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

January 11, 1988

MEMORANDUM FOR: Stewart Ebneter, Director
Office of Special Projects

FROM: John C. Bradburne, Director
Congressional Affairs
Office of Governmental and
Public Affairs

SUBJECT: CONGRESSIONAL STAFF QUESTIONS ON SEQUOYAH

Attached for your review and appropriate action are questions from the majority staff of the House Interior Committee concerning the Sequoyah nuclear power plants.

CONTACT: Frederick Combs x-41443

Attachment: January 6, 1988 note from Henry Myers to Harold Denton,
Subject: Attached Questions Concerning Sequoyah

cc: Chairman Zech
Commissioner Roberts
Commissioner Bernthal
Commissioner Carr
Commissioner Rogers
GPA (Denton)
OGC
EDO (Taylor)
OI
OIA

January 6, 1988

To Harold Denton
From Henry Myers #M

Re: Attached Questions Concerning Sequoyah

In the course of our inquiry into the Commission's regulation of TVA's nuclear program, we have reviewed many NRC and TVA documents pertaining to Sequoyah. These documents indicate the existence of conditions at Sequoyah which do (or did) not comply with NRC requirements. Attached hereto is a list of questions derived from our review. Many of these questions are referenced to specific documents and are of the following general type:

1. What reviews of the document and/or assessment of conditions described therein have been performed by the NRC? If such reviews were not conducted, what was the reason for their not having been done?

2. Where and how are the results of any such reviews documented?

3. With respect to specific conditions enumerated in the referenced document, what corrective actions have been required by the NRC and how are these documented?

4. With respect to specific conditions enumerated in the referenced document, what corrective actions have been completed by TVA?

5. Are problems and/or deficiencies identified in the referenced document to be subject to corrective action prior to restart of Sequoyah? If not, what is the basis for not requiring corrective action prior to restart?

We believe answers to the attached questions (many of which presumably exist) do or would provide information that is necessary, but not sufficient, for a determination of whether Sequoyah complies with NRC regulations. Accordingly, we believe that the NRC official responsible for authorization of Sequoyah restart should have (A) the answers to these questions within reach or (B) an explanation as to why particular questions are not relevant to the Sequoyah restart authorization.

January 5, 1988

QUESTIONS CONCERNING SEQUOYAH ISSUES

I. NRC Assessments of TVA Reviews

Major TVA sponsored reviews of various aspects of TVA's nuclear program have been conducted by TVA's Nuclear Safety Review Staff, Black & Veatch, Gilbert Commonwealth, TVA's Design Baseline & Verification Program (DB&VP), TVA's Engineering Assurance Audit 87-09, and TVA's Engineering Assurance Oversight Review (EA-OR-001). These TVA reviews identified numerous issues bearing directly on the safety of TVA's nuclear facilities. In addition, TVA employees have enumerated a large number of actual and possible deficient conditions at Sequoyah and Watts Bar.

A. Which of these reviews have been provided by TVA to the NRC? Which have been reviewed by the NRC?

B. Has NRC analyzed the design and construction problems identified by these TVA reviews and employee concerns to determine their generic applicability to Sequoyah and/or Watts Bar? Where are any such analyses documented?

C. Has the NRC compiled a comprehensive, categorized listing of Sequoyah design and construction deficiencies enumerated in the foregoing TVA reviews?

D. Has the NRC determined which of the Sequoyah design and construction deficiencies enumerated in the foregoing TVA reviews predated issuance of the Sequoyah Operating License?

E. Has NRC determined which of the problems identified by the TVA reviews and employees have been adequately resolved and/or subjected to corrective action?

F. What action has NRC taken to identify and track resolution of design and construction problems identified in the foregoing TVA reviews?

G. What actions has NRC taken to determine which Nuclear Safety Review Staff report findings, Black & Veatch (B&V) findings, and employee concerns pertain to Sequoyah? What is the status of resolution of such findings and concerns?

H. Which TVA employee concerns have been reviewed by the TVA Inspector General's Office? Which of such concerns

have been substantiated? Which have not been substantiated?

I. On November 7, 1985, TVA sent the NRC a Gilbert-Commonwealth review of "...the current design control program for the Sequoyah Nuclear Plant. This review was intended to provide an overall assessment of the completeness of the program, and its understanding and implementation by engineering personnel."

1. What were the major findings of the Gilbert-Commonwealth review?

2. What action has NRC taken with respect to the Gilbert Commonwealth findings concerning design control at Sequoyah?

3. With respect to such findings, what corrective actions by TVA will be required prior to Sequoyah restart?

J. The following questions refer primarily to (A) the Design Baseline & Verification Program (DB&VP) and (B) the Engineering Assurance Review of the Sequoyah Unit 2 DB&VP, EA-OR-001, dated April 29, 1987. The latter listed 357 action items, each such item apparently referring to a deficiency in the DB&VP and/or a Sequoyah design deficiency which the DB&VP had failed to identify.

1. What reviews have been conducted by the NRC of TVA's DB&VP?

2. What are the results of any such NRC reviews?

3. What does the NRC believe to be the DB&VP's major findings?

4. Which DB&VP findings indicated the existence of non-complying conditions that existed prior to the issuance of the Sequoyah Operating License?

5. What does NRC believe to be the major findings of the Engineering Assessment (EA-OR-001) review of the DB&VP?

6. What does NRC believe to be the major findings of the EA-OR-001 with respect to deficiencies in the DB&VP?

7. What hardware and design changes have resulted from the DB&VP and/or the Engineering Assessment

of the DB&VP?

8. Has NRC evaluated the scope and implications of TVA's not meeting requirements of the Topical Report Section 17.1 and 10CFR50.71 as they pertain to design criteria, calculations, and FSAR requirements on safety-related systems?

9. EA-OR-001 states that the Engineering Assessment (EA) findings resulted in the issuance of "38 CAQs over and above those" identified by the DB&VP.

   a. How many CAQs were identified by the DB&VP?

   b. What are the 38 CAQs (i.e. identification number and substance) issued as a result of the EA-OR-001 review?

   c. What does generation of additional CAQ's by the EA effort imply with respect to the thoroughness of the DB&VP?

10. Does EA-OR-001 and/or the DB&VP take adequate account of missing and/or incomplete calculations described in EA-87-09?

11. EA-OR-001 refers to the restart design basis document (RDBD). (See EA-OR-001, p. 4-8.) Has the RDBD been reviewed by the NRC?

12. Has NRC reviewed the adequacy of the EA-OR-001 procedure for designating the extent (i.e. the generic applicability) and significance of the EA-OR-001 findings? Has NRC reviewed the adequacy of implementation of the EA-OR-001 procedure for designating the extent and significance of EA-OR-001 findings? [See EA-OR-001, p. 8-11 and Table 8.4-7.] Where are any such NRC reviews documented?

13. Does EA-OR-001 contain a separate listing of Action Items indicative of generic deficiencies in the DB&VP? Where does any such listing appear? Has the NRC reviewed the EA-OR-001 Action Items in order to determine the adequacy of the categorization of such items with respect to generic applicability and significance?

14. At the April 10 meeting between TVA and NRC staff, Mr. John Cox, who was assigned overall direction of the DB&VP, stated that:

"... none of these deficiencies [found by the DB&VP], if left uncorrected, would or could have jeopardized the health and safety of the public from the operation of the facility." [Tr., p.18.]

a. Is it TVA's position that none of the deficiencies found by the DB&VP, if left uncorrected, would or could have jeopardized the health and safety of the public from the operation of the facility?

b. If so, does NRC staff agree with this position? Is such a position consistent with the findings of the Engineering Assurance Oversight Review Report (EA-OR-001)?

c. Is such a position consistent with the findings of Engineering Assurance Audit EA-87-09?

15. What has NRC done to date and what will it do in the future to determine the adequacy of corrective action plans and implementation with respect to the 357 action items enumerated in EA-OR-001? Where are any such NRC actions documented?

16. With reference to EA-OR-001, Appendix D, page 12 of 13, trend code for Action Item Q12, this item (Q12) affects design criteria preparation, it is not a pre- or post-restart issue, it pertains to inadequate design criteria documentation.

a. What review has NRC conducted of Q12?

b. Should Q12 have been identified as a restart issue for Sequoyah?

c. What action will NRC require be taken by TVA with respect to Q12?

d. Does NRC concur with TVA's response to Q12?

K. On June 18, 1987, the TVA Nuclear Manager informed the TVA Congressional Caucus that:

The 37 major safety systems needed to shutdown the [Sequoyah] plant in the event of an emergency were evaluated and verified as capable of performing their designed functions. Deficiencies were

identified during the review and they are being tracked to ensure they are corrected. These 37 system reviews were very comprehensive. The completed review for one system, the Essential Raw Cooling Water System, required 19 volumes, each volume occupying a three-inch thick binder. These reviews went back to the original system design requirements and forward to the latest design modifications to ensure the system would perform its intended function. [Underline added.]

The TVA Nuclear Manager further informed the Caucus that he disagreed with the NRC as to the necessity for additional design/construction verifications (the Integrated Design Inspection (IDI)).

a. What reviews have been conducted by the NRC of the TVA review of 37 systems?

b. What comparison has been made by the NRC of the IDI findings with TVA findings resulting from its various reviews of the Essential Raw Cooling Water (ERCW) system including reviews conducted in the course of the DB&VP?

c. Is a finding that systems are capable of performing their designed (or intended) functions equivalent to finding that the systems comply with applicable NRC regulations and TVA licensing commitments? If so, why does TVA not state that the systems in question comply with applicable NRC regulations and TVA licensing commitments? If not, what is necessary to show that the systems in question comply with applicable NRC regulations and TVA licensing commitments?

II. NRC Requests for Responses to NRC Inspection Reports and Other Matters

A. On January 15, 1986, NRC requested information on five design control questions pertaining to Sequoyah.

1. What reviews of TVA's response to the January 15 letter have been conducted by the NRC?

2. What are the results of any such review?

B. On October 20 and November 14, 1986, the NRC sent TVA letters concerning NRC findings from an inspection of

procurement and quality assurance records pertaining to Sequoyah.

1. What review of TVA's response to the October 20 and November 14 letters has been conducted by the NRC?

2. What are the results of any such review?

C. On March 5, 1987, the NRC Director of Inspection and Enforcement sent a letter to TVA which raised questions as to deficiencies in the initial design of Sequoyah and the design modification process as applied to Sequoyah.

1. What reviews of TVA's response with respect to specific issues raised in the March 5 letter have been conducted by the NRC?

2. What are the results of any such review?

D. On March 18, 1987 Commissioner Asselstine sent the NRC staff a list of questions concerning compliance of the Sequoyah Nuclear Plant with the Commission's regulations and the nature of reviews that would be necessary to establish compliance. On March 31, 1987, NRC requested TVA to provide its views concerning questions posed by Commissioner Asselstine in his March 18 letter. TVA responded on June 10, 1987.

1. What reviews of TVA's June 10, 1987, response to Commissioner Asselstine's memorandum have been conducted by NRC? What were the results of any such reviews?

2. In the conduct of any such reviews, did NRC staff make use of comments by Mr. Dallas Hicks, transmitted to House Interior Committee staff on July 10, 1987, and forwarded to the NRC on July 13, 1987? What review of Mr. Hicks' comments has been performed by the NRC?

E. On April 24, 1987, NRC transmitted the results of Inspection 50-327/86-68 to TVA.

1. What reviews of TVA's response with respect to specific issues raised in 50-327/86-68 have been conducted by the NRC?

2. Where are any such reviews documented?

3. What corrective actions have been undertaken to

remedy deficiencies noted in 50-327/86-68?

F. On August, 24, 1987, NRC transmitted to TVA the results of Inspection 50-327/87-27. This report stated, among other things, that:

> The TVA/CEB reviews highlighted above [i.e. SQN CEB 87-02, SQN CEB 87-03, SQN CEB 87-04, and SQN 87-06] indicate that a significant number of problems exist with newly regenerated calculations, many of which have been prepared by contract personnel.
>
> With respect to the main feedwater water hammer analysis, the 50-327/87-27 cover letter stated:
>
> > The TVA evaluation did not assess the main feedwater piping integrity and the increased loads transmitted to pipe snubbers. A TVA analysis performed on the Watts Bar main feedwater piping yielded snubber water hammer loads that were approximately 10 times greater than the snubber seismic loads.
>
> The inspection 50-327/87-27 cover letter also stated:
>
> > The team also noted ineffective implementation of a procedure to track unverified assumptions made in calculations ....

1. What reviews of TVA's response with respect to specific issues raised in 50-327/87-27 have been conducted by the NRC?

2. Where are any such reviews documented?

3. What corrective actions have been undertaken to remedy deficiencies noted in 50-327/87-27?

G. On September 25, 1987, NRC transmitted the results of Inspection 50-327/87-52 to TVA. This report, which appears to have resulted from the walkdown portion of the IDI, stated, among other things, that:

> We are particularly concerned that your design control process allowed components with undesignated valves, whose positions could affect the design of the ERCW system, to be installed in the plant without proper translation into specification, drawings, procedures and

instructions.

Other findings included:

* A-1. The drawings and instructions for the ERCW system did not reflect skid mounted valves in the ERCW lines that could isolate ERCW flow to the safety injection pump oil and bearing coolers and to t' e centrifugal charging pump oil coolers and there were no instructions for the initial or periodic alignment of the valves. Further, the drawing did not show the specified high point vent valves.

* A-2. Cable installation procedures that allowed routing of safety-related cables through undesignated cable trays, without apparent regard to thermal loading, electrical separation, volumetric tray loading.

A-3. Procurement process did not specify that the ERCW screen wash pump be ASME Code Class III as specified in FSAR.

* A-4. Procurement error that resulted in purchase of a flexible hose designed for 100 psi for application requiring 150 psi.

* A-5. Disconnection of sensors without review by TVA design organizations.

* A-6. Installation of a prohibited cross connection between supposedly independent ERCW loops.

* B-1. Three instrumentation drawings for the ERCW pump house instrument sense line floor sleeve packing showed conflicting requirements for its height and it was not installed according to any of them.

* B-2. Although the existing drawings reflected differently, heat tracing was not installed on the RA ERCW pump discharge pressure instrument line.

* B-3. Failure to include safety-related instruments on CSSC list.

* B-4. Failure to provide instructions for the positioning of valves downstream of the primary root valves.

B-5. Failure to assure prevention of touching of

cables between divisions.

* B-6. Failure to route cables pursuant to cable pull cards and/or schedules.

* C. Failure to control documents to show deletion of relief valves.

[Note: (*) indicates items that did not carry over to the IDI.]

Inspection Report 327/87-52 concluded:

> Although deficiencies associated with the ERCW system were observed by the inspection team, the team concluded that, in general and subject to resolution of those deficiencies, the ERCW system is satisfactorily installed and constructed in accordance with design specifications.

TVA was asked to respond to 327/87-52 within 30 days.

1. Why were only two of the thirteen foregoing 87-52 findings listed in the IDI?

2. On what date did TVA respond to 327/87-52?

3. What reviews of TVA's response to 50-327/87-52 have been conducted by the NRC?

4. What analyses of the 50-327/87-52 findings have been conducted to determine the generic applicability of such findings?

H. On December 3, 1987, NRC transmitted the results of Inspection 50-327/87-31 to TVA. This report, concerning an inspection of the DB&VP stated, among other things, that:

> .... implementation of corrective actions for DB&VP findings was still in progress at the time of the inspection, as was Engineering Assurance (EA) sampling and verification of implementation.

1. What reviews of DB&VP and EA corrective action plans and implementation of such plans have been conducted by the NRC?

2. Where are such reviews documented?

III. <u>10CFR50-Appendix B, CAQ Program Ineffectiveness, Material Traceability/Procurement/Q-List/CSSC List, Engineering</u>

Change Notice (ECN)

A. What reviews have been performed by TVA since 1985 to determine the adequacy of TVA's efforts to identify possible Appendix B violations at Sequoyah similar to those found at Watts Bar? Where are any such reviews documented? What are the major findings resulting from any such reviews?

B. With respect to TVA reviews conducted since 1984, what are the major design and construction deficiencies at Sequoyah that have been identified as resulting from failures to comply with Appendix B? Does NRC have a compilation of actions taken by TVA to correct such design and construction deficiencies?

C. Various TVA reviews have indicated that the TVA program for handling Conditions Adverse to Quality (CAQ) is deficient. [E.g., Division of Nuclear Quality Assurance Audit, Deviation No. QSS-A-87-0012-D02 and the June 16, 1987, memorandum from N.C. Kazanas, Director of Nuclear Quality Assurance to Abercrombie et al.: REVIEW OF THE NEW CONDITION ADVERSE TO QUALITY (CAQ) PROGRAM EFFECTIVENESS AT SEQUOYAH NUCLEAR PLANT (SQN).]

1. With respect to the CAQ program deficiencies existing as of this date, what corrective actions will have been completed vis-a-vis the CAQ program prior to Sequoyah restart?

2. With respect to corrective action program deficiencies since issuance of the Sequoyah Operating License, what actions have been taken to identify and correct non-complying conditions that may not have been corrected as a result of shortcomings in the corrective action program?

D. Various TVA and NRC reports describe deficiencies associated with material traceability/procurement, Q-List, and the CSSC List. (E.g., NSRS R-84-17-NPS, 50-327/86-11, 50-327/86-61, 50-327/86-68, 50-327/87-40, etc.)

1. What is the status of resolution of such deficiencies? Which of these deficiencies will be the subject of corrective action(s) prior to Sequoyah restart?

2. What is the basis for NRC's not requiring as of January 1, 1987, a detailed Q-List or its equivalent for Sequoyah? What is the basis for any claim that TVA's CSSC list is adequate and

that a Q-List or equivalent is not required?

3. TVA documents dated October 6, 1986, January 4 and 29, 1987, April 21, 1987, and May 4, 1987, refer to traceability of materials used in pressure retaining piping components.

   a. What reviews of these documents have been conducted by the NRC?

   b. What is the NRC's position with respect to TVA's resolution of the employee concerns that resulted in the surfacing of this issue?

E. There have been varying degrees of problems in handling ECNs by TVA per TVA's procedures.

1. Do the ECN problems call DB&VP results into doubt?

2. How will NRC oversee resolution of this problem prior to Sequoyah restart?

3. What actions have been taken (or will be taken) by the NRC to assure correction of ECN deficiencies? Which of such actions will be taken prior to Sequoyah restart?

F. Since 1984, has TVA understated or misrepresented the scope and/or significance of the various safety and licensing problems associated with its nuclear program with respect to design and construction of Sequoyah?

IV. <u>Civil/Structural Calculation Issues</u>

A. General Civil/Structural Calculation Questions

1. Does NRC now know the extent of missing civil/structural calculations?

2. Will NRC have reviewed TVA's original and regenerated Sequoyah calculations for adequacy prior to restart?

3. What is the reason for the belated discovery of the calculation deficiencies which became a critical item in the Sequoyah restart schedule?

4. Did TVA misrepresent to the NRC or unduly delay reporting to the NRC the status of the Sequoyah calculation problems?

B. Specific Civil/Structural Calculation Questions related

to NRC findings of deficiencies in the civil/structural discipline in areas such as structural calculations, seismic calculations, and seismic response spectra.

1. Why were these problems not identified by the NRC prior to the IDI or by TVA via the DB&VP?

2. What verification of TVA's corrective actions in these areas will NRC perform to insure that the actions taken are adequate for the safe operation of Sequoyah?

C. Civil/Structural Questions Derived from the IDI:

1. Which of the civil/structural problems, identified during the IDI, were not identified in the course of TVA's DB&VP and Engineering Assessment reviews?

2. What is the reason for TVA's failure to find any such civil/structural problems prior to the IDI?

3. With respect to problems identified by the DB&VP, why had corrective actions not been taken prior to the initiation of the IDI?

4. What reviews are being undertaken by TVA and/or NRC to determine whether the IDI findings are generic to the 37 Sequoyah safety systems other than the ERCW? If such reviews are not being undertaken, what is the rationale for not doing so?

5. If TVA performs such reviews for generic implications and takes corrective actions, will NRC verify that potentially generic problems have been identified and/or corrective actions have been taken?

6. What corrective actions will be required for resolution of the specific deficiencies identified by the IDI in the civil/structural area? Which of such corrective actions will be required prior to Sequoyah restart?

V. Electrical/Instrumentation & Control (I&C)

A. Calculations

1. Has NRC reviewed TVA's regenerated electrical calculations for adequacy?

2. Will NRC require independent review of the

electrical calculations to assure their adequacy and that appropriate plant modifications are made where the regenerated calculations indicate such a need?

B. Electrical and Instrumentation and Control (I&C) Questions Derived from the IDI

1. Which of the electrical/I&C problems, identified during the IDI, were not identified in the course of TVA's DB&VP and Engineering Assessment reviews?

2. What is the reason for TVA's failure to find any such electrical/I&C problems prior to the IDI?

3. With respect to electrical/I&C problems which were found by the DB&VP, why had corrective actions not been taken prior to initiation of the IDI?

4. What reviews are being undertaken by TVA and/or NRC to determine whether the IDI electrical/I&C findings are generic to the 37 Sequoyah safety systems other than the ERCW? If such reviews are not being undertaken, what is the rationale for not doing so?

5. If TVA performs such reviews for generic implications of electrical/I&C findings and takes corrective actions, will NRC verify that potentially generic problems have been identified and/or corrective actions have been taken?

6. What corrective actions will be required for resolution of the specific deficiencies identified by the IDI with respect to electrical and I&C? Which of such corrective actions will be required prior to Sequoyah restart?

C. Cables

NSRS REPORT I-85-06-WBN (July 8, 1985), the Franklin Research Center's Technical Evaluation Report (dated February 19, 1987), TVA employee concerns, and other sources have provided substantial evidence of cable problems at TVA nuclear plants. Actual and potential cabling problems include: poor engineering, inadequate calculations and methods for sizing cabling, improper implementation of the National Electrical Code as committed in the FSAR (problems such as cable tray overfills, lack of properly derating cables, etc.), inadequate specifications, inadequate procurement practices, inadequate installation procedures and

practices, inadequate testing, inadequate QA, improper cable bending radii, problems caused by cable pull-bys and jamming and vertical cable supported by 90 degree condulets, cable splicing and repair problems, cable pull tension and tension monitoring problems, inadequate lubricants, cable sidewall pressure problems, and cable ampacity problems.

Moreover, TVA's cable testing to date appears to have had such limited scope that questions exist as to whether significant cabling problems have been addressed adequately.

1. NRC staff have indicated that cable problems are limited mainly to silicone rubber insulated cables and, for this type cable, only those in containment. What is the basis for any conclusions that cable problems identified by the above noted sources are limited to silicone rubber cables?

2. What cable issues remain unresolved? What corrective actions involving cables need be taken prior to Sequoyah restart?

   For example, what is the rationale for there being no requirement for tests on all insulation types and in all types of cable raceways to address the full range of cabling problems identified by various sources?

3. Does NRC have or plan to have a detailed and comprehensive accounting of cable problems and resolutions or proposed resolutions? If there is none, when will there be such an accounting? Will NRC review, prior to Sequoyah restart, the adequacy of such resolutions and any plant configuration changes?

4. How has NRC verified at Sequoyah the as-constructed cable routing versus the as-engineered routings? Where is any such verification documented? If no such verification has been made, what is the basis for assuming that cable installation conforms to various requirements with respect to separation, ampacity and cable tray loading?

5. What is the status of the Sequoyah cable ampacity program? What reviews of this program have been conducted by NRC to determine the adequacy of this program and any corrective actions resulting from

it?

6. On November 2, 1987, a fire occurred in the Browns Ferry Unit 2 Reactor Building.

   a. What actions have been taken and/or are planned by NRC to investigate the nature and cause of this November 2 fire?

   b. Was the fire caused by any of the cabling problems that have been identified by the above noted sources?

   c. Was PVC insulation involved? What was the nature of damage caused by products of PVC combustion?

D. Diesel Generators

Various TVA documents raise questions as to the compliance of the Sequoyah diesel generator system with NRC requirements. [E.g. See D51-A-84-0006-D01 dated July 2, 1984; PNO 05098, June 17, 1986, describing a TVA determination that the Sequoyah diesel generators "may overload if a loss of off-site power occurs in coincidence with a phase B isolation"; and May 18, 1987 minutes of March 26, 1987, NRC/TVA meeting to discuss Sequoyah Diesel Generator Sequencing Calculations.] What actions have been taken by NRC to assure adequate and reliable diesel generator capacity and shutdown capability?

VI. Mechanical/Nuclear

A. Mechanical/Nuclear Calculations Questions

Significant deficiencies have been identified in calculations in the mechanical and nuclear areas.

1. Does NRC have a detailed accounting of the status of missing and deficient calculations in these disciplines?

2. What reviews have been or will be conducted by the NRC to assure that TVA's regenerated calculations and those not regenerated are adequate?

3. Since 1984, has TVA understated or misrepresented the scope and/or significance of the status of calculations?

B. Mechanical/Nuclear Questions Derived from the IDI

1. Which of the mechanical/nuclear problems, identified during the IDI, were not identified in the course of TVA's DB&VP and Engineering Assessment reviews?

2. What is the reason for TVA's failure to find any such mechanical/nuclear problems prior to the IDI?

3. With respect to mechanical/nuclear problems identified by the DB&VP, why had corrective actions not been taken prior to initiation of the IDI?

4. What reviews are being undertaken by TVA and/or NRC to determine whether the IDI mechanical/nuclear findings are generic to the 37 Sequoyah safety systems other than the ERCW? If such reviews are not being undertaken, what is the rationale for not doing so?

5. If TVA performs such reviews for generic implications of the mechanical/nuclear findings and takes corrective actions, will NRC verify that potentially generic problems have been identified and/or adequate corrective actions have been taken?

6. What corrective actions will be required for resolution of the specific deficiencies identified by the IDI in the mechanical and nuclear areas? Which of such corrective actions will be required prior to Sequoyah restart?

VII. Welding Issues

A. What reviews have been conducted to determine the existence at Sequoyah of welding problems identified at Watts Bar?

B. What problems were identified through any such reviews?

C. What corrective actions have been taken with respect to weld problems identified at Sequoyah through TVA reviews, NRC reviews, employee concerns programs, and through other means?

VIII. As-Built Configuration Versus Drawings

A. What is the nature and extent of discrepancies, discovered to date, between and among as-engineered drawings, as-constructed drawings, and the as-built

plant configuration?

B. Inspection 327/87-52 found discrepancies between the Sequoyah design documents and as-built conditions. What actions will NRC take to determine the generic implications of such discrepancies?

C. What discrepancies exist between the control room drawings (i.e. drawings used by control room operators) versus the as-engineered and as-constructed drawings? What corrective actions in this area will be required prior to Sequoyah restart? Will NRC verify that the required actions are taken?

IX. Procedures/Training

A. Has NRC reviewed TVA's procedures, policies, personnel training, operational readiness, emergency preparedness, etc., required for safe management and operation of Sequoyah? What problems have been found in these areas?

B. With respect to procedures and training, what corrective actions will have been taken prior to Sequoyah restart to resolve such problems? With respect to such problems, what corrective actions have been deferred until after Sequoyah restart?

X. Restart Criteria

A. Does NRC have a detailed listing of Sequoyah items required to be resolved prior to restart? If not, when will such a listing be available?

B. Inspection Report 327/87-31 stated:

> A review of the SQEP-45, Attachment 2 forms showed that these items [i.e. punchlist items 518, 955, 6066, and 9304] were actually determined to be pre-restart items. The team believes that there are many discrepancies between the punchlist and SQEP-45, Attachment 2 forms regarding the categorization of the punchlist items, and that the accuracy of the punchlist should be verified before restart. [p. 31.]

How many such discrepancies exist? What are the specifics of the punchlist items that had been determined to be pre-restart items but were shifted to the post-restart list?

C. Will NRC require TVA to provide justification for each

item that has been removed (since initiation of development of the list) from the list of items requiring resolution prior to restart?

D. Will NRC review and approve resolution of each restart item that TVA claims to have resolved? Will NRC approve each of those items for which corrective actions will have been taken prior to restart and those for which corrective actions will be taken after restart?

E. What are the titles and dates of exemptions from compliance with the original Sequoyah Unit 2 Operating License (OL) (including original licensing conditions) granted since the Sequoyah Unit 2 OL was issued?

XI. Licensing

A. What percentage of TVA's total licensing commitments (including operating license basis commitments and subsequent changes to those commitments) has NRC reviewed for adequacy and regulatory compliance for Sequoyah since it was shut down in 1985?

B. Has NRC compiled a current listing of items of non-compliance with NRC regulations and TVA licensing commitments at Sequoyah?

C. Which of such deficiencies will be subject to corrective actions prior to Sequoyah restart?

D. Will NRC require TVA to certify that Sequoyah meets licensing requirements prior to restart? If not, by what authority can NRC allow Sequoyah to restart in the absence of such a certification?

SEQUOYAH NUCLEAR POWER PLANT

Design Baseline and Verification Program
Inspection Report 50-327/87-31 & 50-328/87-31
June 29-July 24, 1987

1. INTRODUCTION AND BACKGROUND

The Design Baseline and Verification Program (DBVP) was developed by TVA's Division of Nuclear Engineering (DNE) to resolve design control issues described in several TVA-sponsored evaluations and audits and NRC inspections. The Sequoyah Nuclear Plant (SQN) Design Baseline and Verification Program has been used by TVA to provide an additional level of confidence that the modifications to selected plant systems, implemented since receipt of the operating license, have not resulted in any violation of the plant's licensing basis.

This report summarizes the results of the fifth NRC inspection conducted to assess the adequacy of TVA's Design Baseline and Verification Program to support restart of Sequoyah Nuclear Plant.

NRC inspection report 50-327/86-38 and 50-328/86-38 summarized (1) the NRC's review of TVA's overall DBVP plan and scope, (2) TVA's procedures for DBVP project review and Engineering Assurance (EA) oversight, (3) TVA's preparation of system walkdown packages within the DBVP scope, and (4) the NRC's preliminary review of TVA's design criteria for FSAR Chapter 15 safety-related systems within the scope of the DBVP.

NRC inspection report 50-327/86-45 and 50-328/86-45 summarized (1) the NRC's review of TVA's compilation and implementation of the commitment/requirement data base, (2) the design criteria which TVA prepared to support SQN restart, and (3) the adequacy of EA's independent oversight review of commitment/requirements and design criteria.

NRC inspection report 50-327/86-55 and 50-328/86-55 summarized the NRC's review of the DBVP engineering change notice (ECN) review.

NRC inspection report 50-327/87-14 and 50-328/87-14 summarized the NRC's evaluation of the System Evaluation Reports (SYSTERs), summary reports that reflect the DBVP's integrated assessment, on a system basis, of the reviews, evaluations, and findings of the program.

Licensee actions for previous inspection findings (including design control inspection 50-327/86-27 and 50-328/86-27), pre-restart corrective action decisions, and the effectiveness of the Engineering Assurance oversight effort were also examined during these inspections.

2. PURPOSE

The purpose of this inspection was to assess the implementation and completion of the DBVP. This included evaluating whether or not the findings identified by the DBVP were being adequately resolved and properly scheduled for corrective action before plant restart. The inspection was also held to evaluate the

effectiveness of the EA Oversight Team and the adequacy of the licensee's actions taken in response to previous NRC inspection findings.

3. INSPECTION ACTIVITIES

The following activities were generally performed by all team members:

(1) Reviewed TVA's corrective actions associated with its in-house Engineering Assurance (EA) oversight of the DBVP. Team members concentrated on the "observations" identified in the EA report (Reference 12).*

(2) Reviewed TVA's resolution of DBVP punchlist items. The team assessed the restart categorization (using docketed restart criteria) of selected items and planned corrective actions.

(3) Verified implementation of corrective actions for selected, more significant findings of the DBVP.

(4) Assessed if the generic implications of inspection activities 1, 2, and 3 had been adequately addressed.

(5) Reviewed the Phase I (pre-restart) reports summarizing both the DBVP (Reference 13) and the associated EA oversight (Reference 12).

(6) Reviewed the action taken by TVA in response to the deficiencies, unresolved items, and observations previously identified in NRC inspection report Nos. 50-327/86-27 and 50-328/86-27, 50-327/86-38 and 50-328/86-38, 50-327/86-45 and 50-328/86-45, 50-327/86-55 and 50-328/86-55, and 50-327/87-14 and 50-328/87-14.

4. SUMMARY OF FINDINGS

The following paragraphs summarize the more significant team findings and conclusions. Sections 4.1 through 4.7 contain detailed descriptions of the inspection findings in each discipline. Observations are provided in Appendix A to this report.

In the operations area, the team concluded that the DBVP was adequately planned and implemented. All questions raised by the team pertaining to both scope and depth of the walkdowns and resolution of deficiencies and findings were addressed and resolved. In particular, the team felt that the EA oversight was effective and responsive in the operations area. The corrective actions reviewed by the team appeared to be relevant and comprehensive. Review of the restart/non-restart categorization process indicated some weaknesses. In particular, the inspectors questioned the tendency to classify as non-restart the actions that were determined to be outside the DBVP boundary (Observation 7.5). Several items were reclassified after the inspectors challenged the original classification. Although several examples of questionable categorizations were identified and ultimately resolved, the overall process for assigning restart classification appeared acceptable in the operations area.

*References are listed in Section C.2 of Appendix C.

During the inspection, the team observed that the concurrence of the DBVP System Engineer and Discipline Evaluation Supervisor were not required for changes to the restart categorization and proposed corrective actions for punchlist items following initial concurrence by the DBVP. TVA adequately resolved this concern by changing project directives to require such concurrence reviews for future technical changes, and has examined those changes which had previously occurred to assess their adequacy. These actions were delineated in an August 20, 1987 letter to the NRC (Reference 17).

In the mechanical systems area, the team reviewed several of TVA's corrective actions for open NRC observations from previous inspections, reviewed TVA's corrective actions for observations made by the EA group, and reviewed how TVA had resolved DBVP punchlist items. The team also reviewed field implementation of corrective actions. The team found the findings, evaluations, and determinations of EA-Mechanical Engineering to be competent, and the resolution and implementation of DBVP punchlist items to be satisfactory.

In the nuclear engineering area, the team reviewed several of TVA's corrective actions for open NRC observations from previous inspections, reviewed TVA's corrective actions for observations made by the EA group, and reviewed TVA's resolution of DBVP punchlist items. The team found the findings, evaluations, and determinations of EA-Nuclear to be competent, and resolution and implementation of DBVP punchlist items to be generally satisfactory. However, the inspection team disagreed with TVA's decision to reclassify from restart to post-restart punchlist item 4426. This item concerns the need to provide a safety-related air supply for the isolation valves in the system that monitors the radiation in containment air (Observation 4.8). Also, the team identified several cases in which there was inconsistency between the DBVP punchlist and the associated Attachment 2 form to Sequoyah Engineering Procedure 45 (SQEP-45) (Observation 7.5).

In the mechanical components discipline, the team reviewed the DBVP and EA reports to assess the adequacy of the DBVP's review of the SQN Unit 2 change documents and nonconformances, and EA's oversight of DBVP project's review.

The team reviewed the Civil Engineering Branch's (CEB's) implementation of a sample of civil/structural punchlist items, DBVP's post-restart categorization of a sample of punchlist items, and DBVP's decision to request generic reviews for a sample of the nonconformances that DBVP personnel prepared to categorize the punchlist items.

The team also reviewed several open action items in EA's report to assess the adequacy of DBVP responses to EA's concerns and, in addition, reviewed EA's verification of DBVP implementation of corrective actions for two of the three mechanical components action items that EA had completed verifying at the time of the inspection.

The team identified two observations during this inspection concerning the lack of a generic evaluation for a nonconformance, and the lack of a calculation to qualify a design variance (Observations 3.16 and 3.17).

The team concluded that the DBVP's review of the SQN Unit 2 change documents and nonconformances issued since the operating license had been issued adequately defined the corrective actions required to validate the design change control process at SQN Unit 2.

In the instrumentation and control (I&C) area, the team reviewed the EA group's oversight of commitments and requirements, design criteria, calculations, DBVP assessments of post-modification tests, SYSTERs and DBVP restart decisions. The team is satisfied that the EA oversight program provided an effective review of the DBVP process and its outputs.

The team also directly reviewed DBVP evaluations of ECNs, post-modification tests, calculations, design criteria, commitments and requirements, SYSTERs, generic implication evaluations, and restart decisions in the I&C area.

Other than two specific exceptions, DBVP evaluations and restart decisions were deemed to be correct and appropriate. Four out of the five condition adverse to quality reports (CAQRs) for the TVA setpoint accuracy calculation program reviewed by the team had appropriate corrective actions, but corrective action for the fifth sample was found to be incomplete. TVA took into account the potential for generic implications of the SQN findings at other similar facilities.

The team generally agreed with TVA's resolution of DBVP punchlist items. DBVP restart decisions were found to be acceptable in each instance reviewed by the team; however, the team did identify one instance in which DNE was in the process of changing a pre-restart decision to post-restart without having adequately evaluated and justified that change.

Throughout the various inspections, the team has been satisfied with the extent and depth of inquiry evidenced by the DBVP. Individual team observations, albeit numerous, did not indicate a programmatic problem with the DBVP approach. TVA has been preparing corrective action design change notices for implementation before restart, a positive indication that latent design problems are now being evaluated and corrected.

In the civil/structural area, the team reviewed the corrective actions taken by the project to resolve the punchlist items that were generated by the DBVP and the EA observations as reported in EA oversight report EA-OR-001 (Reference 12). The team also reviewed the restart categorization of punchlist items to determine whether such categorizations were appropriate.

The review by the team showed that the punchlist items and the EA observations are being closed properly by the DBVP project. The team concurs with the categorization of the punchlist items as noted on the governing SQEP-45, Attachment 2 forms. The team was, however, concerned with the adequacy of the tracking system used to control the status of punchlist items. Discrepancies were noted between the restart status and the implementation status of many punchlist items. The team also noted that when a biased sample of five restart punchlist items associated with field changes was selected for review, none were implemented at the time of the inspection (Observation 7.5).

The team also reviewed the appropriate sections of report EA-OR-001 and the DBVP Unit 2 Phase I report (Reference 13). This review did not identify any deficiencies relating to these two reports in the civil/structural area.

In the electric power area, the team reviewed TVA's corrective actions associated with past NRC inspections of the DBVP, TVA's corrective actions for some significant condition reports (SCRs) and CAQRs, and TVA's process for addressing the generic impact of Sequoyah DBVP findings at other TVA plants. The team also reviewed the restart categorization of several DBVP punchlist items and the report of EA's oversight of the DBVP (EA-OR-001). EA's oversight resulted in a total of 357 action items, of which 91 related to the electric power discipline. These electric power action items were further analyzed and classified into various categories. Approximately 63% of the action items were related to design deficiencies, and approximately 14% of the action items were related to design criteria deficiencies. The NRC team also noted that the electric power discipline was a leading contributor of deficiencies related to unreviewed safety question determinations, testing and interface control.

The types of documents affected by the electric power action items were ECNs (approximately 26.9%), design criteria (approximately 25.8%), SYSTERs (approximately 13.2%), walkdown packages (approximately 9.2%), calculations (approximately 5.9%), and technical procedures (approximately 5.3%).

The NRC team found EA's analysis of findings in the electric power area, as presented in the final report, acceptable.

4.1 Operations

4.1.1. Corrective Actions Associated With EA Oversight of the DBVP

In the operations area, the team examined Engineering Assurance Observations Q1-Q5, T-1, EA-1, and Condition Adverse to Quality Report (CAQR) SQE-870-R01-002 documented in "EA Oversight Review Report", EA-OR-001. This included an assessment of the observations, responses from the SQN Engineering Project and/or DBVP, adequacy of proposed corrective actions and restart categorizations.

Observation Q-1, corresponding to Action Item Q-07, pertained to the implementation of several EA recommendations for the SQEP-13 process, for example, System Engineer review of changes to ECN pre-restart status. The corrective actions were implemented and EA concurred with this disposition.

Observation Q-2 was issued to transfer responsibility for corrective action verification for CAQR 86-03-012 to the EA group. Design criteria and design calculations were not being properly maintained as required by DNE procedures and TVA Topical Report TR751A, Section 17.1.3.1.2.

Part A of the CAQR concerned design criteria. Design criteria required for restart were captured in the Restart Design Basic Document). All specific examples found in Part A of the CAQR were resolved by issuing of appropriate design criteria.

Part B of the CAQR concerned design calculations. TVA's calculation review program is scheduled for completion by September 30, 1987. The program will review and/or regenerate all essential calculations. In addition, the program

will provide a uniform change process and tracking system (Calculation Cross Reference Information System, CCRIS) and will allow for cross referencing of change documents, drawings and calculations.

EA concurred with the proposed corrective actions. EA was to sample implementation of these actions at a later date.

Observation Q-3 concerned SQEP-13, "Transitional Design Change Control." EA recommended several changes to the SQEP-13 process to be included in the next revision. DBVP personnel agreed to revise SQEP-13 to incorporate all the principal items identified. Revision 5 documented this set of changes (see Observation Q-4).

Observation Q-4, corresponding to Action Item Q-11, identified the systematic use of a waiver process to bypass the new SQEP-13 requirements issued to control the ECN process during transition. A revision to SQEP-13 (Rev. 5) eliminated the waiver as a means of ECN implementation. All ECNs processed under the waiver format were reviewed to verify compliance with the requirements of SQEP-13.

Observation Q-5 concerned changes that EA recommended to the draft DBVP report. EA still needed to verify that its recommendations were implemented. The following items were included:

Item 1 Trending of punchlist items was revised to include tracking and resolution via the CAQR process (Ref. CAQR SQE 870R01-002).

Item 2 Resolution to address documentation of closed and implemented SCRs/NCRs which were evaluated in the DBVP.

Item 3 Transitional Design Change Control Procedure was revised to note the use of waivers in the SQEP-13 process.

Observation T-1 noted that the red-line process used to mark up control room drawings did not include an independent review for accuracy by a second party. Inspection report Nos. 50-327/87-24 and 50-328/87-24, and 50-327/87-54 and 50-328/87-54 independently opened this item. A violation for failure to perform independent review of change was identified in these Office of Special Projects inspection reports.

Observation EA-1 concerned items to be corrected in Phase II of the DBVP. All items with corrective actions will be tracked via the CAQR process. Five selected items were reviewed to assess whether the post-restart designation of these items was correct. The inspector concurred in the disposition of the selected items as appropriate to Phase II implementation.

CAQR SQE-870-R01-002 identified by a random sample by EA that approximately 50% of the punchlist items that represented conditions adverse to quality (CAQs) had not resulted in written reports (CAQRs). Disposition of this CAQR included review of all open punchlist items that had not had corrective action reports written against them to ensure that a problem identification report (PIR), a significant condition report (SCR), or a CAQR, as appropriate, is assigned. EA had concurred with this resolution.

what about closed items, what did we do?

Overall, the team concluded that the EA oversight was effective and responsive in the operations area. The corrective actions reviewed by the team seemed to the relevant and comprehensive.

4.1.2 Resolution of DBVP Punchlist Items and Implementation of Corrective Actions

A limited number of punchlist items were reviewed regarding the assignment of restart/post-restart category. The inspector agreed with the assignments in general, but did not agree that punchlist item 5644 was appropriately assigned as a post-restart issue. This item involves the improper (non-seismic) mounting of handswitches on the main control board. The decision had been made to classify this as a post-restart issue because the switches were out of function on the system walkdown boundary identification drawing (SWBID) (addressed in NRC Observation 7.5). The team concludes that the potential effect on system operability should be assessed before restart.

The team raised a question about the adequacy of residual heat removal pump flow indication in the control room. Specifically, when heat exchanger bypass valve 74-32 is open, total pump flow indication is not available. The additional (unmonitored) flow through the bypass valve is enough to force the pump into runout as evidenced by a 1980 test [W2.2 (SCR NEB 8708)]. This item will be tracked by the resident inspectors as part of the normal closeout of SCRs.

During the course of the inspection, the inspector reviewed TVA correspondence relating to emergency diesel generator operations while in the test mode. TVA has determined through the DBVP (punchlist item 8514) that the diesel generator will not transfer from the test mode when a valid emergency start signal is received; this is contrary to the FSAR. This apparent deviation will be followed by the resident inspectors.

The team examined the programmatic controls which were established for tracking, resolving, establishing restart items, closing, and statusing implementation of punchlist items. These were primarily established by SQN SQEP-45 (Rev. 5) and various DBVP directives which amplified and clarified the procedural controls. The controls required System Engineer (SE) and Discipline Evaluation Supervisor (DES) concurrence (documented on SQEP-45, Attachment 2 forms) for both the restart categorization and the proposed corrective actions. In addition, SYSTER closure statements were required to be generated to identify any changes between the corrective action and restart category finally agreed to by the DES and the SE and the categorization at the time of issuance of the SYSTER.

DBVP Directive 87-007 (June 18, 1987) clarified that punchlist items were to be closed when the SE and DES concurred with the restart categorization and the implemented or planned corrective action. The punchlist item was separately tracked for implementation status, as opposed to DBVP closure. The directive stated that the purpose of the DBVP was no longer to verify the adequacy of the work performed by the SQN project; new policies and procedures are in place to correct past design control deficiencies. As such, the SQN project was being allowed to change restart categorization and proposed corrective actions without concurrence of DBVP personnel. The team was concerned that this practice substantially degraded an important feature of

the DBVP, that is, the overall perspective, from a system level, of the impact of the particular punchlist item and its relative importance to system function as evaluated by the DBVP.

The team acknowledged that for some changes in punchlist status, DBVP concurrence reviews were not essential. For example, some punchlist items had corrective actions defined for both pre- and post-restart. Following completion of the pre-restart corrective action, the SQN project was supposed to initiate an Attachment 2 form (SQEP-45) to change the status of the item to post-restart. In addition, the SQN project was supposed to initiate an Attachment 2 form (SQEP-45) to change the status of items to "implemented" to reflect that proposed corrective action had been completed. The team noted that numerous non-administrative changes were also being made to punchlist items, and expressed concern with the apparent relaxation of controls by the DBVP. The team was informed that CAQR SQT-871268 had been initiated by the Engineering Assurance oversight group addressing this same concern.

Following the inspection, the licensee changed the control and processing of changes to the punchlist to address these concerns (TVA letter from Gridley to NRC, dated August 20, 1987). DBVP Directive 87-008 (August 8, 1987) classifies punchlist changes into three categories: administrative changes, implementation status changes, and technical changes. Technical changes now require DBVP concurrence (System Engineer and Discipline Evaluation Supervisor). Punchlist changes occurring before implementation of Directive 87-008 are being reviewed, categorized, and dispositioned in accordance with the directive. These actions adequately resolved the team's concerns.

The team selected a sample of five punchlist items to assess the status of implementation and the consistency between the governing SQEP-45, Attachment 2 form and the actual punchlist database information. The team biased the sample by only selecting punchlist items for which field modifications were required. Of these five punchlist items:

- One was listed as outside the scope of the DBVP, tabulated as implemented with actual status unknown.
- Two were not implemented.
- One was listed as implemented; however the associated SQEP-45, Attachment 2 form documenting implementation was not available - the associated SQEP-45, Attachment 2 form documenting DBVP closure indicated that pre- and post-restart corrective actions were required, implying improper implementation status.
- Another implemented item did not have the required SQEP-45, Attachment 2 form on file and apparently was improperly listed as implemented, based on DBVP closure.

The fact that none of the selected punchlist items within the scope of the DBVP were implemented was of concern to the team, notwithstanding the biased selection of punchlist items requiring field modifications. The team further noted that the licensee's procedures for control and statusing of punchlist items did not specifically address handling of these aspects of the punchlist items (NRC Observation 7.5).

4.2 Mechanical Systems

4.2.1 Corrective Action Associated With EA Oversight of the DBVP

During this inspection, the team reviewed the EA observations contained in EA Oversight Review Report EA-OR-001 and the DBVP and/or SQN project response to these observations. The mechanical engineering discipline of EA reported four observations.

EA Observation M1 identifies a concern related to the adequacy of the information for valve stroke times included in the auxiliary feedwater system design criteria. The project responded by issuing Quality Information Requests and a commitment to issue Design Input Memoranda or design criteria revisions. EA found the response generally acceptable. However, EA questioned the use of plant technical specifications as the source of the valve stroke data, and was holding the observation open pending SQN project response to this concern and EA review of the memoranda and revised design criteria.

EA Observation M2 concerns the need for the System Evaluation Report (SYSTER) to state whether identified corrective actions need to be completed before or after restart. The observation also noted that the draft SYSTER for the containment spray system addressed the incorrect use of cable lengths in certain electrical calculations. EA report EA-OR-001 notes that this observation was resolved by a DBVP commitment to issue instructions to ensure a thorough "buy-in" of corrective action categorization by the System Engineer (SE) and Discipline Evaluation Supervisor (DES) and a commitment to issue an Electrical Engineering Branch (EEB) policy memorandum regarding how cable lengths are to be used in electrical calculations.

EA Observation M3 addresses three EA action items: M-30, M-43, and M-46. The observation, action items, and SQN project response were reviewed and found to be acceptable. The SQN response to M-43 was to conduct a pre-restart leakage test of the component cooling water surge tank baffle. The test was performed. However, the test produced inconclusive results because there are valves in the system that may allow leakage in the test configuration. EA is holding this item open pending a visual inspection or a test that measures only baffle leakage.

EA Observation M4 identified a concern that, in some cases, punchlist items have been implemented and closed before the corrective action was assigned on the initiating condition adverse to quality (CAQ). At the time the EA report was issued, the observation remained unresolved. The observation has subsequently been closed by DBVP reviews and policy promulgated in SEQP-45, Revision 3, "Control of DBVP Action Items," and DBVP Directive 87-06, Revision 1, "Statusing Punchlist Items."

In addition to the above observations, the mechanical engineering discipline of EA initiated and reported on two CAQRs in its oversight report:

- CAQR SQE-870-R01-001 reported an unverified assumption in a calculation.
- CAQR SQE-870-R01-003 reported an inconsistency in the design temperature for the containment spray piping inside of containment.

Subsequent to the oversight report, the first CAQ has been resolved by EA based on corrective action proposed by the SQN project and the determination that the CAQ is not significant and is a post-restart item. EA and the SQN project found that the second CAQR did not present a condition adverse to quality as the inconsistent temperature identified in the CAQR is not a design condition. Rather, it is a beyond-design-basis condition used only for piping design and support stress analysis.

In general, the inspection team found the findings, evaluations, and determinations of EA-Mechanical Engineering to be competent. The team expects that this competency and satisfactory EA results can be continued, provided the EA resources and manpower are maintained at a level commensurate with the effort required for a 5% sampling of the DBVP results.

4.2.2 Resolution of DBVP Punchlist Items

During this inspection period, the team also inspected 25 DBVP punchlist restart decisions. Many of the punchlist items were selected from those identified in the DBVP Phase I report as not required for Unit 2 restart. Most of the decisions to place the punchlist item in a post-restart category were found to be justified. However, several post-restart decisions involving the following punchlist (PL) items required close review during this inspection.

(1) PL 2672 - Replace Missing AFW Steam Line Insulation

The decision to categorize this item as post-restart was questioned by the inspection team because of two potential adverse effects of uninsulated steam piping: (a) the formation of additional condensate which challenges both the auxiliary feedwater (AFW) steam piping drain system and the fast start capability of the AFW steam turbine drive and (b) additional heat loads on safety-related heating, ventilation, and air conditioning (HVAC) systems. During the inspection, DBVP personnel informed the team that PL 2672 was mistakenly categorized as post-restart and that the work required by the item is, in fact, being done before restart. During the second inspection period, the team was provided with information showing that the insulation had been replaced under work package (WP) 12301.

(2) PL 1946 - Containment Bypass, System 26

The DBVP Phase I Report observed that System 26, the high-pressure, fire-protection system, may become a bypass of the auxiliary building gas treatment system (ABGTS) if parts of System 26, such as the head tank and associated piping that are not designed as safety-related, should fail. The item was categorized as post-restart by DBVP on the basis that the bypass is a bypass of the ABGTS, not a bypass of primary containment. However, upon questioning by the inspection team, TVA determined that the FSAR offsite dose calculations take credit for the effectiveness of the ABGTS.

TVA was informed at the end of the first inspection period that the team considered that this should be a restart item. During the second inspection period, the team was provided with information showing that PL 1946 had been recategorized to a pre-restart status.

(3) PL 8894 - RHR RETEST

Attachment 1 of SQEP-45 was issued for punchlist item 8894 as a result of significant condition report (SCR) SQN-NEB-8708, which identified cavitation problems during preoperational testing of residual heat removal (RHR) pumps on Unit 1. The SCR observed that severe cavitation problems occurred when one RHR pump was aligned to four cold-leg injection lines. As a consequence, the RHR preoperational test instructions for Unit 2 were revised to avoid testing in the cooldown modes which created severe cavitation in Unit 1. The description of condition of the SCR further addressed the need to test in the emergency core cooling system (ECCS) modes on Unit 2 to ensure that the adverse effects of cavitation observed at Unit 1 would not occur. However, in the root cause and corrective action sections of the SCR, it was concluded that testing was not required.

A subsequent SQEP-45, Attachment 2 form and Revision 1 to SCR SQN-NEB 8708 changed the item's category to post-restart. However, the revised SCR contains no clear explanation for this action.

Discussion with TVA personnel revealed the following information that was not in the SCR:

(a) The condition of cavitation observed at Unit 1 occurred with one RHR pump in operation, return flow to the reactor through four cold-leg injection lines, and flow through the RHR bypass line with the bypass valve in a throttling mode. The reactor vessel head was off and the reactor coolant system was cold and depressurized. Cavitation occurred in the bypass line and valve, not at the RHR pumps or in the injection lines.

(b) The configuration noted above will not be used for cooldown. Furthermore, the heat exchanger bypass line is closed off by manual block valves in all modes of ECCS standby and operation.

(c) Surveillance test procedures 6.1.e and 6.1.a.1 have been performed at Unit 2 to demonstrate satisfactory performance of the RHR aligned in the ECCS modes.

During the second period of the inspection, the team reviewed the results of Pre-operational Test W-6.1A1, "Safety Injection System Integrated Flow Test." This test confirms the adequacy of net positive suction head in the ECCS modes and the validity of the post-restart recategorization. However, SCR SQN-MEB-8708 should be revised to clarify the decision and the remaining post-restart actions.

4.2.3 Implementation of Corrective Actions for DBVP Findings

In the mechanical systems area, the team reviewed implementation of corrective action by a field inspection of two recently completed punchlist items.

PL 2672 required the installation of missing insulation on the auxiliary feedwater turbine steam line. The work was done under WP-12301. Field inspection showed that the steam line was fully insulated.

PL 3264 required that a ventilation grill in System 31 be cleaned and cleared of penetration sealing splatter that was obstructing air flow. The team found that the work, done under work request (WR) 121450, was satisfactorily completed.

4.3 Mechanical Components

4.3.1 Corrective Actions Associated With Engineering Assurance Oversight of the DBVP

TVA's Engineering Assurance (EA) oversight review of the Sequoyah Nuclear Plant (SQN) Unit 2 Phase I Design Baseline and Verification Program (DBVP) is summarized in EA Oversight Review Report EA-OR-001, entitled "Sequoyah Nuclear Plant - Unit 2 Design Baseline and Verification Program," which EA issued on April 29, 1987. Section 5.0 of the report summarizes EA Observation Nos. C1 through C6, which EA documented to track 16 action items in the civil/structural discipline. EA had accepted the corrective action plans for these action items, but the DBVP and/or SQN project had not completed implementing all the associated corrective action, nor had EA yet verified its entire sample of the completed corrective actions.

In the mechanical components area, the team reviewed Action Item C-10 (EA Observation No. C2), Action Items C-15 and C-27 (EA Observation No. C3), and Action Items C-28, C-53, C-54, C-55, and C-57 (EA Observation No. C6). The team reviewed EA's documented concerns for each of the action items, and evaluated the adequacy of the response to EA's concerns. The team noted that the DBVP had not completely defined or fully implemented corrective action for several action items. However, the team concluded that the DBVP was responding adequately to EA's documented concerns.

Action Item C-10 documented EA's concern that the SQN project had not captured the following provisions of NRC Regulatory Guide 1.29 in the SQN design criteria:

(1) protection of Category I piping and equipment from the potential failure of non-Category I piping

(2) extension of seismic Category I design to the first seismic restraint beyond the Category I isolation valve.

EA also noted that the SQN design criteria did not adequately define the distinctions between Category I, safety-related pressure-retention, and safety-related position-retention piping. The DBVP prepared Problem Identification Report (PIR) SQN-CEB-8670 (RIMS No. B25 861008 015) to address EA's concerns. On June 5, 1987, EA characterized Action Item C-10 as resolved but open, pending the DBVP's response to EA's request for additional corrective action.

Action Item C-15 noted that design criteria SQN-DC-V-13.3, "Detailed Analysis of Category I Piping Systems," did not address the following requirements:

(1) overlap design considerations, such as rigorous analysis interface with alternate analysis or dead weight hung piping

(2) interface procedures to control and identify the system/piping design input required by the pipe stress analyses to implement the design criteria

(3) interface criteria to define the TVA stress analysis scope and the Westinghouse Class I nuclear steam supply system (NSSS) analysis

(4) applicability of the design criteria to tubing

(5) protection of Category I piping and equipment from the potential failure of non-Category I piping.

The DBVP did not prepare any conditions adverse to quality (CAQs) in response to EA's concerns, noting that the DBVP was tracking item (5) by PIR SQN-CEB-8670 (see Action Item C-15). On June 25, 1987, the DBVP provided EA with a summary of completed corrective actions to address Action Item C-15. Action Item C-15 remains open, pending the DBVP's response to EA's request for additional information.

EA reviewed Westinghouse design criteria SQN-DC-V-27.4, "Reactor Coolant System (RCS)," and prepared Action Item C-27 to document the following EA concerns:

(1) The RCS design criteria references design criteria SQN-DC-V-13.3, "Detailed Analysis of Category I Piping Systems," which specifically excludes consideration of RCS piping.

(2) A lack of definition in the RCS design criteria for the TVA/Westinghouse RCS pressure boundary interface.

(3) The need to review other Westinghouse piping systems to ensure the existence of proper stress qualification criteria.

The DBVP prepared PIR SQN-CEB-8669, Revision 1 (RIMS No. B25-861219-063), to address the concerns that EA identified in Action Item C-27. EA has reviewed the corrective actions documented in the PIR and is keeping Action Item C-27 open, pending response to EA's request for additional information.

EA reviewed design criteria SQN-DC-V-27.5, Containment Spray System (CSS), and prepared Action Item C-28 to document the following concerns:

(1) failure to reference four design criteria: SQN-DC-V-24.1, "Location and Design of Piping Supports and Supplemental Steel in Category I Structures"; SQN-DC-V-2.14, "Piping and System Anchors Installed in Category I Structures"; SQN-DC-V-1.1.2, "Auxiliary Building Structural Steel"; and SQN-DC-V-1.3.4, "Category I Cable Tray Support System"

(2) reference to Civil Engineering Branch interim restart criteria

(3) improper reference to design criteria SQN-DC-V-13.8, Seismically Qualifying Round and Rectangular Duct

(4) reference to civil design guides instead of to applicable design criteria

The DBVP prepared PIR SQN-CEB-8672 (RIMS No. B25-861008-008), to address the concerns EA identified in Action Item C-27. EA concurs with the corrective action to address EA's concerns, and is keeping Action Item C-28 open, pending EA verification of SQN project's corrective actions.

EA reviewed engineering change notice (ECN) L6710 and issued Action Item C-53 to document the following EA concerns:

(1) discrepancies between the pipe support design loads used in the calculations and the pipe support design loads tabulated on the load summary sheets for three pipe supports

(2) inconsistent definition and use of normalized/unnormalized design loads for two pipe supports

The DBVP prepared PIR SQN-CEB-8709, Revision 1 (RIMS No. B25-870220-088) to address EA's concerns. EA has accepted the proposed corrective actions to address Action Item C-53. EA is keeping Action Item C-53 open, pending EA verification of project's corrective actions.

EA issued Action Item C-54 to document an EA concern that a temporary alteration control form (TACF) which specified the tack welding of the valve bonnet to the valve yoke for two high-pressure fire-protection (HPFP) valves had not been adequately evaluated for seismic considerations. EA has accepted and verified the DBVP corrective actions to address Action Item C-54 and has closed this action item.

EA prepared Action Item C-55 to note that the cumulative effects matrix which the DBVP prepared for the high-pressure fire-protection SYSTER did not include field change notices (FCNs), TACFs, or local design change requests (LDCRs), and did not include a detailed evaluation of potential synergistic effects. EA has accepted and verified the DBVP's corrective actions to address Action Item C-55 and has closed this action item.

EA reviewed the SYSTER for the residual heat removal (RHR) system and prepared Action Item C-57 to document the following EA concerns:

(1) An engineering change notice (ECN) evaluation did not reference a punchlist item.

(2) Three ECNs were inconsistently documented.

(3) The inability to confirm that bolts associated with a partially implemented ECN within the system walkdown boundary identification drawing (SWBD) had been torqued to the requirements specified on the typical pipe support detail drawing.

(4) The SCR/NCR evaluations did not identify punchlist items.

(5) Discrepancies existed between the System Engineer's SQEP-12, Attachment 2 form and the civil/structural DBVP checklist.

(6) Restart categorization of two ECNs that involved component analysis was questioned.

(7) An ECN had two SQEP-45 attachments which disagreed on corrective action and justification for a restart decision.

(8) A SQEP-45, Attachment 2 form did not document the corrective action and justification for restart decision for an ECN punchlist item.

(9) No restart categorization designations were on the SQEP-45, Attachment 2 forms for several punchlist items.

(10) A punchlist item involved components that lack qualification documents. These components are subject to potential water spray from Category I(L) piping. EA questioned the documented restart determination for this punchlist item.

(11) Discrepancies exist in the restart determination for an ECN punchlist item.

(12) Two punchlist items lack a civil/structural evaluation.

EA is currently evaluating the DBVP's responses to each of EA's documented concerns, and is keeping Action Item C-57 open, pending completion of this review.

4.3.2 Review of TVA's Resolution of DBVP Punchlist Items

The team reviewed the restart categorization of the following component cooling water system (CCS) punchlist items:

(1) punchlist item no. 06881 (NCR SQN-CEB-8203)

(2) punchlist item nos. 00756, 00763, 00776, 00777, 00793, 00798, 00802, 00805, 00808, 01229, 04917, 06192, 06208, 06967, 07610, and 08974 (PIR SQN-CEB-8638)

(3) punchlist item no. 06241 (PIR SQN-CEB-8657)

(4) punchlist item nos. 00801, 03696, 04544, 04806, 04807, 04810, 04835, 04859, 04871, 06184, 07484, and 07563 (PIR SQN-CEB-8665)

(5) punchlist item no. 08398 (Cat. D FCR 4391)

The team reviewed the SQEP-45, Attachment 2 form for each punchlist item, and the DBVP report, "Sequoyah Nuclear Plant (SQN) - Submittal of Design Baseline and Verification Program (DBVP) Unit 2 Phase I Report," to assess civil/structural DBVP's restart disposition of the PIRs and associated punchlist items. The team concurs with the DBVP's post-restart disposition.

The team reviewed 16 (of 185) punchlist items associated with PIR SQN-CEB-8638, which identify ECNs that were not documented in piping analysis calculation packages or on piping isometric drawings. The project has verified that the identified ECN changes were incorporated into the calculations and design output documents, and will update the calculations and drawings to reference the identified ECNs after restart.

Punchlist item 6241 is being closed under punchlist item 4835, which is being tracked by PIR SQN-CEB-8665. The punchlist items tracked by PIR SQN-CEB-8665 identify the lack of alternate analysis (field-routed piping) documentation. The DBVP has closed all (210) punchlist items associated with PIR SQNCEB8665. Corrective action to address lack of alternate analysis documentation is being performed under the SQN alternate analysis program, which has completed all Phase I activities required for restart of SQN Unit 2.

Punchlist item 8398 documented a minor drawing discrepancy which is scheduled for correction after restart, and punchlist item 6881 identified a nonconformance report (NCR) that lacks a signature. The NCR will be corrected after restart.

The team reviewed the following NCRs to confirm the adequacy of CEB's internal and external generic reviews:

(1) PIR SQN-CEB-8637, dated July 21, 1986 (RIMS No. B25-860819-019)
(2) PIR SQN-CEB-8638, dated July 24, 1986 (RIMS No. B25-860730-006)
(3) PIR SQN-CEB-8639, dated July 21, 1986 (RIMS No. B25-860819-016)
(4) PIR SQN-CEB-8657, dated February 20, 1987 (RIMS No. B25-87033-004)
(5) PIR SQN-CEB-8665, dated September 16, 1986 (RIMS No. B25-861126-013)
(6) PIR SQN-CEB-8669, dated November 14, 1986 (RIMS No. B25-861219-063)
(7) PIR SQN-CEB-8670, dated September 25, 1986 (RIMS No. B25-861008-015)
(8) PIR SQN-MEB-86117, dated January 7, 1987 (RIMS No. B44-870108-007)
(9) PIR SQN-MEB-86118, dated January 7, 1987 (RIMS No. B44-870108-006)
(10) PIR SQN-MEB-86127, dated January 13, 1987 (RIMS No. B44-870120-003)

The team concurred with DNE's decisions to conduct internal and external generic reviews for these PIRs as required, except for MEB's failure to conduct an external generic review for PIR SQN-MEB-86127. MEB prepared PIR SQN-MEB-86127 to identify motor operators that were not installed as shown on the piping physical drawings. MEB did not require a potential generic condition evaluation (PGCE) for this PIR, noting that the deficiency was an "isolated case unique to Sequoyah." The team did not concur with MEB's disposition for PIR SQN-MEB-86127 (NRC Observation 3.16).

The team also reviewed the following additional sample of punchlist items associated with PIR SQN-CEB-8637 for the essential raw cooling water (ERCW) and component cooling water systems (CCSs):

(1) punchlist items 0829, 0831, 0832, and 0876 for the component cooling water system.

(2) punchlist items 0828, 0851, 0875, 1186, and 6112 for the ERCW system

Punchlist items 0828, 0829, 0875, and 0876 documented missing seismic qualification documents for valves installed at SQN that had been transferred from Watts Bar Nuclear Plant. Punchlist item 0831 documented missing seismic qualification documents for a replacement switch, and Punchlist item 0832 documented the lack of seismic qualification documents for several valves. Punchlist items 0851 and 1186 documented the lack of seismic Category I(L) position-retention documentation to qualify several switches, and punchlist item 6112 documented a lack of seismic qualification documents for several replacement valve motor operators.

The team reviewed the SQEP-12, Attachment 2A civil/structural checklist forms, the SQEP-45, Attachment 2 forms and the referenced ECNs for each punchlist item to confirm that these punchlist items had been properly dispositioned for post-restart corrective action. The team concurs with the DBVP's post-restart disposition of these punchlist items.

4.3.3 Implementation of Corrective Actions for Punchlist Items

The team reviewed punchlist item 0442 for the ERCW system and punchlist items 7349 and 9005 for the component cooling water system to assess the adequacy of the calculations that CEB regenerated to resolve these punchlist items.

The DBVP prepared PIR SQN-CEB-8639 (subsequently upgraded to SCR SQN-CEB-8714), to track the corrective action required for these punchlist items. The civil/structural DBVP wrote a total of 1070 punchlist items to track missing calculations, out of a total of 1688 valid civil/structural punchlist items.

The team reviewed the following sample of regenerated calculations which the CEB project prepared for each of these punchlist items:

(1) pipe support calculations 47A450-21-450 and 47A450-21-451 for punchlist item 0442

(2) pipe support calculations 2-H10-119 and 1-H10-1128 for punchlist item 7349

(3) pipe support calculations 2-J10-910 and 2-H10-911 for punchlist item 9005.

The team concluded that the calculations prepared by CEB properly implemented the corrective action required to resolve these punchlist items.

The team also reviewed CEB's implemented corrective actions for two of the three punchlist items that civil/structural EA had completed overviewing at the time of the inspection. Punchlist item 0928, associated with PIR SQN-CEB-8637, documented missing seismic qualification documents for a number of replacement solenoid valves installed in the auxiliary feedwater system to meet the requirements of NUREG-0588. Punchlist item 7939, associated with PIR SQN-CEB-8669, documented the absence of design criteria for the reactor coolant system piping in design criteria SQN-DC-V-13.3, which specifically excludes the reactor coolant loops. The team concurs with EA's acceptance of CEB's corrective actions to address these punchlist items. However, the team's review of the work plan which installed the replacement solenoid valves in the auxiliary feedwater system indicated that two support configurations for solenoid valves mounted in the radiation monitoring system lacked CEB seismic qualification calculations (NRC Observation 3.17).

4.3.4 Review of EA and DBVP Reports

The team reviewed the DBVP report entitled "Sequoyah Nuclear Plant (SQN) - Submittal of Design Baseline and Verification Program (DBVP) Unit 2 Phase I Report," dated May 29, 1987 (RIMS No. B25-87059-010), and EA's Oversight Review Report EA-OR-001 entitled "Sequoyah Nuclear Plant - Unit 2 Design Baseline and

Verification Program," dated April 29, 1987. No problems were identified during this review beyond the issues identified previously in Section 4.3 of this report.

4.4 Nuclear Engineering

4.4.1 Corrective Action Associated With Engineering Assurance Oversight of the DBVP

The TVA Engineering Assurance Oversight Review Report (EA-OR-001) listed seven observations (N1 through N7) for the Nuclear Engineering Branch (NEB). These seven observations embodied numerous action items identified earlier. The team reviewed each of the EA nuclear observations from the standpoint of the adequacy of the agreed-upon corrective action (if the item was considered resolved) and the plan by which EA intended to verify proper implementation of the corrective action.

The team found that each of the seven EA nuclear observations were considered resolved relative to having a corrective action that has been agreed to by both EA and the project NEB. In one instance (N6), EA's review of the implemented corrective action resulted in the status being changed from "resolved" to "unresolved". The project responded with a five step approach to the corrective action. This revised approach was agreed to by EA and the observation was again given a resolved status. The team found the steps taken regarding Observation N6 to be adequate.

The team reviewed the proposed corrective action for each of the EA observations and found them to be representative of the concern and adequate. The team met with the EA nuclear staff to discuss their approach for verifying of the implementation of the corrective action.

The team questioned the representativeness of the EA verification approach with respect to EA Observation N4. The thrust of this observation was to reconcile the restart category and status between the SYSTER (including addendum) and the punchlist. The reconciliation is to be reported in SYSTER "Closure statements." The purpose of the closure statement is to ensure involvement and concurrence of the System Engineer with the corrective action and restart categorization for punchlist items developed by the DBVP. EA proposes to verify proper implementation by selecting punchlist items and determining if there is consistency between the SYSTER plus addendum and the punchlist. The team feels that since the reconciliation is being done on a system basis, an enhanced approach would involve a sample of systems for which each associated punchlist item is checked for restart category and status consistency.

The team inspected the remaining EA observations and found that both the agreed to corrective action and the proposed approach by EA to verify proper implementation were adequate.

The team reviewed the SQEP-45, Attachment 2 forms and the associated punchlist items for consistency. This was part of the team's effort to independently assess the planned corrective action and restart category. The team found several instances in which the SQEP-45, Attachment 2 form indicated "no change" for the restart category; however, the punchlist notation was changed from "required for restart" to "not required for restart."

The team was concerned and believed that the problem could have arisen because of the procedure that controlled the entry of data into the punchlist. The team feels that TVA should resolve the problems so that the information contained on the punchlist is accurate and usable (NRC Observation 7.5).

4.4.2 Review TVA's Resolution of DBVP Punchlist Items.

The team reviewed the resolution of several punchlist items. It was noted during this review that punchlist item 4426 had been reclassified from pre-restart to post-restart. Punchlist item 4426 and SCR SQN-NEB-8615 identify the corrective action to provide safety-grade auxiliary control air to System 90 radiation monitor supply valves in order to meet the requirements of Regulatory Guide 1.45 and design criteria SQN-DC-V-9.0 R2. The punchlist item has been reclassified as post-restart and closed based on this reclassification. Continued use of non-safety-grade air can cause loss of capability to maintain airborne monitoring capability following a safe shutdown earthquake (SSE) as required by Regulatory Guide 1.45. Furthermore, a loss of non-safety-grade air will not cause containment ventilation isolation, as claimed in quality information request (QIR) NEB-86241.

The inspection team was advised that TVA is currently evaluating QIR NEB-86241. The reclassification of punchlist item 4426 and the present status of QIR NEB-86241 are the bases for NRC Observation 4.8.

4.5 Electric Power

4.5.1 Corrective Actions Associated With EA Oversight of the DBVP

In the electric power discipline, the NRC team reviewed EA's process for resolving those action items for which the DBVP and/or SQN project's response was found to be satisfactory. The team also examined closure of those action items for which the corrective action either has been completed, or has been defined by the project and accepted by the EA group.

In the electrical discipline, the EA review of the DBVP resulted in 91 action items. Twenty-three action items remained open when report EA-OR-001 was issued. These were grouped where desirable and converted into 14 EA observations. The team noted that all 14 of these observations were resolved. The team reviewed the resolution of selected action items. Satisfactory resolution of each action item was based upon review of the response addressing proper resolution of the concern, assessment of the cause, extent, action to correct the concern, schedule of implementation of the corrective action, action to prevent recurrence, and significance of the concern for the design function of the safety system. The following paragraphs summarize the EA observations that the team reviewed.

Observation E1: This observation involves Action Items E87 and E88.

Action Item E87 related to a discrepancy involving drawing 45N727 and walkdown package (WDP) 82-S2. The drawing discrepancy was scheduled to be corrected before restart.

Action Item E88 related to errors involving the recording of incorrect walkdown data for 480 V breakers in the auxiliary power system. A supplemental walkdown

for 31 samples was performed for this action item and an additional error was noticed by EA. Therefore, a 100% comparison of as-constructed and walkdown drawings of the 480V breaker trip settings was initiated. This review revealed several more discrepancies.

The NRC team questioned why these discrepancies between actual settings or the breakers and setting data on the as-constructed drawings had not been spotted during surveillance testing. The team was told that during surveillance testing the test technicians failed to readjust the settings to their pre-testing position. To prevent this error in the future, TVA revised surveillance instructions SI-275.1, Revision 8; SI-275.2, Revision 12; SI-258, Revision 11; and SI-258.2, Revision 13.

Observation E2: This observation involves Action Item E57, which was related to acceptance of failed test results without justification. A test was performed for engineering change notice (ECN) 2945, in accordance with procedure TVA-22, which requires verification that a 10°F temperature differential between outside air and the dc ventilation fan exhaust is not exceeded to prevent overheating of the controller. The testing verified a successful pump run for 48 hours, but failed to meet the 10°F temperature differential requirement. The consequences of excessive heating were corrected before the test by moving the controller to a cool area and insulating the heat sources. As a result of these measures, the 10°F temperature differential condition was no longer required, but the test procedure was not revised. Corrective action for this action item includes revision of test procedure TVA-22 to remove the 10°F differential temperature condition.

Observation E3: This observation involves Action Items E51, E53, E55, E64, E65, E69, E72, and E75.

Actions Items E51 and E53 identified that reviews per the SQEP-12 checklist for ECN 6712 and ECN 6676 failed to address cable sizing requirements. In response to these action items, the DBVP referenced the cable ampacity program in lieu of verification of sizing and thermal ratings for the ECN-specific cables. The NRC team noted that the DBVP took similar credit for cable sizing evaluation for all ECNs that involved power cables. The ampacity program is based on statistical sampling. In light of this fact, the team was concerned about the validity of 100 percent review for each affected ECN. The cable program is being reviewed separately by the NRC Office of Special Projects. Acceptability of this program will be separately addressed by the Office of Special Projects.

Action Item E55 involved a motor replacement with a larger horsepower motor per ECN 2945, without evaluation for sizing of the motor overloads. In response to this action item, the SQN project evaluated and replaced the overloads per work request B222144. Action Item 69 involved minor drawing discrepancies between ECN 6573 drawings, which were corrected by the project. EA closed this action item after verification.

Action Item E64 identified that the voltage range of Brown Boveri relays may not be compatible with the vital dc power voltage range. The project contacted the vendor who confirmed by letter that the range of these relays (70 V-142 V) was compatible with the voltage range of the dc vital power system.

Action Items E65 and E72 were generated to track concerns identified during ECN 5363 review. Action Item E65 identified design discrepancies relating to response time evaluations and discrepancies relating to the improper referencing of 10 CFR 50 Appendix R calculations. The project resolved these discrepancies and the action item was considered resolved by EA. Action Item E72 identified that the design of an ECN did not meet the design objectives. This action item was initiated to address NRC Observation 5.7 of inspection report Nos. 50-327/87-14 and 50-328/87-14. The NRC team reviewed the project's response to this action item and noted that the response did not consider a detailed evaluation of all postulated conditions of plant operation. TVA subsequently submitted a revised response detailing its resolution of this item. Action Item E75 identified that the SQEP-12 checklist did not adequately address the problem of imposed voltage for the failure mode analysis. This corresponds to NRC Observation 6.14, which is addressed in Appendix B to this report.

Observation E4: This observation (Action Item E10), was generated by the electrical EA group to identify that the review scope of SQEP-11 did not address technical evaluations of potential generic conditions evaluations in the DBVP. The DBVP resolved this concern by directing engineers (via memo 86-17-04, dated June 13, 1986) to perform a 100 percent review of the electrical potential generic conditions evaluations (PGCEs) for problems identified at other TVA plants which may have an impact on the Sequoyah design. Procedure NEP-9.1 addresses evaluations of the effects of the PGCEs for Sequoyah on other TVA plants. On the basis of the above DBVP response, EA has resolved this observation.

Observation E5: This observation was initiated to track 35 action items covering all disciplines. These action items are related to items concerning the commitment/requirement database and appropriate capture of commitment/requirements in the applicable design criteria. EA has resolved this observation.

Observation E6: This observation involves Action Item E25, which was initiated to identify that a number of electrical design requirements were not captured in mechanical design criteria SQN-DC-V-11.8 R0, "Diesel Generator and Auxiliary Systems." The project included all the required missing electrical criteria in the current revision of design criteria SQN-DC-V-11.8. The effect of the missing criteria on the diesel system was evaluated. This response from the project was found acceptable by the EA group and this observation is now considered resolved.

Observation E7: This observation involves Action Item E26, which identified that testing requirements were omitted from design criteria SQN-DC-V-11.6 R3, "120V Vital Instrument Power System." The project intends to include the missing test requirements in the latest revision of the criteria. Pending verification of the project's response, EA considers this observation resolved.

Observation E8: This observation involves Action Item E31, which identified missing references in design criteria SQN-DC-V-27.5 (preliminary), "Containment Spray System." The project plans to incorporate the missing references in the next revision of these design criteria. Pending verification of the project's response, EA considers this observation resolved.

Observation E9: This observation involves Action Item E74, which identified inappropriate labeling of Class 1E cables for the reactor protection system. The project issued work orders B214300, B218263, and B218266 to install the proper tags. EA reviewed the tagging and found it acceptable. This observation is now considered closed by the EA group.

Observation E10: This observation involves Action Item E77, regarding directive DBVP-D-86-019 which eliminated all open CAQs from the DBVP review scope. EA was concerned that non-DBVP personnel performing reviews of open CAQs would not have sufficient information to conduct the review adequately. The DBVP responded that open CAQs will be reviewed in accordance with the guidelines of procedure NEP-9.1. This response was acceptable to EA and EA considers this item resolved.

Observation E11: This observation involves Action Item E80, which was initiated to identify a concern that three change documents were not included in the SYSTER evaluation package for System 82. The project responded that the missing documents will be included in an addendum to the SYSTER. EA verified inclusion of these missing documents in the SYSTER for System 82 and considers this observation closed.

Observation E12: This observation involves Action Items E83 and E85. Action Item E83 identified a mismatch of the restart category for punchlist items E3586 and E6301 between the vital power system SYSTER evaluation and the SQEP-45 punchlist. It was further noted that many punchlist items having PIRs as originating documents were improperly downgraded to post-restart items based solely upon their categorization as PIRs. To correct this problem, the DBVP issued a directive (DBVP-D-87-002), instructing all the responsible System Engineers to re-review the restart category of applicable punchlist items on the basis of system function. EA considers Action Item E83 resolved.

Action Item E85 noted that several SQEP-45 punchlist items were omitted from the vital power system SYSTER and several conflicted with the restart categorization in the SYSTER. The DBVP responded that the missing punchlist items will be included in the SYSTER package addendum and the punchlist items will be re-reviewed for restart category based on functionalty of the system in accordance with directive DBVP-D-87-002. This response was acceptable to EA.

Observation E13: This observation involves Action Item E90, which identified a concern that unimplemented ECNs 5668 and 2656 were incorrectly evaluated as not required for restart. This incorrect restart decision also raised a general concern that appropriate restart criteria were not used in making the restart decisions for unimplemented and partially implemented ECNs. The DBVP responded that ECN 5668 and ECN 2656 would be addressed correctly in the auxiliary power system SYSTER addendum. The DBVP indicated that all of the unimplemented and partially implemented ECNs have now been re-reviewed by the System Engineers per Sequoyah Standard Practice SQA-183 and directive DBVP 87-005. EA verified this by sampling five ECNs (out of total of 34 re-reviewed ECNs in the electrical discipline) and found the evaluation acceptable. EA considers this observation resolved.

Observation E14: This observation involves Action Item E91, which identified a concern that corrective action defined for punchlist item 6399 did not address the full scope of the problem. In addition, the restart category was not defined. The project response included the correct restart category for

the punchlist item and the revised scope of the corrective action addressed the problem completely. The project's response was acceptable to the EA group.

4.5.2 Conditions Adverse to Quality Reports (CAQRs)

The NRC team also reviewed the handling of conditions adverse to quality (CAQs) to assess TVA's corrective actions for both SCRs and significant CAQRs identified by the DBVP within the scope of the electrical discipline. The team's review included CAQR SQE-870-R01-004 generated by EA and two randomly selected DBVP-generated reports (SCRs SQNEEB-8771 and SQNEEB-8790).

CAQR SQE-870-R01-004: This CAQR was written in response to Action Item E30. This action item identified that no indication of the operation of the diesel generator and electrical panel ventilation fans was provided in the main control room. These fans are required to start (in accordance with the technical specifications) in order to keep the diesel inlet air temperature at 120°F or less. Since there is no remote indication for operation of these fans, the plant could be operating outside the technical specification condition without the knowledge of the plant operator. The nominal setpoint for starting these fans is 80°F. The project responded that:

- The 120°F ambient temperature limit can only be exceeded with one diesel generator running. Any time a diesel generator is running, operation of these fans is verified per operating instructions.

- Diesel generator room temperatures are monitored once per shift; if abnormal temperatures (above 80°F) are noticed, temperature readings are taken every hour.

- Failure of one fan to operate constitutes a single failure: redundant fans remain operable.

EA accepted this response and closed this CAQR. The NRC team considered this response acceptable.

SCR SQN-EEB-8771: This SCR identified a situation in which Class 1E documents were revised by a local design change request (LDCR SQ-DCR-L-1745). In error, this modification was classified as non-safety-related. Corrective action included reversion of all TVA drawing changes since the TVA drawings could be used for field settings of ampacity trip sensors. Because the (subsequent) revision of drawings per ECN L6434 (generated to address LDCR SQ-DCR-L-1745) was no longer required, this ECN was cancelled. The project informed the team that the error was caused by lack of proper procedures when this LDCR was issued. Present criteria restrict the use of LDCRs to ensure that they are not used for safety-related modifications. The NRC team found the corrective action and the action required to prevent recurrence acceptable.

SCR SQN-EEB-8790: This SCR identified a concern that drawings 45N749-1 through 4, which are part of the "SQN-Restart Design Basis Document," did not show or reference the breaker trip setting data for the 480V shutdown boards. Corrective action requires the project to revise these drawings to either include adequate references or show the setting data on the drawings. Procedure NEP 5.1 requires the lead engineers to have all drawings prepared in accordance

with Division of Nuclear Engineering Standard 7.01. This procedure requires all related drawings that are not listed as companion drawings to be included as a reference. According to NEP-5.1, revisions to drawings are handled in the same manner as original drawings. Corrective action and action required to prevent recurrence of conditions reported in this SCR were considered acceptable by the NRC team.

The NRC team found EA's approach for identification, resolution, and/or closure of the action items and observations acceptable. The approach was considered to meet the technical objectives of the EA oversight program for the DBVP.

4.6 Instrumentation and Control

4.6.1 TVA Corrective Actions for EA Oversight of the DBVP

The following Engineering Assurance observations were reviewed. Action taken or planned was found to be acceptable:

> EA Observations E3 (corresponding to EA Action Item E-75; NRC Observation 6.14), E9 involving RPS cable tagging in the turbine building, I1 involving upper head injection system design inconsistencies, and I2 involving steam generator level transmitter accuracy.

A number of EA action items were reviewed and found to be satisfactory, such as I-22, I-23, I-24, and I-17. Thirty punchlist items being tracked by EA were also reviewed, and the EA approach was considered satisfactory.

EA has maintained Observation I3 in an unresolved status. This involves a power supply modification for transmitter change-outs and the addition of a diode to a control switch. The team found EA's closure of the transmitter power supply to be satisfactory, and agrees with EA that TVA needs to provide an analysis to confirm that a commercially procured diode is acceptably dedicated as a Class 1E component in the control switch modification.

EA reviewed the DBVP supplemental walkdown results of sensing lines and concluded that there was no pervasive as-constructed inadequacy (TVA report EA OR 001, page 7.2.3-3). On the basis of two walkdown results involving HVAC instruments, the team recommended that TVA consider a 100 percent walkdown of the HVAC systems. TVA has subsequently performed a walkdown of protection and control interlocks for the HVAC systems, and has issued a CAQR for the inadequacy of HVAC instrumentation design drawings.

EA reviewed Action Item I-22 for the upper-head injection tank level switch substitution, and confirmed that the accuracy calculation indicated that the present switches were not satisfactory. The team agrees with EA's review and conclusions regarding this item.

EA Action Items I-23 and I-24 dealt with the addition of the Westinghouse setpoint document as a reference in a number of TVA design criteria documents. The team reviewed TVA's corrective actions for this item and found them to be satisfactory.

EA Action Item I-17 addressed the erroneous categorization of a source document as "not applicable" for the licensing commitment program. The team confirmed that

the TVA Nuclear Engineering Branch performed an adequate re-review of these "NA" designations given to a number of source documents (EA Action Item N-25).

4.6.2 TVA Resolution of DBVP Punchlist Items

The team reviewed approximately 12 PIR/SCR/CAQR sets of records in the DBVP electrical and instrumentation areas involving inadequate corrective action, separation criteria violations, failure to meet design criteria, inadequate equipment conditions, lack of electrical calculations, and the temperature range evaluation of the refueling water storage tank transmitter. In this area, the team generally agreed with TVA's resolution for DBVP punchlist items.

The planned analysis approach described in CAQR SQT-871198 for punchlist item 7843, involving the potential for unintended blowdown of more than one steam generator, was deemed to be satisfactory.

The approach taken for punchlist item 8482 in SCR SQN NEB 8722, involving postaccident monitoring channel 1 separation from non-safety-related wiring, was found to be unsatisfactory (NRC Observation 6.21).

The corrective action analysis for the added isolation power supply in response to punchlist item 6971 was satisfactory.

TVA's corrective action for punchlist item 7658, involving both a slope change to the sensing lines between the AFW pump suction piping and the associated pressure switches and new process pipe tap locations, was assessed as appropriate.

4.6.3 Implementation of Corrective Actions for Punchlist Items

Because of the early stage of corrective action implementation, only several examples were available for inspection. As mentioned in the previous section, corrective action implementation in the analysis area appeared responsive and appropriate. However, the team identified one situation in which the corrective action concurred with by the DBVP was technically questionable, in that the revised corrective action allowed auxiliary control air pressures considerable below design criteria requirements following a postulated LOCA with an adverse auxiliary control air interaction (NRC Observation 6.22).

4.6.4 EA and DBVP Phase I Reports

The team reviewed the applicable sections of TVA Report EA-OR-001 addressing the EA oversight effort, and the DBVP Unit 2 Phase I Report. These reports were considered to generally reflect the results of the EA oversight effort and the DBVP, respectively. NRC Observation 6.20 (Appendix B) addresses several concerns with characterization of selected conclusions in the DBVP report.

The team also noted that the DBVP report was silent on the content of SCR SQN-EEB-8743, which required relocation of AFW instrument sense lines for pump suction pressure switches 2-PS-139A, B, D and 2-PS-3-144A, B, D. This plant modification was needed to ensure proper operation of the ERCW system supply valves to AFW. This provides the safety-related path of water to the

AFW system. This SCR resulted in a significant hardware change to the plant, but was identified only as a calculational deficiency by the DBVP report.

4.7 Civil/Structural

4.7.1 Corrective Actions Associated With EA Oversight of the DBVP

EA Observation C1 contains EA Action Item C-21, which identified an ECN that was thought to affect Unit 1 only; however, a more in-depth review indicated that Unit 2 was also modified by this Unit 1 ECN. The Sequoyah project issued PIR SQN-MEB-8659 (B44 860910 006) to resolve this action item. As corrective action to this PIR, the project reviewed all ECNs that purported to apply solely to Unit 1 and found two additional cases in which the ECNs actually affected both units. EA is waiting for revision of the SYSTERs to include these identified ECNs before closing this observation. The NRC team concurs with the resolution of this action item.

EA Observation C4 contains EA Action Items C-41 and C-56. Action Item C-41 stated that adequacy of partially implemented ECN L5779 was not evaluated by the civil engineering group of the DBVP. The unverified support variances could have affected the supports for a bypass line. The project has stated that partially implemented ECNs are reviewed per SQA-183 and that the SYSTER which includes ECN L5779 would be reviewed by the civil DBVP. EA is keeping this action item open pending the review of the regenerated support variance calculations and the verification of the SYSTER which includes this ECN.

Action Item C-56 raised questions regarding the adequacy of the resolution for various punchlist items that were reviewed by EA. The response to this action item shows that a DBVP directive, DBVP-D-002, issued on March 13, 1987, requires that all punchlist items be signed by the System Engineer and the Discipline Evaluation Supervisor before a particular punchlist item can be closed. The DBVP also committed to reevaluate all punchlist items which were closed before this directive was issued. This action item is being kept open by EA until the DBVP completes this review.

The NRC team reviewed the available documentation regarding Action Items C-41 and C-56. The team concurs with the resolution of both of these action items.

EA Observation C5 contains EA Action Items C-3 and C-44. Action Item C-3 questioned the technical adequacy of several change documents. The technical adequacy question related to calculations which support the change documents, as well as drawing discrepancies which were discovered during the reviews performed by EA. EA also raised questions regarding field change requests (FCRs) which were not adequately reviewed for technical adequacy. The SQN project response stated that review of calculations supporting the change documents was part of the calculation review program which would separately verify technical adequacy. The project's corrective action for this EA action item does not address the concerns raised by EA regarding drawing discrepancies and FCR evaluations. This action item was still being followed by EA because of the lack of defined corrective action. The NRC questioned the "resolved" status of this observation since there was no planned corrective action stated by the project.

In response to the NRC concern, EA changed the status of observation C5 to "unresolved." The project, in turn, revised its response to EA to address resolution of the discrepancies between the calculations and drawings. EA plans to verify that such considerations are properly addressed by the project.

Action Item C-44 is related to Action Item C-3 since EA review of ECN L6213 showed discrepancies between the calculation and drawing related to this ECN. A field walkdown showed that the calculation was correct and the drawing was wrong. The project response for this action item was acceptable to EA since the particular drawing discrepancy was resolved by the walkdown and because the generic implications of drawing discrepancies would be covered under action Item C-3. The resolution of this action item was acceptable to the NRC team.

Observation C6 contains Action Items C-28, C-37, C-40, C-47, C-53, C-54, and C-57, which all relate to various deficiencies in the civil engineering group of the DBVP. In the civil/structural area, the team reviewed Action Items C-37, C-40 and C-47.

Action Item C-37 stated that the SQEP-12 review checklist for ECN 2944 R1 did not reference calculations relating to a pipe support drawing change. Later evaluation of this problem showed that the calculations for this particular support were missing. The project has regenerated the missing calculations under PIR SQN-CEB-8639. The project also reviewed the SQEP-12 Attachment 2 form of the related SYSTER to ensure that this ECN was appropriately captured in the SYSTER. These corrective actions were acceptable to EA and the action item was closed. The NRC team concurs with the resolution of this action item.

Action Item C-40 raised questions about improper incorporation of ECN reviews into the system evaluation checklists by the System Engineers. This was a documentation problem and the DBVP has revised the checklists to include the correct information. The DBVP also stated that discipline reviews of draft and final SYSTERs, as required by directive DBVP-D-86-010, would ensure the accuracy of the final version of the SYSTERs. EA has accepted this response and closed this action item. The NRC team concurs with the resolution of this action item.

Action Item C-47 was written to address NRC Observation 7.4 - Project Review of Support Variance (NRC inspection report Nos. 50-327/86-55 and 50-328/86-55). The NRC observation raised questions about the DBVP's review of ECN-5298. In response to this action item, the SQN project has regenerated the missing support variance calculations. EA is keeping this action item open pending the review of these regenerated calculations. The NRC team concurs with the resolution of this action item.

4.7.2 Resolution of DBVP Punchlist Items and Implementation of Corrective Actions

The team reviewed the corrective actions taken by the project for various punchlist items that were generated as a result of the DBVP. Samples were selected in the following areas (as described in the Sequoyah Unit 2 DBVP Phase I report, Section H-1):

- missing calculations
- open FCRs
- no evaluation for pipe rupture
- inadequate design

Samples in each category were picked by the team. The corrective action was reviewed systematically. The sheet identifying the punchlist item, SQEP-12, Attachment 2B (the civil attachment sheet), was reviewed in conjunction with the calculation which resolved the deficiency to determine whether the corrective action was comprehensive. The calculations were also reviewed cursorily to determine whether they were technically adequate. The following are the team's comments on the corrective actions reviewed.

(1) Missing Calculations

The DBVP review showed that calculations for some changes could not be found.

Punchlist item 449 relates to a missing calculation that could not be located. The civil design review checklist (SQEP-12, Attachment 2B) for ECN L5569 shows that supporting calculations for drawing 48N1314-1 Revision 2 could not be found. In order to resolve this punchlist item, the project has performed calculations (B25-870324-304) to show that the protective structure (MK-6) for the ERCW piping is acceptable. The team found that this corrective action by the project addressed the punchlist item.

Punchlist item 472 identified that FCR 3490, which is related to ECN L6235, was written for a variance to support 47A056-51. The civil design review checklist (attachment 2B) identified that the calculation for the variance could not be found. The project has performed additional calculations (B25-851202-300) to show that the variances to 47A056-51 are acceptable. The team agrees with the resolution of this punchlist item.

Punchlist item 506 was written to address missing calculations for drawing 41N353-14 Revision 1, which added a battery rack foundation under ECN L5599. Attachment 2B of the civil design review checklist shows that these calculations could not be found. The project has performed additional calculations (B25 870407 327) to show that the pads and the anchor bolts for the battery rack are acceptable. The team found the resolution of this punchlist item to be appropriate.

Punchlist item 3772 identified that no calculations could be found for variance 47A055-78-A1 to typical support 47A055-78. The civil design review checklist (attachment 2B) for ECN L5207 showed that FCR 142 was written for this variance, but the DBVP reviewer could not locate any calculations relating to this variance. The project has generated calculation B25-870513-302 to show that this variance to the typical support is acceptable. A cursory review of this calculation showed that it addressed the correct variance to the support. The team agrees with the resolution of this punchlist item.

Punchlist item 6136 relates to missing calculations for typical conduit support 47A056-151. The civil design review checklist (Attachment 2B) for ECN L5298 shows that calculations relating to 47A051-151 for FCR 451 could not be located. In order to resolve this punchlist item, the project has performed a

computer analysis, B25-870507-303, to show that the support is acceptable. The team reviewed this calculation and concluded that it addresses the punchlist item appropriately.

Punchlist item 9291 identified that no calculations could be found for the reinforcing bar cuts that were approved in FCR 1682. The civil design review (checklist Attachment 2B) for ECN L5429 shows that drawing 41N736-1 was revised for reinforcing bar cuts, but no calculations could be located. The project has performed an evaluation, B25-870401-319, to resolve this punchlist item. It has concluded that the structural integrity of the operating deck floor slab has not been compromised by the reinforcing bar cut shown on drawing 41N736-1. The team concludes that this resolution addressed the concern raised by the punchlist item.

(2) Field Change Requests (FCRs)

The DBVP identified various ECNs with open FCRs. At the time of the DBVP review, documentation for these open FCRs was not available and an engineering evaluation could not be made. The team reviewed the following punchlist items relating to this DBVP finding:

Punchlist item 939 was written to identify that the review of ECN L5220 showed FCR 3833 Revision 2 to be open. This FCR was initiated to approve variances to conduit support 47A056-1053B. The documentation package provided by the project, including calculations B25-870223-308, showed that Revision 3 of the FCR cancelled these variances to the conduit support. The changes were not implemented and the FCR was closed as documented in B25-86118-617. The team found the closure of this punchlist item appropriate.

Punchlist item 954 was written to show that FCR 4023 (related to ECN L6533) was not closed out by DNE. The FCR was issued to request a variance to typical conduit support 47056-1002. The documentation provided by the project showed that calculations (B25-860806-306) were performed to qualify the variances to the typical support. The FCR was closed as shown in document B25-860820-602. The team agrees with the closure of this punchlist item.

Punchlist item 964 stated that FCR 4010, relating to ECN L6553, was open at the time of the DBVP review. The FCR was written for variances to conduit typical support 47A056-1066. The documentation reviewed by the team showed that calculations (B25-860814-304) were performed to evaluate the support variances. Also, the FCR was closed, as shown in document B25 861022 685. The team found the closure of this punchlist item appropriate.

Punchlist item 1189 was written because FCR 4076 was open at the time of the DBVP review of corresponding ECN L6533. This FCR was written to cover variances to typical conduit support 47A056-10004. Calculations provided by the project (B25-860717-307) show that the variances were acceptable. This FCR was then closed as shown in document B25-860807-616. The team agrees with the closure of this punchlist item.

Punchlist item 6252 was written because FCR 4581 was open at the time of review for ECN L6649. The FCR was written to obtain approval for several variances to typical conduit support 47A05-114A. The calculations provided by the project, B25-861029-389 and B25-861029-392, showed that the variances were acceptable.

The FCR subsequently was closed as shown in document B25-861118-621. The closure of this punchlist item is acceptable to the team.

(3) No Evaluation for Pipe Rupture

The DBVP review found that for various cases, incomplete or no pipe rupture evaluations were made for plant modifications. Each such case was identified by a punchlist item. The team selected four samples to determine whether the closure of the punchlist items was appropriate. The selected punchlist items and the project evaluation document numbers are as follows:

Punchlist item	ECN No.	Project evaluation RIMS No.
2711	L2775	B41 870611 006
2729	L5194	B41 870228 016
4490	L6533	B41 870617 004
5187	L5594	B41 870228 030

The review of the above documentation showed that the SQN project performed evaluations to determine the effects of pipe ruptures on the changes performed. The team did not perform a detailed review of these evaluations. However, the civil design review checklist (attachment 2B) for each ECN was reviewed to determine whether the concern identified was covered within the SQN project evaluation. The team found the closure of these punchlist items to be appropriate.

(4) Inadequate Design

The review performed by the DBVP identified various ECNs that had technically inadequate calculations or analysis. In the civil/structural area, there were only two ECNs with such a classification. The team reviewed the resolution of both punchlist items.

Punchlist item 4775 identified deficiencies in the resolution of SCR SQNCEB8627 which was related to ECN L6759. The SCR was written to qualify the 1/4-inch surface-mounted plate attached to the crane wall. The project has performed a computer analysis (B25-870107-801) to show that the 1/4-inch plate is structurally adequate. A cursory review of this calculation showed that the concerns raised by the punchlist item were considered properly. The team found the closure of this punchlist item appropriate.

Punchlist item 7720 was written to document that an incomplete analysis was performed for pipe support 17A586-2. The civil design review checklist (attachment 2B) for ECN L6322 shows that the monorail load was not included in the analysis performed for pipe support 17A586-2. In order to resolve this item, the SQN project has performed additional calculations (B25-870119-803) to show that the monorail supports are adequate for supporting the pipe support loads. The team agrees with the resolution of this punchlist item.

The team also reviewed punchlist item 6189, which had already been reviewed by EA, to assess appropriate closure. The civil design review checklist (attachment 2B) for ECN L6263 identified a discrepancy in the length of a structural brace as shown in the calculations and the as-constructed drawings. The SQN project's response showed that this was a drawing discrepancy and that the

SQN project has revised the drawings to show the correct length of the brace. The team, as well as EA, found the closure of this punchlist item adequate.

Overall in the civil/structural area, the limited samples reviewed by the team showed that the punchlist items are being resolved properly.

The NRC team also reviewed 15 punchlist items to determine the adequacy of the restart categorization (punchlist items nos.: 518, 527, 728, 817, 821, 862, 955, 4749, 4907, 4993, 6066, 6218, 7462, 7619, and 9304). The team noted that 4 of the 15 punchlist items (nos. 518, 955, 6066, and 9304) were shown as post-restart items in the computer listing. A review of the SQEP-45, Attachment 2 forms showed that these items were actually determined to be pre-restart items. The team believes that there are many discrepancies between the punchlist and SQEP-45, Attachment 2 forms regarding the categorization of the punchlist items, and that the accuracy of the punchlist should be verified before restart (Observation 7.5).

Overall, the team concurs with the categorization of the punchlist items for restart and post-restart in the civil/structural area.

The team reviewed the appropriate sections of TVA report EA-OR-001 covering the EA effort for the DBVP and the DBVP Unit 2 Phase I report. As shown above, the team selected samples to determine whether the items identified by EA and the DBVP were addressed and closed properly. The review of these reports and the limited samples did not identify any major deficiencies.

5. OBSERVATIONS

Specific findings of individual NRC discipline inspectors are categorized as "observations." These observations elaborate on the general comments stated in this report and in some cases provide additional comments not considered to be of a general nature. The observations identified by each discipline of the NRC team are provided in Appendix A of this report. TVA actions relating to individual observations will be reviewed by the NRC. Individual observations may be closed on the basis of TVA's response to this inspection report as appropriate. Selected items, noted as confirmatory items, remain open, pending TVA confirmation that the indicated action has been completed.

6. REVIEW OF PREVIOUS INSPECTION FINDINGS

The team reviewed TVA's responses to the deficiencies, unresolved items, and observations documented in the following previous NRC inspection reports:

- 50-327/86-27 and 50-328/86-27
- 50-327/86-38 and 50-328/86-38
- 50-327/86-45 and 50-328/86-45
- 50-327/86-55 and 50-328/86-55
- 50-327/87-14 and 50-328/87-14

Details about that review can be found in Appendix B to this inspection report.

7. MEETING SUMMARIES - REFERENCES

A summary of the meetings held relating to the DBVP inspection and a list of references related to the series of design control inspections are provided in Appendix C.

APPENDIX A

OBSERVATIONS

The observations identified by the team during inspection 50-327/87-31 and 50-328/87-31 are described in the following sections. The observation numbers used continue the numbering system used for previous NRC inspections of the DBVP.

Observation 3.16 - Valve Motor Operator Orientation

On January 13, 1987, the Mechanical Engineering Branch (MEB) prepared problem identification report (PIR) SQN-MEB-86127 to document differences between the installed orientations and the physical piping orientations of ten component cooling water system (CCS) valve motor operators. MEB did not request a potential generic condition evaluation (PGCE) to determine if a similar condition existed for other piping systems at (SQN), or at Browns Ferry, Bellefonte, or Watts Bar.

The team questioned the lack of a potential generic condition evaluation for this item, and later learned that on May 27, 1986, MEB had drafted an informal memorandum to request that PIR SQN-MEB-86127 be revised and reissued to require a PGCE. The team concurs with MEB's request to reissue the PIR, but notes that MEB had not yet reissued the PIR. The team also notes that the Civil Engineering Branch (CEB), assigned a portion of the corrective action detailed in the PIR, did not apparently review the PIR for generic applicability, or require initiation of such a review.

Observation 3.17 - Solenoid Valve Mounting Support Variances

TVA drawing 47A054-33 depicts a typical mounting support detail for the installation of solenoid valves and regulators which consists of a steel angle welded to a surface mounted plate restrained by two anchor bolts. Team review of workplan No. ...3, which installed replacement solenoid valves in several different piping systems in accordance with ECN 5457, indicated variances Nos. 54-33-A43 and 54-33-A45 to the typical mounting support detail. These consisted of an unbraced 89-inch span of tube steel supporting six solenoid valves. The team asked CEB to provide the seismic qualification calculation for these variances, but CEB was unable to retrieve the calculation.

Observation 4.8 - Containment Airborne Radiation Monitoring System Air Supply

Punchlist item 4426 had been generated in response to SCR SQN-NEB-8615 which identified that isolation valves in the containment airborne activity radiation monitoring (System 90) sample lines are not supplied with essential control air, making the radiation monitors not seismically qualified. The SCR notes that the condition was identified in a 1980 licensee event report and that TVA committed to applicable portions of Regulatory Guide 1.45, which require the ... particulate radioactivity monitoring system to remain functional when ... to the safe shutdown earthquake. On the other hand, Quality ... Request (QIR) NEB-86241 concludes that it is not necessary for a

seismically qualified air supply to be available to the radiation monitor isolation valves. Reasons stated in the QIR for this conclusion include:

- The sole safety-related function of the monitor is to generate a containment ventilation isolation signal. A loss of air to the sample valves will cause the monitor to produce that input.

- The valves will fail closed upon loss of air. Thus, the containment isolation function is assured without a seismic air supply.

The inspection team reviewed punchlist item 4426 and questioned the decision to reclassify it from restart to post-restart. The intent of Regulatory Guide 1.45 is to maintain the airborne particulate radioactivity monitoring system functioning after a safe shutdown earthquake. This cannot be achieved if the valves close because of failure of the non-safety-grade air supply. Also, the team was advised that QIR NEB-86241 is not correct. A loss of air to the valves will not cause the monitor to produce the input signal to cause containment ventilation isolation.

Observation 6.21 - Change in Corrective Action for PAM Isolation

In SCR SQN-8722, TVA identified that separation of one postaccident monitoring channel (i.e., PAM-1) from non-safety-related wiring had not been implemented as specified in TVA design criteria documents and FSAR Section 7.5.2, which states: "One of the PAM channels may be associated with non-qualified circuits, while the other is fully separated from non-qualified circuits." The DBVP punchlist (SQEP-45, Attachment 2) was closed out late May 1987 on the basis that either qualified isolation devices would be added to provide electrical isolation or the non-qualified instruments would be disconnected from the PAM-1 channel before restart of Unit 2.

In late June 1987, the SQN project was in the process of changing the agreed-upon corrective action. The project stated that the isolation requirement would be deleted from the PAM design criteria and the FSAR, and stated that this item was no longer a constraint for restart of Unit 2. The team did not find documentation that the corrective action change had been coordinated with DBVP, and noted that the proposed change was in direct conflict with a PAM separation requirement stated in TVA electrical separation design criteria document SQN-DC-V-12.2, Section 4.3.5. The team believes that improved controls are necessary when the line organization deviates from DBVP specified corrective actions.

Observation 6.22 - Auxiliary Control Air System Design Criteria

Approximately one year ago, TVA stated that the design of the auxiliary control air (ACA) headers within containment had sufficient separation to preclude adverse interaction with high-and moderate-energy lines. However, this conclusion appears to have been without basis as TVA has been extensively evaluating the acceptability of the current ACA design. Both hardware changes and improved analyses are being considered. The team noted that each alternative currently being reviewed by TVA required that the minimum ACA header pressure of 70 psig, as stated in the design criteria document, be violated. One scenario depicts a minimum ACA pressure of 26 psig, and a period of 5 minutes following a loss-of-coolant accident (LOCA) within containment before

the 70-psig minimum value is restored. Since ACA controls the heating, ventilation, and air conditioning (HVAC) systems used to cool safety-related equipment, the team was concerned with the operability of the HVAC equipment and the impact of degraded ACA header pressure for 5 minutes.

Observation 7.5 - Punchlist Accuracy

The team's review of the computerized output of punchlist data in the civil/structural area revealed that punchlist items 518, 955, 6066, and 9304, were all categorized as non-restart. However, a review of the governing SQEP-45, Attachment 2 forms indicated that all these items should be categorized as pre-restart. Numerous discrepancies were evident between the data base and the Attachment 2 determinations.

The mechanical systems team reviewed for consistency the SQEP-45 Attachment 2 forms and the associated punchlist items. The team found several instances (punchlist items) in which the SQEP-45, Attachment 2, form indicated "no change" for the restart category, however the punchlist was changed from "required for restart" to "not required for restart." This was noted for punchlist items 6688, 6691, 6692, 7572, and 7573.

In the operations area, the team disagreed with the post-restart categorization of punchlist item 5644. This item concerned non-qualified mounting of main steam system handswitches on the control panels. This item was closed out because SCR SQE-8618-R0 was initiated to address this issue. In addition, the change was considered outside the DBVP boundary. The team considers that this item should be examined before restart to assess its potential impact on operability of systems during a seismic event.

The team additionally selected a sample of five punchlist items (Nos. 386, 7742, 8514, 9670, and 9689) to assess the status of implementation and the consistency between the governing Attachment 2 form (SQEP-45) and the actual punchlist database information. The team biased the sample by only selecting punchlist items for which field modifications were required. A printout (dated May 26, 1987) of punchlist items with field modifications required was used as the source for the sample selection. The dated printout was used to assess the licensee's progress toward completing required restart actions. (All selected punchlist items were tabulated as pre-restart on the printout.) The following summarizes the status of this sample:

> Punchlist item 386 concerned the fact that approval of valve support and component nozzle loads in excess of the vendor specifications was not documented (SCR SQNCEB8511). This was given the status of "DBVP closed" based on a decision to exclude from the scope of the DBVP those CAQs that were identified before the DBVP was initiated but not yet implemented. (CAQs identified before the DBVP and already implemented were reviewed by the DBVP). These were to be resolved and tracked by the TVA CAQ process. The punchlist implementation status was tabulated as "completed." The team considered this misleading because the actual status was unknown, and was immaterial to the DBVP.
>
> Punchlist item 7442 identified that non-safety-related pressure indicators were used to replace existing indicators in the auxiliary feedwater

system. A SQEP-45, Attachment 2 form closed this item on April 23, 1987, based on proposed corrective action to replace or qualify the pressure indicators (SCR SQN-EEB- 8726, Part B). This item was erroneously classified as "implemented," as well as "closed," and also as upon receipt of the Attachment 2 form. This was of concern to the team because DBVP closure does not imply implementation of corrective action, and the DBVP indicated that the punchlist database (as updated for implementation status by the SQN project) would be used to verify that all pre-restart requirements were satisfied.

Two items were not implemented, according to the latest punchlist status. Punchlist item 8514 identified an unimplemented design requirement to abort diesel generator testing automatically following receipt of an accident signal and trip the diesel generator supply breaker to the 6.9-kV shutdown board. Punchlist item 9689 concerned the need to restore the hotwell pump trip on a feedwater isolation signal. The FSAR takes credit for hotwell pump trip on feedwater isolation, and alternative trips of the condensate booster and demineralizer pumps (ECN L6215) are not yet implemented, and not scheduled before restart.

Punchlist item 9670 concerned the addition of a fast bus transfer circuit in parallel to a 30-second time delay circuit in the RPS, potentially degrading the existing circuit. The punchlist item was listed as implemented; however the associated Attachment 2 form (SQEP-45) which should have been used to document implementation was not available. The associated Attachment 2 form documenting DBVP closure (7/6/87) indicated that operability of the subject relays should be verified before restart. Post-restart corrective actions, consisting of control circuit revisions to provide individual testing of the subject relays, were also required. No change in restart categorization was authorized. Per verbal discussions with DBVP personnel, punchlist items with both pre- and post-restart portions were to change restart status to "no" upon completion of pre-restart corrective action. The implementation status would remain open pending completion of the post-restart corrective action. This punchlist item appeared as a complete, implemented, pre-restart item in the database without documentation supporting completion of pre-restart corrective action nor a means to track post-restart work.

The team noted that the licensee's procedures for control and statusing punchlist items did not specifically address handling of these aspects of the punchlist items.

APPENDIX B

LICENSEE ACTION FOR PREVIOUS INSPECTION FINDINGS

The team reviewed the corrective actions taken by TVA to resolve the open deficiencies and observations identified in NRC inspection report Nos. 50-327 and 50-328/86-27, 86-38, 86-45, 86-55, and 87-14. Correspondence associated with these findings, including TVA responses, are tabulated in Attachment C. The following are the team's comments on these items.

Report No. 86-27

(Closed) Deficiency 6.1-1 - AFW Pump Discharge Pressure Switch Rating

TVA provided a description of the process used to change the pressure switches and referred to retrievable instrument range and setpoint calculations that supported the individual substitutions of these switches. Based on this additional information from TVA, the team has closed this item.

(Closed) Deficiency 6.1-2 - FW Bypass Control Valve Solenoid Replacement

TVA provided documentation to confirm that the replacement control valve solenoid would be a Class 1E seismically mounted device; hence, this item has been closed.

(Closed) Deficiency 6.1-3 - AFW Pump Suction Pressure Switch Setpoint

As a result of replacement of the AFW pump suction pressure switch, a TVA setpoint calculation was prepared and issued in March 1986. This calculation did not identify or supersede a previous setpoint calculation made in 1979. TVA has subsequently superseded the earlier calculation; on this basis, this item has been closed.

(Closed) Deficiency 6.3-1 - Pressure Switch Hydrostatic Test After Seismic Qualification Testing

The team noted that TVA did not routinely specify that instrument vendors provide confirmation of pressure boundary integrity for pressure switches subject to seismic qualification. TVA had the vendor conduct confirmatory pressure boundary tests for the specific Static-O-Ring (SOR) example identified by the team. These particular SOR pressure switches were shown to be satisfactory. TVA submitted a revised response addressing this issue on January 30, 1987 (Reference 11)*, noting that a review of environmental qualification binders revealed that the instruments had been pressure tested. The need to require some form of a pressure test to confirm the integrity of the instrument pressure boundary following seismic qualification has been referred to the Office of Special Projects for review. Therefore, this item is closed for the purpose of this inspection.

*References are listed in Section C.2 of Appendix C.

Report No. 86-38

(Closed) Observation 1.1 - Impact of Walkdown Findings on Operating Procedures

In inspection report No. 50-328/86-55, the team noted that although the observation was answered and resolved, no sampling had been done to track the corrective action process and confirm satisfactory implementation. The licensee's response indicated that Corrective Action Report SQ-CAR-85-10-016 documents the corrective action taken to address the observation. The team reviewed this report and confirmed that it did address the team's previous concern.

(Closed) Observation 1.2 - Walkdown Scope Difference From Calculation Boundaries

This observation concerned the fact that the extent of the system marked up on the drawing used for the walkdown was not the full extent shown in the boundary calculation. No justification for the difference was filed for review. Procedure SQEP-16 has been changed to require the System Engineer to provide justification for the walkdown boundaries in the System Evaluation Report (SYSTER).

The team reviewed sections of the EA Review Plan which, in turn, had audited the SYSTERs for inclusion of the required justifications. The Review Plan stated: "Has adequate technical justification been provided for any portions of the system on the SWBID [system walkdown boundary identification drawing] but not walked down?" The audit determined that adequate justification had been provided, or in cases where this was lacking, an action item was generated. These determinations resolved the team's concerns with this item.

(Closed) Observation 1.3 - System Interfaces on Drawings

This observation concerned the information related to "out-of-function" portions depicted on system flow (mechanical and controls) diagrams. During system walkdowns performed by TVA, the team noted that some "out-of-function" information was not marked properly or treated in a consistent fashion. The team had left this item open in inspection report No. 50-328/86-55 until a project policy was promulgated regarding out-of-functon information on drawings. This policy was formally implemented in a memorandum from the SQN Project Engineer dated January 30, 1987, and widely distributed. This policy was supplemented by a memorandum from the Project Engineer to the Plant Manager and the Modifications Manager further describing the policy and requesting that personnel using drawings at Sequoyah be trained in the appropriate interpretation of out-of-function information.

(Closed) Observation 4.2 - Reactor Protection System (RPS) and Neutron Monitoring System (NMS) OBVP Scope Boundary

The team reviewed Revision 5 of TVA calculation SQN-OSG7-048 (B25-870319-801), entitled "Identification of Systems Required for Sequoyah Restart." Also reviewed were the marked-up drawings for the RPS and NMS. The team found that the calculations adequately incorporated the necessary portions of RPS and NMS in the description of the systems or portions thereof required to be functional

for safe shutdown and accident mitigation. The team found that the markup of the drawings adequately represented the description given in the calculation. Therefore, the team found the corrective action to be adequately implemented and the observation can be considered closed.

(Closed) Observation 6.2 - Neutron Monitoring System (NMS) Flux Detector Qualification Basis

This observation concerned the lack of qualification of NMS flux detectors and their need to function in a postaccident environment.

In an unreviewed safety question determination (USQD), Westinghouse stated that a new accident scenario was not created for postulated failure of the NMS detectors after a loss-of-coolant accident (LOCA) event within containment that could lead to uncontrolled withdrawal of control rods for approximately 15 seconds. Westinghouse subsequently provided additional text to support its USQD determinations. A cycle-specific analysis has been performed for both Units 1 and 2 by Westinghouse to address the consequences of a continuous rod withdrawal caused by the postulated environmental conditions following a small-break LOCA (Westinghouse letter TVA-86-732). Acceptable margins to critical heat flux (departure from nucleate boiling ratio) were demonstrated for the current cycles. This adequately addresses this concern for pre-restart considerations. The associated CAQ (SCR SQN-NEB-8609-R2) remains open, pending long-term corrective action. Three options are being considered by the licensee: continued cycle-specific analyses, qualification of the detectors, or demonstration that the steam line break accident will not cause the postulated rod withdrawal. These alternatives are considered to be technically adequate.

(Open) Observation 6.3 - Instrument Sensing Line Walkdown

Because of several differences between the design drawings and the actual installation of a sample of heating, ventilation, and air conditioning (HVAC) sensors, the team had recommended that each sensor in HVAC systems (30, 30A, 31, 31A, and 65) be walked down. TVA documented in CAQR SQP-871147 that the design drawings were inadequate for HVAC instrument lines based on a walkdown performed pursuant to procedure SMI-0-317-61. TVA noted that sketches were being made of the installation of HVAC sensors that performed a protective or control interlock function, and that these sketches would be converted into design drawings at some point in the future. The team considers that TVA needs to confirm that the as-built installation as depicted on these sketches is technically adequate and meets the design requirements for these sensors. In addition, TVA should provide a schedule for issuing the applicable design drawings. This is a confirmatory item.

Report No. 86-45

(Closed) Observation 2.3 - Status of NSSS Vendor Proprietary Information

This observation was open, pending a confirmatory letter that commitments/requirements made in a nuclear steam supply system (NSSS) vendor's proprietary document, have been replaced with non-proprietary documents. Information provided by TVA in its revised response (enclosing Westinghouse letter TVA-86-609), states that all information considered to be a commitment or a

design requirement is incorporated in the formal proprietary documents that have been sent by the NSSS vendor and incorporated in the commitments/ requirements list. This satisfactorily resolves and closes this observation.

(Closed) Observation 3.4 - Pipe Support Design Criteria

Observation 3.4 documented provisions for stiff piping clamps and piping sleeves in Watts Bar design criteria WB-DC-40.31.9 that CEB did not reiterate in Sequoyah design criteria SQN-DC-V-24.1, which supersedes the Watts Bar design criteria. On March 19, 1987, CEB issued design input memorandum DIM-SQN-DC-V-24.1 to incorporate these provisions into design criteria SQN-DC-V-24.1. Observation 3.4 is closed.

(Closed) Observation 4.4 - Spray Shields for Certain Hydrogen Igniters

The team reviewed both the system description for the combustible gas control system (System 83) and the System 83 design criteria (SQN-DC-V-26.1, Rev. 1). The team found that both documents have been revised to adequately incorporate references to the need for spray shields. The team also reviewed the backup information upon which the design of the shields is based and found that information was adequately referenced in the system design documents. The team found the corrective action to be adequate. Therefore, NRC Observation 4.4 is closed.

Report No. 86-55

(Closed) Observation 2.6 - Flow Rate Assumption Used in Calculation

Observation 2.6 noted that calculation SQN-60-0053 used the recommended vendor pump head curve and runout condition to calculate design pressure of the refueling water return line to the refueling water storage tank and observed that a system resistance curve or other justification should be the basis for the runout flow used in the calculation of design pressure. The team reviewed the revised calculation which determined the system resistance curve for the refueling water transfer mode of operation for the RHR pump. The calculation was found to be technically adequate. One of the dominant pressure drop factors in the system resistance curve was the partial opening of a valve. The opening of this valve is administratively controlled for purposes of preventing a too rapid drawdown of water inside containment. The team considers NRC Observation 2.6 to be closed, but notes that changes in the administrative procedure controlling the extent of valve opening will affect the results of the calculation. Therefore, the subject procedure and calculation should be linked (cross-referenced) in light of this interdependency.

(Closed) Observation 2.7 - Drawing Control

The team reviewed the TVA proposed corrective actions (planned for post-restart) for this observation and found them to be adequate. TVA plans to issue revised drawings for the SQN waste disposal system by April 1, 1988. The TVA commitment (enclosure 3 to Reference 8), which has been entered into the Corporate Commitment Tracking System, was modified by a TVA letter dated October 2, 1987, to reflect a later completion date.

(Closed) Observation 5.7 - Diesel Breaker Trip

This observation identified a race between load shedding and diesel breaker closure in the diesel generator starting logic which was introduced by a modification. TVA issued a significant condition report (SCR SQN-EEB-8620E-RO) to address this concern. The team was informed that TVA later determined that although a failure a breaker to operate during certain plant conditions (such as a blackout during a routine test of a diesel generator before it is synchronized with the bus) may cause damage to an emergency diesel generator, this kind of failure is covered by the single-failure criteria. In addition, no two diesel generators are tested simultaneously; therefore, the possibility of a common mode failure for two redundant diesels does not exist. TVA provided a revised response to this observation in a letter dated September 1, 1987 (Referance 16). TVA further noted that to ensure that the breakers are maintained in an operable state, an operational test of the load shedding features is performed every 18 months and a complete disassembly and inspection are performed every five years.

TVA further added that the sequence of a safety injection with a delayed loss of offsite power (blackout following a LOCA) is not among the diesel generator loading cases being analyzed (March 12, 1987 letter to the NRC) because it does not significantly contribute to the probability of core melt. The FSAR will be updated in 1988 to eliminate this sequence as a design-basis event.

The NRC team accepts the TVA position that the failure of a breaker to operate can be classified as a single failure and considers this observation closed.

(Open) Observation 6.12 - Periodic Test of Component Cooling Water System Surge Tank Baffle

An internal tank baffle plate within the component cooling water system (CCS) surge tank provides independent water volumes for the redundant CCS pumps. The team noted that the integrity of the baffle plate had not been confirmed by CCS preoperational or periodic tests. TVA subsequently performed a leakage test on the surge tanks in both units, and found no leakage from one tank and minor leakage, possibly from external piping sources, from the other tank. This item remains open, pending assessment of the need for a periodic surge tank leakage test.

(Open) Observation 6.14 - Project Evaluation of SQEP-12, Question 3C

This observation concerned the narrow perspective from which DBVP engineers appeared to be addressing failure modes and effects analysis of facility changes.

Note 17 of SQEP-12, Appendix A design review checklist was modified to confirm that electrical open circuit and short circuit failure modes within a panel would not disable the electrical distribution system to the point that required safety functions could not be performed. TVA evaluated the effect of imposed voltage sources within a panel on safety-related circuits (PIR SQN-EEB-86171). Several changes were made to the TVA separation design criteria document (SQN-DC-V-12.2) for qualification of isolation devices and separation of lighting and power outlet circuits as a result. However, during the SQEP-12 review process, TVA did not consider the application of the maximum credible

ac and dc potential to safety-related circuits within equipment cabinets, panels, and racks. Such analyses are specified in Institute of Electrical and Electronics Engineers (IEEE) Trial Use Standard 379-1972, Section 5.1 and IEEE Standard 379-1977 section 6.1(5). The team believes that the process for future plant modifications should include an imposed voltage analysis as a requirement. In addition, TVA should confirm the acceptability of relay contact-to-contact electrical isolation of Class 1E to non-Class 1E circuits.

(Open) Observation 6.15 - Periodic Functional Test and Reset Time

During a previous inspection, the team identified that 0.5 second time delay relays in four safety-related pump circuits had not been subjected to periodic calibration or system functional tests. TVA subsequently prepared maintenance instruction (MI) 13.1.3 for an out-of-circuit calibration of these time-delay relays. The team reviewed the maintenance instruction and recent calibration data for 11 such relays in each unit, noting the following:

(1) The required time delay accuracy was stated to be ±5 percent. In the procedure, this was converted to ±4 percent which was equivalent to a range of 489 to 520 milliseconds. However, the test equipment used for the calibration had an accuracy of 40 milliseconds, which corresponds to ±8 percent of the relay range. This test equipment was not appropriate for the specified accuracy of these calibrations.

(2) Of the 22 relays calibrated, 1 was found to be inoperable and 12 others were found to be out of tolerance. The range of "as-found" time delay values was 380 to 590 milliseconds.

(3) The calibration method required disconnecting and subsequently reconnecting conductors to these relays. TVA does not plan to perform an "in-circuit" system functional test.

The team remains concerned with item 3 in that portions of an initiating circuit, which need to function for certain accident sequences, are not tested in either an integrated or, alternatively, overlapping fashion.

Report No. 87-14

(Closed) Observation 2.8 - Valve Seat Material Qualification

This observation concerned the environmental qualification of certain soft seals used in containment isolation valves. TVA has issued an addendum to the System Evaluation Report (SYSTER) for System 31 which states that the material is satisfactory based on similar material test data from the Watts Bar Equipment Qualification Program. Furthermore, the seat material will be specifically addressed and qualified for the environmental conditions under the Sequoyah Mechanical Equipment Qualification Program, scheduled for completion by the end of the Unit 2 second refueling outage. This satisfactorily resolves and closes this observation.

(Closed) Observation 3.10 - Control of Field Sketches

Observation 3.10 documented CEB's use of uncontrolled field sketches in a calculation which CEB prepared to qualify sampling tubing and supports. On

March 5, 1987, CEB issued CAQR SQP-870125 to develop verified field sketches and update the calculation as required before restart. Observation 3.10 is closed.

(Closed) Observation 3.11 - Electrical Board Room Cooler Seismic Qualification Document

Observation 3.11 indicated that CEB could not access the seismic qualification documents for the electrical board room cooler. On April 17, 1987, CEB issued PIR SQN-MEB-8797 to retrieve a copy of the missing vendor report post-restart. Observation 3.11 is closed.

(Closed) Observation 3.12 - Retrieval of Seismic Qualification Data

Observation 3.12 indicated that CEB could not retrieve the flooding and seismic calculations that qualified the restraint designs for two removable block walls. TVA has noted that the block walls have been removed and are not planned to be reinstalled. TVA has issued CAQR SGP870170 to regenerate the calculations if the walls are replaced, and has prepared a quality information request to ensure regeneration of the calculation prior to reinstallation of the block walls, should TVA decide to reinstall the walls. Observation 3.12 is closed.

(Open) Observation 3.13 - West Steam Valve Room Main Steam Line Break Evaluation

Observation 3.13 indicated that CEB did not prepare the pipe rupture calculations for the valve room walls in accordance with the FSAR and design criteria. On June 4, 1987, CEB issued Revision 1 to CAQR SGP870183 to specify the required corrective action post-restart. Observation 3.13 remains open pending further NRC review.

(Closed) Observation 3.15 - Zero Period Acceleration Loads

The team reviewed the following calculations which CEB prepared to address the additional effect of zero period acceleration (ZPA) loads on the hanger tank that contains pipe support 1CCH-548:

(1) calculation "Pipe Support H10-621," Revision 0, dated June 18, 1987 (RIMS No. B25-870619-801)

(2) calculation "Reactions at Attachment to Embedded Plate From Cable Tray Support MK 2B," Revision 0, dated June 15, 1987 (RIMS No. B25-870616-802)

(3) calculation "Attachment to Aux. Bldg. Embedded PL MK11, 48N1221, El 689'-0", S9'-0"A4, 29'-0"T," Revision 0, dated June 1, 1987 (RIMS No. B25-870601-800)

(4) calculation "Attachment to Aux. Bldg. Embedded PL MK13, 48N1221, El 689'-0", N5'-6"A5, W13'-2"T," Revision 0, dated June 1, 1987 (RIMS No. B25-870602-800)

(5) calculation "Reactions at Attach. to Embedded Plate From Cable Tray Support MK12B," Revision 0, dated June 15, 1987 (RIMS No. B25-870616-801)

(6) calculation "N2-CEB-NRC-MISC., Evaluation of ZPA Effect on Support 1CCH-548," Revision 0, dated July 20, 1987 (RIMS No. B25-870720-804)

(7) calculation "Attach. to Embed. Plate MK13C, Aux. Bldg. El 690, S1'-2"A5, W13'-2"T," Revision 0, dated September 12, 1986 (RIMS No. B25-870602-801)

The team reviewed CEB's calculations to confirm that CEB used default, instead of interim, general design criteria, and that computed forces, stresses, and deflections were within the allowable limits specified in the long-term criteria.

The team concurs with CEB's conclusion that the referenced calculations adequately qualify the hanger bank which contains pipe support 1CCH-548 for the additional ZPA forces.

The team notes that CEB's latest version of TPIPE incorporates ZPA loads. CEB is using this version for all new piping analysis and reanalysis.

The NRC Office of Special Projects is currently reviewing TVA's handling of ZPA loads under the employee concerns program.

(Closed) Observation 4.7 - Classification of Pre-Restart Items

The team had noted that two System 30A punchlist items, involving thermal calculations for cables replaced for NUREG-0588 and main control room indication of vent fan operation, were listed as post-restart items. TVA responded that the adequacy of cable ampacity would be resolved before restart and that punchlist item 5943 had been recategorized as pre-restart. The vent fan operation concern was identified for System 30A as punchlist item 6521 and for System 30 as punchlist item 6520. TVA responded that punchlist item 6521 was outside the DBVP boundary for System 30A, and that punchlist item 6520 had been closed and implemented. However, the team determined that TVA did not intend to provide a main control room indication of vent fan operation, and had not implemented any hardware design change. This TVA statement was considered misleading; however, the team had no technical disagreement with the licensee's resolution.

(Closed) Observation 5.9 - Punchlist Item Classification

The team reviewed the disposition of punchlist items involving the auxiliary power system, the ventilation system, and the component cooling water system. Review of the punchlist items which had dispositions that were questioned by the inspectors was performed during this inspection period. Several changes were made by TVA for items listed in Observation 5.9. For those items that did not change category, adequate documentation of the rationale for the classification was presented to allow closure of this item.

(Closed) Observation 5.10 - Design Verification of Drawing Changes

The team noted a number of instances in which equipment ratings or settings determined from plant walkdowns differed from values shown on the design drawings. As a result, the team raised a concern about the apparent lack of design verification of technical characteristics by TVA before the design drawings were changed. The TVA response indicated that DNE reviews each

drawing deviation for adverse impact on plant safety, and prepares a CAQR or ECN where necessary to change the plant configuration or to revise other plant documents. In addition, DNE is involved in the resolution of any additional deviations identified by Modifications Engineering. The TVA response also discussed and dispositioned each specific punchlist item identified in the team's observation. On this basis, this item has been closed.

(Closed) Observation 5.11 SYSTER Consistency

The team identified several errors and inconsistencies in the auxiliary power and component cooling water system SYSTERs. The TVA response stated that ECN L-5298 had been readdressed in the responses to SQEP-12, Attachment 2 form, Questions 5.a and 5.3 for voltage drop and cable thermal capacity, respectively. The removal of the electrical interlock for component cooling water pump C-S breakers (ECN L-6310) has been augmented with precaution statements added as Caution Order 1461 and by a change to procedure SOI-70.1, which provide administrative control over the operation of the transfer switch. The post-restart categorization of punchlist items 7797, 8220, 8221, and 8518 have been changed to be pre-restart. Based on these TVA actions, this item has been closed.

(Open) Observation 6.16 - HVAC Flow Switch Calibration Data Records and System 30 Surveillance Instruction Procedures

The team had noted that the calibration records for HVAC flow switches 2-FS-30-200 and -207 had inconsistencies, and that these switches had not been calibrated over the 1982-1985 period. In addition, no system level surveillance instruction existed to the test the various control logic interlocks developed by these sensors.

During this inspection, the team reviewed TVA's response to the calibration data inconsistencies and found the additional information to be satisfactory. Thus, the calibration data record portion of this observation is closed.

In Section 9.4.5.4 of the Sequoyah FSAR, TVA stated that the electrical components, switchovers, and starting controls of the diesel generator building heating and ventilating systems are tested initially and periodically. Such tests have not been conducted in the past, and a TVA CAQR SQT-871016 Operability/Reportability Assessment Sheet (AI-12) stated that operations personnel verify that, in accordance with SQI-82, the appropriate fans are running when the diesels are started. This assessment concluded that this surveillance provides assurance that the HVAC system is operating properly. The team does not agree that this conclusion is correct; rather, such surveillance demonstrates only that a particular fan is running, and does not provide any information regarding starting controls or train-to-train switchover interlocks. The team believes that a surveillance instruction procedure is needed for the HVAC system to provide assurance of its operational capability and also to comply with the existing FSAR commitment.

(Open) Observation 6.17 - Diesel Generator Building Ventilating Fans Control Logic and Surveillance Instruction Procedure

The team identified inconsistencies in the drawings for the diesel generator building ventilation fans. The team was informed that TVA conducted a series of tests that confirmed the correct operation of the system in accordance with the electrical wiring diagrams. These tests also confirmed the existence of drawing errors in the mechanical control drawing and control logic diagrams. TVA indicated that the control room drawings would be corrected before restart.

TVA further stated that CAQR SQT-871016 had been initiated to resolve the discrepancy of periodic test of the HVAC system controls and electrical components; however, upon further investigation, the team learned that TVA did not intend to prepare a surveillance instruction (SI), but rather intended to eliminate the FSAR commitment for periodic test. TVA also changed the CAQR corrective action to be post-restart.

(Open) Observation 6.18 - Centrifugal Charging Pump Auxiliary Oil Pump Low Flow Bypass Switch

The team was concerned about the administrative control of a manual bypass switch added to the 6.9-kV shutdown board to permit starting of a centrifugal charging pump (CCP) without requiring the operability of the auxiliary oil pump. In the unreviewed safety question determination (USQD) for this design change (ECN L-60308), Westinghouse personnel were said to have stated that the CCP could be started several times without having the auxiliary oil pump operable. During the inspection, TVA personnel indicated that neither Pacific Pump nor Westinghouse had provided any additional documentation that would support the basis stated in the USQD.

TVA responded to this concern by stating that the addition of the manual bypass did not create a new operating condition. However, this statement appears to overlook the increased probability that the CCP will be inadvertently started one or more times without initial oil lubrication because CCPs are started so often during normal operation. Hence, this item remains open, pending receipt by TVA of documentation from Westinghouse or the pump vendor to support the USQD statement for this design change. This is a confirmatory item.

(Closed) Observation 6.19 - 480-Volt Board Room Air Handling Unit Control Logic

The team had identified a number of air handling unit fans that could be disabled by a high-temperature cutout switch set at either 85°F or 100°F. Should the temperature switches disable the ventilation fans at the time of need, this action could cause the loss of other safety-related equipment. TVA has subsequently stated that the high-temperature cutout switches would be disabled before plant restart (Reference 15). The team agrees with this commitment; hence, this item is closed.

(Open) Observation 6.20 - Preliminary DBVP Report

The team noted that a number of DBVP draft report evaluations were made from a very narrow perspective by stating the particular instances were "random events" or "isolated situations." For example, the number of similar items

labeled as random varied from 3 to 41 individual situations. The team questioned whether these random or isolated situation characterizations were valid, based on the number of situations evaluated by the DBVP.

The response provided in TVA's July 16, 1987 letter (Reference 15) did not seem to be totally responsive to the team's concern because it dealt mostly with the HVAC system. In the area of inadequate testing, TVA changed the designation to "extensive," which appeared to be more appropriate. The team had remaining questions regarding both the electrical and mechanical discipline's extensive use of the random or isolated characterization for individual items.

APPENDIX C

MEETINGS AND REFERENCES

C.1 MEETINGS

Table C.1 provides a matrix of meeting attendance and lists principal persons contacted for the meetings conducted at Cedar Bluffs, Tennessee and at Sequoyah Nuclear Plant site in Soddy Daisy, Tennessee. Other licensee personnel were also contacted. The following paragraphs summarize the general purpose of these meetings.

Meeting 1: On June 29, 1987, the NRC held an entrance meeting at the TVA offices in Cedar Bluffs, Tennessee. The DBVP System Engineers and EA Oversight Review Teams are located at Cedar Bluffs. The NRC reviewed the inspection team's plans to inspect TVA DBVP findings and corrective actions, to evaluate TVA's Engineering Assurance oversight of the DBVP, and to assess the adequacy of TVA's corrective actions for previous inspection findings.

Meeting 2: On July 2, 1987, a meeting was held at Cedar Bluffs to discuss the interim status and the results of the inspection as of this date.

Meeting 3: On July 20, 1987, a meeting was held at the Sequoyah site to review plans for the onsite inspection. The EA Oversight Review Team also provided the NRC a summary of its findings during EA's review of corrective actions for the DBVP.

Meeting 4: On July 24, 1987, the NRC held an exit meeting at the plant site to summarize the results of the inspection team's efforts.

Table C.1 - MEETINGS

Name	Organization	Title	Meeting Attended			
			1	2	3	4
REArchitzel	USNRC-IE	Team Leader	X	X	X	X
SVAthavale	USNRC-IE	NRC-Electric Power	X	X		
PEHarmon	USNRC-RII	Resident Insp., SQN	X	X	X	X
AduBouchet	NRC-Consultant	NRC-Mech. Components	X	X	X	X
FJMollerus	NRC-Consultant	NRC-Mech. Systems	X	X	X	X
AIUnsal	NRC-Consultant	NRC-Civil/Structural	X	X	X	X
LStanley	NRC-Consultant	NRC-Instr./Controls	X	X	X	X
HEBibb	NRC-RII	SRI St. Lucie	X	X		
JNevshemal	NRC-Consultant	Nuclear Engineer	X	X		
APCappozzi	TVA-DNE	Manager - EA	X	X	X	X
MPBerardi	TVA-EA	EA Oversight Adv.	X	X	X	X
RPSvarney	TVA-EA	Civil/Struct. Engr.			X	
JFCox	TVA-DNE	Asst. Proj. Eng.	X			X
BHall	TVA-ONP	Licensing-Sequoyah	X	X	X	X
JvonWeisenstein	TVA-DNE	Team Leader EA ORT	X	X	X	
EWSteinhauser	TVA-DNE	Mech. Disc. Eval. S.	X	X		
GBKirk	TVA-ONP	Comp. Lisc. Mgr.			X	X
MTTormey	TVA-DNE-S&W	Advisor	X			
DSVassallo	TVA-EA	Senior Civil/Struct. Eng.	X			
JWSemore	TVA-DNE	Elec. Engr.		X	X	
HLJones	TVA-DNE	DBVP Prog. Mgr.	X	X	X	X
PRBevil	TVA-EA	QA Specialist			X	
JBHosmer	TVA-ONP	Plant Engineer				X
RCParker	TVA-DNQA	Plant Engineer				X
HRRogers	TVA-ONP	PORS				X
WRBrock	TVA-DNE	Nuclear DES	X	X	X	
RJames	TVA-DNE	Civil DES	X	X	X	
PBNesbitt	TVA-DNE	Electrical DES	X	X	X	
JCStandifer	TVA-DNE	Staff	X			
APBianco	TVA-DNE	SQEP28 DES	X	X	X	
DLKitchel	TVA-DNE	DBVP Eng. Mgr.	X	X	X	X
RT Holliday	ONSL-KLS	Nuclear Eng.	X	X		
TCPrice	TVA-DNE	Design Basis Mgr.		X		
PKGuha	TVA-DNE	Asst. Br. Ch. - EEB		X		
JAGraziano	TVA-EA	Lead Civil DBVP		X	X	
RTucker	TVA-EA	Lead Mech. DBVP		X	X	
CHGabbard	TVA-EA	Lead Nuclear DBVP		X	X	
CCarey	TVA-DNE	NEB - Nuclear Eng.			X	
RCSaver	TVA-EA	Ops. Eng.			X	
WCrosslin	TVA-DNE	Mech. DES			X	
JHO'Dell	TVA-DNE	DBVP Plant Mgr.			X	
PHBucholz	TVA-ONP	Site Representative				X
JTLaPoint	TVA-ONP	Deputy Site Dir.				X
HAAbercrombie	TVA-ONP	Site Director				X
AMQualk	TVA-ONP	Asst. to Plant Mgr.				X
JRobinson	TVA-ONP	Asst. Mod. Mgr.				X
JRFair	NRC-OSP	[illegible]. Mech. Eng.				X
RAHerman	NRC-OSP	Chief - Eng. Br.				X
LEMartin	TVA-DNQA	Site QA Mgr.				X
TJArney	TVA-DNQA	QA Mgr. SQN				X
NCKazanas	TVA-DNQA	Director - Nuc. QA				X

C.2 REFERENCES

(1) Inspection Report 50-327/86-27 and 50-328/86-27, forwarded by J. Taylor letter dated April 22, 1986.

(2) Inspection Report 50-327/86-38 and 50-328/86-38, forwarded by J. Taylor letter dated September 15, 1986.

(3) Inspection Report 50-327/86-45 and 50-328/86-45, forwarded by J. Taylor letter dated October 31, 1986.

(4) Letter Requesting Additional Information Relating to Inspection Report 50-327/86-27 and 50-328/86-27, J. Taylor, NRC IE to C. C. Mason dated October 30, 1986.

(5) TVA Response to Inspection Report 86-27 (Gridley to Grace), dated July 28, 1986.

(6) TVA revised response to Inspection Report 86-27 (Domer to Grace), dated December 31, 1986.

(7) TVA response to Inspection Reports 86-38 and 86-45 (Domer to Taylor), dated February 3, 1987.

(8) TVA response to Inspection Report 86-55 and other Inspection Items remaining open (Gridley to Ebneter), dated April 22, 1987.

(9) Inspection Report 50-327, 328/86-55, forwarded by J. Taylor letter dated February 3, 1987.

(10) Inspection Report 50-327, 328/87-06, forwarded by S. Ebneter letter dated April 8, 1987.

(11) TVA Additional Information in Response to Inspection Report 86-27, (Domer to Taylor), dated January 30, 1987.

(12) Engineering Assurance Oversight Review Report, "Sequoyah Nuclear Plant-Unit 2 Design Baseline and Verification Program," EA-OR-001, issued April 29, 1987.

(13) Sequoyah Nuclear Plant - Design Baseline and Verification Program Unit 2 Phase 1 Report, dated May 29, 1987.

(14) Inspection Report 50-327, 328/87-14, forwarded by S. Ebneter letter dated June 4, 1987.

(15) TVA response to Inspection Report 50-327, 328/87-14 (Gridley to NRC), dated July 16, 1987.

(16) TVA revised response (Observation 5.7) to Inspection Report 50-327, 328/87-14 (Gridley to NRC), dated September 1, 1987.

(17) TVA letter relating to control and processing of changes to the punch list (Gridley to NRC), dated August 20, 1987.