



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

SAFETY EVALUATION REPORT BY THE OFFICE OF SPECIAL PROJECTS  
EMPLOYEE CONCERN ELEMENT REPORT 201.3(B), "DESIGN CRITERIA"

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR POWER PLANT, UNITS 1 AND 2

DOCKET NOS. 50-327 AND 50-328

I. SUBJECT

Category: Engineering (20000)  
Subcategory: Incorporation of Requirements and Commitments in Design (20100)  
Element: Design Criteria (20103)

The basis for Element Report 201.3(B) Revision 1, dated January 13, 1987 is employee concerns IN-85-886-001, WI-85-100-019 and WI-85-100-044 which state:

IN-85-886-001:

"TVA designs were not developed well enough to be constructible: (1) design changes are still being instituted in areas where there should have been minimal changes especially in area of conflict between TVA and vendor drawings and (2) engineering design criteria is often non-existent, particularly for seismic hanger design. Many design criteria or acceptance criteria are still being changed. This is a generic concern. Any further information would divulge confidentiality. Construction Department concern."

WI-95-100-019:

"Electrical standards and guides are treated as guides, and are not incorporated in design criteria requirements. Electrical design criteria, where it exists, is not complete, is vague, and in general, is inadequate. CI has no further information. Anonymous concern via letter."

WI-85-100-044:

"TVA has set up design criteria for WBNP and after the fact, has inactivated a large percentage of the criteria. CI has no further information. Anonymous concern via letter."

These concerns were evaluated by the licensee as potentially nuclear safety-related and potentially applicable to Sequoyah (generic).

The staff reviewed employee concern IN-85-886 and identified an issue relating to solenoid valve closing time at Watts Bar which does not appear to have been

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addressed by the licensee. This issue is not related to design criteria and will be addressed separately.

## II. SUMMARY OF ISSUES

Four issues were defined by the licensee as applicable to this evaluation:

1. Electrical and other engineering design criteria are not always complete, but are vague and inadequate.
2. Many design criteria are changed late in the project.
3. Engineering design criteria are often nonexistent.
4. Many design criteria were set up and then inactivated, and now cannot be retrieved and used as a basis for modification of the original design.

The licensee noted that issues "1" and "3" are also addressed in Sequoyah Element Report 213.3.

These concerns also generated issues which are addressed in other Sequoyah Element Reports:

- 201.4 Electrical and other engineering standards and guides are treated as guides only. Electrical and other engineering standards and guides are not incorporated into the design criteria.
- 204.4 Engineering designs are not constructible. Too many design changes were made late in the project. Many acceptance criteria were changed late in the project. Too many conflicts between TVA drawings and vendor drawings existed late in the project.

## III. EVALUATION

### Criteria Incomplete, Vague and Inadequate

According to the licensee's evaluation team, design criteria procedures existed as early as 1970 in TVA Division of Engineering Design Quality Assurance Procedure SQN-QAP-III-1.1. This procedure and its successors provide guidance for the preparation, review, approval and revision of design inputs. However, an independent audit performed for the licensee indicated that a more comprehensive effort is needed for the collection and distribution of electrical design criteria. Some specific inadequacies relative to electrical engineering criteria are discussed in Element Report 213.3. In addition, the Mechanical Engineering Branch found it necessary to update their design criteria and use procedure NEP-5.2, "Review" to check for completeness and adequacy. The concern that some electrical and other engineering design criteria were inadequate was admitted by the licensee.

The Design Baseline and Verification Program (DBVP) was developed by the licensee to resolve design control issues. The NRC staff performed inspections

Nos. 50-327/86-45 and 50-328/86-45 to review the licensee's programs for design criteria preparation, a sample of the new criteria and the effectiveness of the licensee's Engineering Assurance (EA) group for independent review of the design criteria. The staff found that a program had been established to identify the licensing commitments and other design requirements. The staff was concerned about the comprehensiveness of the design criteria in several engineering disciplines. In the civil/structural area, the staff found that the plan of action and the attributes shown in the Engineering Assurance (EA) oversight review plan indicate that an adequate plan had been established to review the Sequoyah project work.

In Inspection Nos. 50-327/87-27 and 50-328/87-27, the NRC staff reviewed the corrective actions resulting from the design calculation program which provided detailed technical reviews of calculations. The staff found that the corrective actions being taken by the Mechanical Engineering Branch to resolve Conditions Adverse to Quality Reports (CAQR) relating to calculation reviews were adequate and responsive to the generic implication of their findings. The review of Nuclear Engineering Branch CAQRs showed that the reissued calculations were appropriate and adequately implemented corrective actions. The staff has approved the licensee's interim and final criteria for the pipe support regenerated calculations. The staff intends to inspect the regenerated support calculations and the EA overview of these calculations prior to restart. Several examples of the Electrical Engineering Branch revising design criteria and performing new calculations as a result of EA audits were noted.

In Inspection Nos. 50-327/87-31 and 50-328/87-31, the NRC staff reviewed several of the licensee's corrective actions for open NRC observations from previous inspections and the resolution and implementation of DBVP items was acceptable for mechanical systems, electric power and nuclear engineering. In the civil/structural area, the team found that licensee-generated open items were being closed properly. The findings, evaluations and determinations of the EA oversight group were considered competent.

The staff considers corrective actions to have been implemented.

#### Criteria was Changed

The licensee admitted in report no. GCC-20-66, which was an investigation of employee concern IN-85-886-001, that design/acceptance criteria are still being changed. The licensee's position that design criteria changes are made when dictated by circumstances or to correct deficiencies is acceptable to the staff.

#### Criteria Non-Existent

The licensee's evaluation team verified the nonexistence of some design criteria. The nonexistence of specific Electrical Engineering Branch design criteria is discussed in Sequoyah Element Report 231.5. The GCC report mentioned above confirmed this for seismic hangers and an independent audit concluded that some documentation of original design bases was either not readily available or nonexistent.

The licensee is currently using three procedures for generating the design criteria: Nuclear Engineering Procedure NEP-3.2, "Design Input", Sequoyah Engineering Project SQEP-18, "Procedure for Identifying Commitments and Requirements as Source Information for Sequoyah Design Criteria Development" and SQEP-29, "Procedure for Preparing the Design Basis Document for Sequoyah Nuclear Plant." The adequacy of the implementation of these procedures is subject to audit by the staff.

#### Criteria Inactivated and Lost

Inactivation of design criteria at the discretion of the section supervisor was permitted by Engineering Procedure EP 3.01 Revision 4, dated November 19, 1980, "Design Review Documents - Preparation, Review and Approval", Section 10.0, "Inactivation of Design Criteria." It was permissible to inactivate criteria after approval of the system preoperational test or the post modification test. Revision 6 dated May 22, 1984 allowed inactivation only when the entire system, structure or component was deleted from the plant design or permanently removed from operation. The licensee's evaluation team also found that design criteria were inactivated at Sequoyah when construction was completed and the system was put into operation because all necessary information should be in the design output documents. Inactivated design criteria were identified in the Sequoyah Design Criteria Manual Index. Of the 32 criteria identified as inactive, all were retrieved.

Missing design criteria are being identified by the design calculation review program and the Engineering Assurance oversight group. The procedure that allowed inactivation of design criteria that should have been retained was changed in 1984. Procedures currently exist at Sequoyah that provide for adequate design criteria. The staff considers the corrective actions taken by the licensee to be acceptable.

#### IV. CONCLUSIONS

The NRC staff reviewed TVA Employee Concerns Special Program Report Number 201.3(B) Revision 1, dated January 13, 1987, "Design Criteria" and found their investigation and resolution of the concerns to be adequate. The employee concerns are substantiated. The NRC staff will be monitoring the adequacy of the procedures for generating design criteria through inspection and audits. A portion of employee concern IN-85-886 does not appear to have been evaluated by the licensee and since it does not involve design criteria, it will be handled separately. This issue is not considered to be applicable to Sequoyah since it referred to a specific incident at Watts Bar.