

TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401  
400 Chestnut Street Tower II

50-327

June 6, 1985

Mr. James M. Taylor, Director  
Office of Inspection and Enforcement  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Dear Mr. Taylor:

Enclosed is our response to J. Nelson Grace's May 7, 1985 letter to H. G. Parris which transmitted the Proposed Civil Penalty Action: EA 84-119, Unit 1 Seal Table Leak and Thimble Tube Ejection Event (Reference IE Inspection Report No. 50-327/84-24 dated March 7, 1985) for Sequoyah Nuclear Plant (SQN) unit 1 (enclosure). Please note that in responding to the violations, we have made numerous references to the September 18, 1984 Office of Nuclear Power response on this matter that is Attachment III of the March 7 inspection report. For convenience, we have attached the pertinent pages of our September 18, 1984 report in enclosure 1 as attachment 1. I discussed this with R. D. Walker of Region II on June 6, 1985.

Fees in response to the civil penalty of \$112,500 are being wired to NRC, Attention: Office of Inspection and Enforcement.

If you have any questions, please call R. E. Alsup at FTS 858-2725.

To the best of my knowledge, I declare the statements contained herein are complete and true.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

*J. A. Domer*  
J. A. Domer, Chief  
Nuclear Licensing Branch

Enclosure

cc: U.S. Nuclear Regulatory Commission (Enclosure)  
Region II  
ATTN: Dr. J. Nelson Grace, Regional Administrator  
101 Marietta Street, NW, Suite 2900  
Atlanta, Georgia 30323

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ENCLOSURE  
RESPONSE TO NOTICE OF VIOLATION AND  
PROPOSED IMPOSITION OF CIVIL PENALTIES: EA-119,  
UNIT 1 SEAL TABLE LEAK AND THIMBLE TUBE EJECTION EVENT  
(REFERENCE: INSPECTION REPORT 50-327/84-24)

Violation 50-327/84-24-01

1. Technical Specification 6.8.1 requires the licensee to establish, implement, and maintain procedures recommended in Appendix A of Regulatory Guide 1.33, Revision 2, February 1978. Items 1.c, 1.e., 1.i., 7.e(1) and 9 of Regulatory Guide 1.33 specify that procedures are required for equipment control, procedure review and approval, access to containment, access control to radiation areas including a radiation work permit system, and performing maintenance, respectively.

Contrary to the above, the licensee failed to establish and implement adequate procedures for the conduct of equipment control, procedure review and approval, performance of maintenance, radiation work permit access control, and access to containment. Examples of these failures are cited below:

- a. On April 19, 1984, maintenance procedure SMI-0-94-1 for instrument thimble tube cleaning and flushing was not implemented in that Step 1.1 of the procedure forbids use of the thimble cleaning system at power and cleaning activities were performed with unit 1 at 30 percent power. The procedure established at that time was inappropriate for use at elevated reactor coolant system pressures and temperatures.
- b. Maintenance procedure SMI-0-94-1 was inadequately established when issued on July 10, 1981, in that it contained no initial conditions and no post-maintenance inspection or quality assurance requirements for the thimble tube high pressure seals which constitute a reactor coolant pressure boundary.
- c. Maintenance request implementing procedures for control and review of maintenance activities associated with Maintenance Request (MR) A-238084 dated April 18, 1984, was not implemented in that:
  - (1) MR A-238084 did not delineate the applicable sections of SMI-0-94-1 to be performed and thus provided inadequate work instructions,
  - (2) MR A-238084 did not delineate requirements associated with the job safety analysis as required by procedure SQM2, Maintenance Management System,

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  - (1) MR A-238084 did not delineate the applicable sections of SMI-0-94-1 to be performed and thus provided inadequate work instructions,
  - (2) MR A-238084 did not delineate requirements associated with the job safety analysis as required by procedure SQM2, Maintenance Management System,

- (3) MR A-238084 did not reference the incore instrument disassembly/reassembly instructions of Maintenance Instruction 1.9, and
  - (4) as of April 19, 1984, the Field Quality Engineering review of MR A-238084 did not identify the deficiency of (a) above and did not identify that the post-maintenance testing and quality assurance requirements referenced in MR A-238084 did not exist.
- d. Administrative Instruction -8, Access to Containment, was not adequately established as of April 19, 1984, in that:
- (1) no guidance or positive controls are delineated in the procedure to ensure that airlocks remain accessible for egress during activities in containment in Modes 1 through 4 or to ensure that workers are kept informed of changes in available egress routes and
  - (2) paragraph 2.4 did not clearly delineate those maintenance activities on the incore flux monitoring system for which the clearance on the incore flux drive motors could be removed; this resulted in incore detector system disassembly activities being performed without the appropriate clearance in effect.
- e. Administrative Instruction -3, Clearance Procedure, paragraph 5.1.4, requires that no work begin on equipment under clearance until the clearance is issued to the person responsible for the work. This requirement was not properly implemented in that as of April 19, 1984 the clearance for the incore detector drive motors covering thimble tube cleaning activities was issued to a member of the operations staff and not to a field services supervisor responsible for the cleaning activity.
- f. Radiation Work Permit 02-1-00102 issued January 1, 1984, for seal table area inspection and maintenance required workers to verify the presence of a clearance on the incore instrument probes prior to entering the containment lower compartments and annulus. This requirement was not implemented on April 18 and 19, 1984, by workers entering the seal table area in that the clearance was not in effect on the problems during work activities.

This is a Severity Level III violation (Supplement I). (Civil Penalty - \$37,500)

## TVA RESPONSE

### 1. Admission or Denial of the Violation

TVA admits the violation occurred as stated.

### 2. Reasons for the Violation if Admitted

#### Item 1.(a)

Please refer to the attached discussion and/or conclusion for item 1-84-12-SQN-5 in the TVA Office of Nuclear Power (NUC PR) response to NSRS Report 1-84-12-SQN.

#### Item 1.(b)

Please refer to the attached discussion for item 1-84-12-SQN-7 of the NUC PR response identified in item 1.a.

#### Item 1.(c)

Please refer to the attached discussion for item 1-84-12-SQN-11 of the NUC PR response identified in item 1.a.

#### Item 1.(d)

Please refer to the attached discussion for item 1-84-12-SQN-12 of the NUC PR response identified in item 1.a.

#### Item 1.(e)

Please refer to the attached discussion for item 1-84-12-SQN-9 of the NUC PR response identified in item 1.a.

#### Item 1.(f)

Please refer to the attached discussion for item 1-84-12-SQN-8 of the NUC PR response identified in item 1.a.

### 3&4. Corrective Steps Which Have Been Taken and Results Achieved and Corrective Steps Taken to Avoid Further Violations

#### Items 1.(a), 1.(b), 1.(c)

Please refer to the attached NUC PR response to items 1-84-12-SQN-5, 7, and 11.

Item 1.(d)

Please refer to the attached NUC PR response to item 1-84-12-SQN-12.

Item 1.(e)

Please refer to the attached NUC PR response to item 1-84-12-SQN-9.

Item 1.(f)

Please refer to the attached NUC PR response to item 1-84-12-SQN-8.

5. Date When Full Compliance Will Be Achieved

Full compliance has been achieved.



Violation 50-327/84-24-02

2. Technical Specification 6.5.1.6 requires that the Plant Operations Review Committee review unit operations to detect potential nuclear safety hazards and review all procedures required by Technical Specification 6.8.1.

Contrary to the above, these requirements were not implemented in that the Plant Operations Review Committee:

1. did not meet and review the operational hazards associated with thimble tube cleaning activities to be conducted in containment with the unit at power on April 19, 1984, and
2. did not adequately review maintenance procedure SMI-0-94-1 for thimble tube cleaning and flushing on July 10, 1981, as evidenced by the deficiencies identified in violation 1.(b) above.

This is a Severity Level III violation (Supplement I). (Civil Penalty - \$37,500)

TVA RESPONSE

1. Admission or Denial of the Violation

TVA admits the violation occurred as stated.

2,3

- &4. Reasons for Violation If Admitted, Corrective Steps Which Have Been Taken and Results Achieved, and Corrective Steps Taken to Avoid Further Violations

Please refer to the attached conclusions and responses for items 1-84-12-SQN-17 and -22 provided in the NUC PR response to the NSRS Reprot 1-84-12-SQN.

5. Date When Full Compliance Will Be Achieved

Full compliance has been achieved.

Violation 50-327/84-24-03

3. 10 CFR Part 50, Appendix B, Criterion II requires that activities affecting quality shall be accomplished under suitably controlled conditions which includes the use of appropriate equipment. In addition, Criterion III requires that appropriate measures be established for the selection and review for suitability for the application of equipment.

Contrary to the above, as of April 19, 1984, the modified incore flux monitoring system thimble cleaning tool used for thimble cleaning activities at power was not appropriate equipment for use on the reactor coolant pressure boundary in that excessive stresses were transferred to the high pressure seal on incore thimble D-12. This requested in a breach of the reactor coolant pressure boundary. In addition, management controls for and reviews of modifications to the original vendor-supplied cleaning tool were inadequate to prevent inappropriate modification of the tool and subsequent use.

This is a Severity Level III violation (Supplement I). (Civil Penalty - \$37,500)

1. Admission or Denial of the Violation

TVA admits the violation occurred as stated.

2,3,

- & 4 Reasons for the Violation If Admitted, Corrective Steps Which Have Been Taken and Results Achieved, and Corrective Steps Taken to Avoid Further Violations

Please refer to the attached conclusions and response for item 1-84-12-SQN-10 provided in the NUC PR response to the NSRS Report 1-84-12-SQN.

5. Date When Full Compliance Will Be Achieved

Full compliance has been achieved.



## ATTACHMENT 1

### I-84-12-SQN-5, Selection of an Inappropriate Instruction for the Control of the Work Activity

#### Conclusion

Special Maintenance Instruction SMI-0-94-1 was a poor quality instruction and inappropriate for the activity to be controlled. However, the instruction was selected during the planning process as the primary procedural control for the cleaning activity apparently because those performing the planning and coordination function were not aware of what quality elements an instruction should contain, the change process for inadequate instructions, or had a careless attitude toward procedural compliance.

### I-84-12-SQN-7, Inadequate Field Quality Engineering (FQE) Review of Maintenance Request (MR) and Referenced Work Instruction

#### Conclusion

SMI-0-94-1 was referenced and attached to the MR when sent to FQE for review. The poor quality of the instruction was not identified nor was the fact that the instruction could not be used to perform the cleaning activity with the reactor at power. The FQE review process had not been effective in initiating quality improvement of the instruction since its original issuance in July 1981.

### I-84-12-SQN-11, Violation of Work Instruction

#### Conclusion

SMI-0-94-1 clearly stated that the Teleflex-supplied equipment and the instruction were not to be used at power. Using the equipment and instruction for that operation was a violation of work instruction and the unit 1 SQNP Technical Specifications. If the responsible engineers had written an adequate procedure appropriate for the activity and that procedure had been Plant Operation Review Committee (PORC) reviewed, the result of the cleaning operation may have been different (see section IV.D.2a for details).

### I-84-12-SQN-17, Poor Quality Cleaning Procedures and Inadequate PORC Review

#### Conclusion

As noted in section III.C.2, SMI-0-94-1 was not adequate for its intended use. SMI-0-94-2 was written after the accident to clean the tubes via the NUS method. It too was a poor quality instruction and could promote accidents of a similar nature in the future. This conclusion is based upon the facts that SMI-0-94-2 had no cautions or warnings to prevent damage to the mechanical seals, no administrative barriers to prevent cleaning the tubes at pressure, no instructions for disassembly and reassembly of the detector drive system, no postmaintenance inspections after cleaning and before pressurizing the reactor, and postmaintenance testing to ensure operability was optional.

I-84-12-SQN-17, (Continued)

Despite the poor quality of the instructions, both were recommended for approval by PORC. In these instances, PORC failed to adequately fulfill its responsibilities to the Plant Manager on these matters relating to nuclear safety.

I-84-12-SQN-22, Significant Breakdown in the SQN Procedure Process for Maintenance Activities

Conclusion

There is an apparent breakdown in the procedure process at SQN for maintenance activities as PORC reviewed and recommended approval of two poor quality instructions used for cleaning thimble tubes (one after the accident); the biennial review did not correct poor quality in one instruction; instructions being used were inappropriate for the activities being performed; an instruction was violated; and some engineers and managers interviewed did not seem to understand what quality elements should be in a maintenance instruction, were not aware of the procedure change process, or expressed a careless attitude toward procedure compliance.

Response (For Items I-84-12-SQN-5, I-84-12-SQN-7, I-84-12-SQN-11, I-84-12-SQN-17, and I-84-12-SQN-22)

To adequately respond to the referenced findings one must consider the sequence of events leading up to and including initiation of this maintenance activity.

- (1) Prior to the unit 1 cycle 2 outage, the Reactor Engineering Unit identified the need for thimble tube cleaning and prepared maintenance requests (MRs) to accomplish the cleaning. The MRs were included in the unit 1 cycle 2 refueling outage activity schedule and work was started to accomplish the cleaning but was terminated without adequate feedback to the Reactor Engineering Unit.
- (2) During subsequent low power physics testing, it became apparent there was an inadequate number of unblocked thimble tubes to accomplish a full flux map.
- (3) Management evaluated the performance of this maintenance activity by requiring a survey of other utilities, vendors, and Westinghouse to ascertain the acceptability of at-power performance.
- (4) Management recognized the unique aspects of the job and provided for full-time health physics and engineer coverage.

I-84-12-SQN-5, -7, -11, -17, and -22 (Continued)

- (5) Management made the decision to clean the blocked thimbles tubes while at the 30 percent power level and specified adequate guidelines and precautions to conduct this work activity. However, the work package (MR and Special Maintenance Instruction SMI-0-94-1) were not revised to reflect these directions.
- (6) The MR was reviewed by FQE as part of their responsibility to ensure an adequate procedure exists for the performance of the work.
- (7) A job safety analysis was performed by the maintenance foreman as required by the MR process. Discussions were held between the cognizant engineer and foreman concerning the high pressure connections and their proximity to the 10-path breakdown connections. No work was to be done nor was it done without the lead engineers at the seal table.
- (8) Hold orders and Radiation Work Permits (RWP) were obtained for this maintenance activity.
- (9) The 10-path transfer devices were disconnected and rolled back prior to beginning the cleaning process without a MR or procedural guidance, but the engineers involved were aware of the unit conditions at the time of the work, the system design, mechanical makeup of the components, and potential hazards. Employee awareness of the unit conditions and absolute requirements was demonstrated by informal planning and cursory attempts at satisfying requirements.
- (10) The at-power cleaning process began using the MR and SMI-0-94-1 as procedural guidance.

After thoroughly analyzing this event and the NSRS conclusions, SQNP acknowledges the following: (1) The work package (SMI-0-94-1 and MR) provided poor quality instructions in that they were not revised to reflect at-power cleaning and did not meet technical specification requirements for this maintenance activity. This procedure has been cancelled. (2) SMI-0-94-2 did not contain all the quality elements necessary for this maintenance activity and it is being revised to reference Maintenance Instruction MI-1.9 "Bottom Mounted Instrument Thimble Tube Retraction and Reinsertion" for the disassembly and assembly of the 10-path transfer devices. Appropriate cautions and warnings are being added to prevent damage to the mechanical seals. Postmaintenance inspections and testing requirements will be added to SMI-0-94-2; however, it should be noted that this procedure previously contained a double signoff that precluded its use at power. (3) The MR and FQE's review of the MR did not meet the requirements of Sequoyah's Standard Practice Maintenance Instruction, SQM-2. SQNP will review

I-84-12-SQN-5, -7, -11, -17, and -22 (Continued)

the MR system and QA review process by October 31, 1984, to ensure no programmatic deficiencies exist. (4) Adequate feedback did not exist to the Reactor Engineering Unit regarding the failure to satisfactorily clean blocked thimble tubes during the outage. In the future, a detailed scheduling process for incore thimble tube maintenance will be incorporated into the outage schedule and any deviations from scheduled work will be justified to plant management. (5) A problem existed in the coordination of the hold order and RWP associated with this maintenance activity. To alleviate this problem, Administrative Instruction AI-8 will be revised to clarify what moveable detector system maintenance requires a hold order and hold order requirements for RWPs will be modified to indicate AI-8 will be followed.

SQNP does not believe generic program weaknesses have been indicated by this event. However, SQNP management understands their detailed involvement in how the job was to be implemented during the evaluation to determine its feasibility may have unintentionally sent a message to key implementing employees creating the impression they had authority to proceed without adherence to normal plant practices.

Conclusion

RWP No. 01-1-00102 specified the following requirement: "Verify hold order is in effect on incore probes prior to entering Reactor Building lower compartments and the Annulus." On April 18 and 19, FSG evening and day shift employees and an HP technician entered the reactor building lower compartment while the hold order was not in effect.

Response

For this particular job at least two (2) PORC-approved procedures were being followed, Radiological Control Instruction RCI-14 and Administrative Instruction AI-8. The intent of special instruction 11 of RWP 02-1-00102; "Verify hold order is in effect on incore probes prior to entering reactor building lower compartments and the annulus," is a reminder to comply with AI-8. AI-8 section 2.4 contains the following statement: "The removal of the hold order clearance for maintenance purposes may be accomplished after proper coordination with the following; operations, health physics, applicable maintenance sections." This coordination is allowed to provide for troubleshooting of the incore detector system. In order to troubleshoot the system, it must be operable while personnel are in the seal table area and, therefore, the hold order cannot remain in place. Due to the confusing nature of this allowance, some nontroubleshooting work was performed without verification of the hold order, but the work was performed with the coordination required by AI-8. For additional clarification, special instructions for hold order requirements for RWPs will be modified to indicate AI-8 requirements will be followed and AI-8 will be revised by October 31, 1984, to clarify that the conditional allowance is for troubleshooting only.

I-84-12-SQN-9, Noncompliance With Requirements of Section 5.1.4 of  
AI-3, "Clearance Procedures"

Conclusion

Hold Order No. 1 was issued only to the Assistant Shift Engineer (ASE) and not as required by AI-3 to the persons responsible for work being performed in the instrument room between 0220 on April 17 and 0400 on May 1. This is contrary to the requirements of section 5.1.4 of AI-3.

Response

The maintenance personnel responsible for performing the work were not included in the clearance while the work was being performed. The ASE was aware of the work being performed and was on the hold order on the incore probes. Additional emphasis will be placed on making all personnel aware of the requirement for the person responsible for work to be on the clearance. This will be accomplished in preoutage briefings, existing clearance procedure training classes, and the periodic management safety meetings which are attended by managers, foremen, and engineering personnel.



I-84-12-SQN-10, Modification of Cleaning Tool Base Supports Without  
Performing a Technical Evaluation or Testing

Conclusion

The cleaning tool base support was modified and a temporary base was constructed and used without a technical evaluation of the effect on the mechanical seals. No testing was performed before use. Use of the tool and its support was determined during post-accident testing to impose forces of considerable magnitude on the mechanical seals and those forces were found to cause strain sufficient that the thimble tube separated from the mechanical seal.

Response

A review of the final support fixture in use at the time of the event indicates that resultant forces were applied to the fitting by the fixture, but would apply approximately 50 percent less resultant force multiplication to the fitting than the originally fabricated support base which had been scrapped. These forces were not fully considered in any preevent analysis and, therefore, the NSRS conclusion is substantially correct. However, the actual error occurred in that the original tool supplied by Teleflex was modified by the addition of a base and not by fabricating a new base.

SQNP will review "special tools" and evaluate the need for modification controls for these types of tools.

I-84-12-SQN-12, Lack of Control of Egress Capability from Containment

Conclusion

For approximately 30 minutes during the morning of April 19, the inner door of the personnel airlock was made inoperable without the knowledge of some of the workers cleaning the thimble tubes. This would have hindered egress from the room if the mechanical seal had failed at this time. The FSG workers were unaware of the Technical Specification requirements for maintaining containment integrity and that leaving the inner door of the airlock open would enter the unit into a limiting condition for operation. Leaving the inner door open would have hampered rescue efforts if needed.

Response

It is evident from the supporting details of the NSRS report that the shift engineer made an evaluation of the work in progress and in his judgement the time necessary to clear the airlock provided adequate protection for the employees inside. It is important to note that the workers involved knew alternate egress routes from the incore instrument room. In particular the submarine hatch was nearby and available as an unhindered egress route.

SQNP certainly agrees that reactor building egress should not be impaired when maintenance or other activities within containment are necessary while the unit is at-power conditions. The establishment of good communications is essential particularly in situations where one maintenance activity has the potential for affecting egress routes associated with another maintenance activity. Present policies regarding such communication are being reviewed to ensure their effectiveness. However, it must be noted that plant policies must retain the flexibility for the shift engineer to evaluate such situations on an individual basis and determine the extent of notification required.

SQNP acknowledges the FSG personnel were not adequately aware of the technical specification requirements associated with the containment airlocks. Future emphasis will be placed on ensuring responsible maintenance personnel are made aware of the technical specifications associated with the airlocks on a job-by-job basis.