



UNITED STATES
NUCLEAR REGULATORY COMMISSION
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ENCLOSURE

SAFETY EVALUATION
OF THE DCRDR PROGRAM IMPLEMENTATION AT THE
SEQUOYAH NUCLEAR PLANT, UNITS 1 & 2
DOCKET NUMBERS 50-327 AND 50-328

1.0 INTRODUCTION

By letter dated May 7, 1992, the Tennessee Valley Authority (TVA) described the implementation status of the Detailed Control Room Design Review (DCRDR) program at the Sequoyah Nuclear Plant Units 1 and 2. In that letter, TVA indicated that all Category 1 human engineering discrepancies (HEDs), as well as a number of Category 2 and 3 HEDs, had been implemented during the Cycle 4 refueling outages for both Units 1 and 2. In addition, since issuance of the DCRDR summary report on November 26, 1986, a number of Category 2 HEDs had either been downgraded to Category 3 or re-evaluated to conclude that corrective action was no longer needed. In the letter TVA also stated that the remaining Category 2 HEDs would be resolved during the Unit 2 Cycle 6 refueling outage, which would effectively complete all safety significant HEDs.

By letter dated February 4, 1993, TVA again reported the status of the remaining HEDs, indicating that the Category 1 and 2 HEDs had been resolved, that a number of Category 3 HEDs were no longer cost effective and would not be implemented, that the remaining Category 3 HEDs would be resolved during the Cycle 6 refueling outages for each Unit, and that some Category 2 HEDs had been downgraded to Category 3. A list of the Category 3 HEDs that were being cancelled was included.

A site visit was conducted on September 13 - 16, 1993, to evaluate both TVA's reassessment of the Category 2 HEDs and the licensee's implementation of corrective actions for completed HEDs. At this time the licensee also indicated that even though all Category 2 HEDs had been resolved, there were some non-safety enhancements related to a few Category 2 HEDs that were being performed.

2.0 EVALUATION

The staff reviewed the licensee's assessment and implementation of corrective actions for a selected sample of completed HEDs as well as the proposed corrective actions and justifications for those Category 2 HEDs which the licensee downgraded to Category 3. The staff noted that the plant has operated successfully for over 12 years. A number of operators were interviewed regarding the design and layout of the control room. Specific questions were asked regarding modifications made to the control room

instrumentation, lighting and communications as a result of the DCRDR program.

Generally, operators stated that control room modifications made as a result of the DCRDR program were effective in improving the ease of operation of the plant. In particular, the operators stated that relocation of instruments and color coding of equipment labels greatly facilitated plant operations under both normal and abnormal conditions.

Staff evaluation of a selected sample and each of the four HEDs downgraded to Category 3 are addressed individually below.

2.1 HED 210 - The main feedwater bypass valves do not have control room indication of their status

The original HED stated that operators did not have positive indication of the position of the main feedwater bypass valves following a feedwater isolation signal.

This HED was closed by the licensee with no corrective actions in the May 7, 1992, letter. In the letter, the licensee stated that, following a feedwater isolation, operators have multiple secondary means of verifying the position of the feedwater bypass valves. The licensee also stated that feedwater isolation may also be accomplished using a set of isolation valves, FCV-3-33, 47, 87 and 100, which are located downstream from the feedwater bypass valves, and which have position indication in the control room.

The staff finds the licensee's analysis acceptable and considers this HED resolved.

2.2 HED 219 - Layout of O-M-27A is confusing due to mirror imaging, disassociation of controls and the presence of "depowered" hand switches

The original HED stated that the location of controls for the Essential Raw Cooling Water (ERCW) system on Panel O-M-27A was confusing due to mirror imaging, disassociation of controls and the presence of "depowered" hand switches.

Upon visiting the Sequoyah control room, the staff noted that a comprehensive mimic had been added to Panel O-M-27A. Discussions with operators revealed that this, in conjunction with other control board improvements, has resulted in a significant improvement and increased "useability" of the ERCW controls.

The staff finds the licensee's analysis acceptable and considers this HED resolved.

2.3 HED 235 - The RCS pressure indicators do not have the required range and resolution

The original HED noted that the reactor coolant system (RCS) pressure indicators were scaled in increments of 50 pounds per square inch (psi), while some operating procedures required operators to read the pressure to within 20 psi.

Upon visiting the Sequoyah control room, it was noted that the RCS pressure indicators had been replaced with a digital indicator whose accuracy was well within the 20 psi requirement. Discussions with the operators revealed that this new instrument alleviated previous difficulties in obtaining accurate pressure readings.

The staff finds the licensee's analysis acceptable and considers this HED resolved.

2.4 HED 303 - A pressurizer relief tank level recorder is needed to determine trend as required in Emergency Operating Instructions

The original HED noted that there was no provision for trending pressurizer relief tank (PRT) level and proposed either adding recorders in the control room or providing trending capability on the technical support center (TSC) computers.

Upon visiting the Sequoyah plant, it was noted that the TSC computer had been modified to provide the capability to determine PRT level and that is also obtainable from the three computer monitors located at the operators' work stations in the control room.

The staff finds the licensee's analysis acceptable and considers this HED resolved.

2.5 HED 320 - Control room communications

The original HED noted that operators experienced difficulty in reaching the phones located behind the desk in the control room horseshoe area.

Upon visiting the Sequoyah control room, it was noted that additional phone sets had been installed and that communication responsibilities between the two reactor operators staffing each unit had been adjusted to enhance operator communications. Plant management also stated that a comprehensive communications study outside the DCRDR effort had been conducted by TVA, and that additional improvements were planned. Interviews with operators revealed that these changes had resulted in significant improvement in communications.

The staff finds the licensee's analysis acceptable and considers this HED resolved.

2.6 HED 326 - RCS cold leg temperature must be manually recorded at hourly intervals

The original HED noted that operators were required to manually record and trend the RCS cold leg temperature to determine RCS cool down rates.

Upon visiting the Sequoyah control room and TSC, the staff noted that the TSC computer had been equipped with the capability to trend both heat up and cool down rates. The licensee also stated that provision for obtaining RCS cold leg temperatures directly had been included on panel P-250 in the control room.

The staff finds the licensee's analysis acceptable and considers this HED resolved.

2.7 HED 379 - Main steamline radiation monitors are needed

The original HED noted that the main steamline radiation monitors did not have sufficient sensitivity to detect small steam generator tube ruptures.

This HED was downgraded from a Category 2 to a Category 3 HED by the licensee in its May 7, 1992, letter. The downgrade was based on a revision to the pertinent procedures and the HED was subsequently closed by the licensee.

Radiation monitors were previously installed on the main steamlines to detect a gross failure in the steam generator as opposed to a small tube rupture. In its letter, the licensee stated that the abnormal operating instructions associated with identification of steam generator tube failures had been revised to direct operators to use existing instruments to diagnose smaller steam generator tube failures. The operators are directed to use the steam generator blowdown radiation monitors and the condenser vacuum exhaust radiation monitors, both of which are more sensitive to increases in radiation than the currently installed main steam line radiation monitors.

The staff finds the licensee's analysis acceptable and considers this HED resolved.

2.8 HED 2001 - Communication - Paging Systems

The original HED stated that the paging system could not be heard/understood in certain areas of the plant.

This HED was closed by the licensee with no corrective actions in the May 7, 1992, letter. In the letter, the licensee stated that the root cause for this HED was the frequent unavailability of portable radios for use by operators. Communication with operators in the plant has been improved by the use of new higher wattage portable radios. Previously identified radio problems also included unreliable radio batteries. The licensee has purchased a new, more reliable, battery charger that substantially reduces the need for use of the plant paging system by operators in the plant. Discussion with Sequoyah operators revealed that use of this new equipment has significantly improved communications and essentially eliminated the need for the plant paging system for normal operator communications.

Use of the paging system under emergency conditions is periodically tested by plant emergency preparedness personnel and has been found to be acceptable. Significant abnormal plant conditions are communicated to plant personnel by use of unique and easily recognizable audio signals other than voice, such as sirens or pulsating tones.

The staff finds the licensee's analysis acceptable and considers this HED resolved.

2.9 HED 3015 - There are many alarms that require the operator to obtain more information to determine the required action

The original HED stated that several annunciators had multiple inputs and that operators were unable to determine the cause for the annunciation without performing a field verification.

This HED was downgraded from a Category 2 to a Category 3 HED by the licensee in the May 7, 1992, letter. The downgrade was based on a modification to another system that eliminated the need for operators to verify the cause for specific annunciators in the plant.

The licensee installed a new annunciator system that has the capability to specifically identify multiple input points that previously went to a common annunciator. The new system also provides annunciator input information on the three monitors located at the operators' work stations in the control room. Discussions with plant operators revealed that the new system is a significant improvement over the previous system and the need for performing field verifications of abnormal conditions has been substantially reduced.

The staff finds the licensee's analysis acceptable and considers this HED resolved.

2.10 HED 3173 - Need better annunciation for Phase A, Phase B, and containment vent and indication of reset

The original HED noted that operators could not determine whether Train A or Train B or both trains of containment isolation circuitry were actuated from the control room annunciators. Also, insufficient information was provided to indicate whether the containment vent and/or isolation signals were capable of reset.

This HED was downgraded from a Category 2 to a Category 3 HED by the licensee in the May 7, 1992, letter. The downgrade was based on the completion of a modification that corrected the safety significant portion of the HED. The HED was subsequently closed as discussed below.

The licensee performed a modification to the control board that added explicit annunciators for both trains of Phase A and Phase B containment isolation and containment vent isolation. These annunciators were placed on the same panel as the annunciators for feedwater isolation, thereby grouping the isolation annunciators on the same panel. This addressed the lack of annunciation for Phase A and Phase B containment and containment vent isolations.

The portion of the HED which remained open required that the annunciators have a separate reset indicator, and that the annunciators be grouped by train. In its May 7, 1992 letter, the licensee stated that the clearing of a given annunciator window provides indirect indication that a signal has been reset and that, although this provision of annunciation was considered safety significant, regrouping of the annunciators was not considered to be safety significant. The licensee subsequently evaluated the regrouping of the

annunciators and determined that no additional modifications were necessary. Discussions with operators revealed that they were very comfortable with the location of the Phase A and Phase B containment isolation and containment vent isolation annunciators and that additional modifications were not necessary.

The staff finds the licensee's evaluation acceptable and considers this HED resolved.

2.11 HED 5020 - Use of zone coding

The original HED noted that several different methods of identifying normal ranges for various parameters on control room indicators were used, which could cause operator confusion under stressful situations.

This HED was downgraded from a Category 2 to a Category 3 HED by the licensee in the May 7, 1992, letter. The downgrade was based on the implementation of zone coding on those indicators identified in the original HED.

Upon visiting the Sequoyah site, it was determined that TVA has written, and is in the process of implementing, a standard for identifying normal, abnormal and danger ranges on all safety related indicators throughout the plant. Some of the modifications to plant indications were observed in progress. Discussion with operators revealed that these modifications were beneficial and that determination of plant status was enhanced.

The staff finds the licensee's evaluation acceptable and considers this HED resolved.

3.0 CONCLUSION

Based on the above evaluation of the licensee's actions, the staff finds that the licensee has identified appropriate corrective actions for the safety significant HEDs at the Sequoyah site. Implementation of the corrective actions for the remaining Category 2 HEDs will satisfactorily complete the implementation of corrective actions for all safety significant HEDs. This will also resolve all staff concerns regarding the Sequoyah DCRDR program.

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