

PDR

August 8, 1988

To Harold Denton, John Bradburne
From Peter Stockton, Henry Myers

Re: Staff Report on Inquiry into NRC Regulation at TVA

We are preparing a report on our inquiry into NRC's regulation of TVA's nuclear program. The purpose of this memorandum is to reiterate past requests for documents that support resolution of issues (A) that have been the subject of the Sequoyah aspects of our inquiry and (B) that are addressed in NUREG-1232, Volume 2.

If further documentation along the lines described previously and herein is not provided prior to September 6, we will assume that none such exists.

While NRC staff may claim that the requested documentation has been given to us, the fact is that much of what we have received lacks specificity, does not address generic implications, and does not describe the nature and/or status of corrective actions. In other words, we are unaware of any of the following: (1) comprehensive descriptions of programs undertaken to identify Sequoyah deficiencies, (2) comprehensive listings of Sequoyah deficiencies identified by such programs, (3) comprehensive descriptions of actions taken at Sequoyah to correct deficiencies, and (4) status of corrective actions programs at Sequoyah.

A principle conclusion emerging from our inquiry is that, with respect to several significant issues, the NRC's process leading to restart of the Sequoyah reactors has failed to establish a document trail -- a readily available and readable set of documents -- that would permit NRC Commissioners or outside reviewers to evaluate the actions taken to identify and correct deficiencies in design and construction of the Sequoyah reactors. One simple manifestation of the deficient document trail is the NRC staff's consistent failure to list all references to a particular inspection finding.

The document trail is deficient because, among other things, actions were not taken to identify and correct deficiencies: i.e. documentation does not exist because there was no action to document. In many instances, TVA and NRC agreed upon the nature of remedial actions in the course of poorly documented meetings and discussions. Some such agreements were made following superficial reviews of the issues in question. Moreover, NRC considered long standing deficiencies in isolation rather than as potential indicators of a generic defects. In some cases, the problem addressed by analysis and corrective action was different from the problem that had originally been defined.

In particular, with respect to deficiencies listed below in the various issues categories, neither NUREG-1232 nor documents referenced therein (which we assume constitute the relevant

documents) do not themselves provide details of with respect to any or all of the following:

- listings of identified design and construction deficiencies
- determination of safety significance of deficiencies
- determination of generic extent of deficiencies
- corrective actions required
- corrective actions taken

A theme running through the Sequoyah restart documents is that certain "pre-restart" issues would be resolved prior to restart but that "post-restart" corrective actions would be required for others.

Questions:

- ① What is the definitive document which established criteria for assigning issues to the pre-restart or post-restart category?
- ② What documents describe the regulatory basis for allowing certain issues to be resolved following restart?
- ③ What document describes an analysis of the total impact upon safety of relegating certain issues to the post-restart category?
- ④ What document describes issues closed on the basis of TVA commitments to perform post-restart actions?
- ⑤ What TVA and NRC documents present the specific rationales for switching certain Sequoyah issues from the pre-restart category to the post-restart category, and other issues from the post-restart category to no category, i.e. to a status that requires no further NRC scrutiny?

I. Control of Design and Construction

In the case of design control, the NRC bottom line conclusions assume that the original design and construction were in accord with NRC regulations and TVA's licensing commitments; i.e. the staff stated in its April 20, 1988 Matrix of Responses:

The results to date of reviews performed by TVA and the results of inspections and reviews conducted by the staff do not support a conclusion that the original licensing

process for the Sequoyah plant was significantly flawed. At this point, the original design basis is not suspect and, therefore, additional certifications are not warranted.

The foregoing statement was made notwithstanding considerable evidence in TVA and NRC documents indicating that the original design and/or construction did not comply with NRC regulations and TVA licensing commitments. Excerpts from such documents follow. They indicate the potential or actual existence of design and/or construction deficiencies in activities undertaken prior and/or subsequent to issuance of the Sequoyah operating licenses.

TVA's 1985 review of quality assurance in the Office of Engineering stated:

These [previously mentioned] areas of the [Office of Engineering QA program] program need immediate and continued management attention to correct the problems. Although these problems were documented during FY 85, it is now apparent that many of them originated in previous years. OE is presently working to correct the problems. However, during FY 85 the OE quality assurance program, was not adequate to assure design bases were documented; that interfaces were documented and controlled; that nonconformances were documented, generic implications considered, root causes identified, and corrective actions taken to prevent recurrences; and that the verification program identified significant problem areas in the program or implementation of the program.

On January 15, 1986, Mr. B. Youngblood of the NRC staff sent to Mr. White a letter requesting information on five design control questions at Sequoyah. The NRC letter asked (1) why Browns Ferry and Watts Bar design control problems did not apply to Sequoyah; (2) how the scope of the review of employee concerns program will bound the issues; (3) for "[a] more complete description of the basis for your conclusion that SQN design controls were adequate prior to June 1985; (4) how design changes initiated at Watts Bar would be addressed with respect to Sequoyah; and (5) for a description of ongoing Sequoyah electrical calculations.

[Note: On March 10, 1986, TVA's R.B. Kelly sent a memo to R.L. Gridley regarding a proposed response to Youngblood's January 15, 1986 request for information concerning design controls. Mr. Kelly stated that the proposed response to NRC Question #1 "should more clearly state the status of the evaluation of employee concerns identified at WBN and referred to SQN." Mr. Kelly also noted that "OE did not state if the problems identified by Gilbert/Commonwealth in the design control program at

SQN after June 1985 also existed prior to June 1985." Mr. Kelly also said:

The draft OE response to the January 15, 1986 NRC letter indicates the design control system prior to June 1985 was adequate; however, the annual assessment of OE and the survey by the SQN QA Staff indicate otherwise. The OE response should not be sent to the NRC until these issues are addressed.

In brief, Mr. Kelly points to the fact that there was doubt about design control adequacy prior to June 1985 and that TVA should address this fact. Where does TVA address the question of why the OE design control system was not adequate prior to 1985, but was adequate prior to licensing of Sequoyah in 1980 and 1981?

[Note: While the Matrix of Responses indicates that TVA's response to the January 15, 1986 NRC letter (signed by Mr. Youngblood) is addressed in Sections 2.1 and 2.2 of the SQN SER, we find in these sections no discussion of the response to the January 15 letter. Moreover, the January 15, 1986 letter is not referenced in the Sequoyah SER (NUREG-1232, Volume 2) list of References.]

Inspection Report 50-327/86-27 includes the following findings:

"...several instances of TVA's failure to implement piping code requirements or FSAR commitments" with respect to the main and auxiliary feedwater system at Sequoyah. [p. 5.]

"...reinforcing bars were cut without evaluation of the structural adequacy of the elements in question. [p. 6.]

".... TVA had not maintained control of the original or interim plant design basis for either procurement of replacement instruments or setpoint calculation changes." [p. 7.]

"G/C [Gilbert Commonwealth] concluded that, assuming completion of the TVA action plans and resolution of open items, the modifications made to the main and auxiliary feedwater system will have maintained the technical adequacy of this system since the operating license was issued. Due to the root causes of some of the technical issues, this conclusion could not be extrapolated to other systems without further evaluation of design modifications. [Underline added.] [p. 7.]

In several cases standard industry codes and practices were not followed in the samples of original design work

examined by the NRC staff in conjunction with the review of the Gilbert/Commonwealth effort. [Cover letter, p. 2.]

A lack of available calculations supporting the original design in some disciplines. For example, calculations do not exist to support the sizing of station batteries, vital inverters, and battery chargers. [Id.]

Report 86-27 enumerated as significant findings the following [p. 10.]:

The failure to include friction in the design of supports for large bore pipe.

The lack of systematic evaluation of thermal loads in pipe supports for field routed pipe.

The failure to model flexible equipment in piping analyses.

The failure to consider the effects of cutting rebar (for example in the pressurizer cavity wall).

The use of incorrect loading assumptions in about 10% of the cable tray calculations examined.

Report 86-27 stated that:

A final NRC determination regarding the overall adequacy of design control for Sequoyah could not be made, considering the need for significant corrective actions to address G/C and TVA reviews and the NRC team findings. [p. 10.]

On December 11, 1986, TVA responded to a September 11, 1986 NRC request for information including a justification for TVA's Design Baseline & Verification Program (DB&VP) "covering only modifications made since licensing and not the as-built plant."

[Note: TVA's December 11 letter states, among other things, that the DB&VP is "directed at providing confidence that the plant modifications implemented since issuance of the OL can be supported by engineering analysis/documentation and that these modifications do not degrade the system's abilities to mitigate Chapter 15 accidents and safely shut down the plant."]

On March 5, 1987, Mr. Taylor sent a letter to Mr. White (TVA) regarding an NRC inspection (conducted in February 1987) of TVA's DNE design calculation review efforts. The letter stated, among other things, that:

Many of the deficiencies identified by the inspection team as well as by TVA in its reviews involve initial design activities. While the focus of TVA's effort in the DBVP has appropriately been on the design change process after the operating license was issued, TVA must, in some fashion, address the generic implications of instances where initial design deficiencies were identified. In this connection, we recognize that, in some areas, TVA has already indicated that it will conduct a complete review of calculations similar to those that have been found to be deficient. [Underline added.]

[Note: The NUREG 1232, Vol. 2 reference list does not include the March 5, 1987 letter from Mr. Taylor to TVA.]

On March 31, 1987 NRC staff asked TVA to answer questions put forth by Commissioner Asselstine. One question raised the issue of the adequacy of the original Sequoyah design; it asked whether TVA should be required to certify that Sequoyah had been "designed, constructed, and modified in accordance with national standards and regulations applicable at the time of licensing." TVA's response was, in effect, that NRC's issuance of the Sequoyah Operating License represented an NRC finding of the original design being in accord with NRC regulations.

On September 25, 1987, NRC issued Sequoyah Inspection Report 327/87-52. The report concerned an as-built verification of the SQN ERCW system, apparently the walkdown part of the IDI. [It is unclear why this was not included in the IDI report, 327/87-48.] The 327/87-52 cover letter stated:

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

Other findings included:

- * A-1. The drawings and instructions for the ERCW system did not reflect skid mounted valves in the ERCW lines that could isolate ERCW flow to the safety injection pump oil and bearing coolers and to the centrifugal charging pump oil coolers and there were no instructions for the initial or periodic alignment of the valves. Further, the drawing did not show the specified high point vent valves.
- * A-2. Cable installation procedures that allowed routing

of safety-related cables through undesignated cable trays, without apparent regard to thermal loading, electrical separation, volumetric tray loading.

A-3. Procurement process did not specify that the ERCW screen wash pump be ASME Code Class III as specified in FSAR. (D2.3-4)

- * A-4. Procurement error that resulted in purchase of a flexible hose designed for 100 psi for application requiring 150 psi.
- * A-5. Disconnection of sensors without review by TVA design organizations.
- * A-6. Installation of a prohibited cross connection between supposedly independent ERCW loops.
- * B-1. Three instrumentation drawings for the ERCW pump house instrument sense line floor sleeve packing showed conflicting requirements for its height and it was not installed according to any of them.
- * B-2. Absence of heat tracing on the RA ERCW pump discharge pressure instrument line. [p. 18.]
- * B-3. Failure to include safety-related instruments on CSSC list.
- * B-4. Failure to provide instructions for the positioning of valves downstream of the primary root valves.
- B-5. Failure to assure prevention of touching of cables between divisions. (U5.2-6)
- * B-6. Failure to route cables pursuant to cable pull cards and/or schedules.
- * C. Failure to control documents to show deletion of relief valves.

[Note: (*) indicates items that appear not to have carried over to the IDI report, 327/87-48.]

Notwithstanding the foregoing findings Inspection Report 327/87-52 concluded:

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

On November 6, 1987, Mr. Ebneter sent the IDI report (327/87-48) to TVA with a cover letter. The cover letter stated that the IDI had uncovered several areas of programmatic weaknesses in the Sequoyah design process. The letter stated that the IDI findings had resulted in the IDI team being unable to draw conclusions regarding the structural adequacy of the plant to withstand design basis events "based on the structural calculations reviewed during the [IDI] inspection."

[Note: The SQN SER, NUREG 1272, Volume 2, does not discuss the IDI in any detail. It states (p. 2-1) that the IDI "... indicated the need for the licensee to pursue further corrective actions, most notably in the area of civil engineering." The foregoing statement is consistent with the above noted 327/87-48 cover letter. NUREG 1272, Volume 2 (p. 2-1) stated that the IDI was further discussed in 327/87-74. Typical of the obstacles making it difficult to track resolution of issues is that the foregoing reference to the IDI does not indicate that the IDI is also discussed in 327/88-12 and 327/88-13. In these subsequent reports the seriousness of the IDI findings is significantly downgraded without explanation. i.e. the post-IDI documents do not describe in detail why the seriousness of a particular deficiency diminished significantly between November 1987 and February 1988. With respect to several of the most significant findings, one subsequent report, 327/88-12, contains statements to the effect that post-IDI TVA evaluations showing adequate safety margins were "considered acceptable for restart."]

On January 20, 1988 Mr. Ebneter requested that TVA provide additional information addressing issues identified in the IDI report, 327/87-48. Among information sought was that concerning "weaknesses in design verification process during initial plant design."

[Note: This is at least the third NRC request that TVA address the adequacy of the original Sequoyah design. This request -- made on the day that NRC staff informed the Commission that "a schedule that points to restart of Sequoyah on February 23rd is achievable"-- raised again the question asked by Commissioner Asselstine on March 18, 1987: i.e. "whether the original licensing basis of Sequoyah was adequately justified and demonstrated at the time of licensing."

The May 1988 SQN SER, NUREG 1272, Volume 2 states:

Conclusion [Plant Modification and Design Control]:

On the basis of the findings as documented in IR

50-327/328 87-24, 87-65, and 88-19, the staff concludes that TVA has taken the appropriate steps to correct design control problems at Sequoyah for restart. [p. 2-5.]

[Note: The conclusory sentence does not reference the IDI which was supposed to determine, among other things, the adequacy of design control. 87-24 was issued prior to conduct of the IDI. 87-65 was directed primarily at matters other than design issues and touches on only a few such issues. 88-19 was issued on May 27, 1988, after the Commission authorized SQN 2 restart; it is directed primarily at matters other than design issues.]

Conclusions [Design Baseline and Verification Program]:

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, including those identified by G/C, TVA and NRC. These programs provided substantial additional information that has allowed the staff to conclude that design control problems at Sequoyah are being corrected and that once the defined corrective actions are completed, the plant will conform to its licensing basis. [p. 2-10. Underline not in original.]

[Note: The foregoing implies incorrectly that issues identified by employee concerns, G/C, TVA and the NRC were in fact addressed by the DBVP and EA. The fact is that the DBVP focussed on post-licensing modifications while employee concerns etc. pointed to design deficiencies that affected Sequoyah prior to and after licensing. Moreover, the conclusion (see underlined part) says that the plant does not conform to its licensing basis, and leaves it to the reviewer to determine the deviations from the licensing basis and the significance thereof.]

Questions:

- ⑥ What documents describe the rationale for concluding that deficiencies in the design and construction process, admitted to occur after issuance of the OL, also did not occur prior to issuance of the OL?
- ⑦ What NRC documents describe the rationale for accepting

TVA's December 11, 1986 explanation for the DB&VP covering "only modifications made since licensing and not the as-built plant?"

- 8 What NRC documents describe the rationale for accepting TVA's June 10, 1987 explanation as to why TVA should not be required to certify that Sequoyah had been designed, constructed, and modified in accordance with the national standards and regulations applicable at the time of initial licensing?

[Note: Acceptance of the TVA explanation assumes that it is the NRC position that, if the defects in the original Sequoyah design and construction were known at the time of issuance of the original Operating Licenses, the NRC would have issued such licenses notwithstanding the existence of such deficiencies. Is there an NRC document that describes the NRC's rationale for accepting the original findings of compliance with regulatory requirements that were the basis for issuance of the Sequoyah Operating Licenses in 1980 and 1981?]

- 9 What documents state the regulatory rationale for allowing SQN restart with IDI items listed in 327/87-74 and related inspection reports remaining open?
- 10 What documents state the regulatory rationale for considering an analysis "acceptable for restart" but not acceptable over the lifetime of the plant?
- 11 What NRC document contains the NRC staff rationale and/or provides NRC concurrence for the SQN 2 heatup actions enumerated in the enclosure to the January 26, 1988 letter from M.J Ray to NRC (NRC PDR 5000327, 8801280682, 880126)?
- 12 What TVA document contains the response to Mr. Ebnetter's January 20, 1988 request that TVA provide additional information addressing issues identified in the IDI report, 327/87-48, including information concerning "weaknesses in design verification process during initial plant design?" What NRC document contains the NRC's assessment of the adequacy of TVA's response to the January 20, 1988 request for information concerning weaknesses in design verification during the initial Sequoyah plant design process?
- 13 Does there exist a comprehensive listing of design deficiencies identified at Sequoyah since August 1985? Does there exist a comprehensive listing of actions required to correct such deficiencies and the status of these corrective actions?

- II. TVA did not install electrical cable in accord with NRC requirements and TVA's licensing commitments. Cable installation deficiencies are described at length in TVA and NRC documents. For example, on July 9, 1985 TVA's Nuclear Safety Review Staff (NSRS) issued a report (I-85-06-WBN) which called into question the basis for confidence in cables at Watts Bar. While this report applied specifically to Watts Bar, it appears to have been the basis for NRC letters to TVA on August 4 and 29, 1986, in which the NRC asked TVA to answer questions concerning cable installation practices at Sequoyah. These questions were aimed at determining whether cables had been damaged by virtue of faulty installation practices. It appears that TVA did not answer the questions contained in the August 4 and August 29 letters.

The cable issue was also reviewed by an NRC contractor, the Franklin Research Center, which raised questions concerning the Sequoyah cables similar to those raised by NSRS I-85-06-WBN. On March 9, 1987, Mr. B.J. Youngblood of the NRC staff sent TVA the Franklin Research Center (FRC) Technical Evaluation Report (TER) on cable bend and cable radii issues. The overall conclusion of the TER stated:

Although no outright cable damage was found at the Sequoyah plant, the controls on the installation process were such that damage could have occurred from jamming, pullbys, severe bending, and tension through T and 90 [degree] condulets. Long-term random and accident-related common mode failures are possible for these types of damage. Further testing and evaluation of a sample of cables in conduits where pullbys occurred, and where jamming may have occurred, is necessary to assure that significant damage has not occurred. If the evaluation of the cables indicates that damage was significant, replacement of cables installed under similar conditions will be necessary. [p. 50 - 51.]

Less than 2 pages of the Sequoyah SER, NUREG-1272, Volume 2 are devoted to the cable installation issue. NUREG-1272 does not state that TVA cable tests adequately addressed the concerns expressed in the Franklin Research Center TER.

Questions:

- 14 What documents indicate that the NRC staff reviewed TVA's cable test program to determine whether it adequately addressed the findings of the Franklin Institute TER?
- 15 What document lists the specific cable deficiencies identified in the course of TVA tests conducted to determine the extent of cable damage incurred during installation?

16 Does there exist an NRC finding that the TVA cable tests were adequate to identify damage caused by improper cable installation practices of the kinds described in the findings and conclusions of the Franklin Institute TER?

17 Does a document exist indicating that the authors of the Franklin Institute TER agree that TVA's cable tests adequately addressed the deficiencies implicit in their findings?

III. Since issuance of the Sequoyah Operating License in 1980, TVA has not complied with NRC regulations requiring onsite emergency electrical power supplies. Noncompliance with such requirements is described at length in documents prepared by Mr. Dallas Hicks, and made available to the NRC beginning in 1985 and perhaps earlier. In citing numerous deficiencies with electrical systems at all TVA plants, Mr. Hicks noted that diesel generator margins were inadequate at Browns Ferry, Sequoyah and Watts Bar.

Also, a TVA contractor, Sargent & Lundy, listed the following findings (p. III-26) related to diesel generators in an April 9, 1986 report:

- (1) The [diesel generator load analysis] calculation is not clearly identified as safety related or non-safety related.
- (2) The computer program used and its output are not adequately identified.
- (3) Justification for the use of engineering judgement in several areas to limit the scope of the calculation should be addressed.
- (4) The criteria for acceptance of the results of the calculation are not mentioned.
- (5) It is not explicit from the conclusion of the [diesel generator load analysis] calculation if the performance of the diesel engine is acceptable according to the design basis. This point should be addressed.
- (6) Resolution of the voltage regulator question should be completed prior to restart.

Circa, October 15, 1986, a TVA document describes potential diesel generator overloads:

Failure to establish an adequate system of procedures to ensure that calculations/studies

performed by EEB are updated and revised to support the design as changes are made after plant operation. This was identified in Office of Quality Assurance Deviation Report D51-A-84-0006-D01 dated July 2, 1984. Also, a previous analysis erred in assuming that the worst-case loading would occur for a concurrent SI and phase B containment isolation. [SCR SQNEEB8629 R3, p.3/4, 10/2/86.]

Revision 2 of the DG load analysis (B43 860827 909) has identified heavier loadings for the condition of a loss of offsite power with a delayed SI and Phase B isolation. Also in R2 of the load analysis, it was determined that load sequence timers for the ERCW pumps are reset by an SI in either unit. An SI in one unit can cause the simultaneous start of the ERCW and AFW pumps in the other unit. The voltage dip for the simultaneous start is 30 percent, which exceeds Reg. Guide 1.9 limits (25%). [Id., Att. 1.]

The diesel generators at Sequoyah Nuclear Plant will have an engine failure (engine overload) if the random loads of the generator are applied at t=30 seconds. Maximum total load (starting and running loads) at the t = 30 seconds cannot exceed 4482 kW. At present time, a loss of offsite power with a safety injection (SI) and Phase B isolation, the total loads at t = 30 seconds are: 1A-4563 kW, 1B-4636 kW, 2A-4650, and 2B-4925 kW. [SCR SQNEEB8629 R3.]

The Sequoyah SER, NUREG-1232, Volume 2 indicates that NRC analysis of TVA's diesel calculations did not predict the results of tests. NUREG-1232 stated that the diesel margins were adequate but less than was expected when the plant was licensed. NUREG-1232 stated:

The [diesel] margin that remains is sufficient to assure safe operation of Sequoyah for restart and for the limited period of time until corrective action is taken to re-establish the margin that was believed to exist at the time of licensing. [p.2-27.]

NUREG-1232 also stated that:

In a March 3, 1988 submittal, TVA committed to evaluate the performance of the EDG's and implement corrective action prior to restart after the next Unit 1 refueling outage.

....

It should be noted that the major TVA calculations on which the staff's findings are based assume that Sequoyah Unit 1 is in cold shutdown and must be revised to support Unit 1 restart. Further, the staff notes its reliance on TVA's commitment to undertake, after restart, a major review and modification effort to improve performance of the DG regulator/exciter system. [p. 2-28, 2-29.]

Questions:

- 18) What NRC documents answer Mr. Dallas Hicks' questions pertaining to the SQN diesel generators?
- 19) What documents describe the details and results of the Sequoyah diesel surveillance tests conducted during the period from July to November 1987?
- 20) What documents describe existing diesel margins and margins that are less than those that were "believed to exist at the time of licensing?"
- 21) What documents address the regulatory rationale for allowing Sequoyah to operate with diesel margins less than those that were "believed to exist at the time of licensing?"
- 22) What documents describe the diesel generator evaluations and corrective action that will be required "prior to restart after the next Unit 1 refueling outage?"
- 23) What documents describe the basis for the above noted statement regarding the staff's findings being based on TVA calculations that assume Sequoyah Unit 1 is in cold shutdown; i.e:

It should be noted that the major TVA calculations on which the staff's findings are based assume that Sequoyah Unit 1 is in cold shutdown and must be revised to support Unit 1 restart.

- 24) What documents describe the nature of the review and modification required to improve performance of the diesel generator regulator/exciter system?

IV. TVA did not comply with NRC regulations intended to prevent installation of non-safety grade components in safety related systems. Such non-compliance is documented in various TVA and NRC documents.

Circa 1986, Mr. Howard Knox, former TVA Principal Materials Engineer, Division of Engineering and Technical Services,

Quality Engineering Branch, Electrical Section Supervisor, provided the NRC a list of meetings between himself and TVA officials for the purpose of discussing plant records.

On November 14, 1986, NRC sent to TVA Inspection Report 328/86-61. This inspection concerned procurement and quality assurance records at Sequoyah. The NRC letter transmitting this report stated:

The purpose of this inspection was to review Tennessee Valley Authority's (TVA's) corrective action to Nuclear Safety Review Staff (NSRS) Reports NSRS R-84-17-NPS, I-83-13-NPS, and R-85-07-NPS. The findings in the areas of procurement of safety-related equipment, record storage and retrieval, and receipt inspection indicate a failure to take adequate corrective action to these previously identified concerns. In particular, your program has allowed previously qualified equipment (seismic and environmental) 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. In addition, retrieval of quality assurance records for installed equipment did not have a unique plant identification number, the records could not be retrieved. Further, in some cases receipt inspectors have not been provided with adequate instructions to enable them to perform meaningful inspections. These deficiencies have been classified as a single Potential Enforcement Finding (50-327, 328/86-61-01) concerning failure to take adequate corrective action.

Inspection Report 328/86-61, attached to the November 14, 1986 letter stated among other things:

10 CFR 50, Appendix B, Criterion XVI requires that conditions adverse to quality be promptly identified and corrected. However, although NSRS Report R-84-17 NPS, dated March 12, 1985, pointed out that TVA was using commercial grade items as basic components without determining the effect on the safety function of the component or system in which it is being installed, TVA has not initiated an effort to identify equipment which may be in nonconformance with seismic or environmental qualification requirements as a result of this practice.

Along with Inspection Report 328/86-61, the NRC sent to TVA Potential Enforcement Finding 50-327, 328/86-81-01 which stated that:

10 CFR Appendix B, Criterion XVI, states, in part, "Measures shall be established to assure that conditions adverse to quality, such as failures,

malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected."

Contrary to the above, TVA has failed to correct deficiencies in the areas of procurement of safety-related equipment, storage and retrieval of quality assurance records, and receipt inspection of safety-related equipment which were identified in Nuclear Safety Review Staff Reports R-84-17-NPS, I-83-13-NPS, and R-85-07-NPS.

On July 16, 1987, NRC issued SECY-87-173: STATUS OF STAFF ACTIONS REQUIRED BEFORE RESTART OF SEQUOYAH 2, which described the status of resolution of various Sequoyah issues. One such issue was heat code traceability.

On September 11, 1987, NRC staff met with TVA in Knoxville to discuss the IDI findings. The following is excerpted from the meeting transcript.

With regard to the definition and application of code commitments, TVA has been inconsistent with the safety related piping components, specification, and in-service testing. ... Therefore, TVA needs to clearly define how the various codes in effect are applied and document them consistently in the design basis documents. [Tr. p. 22-23.]

On October 6, 1986 TVA management distributed MC-40703 on the investigation of employee concerns regarding traceability of materials used in pressure retaining piping components. The memorandum stated that a stop work order was necessary for certain activities involving Nuclear Class I, II and III piping components. With respect to lack of material traceability and non-compliance with Appendix B during construction, MC-40703 concluded:

The Nuclear Class Piping Components installed at SQN do not comply with the requirements of the Code of Record and 10 CFR 50 Appendix B for identification and control of these components during their fabrication, erection, installation, and use. This non-compliance has resulted in the receipt, storage, and installation of material that cannot be traced to the CMTR, attesting to it's (sic) suitability for the Nuclear and/or Pressure Class in which it is installed.

On January 4 and 29, 1987 TVA initiated ECSP MC-40703-SQN which concerns issues involving nuclear class piping components including (-01) lack of clarity in defining applicable codes, (-02) lack of control over materials, (-03) inadequate procedures to govern handling of materials, (-04)

lack of procedures to provide a documented traceability path between installed nuclear class piping components and their CMTR, (-05) improperly qualified inspectors, and (-06) modifications on ASME Section XI piping components which do not comply with ANSI B31.7 and Criterion VIII of 10CFR50, Appendix B.

On May 4, 1987, TVA Memorandum (A02 870428 034) from S.A. White to W.R. Brown transmitted the April 21 "independent assessment of the heat code traceability issue" performed by Messrs Kelly and Landers because Employee Concerns Task Group did not agree with Heat Code Traceability Task Group on the extent of corrective actions necessary to resolve the matter. Although Kelly/Landers concluded that traceability problems did not affect large bore piping, the Kelly/Landers report included a list of corrective actions, some of which affected large bore piping and which among other things specified "The need to examine all Nuclear Class 1, 2, and 3 (TVA Class A, B, C/D) pressure-retaining piping components, verify and document their suitability for service in accordance with the applicable requirements or replace them." (Kelly/Landers p. 23, underline added.) [See also CATD No. 40703-SQN-02-RO which, along with other corrective action documents, is attached to the Kelly/Landers report.]

The Sequoyah SER, NUREG-1232, Volume 2, Section 3.3 lists numerous programmatic problems involving degradation of system performance resulting from use of commercial grade components in safety systems. The SER's descriptions, however, are quantitative; there is no indication of the extent to which commercial grade materials or equipment were actually installed in safety systems. Nor does the SER discuss the extent to which commercial grade components have been either replaced by safety-grade components or certified as being equivalent to such components. To the extent that commercial grade items were used in safety systems, the SER does not describe the process by which TVA qualified such items for safety grade functions.

Moreover, the SER describes TVA's plans and commitments to identify and correct deficiencies resulting from the use of commercial grade items. The SER does not describe the status of implementation of such programs. The SER, in effect, drops the matter with a statement that proper implementation of TVA's corrective action plan will remedy whatever problems might have arisen from the use of non-safety grade components.

Questions:

25

What documents describe NRC actions concerning any NRC or TVA inquiry into the concerns of Mr. Howard Knox, former TVA Principal Materials Engineer, with respect to

problems involving procurement of items and materials for purposes for which such materials and items were not qualified?

(26) What documents indicate the extent to which commercial grade items were actually installed in safety systems?

(27) What documents discuss the extent to which commercial grade components have been either replaced by safety-grade components or certified as being equivalent to such components?

(28) What documents describe the status of implementation of programs described in NUREG-1232 with respect to TVA's plans and commitments to identify and correct deficiencies resulting from the use of commercial grade items?

(29) What NRC documents address in detail the disagreement among TVA engineers concerning the MC-40703-SQN findings of non-compliances that resulted in the receipt, storage, and installation of material that cannot be traced to the CMTR, attesting to its suitability for the Nuclear and/or Pressure Class in which it is installed?

(30) What NRC documents address in detail the disagreement among TVA engineers concerning "...the need to examine all Nuclear Class 1, 2, and 3 (TVA Class A, B, C/D) pressure-retaining piping components, verify and document their suitability for service in accordance with the applicable requirements or replace them?"

(31) What NRC documents address explicitly the findings implicit in MC-40703:

- TVA records do not assure that pressure-retaining piping components, found to be defective after installation at Sequoyah, could be located for the purpose of determining whether such components were suitable for service or required replacing; and,
- TVA records are not capable of demonstrating that specific installed pressure-retaining piping components can perform their intended function?

V. NRC and TVA reviews revealed that significant Sequoyah civil/structural calculations are missing or deficient. Many such deficiencies are listed in the NRC's Integrated Design Inspection (IDI) (50-328/87-48.)

The November 6, 1987 NRC cover letter to the IDI report stated, among other things, that the IDI team had found deficiencies with respect to structural calculations for

safety related buildings. Among the deficiencies were simplifying assumptions for which there was no apparent technical basis, inconsistencies between dimensional data used in calculations and the dimensional data specified on detailed structural drawings, and a failure to evaluate "certain fundamental design considerations or design loading conditions." The November 6 letter noted concerns about the placement of rebar in reinforced concrete and the seismic design of the steel containment vessel. The letter stated that these findings had resulted in the IDI team being unable to draw conclusions regarding the structural adequacy of the plant to withstand design basis events "based on the structural calculations reviewed during the [IDI] inspection."

With respect to the IDI civil calculational issues, the NRC's SER on Sequoyah, NUREG-1232, Volume 2 stated:

In addition, the NRC staff's IDI identified a number of issues with TVA's civil calculations. These issues have been resolved by the [NRC] staff for [Sequoyah] restart. The details of remaining items in the civil calculation area are discussed in IRs 50-327/328 88-12 and 88-13. [p. 2-13.]

Questions:

32 Is there a document or document which lists the various inspection reports so that one can track an issue from its identification (e.g. by the IDI) to its resolution? For example, is there a document that enumerates the IDI findings (327/87-48, p.iii-viii) and subsequent documents in which these findings and associated corrective actions are discussed?

[Note: In at least one instance, tracking of resolution of an issue is made difficult because the issue number changes; i.e. IDI (327/87-48) Issue D4.3-2 is discussed subsequently in 327/87-74, 327/88-12 and 327/88-13. In 327/88-12, which was issued after 327/88-13 and which contains the latest discussion of the item, gives D4.3-2 a new identification number, URI 88-12-11. The latter remains an unresolved issue. The change of the designation creates a problem for anyone, new to the issue, who seeks background information; i.e. in coming across URI 88-12-11, how would one know that this item began life as D4.3-2?]

33 What document analyzes the effect of the 0.9 second duration used by TVA in generation of response spectra for the steel containment vessel? [See 327/88-12, p. 13-14.]

(34) Does 327/88-12 contain a complete listing of the post-restart calculations required by the NRC? If not, what other document contains a complete listing of the post-restart calculations required by the NRC? What assessment was conducted of the combined effect upon safety of the uncertainties due to deferral to post-restart of the calculations referred to in 327/88-12?

VI. The Sequoyah SER, NUREG-1232, Volume 2 (p. 5-1) refers to "over 300 element reports that address related [Sequoyah] concerns."

Element Report 80400 concluded:

The subcategory results indicated that the systems employed to control the nonconformance program were ineffective in assuring compliance to 10CFR50, Appendix B requirements. Management's inability to satisfy regulatory requirements and commitments resulted in inadequate implementation by the line organization and conflicting direction in procedures. In some instances adequate procedures were in place but were not implemented. Nonconformances were allowed to remain undocumented and/or uncorrected for extended periods of time. Although some significant problems had been identified by TVA, NRC, INPO, and others, they were allowed to remain uncorrected or, in some cases, effective preventive action was not taken and problems multiplied to a point where the quality of the TVA nuclear program was highly criticized.

....

The problems identified in the [80400] report are a result of management's inability to adequately implement Quality Assurance Procedures to meet and comply with Appendix B to 10CFR50. This condition resulted in a procedural system which was inadequate and inconsistently applied.

Questions:

- (35) What document contains an NRC review of the "over 300 element reports" referred to by NUREG-1232?
- (36) What document reports on NRC reviews of the implications of the above referenced findings of Element Report 80400?
- (37) Does NRC possess a document which specifies or otherwise discusses the time period during which the Element Report 80400 deficiencies existed?

38

Does NRC possess a document which provides a basis for assuming that the Element Report 80400 deficiencies did not allow significant defects in Sequoyah's design and construction to remain undetected and uncorrected?

DOCUMENTARY REFERENCES RESPONSIVE
TO STOCKTON/MYERS MEMO OF AUGUST 8, 1988

- NOTES: (1) Question numbering provided by NRC; see enclosed copy of memo for numbering.
- (2) References in 10 CFR 50, NUREG-1232, Vol. 2 and TVA Sequoyah Nuclear Performance Plan are not provided in individual questions; copies of the bound documents are provided.
- (3) Bulky enclosures to documents only provided when directly relevant; available if requested.

Directly Responsive	Generally Responsive	Same General Subject	Comments
1. TVA SQN Nuclear Performance Plan, Section IV and Table 7			
NRC letter dated 6/9/87 subj: Restart Criteria			
2. NUREG-1232, Vol. 2, Section 4.1.2	10 CFR 50.39		
3.			No overall NRC assessment; cumulative impacts of post-restart items were considered in reviews of individual remedial programs
4.			No single list compiled, closure discussed in individual program evaluations
5. TVA SQN NPP Section II.2.5	NUREG-1232, Vol. 2 Section 4.3.1		
6.		NUREG-1232, Vol. 2 Section 2.2 and 4.9	NRC never assumed that no errors occurred in original design and construction. The calculation program, restart test program and numerous corrective action programs addressed initial design and construction. Even within DBVP, system walkdowns, test reviews and system evaluations addressed system function as a whole not just modifications.

Directly Responsive	Generally Responsive	Same General Subject	Comments
7. NUREG-1232, Vol. 2 Section 2.0			
8.		NUREG-1232, Vol. 2 Section 2.2.1 and 4.9.2	See (6) above.
9.	IR 88-12 dated 6/24/88, subj: DBVP and IR 88-13 dated 5/26/88, subj: IDI		
10.	10 CFR 50.55a; a.3., g.3.v., and g.6.1		
11. NRC letter dated 2/23/88, subj: Heatup Evaluation	TVA letter dated 1/26/88; subj: Heatup Program		
12. IR 88-13 dated 6/26/88	SQN, NPP Section IV, SQN Activities List (SAL), pp IV-16ff		Lists commitments; NRC does not maintain item deficiency list
13.		IR 86-45 dated 7/31/86; subj: DBVP	
14. TVA letter dated 1/29/88, subj: Response to T&R	NRC letter dated 11/13/87, subj: Cable Test Program SER NUREG-1232, Vol. 2 Section 3.12	SER on Emp. Conc. EC10900 dated 3/8/88 AER on OSP-86-A-0062 dated 3/22/88 NRC letter to D. Hicks dated 8/25/88, subj: Cable Tests	

Directly Responsive	Generally Responsive	Same General Subject	Comments
15.		Meeting Summary dated 9/10/87, subj: Cable Tests TVA letters dated 11/20/87, subj: Cable Test and 7/31/88, subj: Cable Qualification	
16. NRC letter dated 5/25/88; subj: Qualification Testing See also (14)	See also (14)	NUREG-1232, Vol. 2 Section 3.12	Inspection of raceway and in-situ tests were to identify gross damage. None was found. Wiley Tests were done to demonstrate operability of cables that may have been damaged (though not grossly) in installation.
17. Franklin TER dated 12/1/87, subj: Cable Pulling and Bend Radii		See also (16)	
18. Marinos Affidavits dated 3/31/88 and 4/13/88			
Director's Decision dated 8/3/88			
19. TVA letter dated 2/29/88, enclosure 1, subj: DG Evaluation		NUREG-1232, Vol. 2 Section 2.3.3.2.1.(2) and (4)	
20. Same	Same		
21. 10 CFR 50.59			

Directly Responsive	Generally Responsive	Same General Subject	Comments
22. TVA letter dated 7/8/88 subj: DG Improvement Plan	TVA letter dated 3/3/88 subj: Operability Analysis	NUREG-1232, Vol. 2 Section 2.3.3.2.1.(4)	TVA committed to provide detailed program plan for corrective action 120 day after SQN-2 restart.
23. TVA Calculations SQN E3-002, Rev. 7 dated 1/23/88, subj: DG load analysis			
24. Same as (22)	same as (22)	same as (22)	same as (22)
25. Allegation Evaluation Report OSP-85A-0072 dated 1/21/88 (to H. W. Knox)	TVA-ECP-86-KX-055-01, subj: Documentation Maintenance		
26. TVA letter dated 2/10/88, subj: SQN RIP Supplemental Program Plan	IR 87-40 dated 11/30/87, sub: Piece Parts		
27. TVA letter dated 2/10/88 subj: SQN RIP Supplemental Program Plan	IR 87-40 dated 11/30/87, subj: Piece Parts IR 88-07 dated 4/13/88, subj: Piece Parts TVA letter dated 8/10/88 subj: RIP Supp. Program Plan (Enclosure 2)		
28. TVA letter dated 8/10/88 subj: RIP Supp. Program (Enclosure 1)	TVA letter dated 2/10/88, subj: SQN RIP Supplemental Program Plan		
29.	IR 87-44 dated 10/6/87; subj: Employee Concerns and SER on Traceability dated 11/17/87		

Directly Responsive	Generally Responsive	Same General Subject	Comments
30.	Same as (29)		
31.	Same as (29)		
32. IR 88-12 dated 6/24/88, subj: DBVP	IR 87-74 dated 2/22/88, subj: IDI Followup IR 88-13 dated 5/26/88, subj: IDI		URI 88-12-11 was identified in review of DBVP item D.4.3-7 but was unrelated to that issue
33.		IR-38-12 dated 6/24/88, subj: DBVP	TVA to carry calculation beyond .9 sec after restart. Acceptable basis for allowing postponement was provided to the staff but was not documented in IR 88-12
34.	TVA letter dated 2/29/88, subj: NRC Commitments		See TVA letters referenced in IR-88-12 for individual commitments
35. NRC letter dated 3/11/88 subj: Prelim SERS on Employee Concerns			
36.		NUREG-1232, Vol. 2 Section 5	NRC elected not to review subcategory reports (such as 80400) as part of SQN restart review. SQN applicable concerns in 80400 were reviewed as part of element reports SQN - 804XX series.
37.			See (36) above
38.			See (36) above