment that the WBN DCRDR team satisfied the requirement for a multidisciplinary review team.

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

The approach to System Function and Task Analysis used by the WBN DCRDR team, which is described in detail in Section 4.0 of the Summary Report, satisfactorily achieved the goal of the required task analysis effort. However, there were three areas of the Westinghouse Owners Group Emergency Response Guidelines (ERG) based emergency procedures requiring task analysis for which task analysis was not conducted. These areas are:

- a. the six critical safety function trees;
- b. the symptoms sections of the emergency procedures, and;
- c. six Emergency Contingency Actions (ECAs)

- ECA 1.1 Loss of Emergency Cooling Circulation
- ECA 1.2 Loss of Coolant Accident Outside Containment
- ECA 2.1 Uncontrolled Depressurization of All Steam Generators
- ECA 3.1 Steam Generator Tube Rupture Loss of Coolant Accident with Subcooled Recovery
- ECA 3.2 Tube Rupture Plus Loss of Coolant Accident with Saturated Recovery
- ECA 3.3 Steam Generator Tube Rupture With Loss of Pressurizer Pressure Control.

Because of the above deficiencies, the staff finds that the licensee has not met the requirement to perform a System Function and Task Analysis of Control Room Operators tasks. In order to meet this requirement, TVA needs to conduct additional System Function and Task Analysis on the ERG-based items identified above, and to document the task analysis activity and results in a supplemental DCRDR summary report.

2.3 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. All discrepancies identified were appropriately documented and included in plans for correction.

The audit team found that the WBN DCRDR team conducted a successful comparison of display and control requirements versus the control room inventory for those areas for which task analysis had been performed. However, because there still exist some areas requiring task analysis, as discussed in paragraph 2.2, the staff finds that the licensee has not satisfied this requirement. In order to

meet this requirement, TVA must conduct a supplemental comparison of display and control requirements to the control room inventory for the additional task analysis activity discussed in paragraph 2.2. This activity should be included in the supplemental DCRDR summary report which documents the additional System Function and Task Analysis.

2.4 Control Room Survey

The WBN DCRDR team conducted a control room survey using the criteria provided in NUREG-0700, modified as necessary to be plant specific. Additionally, the DCRDR team conducted extensive interviews with control room operators to identify human engineering problems. It is the staff's assessment that the DCRDR team conducted a thorough control room survey, and that the licensee has met the corresponding NUREG-0737 requirement.

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

In general, the HED assessment process conducted at WBN adequately determined which HEDs should be corrected based on their potential impact on plant safety. The methodology employed by TVA included evaluation of the safety significance of each HED and of the aggregate effects of HEDs.

The audit team identified two areas requiring additional HED assessment activity. First, any HEDs arising out of the additional task analysis and control room inventory activity to be conducted must be assessed for significance. Second, TVA should reassess HEDs 082 and 199 in order to address the audit team's concerns, which are detailed in Section 2.5 of the attached TER.

The staff concludes that the licensee has not met the requirement to assess HEDs for significance to determine which ones require correction. In order to meet this requirement, TVA must assess the significance of any new HEDs arising from the additional task analysis to be conducted, as discussed in paragraph 2.2 of this SE, and address the issues associated with HEDs 082 and 199. The results of the additional assessment activity should be documented in the supplemental DCRDR summary report.

2.6 Selection of Design Improvements

This attribute of the DCRDR requires licensees to develop design changes and implementation schedules to remedy the HEDs identified for correction. The audit team found that WBN DCRDR team's development of conceptual designs to fix the HEDs was thorough and technically adequate, and that TVA plans to correct all the HEDs identified for correction in the DCRDR summary report prior to Unit 1 fuel load.

The staff finds that TVA has met the NUREG-0737, Supplement 1, requirement for selection of design improvements.

2.7 Verification that Selected Design Improvements Will Provide the Necessary Correction

The audit team found that no formal mechanism existed to verify that the selected design improvements would result in the implementation of effective corrective action for their respective HEDs. As a result, the staff finds that TVA did not meet the requirement to verify that selected design improvements would provide the necessary correction of HEDs. In order to satisfy this requirement, TVA should implement the necessary formal process and should report its implementation in the supplemental DCRDR summary report.

2.8 Verification that Selected Design Improvements Will Not Introduce New HEDs

The audit team found that no formal mechanism existed to verify that the selected design improvements to be implemented would not result in the creation of any new HEDs. As a result, the staff finds that TVA did not meet the requirement to verify that selected design improvements will not create any new HEDs. In order to satisfy this requirement, TVA should implement the necessary formal process, and should report its implementation in the supplemental DCRDR summary report.

2.9 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

As detailed in the attached TER, the staff concludes that TVA has met the NUREG-0737, Supplement 1, requirement for coordination of control room improvements with changes from other programs which affect the control room and the operators' emergency response capability.

3.0 CONCLUSIONS

In summary, the staff concludes that the DCRDR activities for Watts Bar Nuclear Plant, Units 1 and 2, will meet the requirements of NUREG-0737, Supplement 1, when TVA provides NRC with a supplemental DCRDR summary report which adequately addresses the concerns described in the following sections of this SE, and detailed in the corresponding sections of the attached TER:

- 2.2 System Function and Task Analyses to Identify Control Room Operators Tasks and Information and Control Requirements During Emergency Operations
- 2.3 Comparison of Display and Control Requirements with a Control Room Inventory
- 2.5 Assessment of HEDs to Determine Which Are Significant and Should be Corrected
- 2.7 Verification that Selected Design Improvements Will Provide the Necessary Correction

2.8 Verification that Selected Design Improvements Will Not Introduce New HEDs.

All of these concerns should be resolved prior to the issuance of an operating license for WBN Unit 1.

We further note that TVA's plan to correct the HEDs prior to fuel load represents a significant, and very positive, commitment to enhancing the safety posture of the Watts Bar Nuclear Plant. We would like to reiterate that any changes to this commitment, either in terms of schedule or content, should be identified in writing, in a timely manner, to NRC.