UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

Report Nos.: 50-327/85-48 and 50-328/85-48

Licensee: Tennessee Valley Authority
6N11 B Missionary Ridge Place
1101 Market Street
Chattanooga, TN 37402-2801

Docket Nos.: 50-327 and 50-328 License Nos.: DPR-77 and DPR-79

Facility Name: Sequoyah 1 and 2

Inspection Conducted: December 16-20, 1985

Inspectors: M F Runyan 2/6/86
M. F. Runyan Date Signed

M. A. Scott for 2/6/86
M. A. Scott Date Signed

Approved by: G A Belisle 2/6/86
G. A. Belisle, Acting Section Chief Date Signed
Division of Reactor Safety

SUMMARY

Scope: This special, announced inspection involved 66 inspector-hours on site in the area of previous design control adequacy.

Results: No violations or deviations were identified.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

L. Alexander, Mechanical Supervisor, Modifications
*R. Birchell, Compliance
*C. Bryant, Mechanical Maintenance Engineer
*D. Craven, QA Staff Supervisor
*D. Cowart, Quality Surveillance Supervisor
G. Hall, Electrical Project Engineer, Office of Engineering (OE)
F. Hegdon, Document Control
*G. Kirk, Compliance Supervisor
S. Littrell, Environmental Qualification (EQ) Coordinator
M. McGuire, Quality Engineering Branch
*R. Olson, Modifications Manager
J. Ownby, Supervisor, OE
J. Neiri, Mechanical Engineer, Design Services
M. Parsons, Electrical Engineer, Modifications
G. Poe, Associate Engineer, Modifications
*H. Rankin, Manager, Design Services
*M. Sedlacik, Modifications Supervisor
A. Sessoms, Project Coordinator, EQ Project
J. Sweringer, Manager, Planning and Design Services
J. Teague, Site Coordinator, EQ Project
*J. Vineyard, Project Manager, OE
*P. Wallace, Plant Manager
D. Widner, Modifications

Other licensee employees contacted included technicians and office personnel.

NRC Resident Inspectors

*K. Jenison, Senior Resident Inspector
L. Watson, Resident Inspector

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on December 20, 1985, with those persons indicated in the paragraph above. The inspector discussed in detail the areas inspected. No dissenting comments were received from the licensee. The licensee did not identify as proprietary any of the material provided to or reviewed by the inspector during this inspection.

3. Licensee Action on Previous Enforcement Matters

This subject was not addressed in the inspection.

4. Unresolved Items

Unresolved items were not identified during the inspection.

5. Design Changes and Modifications

Several recent developments at TVA's Sequoyah Nuclear Plant raised uncertainties as to the adequacy of past design controls. The intent of this inspection was to assess the extent of such inadequacies which may have been present in the previous design control program in light of the following occurrences:

a. TVA replaced all engineering procedures with an Engineering Program Directives Manual on June 28, 1985. Variances to the Directive's Manual specific to the Sequoyah site were issued as a Sequoyah Project Manual on September 27, 1985.

b. Gilbert/Commonwealth, Inc., conducted an assessment of the Sequoyah design control program in October 1985. Three exceptions (nonconformances) were identified to which TVA committed corrective action by January and February 1986. In addition, TVA corporate and Sequoyah site QA audits identified several deficiencies in the design control program, the most significant of which was a configuration control problem resulting from the transfer of design drawings from Construction to Operations QA for Unit 2.

c. Two environmental qualification (EQ) problems were recently identified at Sequoyah. One problem involved the internal wiring of Limitorque valve operators, which could not be verified as environmentally qualified. The other involved electrical cables within containment that were found to be at an elevation low enough to be potentially submerged following a loss of coolant accident.

These three areas were reviewed in terms of their implications on the adequacy of the past design control program and whether such inadequacies, if found, may suggest the potential for existing, unidentified safety concerns. The inspection results for each item were as follows:

a. The replacement of engineering procedures with the Directives and Projects Manuals was not a program enhancement. It was an effort to simplify and reorganize a confusing array of redundant, overlapping procedures. This effort paralleled the transference of OE personnel from Knoxville to the site. Other than inefficiencies caused by old procedures, replacing them does not suggest past design control problems.

b. The inspectors reviewed the findings (three exceptions and three enhancements) of the G/C report and several licensee QA audit and surveillance findings which are discussed below. After discussions with cognizant Sequoyah personnel, the inspectors determined that the most relevant exception appeared to be concerned with inadequacies in processing plant configuration information. In response to this finding, the licensee committed to evaluate using design change drawing supplements at Sequoyah by February 1, 1986. This system is already being implemented at Browns Ferry. In the interim period, the licensee is reviewing new safety-related modifications involving applicable portions of the "as-constructed" and "as designed" drawings and resolving any differences. The licensee also committed to review a sample of previous Engineering Change Notices (ECN) generated under the previous design control program since plant licensing to determine whether significant configuration control problems exist. According to licensee personnel, this effort has been contracted to G/C and is scheduled to begin December 23, 1985, with an approximate completion date of March 1, 1986.

The inspector reviewed TVA audit reports and surveillance reports related to the Sequoyah design control program. These reports were prepared by the Knoxville Quality Management Staff (QMS) when they reviewed OE design activities, by the Chattanooga Quality Audit Branch (QAB) when they reviewed the on-site Nuclear Power group design activities, and by site QA/QC groups when they reviewed the on-site Nuclear Power group design activities. The following are the specific reports reviewed:

Report Number	Notes	Date of Issue
QMS 85-05	(1)	February 28, 1985
QMS 85-33	(1)	May 23, 1985
QMS 85-21		July 5, 1985
QMS 85-12		July 23, 1985
QMS 85-29		September 11, 1985
QAB SQ-82TS-02		July 7, 1982
QAB SQ-8400-07		April 20, 1984
QAB QSQ-A-85-0007		May 15, 1985
QC 19C-84-A-001		March 6, 1984
QC 19C-84-P-001	(2)	March 22, 1984
QA 19C-84-S-013		December 13, 1984
QA 19C-84-A-012		January 16, 1985
QA 21-84-S-014	(2)	January 16, 1985
QA 19C-85-A-002		April 30, 1985
QA 19C-85-A-001		April 30, 1985
QA 21-85-P-002	(3)	May 1, 1985
QA 19A-85-P-003		May 31, 1985
QA 1C-85-S-004		May 31, 1985
QA 19C-85-P-004		June 6, 1985

QA-19C-85-P-005	September 25, 1985
QA-19C-85-S-006	December 20, 1985

Notes:
(1) These audit reports discussed OE problems in tracking nonconformance reports (NCR). This is addressed later in this report.

(2) These reports discussed as-built drawing discrepancies which are addressed later in this report.

(3) This special surveillance reviewed 473 Engineering Change Notices (ECN) and Design Change Requests (DCR) for post modification test requirements.

Presently, with OE personnel on site, Nuclear Power (QAB or site QA) does not audit OE and, similarly, QMS does not audit Nuclear Power. There was an on-going discussion by site QA and QAB regarding the auditing of OE interfaces with Nuclear Power.

The inspector selected five NCRs from the above audit reports that were written against OE. The NCRs should be closed prior to the upcoming start-up. As indicated in note (1) above, OE had problems tracking NCRs in the past. The selected NCRs/deficiencies were as follows:

85-29-02	SCR SQN CEB 8508
SQNNEB 8501	ECN 6554/6546
85-12-01	SCR SQN MEB 8502
85-12-02	SCR SQN MEB 8503

The SCR above is the abbreviation for Significant Condition Report number assigned to the NRC. The inspector determined that the NCRs were being tracked by OE and that OE had transmitted the required changes to Nuclear Power. Additionally, Nuclear Power had taken actions to clear the NCRs prior to start-up.

Surveillance 1C-84-P-001 identified problems with randomly selected as-built drawings. The drawing deficiencies and on-going corrective actions are described in Corrective Action Report (CAR) SQ-84-03-008 and its attendant background material and site responses. This survey identified the following types of problems:

As-constructed drawings showed components which have never been installed and vice versa.

Some Engineering Change Notices (ECN) have been closed out as complete even though not all the work has been finished.

Research indicates that many of the drawing problems have been known to various plant sections for some period of time, but apparently no corrective action has been initiated.

Some drawing errors resulted in errors to Surveillance Instructions and Startup Check Sheets. Checklists contained in these documents were used repeatedly without the deficiencies being corrected.

Most of the problems appear to be a result of the Unit 2 transfer of drawings from Construction to Nuclear Power control. This problem involved 11 drawings. The drawings and attendant documentation have been corrected or were in the process of being corrected. Further, the CAR indicated that the task force on as-constructed drawings would review these problems.

The as-built drawing task force for the site was created several years ago as a result of findings from Browns Ferry. The task force consisted of site and corporate personnel who were involved with Browns Ferry configuration control problems. The inspector reviewed some task force meeting minutes. Per the meeting minutes for June and July 1984, 30 out of 161 ECNs closed by Nuclear Power (post plant turnover from construction) had been reviewed by the task force for completeness of documentation. The following are the generic problems identified by the meeting minutes with the frequency of occurrence identified in parenthesis for the ECNS reviewed:

GENERIC PROBLEM #1: Design drawings for areas of the powerhouse carry a unit designation but contain equipment involving both units. (4)

GENERIC PROBLEM #2: Some ECNs were closed without verifying work done on Unit 2 by Construction before transfer. (8)

GENERIC PROBLEM #3: EN DES does not issue completed ECN Data Sheets with the ECN Inventory Sheet. (30)

GENERIC PROBLEM #4: Some ECNs have been closed with ECN Data Sheets that did not show the revision level for the listed drawings. (12)

GENERIC PROBLEM #5: The ECN closure process does not prevent Field Change Request approval (and subsequent drawing change) from the time the ECN Inventory Sheets are issued to the time the ECN is closed. This has, in the past, been handled with ECN LS1 drawing issues. (2)

GENERIC PROBLEM #6: On some ECNs, the Drawing Control Center updated higher revision level drawings than called for by the Work Plan. This results from the as-constructed drawings being at a higher revision level due to other ECNs being complete or due to Field Change Requests being incorporated. (3)

GENERIC PROBLEM #7: EN DES does not provide vendor drawings needed to modify manufacturer supplied equipment packages. (1)

Aside from generic problem number two, these problems do not appear significant. The above problems have been resolved or are in the process of being resolved. Discounting generic problem three, only nine ECNs had no generic problems. This review by the task force did not directly address potential as-constructed drawing problems prior to construction turnover of the plant to Nuclear Power (i.e., prior to ECN generation); indirectly, construction problems would be identified by such a review.

The site modifications group was tasked with reverification of ECN closure. Utilizing P&S-SIL-1, ECN Closure Re-verification Procedure, Revision 0, and other resources, a group of engineers assigned from modifications is currently reviewing all closed ECNs. This number has grown from 161 identified by the task force to 195 ECNs. At the time of this inspection, 66 ECNs have been reexamined. Major problems have not been identified in the reverifications. One Field Change Request (FCR) had to be written to obtain an Engineering Design drawing change approval. As with the ECNs reviewed by the task force, no reportable occurrences or rework has been evinced. ECNs in plant walkdowns have not occurred unless drawing discrepancies have been noted in the ECN reverification process. The ECN closure group has been using AI-25 (PART I), Drawing Control After Unit Licensing, Revision 11, definition of critical drawing in their review of ECNs. The group reviews drawings from this critical drawing list for each ECN plus additional drawings. The group has drafted a change to AI-25 to revise the definition of critical drawings. The inspector did not explore the intent of this list, but did recognize that the list was a subset of the total site drawings.

AI-25, Section 5.2.9 and Attachment C, require personnel to report as-constructed drawing problems. Should a site employee discover a plant configuration that does not match the latest as-constructed drawings, he is to immediately notify the Shift Technical Advisor (STA) and fill out Attachment C, "As Constructed" Drawing Deviation of AI-25. The STA reviews the discrepancy to determine reportability and the effect on plant operation; then Attachment C is forwarded to the modifications group for resolution (the same group of engineers which are handling ECN closures). According to site personnel, none of the as-constructed discrepancies at the time of this inspection had been reportable or affected operations. The change to AI-25, which caused reporting to occur, has been in effect for approximately three months (during outage conditions). At the time of this inspection, 13 forms (Attachment C) have been submitted to modifications; 23 critical and 76 non-critical drawings were affected by the submitted forms' discrepancies. The modifications subgroup has reviewed all of the forms and resolved approximately three of the problems on the critical drawings. The inspector reviewed five of the drawing problems; those

problems did not appear significant; varying from a typographical error to a drain not being installed (two other drains are present in the immediate vicinity). The reviewing group was walking down each of the problems in the plant. According to the modifications group, Operations had turned over 175 additional forms. These were returned to Operations for a re-review due to a misunderstanding of common and unit drawing revision levels. According to an Operations supervisor, Operations had not begun the re-review of the drawings/forms due to a drawing control center activities conflict (their activities are addressed later).

In summary, site efforts to resolve problems identified in surveillance 1C-84-P-001 appear to be adequate and meet the intent of utility self-identification of problems described in 10 CFR Part 2, Section V.A. Task force and modifications review of ECNs appear to indirectly canvas the construction problems identified in the survey by virtue of the fact that ECNs are based on Construction's as-built drawings. An indicator of design activities and potential as-constructed drawing problems lies in the results of the modifications group review of the generated AI-25 forms and the G/C inspection.

Surveillance 21-84-S-014 identified problems with drawings in the control room and shift engineer's office for Unit 2. As Work Plans of ECNs were completed, the cognizant modification engineer would mark up Operations' drawings (preliminary as-constructed) to provide status while controlled drawings were being prepared by the drawing control center from marked-up copies similarly provided. Examples of problems seen in both units' drawings included missing drawings, illegible drawings, and drawings not marked-up as-constructed or not clearly marked-up. Most of these problems have been remedied or are in the process of being corrected. According to a member of TVA configuration task force who is now assigned to Sequoyah, 200 critical drawings (there are approximately 2600 critical drawings) have some degree of legibility problems. This problem coupled with the revision level problem mentioned earlier (interfering with Operations' review of AI-25 forms) is presently being corrected. The inspector did not determine if this review activity would be accomplished prior to start-up. Ultimately, Sequoyah does not plan to have marked-up drawings used at the site and to have only controlled copies provided to operations.

c. The inspectors reviewed environmental qualification (EQ) problems recently identified by TVA to determine whether they are symptomatic of a larger scope design control problem. The examples selected were the rewiring of Limitorque valve operators and the relocation of potentially submerged cables.

Before beginning this effort, the potential link between EQ and design control problems was assessed on a more general basis. Numerous personnel in OE, Modifications, and Technical Service branches were interviewed. From these interviews, the following were identified as pathways for EQ problems.

(1) The previous design control process was fragmented in that each discipline involved in the design effort concentrated resources in their segregated area with little coordination or communication. Consequently, documentation certifying the environmental qualification of sensitive equipment was scattered, unorganized, and often not retrievable. Consequently, when an EQ issue developed, documentation necessary to certify the equipment was not available.

(2) The previous EQ program was not administratively fully developed, properly prioritized, or easy to use. As a result, designers were not always aware of EQ considerations affecting their design work.

(3) As the EQ program evolved, new interpretations led to the discovery of EQ applications not previously considered. Previous design work, therefore, did not in many cases satisfy the pertinent EQ issues.

(4) In some instances, vendor QA programs were relied. Subsequently, the vendor was unable to supply equipment certification necessary to satisfy EQ issues.

(5) During the early design of the plant, knowledge and awareness of EQ issues was comparatively limited and designers overlooked issues which otherwise should have been addressed.

Of the pathways described, only numbers 1 and 5 constitute a direct relationship between inadequate design controls and EQ problems. The Limitorque valve wiring problem involved pathways 3 and 4 while the potentially submerged cabling problem involved pathway 5. These problems are discussed individually in the following paragraphs:

(1) Limitorque Valve Operator Wiring

The licensee installed numerous valve operators purchased from Limitorque. The valve operators were procured under the assumption that the vendor's qualification of the equipment implied that all internal components were resistant to the specified harsh environment. During recent efforts to solidify the EQ program, check sheets were generated which included the requirement to evaluate not just the valve operator as a whole, but all materials contained within the valve. This led to an assessment of the internal wires of the valve operators and an attempt to qualify them by identifying each wire, tracing it to a contract, and extracting the applicable test report. However, because of the construction of the valve operator, there are many pieces of wire which were too short to read the imprinted wire identification. The vendor was unable to fill these gaps. Furthermore, the tests run by the vendor did not distinguish chemically cross-linked from radiation cross-linked polyethylene

wiring. Due to this lack of certainty, the licensee decided to replace all questionable wiring.

(2) Potentially Submerged Cables

During the initial design of the plant, designers failed to specify cable routing criteria to avoid submergence problems based on a design basis loss of coolant accident. As a result of recent efforts to upgrade the EQ program, it was identified that certain segments of cabling could become submerged during a design basis loss-of-coolant accident and that the cabling would be subjected to a boric acid solution. The licensee is rerouting the cabling above the post-accident flood level.

With respect to the cable routing problem, the inspector established a definite link between previous design control problems and recently-identified EQ problems. The Limitorque valve operator problem was not considered an example of improper design controls.

The intent or theme of this portion of the inspection was to determine whether the recently-identified EQ problems were indications of previous design control problems which may have caused existing, but unidentified, safety problems in other areas. Due to the limited scope of the inspection, the answer to this question is indeterminate. Although the cable routing problem revealed an inadequate design effort, it may indicate a lack of awareness and knowledge, or a "pre-learning curve" mistake, rather than a faulty design control process. The original designers and reviewers apparently overlooked the possibility that cabling could be routed or rerouted through field changes to place portions of it under the potential flood level.

As the nuclear industry has progressed, design parameters have continually been enhanced and expanded in response to historical problems and enhanced insight. The cable routing problem may fall into this category and be an isolated example. However, in general, the review of recent EQ issues did not support or refute the potential for significant past design control problems.

6. Report Conclusion

The information gathered during this inspection does not suggest that significant design control problems have existed in the past such as to undermine the current confidence level of safety-related systems. The scope of the inspection, however, did not include individual system walkdowns or a detailed review of ECN packages. The licensee has contracted to conduct a "hardware inspection" as such and will keep NRC apprised of the results. Specific commitments to upgrade the programmatic aspects of the design control process are due February 1, 1986. NRC will conduct a followup inspection in this area at an appropriate time.