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Division of Quality Assurance, Vendor,
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6N, 38A Lookout Place
1101 Market St.
Chattanooga, TN 37402-2801

Facility Name: Sequoyah Nuclear Plant, Units 1 & 2

Inspection At: Soddy Daisy and Knoxville, TN

Inspection Conducted: June 9-13 and 16-20, 1986

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LIST OF ABBREVIATIONS

ANSI	American National Standards Institute
CFR	Code of Federal Regulations
DBVP	Design Baseline and Verification Program
DNE	Division of Nuclear Engineering
EA	Engineering Assurance
ECN	Engineering Change Notice
ESF	Engineered Safety Features
EQ	Environmental Qualification
FCN	Field Change Notice
FSAR	Final Safety Analysis Report
HVAC	Heating, Ventilation and Air Conditioning
IEEE	Institute of Electrical and Electronics Engineers
LOCA	Loss of Coolant Accident
NRC	U.S. Nuclear Regulatory Commission
NSSS	Nuclear Steam Supply System
P&ID	Piping and Instrumentation Diagram
RHR	Residual Heat Removal
SLE	System Lead Engineer
SQN	Sequoyah Nuclear Plant
TACF	Temporary Alteration Control Form
TVA	Tennessee Valley Authority
USQ	Unreviewed Safety Question
WDP	Walkdown Package

SEQUOYAH NUCLEAR POWER PLANT
Design Baseline and Verification Program (DBVP)
Inspection Report 50-327/86-27 & 50-328/86-27
June 9 through June 20, 1986

1. INTRODUCTION AND BACKGROUND

This program was developed by the Division of Nuclear Engineering to resolve design control issues described in several evaluations and audits including:

- Comprehensive review of the existing program.
- Studies/evaluations performed by TVA and others.
- Interviews of key personnel within the TVA organization.
- The preliminary results of the NRC design control team inspection (Report 50-327;50-328/86-27).
- Two reviews performed by Gilbert/Commonwealth.
- The corporate evaluation conducted by INPO.

The Sequoyah Design Baseline and Verification Program will be used by TVA to provide the required level of confidence that the plant modifications, implemented since receipt of the operating license, have not resulted in the violation of the plant's licensing basis.

The program is described in the "Program Plan for the Engineering Assurance Independent Oversight Review for the Sequoyah Nuclear Plant Design Baseline and Verification Program," dated May 9, 1986 and forwarded to the NRC as an enclosure to Mr. R. L. Gridley's letter dated June 27, 1986.

NRC inspection activities related to the TVA's DBVP and associated Engineering Assurance (EA) independent technical oversight of Sequoyah Nuclear plant are planned to be conducted in several phases:

(1) Inspection of program preparation and initial implementation (EA Review plans and procedures, DBVP procedures, walkdown results).

(2) Inspection of program implementation, including design criteria preparation, Engineering Change Notice (ECN) and system evaluations.

(3) Inspection of DBVP and EA oversight results and corrective actions.

2. PURPOSE

This was the first in a series of inspections planned to evaluate the DBVP. The purpose of this inspection was to assess (1) the overall DBVP plan and scope; (2) the implementing procedures for both the project and the associated independent Engineering Assurance (EA) oversight; (3) conduct and results of the walkdowns; and (4) perform a preliminary inspection of the preparation of

design criteria. Specifically, the NRC evaluated EA review plans for each technical discipline to ensure that the review plans were in accordance with the program plan and also that they were in sufficient technical depth to achieve the program objectives. The NRC also reviewed project work to date, including definition of program boundaries and completion of system walkdowns. The NRC reviewed procedures for the DBVP to verify that technical attributes were properly addressed, and also performed a cursory overview of TVA's program for generation and updating of the design criteria, including the creation of a commitment/requirement data base, for the Sequoyah Nuclear plant.

The timing of the inspection was such that the walkdowns were nearing completion and substantial technical evaluation had not begun. A decision was made to perform an inspection at this time to evaluate the content and conduct of the walkdowns. The team could not extensively review technical products of the program except for walkdown packages and certain technical procedures/calculations.

3. INSPECTION ACTIVITIES

The following activities were generally performed by all team members.

(1) Review of TVA Calculation SQN-OSG7-048 "Identification of Systems Required for Restart."

(2) Review of TVA's EA Oversight Program Plan and related DBVP procedures.

(3) Interviews with key EA Oversight and DBVP project team personnel.

(4) Review of selected walkdown packages, governing procedures and maintenance instructions.

(5) Preliminary scoping and review of select ECNs which are candidates for subsequent direct inspection.

(6) Qualification of DNE project and EA personnel.

TVA's program plan for the Design Baseline and Verification Program (attachment B reference 2) was evaluated. The objectives of the program are to verify the adequacy of changes made since operating license (OL) to systems required to mitigate design basis events and to provide for safe shutdown of the plant. This program document breaks the overall program down into five major areas:

- Interim Change Control
- Design Criteria/Design Basis
- System Walkdown/Test
- Evaluation of ECN and Other System Changes
- System Evaluations and Corrective Actions

The document further requires that procedures be issued on many of the program activities including Engineering Assurance Oversight Review.

The team was also provided with a copy of the program plan for Engineering Assurance Oversight Review (attachment B reference 6). This plan establishes a team of experienced technical personnel to monitor, on a sample basis, every aspect of the pre-restart phase of the design baseline and verification program. The independent review by Engineering Assurance is to:

- o Confirm and validate that engineering activities are being conducted in accordance with the overall approved program plan, in accordance with the approved procedures established for the design baseline and verification program, and by personnel trained for the specific activity being confirmed/validated.

- o Confirm the technical adequacy of the system evaluations and the completeness/correctness of the supporting documentation.

- o Verify that the corrective actions resulting from the evaluation have been implemented and documented.

4. SUMMARY OF FINDINGS

Several weaknesses in implementation were pointed out to TVA. These were identified as observations during the inspection and presented to TVA management during the exit meeting held on June 20, 1986. The following items were among those discussed at this meeting.

4.1 Overall DBVP Plan and Scope

In general, the team concluded that the overall program plan and plan for oversight review by EA appear to contain the elements and program areas necessary to adequately address DBVP objectives.

The team was concerned that in some areas the DBVP scope might inadvertently exclude issues or items significant to safe restart. For example, the calculation defining program boundaries did not provide a rationale for excluding certain events (Observation No. 4.1). TVA advised the team that the calculation was being revised, based on a similar concern identified by the EA oversight group. The team also noted that some system boundaries are not specifically defined in the calculation, such as those for the reactor protection system (Observation No. 4.2).

The team found that, if properly implemented, the EA Oversight Review program plan should provide confirmation that Sequoyah design baseline documentation required for systems within program boundaries is current and verified for correctness. The program should also confirm that methods used to implement engineering work needed for plant restart are controlled and appropriate. Sampling of implemented engineering work by EA should confirm the adequacy of the methods used and products such as design drawings and calculations.

4.2 Implementing Procedures for Both the Project and the Associated Independent Engineering Assurance (EA) Oversight

During reviews of the walkdown packages, the team noted that some portions of walkdown limits were less inclusive than the DBVP boundaries (Observation No. 1.2). Although this was allowed by the program, documentation regarding the basis for such decisions was only required at the time of system evaluation. The procedure for performing system evaluations had not yet been written, but was referenced in the walkdown procedure as the governing procedure for documenting differences between walkdown scope and program boundaries.

The NRC team observed that many procedures and criteria needed to complete the DBVP were not yet issued and approved. TVA is developing procedures and

criteria as the program progresses. The team was concerned that this may result in accommodation of the procedures to the actual work performed.

Regarding the EA Oversight review, the team considered that more explicit criteria for sampling work products was required. The program plan only states the required sample size (5%) and does not give guidance regarding safety significance or other relevant attributes of effective sample selection (Observation No. 4.3).

4.3 Conduct and Results of the Walkdowns

Inconsistencies between Units' 1 and 2 walkdowns were identified, stemming from latitude left to systems engineers on attributes to be included (Observations Nos. 1.1, 3.1, 6.3 and 7.1). The team also noted that the program lacked verification of portions of system drawings where portions of the system appeared on more than one drawing (Observation No. 1.3). The team also determined that the actual system walkdowns performed did not ascertain dimensional information. Therefore, the configuration information was of limited use in evaluation of civil/structural aspects. The licensee informed the team that dimensional data would be obtained as needed, following a determination by engineers reviewing ECN packages, during the conduct of supplemental walkdowns.

The team noted that the scope of the walkdowns does not include physical verification of instrumentation and electrical aspects, such as conformance of system functionality to single-line elementary or schematic diagrams, cable separation, etc. (Observation No. 5.1). TVA stated that they intend to assess the adequacy of these aspects by review of test documentation (including surveillance tests) or other controlled documentation which is available. The rationale to support TVA's position needs to be documented. The team noted that the electrical test evaluation procedure did not specifically require modification of pre-operational testing acceptance criteria as needed to adequately assess modified systems or components (Observation No. 5.3).

4.4 Preparation of Design Criteria

A cursory overview of the preparation of design criteria at the DNE offices in Knoxville, Tennessee was also conducted. The team noted that several TVA Civil Engineering Branch General Design Criteria specified reduced margins of safety (below those committed to in the FSAR) to be allowed for restart (Observation No. 3.1). The licensee was informed that these reduced margins of safety would need to be reviewed and approved by the NRC. The team also noted lack of a tracking system to assure equipment requalification following use of such interim acceptance criteria (Observation No. 3.2).

TVA contracted with IMPELL to generate a set of commitment/requirements to be used in the preparation of a data base. Outputs of this data base are to be used as design input in the development of system and general design criteria. The team noted (Observation No. 5.4) that the IMPELL work had not been independently verified, and thus questioned the validity of the derivative design criteria.

4.5 Summary

Based on the nature of the findings discussed above, the team concluded that there do not appear to be any major flaws, provided TVA addresses the concerns

identified in this report in subsequent programmatic or implementation activities. Due to the limited amount of technical work accomplished as of the time of the inspection, a final determination of overall program adequacy must be made following substantial program implementation.

5. SPECIFIC COMMENTS

Specific comments of individual NRC discipline inspectors are categorized as observations. The observations and a description of the activities performed by each discipline of the NRC team are provided in Attachment A of this report. Responses to individual observations will be reviewed by the NRC during its inspections of program implementation or corrective actions. These observations elaborate on the general comments stated in the cover letter and in some cases provide additional comments not considered to be of a general nature.

6. MEETING SUMMARIES - REFERENCES

A summary of the meetings held relating to the DBVP inspection and a list of references is provided in Attachment B.

Attachment A - Inspection Activities and Observations

1. OPERATIONS

The objective of this portion of the inspection was to overview the Design Baseline and Verification Program (DBVP) to ascertain if operational consideration was being given to the system walkdown findings and how operational concerns were being resolved.

The controlling documents for the DBVP were reviewed, including:

- SQEP-08, Packaging and Controlling of Walkdown/Test Documentation
- SQEP-12, Procedure for Evaluating ECNs and FCNs
- SMI-0-317-30, Systems Walkdown

The procedure which will evaluate the findings of the system walkdowns, SQEP-16, was not issued and therefore could not be reviewed. With this procedure not issued, what is to be done with the walkdown findings and the extent of Operations Department involvement in the evaluation process could not be determined.

Several completed walkdown packages (WDP) were reviewed to examine the scope of the findings and to check if items of operational impact were being discovered. The packages reviewed were:

- 87 Upper Head Injection
- 26 High Pressure Fire Protection
- 65 Emergency Gas Treatment
- 43 Sampling
- 15 Steam Generator Blowdown
- 01 Main Steam
- 74 Residual Heat Removal (RHR)
- 03 Auxiliary Feedwater (AFW)

An independent walkdown of portions of the RHR and AFW systems was accomplished to get an understanding of the completeness of the project and EA walkdowns.

Four observations were identified relating to the impact of the walkdown findings on operational procedures, differences between the walkdown boundaries and the calculation that defines the system boundaries in the scope of the DBVP, assessment of system interfaces on drawings, and the justification for not including optional attributes in walkdowns (Observations Nos. 1.1 - 1.4).

Observation No. 1.1 - Impact of Walkdown Findings on Operating Procedures

No specific DBVP procedure exists that clearly identifies the extent of Operations Department review of the system walkdown findings for impact on operating procedures, valve lineups, surveillance procedures, emergency operating procedures, etc. Three different cases were noted by the team:

> Pressure transmitters PT-3-145 and PT-3-168 were found to be labeled reversed. A review of which functions each of these transmitters serve should be performed to ensure that no surveillance frequency or functional requirement was missed due to the reversal of the labeling.

Penetrations X78 and X51 in the high pressure fire protection system do not show on the system drawing. A review of local leak rate testing and in-service inspection requirements should be performed to assure that the penetrations which are not shown on the drawing are in the required testing programs.

In the upper head injection walkdown package it was reported that several valves were found to exist in the plant that did not show on the system diagram. A review of operating procedures, valve lineups, etc., should be made to ensure that all valves in the plant appear in the appropriate documents for this system.

Observation No. 1.2 - Differences between Walkdown Boundaries and Calculation SQN-OSG7-048, "Identification of Systems Required for Restart"

There is no justification documentation for the differences between the calculation that defines the scope of the DBVP and the walkdown boundaries in the walkdown packages. Differences also exist between the boundaries as defined in the walkdown packages for Unit 1 and Unit 2 for the same system (RHR for example). No justification is included in the walkdown packages for this difference.

Procedure SQEP-08, Packaging and Controlling of Walkdown/Test Documentation, paragraph 3.1.3, requires justification and documentation in accordance with SQEP-16 (not yet issued) for differences between the calculation and walkdown package. No specific instructions exist for documentation of justification of differences between the same system in Unit 1 and Unit 2. There is currently no documentation of differences in the walkdown packages. The licensee stated that the required documentation would be added to the walkdown packages following issuance of SQEP-16.

Observation No. 1.3 - System Interfaces on Drawings

No DBVP procedure is in place with instructions regarding how the drawing interface between systems is to be assured accurate. Many system flow diagrams include more than one system and/or unit. For example, the diagram may be titled RHR System - Unit 1 and be used to walkdown the RHR system in Unit 1 but may also include some portions of the safety injection (SI) system. Depending on the system engineer who marked the boundaries of the walkdown on the RHR diagram, the portions of the SI system shown thereon may or may not have been included for walkdown. If the SI system portion shown on the RHR diagram were not walked down using the RHR diagram then this depiction of the SI system could be in error, even though a walkdown of the same run of piping during a SI walkdown with a different drawing may yield no configuration problems.

The team noted that RHR system drawing 47W810-1 includes a portion of the SI system with flow control valve 63-1 and check valve 63-502. Walkdown package 74 (RHR) included these valves within the walkdown boundaries for Unit 1. The walkdown found that the configuration in the plant is different from that shown on the RHR drawing. The walkdown boundaries for Unit 2 excluded this portion of the SI system, therefore whether the same disagreement of arrangement between the drawing and plant exists for unit 2 is unknown. No program was in place which would assure that this type of error is to be corrected.

Observation No. 1.4 - Diesel Fuel Oil Line Pipe Size

The NRC team reviewed the walkdown package for the emergency diesel generator fuel oil system. The DBVP walkdown team had noted a discrepancy in the fuel oil transfer pump discharge line. The walkdown package drawing listed the line size as 1.5 inch pipe. The actual size was found to be 1.0 inch. This discrepancy was noted even though determining pipe size was not a specified attribute in this package. The walkdown team considered it significant enough to note without being required to do so. In fact, pipe size for this particular section could be significant to the functional capability of the diesel generator during periods of extended full power runs. In this instance, the system engineer's decision to exclude pipe size as an attribute is questionable.

Regarding this item, during review of Systems Walkdown Procedure SMI 0-317-30, the NRC noted that attributes assigned to the individual walkdown packages were allowed to be excluded without justification. The team noted that of the 14 attributes only 4 were required for all walkdowns, the others were omitted at the discretion of the system engineer. The team recognizes that not all attributes are necessary for each specific walkdown, however attribute omission should be justified and documented.

2. MECHANICAL SYSTEMS

During the period of June 9-20, 1986, the team accomplished the following:

Conducted partial walkdown inspections of the residual heat removal and diesel fuel oil systems.

Reviewed several TVA walkdown packages, including auxiliary feedwater, residual heat removal, diesel fuel oil and component cooling water.

Reviewed several TVA Sequoyah Engineering Procedures.

Reviewed information from TVA Engineering ECN files.

Two observations were identified relating to the walkdown scope and the recording of nameplate and dimensional data (Observations Nos. 2.1 and 2.2).

Observation No. 2.1 - Walkdown Scope

TVA's walkdown results for WDP-74, Residual Heat Removal System, Unit 1, identified that valve 1-FCV-74-2 has a stem leakoff piping and valve that is not shown on the flow diagram used for the walkdown. A walkdown of part of the Unit 1 RHR by the NRC inspection team found that valve 1-PCV-74-3 also has a stem leakoff valve and piping that was not shown on the flow diagram. This condition was not identified on the TVA walkdown action list.

In another case, the TVA walkdown of Unit 2 identified that local gauges, actually located outside of the pump cubicle, were shown as inside the cubicle

on the walkdown drawing. The NRC inspection team observed that Unit 1 has a similar configuration. However, the TVA walkdown of Unit 1 did not identify this discrepancy.

These two examples indicate inconsistency in the approach being taken by the various TVA walkdown teams.

Observation No. 2.2 - Nameplate and Dimensional Data

The team observed that a sampling program initially planned for nameplate data has been deleted. A sampling program was proposed in lieu of taking down all nameplate data during walkdowns. Instead of such a program, ECNs, TACFs and other change documents will be used to identify equipment which has been modified or replaced since operating license. This list will then be reduced to changes requiring resolution before restart. Supplemental walkdowns will be used to collect nameplate data and dimensional data required to support the engineering evaluation. This determination of whether a supplemental walkdown is necessary is to be made by the system engineer. Some guidelines should be issued to assure consistency in the scope of supplemental walkdowns in this area and that all data important to the DBVP is obtained.

3. MECHANICAL COMPONENTS

In the mechanical components discipline (which for TVA is a part of the Civil/Structural Engineering Branch), the team reviewed the following elements of the DBVP for the Sequoyah Nuclear Plant:

The documentation and procedures governing the DBVP (References 1-3).

The procedures governing the preparation and control of system walkdown packages (References 4-5).

The procedures governing the TVA Engineering Assurance program in the civil/structural area (References 6-7).

System walkdown packages 15 (also reviewed by EA); 43 and 26 (partially reviewed by EA); and 18, 72 and 87 (not reviewed by EA).

Twenty-six ECNs (partially reviewed by EA).

Interim revisions to Civil Engineering Branch general design criteria (References 8-11).

Three observations were identified relating to the documentation of containment penetrations on walkdown packages, the use of interim acceptance criteria, and control of dual qualification criteria application (Observations Nos. 3.1, 3.2 and 3.3).

Observation No. 3.1 - Documentation of Containment Penetrations

The Sequoyah Nuclear Plant Unit 2 walkdown packages for systems 26 (fire protection), 43 (post-accident sampling) and 87 (upper head injection) did not document containment penetrations consistently:

(1) Flow diagrams were not consistently marked up to add missing penetration identification numbers.

(2) Location sketches were not consistently prepared for penetrations which lacked identification tags.

(3) Walkdown packages did not consistently reference the containment penetration schedule, which tabulates penetration identification numbers, elevations and azimuths.

(4) Some sketches specified penetration locations which were incomplete or did not agree with the locations specified on the penetration schedule.

(5) Work requests were not consistently issued to provide identification tags for penetrations which lacked them.

Observation No. 3.2 - Margins of Safety for Restart

The TVA Civil Engineering Branch has issued interim revisions to several general design criteria to be used for the restart of Sequoyah Nuclear Plant which specify reduced margins of safety. These interim revisions specify that hardware qualified to these interim criteria are to be requalified to the original general design criteria during the interim acceptance period. Some examples of interim revisions to general design criteria are:

(1) DIM-SQN-DC-V-13.3-3, an interim revision to Design Criteria SQN-DC-V-13.3, Detailed Analysis of Category I Piping Systems.

(2) DIM-SQN-DC-V-1.3.4-3, an interim revision to Design Criteria SQN-DC-V-1.3.4, Category I Cable Tray Support Systems.

(3) PM86-03 (CEB), an interim revision to Design Criteria SQN-DC-V-24.1, Location and Design of Piping Supports and Supplemental Steel in Category I Structures (in draft form on June 18).

(4) QIR CEB-86-001, an interim revision to Civil Design Standard DS-C1.7.1, General Anchorage to Concrete.

The team noted that TVA must obtain NRC review and approval of any interim criteria which constitute a reduction in licensing commitments.

Observation No. 3.3 - Control of Dual Qualification Criteria

The TVA Civil Engineering Branch does not have a procedure to ensure that hardware qualified to interim design criteria which specify reduced margins of safety will be requalified to the original requirements of the general design criteria.

4. NUCLEAR SYSTEMS

In the nuclear systems discipline, the following specific activities were examined by the NRC, in addition to the general inspection team activities.

Review of the residual heat removal (RHR) system walkdown packages, and a partial walkdown of the RHR System by the NRC inspection team.

Review of ongoing Engineering Assurance (EA) oversight and DBVP project activity for Nuclear Steam Supply Systems, including the reactor protection system.

While technical details were examined in the review, the inspection was programmatic in nature. The three resulting observations all focus on obtaining assurance that the TVA DBVP program process will not inadvertently exclude issues or items significant to the safe restart of the Sequoyah Nuclear Plant (Observation Nos. 4.1, 4.2, and 4.3).

Observation No. 4.1 - Rationale for Selection of Design Basis Events

TVA Calculation SQN-OSG7-048, "Identification of Systems Required for Restart" establishes the systems required for safe restart. The calculation states that, "...certain selected events described in Chapter 15 of the FSAR" form the basis for identifying systems required for restart and that, "events were selected based on the event severity to the plant."

The calculation does not provide a rationale for excluding certain events, does not identify which events have been excluded and does not provide criteria for determining event severity. In addition, based on interviews with TVA's EA and project staff, the calculation does not appear to include indication of variables important to operator actions that are necessary to the detection of and recovery from the postulated events.

The NRC inspection team understands that a revision of this calculation is in progress that is intended to clarify the rationale for selecting design basis events in establishing the scope of systems required for restart. The above items should be addressed in the revised calculation.

Observation No. 4.2 - Definition of Reactor Protection System and Neutron Monitoring System Scope.

TVA Calculation SQN-OSG7-048 establishes the boundaries for systems required for restart. As required by Attachment A to the TVA DBVP program description, marked drawings provided with this calculation are to be used for delineating exact portions of the systems required.

Based on interviews with EA and project personnel, it appears that no such explicit definition of system boundaries exists or is planned for the reactor protection system and neutron monitoring system. Because of the variety of process, electrical, and supporting system interfaces that exist relative to the reactor protection system, the team believes it is important to define system boundaries as explicitly as was done for other systems defined by the calculation, so that no items are inadvertently omitted from the review scope. To a lesser degree, this explicit definition is also important for the neutron monitoring system.

Observation No. 4.3 - Criteria for Sampling Project Work Products for EA Oversight.

The TVA Program Plan for the EA Independent Oversight Review provides guidance for determining sample size for reviewing each aspect of the engineering process, but does not provide guidance in determining which products should be sampled so as to effectively measure assurance of safe restart. For example, no guidance is provided for considering:

(1) systems that dominate in assuring safety,

(2) complexity of the work product reviewed, or

(3) the history of industry or plant specific problems in implementing certain modifications.

Interviews with TVA's EA staff indicate that the sample size guidance (5%) is generally being followed, but that different disciplines appear to use different rationale in selecting work products for oversight review.

The NRC inspection team believes generic criteria should be established for selecting work products for EA oversight, in addition to the sample size guidelines already provided by the TVA Program Plan.

5. ELECTRICAL POWER

In the electrical power discipline, the NRC team reviewed the following:

Design verification procedures SQEP 8, 11, 12, 14, and 18, checking for technical attributes.

Engineering Assurance procedures and checklists.

Completed EA review plans for review procedure 11, "Evaluation of Change Documents," assessing ECNs 2768, 2777 and L5877.

Walkdown Package 67, Rev. 1, for the essential raw cooling water system.

The process for generation of design criteria.

Four observations were identified relating to the walkdown scope, the technical attributes required for evaluation of ECNs, the use of appropriate test acceptance criteria, and the design verification of the commitments and requirements data base (Observations Nos. 5.1 - 5.4).

Observation No. 5.1 - Walkdown Scope

The NRC team noted that initial walkdown process does not address verification of the electrical aspects of the plant installation, such as correctness of wiring, condition of electrical items such as cables, trays, junction boxes, terminal blocks, fuses, etc., and application of separation criteria. For instruments, the walkdown scope ends at the root valves and does not address verification of the correct tap connections. The team was informed that testing

of the systems verifies some of the electrical attributes. For verification of the remaining attributes, several other programs are in place. The team believes that cross reference to such programs should be provided in the DBVP documentation. TVA rationale should be provided as to the acceptability of this approach.

Observation No. 5.2 - Technical Attributes of Design Verification Procedures

The team noticed that a draft revision (Rev. 1) to procedure SQEP 12 proposed deletion of requirements for evaluation of effects of the component failure and requirements to consider the thermal loading of the power cables. Following discussions with the NRC team, TVA agreed not to drop these attributes from the scope of review of the procedure.

Observation No. 5.3 - Test Acceptance Criteria

During review of the procedure SQEP 14, "Electrical Test Evaluation," the team noted that the procedure directs the reviewer to use test acceptance criteria of the old pre-operational tests for evaluating the results of the tests on the modified system. The team believes that use of old test acceptance criteria for the modified system may not be correct. The modification to the system may change its static and dynamic characteristics, such as uncertainties, drift, response time, and therefore the test results acceptance criteria for modified system tests should reflect these changes. The team does consider examination and evaluation of preoperational test data to be a useful tool for evaluation of the adequacy of subsequent modifications.

Observation No. 5.4 - Design Criteria

During initial NRC review of the process for generation of the commitment/requirement data base, the team noticed that the existing program did not have provisions for independently verifying or assuring the accuracy of the design/licensing commitments input to the system. The NRC will evaluate TVA's control and use of this data base information during future DBVP inspections.

6. INSTRUMENTATION AND CONTROL

The team discussed the planned scope and depth of review by the TVA EA oversight instrumentation and control discipline, and it was determined that the auxiliary feedwater, sampling, component cooling water, and a fourth as yet undesignated system out of the 31 safety-related systems would be included. The team reviewed the EA oversight review and resultant action items for the turbine driven auxiliary feedwater system (46) walkdown package. In addition, walkdown packages for the demineralized water system (59), steam generator blowdown system (15), ice condenser system (61), and motor driven auxiliary feedwater system (3B) were reviewed for their instrumentation and control aspects. Preoperational test records for the auxiliary feedwater system and recent engineering change notices affecting this system were also reviewed. The team reviewed several technical concerns, discussed below, regarding the safety system boundary calculation SQN-OSG7-048 and neutron monitoring excore detector qualification requirements with TVA and Westinghouse personnel.

The Oversight Review Program generally appears to be comprehensive in terms of its scope and depth of review. A discipline specific review plan (#3100, revision 2) was reviewed by the team. Using written checklists, this plan commits to a review of the following items.

(1) Walkdown results for four systems.

(2) Ten representative commitment/requirements from the Sequoyah C/R data base.

(3) Three design criteria and several discipline specific sections of the design basis document.

(4) Approximately 15 engineering change notices.

(5) Approximately 7 field change notices.

(6) A sample of control room drawings from the four selected systems.

(7) An unspecified number of test evaluation results.

(8) An unspecified number of system evaluations.

The team identified four concerns regarding manually initiated safety-related actions (Observation 6.1), neutron monitoring detector qualification basis (Observation 6.2), consistency in turbine driven auxiliary feedwater system walkdown reviews (Observation 6.3), and conduit box covers (Observation 6.4).

Observation No. 6.1 - Manually Initiated Safety-Related Actions

TVA calculation SQN-OSG7-048 provides the basis for a technical adequacy review of design changes made since the Sequoyah operating license was issued. This calculation does not specify the safety-related operator actions and associated Class 1E display instrumentation needed by the operator during and after a design basis event which are in fulfillment of Regulatory Guide 1.97 provisions.

In 1982, TVA prepared a licensing basis for compliance with Regulatory Guide 1.97, and identified 18 operator action Type A variables in Appendix A to TVA design criteria SQN-DC-V-19.0. TVA is currently reassessing the commitments made in this document in anticipation of a planned 1987 hardware implementation. However, the team could not confirm whether a definitive plan exists to assure that the operator action instrumentation would be reviewed for technical adequacy in a similar manner to the design modifications whose review is deemed necessary for plant restart.

Observation No. 6.2 - Neutron Monitoring Detector Qualification Basis

TVA calculation SQN-OSG7-048 stated that the neutron monitoring detectors were not qualified for a loss of coolant accident environment, but also indicated that the detectors were required to initiate reactor trip for a rod ejection accident. Because these detectors provide input signals to the reactor trip system, the team explored the issue of detector qualification that would assure their operability following end-of-life exposure to operating temperature and

radiation levels inside containment as required by IEEE Std. 279-1971 and discussed in NUREG-0800 Branch Technical Position ICSB 26.

The team determined that TVA had assigned these detectors to qualification category "C" in TVA calculation SQN-OSG7-0014, based on information provided in Westinghouse letter WAT-D-5709 dated September 22, 1983. Equipment assigned to category "C" is not required to function to mitigate harsh environment accidents, and whose failure (in any mode) is deemed not detrimental to plant safety. However, Westinghouse recently provided TVA with documentation to indicate that use of the qualification category "C" designation was incorrect because of a previously unanalyzed control and protection system interaction.

In the postulated event scenario developed by Westinghouse, a small steam line rupture inside containment could cause an adverse failure of the neutron monitoring detectors. This failure could initiate automatic control rod withdrawal because of a control and protection system interaction present in the Westinghouse design. In this situation, reactor trip would occur from overpower delta temperature measurements approximately 20 to 40 seconds after event initiation. Based on this information, TVA initiated Significant Condition Report SQN-NEB-8609 for corrective action to the Sequoyah environmental qualification program.

As a minimum, the team believes that TVA should have selected qualification category "B" for these detectors to eliminate the possibility of an adverse control and protection system interaction. This category would have required that the detectors not fail in a manner detrimental to plant safety through a demonstration of their capability to withstand the accident environment with safety margin to failure.

Observation No. 6.3 - Consistency in AFW Turbine Controls Walkdown Scope

An identical scope of review was required for the walkdown of auxiliary feedwater system turbine instrumentation and control for Sequoyah Units 1 and 2. However, approximately six components, including handswitches, transfer switches, turbine overspeed switches, and flow control valves, were inspected on one unit but not on the other unit. TVA stated in response to Action Item I-3 that when instrumentation and control components lacked panel designations on the drawings, they were excluded from the walkdown; however, the actual walkdown practice has not been consistent in this area. Similar inconsistencies were noted in the instrumentation walkdowns of the Unit 2 essential raw cooling water and turbine driven auxiliary feedwater systems. No resolution of the inconsistencies in walkdown inspection practices was evident.

Sequoyah procedure SQEP-17, revision 0 used for the DBVP origination and categorization of configuration control drawings, states that test data may be used instead of field walkdown data to verify control diagrams, logic diagrams, and single-line drawing configurations. Procedure SQEP-14 identifies functional tests, post-modification tests, pre-operational tests, and surveillance instruction periodic tests as sources of such data. Because of inconsistencies noted by the team in the amount and type of data collected during instrumentation and control walkdowns, the use of test data to verify accuracy and correctness of control and instrumentation diagrams will be examined during future inspections. This will include examination of DBVP supplemental walkdowns.

Observation No. 6.4 - Conduit Box Covers and Installed Cable Pull Rope

During a brief walkdown conducted by the team of the Unit 1 residual heat removal system, a cable pull rope was found hanging from an open conduit box above rack 1-L-55A. TVA determined that no modifications were currently in process for this rack, and stated that the pull rope would be inserted into the box prior to reinstallation of the cover plate. However, the team believes that current TVA installation and maintenance instructions would not permit flammable materials, such as the cable pull rope, to be present with electrical cables inside a safety-related conduit. In addition, two ECNs have been written about missing junction box cover plates or installed cover plates that do not conform to the design drawings. The team was concerned with this item because deviations regarding these cover plates can impact equipment qualification.

7. CIVIL/STRUCTURAL

In the Civil/Structural area, the NRC team reviewed various documents that were developed by the project and the EA team. This review was primarily a documentation review, because the project and the EA team had performed limited technical evaluations in the Civil/Structural area.

The team reviewed the pertinent sections of Sequoyah engineering procedures 8, 11, 12 and special maintenance instruction SMI-0-317-30 for walkdowns. The team also reviewed Civil/Structural review plan 5100 R1. The attributes for various items, including the review of walkdown packages, ECNs, FCNs, FCRs, TACFs, SCRs and NCRs were reviewed.

The team reviewed walkdown packages 01, 30A, 30B, 30C, 31A, 62, 74, and 77. Since the walkdown packages did not contain any dimensional information, structural items could not be located or assessed. Nevertheless, a check of penetration location markups by the team revealed that one drawing did not depict a containment penetration (Observation 7.1).

The NRC team reviewed the 26 ECNs which had been evaluated by the EA team. No technical aspects were assessed in the EA review. The EA team had issued 6 action items to date in the Civil/Structural discipline. The NRC team reviewed these action items. All of these items were related to documentation reviews, since the technical evaluations had not started.

The NRC team also reviewed the design and seismic qualification of HVAC ducts and duct supports. This issue was raised by the Watts Bar project and also is generic to the Sequoyah Plant. The NRC team met with TVA Civil Engineering Branch to determine the steps taken for the resolution of this issue (Significant Condition Report SQNCEB8602). During this interview and a sample walkdown of the problem areas, the NRC team confirmed that this issue will be resolved before restart. It appears that TVA's seismic evaluation of the HVAC duct systems will lead to hardware modifications of various duct supports.

Observation No. 7.1 - Inconsistency in Walkdowns

During the review of walkdown package 77 (Waste Disposal, Unit 2), the NRC team noted that a boundary line is shown for inside containment on drawing 47W809-7 R7. At this boundary the drawing does not show a penetration. Further review showed that this penetration was identified on another drawing within the same walkdown package. Drawing 47W809-7 should be revised to show the penetration, so that both drawings will be consistent regarding the location of the penetration in question.

Attachment B - Meetings and References

B.1 Meetings

Inspection activities were conducted at the DNE offices in Knoxville and at the Sequoyah site. Several meetings were held between TVA and NRC to plan and schedule inspection activities. Entrance and exit meetings were held to discuss the inspection plans and findings, respectively. The following describes the general purpose of the various meetings. Table A.1 is provided as a matrix of meeting attendance.

Meeting 1: The purpose of this meeting, held on April 23, 1986, was to obtain background for future NRC overview of TVA design control activities and to understand the actions proposed and taken by TVA to address design control problems.

Meeting 2: The purpose of this meeting, held on May 13, 1986, was to assess conduct of TVA system walkdowns, obtain background for future NRC inspection of TVA design control activities, and assess the early implementation of the Design Baseline and Verification Program and associated Engineering Assurance independent oversight.

Meeting 3: The entrance meeting for the EA independent oversight team was attended by the NRC on May 14, 1986.

Meeting 4: On June 6, 1986, an entrance meeting was held at the Sequoyah site. The NRC explained the plans for the assessment of TVA's program for Design Baseline and Verification and the Engineering Assurance oversight. Engineering Assurance personnel presented the methodology, scope and status of their review.

Meeting 5: On June 20, 1986 an exit meeting was held at the Sequoyah site. NRC management discussed the scope and findings of the inspection. The team members presented the more significant findings within each discipline.

TABLE B.1 MEETINGS (cont.)

Name	Organization	Title	Meeting Attended 1	2	3	4	5
MASkarzinski	TVA	Elec. Maintenance Supv.					x
RHBuchitloz	TVA	Site Rep.					x
DLWidner	TVA	Modification Engr.					x
RJFaubert	TVA	Reviewer			x	x	x
TGCarson	TVA	Reviewer			x	x	x
RHO'Donnell	TVA	Staff Engineer			x		
BMPatterson	TVA	Maintenance Engr.		x			
DGRenfro	TVA	Principal Engr.			x	x	x
JThompson	TVA	QA Engineer			x		
AHRitter	TVA	EA Engineer		x	x		x
HDElkins	TVA	Instru. Mtn. Supv.				x	
HGBird	TVA	EA Engineer				x	
CEGrass	TVA	EA Engineer			x	x	
BGore	TVA	EA Reviewer Lead			x	x	x
TESpink	TVA	EA Engineer			x	x	x
WSWilburn	TVA	Maintenance				x	x
TMGalbargh	TVA	Site Rep.					x
RPSvarney	TVA	EA Reviewer			x	x	x
MTTormey	TVA	Restart Task Force			x	x	x
MRMathews	TVA	Restart Task Force					x
SShuman	TVA	EA Reviewer			x	x	
RTucker	TVA	EA Reviewer			x	x	
JWSemore	TVA	EA Reviewer			x	x	
JWKelly	TVA	EA Reviewer		x	x	x	
JWeisenstein	TVA	EA Engineer			x	x	
ABSavery	TVA	EA Engineer			x	x	
KFLiao	TVA	EA Engineer				x	
CKBuck	TVA	EA Engineer			x		
TLHoward	TVA	QA Engineer			x		
CYWang	TVA	DNE Project			x		
EJJiskin	TVA	Task Group	x				

Attachment B - Meetings and References

TABLE B.1 MEETINGS

Name	Organization	Title	Meeting Attended 1	2	3	4	5
JMTaylor	USNRC-IE	Director, OIE					x
BKGrimes	USNRC-IE	Director, DQAVT/OIE	x				x
EVImbro	USNRC-IE	Section Chief, QAB/OIE	x	x	x		x
RHeishman	USNRC-IE	Branch Chief, VP				x	
REArchitzel	USNRC-IE	Team Leader	x	x	x	x	x
SVAthavale	USNRC-IE	NRC-Electric Power				x	x
BTDebs	USNRC-RII	Section Chief		x	x		x
RPHolmes	USNRC-RII	Sr. R. Inspector-Hatch				x	x
KMJenison	USNRC-RII	Sr. Resident Insp.		x	x		x
LJWatson	USNRC-RII	Resident Insp., SQN	x				x
PEHarmon	URNRC-RII	Resident Insp.,SQN				x	x
DPLoveless	USNRC-RII	Resident Insp. SQN					x
ADuBouchet	NRC-Consultant	NRC-Mech. Components				x	x
FJMollerus	NRC-Consultant	NRC-Mech. Systems				x	x
AIUnsal	NRC-Consultant	NRC-Civil/Structural				x	x
JMLeivo	NRC-Consultant	NRC-Instr./Controls				x	x
LStanley	NRC-Consultant	NRC-Instr./Controls				x	x
WCDrotleff	TVA	Dir. Nuc. Engineering	x				x
HLAbercrombie	TVA	Site Director				x	x
RPWallace	TVA	Plant Manager				x	
RCParker	TVA	Site Quality Manager					x
JEHuston	TVA	DY. Dir. Nuc. QA					x
JFWeinhold	TVA	EA Manager	x		x	x	x
HLJones	TVA	Program Manager-DBVP			x	x	x
MRHarding	TVA	Site Licensing Manager		x		x	x
WEAndrews	TVA	Site Quality Manager		x	x	x	x
SLong	TVA	Walkdown Manager		x	x	x	x
HLJones	TVA	DNE Program Manager			x		
LMNobles	TVA	Supdt. (O&E)		x		x	x
CNJohnson	TVA	Civil Project Manager			x		
JBlankenship	TVA	Manager Info. Services					x
RGDomer	TVA	Manager Pro. Engr.					x
GTHall	TVA	Elec. Project Engr.					x
DWWilson	TVA	Project Engineer		x	x	x	x
APCapozzi	TVA/S&W	Asst. Chief Engineer	x		x	x	x
MPBerardi	TVA	EA Oversight Team Lead	x		x	x	x
GBKirk	TVA	Compliance Supervisor		x		x	x
JEStaub	TVA	I&C Supervisor					x
RMMooney	TVA	System Engr. Supv.		x			
FEDenny	TVA	QA Engineer			x	x	
RCBirchell	TVA	Mechanical Engineer		x	x	x	x
AWLatti	TVA	DNE Management			x		x

B.2 REFERENCES:

1. TVA Design Basis Program for TVA Nuclear Plants, dated March 28, 1986.
2. TVA Baseline and Verification Program for Sequoyah Nuclear Plant, Rev. 0, dated May 1, 1986.
3. TVA OE Calculation SQN-OSG7-048, Identification of Systems Required for Sequoyah Restart, Rev. 0, dated April 29, 1986.
4. TVA Sequoyah Engineering Procedure SQEP-08, Packaging and Controlling of Walkdown/Test Documentation, Rev. 2, dated May 29, 1986.
5. TVA Special Maintenance Instruction SMI-0-317-30, Systems Walkdown, Units 0, 1 and 2, Rev. 0, dated April 29, 1986.
6. TVA Program Plan for the Engineering Assurance Independent Oversight Review for the Sequoyah Nuclear Plant Design Baseline and Verification Program, Rev. 0, dated May 9, 1986.
7. TVA Engineering Assurance Oversight Civil/Structural Review Plan No. 5100, Rev. 1, dated June 9, 1986.
8. DIM-SQN-DC-V-13.3-3, dated June 10, 1986.
9. DIM-SQN-DC-V-1.3.4-3, dated June 13, 1986.
10. PM86-03 (CE3), dated June 9, 1986.
11. QIR CEB-86-001, dated April 29, 1986.