ABSTRACT

The Safety Evaluation Report (SER) Sequoyah Nuclear Performance Plan, NUREG-1232, Volume 2, was based on the information submitted by the Tennessee Valley Authority (TVA) in its Sequoyah Nuclear Performance Plan (SNPP), through Revision 2, and on supporting documents. It was issued on May 18, 1988, by the U.S. Nuclear Regulatory Commission staff for the restart of Sequoyah Unit 2. The SNPP addresses the plant-specific concerns requiring resolution before startup of either of the Sequoyah units. In particular, the SER addressed required actions for Unit 2 restart.

In most cases, the programmatic aspects for Unit 1 are identical to those for Unit 2. TVA provided a description of the differences in programs between Unit 1 and Unit 2 in Revision 3 of the SNPP. This was submitted by TVA in its letter dated May 9, 1988. Where the Unit 1 program is different, the staff's evaluation is provided in this SSER which is a supplement to the staff's SER in NUREG-1232, Volume 2.

On the basis of its review, the staff concludes that Sequoyah-specific issues have been resolved to the extent that would support the restart of Sequoyah Unit 1.

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1 INTRODUCTION

On September 17, 1985, the Nuclear Regulatory Commission (NRC) Executive Director for Operations issued a letter to the Chairman of the Board of Directors of the Tennessee Valley Authority (TVA) pursuant to Title 10 of the Code of Federal Regulations Part 50.54(f) (10 CFR 50.54(f)). This letter requested information on the actions TVA was taking to resolve NRC's concerns about TVA's nuclear program. These concerns were divided into four categories: (1) corporate activities, (2) the Sequoyah Nuclear Plant (SQN), (3) the Browns Ferry Nuclear Plant and (4) the Watts Bar Nuclear Plant.

TVA's Corporate Nuclear Performance Plan (CNPP), which was prepared in response to the NRC letter, was originally submitted to the NRC on November 1, 1985. The revised plan was submitted on March 10, 1986, subsequent revisions were submitted to the NRC on July 17, July 31 and December 4, 1986, March 26 and December 10, 1987. The NRC staff Safety Evaluation on the revised CNPP, through Revision 4, was issued on July 28, 1987, as NUREG-1232, Volume 1.

In addition to its corporate plan, TVA prepared separate plans to address site-specific problems at its Sequoyah and Browns Ferry nuclear plant sites. A separate plan has yet not been submitted for the Watts Bar nuclear plant site. Volume 2 of NUREG-1232 documents the staff's evaluation of the corrective actions implemented by TVA to resolve problems at Sequoyah. In many cases, long-term corrective actions, extending beyond startup, are required to fully resolve these issues. The Sequoyah Nuclear Performance Plan (SNPP) was submitted on November 1, 1985. Revisions 1 to 3 to the plan were provided to the NRC by TVA on April 1 and July 2, 1987, and May 9, 1988, respectively. Separate staff evaluations will be issued for Browns Ferry and Watts Bar at a later date.

This Supplemental Safety Evaluation Report (SSER) is a supplement to Volume 2 of NUREG-1232. Volume 2 is the staff's evaluation of the restart of Sequoyah Unit 2. It was issued by the staff's letter dated May 13, 1988. This SSER is the staff evaluation on the restart of Sequoyah Unit 1. It is the staff's evaluation of the differences in the Unit 1 SNPP programs from the programs evaluated and approved for Unit 2. These differences were documented in TVA's letters dated March 31 and May 9, 1988 and in the meeting with the staff on April 14, 1988. The meeting summary was issued on May 4, 1988.

For Sequoyah Unit 2, TVA established a Sequoyah Task Force on March 19, 1986, to review implementation of the corrective actions applicable to Sequoyah, to initiate specific actions to address Sequoyah problems, to monitor and ensure

that a list of all known work items has been compiled, and to review the process and identification of those items required to be completed before restart of Sequoyah Units 1 and 2, which were shut down by TVA in August 1985. This task force examined the distribution of Sequoyah-related issues that had been identified by the corporate level team of industry advisors, to confirm that root causes of problems were suitably addressed. Sequoyah site-specific issues deal primarily with operations, maintenance, design control, and management system implementation. The SNPP describes the programs and activities planned by TVA to improve performance in each of these areas.

To complete its assignment, the Sequoyah Task Force developed a list of Sequoyah plant activities (except for those of a routine nature) to be completed before restart. The Sequoyah Activities List (SAL) was based on issues identified by NRC inspections, TVA quality assurance (QA) audits, American Nuclear Insurers (ANI) audits, Institute of Nuclear Power Operations (INPO) inspection reports, Sequoyah corrective action reports (CAR) and discrepancy reports (DR), TVA Nuclear Safety Review Staff (NSRS) and Nuclear Safety Review Board (NSRB) reports, employee concerns, Sequoyah reactor trip reports and licensee event reports (LERs), and technical issues identified by TVA's Division of Nuclear Engineering (DNE).

The Sequoyah Task Force established criteria (Section IV.2.0 of the SNPP) to determine which items were required to be resolved for restart. The staff reviewed and accepted these criteria by letter dated June 9, 1987. The task force reviewed the process the line organization used to identify, evaluate, disposition, and close out items and reviewed the adequacy of planned actions to be taken before Sequoyah Unit 2 restart. As new issues arose and work activities were developed, they were reviewed by Sequoyah management to determine their importance to restart. The Site Director had to approve all new items added to the restart list; however, only the Manager of the Office of Nuclear Power (ONP) (present title is Senior Vice President/Nuclear Power) could delete items that had been designated for restart.

For Unit 1, the identification and tracking of restart items are being accomplished by TVA's permanent tracking system and reporting of open items (TROI) computer system rather than by the SAL used for Unit 2. The Unit 1 restart list was developed by an item-by-item review of completed and open Unit 2 and common restart activities and of open Unit 1 issues. The criteria used to guide the line organizations in raising potential restart issues and making recommendations to management have been the same restart criteria used for Unit 2. The Site Director has designated either the Restart Director or Assistant to the Site Director to evaluate proposed new activities and ascertain that these activities meet the restart criteria.

TVA described a number of special programs to ensure integrated corrective actions dealing with problems created by deficiencies in the past conduct of activities. Section III of the original SNPP identified special programs that needed to be resolved before restart of Sequoyah Unit 2. These include programs to:

- complete the documentation and resolve electrical equipment environmental qualification questions initially raised at the time Sequoyah was shut down

- verify the adequacy, with regard to safe plant restart, of past selected safety-related design modifications keeping in mind the weaknesses in past design control programs
- reexamine cable tray support analysis for weaknesses in the analytical basis
- complete system analyses where proper design documentation did not exist in the past
- verify the adequacy of piping and supports that were not rigorously analyzed and where alternate analysis methodology has been poorly applied in the past
- resolve any differences in the effects of increased temperatures during main steam line breaks engendered by revised vendor analysis
- resolve identified areas of noncompliance with 10 CFR 50, Appendix R, fire protection requirements
- assess the adequacy of the welding program at Sequoyah, an issue raised through the employee concern program
- examine issues with regard to instrumentation sensing lines

Since the original issuance of the SNPP, TVA added other special programs to Section III of the plan. These include programs to:

- determine if a problem exists with regard to pipe wall thinning, similar to that which led to a pipe rupture at the Surry Nuclear Plant
- establish a Restart Test Program
- review replacement components and parts and resolve those that do not meet the same quality requirements as the installed equipment
- assess the adequacy of cable ampacity design calculations
- resolve cable pulling concerns such as sidewall pressure, bend radius, jamming, and vertical drop
- correct a misapplication of actuator fuses
- resolve an apparent nonconformance with 10 CFR 50, Appendix A, involving containment penetrations

There are other programs as well to consider miscellaneous civil engineering issues, moderate energy line break flooding, containment coatings, emergency core cooling system (ECCS) water loss outside the crane wall, platform thermal growth, and heat code traceability. Many of these programs are applicable to

Units 1 and 2 although actual implementation for Unit 1 may not have been completed until after Unit 2 restart.

The programs mentioned above were evaluated for Sequoyah Unit 2 in Sections 2 through 4 of the Safety Evaluation Report (SER) on the SNPP through Revision 2. This SER was issued as NUREG-1232, Volume 2, on May 18, 1988.

This SSER addresses the differences in the SNPP programs between Unit 1 and Unit 2. These differences were described in Revision 3 to the SNPP which was submitted by TVA to the staff by letter dated May 9, 1988. This SSER follows the same format as NUREG-1232, Volume 2. Where TVA has stated there are no differences, this SSER will refer to the appropriate section in the NUREG.

Another major problem area included the concerns expressed by TVA employees regarding the quality of TVA's nuclear activities. The programs relating to employee concerns are briefly described in Section 5 of this evaluation.

The NRC plans for addressing allegations is discussed in Section 6 of this evaluation.

2 ADEQUACY OF DESIGN

One of the root causes of the problems at Sequoyah was the failure to consistently document changes to the plant's design basis and to maintain the plant's configuration in accordance with that basis. TVA's efforts to strengthen its design control programs and to assess the effects of past weaknesses on the plant are discussed below.

TVA's efforts in its design control programs were evaluated for Sequoyah Unit 2, in preparation for its restart, in the staff's SER, NUREG-1232, Volume 2, on the TVA Sequoyah Nuclear Performance Plan (SNPP). This section of this SSER is on the differences in the SNPP programs for Unit 1 concerning the adequacy of design. Where there are no differences in the SNPP program from that evaluated in NUREG-1232, Volume 2, for Unit 2, the reader will be referred to the appropriate section of the NUREG. This safety evaluation is a supplement (SSER) to the NUREG. Because this SSER has essentially the same table of contents as NUREG-1232, Volume 2, the appropriate section is the same section as in this SSER.

By letters dated March 31 and May 9, 1988 and a meeting on April 14, 1988, TVA identified the differences in the SNPP programs for Unit 1 from those approved by the staff for Unit 2. The meeting summary for the April 14, 1988 meeting was issued on May 4, 1988. These programs, for the adequacy of design, are the following: design baseline and verification program (DBVP) (Section 2.2) and civil engineering design calculations (Section 2.3.2.). TVA assumed Unit 1 was in cold shutdown (Mode 5) for many electrical design calculations. These were revised by TVA before the restart of Unit 1 and are discussed in Section 2.3.3.

As with Unit 2, there are Phase II programs for DBVP, design calculations program, alternatively analyzed piping and supports, and cable tray supports for Unit 1. As discussed in NUREG-1232, Volume II, the Phase I programs are completed before the restart of the unit and the Phase II programs will be completed after restart. There have been meetings with TVA on June 22 and July 21, 1988 on Phase II programs. The meeting summaries were issued on July 1 and August 4, 1988.

The Safety System Quality Evaluation (SSQE) Inspection was conducted on the Unit 1 containment spray system (CSS) by the staff in part to audit the adequacy of the design programs for Unit 1. The SSQE was to provide additional assurance that the major programs had been properly implemented by TVA on Unit 1 and that the major design and construction problems had been identified and resolved before Unit 1 restart. The SSQE is discussed in Inspection Report (IR) 50-327/88-29 which will be issued in September 1988.

All commitments made by TVA for these programs for Units 1 and 2 are identified in the appropriate sections below. These commitments may also be stated in NUREG-1232, Volume 2.

2.1 Plant Modification and Design Control

TVA did not identify any differences in the Unit 2 program for Unit 1. The staff's evaluation of this program for Unit 2 is in Section 2.1.2 of NUREG-1232, Volume 2. The conclusions of the staff are from this SER. The DBVP and calculations review programs are discussed in Sections 2.2 and 2.3 below, respectively.

TVA's improved design change control program will be implemented in two phases for current and future plant modifications.

The first phase was to be implemented before restart of Unit 2 and included a change control board and a transitional design control system. This process requires that design changes that are to be implemented be contained in complete packages specific to the appropriate unit. This will facilitate the reviews required to ensure that each change has been quality engineered, that it can be installed and tested, and that documentation and safety analyses are complete and based on actual plant configuration. A task engineer was assigned to coordinate these efforts.

The second phase in the development of the improved design control program is to establish a permanent design control system based on the plant modification package concept. A procedure will be developed to ensure a comprehensive and focused evaluation of modifications and proper implementation and follow through. Enhanced aspects of this program include the use of the actual plant configuration for design, updated design criteria, accurate reflection of the modification in licensing documents, and an integrated, project-oriented approach to handle changes to the plant, as opposed to the fragmented work-plan approach used in the past.

In its December 11, 1986 letter, TVA committed to consolidation of the "as-constructed" and "as-designed" information on DBVP primary drawings before the end of the second refueling outage (Cycle 4) after restart of Unit 2. The staff finds this commitment acceptable because (1) the first refueling is presently planned for several months after restart and (2) in the interim, the actual configuration will be depicted on marked-up drawings available for engineering and operational purposes.

By letter dated December 15, 1987, TVA stated that Division of Nuclear Engineering procedures, which were needed to establish the process for preparing Sequoyah implementing procedures, have been implemented. Site level procedures and training were completed by March 31, 1988.

TVA has not committed to implement a single drawing system for drawings other than DBVP drawings which are used by operations to operate the plant (primary drawings such as P&IDs). Other drawings will apparently be produced only as needed to support modifications. The staff believes that a more comprehensive approach, which includes scheduling details and identification of all other drawings to be maintained as configured, is needed. In a letter dated April 1, 1987(a), TVA stated that the details regarding comprehensive scheduling of drawings to be maintained as-configured is still being developed. The staff considers this item to be a post-restart issue for both Units 1 and 2.

On the basis of the findings as documented in NUREG-1232, Volume 2, the staff concludes that TVA has taken the appropriate steps to correct design control problems at Sequoyah for the restart of Unit 1. The staff will review the transitional design control system during its review of the Phase II portion of the DBVP. The staff's evaluation of the DBVP is given in Section 2.2 below.

2.2 Design Baseline and Verification Program

2.2.1 Introduction

TVA's special design baseline and verification program (DBVP) to assess the effect of past weaknesses in design and configuration control and to identify any corrective actions that may be required is addressed in SNPP Section III.2. The DBVP is discussed in Section 2.2 of NUREG-1232, Volume 2. The intent of this program is to provide additional confidence that the plant meets its original licensing basis.

TVA identified differences in the Unit 1 DBVP program from that for Unit 2. These differences are evaluated below.

2.2.2 Evaluation

TVA submitted the SNPP to the NRC on November 1, 1985. Revisions 1 and 2 to the plan were provided to the NRC on April 1 and July 1, 1987 respectively. Although the SNPP was primarily directed at problems identified at Sequoyah Unit 2, some of the programs were also applicable to Sequoyah Unit 1. The staff safety evaluation of the SNPP through Revision 2 is contained in NUREG-1232, Volume 2.

TVA submitted Revision 3 to the SNPP to the NRC on May 9, 1988 and provided a description of Sequoyah Unit 1 startup programs that are different from the Unit 2 programs. The Sequoyah DBVP was identified as a program area where differences exist between Unit 1 and Unit 2. The differences identified were: (1) the Unit 1 DBVP takes credit for reviews already done under the Unit 2 program and (2) responsibility for the review of testing has been transferred to TVA's restart test program.

TVA's DBVP was developed to assess the effect of past weaknesses in design and configuration control at Sequoyah and to identify required corrective actions. The Unit 1 DBVP program is described in Section III, Part 2 of the SNPP. The Unit 1 program includes (1) verifying and establishing the plant functional configuration, (2) reconstructing the design basis, (3) reviewing and evaluating modifications since the operating license was issued against the design basis, and (4) performing the modifications developed from this review.

The Unit 1 DBVP was initially described in TVA's March 31, 1988 submittal on the Unit 1 restart plan. The Unit 1 DBVP is being implemented in two phases. The pre-restart phase addresses the Unit 1 portion of the systems required to mitigate accidents addressed in Chapter 15 of the Final Safety Analysis Report (FSAR) and systems required to provide safe shutdown. The post-restart phase continues engineering activities within the pre-restart phase that TVA considered not essential to safe restart but are necessary to address identified design control problems. TVA used the staff approved restart criteria to

decide what was essential for safe restart. The post-restart phase will also include other safety-related systems.

TVA defined the scope of the post-restart (Phase II) portion of the DBVP in a May 12, 1987 letter. The staff has not completed its review of the Phase II program; however, this review by the staff is not essential to issuing an SER that addresses the acceptability of TVA's programs to support restart of Sequoyah Units 1 and 2. An evaluation of the Phase II program will be issued by the staff at a later date.

Scope of Pre-Restart Phase

The scope of the Unit 1 pre-restart phase of the DBVP as described in Revision 3 of the SNPP is identical to the scope of the Unit 2 program. The staff review and acceptance of the Unit 2 pre-restart phase of the DBVP is documented in Section 2.2.2 of NUREG-1232, Vol. 2. Based on the staff's previous review and acceptance of the Unit 2 pre-restart scope, the staff concludes that the same scope and system selection for Unit 1 is acceptable.

Unit 1 and Unit 2 Program Differences

Revision 3 of the SNPP identified two program differences between the Unit 1 and Unit 2 DBVP: (1) the Unit 1 program takes credit for reviews that had been performed under the Unit 2 program and (2) responsibility for the review of testing has been transferred to the restart test program. The first item is acceptable to the staff provided TVA identifies and evaluates all areas of the Unit 2 program reviews where Unit 1 differences exist.

During the Unit 2 DBVP, functional test requirements were identified by the DBVP and provided to the restart test program. For Unit 1, the functional test requirements will be evaluated by the restart test program and the results accepted by the DBVP. TVA's EA performed an assessment of the management controls established for the conduct of Unit 1 restart testing. Based on its review, EA supported the DBVP plan to accept the results of the restart test program to satisfy the functional test requirements. The staff considers TVA's plan to transfer responsibility for the review of testing to the restart test program acceptable. The staff evaluation of the restart test program is contained in Section 4.9.

During a meeting with TVA on July 21, 1988, the staff identified two areas of the Unit 1 program description for system evaluations and corrective actions that were different from the Unit 2 program description. TVA stated that these areas were identical for both units and committed to provide a revision to the Unit 1 program description to clarify these items.

2.2.3 TVA Independent Oversight Review

As an integral part of the DBVP, TVA's Engineering Assurance (EA) group of the Division of Nuclear Engineering performed an independent oversight review of the DBVP. An in-depth description of the independent oversight review process and its results for Unit 1 is contained in TVA Report EA-OP-003, "Engineering Assurance Oversight Report, SQN Unit 1 DBVP," dated June 27, 1988. The objectives of this independent review are the same for Unit 1 as the objectives were for Unit 2.

In an effort to gain further confidence in TVA's DBVP and in particular the independent oversight activities of the EA organization relating to this DBVP, the NRC staff has reviewed a sample of five supporting back-up data packages. These documents address the results of the Engineering Assurance oversight review efforts including an independent evaluation and verification of actions to correct and close-out outstanding issues. This review was in addition to the NRC inspections of TVA's DBVP (Reference Inspection Reports 50-327, 328/86-38, -45 and -55, 50-327, 328/87-14 and -31) which also assessed the effectiveness of the EA oversight effort.

The five data packages [Action Items C28 and C40 (Observation C6), E25 (Observation E6), F65 (Observation E3), E91 (Observation E14) and O-12 (Observation O2)] consisted of results of analysis reviews and verifications by the DNE and the EA organizations which support the action items/observations in the EA Reports EA-OR-001 and EA-OR-001S. As a result of reviewing each of the five packages, the staff found that the EA organization was actively and effectively involved in evaluating and reviewing the DNE DBVP efforts and in assessing and verifying the findings, corrective actions and close-out of these packages. Further, the staff concludes that the restart open issues previously reported in EA-OR-001 and -001S have been adequately resolved and closed out.

Of particular interest has been the resolution of Action Item 012 (Observation 2). This action item resulted from a design deficiency identified in CAQR 86-03-012 and pertains to: A. design criteria not being maintained; B. design calculations not being maintained; and C. plant configuration (as-built) design documents being different from FSAR commitments.

In regard to Part A, Engineering Assurance has verified that all Sequoyah Unit 2 design criteria are complete with the issuance of the restart design basis document (RDBD). All post-restart design criteria development is committed to be completed by June 1, 1989. This latter issue is a post-restart open item. In regard to Part B, Engineering Assurance has verified that DNE has adequately reviewed all safety-related calculations to ensure they are technically adequate and up-to-date and that a cross-reference information system has been established to maintain accountability of the status of calculations against pertinent documents, drawings and other calculations. All issues in Part B are, therefore, closed.

The deficiency and corrective action associated with Part C was transferred to a separate corrective action report SQ-CAR-86-04-021. The corrective action requires that the FSAR be updated and verified to the current design and as-built conditions. The schedule for completion of this action in is April 1989. This issue remains open.

The restart open issues previously reported in EA-OR-001 and -001S have been adequately resolved and closed out.

The staff will verify that all committed post-restart design criteria are completed by June 1989. The staff will also verify the completion of corrective action report SQ-CAR-86-04-021 by April 1989. In the process of completing these actions, the resolution of design deficiencies will involve consideration of unreviewed safety questions pursuant to 10 CFR 50.59 as appropriate.

Based on the above and the staff's previous review of the program and its implementation on Unit 2, the staff concludes that the EA program for Unit 1 is acceptable.

2.2.4 Conclusions

TVA initiated the DBVP and EA independent oversight review as part of its effort to correct past design control deficiencies identified by employee concerns and design control reviews. This program was extensively reviewed and inspected prior to Sequoyah Unit 2 restart. The staff concludes that the same program with the modifications discussed above is sufficient to correct design control problems at Sequoyah Unit 1 and that once the defined corrective actions are completed, the plant will conform to its licensing basis.

In a phone conference call with TVA on September 16, 1988, TVA stated that the DNE review board has been disbanded and was not included in the Unit 1 Phase I DBVP. This board was used in the Unit 2 Phase I DBVP. In the meeting of July 21, 1988 on Phase II DBVP, TVA stated that this board would also be used in the Unit 1 Phase I DBVP. The meeting summary was issued on August 4, 1988. In further telephone conference calls on this difference between Unit 1 and Unit 2 DBVP, TVA stated that it would submit justification for not needing this board in the Unit 1 Phase I DBVP. This justification will be submitted by September 30, 1988 before entry of Unit 1 into Mode 2. The staff will complete its evaluation of the Unit 1 DBVP without the use of the DNE review board before it approves entry of Unit 1 into Mode 2.

Based on the inspections on Unit 2 and the SSOE inspection on the Unit 1 CSS, the staff concludes that Phase I of the DBVP has been sufficiently implemented for Unit 1 to heatup and enter Modes 4 and 3. The Unit 2 inspections are discussed in Section 2.2 of NUREG-1232, Volume 2. The staff will review the transitional design control system during its review of the Phase II portion of the DBVP.

2.3 Design Calculations Program

TVA and the NRC have conducted several reviews in the past that have shown inadequate documentation of the calculations supporting the design basis for TVA's nuclear plants. Calculations were determined to be missing, incomplete, or outdated. TVA's engineering disciplines (nuclear, mechanical, civil, and electrical) have each developed programs to resolve these problems. These efforts include (1) identifying essential calculations; (2) verifying the existence of, or regenerating, essential calculations; (3) ensuring the technical adequacy of these calculations; and (4) ensuring the calculations are current.

Essential calculations are those which address existing plant systems or features whose failure could (1) result in a loss of integrity of the reactor coolant system, (2) result in the loss of ability to place the plant in a safe shutdown condition, or (3) result in a release of radioactivity off site in excess of a significant fraction of the 10 CFR 100 guidelines.

The calculations review efforts for the engineering disciplines is discussed in detail in Section 2.3 of NUREG-1232, Volume 2. The following sections discuss and evaluate the identified differences in the TVA design calculation program for Unit 1.

2.3.1 Nuclear and Mechanical Calculations

The nuclear and mechanical calculation review program for Unit 2 was described in Section III.4.2 and III.4.3 of the SNPP. TVA did not identify any differences in the programs for Units 1 and 2. Based on Section 2.3.1 of NUREG-1232, Volume 2, the staff concludes that the nuclear and mechanical engineering calculation review effort has been adequately defined and implemented to identify the necessary essential calculations for the operation of Sequoyah; that the technical adequacy of the calculations has been adequately demonstrated; and that necessary corrective actions are being scheduled in accordance with the staff approved restart criteria. Therefore, the staff finds the TVA actions for resolution of nuclear and mechanical calculations concerns acceptable for the restart of Unit 1.

2.3.2 Civil Calculations

2.3.2.1 Introduction

The civil calculation review program for Sequoyah Unit 2 was described in Section III.4.4 of Revision 1 to the SNPP. The scope of the civil calculation review plan was described in greater detail in TVA submittals to the NRC on July 21, 1987 (Gridley) and August 21, 1987 (Gridley). The staff safety evaluation of the SNPP through Revision 2 is contained in NUREG-1232, Volume 2.

TVA submitted Revision 3 to the SNPP to the NRC on May 9, 1988. Part 2 of Revision 3 provided a description of Sequoyah Unit 1 start-up programs that are different from the Unit 2 programs. The Sequoyah civil engineering program was identified as a program area where differences exist between Unit 1 and Unit 2. The difference identified was that TVA would submit a final report on Inspection and Enforcement (IE) Bulletin 79-14 for Unit 1. IE Bulletin 79-14 had been completed by TVA on Sequoyah Unit 2; however, the bulletin was still considered open by TVA on Unit 1.

TVA originally identified concerns with IE Bulletin 79-14 in Section III.15.1 of the SNPP under the heading of miscellaneous civil engineering issues. The staff's evaluation of this topic was contained in Section 2.7 of NUREG-1232, Volume 2. TVA had also covered the topic of piping and supports in the civil calculation program in Section III.4.4 of the SNPP. The staff evaluation of the civil calculation program was contained in Section 2.3.2 of NUREG-1232, Volume 2. For Sequoyah Unit 1, TVA combined the discussions of IE Bulletin 79-14 and the pipe support calculation effort under the heading of civil engineering program in Revision 3 to the SNPP.

2.3.2.2 Discussion

The Unit 1 civil engineering program was initially described in TVA's March 31, 1988 submittal on the Unit 1 restart plan. The TVA submittal identified that the Unit 1 civil engineering program was essentially the same as the Unit 2 program with the exception that a final report would be submitted on IE Bulletin 79-14 for Unit 1. The Unit 1 IE Bulletin 79-14 implementation had been addressed by an employee concern report (EN 21202). EN 21202 identified that discrepancies existed with previous TVA pipe support inspections on Unit 1 and that TVA initiated a pipe support enhancement program as a corrective action.

In a meeting with the staff on April 14, 1988 (Meeting Summary dated May 4, 1988), TVA presented additional details on the program scope of the IE Bulletin 79-14 and pipe support calculation efforts. In addition TVA stated it would use the same criteria for determining required restart modifications for Unit 1 that was used for Unit 2. TVA submitted the results of this IE Bulletin 79-14 evaluation in a letter dated August 4, 1988 (Gridley).

IE Bulletin 79-14 requires that licensees verify that the seismic analysis of piping applies to the actual configuration of the plant. As a result of concerns raised by the original NRC inspections of TVA's IE Bulletin 79-14 program at Sequoyah Unit 1, TVA initiated a sampling inspection program. As part of this program, 80 piping isometrics inside the containment were inspected using Special Maintenance Instruction MI-6.17. In December 1985 and February 1986 TVA's quality assurance staff identified weaknesses in the MI-6.17 walkdowns and, as a result, two Corrective Action Reports (CARs) were issued. In response to the CARs, TVA performed additional inspections of the 80 piping isometrics to Special Maintenance Instruction SMI-1-317-24 (SMI-24). This program was reviewed by the employee concerns program (EN 21202). The employee concerns report found the Sequoyah Unit 1 program had been substantially improved to correct past deficiencies and concluded that no further corrective action was required.

In its August 4, 1988 submittal, TVA identified a more comprehensive program for the evaluation of rigorously analyzed piping at Sequoyah Unit 1. This program included the evaluation of all open items that had been identified from previous programs against the piping analysis and support designs, and the upgrading of the support calculations to the new design criteria SQN-DC-V-24.2. The scope included 162 piping analyses and approximately 2900 piping supports.

TVA developed Special Maintenance Instruction SMI-0-317-69 (SMI-69) to control the collection of additional as-built data for the Unit 1 rigorously analyzed piping. In its submittal, TVA identified that approximately one-third of the pipe supports and all but six piping isometrics were inspected to SMI-69. SMI-69 contained requirements for as-built dimensioning of piping that had not been obtained by some of TVA's previous walkdowns.

TVA used the criteria in SQN-DC-V-24.2 to evaluate supports and CEB-CI-21.89 to identify the required restart modifications. TVA identified that 373 modifications were required to meet the criteria in SQN-DC-V-24.2 and 179 restart modifications were required to meet the criteria in CEB-CI-21.89.

TVA's submittal also identified that the closure of IE Bulletin 79-14 for Unit 1 rigorously analyzed piping in common plant areas was based on TVA's original inspections supplemented by the additional SMI-24 inspections. TVA also identified that the common area supports had been previously evaluated by the Unit 2 calculation program which included a functional verification inspection per CEB-CI 21.83. In addition to the rigorously analyzed piping, TVA identified that alternately analyzed piping within the scope of IE Bulletin 79-14 had been addressed by the Sequoyah alternate analysis program. This program had been previously described in Section III.5.0 of the SNPP.

2.3.2.3 Evaluation

TVA's civil calculation program for Sequoyah Unit 2 as described in Section III.4.4 of the SNPP involved the identification of essential calculations, verification of retrievability, regeneration of missing essential calcu-lations and verification of the technical adequacy of existing calculations. The Unit 2 civil calculation program was extensively audited by NRC calculation program inspections and the NRC integrated design inspections. The staff's evaluation of the Unit 2 program is contained in NUREG-1232, Volume 2.

Revision 3 of the SNPP identified that the Unit 1 program was essentially the same as the Unit 2 program except a final report on IE Bulletin 79-14 would be issued. During the review of civil engineering calculations, TVA determined that a large number of rigorously analyzed pipe support calculations were not retrievable. The Sequoyah Unit 1 program combines the regeneration of the pipe support calculations with the resolution of IE Bulletin 79-14. The Unit 1 pro-gram scope for rigorously analyzed pipe supports as described by TVA is more comprehensive than the Unit 2 program since additional detailed walkdowns were performed for Unit 1. Based on the staff's previous review of the Unit 2 program, the same program for Unit 1 with the addition of a final report on IE Bulletin 79-14 is acceptable.

TVA identified that it did not use the upgraded (SMI-69) IE-Bulletin 79-14 walkdowns for common areas where the supports had been previously evaluated by the Unit 2 program or for piping covered by the alternate analysis program. The supports in Unit 1 common areas had been functionally verified during the Unit 2 pipe support calculation effort. In addition, the NRC's integrated design inspection of the essential raw cooling water system had performed as built inspections of the common area for Unit 2. TVA's alternate analysis program procedures for piping inspections had been previously reviewed and the staff's evaluation is contained in Section 2.4 of NUREG-1232, Volume 2. Based on the staff's previous acceptance of the Unit 2 piping and support evaluations and the Unit 2 alternate analysis program, the same programs applied to Unit 1 are also acceptable.

TVA identified that it used the same criteria for Unit 1 to evaluate rigorously analyzed pipe supports that had been used for Unit 2. The staff's evaluation of these criteria is contained in Section 2.3.2 of NUREG-1232, Volume 2. The staff evaluation of SQN-DC-V-24.2 determined that the criteria were acceptable for restart, and that the staff would be performing additional evaluations of the standard component supports as a post-restart effort. The staff evaluation of CEB-CI-21.89 approved the criteria with certain restrictions in a letter to TVA dated February 23, 1988. In addition, the staff identified several concerns with TVA's implementation of the pipe support criteria for Unit 2 in Inspection Report 50-327, 328/88-12. TVA's resolution of these inspection items is also applicable to Unit 1. All supports must satisfy the restart criteria as accepted by the staff before the restart of Sequoyah Unit 1; the present schedule for compliance with the long-term criteria is the end of cycle 4 for Unit 1 (August 4, 1988 submittal). TVA's use of the same criteria, as accepted by the staff, for Unit 1 that was used for Unit 2 is acceptable.

TVA's implementation of IE Bulletin 79-14 for Unit 1 has been reviewed by several NRC inspections. The NRC's original inspections identified concerns with TVA's IE Bulletin 79-14 program on Unit 1. TVA's subsequent corrective actions were reviewed in Inspection Report 50-327, 328/85-49. The inspection

report identified several pipe support discrepancies and TVA was cited with a violation. Inspection Report 50-327, 328/86-16 identified additional discrepancies in a follow-up inspection. Inspection Report 50-327, 328/86-55 closed the violation from Inspection Report 85-49. The inspection report also contained a review of the work being performed under Special Maintenance Instruction SMI-1-317-24. The inspection report did not identify any violations or deviations. The staff also performed a Safety System Quality Evaluation inspection of the Unit 1 Containment Spray System. This inspection included a sample review of pipe support calculations and pipe support as-built configuration. In addition to these inspections the NRC conducted a special as built inspection of the essential raw cooling water system, Inspection Report 50-327, 328/87-52 which covered the Unit 1 and Unit 2 common plant piping. Based on inspections performed by the staff of IE Bulletin 79-14, review of TVA's implementation of the bulletin by the employee concerns program and TVA's additional inspections using SMI-69 the staff concludes that TVA's IE Bulletin 79-14 program for Unit 1 is adequate to verify the as-built piping configuration. The staff plans to document the final close out of the bulletin for Sequoyah Unit 1 after the restart of Unit 1.

2.3.2.4 Conclusions

TVA initiated a civil calculation program to assess the adequacy of existing civil calculations and regenerate missing calculations. This program was extensively reviewed and inspected prior to Sequoyah Unit 2 restart. The staff concludes that the same program with the additional as-built verification performed for Sequoyah Unit 1 is acceptable for restart.

2.3.3 Electrical Calculations

The electrical calculation review program is described in Section III.4.1 of the SNPP. The TVA electrical calculation review program is divided into two phases. Phase I for each unit is to be completed before plant restart of that unit and covers the essential minimum set electrical calculations needed for restart. Phase II covers the remaining electrical calculations and will be completed after plant restart. The staff notes that TVA has committed to expand and formalize its calculation control program over the long-term to cover all calculations, not just those identified as the essential minimum set. The staff relies on this commitment as the most effective means to assure that TVA's electrical calculations required to assure safety are maintained in the acceptable condition that the present program has established.

The staff has evaluated the restart electrical design calculations for Unit 2 in Section 2.3.3 of NUREG-1232, Volume 2. The staff concluded in its evaluation that there was reasonable reassurance that electrical systems are adequate for the safe restart and operation of Unit 2.

In NUREG-1232, Volume 2, the staff's conclusion on the general adequacy of the electrical calculation program for Unit 2 did not extend to Unit 1 restart because of the following reasons

(1) A number of calculations do not assume two unit operation and require upgrading to support Unit 1 operation.

(2) A number of deficiencies identified as required for restart have been completed for Unit 2 but not for Unit 1.

TVA provided information on the restart electrical design calculations for Unit 1 in its submittals dated August 4 and 11, 1988. TVA stated in its letters that to demonstrate the adequacy of the electrical calculations program for Unit 1 restart, it is both necessary and sufficient to demonstrate that the above two staff concerns have been fully addressed. TVA stated that this is being accomplished by documenting that:

- all Unit 1 specific essential minimum set calculations have been issued and that all calculations that assume Unit 1 in Mode 5 have been revised to adequately address two-unit operation, and

- all deficiencies applicable to Unit 1 restart have been resolved or are presently scheduled for completion before restart of the unit.

The staff has reviewed these submittals and concluded that TVA has not provided sufficient detail for the staff to conclude that there is reasonable assurance that the electrical systems addressed will provide for the safe restart and operation of Unit 1. TVA provided this detail by letter dated September 15, 1988. The staff has not completed its review of this information.

Lastly, there are a number of deficiencies designated to be corrected after restart and there are a number of long-term programs TVA has committed to undertake after restart. These are listed in the various documents cited in Section 2.3.3.1 of NUREG-1232, Volume 2. Expeditious completion of these long term commitments was assumed in the staff's evaluation of the adequacy of the TVA electrical calculations program for Unit 2.

Because Unit 1 has been in Mode 5 (Cold Shutdown) since 1985, there is little decay heat in the core. Therefore, the staff concludes that TVA's submittals provide the reasonable assurance for Unit 1 to enter Mode 4 (Hot Shutdown) and Mode 3 (Hot Standby) before the staff completes its evaluation of the restart electrical design calculations. The staff will complete its evaluation of these calculation before it approves entry of Unit 1 into Mode 2 and criticality for the reactor core.

2.3.4 Branch Technical Position PSB-1

The staff's evaluation of Unit 2 against Branch Technical Position (BTP) PSB-1, is given in Section 2.3.4 of NUREG-1232, Volume 2. The staff concluded that Unit 2 acceptably met the BTP.

The staff will be evaluating Unit 1 against the BTP PSB-1 as part of its evaluation of the Unit 1 electrical design calculations. This is discussed in Section 2.3.3 above. The staff will complete its evaluation before it approves entry of Unit 1 into Mode 2.

2.4 Alternately Analyzed Piping and Supports

SNPP Section III.6 describes a TVA program to verify the adequacy of piping and pipe supports that had been installed and qualified by alternate analysis (AA) criteria. TVA's AA criteria use general criteria and guidelines to locate supports in lieu of rigorous piping analysis. This is discussed in Section 2.4 of NUREG-1232, Volume 2.

TVA is conducting a two-phase program to resolve the concerns on the Category I (safety class) AA piping systems. TVA provided a description of the Phase I program activities in Section III.5.2.1 of the SNPP. The scope of the Phase I program includes those systems required to mitigate events addressed in FSAR Chapter 15 and safely shut down the plant. This scope is consistent with the scope of Phase I of the Design Baseline Verification Program. The Phase I review effort involved screening of AA piping systems for specific deficiencies that had been identified in TVA's AA program as discussed earlier. The Phase I scope is evaluated in Section 2.4.2 of NUREG-1232, Volume 2.

The staff evaluation of restart program implementation was based on an audit of the Unit 2 program. On the basis of this audit, the staff concluded that TVA had adequately defined and was adequately implementing a program to ensure that short-term safety concerns would be identified, evaluated, and resolved before Unit 1 restart. TVA was unable to provide the basis for the deflection criteria that ensure that pipe supports are rigid. In a letter dated January 28, 1987, TVA stated it will perform an evaluation during the long-term program to justify the adequacy of the criteria. This was acceptable to the staff.

TVA, in a letter dated August 18, 1986, defined a set of interim acceptance criteria for evaluating piping and pipe supports in the restart program. TVA originally defined the proposed interim criteria in terms of exceptions to FSAR commitments. These exceptions and the staff's acceptance of them are listed in Section 2.4.2 of NUREG-1232, Volume 2. In addition, TVA proposed criteria for support evaluations taken from Section 3.8.4 of the current NRC Standard Review Plan and from Subsection NF of Section III of the American Society of Mechanical Engineers (ASME) Code. These criteria are not in accordance with the Sequoyah FSAR; nonetheless, the use of these criteria on an interim basis is acceptable to the staff. However, the long-term program should use the criteria that meet the commitments in the FSAR.

TVA discussed the scope and activities of the Phase II effort in Section 5.2.2 of the SNPP. This is evaluated in Section 2.4.2 of NUREG-1232, Volume 2. Phase II will evaluate the remaining Category I AA safety class piping systems not required for restart for the areas of concern identified in the Phase I program. Phase II also will address instrument lines and their supports. The acceptance criteria for Phase II will be TVA's established design criteria for piping and supports. TVA presented the scope and the schedule for Phase II in a letter dated April 8, 1987. In addition to the deficiencies evaluated in the Phase I program, TVA also will address the areas of concern listed below in the Phase II program.

- consideration of thermal flexibility analyses for piping systems with operating temperatures between 120°F and 200°F
- consideration of the interface between AA piping and deadweight supported piping for pipe sizes less than or equal to 2 inches in nominal diameter
- consideration of the effects of long piping runs and large concentrated weights

As discussed in Section 2.4.2 of NUREG-1232, Volume 2, the staff concludes that TVA has defined an adequate program for resolution of short-term safety

concerns required for plant restart. On the basis of its audit of sample design packages and a field inspection of sample Unit 2 piping systems, the staff found that the program was adequately implemented. The staff concludes that completion of the Phase I program for Units 1 and 2 will provide confidence that sufficient safety margins exist--in the design of AA piping/support systems required to mitigate FSAR Chapter 15 events and safely shut down the plant--to allow Unit 1 to restart.

2.5 Cable Tray Supports

TVA's original design criteria for cable tray supports were developed between 1972 and 1974. Although these design criteria included the effects of earthquakes, they did not consider the effects of design-basis accidents (DBA). In 1975, TVA revised the original design criteria to include the DBA loads, but the original designs were never reviewed to ensure that they complied with the revised criteria. This deficiency affected only the cable tray supports attached to the steel containment vessel (SCV); however, other deficiencies found in 1984 and 1986 dictated a thorough review of the adequacy of all the cable tray supports. During that review, TVA discovered that the existing cable tray supports could not satisfy the basic commitments made in the FSAR. At a meeting on July 17 and 18, 1986, TVA proposed a set of interim acceptance criteria for cable tray supports that were less stringent than those in the FSAR. As a part of its request, TVA also committed to restore the original FSAR criteria for the affected cable tray supports in an orderly manner after restart.

2.5.1 Interim Acceptance Criteria

2.5.1.1 Evaluation

The staff's evaluation of the interim acceptance criteria proposed by TVA is given in Section 2.5.1.1 of NUREG-1232, Volume 2. The conclusions of the staff apply to Unit 1 and are given below.

(1) Damping

TVA proposed to use 7 percent of critical damping for the cable tray for the safe-shutdown earthquake and design-basis accident (SSE/DBA) loading, as compared with the 5 percent allowed in the FSAR. For restart of Unit 1, the 7 percent damping proposed by TVA for DBA/SSE loading is acceptable to the staff.

(2) DBA/SSE Load Combination

In the FSAR, TVA committed to use the absolute sum combination of SSE and DBA loading effects. TVA now proposes to use the square root of the sum of the squares (SRSS) combination for the interim acceptance criteria. The staff finds the SRSS method a reasonable load combination approach for Unit 1 restart and it is acceptable.

(3) Elimination of 1/2 SSE Load Case

In the FSAR, TVA commits to considering the SSE and 1/2 SSE loads. TVA now proposes to use the SSE loading only for the interim acceptance criteria. The

proposed elimination of 1/2 SSE case is acceptable to the staff on an interim basis.

(4) Allowable Stresses

In the FSAR, TVA makes a commitment that the cable tray support stresses be less than 0.9 times the yield strength for SSE/DBA loading. TVA now proposes to change this requirement to 1.7 times the American Institute of Steel Construction (AISC) allowables for SSE plus DBA loading, and 1.6 times the AISC allowables for the SSE alone. The criteria proposed by TVA for cable tray support calculations are acceptable.

2.5.1.2 Implementation of Interim Criteria

The staff's evaluation of the implementation by TVA of the interim criteria is given in Section 2.5.1.2 of NUREG-1232, Volume 2. The conclusions of the staff apply to Unit 1 and are given below.

(1) Cable Tray Supports Attached to Steel Containment Vessel

The re-evaluation of supports attached to the steel containment vessel was required to resolve Nonconformance Report (NCR) SCNCER 8414. The NCR addressed the fact that the cable tray supports on the steel containment vessel were not designed for DBA loadings. The staff concluded that methods used in re-evaluating the SCV cable tray supports were adequate and that the interim acceptance criteria were appropriately implemented to qualify the supports for the restart of Unit 1.

(2) Cable Tray supports on the Reactor Building Shield Wall

Many cable trays located in the annulus between the SCV and the shield wall are supported from the shield wall. The staff concluded that TVA has demonstrated that each cable tray support attached to the shield wall had sufficient capacity to meet the interim criteria for the SSE load condition.

(3) All Other Cable Tray Supports

There are 2900 cable tray supports in Category I structures (excluding the steel containment building and the reactor building shield wall). Most of these are in the auxiliary building (1700) and the control building (850). The staff concluded that the program conducted by TVA for qualification of these cable tray brackets and supports was adequate and acceptable for Unit 1 restart.

2.5.1.3 Anchoring in Concrete

This discussion applies to supports that are anchored in concrete by means of base plates, anchor bolts, and embedded plates. This is evaluated in Section 2.5.1.3 of NUREG-1232, Volume 2.

In the Phase II design qualification work, TVA proposed to upgrade the minimum safety factors for self-drilling (SSD) and wedge (WB) type expansion bolts to 2.8 and 2.5, respectively. After reviewing TVA's proposal, the staff concluded that TVA should use, as a minimum, the original FSAR design criterion requiring

2.5 for WB and 2.8 for SSD as safety factors for the interim period and for the long-term effort, TVA should determine the actual safety factors and evaluate them against the requirements of IE Bulletin 79-02.

TVA, in its submittal of January 14, 1987, committed to the interim criteria proposed by the staff; therefore, this is acceptable.

2.5.1.4 Base Plate Analysis

The staff's evaluation is in Section 2.5.1.4 of NUREG-1232, Volume 2. The staff concluded that the modeling and analysis of base plates are acceptable.

2.5.1.5 Concrete

The resolution of this issue is discussed in Section 2.6 of this report.

2.5.1.6 Confirmatory Items

The staff identified ten confirmatory items in Section 2.5.1.6 of NUREG-1232, Volume 2. These items were identified during the audit of September 29 through October 3, 1986, and were required to be resolved by TVA before restart of a unit.

From reviewing the information provided in TVA submittals dated January 14, and February 4, 1987, the staff concluded that TVA had taken proper corrective action for the above ten confirmatory items and that this is acceptable for Units 1 and 2 restart. TVA conducted a test for the wedge bolt anchor in the area of the cracked concrete in accordance with TVA Construction Specifications and found that no degradation of the base plate anchor was observed. Based on an engineering judgment, this is considered to be acceptable for restart. However, an audit of the above items, including the cracked concrete, will be conducted following restart of the plant.

2.5.1.7 Conclusion

The staff concluded that the interim acceptance criteria proposed by TVA for Sequoyah Units 1 and 2 restart, as modified in accordance with this report, are acceptable for the restart of both units.

2.5.2 Diesel Generator Building Supports Analysis

As discussed in Section 2.5.2 of NUREG-1232, Volume 2, TVA has evaluated all cable tray support calculations in the diesel generator building and the additional diesel generator building for a failure to take the effect of zero period acceleration (ZPA) into account. In those instances where the originally calculated acceleration was less than the ZPA, the ZPA was applied in the re-analysis. Results of the re-analysis indicate that the existing cable tray supports are still able to serve their intended function during a seismic event. Therefore, on the basis of its inspection and its review of the information presented by TVA, the staff finds that no structural modifications are required.

2.5.3 Cable Tray Support Base Plate Installations

Sixteen base plates (eight per unit) for the cable tray supports in the auxiliary building were improperly installed in that every hole in the base plates was drilled per the engineering drawing with a diameter 3/8 inch larger than specified by TVA procedures.

Based on its evaluation in Section 2.5.3 of NUREG-1232, Volume 2, the staff concludes that TVA has completed all the necessary corrective actions regarding the base plate installation deficiencies. As a result, the modified connections are judged to be able to serve their intended function as required by the design. On this basis and its review of Section III.3 of the SNPP, the staff finds the issue of oversize holes in the base plate has been acceptably resolved for both Units 1 and 2.

2.6 Concrete Quality

The TVA evaluation of Employee Concern IN-85-935-002, related to the adequacy of the concrete quality at the Watts Bar Nuclear Plant site, prompted the NRC staff to request further evaluations of the in-place strength of the concrete at the Sequoyah site.

On the basis of its evaluation in Section 2.6 of NUREG-1232, Volume 2, the staff concludes that all previous concerns related to adequacy of the structural criteria for concrete strength and frequency of sampling and controls and standards for the bedding mortar have been resolved for the restart of Unit 1.

2.7 Miscellaneous Civil Engineering Issues

TVA identified a need to address the seismic qualification of components in meeting code and regulatory requirements. This effort includes the review of components, piping, pipe supports, cable tray supports, conduit supports and heating/ventilating duct supports as well as structures. Section 15 of Part III of the SNPP addresses miscellaneous civil engineering issues related to Sequoyah.

The staff evaluated TVA's special programs to resolve the miscellaneous civil engineering issues in Section 2.7 of NUREG-1232, Volume 2.

TVA stated that there were program differences between Unit 1 and Unit 2 in this area; however, the differences were concerned with TVA's implementation of IE Bulletin 79-14. This is discussed in Section 2.3.2, Civil Calculations, above of this SSER.

As discussed in Section 2.7 of NUREG-1232, Volume 2, and on the basis of its review of the TVA plans to execute these special programs, the NRC staff finds that with proper implementation of the plans the special issues should be fully resolved for Units 1 and 2.

2.8 Heat Code Traceability

Section III.15.6 of the Sequoyah Nuclear Performance Plan (SNPP) describes a TVA commitment to investigate materials control concerns involving FSAR commitments, design requirements, and traceability relative to pressure boundary piping components in the Sequoyah safety-related piping systems. The

multi-phased investigation is concerned with clearly determining the commitments made and compliance to those commitments relative to design, fabrication, installation and traceability of documentation.

The issue of heat code traceability has also been evaluated through the employee concern program (element report MC-40703). In particular, the key issue that developed from this review was the use of TVA Class B small bore pipe and fittings in TVA Class A applications. The TVA resolution of this problem is discussed and evaluated in Section 2.8 of NUREG-1232, Volume 2.

The NRC concludes that TVA has properly characterized the problems with heat code traceability as a part of the SNPP and adequately addressed the employee concerns identified in TVA Employee Concern element report MC-40703, "Heat Code on Related to Material Control."

3 SPECIAL PROGRAMS

The Sequoyah Restart Task Force identified a number of technical issues of particular interest that were to be addressed before the restart of either of the Sequoyah units. These issues include major regulatory programs, such as environmental qualification of equipment and fire protection, as well as specific technical issues, such as adequacy of electrical cables. The resolution of these issues are discussed in the sections below. In some cases, there are related employee concerns; the individual evaluations of the element reports are discussed in Section 5.

In its letters dated March 31 and May 9, 1988, TVA did not identify any differences in the Unit 1 SNPP special programs from the Unit 2 programs that resolved the technical issues discussed in this Section. The staff did conduct an additional inspection on Unit 1 on fire protection. This inspection and the commitments made by TVA to NRC to resolve these special programs will be discussed below.

3.1 Fire Protection

3.1.1 Program Evaluation

Following a staff inspection of July 16-20, 1984, at Watts Bar on compliance with Appendix R to 10 CFR 50, the staff issued a Confirmatory Action Letter to TVA on August 10, 1984. This letter identified the actions to be taken by TVA to implement a complete review of the Appendix R program at Sequoyah. In accordance with the Confirmatory Action Letter, TVA established roving firewatches to provide continued surveillance of selected areas in the auxiliary building, control building, and the turbine building. These firewatches covered areas of the plant that contain cable/safe shutdown system interactions that did not meet the requirements of 10 CFR 50, Appendix R, Section III.G. In addition, these roving firewatches were required to cover their assigned areas at least once an hour and document their actions in accordance with TVA's Operations Section Letter Administrative 73.

The staff evaluated the Appendix R program at Sequoyah in Section 3.1 of NUREG-1232, Volume 2. This evaluation discusses the deviations requested by TVA from the requirements of Appendix R to 10 CFR Part 50 and the compliance of Sequoyah to Sections III.G, III.J and III.O of Appendix R. On the basis of this evaluation, the staff concluded that when the modifications and implementation of the procedural corrective actions associated with TVA's deviation requests (as identified in the staff's SERs of May 29 and October 6, 1986) and modifications and procedures (as identified in Inspection Reports 50-327/88 and 50-328/88) are completed, TVA's Appendix R program will provide an acceptable level of fire protection, equal to that required by 10 CFR 50, Appendix R, Sections III.G, III.J, III.L, and III.O for Unit 1.

As a result of the recent inspection (July 25-29, 1988), the staff found additional interactions that had to be addressed. This is discussed in Section 3.1.5 below.

3.1.2 Staffing of the Fire Brigade

By letter dated June 13, 1988, the licensee submitted a description of the reorganized fire brigade at Sequoyah Units 1 and 2. This reorganization is part of an overall plan to upgrade the fire fighting capabilities at all TVA nuclear plants with professional fire brigade personnel. The new fire brigade organization is in compliance with Sequoyah Technical Specification change 87-44 submitted to NRC by TVA letter dated March 1, 1988.

TVA is committed to meeting the requirements of Appendix A of Branch Technical Position (BTP) APCSB 9.5-1 at Sequoyah. The original NRC staff approval of the Sequoyah fire brigade is addressed in Section 9.5, Fire Protection Systems, V. Administrative Controls, of Supplement 1 of the Sequoyah SER NUREG-0011 which supports the licensing of Sequoyah. The SER describes the Sequoyah fire brigade as consisting of at least five members equipped with breathing apparatus, portable communications equipment, portable lanterns and other fire fighting equipment. The SER also states that the fire brigade participates in periodic drills and meets the requirements of Appendix A to BTP ASB 9.5-1, NFPA recommendations and supplemental staff guidelines.

The original fire brigade was staffed by the Assistant Shift Engineer as the fire brigade leader and four operations personnel. The reorganized fire brigade will be controlled by the assistant shift operations supervisor (formerly assistant shift engineer). The assistant shift operations supervisor will serve as the incident commander but the brigade will be staffed by the brigade leader and four individuals from the onsite Fire Operations Unit. The incident commander will respond to all plant fire emergencies and will provide the technical knowledge of safe shutdown systems to determine the effects of fire and fire suppressants on safety-related systems. The incident commander will also remain in direct communications with the shift operations supervisor/emergency coordination in order to provide any technical information that may be required for the plant operations staff to safely shut down an operating reactor. Each duty shift of the Fire Operations Unit is staffed by a fire captain (brigade leader) who has professional fire service experience; and four fire operators. The fire operators have met the minimum standards for certification as firefighter II as defined by NFPA, have had 80 hours of classroom instructions on site specific fire protection systems as well as on-the-job-training, emergency health physics training, and emergency medical training.

It is the licensee's position, and the staff agrees, that the reorganized fire brigade meets or exceeds the existing fire brigade commitments and requirements. The licensee has provided a comparison of its fire brigade to the requirements of BTP CMEB 9.5-1 (which the licensee is not committed to). The comparison shows that the reorganized fire Operations Unit meets the intent of the requirements of CMEB 9.5-1 in Section C.3 Fire Brigade.

The staff concludes that the reorganized fire operations unit meets the staff guidance in Appendix A of BTP APCSB 9.5-1, in regard to the staffing, training and equipping of the plant fire brigade, and is acceptable.

3.1.3 Fire Pump Design Deficiency

TVA identified a design deficiency on April 14, 1987 which could cause Class 1E electrical components to operate outside of their design limits during a postulated Loss of Coolant Accident (LOCA) event. TVA reported the design deficiency to NRC in accordance with the requirements of 10 CFR 50.73 on August 18, 1987. This report was documented in a Licensee Event Report (LER) 87-042.

The design basis of the plant does not provide for a LOCA condition concurrent with a fire. This occurrence would be considered a low-probability event. However, TVA identified the potential of the fire pumps starting automatically as the result of a LOCA condition. The electrical analysis of the Class 1E electrical system by TVA also identified that the fire pump starting and running during a LOCA condition resulted in degraded voltage of the Class 1E electric auxiliary systems. Further, if power is supplied from the standby emergency diesel generators (EDGs) these EDGs could also be overloaded.

There are two fire pumps associated with each Sequoyah unit. The pump motors are supplied electrical power from their respective redundant Class 1E electrical auxiliary systems. The pumps of each unit discharge into their respective headers. The headers from each unit are interconnected by a normally open isolation valve.

The fire pump control logic was designed to provide an automatic start from the fire protection heat sensors within the containment. The heat sensor actuation design setpoint temperature was specified as 220° F. The containment temperature during a LOCA can exceed 240° F, causing the fire pumps to start. The starting of the fire pumps during a LOCA condition would result in the degradation of the Class 1E electrical auxiliary power system.

TVA took a short-term correction action to prevent problems during the Unit 2 restart by placing the Unit 2 fire pumps control switches in the lockout position. This operation would prevent the automatic start of the fire pumps, associated with Unit 2, should there be a Unit 2 LOCA event. The Unit 1 fire pumps would be available, if needed, for both units.

TVA's long-term corrective action before Unit 1 start-up involves modification of all fire pump start logic. This modification blocks the automatic start of Unit 1 fire pumps 1A and 1B during a Unit 1 LOCA condition. Similarly, the Unit 2 fire pumps 2A and 2B would also be modified to prevent their automatic start during a Unit 2 LOCA condition.

On the basis of our review, the staff concludes that the modification proposed by TVA, to correct the design deficiency, is acceptable. The staff will review the electrical calculations for two-unit operations to verify that automatic starting of the fire pumps concurrent with other unit operating conditions does not cause degrading of the Class 1E auxiliary electrical systems. This review is discussed in Section 7.3.3 above.

3.1.4 Fire Protection Calculations Revision 9

By letter dated June 10, 1988, TVA submitted Revision 9 of the Sequoyah Appendix R shutdown logic calculations. TVA stated that the Unit 2 plant configuration and associated Appendix R documentation reflect this revision to the calculations except where interim compensatory measures exist. TVA explained that Unit 1 is in a verification process and any modifications identified during this process will be completed before Unit 1 restart except where interim compensatory measures exist.

TVA stated that the Unit 1 verification process would be completed by July 11, 1988. The staff conducted an inspection on July 25 through 29, 1988. The Revision 9 of these shutdown logic calculations were reviewed by the inspection team during the inspection. The staff's evaluation will be in the Inspection Report 50-327,328/88-37 which will be issued in September 1988. There are no unresolved Mode 4 items.

3.1.5 Inspection

An inspection of the Unit 1 fire protection program was conducted on July 25 through 29, 1988. The details of the inspection and the conclusions of the staff will be issued in Inspection Report 50-327,328/88-37 in September 1988.

3.1.6 Conclusion

The staff has evaluated the Sequoyah fire protection as discussed above. The staff will be issuing its evaluation of Revision 9 of the Sequoyah Appendix R shutdown logic and its Inspection Report 50-327,328/88-37 in September 1988 before Unit 1 enters Mode 2. The staff's evaluation discussed above is sufficient to allow Unit 1 to restart from the current outage.

3.2 Environmental Qualification of Electric Equipment Important to Safety

3.2.1 Compliance with 10 CFR 50.49

A licensee must demonstrate that equipment that is used to perform a necessary safety function is capable of maintaining functional operability under all service conditions postulated to occur during its installed life for the time it is required to operate. This requirement is applicable to equipment located inside as well as outside containment. More detailed requirements and guidance relating to the methods and procedures for demonstrating this electrical equipment capability are in 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants"; in NUREG-0588, "Interim Staff Position on Environmental Qualification on Safety-Related Electrical Equipment" (which supplements IEEE Standard 323 and various NRC regulatory guides and industry standards); and "Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors" (Division of Operating Reactors (DOR) Guidelines).

The staff evaluation of the compliance of Sequoyah to requirements in 10 CFR 50.49, environmental qualification, is in Section 3.2 of NUREG-1232, Volume 2. In this evaluation, the staff concluded that the methodology being used by TVA for identifying equipment within the scope of 10 CFR 50.49(b)(1), (b)(2) and

(b)(3) is acceptable because it provides reasonable assurance that equipment within the scope of 10 CFR 50.49 has been identified.

With regard to 10 CFR 50.49(b)(3), TVA evaluated existing system arrangements and identified equipment for the variables defined in Regulatory Guide (RG) 1.97, Revision 2. TVA has submitted a report outlining the results of the review and schedules for modifications. Because the review is not complete, some of the equipment items jointly within the scope of NUREG-0737 and RG 1.97 have not been included in the 10 CFR 50.49 scope. When the RG 1.97 report and equipment lists contained therein have been finalized and accepted by the staff, appropriate equipment not already in the 10 CFR 50.49 scope will be added in accordance with the RG 1.97 implementation schedule.

TVA will complete environmental qualification of the applicable FSAR Class 1E-designed instrumentation and the FSAR post-accident monitoring (PAM) instrumentation before Unit 1 restart. For those instruments already added to the plant because of a commitment to meet post-TMI requirements (NUREGs-0578 and -0737), TVA will complete its environmental qualification in accordance with its responses to those NUREGs or any extension granted with respect to those responses.

For instrumentation that is not considered operable or not installed but that will be complete by startup from Unit 1, Cycle 4 refueling outage in accordance with the implementation schedule for RG 1.97 or post-TMI NUREGs, environmental qualification will be complete when the equipment is installed and operable. For that instrumentation that exists at the plants but that was not included in the original PAM instrumentation set but that will be Category 1 or 2 RG 1.97 instrumentation, TVA will complete environmental qualification in accordance with the implementation schedule for RG 1.97.

On the basis of its evaluation in NUREG-1322, Volume 2, the staff has reached the following conclusions with regard to the qualification of electric equipment important to safety within the scope of 10 CFR 50.49:

(1) The Sequoyah electrical equipment environmental qualification program complies with the requirements of 10 CFR 50.49.

(2) TVA's proposed resolutions for each of the environmental qualification deficiencies identified in the staff's SER and the FRC's TER are acceptable.

The staff's findings regarding compliance with 10 CFR 50.49 rely on certain modifications/replacements that must be completed for the affected equipment to be qualified. TVA will provide certification that all restart work is complete for Unit 1 before the entry of the unit into Mode 2.

3.2.2 Superheat Transient (Main Steam Temperature Issue)

TVA designed Sequoyah to withstand an unisolable break in a main steam line either inside containment or in the main steam valve vaults (MSVVs) located outside containment. As part of this design the electrical equipment used during this accident would be required to operate in the high temperatures generated by such a line break. After the plant was completed, the information on which the design was based was changed by Westinghouse. This resulted in

increased accident peak temperatures in containment and the valve vaults. As a consequence, the design of the equipment located in these areas required re-evaluation. This issue is discussed in Section III.6 of the SNPP and involves the Main Steam Line Break (MSLB) in the MSVVs and inside containment.

This issue is evaluated by the staff in Section 3.2.2 of NUREG-1232, Volume 2. The staff concluded for Sequoyah Units 1 and 2 that this issue for the MSLB in the MSVVs was resolved.

The staff's conclusion that the containment temperature profile for the design basis MSLB inside containment is acceptable contingent on the verification that the analysis contained in the Westinghouse Reports WCAP-10986 and -10988 is accurate. The staff's review of these reports is being conducted on a generic basis and the results of the generic review will be addressed separately. TVA has submitted information to the staff in its letters dated November 10, 1987 and February 10, June 1 and August 31, 1988.

3.3 Piece Part Qualification (Procurement)

TVA Nuclear Safety Review Staff (NSRS) reports R-84-17-NPS and R-85-07-NPS identified deficiencies in TVA's practices for the procurement of safety-related replacement items. NRC Inspection Report 50-327/328 86-61, dated November 14, 1986, cited related deficiencies which were classified as a potential enforcement item (86-61-01) for failure to take corrective action. Specifically, the TVA program could allow previously qualified equipment to be degraded by purchasing replacement components and parts as commercial-grade, without documentation of its qualification and without adequate dedication of the items by TVA. This is discussed in Section 12.0 of Part III of the SNPP, Revision 1.

TVA has established the Sequoyah Replacement Items Project (RIP). Through its RIP, TVA will establish a maintenance history of plant replacement activities by reviewing maintenance requests, preventive maintenance activities, surveillance instructions, and work plans. DNE will perform a documented engineering review and evaluation to establish the suitability of replacement items for their intended application.

TVA responded to the staff's concern by letters dated April 1 and December 8, 1987 and provided a long-term program plan by letter dated February 10, 1988. The staff evaluated the RIP in Section 3.3 of NUREG-1232, Volume 2. The staff concluded that this process was sufficient to support plant restart of Unit 2.

The staff has reviewed TVA's supplemental program plan to the RIP which was submitted as an enclosure to TVA's letter to the NRC dated February 10, 1988. This supplements the original RIP program plan which was submitted to the NRC on April 1, 1987 and addresses TVA's commitment to provide a supplemental RIP program plan in TVA's letter dated December 8, 1987. TVA submitted the implementation schedule for the supplemental program plan in a letter to NRC dated August 10, 1988.

The original program plan provided for TVA's review and evaluation for adequacy of qualification, all installed replacement items within the scope of 10 CFR 50.49 and seismically sensitive replacement items within the boundary of SQN Unit 2 pre-restart phase of the Design Baseline Verification (DBVP).

All other Unit 2 installed safety-related replacement items were to be reviewed and evaluated post-restart. The original program further provided for similar reviews and evaluations to be performed on Unit 1 with the same pre-restart and post-restart scheduling restrictions. The pre-restart reviews and evaluations were performed for Unit 2 as required.

The supplement program changes the original program to allow for the substitution of a warehouse inventory review and evaluation of safety-related replacement items for adequacy of qualification instead of performing the reviews and evaluations on actual installed replacement items covered within the original scope of Unit 2 post-restart items and Unit 1 pre-restart and post-restart items. The plan also provides for review of deficiencies identified during the Unit 2 pre-restart efforts and the warehouse inventory efforts relative to the need for corrective action on replacement items installed in the plant. TVA provided justifications for the proposed changes in the supplemental program plan and the cover letter transmitting the plan.

The staff reviewed and evaluated the supplemental program plan and its schedule for the following: (1) differences between the original program plan and the supplemental plan; (2) adequacy of TVA's justifications for the program changes; and (3) adequacy, relative to restart of Unit 1, of TVA's actions toward the resolution of Unresolved Items (URI) 50-327/87-40-01 from NRC Inspection Report 50-327,328/87-40 dated November 30, 1987. Additionally, the supplemental plan was evaluated to determine if it provided an adequate level of confidence that Unit 1 could be operated safely. Based on the staff's reviews and evaluations, the staff finds that, with proper implementation of the plan, this special issue (including actions toward resolution of the URI) is satisfactorily resolved for the restart of Unit 1.

3.4 Sensing Line Issues

Issues were raised through the employee concerns program concerning the instrument line slope, compression fittings and teflon tape. These issues were evaluated by the staff in Section 3.4 of NUREG-1232, Volume 2. TVA did not identify any differences in the Unit 1 program from that for Unit 2.

TVA has issued an electrical design standard to be used for instrument line slope criteria in future modifications. TVA has also issued an instrumentation engineering requirements specification that specifies the design standards and the required QA inspections. The staff has reviewed the new electrical design standard and believes that design standard together with the instrument specification will prevent the future recurrence of the problem.

Based on its evaluation in NUREG-1232, Volume 2, the staff finds that these issues are adequately resolved for the restart of Sequoyah Units 1 and 2.

As a long-term action, corporate guidance on the use of teflon tape and a single-defined tape replacement plan will be issued.

3.5 Welding

In Section III.8 of the SNPP, TVA discusses the welding project program to evaluate the adequacy of the TVA welding program for all of the TVA plants and the suitability of welded structures and systems for service. In addition,

approximately 30 percent of the safety-related employee concerns pertain to various aspects of the TVA welding program.

By letter dated January 17, 1986, TVA formally submitted its program plan to address employee concerns related to welding for staff review. TVA formulated its program to evaluate the welding program at each TVA nuclear power plant in two separate work phases. The Phase I effort consisted of a review of the written TVA welding program (design documents, policies, and procedures) to ensure that the welding program correctly reflects TVA's licensing commitments and regulatory requirements. The Phase II effort consisted of actual re-inspection of selected welds and the inspection results were used to evaluate the implementation of the written welding program. In both phases of the program plan, TVA was to identify and categorize any deficiencies in the existing program, correct the problems, and implement changes to prevent recurrence.

The staff has evaluated the TVA welding program for Sequoyah in Section 3.5 of NUREG-1232, Volume 2. TVA did not identify any differences in the Unit 1 program from that for Unit 2.

TVA has committed to standardize among all nuclear plant sites the means of maintaining welder qualifications. This will be accomplished by having the QC inspector or the welder foreman initial the welder's rod issue slip indicating that the welder has maintained qualification by the use of the process.

Section III.3 of TVA's revised SNPP provides an action plan that will improve the design control program for Sequoyah when implemented. This plan includes the reconciliation of "as constructed" and "as designed" drawings to achieve a single set of plant drawings. This plan should address the irregularities identified above to ensure that the welds and welding requirements stated on the "as designed" drawings match the installed hardware.

On the basis of its evaluation in NUREG-1232, Volume 2, the staff concluded the following for Units 1 and 2:

(1) During construction of both Sequoyah units, TVA's implementation of the QA/QC program in the area of welding, while generally effective, was ineffective in certain instances. For example, a significant number of deficient welds were found that required engineering calculations to demonstrate their suitability for service. These calculations should have been performed during construction. In addition, discrepancies between the design drawings and the actual hardware installed were identified. Notwithstanding these findings, the fact that no welds required repair to meet design code requirements indicates an overall effective implementation of the QA/QC program in the area of welding.

(2) The effectiveness of TVA's process for QC inspector training and qualification/certification to visually inspect welds during plant construction and after operation is questionable. The welding deficiencies discussed above should have been detected and corrective actions should have been taken.

(3) In spite of the deficiencies found in the implementation of the QA/QC program for welding activities, including some that were of a programmatic nature, the staff finds that these deficiencies have not significantly affected the suitability for service of plant hardware.

(4) With the exception of QC inspectors' training and qualification/certification, the staff finds that other essential elements (i.e., welding procedures, welder qualification and training, weld design and configuration, and filler metal control) of a sound welding program were functioning and the resultant hardware is suitable for service.

Therefore, the staff concludes that TVA's welding re-evaluation program has been carried out adequately and that TVA has demonstrated that the hardware as constructed is suitable for service, that is, the design load limits for welded connections have been met. The staff further concludes that restart of both Sequoyah units will not endanger the public health and safety.

For an overall improvement of the welding program at Sequoyah, the staff endorses the following TVA proposed changes in its internal control documents contained in the SNPP:

(1) Combining the requirements of General Construction Document G-29 and Process Specification N73M? into a single document.

(2) Replacing the general construction specification for each unit with specific specifications.

(3) Maintaining indirect quality control of fit up inspection by monitoring processes as provided in 10 CFR 50, Appendix B (1) by having the welder and his foreman document that fit up is suitable for the QC inspector to verify weld size during final inspection and (2) by having the QC inspector selectively inspect a sample of fit ups to verify this documentation.

(Consolidate inspector training and certification into one program under the control of a certified Level III NDE examiner.

(5) Provide training or orientation to engineers, designers, technical supervisors, and engineering managers of the content and use of the internal control documents.

(6) Standardize the process of maintaining welder's certification by having the QC inspector or welder foreman initial the rod issue slip indicating that the specific welder has used the process.

In a letter dated January 30, 1987, TVA committed to an augmented and accelerated inservice inspection as recommended by NRC staff. The inspection program will include the elements listed below.

(1) A 100-percent examination of the ASME Class 1 and 2 piping field welds will be completed in the first 10-year in-service interval. Those welds that remain to be examined will be scheduled for examination in the next plan and the restart of any unit.

(2) A 100-percent examination of the ASME Class 1 and 2 pipe support field welds will be completed in the first 10-year in-service interval. Those welds that remain to be examined will be scheduled for examination in the next two consecutive refueling outages following the submittal of the revised plan and the restart of any unit.

(3) Major component support welds made in the field on the reactor vessel, steam generator, pressurizer, and reactor coolant pumps that have been identified to be examined in the first 10-year program will be completed. Those welds that remain to be examined will be scheduled for examination in the next two consecutive refueling outages following the submittal of the revised program and the restart of any unit.

(4) where possible, the percentage of welds examined during the program will be maintained as required by the code in the Tables IWB-2412-1 and IWC-2412-1 (Inspection Program B). Note that the required percentages may not be met for all categories of specific systems, or item numbers, because certain systems contain a large number of socket welds that are field welds and the majority of pipe support welds are also field welds. Where conflicts arise with the percentage requirements, the revised augmented/accelerated program will identify specific requirements for relief.

Credit for program examination will be taken for all examinations performed and no additional Class 1 and 2 field welds will have to be re-examined in the remaining time of the first 10-year interval, with the exception of the Code required additional examinations resulting from unacceptable indications in the initial or required successive examinations. Future 10-year interval examinations will follow their original schedule and will not be required to meet the accelerated program.

Because the first refueling outage is scheduled to occur approximately 4 to 6 months after restart of Unit 2, the short duration of the operating time may not provide the needed time for the increased planning and scheduling, staffing and craft support required to perform the increased inspections of items 1, 2, and 3 above. In this case, the implementation of any accelerated program would be deferred to the second and third outages following restart of Unit 2. Scheduling parts of the actual inservice inspection for Unit 2 for the second and third refueling outage after restart rather than the first and second refueling outage after restart is acceptable to staff.

Further, the staff recommends that TVA consider the following:

(1) using industry-generated standards where possible, particularly using American Welding Society (AWS) standards for certifying the AWS scope weld inspectors;

(2) amending relevant FSAR sections to reflect changes in commitments and to formalize the intent as stated above; and

(3) training personnel in the application of the standards adopted.

3.6 Containment Isolation

3.6.1 Containment Isolation System Design

General Design Criteria (GDC) 54 through 57 of Appendix A to 10 CFR 50 contain NRC design requirements for isolation of piping systems penetrating containment. In particular, GDC 54 contains general provisions for leak detection, redundancy, and reliability. GDC 55 requires each line that is part of the reactor coolant pressure boundary (RCPB) and that penetrates the containment to have isolation valves as listed below, unless it can be demonstrated that the provisions for a specific class of lines are acceptable on some other defined basis.

The staff identified apparent discrepancies in system compliance with containment isolation requirements during an inspection conducted at Sequoyah on March 3-14, 1986. Specifically, Inspection Report 50-327/328 86-20 documents five containment penetrations of the chemical and volume control system (CVCS) that did not appear to meet 10 CFR 50, Appendix A GDC for containment isolation.

TVA submitted, by letters dated January 23 and February 3, 1987, requests for exemption to the requirements of 10 CFR 50 GDC 55 and 56 for the penetrations in question. Supplemental information to these requests was submitted by TVA on April 8, 1987.

In its evaluation in Section 3.6.1 of NUREG-1232, Volume 2, the staff discusses each penetration not meeting the explicit GDC requirements as identified by TVA in Table 2.2 of its submittal of January 2, 1987. The discussion includes the exemption granted by the staff to have the Sequoyah containment isolation design in conformance with GDC 54 through 57 of Appendix A to 10 CFR 50.

The staff normally requires that all power-operated containment isolation valves have position indication in the main control room. TVA recently confirmed that with the exception of 22 valves, all other power-operated valves have position indication in the main control room. Position indication for the 22 exceptions are provided in either the auxiliary building or the hot sample room. Installation of position indication for the 22 containment isolation valves in the main control room is planned for the cycle 4 refueling outage.

On the basis of its evaluation, the staff concludes that, with the approved exemptions, the Sequoyah containment isolation design is in accordance with Appendix A to 10 CFR 50 and, therefore, it is acceptable.

3.6.2 Containment Isolation Leakage Testing Program

As discussed above, Inspection Report 50-327/328 86-20 contained open items regarding the containment isolation design for certain containment penetrations. By letter dated September 24, 1986, and January 2, 1987, TVA proposed to partly resolve these open items by redesignating certain valves as containment isolation valves. The acceptability of these proposals is addressed above. TVA also has evaluated the redesignated containment isolation valves in regard to the requirements of Appendix J to 10 CFR 50 concerning local leakage rate testing. The staff's review of this issue is documented in Section 3.6.2 of NUREG-1232, Volume 2.

By letters dated July 11 and August 8, 1988, TVA requested an exemption to Appendix J for leak rate testing the check valves of the Containment Spray System (CSS) and Residual Heat Removal Spray System (RHRSS) for Sequoyah Units 1 and 2. The Sequoyah design for the CSS and RHRSS relied on a check valve inside containment and a remote manual valve with seal water system outside containment to satisfy the requirements of GDC 56. This design is such that TVA has stated that it is impractical to test the inboard check valves; therefore, TVA has requested an exemption from the Appendix J leak rate testing requirements for these check valves. TVA proposed to rely on the remote manual valve and seal water system and the closed CSS and RHRSS outside of containment as the basis for not Appendix J leak rate testing the check valves. This exemption is under review by the staff. It is needed for Unit 1 to enter Mode 4 where containment integrity is required by the Technical Specifications.

Based on the evaluation in NUREG-1232, Volume 2, the staff finds that with the above exemption, the proposed local leakage rate testing program for penetrations is in accordance with the requirements of Appendix J to 10 CFR 50, and is, therefore, acceptable for Units 1 and 2.

3.6.3 Containment Leakage Testing

The staff requested that TVA perform a visual inspection of the Sequoyah Unit 1 containment before restart of the unit. The purpose of the visual inspection is to demonstrate that the containment was not accidentally damaged during the extended outage since the last integrated leak rate test of the containment in December 1985.

TVA has reported that since the plant shutdown approximately 3 years ago, there has been no additional loading on the containment for that period. Although there has been no containment loading during the shutdown period, there have been major modifications performed inside of containment which increase the likelihood of accidental damage to the containment. Actual experience with other utilities has demonstrated that containment liners have been accidentally damaged during shutdown intervals much shorter than 3 years.

TVA has conducted an audit of the work orders performed during the shutdown interval to demonstrate that proper controls were in effect to prevent damage to the containment. However, such audits would only reveal accidental damage to the containment if it was reported. Unreported damage to the containment would not be identified by such audit.

A visual inspection of the containment should identify any accidental damage, both reported and unreported, that may have occurred during the 3 year shutdown interval. By the letter dated August 19, 1988, the licensee committed to perform a visual inspection of the containment under Surveillance Instruction (SI) 254, prior to restart. If the inspection demonstrates that the containment was damaged, the containment would need repairing and these repairs would need testing for leakage before restart.

3.7 Containment Coatings

TVA identified deficiencies found during a review of maintenance records relating to its programs for coatings inside containment. These deficiencies are listed in Section 3.7 of NUREG-1232, Volume 2. TVA did not identify any differences in the Unit 1 program from that for Unit 2.

Following a loss-of-coolant accident (LOCA) or main steam line break (MSLB), water from the containment sump is used for makeup to the core and for containment spray. The sump has a 6-inch trash curb around the base with 1/4-inch wire mesh screens that slope upward and outward from the sump to prevent debris from entering. Failure of coatings during a LOCA or MSLB could lead to blockage of sump screens, thus an inadequate recirculation flow to the core or blockage of spray systems.

TVA's corrective actions were evaluated in Section 3.7 of NUREG-1232, Volume 2. The staff concluded that a sufficient area of the sump screen would remain unblocked following an MSLB or a LOCA to allow the containment spray and RHR pumps to operate safely. Therefore, the containment coatings issue is considered resolved for both Sequoyah Units 1 and 2.

3.8 Moderate Energy Line Breaks

In Section III.15.2 of the SNPP, TVA identified the actions it would take before restart of Sequoyah Units 1 and 2 to correct the moderate-energy line break (MELB) flooding issue. The staff's evaluation is documented in Section 3.8 of NUREG-1232, Volume 2. TVA did not identify any differences in the Unit 1 program from that for Unit 2.

Based on its evaluation in NUREG-1232, Volume 2, the staff accepted the licensee's procedures and assumptions for evaluating MELB flooding. The staff further accepted the licensee's commitment to complete the actions listed below before restart of Unit 1.

(1) ensure adequate sealing between the turbine building, control building, and the auxiliary building;

(2) provide administrative control for possible flooding in the annulus;

(3) verify that the electrical equipment and electrical boards on the 704-foot and 749-foot level are above MELB flood levels; and

(4) update the previous review of unimplemented ECNs to determine if subsequent ECNs impact the flooding evaluation.

The staff concludes that completion of these actions will be sufficient for restart of Unit 1. However as a post-restart action, the staff recommends that TVA be able to demonstrate quick response to MELBs in safety-related areas.

3.9 ECCS Water Loss Outside Crane Wall/Air Return Fan Operability

By letter dated July 8, 1987, and as supplemented August 4, 1987, the licensee identified a condition involving the collection of water from the containment and residual heat removal sprays following a design-basis accident (DBA). Spray water collecting on the operating deck floor could drain directly into areas outside the crane wall through the opening for the containment air return fan A-A. The concerns were that this drainage could result in undesirably low water levels above the sump and in flooding of the air return fan A-A.

The staff's evaluation of TVA's actions, including modifications, to resolve this issue are in Section 3.9 of NUREG-1232, Volume 2.

All efforts associated with the curb and drain modifications have been completed on Unit 2; those modifications for Unit 1 will be completed before restart.

Based on its evaluation in NUREG-1232, Volume 2, the staff concluded that the re-design of the containment drainage system will ensure that spray water will not damage the air return fans or bypass the sump; therefore, the design is acceptable for Units 1 and 2.

3.10 Platform Thermal Growth

In its preliminary evaluation dated March 25, 1988, the staff approved TVA's plan for the resolution of the structural thermal growth issue as described in Section 15.5 of the SNPP. The staff has completed a review of the details of the licensee's resolution of the issues that include enhanced calculations, generic implications, and other effects of the corrective action. The staff's evaluation is in Section 3.10 of NUREG-1232, Volume 2. TVA did not identify any differences in the Unit 1 program from that for Unit 2.

TVA contracted Bechtel North American Power Corporation to review the corrective action plan; Bechtel recommended several additional items. TVA provided supplemental information on this issue in its letter of February 29, 1988. The recommendations consisted of additional calculations for design justification and modification of some structures and their supports. Examples to be reviewed in the future by the staff include structures within the main steam line valve vault rooms as well as snubbers within the reactor building. TVA has determined using the staff approved restart criteria that these modifications may be completed after Sequoyah Units 1 and 2 restart.

On the basis of the discussion in NUREG-1232, Volume 2, as well as its previous review of SNPP Section 15.5, the staff concludes that the issue of the structural thermal growth has been adequately addressed by TVA for Units 1 and 2.

3.11 Pipe Wall Thinning Assessment

On December 9, 1986, Unit 2 at the Surry Power Station experienced a catastrophic failure of a main feedwater pipe, which resulted from the

erosion/corrosion of a carbon steel pipe wall. Although erosion/corrosion pipe failures have occurred in small diameter piping containing a water-steam mixture and in water systems containing solids, there have not been any previously reported failures in large diameter carbon steel piping systems containing high-purity water, thus, the licensee did not have a procedure for the systematic examination of the thickness of the walls of the feedwater and condensate piping.

Main feedwater systems, as well as other power conversion systems, are important to safety. Failure of piping containing high-energy fluids such as the feedwater system can result in complex challenges to the operating staff because of potential interactions of high energy steam and water with other systems, such as electrical distribution, fire protection, and security. The licensee's commitments for the functional capability of systems containing high-energy fluids are a part of the licensing basis for the facility; an important part of this commitment is that piping will be maintained within allowable thickness values.

The staff's evaluation is based on the SNPP and meetings with the licensee on June 29, September 14 and 30, and October 29, 1987. Information was also obtained from the licensee's response to NRC Bulletin No. 87-01, "Thinning of Pipe Walls in Nuclear Power Plants," which is being evaluated separately. TVA's response of September 18, 1987, included its tests and inspections of piping. TVA did not identify any differences in this program for Unit 1 from that for Unit 2.

The staff's evaluation is in Section 3.11 of NUREG-1232, Volume 2. The NRC staff concluded that TVA's inspection and surveillance program is acceptable. The staff also concluded that monitoring TVA's implementation of the surveillance program is not necessary at this time. TVA plans to monitor susceptible areas and trend the results.

3.12 Cable Installation

3.12.1 Program Evaluation

A number of employee concerns were received relating to construction practices at Watts Bar, particularly with respect to cable installation. The evaluation of these concerns was extended to the Sequoyah plants Units 1 and 2.

The staff's evaluation of TVA's cable installation practices at Sequoyah is provided in Section 3.12 of NUREG-1232, Volume 2 for Units 1 and 2. The staff has concluded that the cable installation practices were acceptable but there was a question on the silicone rubber insulated cable installed in containment. For Unit 2, the AIW cable was removed and the TVA test data on the Anaconda and Rockbestos cable, a partial qualification of the silicone rubber insulated cable for a period of 10 years, provided sufficient margin for the startup of Unit 2. TVA would qualify these cables for the expected life of Unit 1 and Unit 2 before the return of Unit 2 to power from the next refueling outage. TVA's test program to extend the qualified life of the Anaconda and Rockbestos cable is evaluated in Section 3.12.2 below.

3.12.2 Silicone Rubber Insulated Cable Environmental Qualification

By letter dated, November 24, 1987, TVA submitted the results of tests conducted by the Wyle Laboratories on silicone rubber insulated cables (cables) installed inside containment at Sequoyah. By letter dated December 28, 1987, TVA documented its basis for concluding that the cables installed in containment at Sequoyah are environmentally qualified to perform their intended function for a 10 year period following the original cable installation. The staff reviewed the TVA data and concluded that the Wyle Laboratory environmental qualification tests of the Anaconda and Rockbestos cables and the replacement of AIW cables inside Unit 2 containment provided adequate assurance that the functional integrity of the cables at Sequoyah Unit 2 is adequate to allow restart of that Unit.

By letter dated May 25, 1988, the staff requested that TVA submit details of a cable test program for extending the qualified life of the Rockbestos and Anaconda cables to 40 years. The staff accepted TVA's schedule for completing this testing before the Unit 2 return to power from the Cycle 3 refueling outage. In that letter the staff outlined the basic requirements for an acceptable cable test program and by letter dated July 6, 1988, TVA submitted the details of their cable test program.

The staff, in its letter dated May 25, 1988, requested that TVA submit a cable test program for testing silicone rubber insulated cables installed in containment at Sequoyah Unit 1 and supplied by all three manufacturers (Anaconda, AIW and Rockbestos) unless TVA decided to remove AIW cables from the Unit 1 containment. TVA has elected to remove all the AIW silicone rubber insulated cables from the Unit 1 containment and has proposed a test program for cables supplied by the remaining two manufacturers. This cable test program is the test program to extend the qualified life of the Rockbestos and Anaconda cables for 40 years which is discussed above.

The cable test program requires removal of installed cables for testing, five from each manufacturer, selected from the worst-case conduit configurations located in containment at the Watts Bar Nuclear Plant. TVA has identified criteria used to determine the worst case conduit configuration. These criteria are similar to the criteria identified in TVA's letter of July 31, 1987, and include the length of cable pull, sidewall pressure, and 90° condulets. The test program also includes thermal aging, radiation aging, Loss of Coolant Accident (LOCA) test (steam/chemical environment) as well as post-LOCA-high-pot test. The only exception is that the post-LOCA-high-pot test will be performed at twice the cables' rated voltage plus 1,000 volts instead of 240 Vdc/mil. Aging and LOCA tests are sufficient to demonstrate the functional operability of the cables. The post-LOCA high-pot test will be used to demonstrate the margin available to account for test uncertainties. Hence, the staff finds the proposed test program acceptable.

The staff has reviewed TVA's proposed test program and has determined that the test program meets the requirements outlined in the staff's letter of May 25, 1988 with the following clarifications:

(1) TVA has defined the scope of the test program to include only the cables which are covered by 10 CFR 50.49 Category A and B. The staff requires that all 10 CFR 50.49 cables be included in the program. TVA has informed the staff that all 10 CFR 50.49 cables are covered by Category A and B.

However, to clarify the matter TVA will delete the reference to Category A and B.

(2) Enclosure 2; "Sample Selection, Size and Removal Process"; TVA should add a step between (4) and (5) to state that the cable sample will be selected from a conduit with no less than 3 cables, unless justified. TVA has informed the staff that their selection criteria already include this item and will add the criteria to the test program.

(3) Enclosure 2; "Resolution of Test Anomalies and Test Failures"; 3rd paragraph: TVA should add a requirement that, as soon as the determination is made that a test anomaly is in fact an actual test failure, NRC will be promptly notified of such determination. TVA has agreed to add this requirement to the test program.

Based on our evaluation, we conclude that the proposed cable test program is acceptable provided TVA revises the program as discussed in Items (1) through (3) above. TVA's removal of AIW cables from Sequoyah Unit 1 and the previous qualification test of Anaconda and Rockbestos cables at the Wyle Laboratories provides adequate assurance of the integrity of cables installed at Sequoyah Unit 1 for a period of 10 years. This is adequate for the restart of Unit 1. Successful completion of the proposed test program will extend the environmentally qualified life of these cables to 40 years.

3.13 Fuse Replacement

TVA has experienced problems with fuses at Sequoyah. This is discussed in Section 3.13 of NUREG-1232, Volume 2. TVA did not identify any differences in this program for Unit 1 from that for Unit 2.

Based on the test results and experience with the FLAS-5 cadmium solder fuses from lots 4 and higher, the staff finds the replacement fuses acceptable. However, because the analysis performed by TVA on the service life of the solder junction is predicted to be 80 month on the average and 25 month minimum, TVA should either replace these fuses every 25 months or extend the life of these fuses with further testing and analysis based on the ambient conditions and failure rates of these fuses.

4 RESTART READINESS

There are a number of programs necessary for safe conduct of nuclear activities at Sequoyah discussed in the Sequoyah Nuclear Performance Plan (SNPP). These programs related to restart readiness are the following: operational readiness, management, quality assurance operating experience improvement, post-modification testing, surveillance instruction review, maintenance, restart test program, training, security, emergency preparedness and radiological controls. The programs, management controls, initiatives and procedures related to these activities were evaluated for the restart of Sequoyah Unit 2 in Chapter 4 of NUREG-1232, Volume 2. This NUREG was issued by the NRC letter to TVA dated May 18, 1988. These activities will be evaluated here for the restart of Unit 1.

In its letters dated March 31 and May 9, 1988, TVA identified Unit 1 SNPP programs that were different from Unit 2 programs. Those different Unit 1 programs that will be evaluated in this chapter are the following: operational readiness and Sequoyah activities list. Where the Unit 1 program is the same as the Unit 2 program, references will be made to NUREG-1232, Volume 2. Any commitments made by TVA to NRC in resolving issues identified during the staff's evaluation of these programs will be referenced below.

Inspections of the effectiveness of these programs have been conducted by the staff and will continue to be conducted.

4.1 Operational Readiness

4.1.1 Introduction

TVA has historically demonstrated weaknesses in performance of nuclear activities as has been discussed in previous Systematic Assessment of Licensee Performance (SALP) reports. On September 17, 1985, on the basis of continued poor performance as described in the fifth TVA SALP, the NRC issued a letter delineating their concerns pursuant to 10 CFR 50.54(f).

Enclosure 2 to the staff's 10 CFR 50.54(f) letter posed certain questions to TVA regarding

(1) equipment qualification (Questions 1 and 2)
(2) operational readiness (Question 3)
(3) cable tray support (Question 4)
(4) design control (Question 5)

Items (1), (3), and (4) are discussed in Sections 3.2, 2.5, and 2.1, respectively, of this report. Operational readiness will be discussed in this section.

TVA has undertaken a significant effort to address and correct operational readiness issues. A special Sequoyah Task Force was established by the Manager of Nuclear Power on March 19, 1986, to identify problems and initiate those

actions necessary to resolve the problems before restart of either Sequoyah unit. The Sequoyah Nuclear Performance Plan (SNPP), Revision 1, provides the assessment and plans for resuming operation of the Sequoyah units and Section V discusses those topics related specifically to operational readiness.

TVA has stated that the overall purpose of operational readiness is to provide the Site Director with verification that activities, programs, and commitments required for restart are completed. This is to be accomplished by designating an Operational Readiness Manager who reports to the Senior Vice President, Nuclear Power and an Operational Readiness Manager who reports to the Site Director. The Operational Readiness Manager provides independent oversight of the development and implementation of the operational readiness program and assists the site in ensuring the program adequacy while also providing independent assessments and evaluations to the Senior Vice President, Nuclear Power. The Site Director will use the results of the operational readiness program and other status reviews to make his recommendation for Unit 1 restart to the Senior Vice President, Nuclear Power. The Senior Vice President, Nuclear Power will not approve restart of Unit 1 until he is satisfied that all preparations for restart have been satisfactorily completed.

The Operational Readiness Manager assesses whether corrective action plans have been established to address the underlying causes of deficiencies or problem areas, evaluates the adequacy of corrective action, reviews the closeout practices and provides comments to improve the process and program content. The Operational Readiness Manager is responsible for working with the site and line organizations to obtain verification of program implementation, to obtain verification of organizational readiness through the evaluation of performance objectives, and to develop the restart prerequisite checklist. The checklist will be used to verify that hardware issues directly impacting system operability are closed before applicable mode changes.

4.1.2 Evaluation

Success of the operational readiness program is contingent upon the successful implementation of the three program elements: the SNPP completion of Volume 2 programs, the establishment and assessment of performance objectives, and the restart prerequisite verification (Restart Test Instruction 9 - Unit 1 Master Test Sequence).

Implementation of the first element will be to verify (1) that restart activities as defined in the TVA Tracking Open Items (TROI) computer list have been completed, (2) that SNPP Volume 2 text statements of intention have been completed, and (3) that major projects, having broad impact on other plant activities, have been completed prior to restart. Some long-term program enhancements will be open at restart and will be tracked through routine NRC observations of the TVA corporate commitment tracking system.

The purpose of the performance objectives evaluation is to ensure that site organizations function effectively and are prepared for plant restart and operation. Generic performance objectives and criteria have been established and assigned to site organizations so that they may address the areas of procedures, staffing, supervisory involvement, internally and externally identified findings, housekeeping, and readiness of support organizations during restart. Additional performance objectives and criteria have been developed for the functional areas of organization and administration, document control,

maintenance, training, licensing, engineering, and configuration control. Performance objectives in these functional areas also have been assigned to the appropriate site organizations.

TVA's performance objectives are based on the guidance provided by "Performance Objectives and Criteria for Operating and Near Term Operating License Plants," INPO 85-001, Institute for Nuclear Power Operations, January 1985.

This operational readiness evaluation will include the following:

- establishing appropriate objectives and criteria
- evaluating readiness against established criteria
- assessing impact of deficiencies identified
- developing and implementing additional corrective actions for identified deficiencies
- verifying that performance objectives have been met and readiness is assured

TVA has established plant instructions and tracking systems to ensure that hardware issues directly impacting system operability are closed before mode changes. To ensure that these hardware issues are complete, a restart prerequisite checklist has been developed. This checklist was developed by the SQN operational readiness staff and serves to consolidate hardware operability issues, including those listed below.

- maintenance or work request backlog
- outstanding clearances
- modification status
- outstanding temporary alteration control forms (TACFs)
- outstanding preventive maintenance packages
- instrumentation availability
- outstanding hardware-related PROs and CAQRs

The restart prerequisite checklist will be provided to the Sequoyah Restart Test Manager for inclusion in the plant restart test sequencing instruction. This instruction will provide for PORC review and plant manager approval of results prior to leaving specified hold points. In addition to incorporating the restart prerequisite requirements, this instruction will address the completion of required special testing during the restart of Unit 1.

A parallel, independent assessment of operational readiness was performed by the ONP Operational Readiness Manager. This review was conducted by senior personnel with plant experience from both inside and outside TVA. The team provided its findings and recommendations to the Senior Vice President, Nuclear Power in a letter dated August 23, 1988. Further, the Senior Vice President, Nuclear Power has requested that the SQN Nuclear Safety Review Board (NSRB) review the SNPP Volumes 1 and 2 and the actual status of preparation for restart of Sequoyah units from a safety perspective. The NSRB has reviewed and accepted the overall approach outlined in the SNPP. The Board also has reviewed the special programs and certain secondary hardware issues and the onsite safety review process, maintenance planning and procedure development.

The staff has reviewed the Independent Readiness Review as part of the ongoing staff evaluation of the implementation of the Operational Readiness Review

Program. In addition, the staff has conducted an operational readiness inspection at Unit 1.

4.1.3 Conclusions

Initially, the staff believed that TVA needed to clarify the meaning of hardware issues in the paragraph describing the restart prerequisite verification element. Provisions have been included to ensure that TVA assesses hardware operability for the cumulative effect on system performance. Overall the staff has concluded that the implementation portion of the operational readiness program represents a realistic and systematic format to ensure that plant activities, programs, and commitments required for restart are completed. The conclusion of the staff from its operational readiness inspection was that Unit 1 readiness was acceptable.

On the basis of its review, staff finds that this program is acceptable. As designed the program should provide the Site Director and Senior Vice President, Nuclear Power verification that activities, programs, and commitments required for restart for both Units 1 and 2 are completed.

4.2 Management

TVA's SNPP states that in the past there has been a lack of clear assignment of responsibility and authority to managers and their organizations. To correct this weakness, TVA has reorganized the Sequoyah site organization. TVA also has taken specific actions to clarify each manager's authority and area of responsibility and to establish accountability. TVA also has programs under way to improve the level of plant knowledge of plant managers and supervisors. The staff has evaluated the efforts made by TVA to improve the management and organization at Sequoyah in Section 4.2, Management, of NUREG-1232, Volume 2.

Long-term and short-term actions are under way to improve the plant procedures. The short-term effort consists of the development or revision of those procedures necessary to support plant restart. Work for Unit 2 was completed before the restart of Unit 2. Changes that are not necessary prior to plant restart will be handled as part of the long-term procedure upgrade program. The long-term procedure upgrade program is a corporate-wide effort that will extend beyond restart of a Sequoyah unit. As part of this program, the Sequoyah plant procedures will be incorporated into an overall five-tiered package of policies, directives, standards, procedures and instructions that will govern the operations of TVA's entire Office of Nuclear Power. A Site Procedures Group has been established on a permanent basis at Sequoyah to participate in this long-range program.

On the basis of its evaluation, the NRC staff concludes that TVA has acceptably addressed the Sequoyah-specific management concerns and weaknesses for the restart of Unit 1.

4.3 Quality Assurance

4.3.1 Quality Assurance Program

This section is on TVA's program to resolve conditions adverse to quality in its nuclear activities and on its quality assurance program. These programs were evaluated by the staff in Section 4.3 of NUREG-1232, Volume 2. TVA did

not identify any differences in the Unit 1 program from that for Unit 2. It is important to note that the staff's review and acceptance of the QA topical report means only that TVA's commitments meet the programmatic requirements of 10 CFR 50, Appendix B, as described in Section 17 of the NRC Standard Review Plan (NUREG-0800). The staff will assess whether these commitments are fully and effectively met in its ongoing oversight and inspection of TVA's technical and QA programs. Because of TVA's past problems in the QA area, the Region II staff approved this revision (Revision 9) to the QA topical report on January 30, 1987, for a period of 2 years. The staff's decision on extending the approval of the topical report will depend on how effectively TVA implements the program.

Staff reviews and audits of the TVA Condition Adverse to Quality (CAQR) process identified technical and administrative programmatic weaknesses. To address these weaknesses the licensee undertook a detailed and comprehensive program to improve the TVA CAQR (problem identification and resolution) process. The staff evaluated the QA program, QA topical and the CAQR process as described in the licensee's SNPP.

The staff assessment of the QA program and QA topical was that the Sequoyah programs were acceptable and the Unit 2 implementation was adequate. The staff also conducted inspections in this area as discussed in Inspection Reports 50-327/328-88-15, and 88-19.

Inspections 50-327/328-88-15 and 88-19 found that CAQR implementation was adequate and that identified weaknesses were addressed by the licensee. These findings were applicable to both Unit 1 and Unit 2.

On the basis of its reviews and the NRC inspections, the staff concludes that the CAQR process is acceptable and that it is being adequately implemented with respect to both Unit 1 and Unit 2. The staff also finds that the Quality Assurance Program is acceptable for the restart of Unit 1.

4.3.2 NRC Order EA 85-49

By letter dated June 14, 1985, NRC issued the Order EA 85-49 modifying the licenses for Sequoyah. The basis for the Order was the circumstances surrounding the preparation of a nonconformance report (NCR) related to the Sequoyah containment pressure transmitters. As a result of the special review conducted on March 27-29, 1985, NRC identified a breakdown in the management controls for evaluating and reporting potentially significant safety concerns.

TVA responded with letters dated July 2, July 26, August 13, September 17 and November 15, 1985; February 4, March 7 and July 2, 1986; and March 2, 1987. TVA concluded in its letter dated March 2, 1987 that, with the implementation of the TVA revised Conditions Adverse to Quality (CAQ) Program, it had met the requirements of the Order. We have reviewed these letters and the TVA revised CAQ program as described in the TVA Corporate and Sequoyah Nuclear Performance Plans. We have also reviewed the implementation of the program at Sequoyah in several NRC inspections.

As discussed in the Safety Evaluation, enclosed in its letter dated March 31, 1988, the staff concluded that TVA had acceptably addressed the Order for Sequoyah. Therefore, the Order was considered satisfied for Sequoyah. The NRC staff

stated that it would continue, however, to monitor the implementation of the CAQ program at Sequoyah as part of its normal inspection program for the units.

4.3.3 Changes to the CAQ Program

TVA has recently revised its CAQ Program. The previous program was evaluated by the staff and found acceptable prior to the restart of Unit 2 and was the basis for the staff concluding that NRC Order EA 85-49 was closed for Sequoyah. These evaluations are discussed in Sections 4.3.1 and 4.3.2 above and in Section 4.3 of NUREG-1232, Volume 2.

A meeting was held at NRC headquarters in Rockville, Maryland with TVA on September 8, 1988, to discuss the changes to the CAQ program. The staff concluded that the changes are an evolution of the program and do not affect the staff's conclusions in its safety evaluation on Order EA 85-49 dated March 31, 1988. The staff will continue to monitor the CAQ program implementation in its normal inspection activity at Sequoyah to determine the effectiveness of the changes that TVA has made to the program. The summary of the September 8, 1988, meeting will be issued by September 30, 1988.

4.4 Operating Experience Improvement

Item C.3 of Enclosure 2 to the 10 CFR 50.54(f) letter requested a detailed description of the Sequoyah Operational Readiness Plan. In response to this request, TVA described operating experience actions (in terms of enhancements made through reactor trip reduction, limitation of spurious engineered safety features actuations, review of the Davis-Besse event for lessons learned, and review of nuclear operations experiences) in the SNPP. Each of these enhancements were evaluated by the staff in Section 4.4 of NUREG-1232, Volume 2. The staff concluded that the actions taken by TVA were acceptable for the restart of both Units 1 and 2.

4.5 Post-Modification Testing

Past NRC inspections have identified problems with respect to the adequacy of testing of systems and components following modification. TVA instituted programs to address the deficiencies in its post-modification testing. These programs were evaluated by the staff in Section 4.5 of NUREG-1232, Volume 2. The staff concluded that the programs to address post-modification testing were acceptable for the restart of both Units 1 and 2. TVA did not identify any differences in the Unit 1 program from that for Unit 2.

4.6 Surveillance Instruction Review

4.6.1 Introduction

Staff reviews and audits of Sequoyah surveillance instructions (SIs) identified technical and administrative weaknesses in these instructions. To remedy these weaknesses, TVA has undertaken a comprehensive and disciplined program to review and revise these instructions. The program has undergone several evolutions since it was initiated in the summer of 1986. These changes have

resulted in increasing the technical and administrative depth of reviews, the scope of reviews, the independent evaluations of the process and its products, the field verification of SIs and their supporting instructions, and the technical content and specificity of SIs.

4.6.2 Evaluation

The staff assessment of the descriptive material providing the basis for the TVA program to review and revise certain Sequoyah Unit 2 SIs that implement technical specification surveillance requirements before restart included the scope, methodology and organization of TVA's surveillance review and revision program. The staff also conducted inspections in this area as discussed in Inspection Reports 50-327/328 87-36 and 87-50.

The basic objective of the SI program is to ensure all technical specification requirements are addressed and that the SIs and their supporting instructions covered by the program scope are technically adequate to fulfill the surveillance requirements of the technical specifications, have an appropriate level of dependence on the skill of the performer of the instruction, and comply with basic administrative requirements that make performance of the SI reliable. This Unit 2 program was completed prior to Unit 2 restart.

Although the staff concurs with TVA's objectives, TVA should define the skill level required to write, revise, and review the surveillance instructions and supporting procedures and TVA should describe, including starting and completion dates, the long-term program which will be undertaken to ensure complete administrative consistency, achieve standard format and organization and make other improvements and enhancements as are determined to be needed.

The staff's evaluation of the Unit 2 program is in Section 4.6 of NUREG-1232, Volume 2.

The scope of TVA's Unit 1 phase of the SI review program includes those technical specification SIs and supporting instructions that are required for startup, operation, and safe shutdown of Sequoyah Unit 1 to the point of the next refueling. The program methodology and the governing organization, required training and qualification, and instruction verification were discussed in the Unit 2 SER by the staff and found to be acceptable. These parameters are essentially the same for Unit 1.

The program is currently under the control of the site director, and it is implemented by the established plant organization under the day-to-day direction of the SI review project manager.

Both the Unit 1 and Unit 2 phases of the SI review program call for a detailed checklist to be used during the technical review of an instruction to identify technical deficiencies. Part I of this checklist focuses on the technical adequacy of the instruction, with an operability evaluation being performed only if the instruction is found to be technically inadequate. Part II of the checklist focuses on the administrative adequacy of the instruction, but all items within this section do not need to be fulfilled to ensure instruction adequacy. Part II of the checklist does not have to be completed for this program. Certain items in Part II of the checklist, such as SRO approval to

perform the test and verification or double verification signoffs, stem from other documents and are checked to ensure necessary compliance.

TVA has adopted a progressive SI verification approach that obtains the best verification permitted by plant conditions and the approval status of the instruction. During the latter stages of instruction preparation, the responsible section performs nonmanipulative walkdowns to confirm that the instruction is correct.

4.6.3 Conclusions

On the basis of its review and the NRC inspections, the staff concludes that the Surveillance Instruction Review and Revision Program is producing adequate procedures to support Unit 1 startup. However, the staff believes that the program for long-term control of surveillance instruction upgrade including resolution of the issues of temporary changes, qualification of reviewers, and schedule, needs to be provided to completely resolve this issue.

The staff reviews of the Sequoyah Procedure Enhancement Program indicated that this program is not unit specific and that the process being employed by the licensee is essentially the same for Unit 1. No additional inspection activities are necessary.

4.7 Operability "Look Back"

As a result of violations regarding the adequacy and timeliness of corrective actions for repetitive equipment failures and out-of-tolerance conditions, the licensee implemented a trending and tracking program at Sequoyah. Because this program was geared toward identifying future deficiencies, the staff raised concerns regarding potential operability questions resulting from past, undetected, repetitive failures.

TVA conducted an operability "look back" program that was designed to identify adverse conditions associated with equipment operability, to evaluate the safety significance of these conditions, to document the effectiveness of corrective actions, and to propose further corrective actions where necessary. This program was evaluated in Section 4.7 of NUREG-1232, Volume 2. The staff concluded that the scope, guidelines, and implementation of the Sequoyah operability look back review program satisfactorily accomplished its intended purpose for both Units 1 and 2.

4.8 Maintenance

Previous NRC inspections at TVA nuclear units indicated programmatic deficiencies in the site maintenance programs. In the SNPP, TVA discusses specific problems identified by the NRC and TVA that have existed at Sequoyah. These deficiencies include failure to implement appropriate preventive maintenance programs, failure to provide adequate planning of maintenance activities, and inadequacies in the training programs for the corporate and site personnel involved in maintenance activities.

The NRC staff evaluated the scope, organization, and methodology of TVA's maintenance program in Section 4.8 of NUREG-1232, Volume 2. The staff

concluded that the maintenance program is acceptable. TVA did not identify any differences in the Unit 1 program from that for Unit 2.

In its evaluation in NUREG-1232, Volume 2, the staff noted that managers do not adequately address long-term program development and that improvements are needed in time management, interface with support groups, and stabilization of the corporate organization. It also stated that interviews have indicated that TVA has taken the first steps in resolving these problems as evidenced by:

(1) TVA has conducted a time study of managers at the plant and has identified problem areas. It is the staff's understanding that this study involved evaluations of management skills, work processes, climate and stress factors, facilities and tools and that a report with recommendations on improving the utilization of management talent has been provided to TVA.

(2) The staff noted that the maintenance management appears to be working with support groups to establish effective interfaces as evidenced by management planning meetings with QA and utilization of SROs in the work planning process.

(3) The staff noted that the permanent corporate organization is beginning to take shape with the hiring of several very capable managers. The staff feels that the corporate organizations can have a significant impact on the establishment of an effective program, but believe that the stabilization of the corporate staff is essential to making this a positive impact and not a negative impact.

The NRC will review the effect of these actions on the effectiveness of TVA's maintenance program in a future inspection.

4.9 Restart Test Program

4.9.1 Introduction

In response to employee concerns, TVA conducted a reassessment of its plants' operational safety. A major re-review of the Sequoyah Unit 2 initial design, construction and operating practices was conducted and a Restart Test Program (RTP) was instituted to ascertain the functional integrity of the accident mitigation and safe shutdown systems. The principal objective of the RTP is to instill confidence that certain pre-operational tests conducted during initial plant licensing and surveillance inspections routinely conducted following plant licensing and during the long plant shutdown are valid tests that can ensure the current functional integrity of safety systems and components. This assurance is required because the functional integrity might have been jeopardized by plant modifications, maintenance practices, or the like. This assurance is obtained by reviewing post-modification and maintenance tests and any other tests, or programs that might have a potential impact on the validity of the subject tests.

The staff evaluated the RTP for Unit 2 in Section 4.9 of NUREG-1232, Volume 2. The staff concluded that the RTP will ensure the functional integrity of safety systems at Unit 2.

TVA identified minor differences in the Unit 1 RTP program from that evaluated for Unit 2. These differences are discussed in TVA's letters dated March 31 and May 9, 1988. These differences were reviewed by the staff in NRC Inspection 50-327/88-29 on the containment spray system (CSS).

4.9.2 Evaluation

In the Inspection 50-327/88-29, the staff reviewed the Unit 2 CSS RTP test matrix as it specifically applied to the Unit No. 1 CSS as well as comparing the general Unit 1 program against the Unit 2 complete program. The details of the inspection objectives for this review and inspection finding are given in Inspection Report 50-327/88-29 to be issued in September 1988. A summary of these details is provided below.

(1) Unit No. 1 CSS Restart Test Program Review

The inspection effort included a review of the CSS to verify that the Restart Test Group (RTG) functional review process is being adequately implemented, to verify that components/systems functions that are identified as requiring testing are properly dispositioned, to provide a sample assessment of the technical adequacy of several portions of previously completed preoperational tests that are being used to satisfy the functional testing requirements, and to verify that the functional analysis report (FAR) matrix package complied with the applicable documents including the FSAR and TS and contained the necessary information.

It was determined that, for the CSS, the requirements of the Unit 1 restart test program were either properly implemented or TVA agreed to correct the issue prior to Unit restart.

(2) Comparison of Unit 1 RTP to the Unit 2 Completed Program

The purpose of this comparison was to determine the adequacy of the modified Unit 1 RTP as contrasted to the Unit 2 program that was accepted by the staff and documented in Section 4.9 of NUREG-1232, Volume 2. TVA provided the details of the differences between the Unit 1 RTP and the Unit 2 RTP in the enclosure to its May 9, 1988 letter. The RTP for Unit 1 is essentially the same as that for Unit 2 and the evaluation and conclusions discussed in NUREG-1232, Volume 2, are considered valid for both units. However, the Unit 1 program scope was reduced from that applied to the Unit 2 based on lessons learned and as a result of modification to other Unit programs that were process inputs to the RTP. These differences along with the team's comments are provided below:

- Once the design functions were established, the review of the impact of previous modifications was performed by the RTP utilizing SIL-9B to generate the modification review report. This was different from the Unit 2 program which utilized the DBVP output for the list of modifications which may affect the system.

  The team identified a possible weakness with this approach. Specifically, the Unit 2 program had also used red line drawing to depict the as constructed system at the time the preoperational tests were performed. Combining the DBVP output (i.e., mods since time of licensing) with the red line drawing, the Unit 2 program could

evaluate the adequacy of post modification testing of all modifications subsequent to successful preoperational testing. In comparison, the Unit 1 program which did not include the red line drawing process, creates a gap involving the adequacy of post-modification testing between the time the preoperational test was performed and the time of issuance of the operating licensing (OL).

This problem only affected those functions where the licensee was taking credit for preoperational tests to validate adequate testing of the specified function. TVA has determined that 274 modifications fall into the post-preoperational testing and pre-OL category. Of these, 190 modifications were reviewed as part of the modifications review for Unit 1 and 16 were Unit 2 only leaving 68 modifications to be reviewed. Two of the 68 modifications were determined to have a potential impact on previously tested equipment and both of these modifications were determined to be adequately tested and had no impact on the function involved.

- The Unit 2 program requirement to review the results of the post-maintenance test survey was not included in the Unit 1 program. This decision was based on TVA lessons learned from the Unit 2 program which indicated that only approximately 6% of the maintenance requests (MR) reviewed indicated either a lack of adequate test documentation or a lack of adequate testing. Additionally, the post-maintenance test survey was not conducted for Unit 1 as part of DBVP; therefore, the RTP could not use it as an input to their process. Additionally, the team was informed that the additional testing controls put in place at the station as a result of the Unit 2 maintenance program upgrade should reduce the impact of possible inadequate post-maintenance testing on the validity of previous functional tests.

- The Unit 2 requirement to review the impact of the piece parts review was also deleted from the Unit 1 program. TVA described the reduction in the Unit 1 piece parts program in its letter dated February 10, 1988. This reduction is evaluated by the staff in Section 3.3 of this SSER. TVA stated that the RTP, therefore, did not identify a need to review the output of the piece part program for impact on functional test validation. Additionally, as stated above, the licensee feels that the improved maintenance program would ensure that any part replaced as a result of the piece parts review would be adequately tested.

4.9.3 Conclusions

As stated earlier, based on the above minor program implementation changes, the team concluded that the evaluation and conclusion for the Unit 2 program as stated in Section 4.9 of NUREG-1232, Volume 2, adequately bounds the Unit 1 program.

4.10 Training

Because of the programmatic concerns arising from licensed operator requalification deficiencies identified at Browns Ferry and deficiencies identified in operator and shift technical advisor (STA) knowledge of the safety parameter display system (SPDS), the staff determined that the Sequoyah training program would have to be reviewed for adequacy prior to startup.

Section II.2.3 of the SNPP documents TVA's review and evaluation of training and staffing. In the SNPP, TVA committed to increase the reactor operator certification program to 16 weeks and to increase the requalification period to 6 weeks. TVA also noted that training for assistant unit operators was increased from 1 week to 2 weeks in 1986 and will be 6 weeks [illegible] thereafter.

The staff evaluated the training programs instituted by TVA [illegible] of NUREG-1232, Volume 2. TVA did not identify any differences [illegible] program from that for Unit 2. The staff concluded that the programs were sufficiently acceptable to permit restart of Sequoyah [illegible]. However, the staff will continue to monitor these programs to [illegible] implementation.

4.11 Security

In the 10 CFR 50.54(f) letter (September 17, 1985), the staff noted that there were several areas in which TVA had not been performing adequately. These areas were identified from their low ratings within their respective SALP categories. As a result of these concerns, TVA has initiated several actions intended to upgrade performance. In the most recent SALP, the staff found an improving trend in the area of security, compared to the degradations previously noted. However, to ensure that this improvement would continue, TVA undertook several actions. These actions, which are discussed in Item 4 of Appendix 2 to the SNPP, are evaluated below.

TVA identified in the SNPP those measures it will take to enhance the knowledge of supervisors and employees in their responsibilities for complying with security requirements. TVA will trend all security degradations to identify areas for improvement and revise the training program for public safety to include experience from prior security incidents. To ensure the planned improvements were being properly implemented, the staff conducted physical security inspections at the Sequoyah plant as documented in Inspection Report Nos. 50-327/328 86-30, and 50-327/328 86-47.

The staff has reviewed the information provided in the SNPP and has performed several physical security inspections as part of its evaluation of the improvements to the Sequoyah plant security. Based on the results of its evaluation, the staff concludes that the action taken by TVA to improve security addresses the staff's concerns. In addition, the staff finds that with the implementation of these actions, TVA will have an acceptable security program for restart of either Sequoyah unit.

4.12 Emergency Preparedness

SNPP Appendix 2, Section 6, Revision 1, documents TVA's actions taken in the Sequoyah emergency preparedness (EP) program to resolve problems identified in

NRC SALP evaluations. The corporate Emergency Preparedness Branch has been reorganized and additional staff identified to provide additional resources in the areas of emergency planning and procedures, state and local government interfaces, development and conduct of exercises and drills, and onsite and offsite facilities. Additional staff has been identified at the sites for program implementation.

TVA has completed installation of sirens and strobe lights in accordance with approved engineering change notices issued to meet the requirements of IE Bulletin 79-18, Audibility of Alarms in High-noise Areas. Tests to verify the system's effectiveness with the added sirens and strobe lights will be completed after restart of both units, when the equipment operating noise levels are normal.

Emergency preparedness for Sequoyah was evaluated by the staff in Section 4.12 of NUREG-1232, Volume 2. This evaluation covers the improvements made by TVA to its Radiological Emergency Plan for Sequoyah. The staff concludes that, with proper implementation, past EP problem areas should be satisfactorily resolved.

4.13 Radiological Controls

In Section II.1.2.3 of the SNPP, TVA discusses its improvements to the radiological controls (RC) organization. The staff evaluated these improvements in Section 4.13 of NUREG-1232, Volume 2. TVA did not identify any differences in the Unit 1 program from that for Unit 2. The staff concluded that these measures will strengthen the RC program at Sequoyah. The staff also concluded that the actions taken by the licensee, including correction of previous weaknesses in its program for maintaining exposures as-low-as-reasonably-achievable (ALARA), are sufficient to support plant restart for both Units 1 and 2.

4.14 Restart Activities List

4.14.1 Introduction

For Sequoyah Unit 2, TVA established a Sequoyah Task Force on March 19, 1986, to review implementation of the corrective actions applicable to Sequoyah, to initiate specific actions to address Sequoyah problems, to monitor and ensure that a list of all known work items has been compiled, and to review the process and identification of those items required to be completed before restart of Sequoyah Units 1 and 2.

To complete its assignment, the Sequoyah Task Force developed a list of Sequoyah plant activities (except for those of a routine nature) to be completed before restart. The Sequoyah Activities List (SAL) was based on issues identified by NRC inspections, TVA quality assurance (QA) audits, American Nuclear Insurers (ANI) audits, Institute of Nuclear Power Operations (INPO) inspection reports, Sequoyah corrective action reports (CAR) and discrepancy reports (DR), TVA Nuclear Safety Review Staff (NSRS) and Nuclear Safety Review Board (NSRB) reports, employee concerns, Sequoyah reactor trip reports and licensee event reports (LERs), and technical issues identified by TVA's Division of Nuclear Engineering (DNE).

The Sequoyah Task Force had established criteria (Section IV.2.0 of the SNPP) to determine which items were required to be resolved for restart. The staff has reviewed and accepted this criteria by letter dated June 9, 1987. The Sequoyah Task Force reviewed the process the line organization used to identify, evaluate, disposition, and close out items and reviewed the adequacy of planned actions taken before Sequoyah Unit 2 restart. As new issues arose and work activities were developed, they were reviewed by Sequoyah management to determine their importance to restart. The Site Director had to approve all new items added to the restart list; however, only the Manager of the Office of Nuclear Power (ONP) [presently the Senior Vice President, Nuclear Power] could delete items that had been designated for restart.

4.14.2 Evaluation

The identification, tracking and closure of restart items for Unit 1 is discussed in Section IV of Revision 3 of the SNPP. This was submitted by TVA in its letter dated May 9, 1988.

For Unit 1, the identification and tracking of restart items is being accomplished by TVA's permanent tracking system and reporting of open items (TROI) computer program rather than by the SAL used for Unit 2. This program lists the restart and non-restart items for Sequoyah in a database. The status and responsible organization for each item is accessible through computer terminals in computer printouts to plant personnel. This capability was not available with the SAL. The staff has reviewed the data available from TROI and finds it acceptable.

TVA stated that the Unit 1 restart list was developed by an item-by-item review of completed and open Unit 2 and common restart activities and of open Unit 1 issues. Standard Practice SQA203 "Use of TROI for Unit 1 Restart Action List," was issued by TVA to specify the requirements for maintaining and controlling the Unit 1 restart list. The criteria used by TVA to determine if issues must be completed before restart is the same restart criteria used for Unit 2. Standard Practice SQA203 requires each SQN Unit 1 potential restart item to be evaluated against this criteria to determine whether associated corrective action is required to be completed before restart. TVA stated that the Site Director has designated either the Restart Director or Assistant to the Site Director to evaluate proposed new activities and ascertain that these activities meet the restart criteria.

In describing its process to close out restart items, TVA stated that Standard Practice SQA203 specifies that existing site procedures will be used to ensure that Unit 1 restart items are dispositioned and closed in a verifiable manner. Each site manager is responsible for: maintaining the status of his restart items through closure; adding new actions as necessary to resolve an open restart item as the issue evolves; and ensuring that a specific discipline and manager within his organization is assigned responsibility for obtaining timely closure of open restart items. An item is considered closed for restart by TVA when all corrective actions that have been specified to be completed before restart are field completed, documented, and verified as appropriate.

To coordinate the effort to designate new activities as restart items, TVA explained that the Site Director has identified a Unit 1 Restart Director who is responsible for coordinating the Unit 1 restart effort. The Unit 1 Restart

Director reports directly to the Site Director and has responsibility and authority to establish specific schedule priorities, to ensure that line managers are coordinating their activities to complete all restart actions, to establish site goals as appropriate to achieve a safe and timely restart, to call and conduct restart schedule status meetings, and to ensure performance of the individual groups and integrated work activities. TVA stated that this position has been established in order to ensure that all restart requirements are properly completed in an integrated fashion and on a timely basis.

4.14.3 Conclusions

Based on the above, the staff concludes that the use of TROI to identify, track status on and indicate closure of Unit 1 restart items is acceptable.

5 EMPLOYEE CONCERNS

During the spring of 1985, a number of TVA employees informed the NRC and selected members of Congress of safety concerns, primarily related to the Watts Bar Nuclear Plant. In addition, TVA learned of many employee concerns through its own organization. The concerns indicated that many TVA employees had lost confidence in TVA's nuclear management and its ability to properly conduct nuclear activities. In addition, some of these employees expressed fear of reprisal from TVA management if they raised their concerns directly. Two programs relating to employee concerns have resulted; they are referred to as the new program and the special program. These two programs are discussed in detail in the staff's Safety Evaluation Report on the Tennessee Valley Authority Revised Corporate Nuclear Performance Plan, NUREG-1232, Volume 1, dated July 1987.

The new employee concern program (ECP) was implemented at Sequoyah on February 1, 1986, as described in a TVA submittal of February 3, 1986. The key element of the program is the ECP Site Representative at Sequoyah. The ECP staff receive and investigate concerns from employees who feel that normal channels of resolution have failed. The program is further described in other TVA submittals including the SNPP. The staff issued its safety evaluation accepting the TVA new ECP on September 30, 1987.

In May 1985, TVA awarded the Quality Technology Company (QTC) a contract to develop and implement a program for conducting confidential interviews with TVA employees performing assignments for the Watts Bar Nuclear Plant. Concerns also were collected from TVA employees at the Sequoyah and Browns Ferry plants. This program, which emphasized the identification of employee concerns dealing with nuclear safety at all TVA facilities, identified more than 5000 employee concerns. In February 1986, TVA initiated a program to evaluate and resolve these employee concerns. The employee concern special program (ECSP) was developed to review the concerns received through the QTC or from the Nuclear Safety Review Staff (NSRS) for applicability to Sequoyah. This work was performed by the Watts Bar employee concern task group (ECTG). The staff evaluation of the ECSP was issued to TVA by letter dated October 6, 1987.

The employee concerns were grouped into nine categories for evaluation and resolution. The categories are construction; engineering; industrial material control; operations; quality assurance/quality control; welding; management and personnel; industrial safety; and intimidation, harassment, wrongdoing, and misconduct.

Because Sequoyah, Units 1 and 2, were scheduled to be the first TVA plants restarted, the concerns applicable to Sequoyah only, within each employee concern subcategory, were divided into individual element reports that addressed related concerns. For Sequoyah, element reports were prepared covering six of the categories. TVA has submitted over 300 element reports to address the resolution of employee concerns for Sequoyah. These element reports have been divided into those needed to be resolved and evaluated before the restart of

the Sequoyah units and those that may be resolved after restart. The criteria used was the staff-approved restart criteria.

The NRC staff has issued, by letter dated March 11, 1988, its "Preliminary Safety Evaluations on the Tennessee Valley Authority Employee Concern Element Reports" for the restart of Unit 2. This preliminary safety evaluation addressed those element reports that the staff considered had to be resolved before the restart of Unit 2. The safety evaluation for the restart element reports for Unit 1 will be issued before the restart of Unit 1.

Subcategory and category reports will address the resolution of employee concerns for the other TVA nuclear plants. TVA will not submit any element report for the management and personnel and industrial safety categories because TVA has concluded these do not contain safety-related concerns. The staff has concluded that employee concerns in these two categories have been adequately addressed as discussed in letters to TVA (December 14, 1987, and August 24, 1987, respectively). Concerns in the ninth category, relating to intimidation, harassment, wrongdoing, or misconduct, will be investigated and the results reported separately by the TVA Office of General Counsel or the TVA Inspector General. The staff's review of TVA's handling of these concerns is discussed in an October 8, 1987 letter to TVA.

On the basis of its review of the TVA employee concerns program, the NRC staff concluded in Volume 1 of NUREG-1232 that TVA now has a policy that promotes quality and safety and TVA has taken steps to ensure that this policy is understood by TVA employees and that the policy is strictly enforced. The actions taken by TVA to improve employee confidence define an acceptable program for dealing with employee concerns. In combination with the other improvements in the nuclear program that TVA is implementing, these steps should improve the confidence of employees in TVA's management. The staff considers effective implementation of the new employee concerns program necessary if TVA is to significantly change its prior performance record.

The staff will continue to monitor program implementation and the effectiveness of actions taken to deter intimidation and harassment.

The staff will not issue its evaluations on all of the element reports for Units 1 and 2 as Part 2 of NUREG-1232, Volume 2. The staff will, as stated above, issue its evaluations of the restart element reports for Unit 1 as a Safety Evaluation Report before the restart of Unit 1.

6 ALLEGATIONS

Many concerns about nuclear safety problems were made to TVA and investigated under their employee concerns program; many concerns about nuclear safety and other issues were made directly to the NRC staff. In a number of instances, the technical content of these allegations were provided to TVA for inclusion into the employee concerns program. The NRC staff used TVA's responses as well as independent reviews to evaluate the issues and corrective actions. The remaining allegations will be handled by the staff in accordance with established NRC policies for allegations. All potential nuclear safety significant Sequoyah-related allegations will be evaluated and resolved to the satisfaction of the NRC staff before the restart of Unit 1.

APPENDIX A

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September 21, 1988

Docket Nos. 50-327/328

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Mr. S. A. White
Senior Vice President, Nuclear Power
Tennessee Valley Authority
6N 38A Lookout Place
1101 Market Street
Chattanooga, Tennessee 37402-2801

Dear Mr. White:

SUBJECT: PRELIMINARY SAFETY EVALUATION ON THE TENNESSEE VALLEY AUTHORITY SEQUOYAH NUCLEAR PERFORMANCE PLAN - SEQUOYAH UNIT 1 (TAC 60081, 60409, R00370, R00371, R00354)

This letter forwards our preliminary Safety Evaluation (SE) on the Tennessee Valley Authority's (TVA) response to the Nuclear Regulatory Commission's (NRC) 10 CFR 50.54(f) letter of September 17, 1985, relating to site-specific issues at the Sequoyah site for Unit 1. This SE represents the staff's evaluation of the TVA Sequoyah Nuclear Performance Plan through Revision 3, with supporting documents, for Unit 1. Volume 2 of NUREG-1232 was issued by the NRC on May 18, 1988, and addressed the Sequoyah Nuclear Performance Plan for Unit 2.

Based on the enclosed SE, the staff concludes that, subject to resolution of the restart electrical design calculations, TVA has resolved concerns at Sequoyah Unit 1 that led to issuance of the staff's 10 CFR 50.54(f) letter, and that the programmatic improvements are sufficient to support TVA nuclear plant operations for Unit 1. The staff's acceptance of your programmatic improvements is based in many cases on commitments made by TVA. Implementation will be monitored through normal NRC inspection activities. In addition, certain significant activities are highlighted in the enclosed SE that TVA has committed to complete either for restart of Unit 1 or as post-restart actions.

Sincerely,

Original signed by

Steven D. Richardson, Director
TVA Projects Division
Office of Special Projects

Enclosures:
As stated

cc w/enclosures:
See next page

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