TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401 5N 157B Lookout Place

JUL 0 2 1987

U.S. Nuclear Regulatory Commission ATTN: Document Control Desk Washington, D.C. 20555

Gentlamen:

In the Matter of Tennessee Valley Authority Docket Nos. 50-327 50-328

SEQUOYAH IN TEAR PLANT (SQN) - MODERATE ENERGY LINE BREAK EVALUATION

TVA identified the restart corrective actions for the moderate energy line break flooding studies in section III.15.2 of Volume 2 of the Sequoyah Muclear Performance Flan. Two significant condition reports, SQN NEB 8520 and SQN NEB 8617, were referenced in the discussion of this problem. NRC requested by telephone that copies of these significant condition reports be provided in order to complete their review of this issue. Copies of the significant condition reports and the associated calculation are enclosed. These documents outline the problem, the methodology for resolution, and the proposed corrective actions.

If you have any questions concerning this matter, please telephone M. J. Burzynski at (615) 870-6172.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

R. Gridley, Director Muclear Safety and Licensing

Enclosures cc: see page 2

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cc (Enclosures):

Mr. G. G. Zech, Assistant Director for Inspection Programs Office of Special Projects U.S. Nuclear Regulatory Commission Region II 101 Marietta Street, Nw., Suite 2900 Atlanta, Georgia 30323

Mr. J. A. Zwolinski, Assistant Director for Projects Division of TVA Projects Office of Special Projects U.S. Nuclear Regulatory Commission 4350 East West Highway EWW 322 Bethesda, Maryland 20814

Sequoyah Resident Inspector Sequoyah Nuclear Plant 2600 Igou Ferry Road Soddy Daisy, Tennessee 37379

ENCLOSURE

SEQUOYAH NUCLEAR PLANT

MODERATE ENERGY LINE BREAK DOCUMENTS

- 1. SCR SQN NEB 8520 Significant condition report for pipe break flooding outside containment
- 2. SCR SQN NEB 8617 R1 Significant condition report for pipe break flooding outside containment
- 3. SQN-SQS4-126 Moderate Energy Line Break Flooding Evaluation Report, SL-4424

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HILLS SIGNIFICANT CONDITION REPORT B45 Accession was [1] Project/Plant and Unit D SCR Number and Her Sequevah Miclear Plant Units 1 and 2 12/11/85 CRSONNEB8520 (4a Preparer and Organization 40 K NOR No Deticiency Height Edward Sheehy /OF-NEB-OSG7 For OC Use Only) be Contract Number N/A N/A [5c] Hequirement Viciated Evaluation not performed of pipe break flooding efforts outside of containment 0 [50] Source of Requirement SON-DC-V.1.1.11 (Section 6.3.8.2) be Description of Condition There is inadequate documentation to conclude that the efforts of flooding after a pipe break in category 1 structures outside of containment is acceptable. arms [51] System 50 UNID/Component Code (For OE Use Only) N/A N/A Date of 7 Method of Discovery Gen Implication Estimated Actual Occurrence Oct. 1973 x Eval of SCR SCRWBNNEB8523 8 Significant Condition Organization to Determine Corrective Action Adverse to Quality MUC PR 10e If significant, NEB-NLS Contact d TOC Consected by R. T. Holliday 12/11/85 D. Y. Justice Is a Potential Generic Condition If yes, initiate Attachment 5 of OEP 17 and [12] Branch Chief or OC Quality Manager Evaluation Required? list Attachment 5 RIMS Accession No. Distribute as required -- see block 30.) Yes See B45851129278 ORCHAIN for J.A. Randofon 12-12-85 [13] Root Cause This deficiency is due to a failure to properly assign and track this task within the responsible engineering organization. Although several engineers were cognizant of the requirement, the failure to enter the task into the task assignment logs resulted in the failure to assign the task and schedule a date for 8 completion. This occurrence is considered to be an isolated design oversight. thi complete [14e] Corrective Action This item is being tracked by ONP as SCRSONNER8520. 17.5 Action Corrective

ensure that all identified tasks are properly assigned and tracked by existing mechanisms. The existing assignment and tracking mechanisms are considered to be adequate to ensure that identified tasks are not overlooked. No further actions to prevent recurrence are considered pecessary.

TVA 10/00 (0) 8 85)

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[14] Coordination Review of OE Work (Provide Initials)

14c Scheduled Date of Completion

SIGNIFICANT CONDITION REPORT COMPLETION VEHALICATION SHEET



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SIGNIFICANT CONDITION REPORT

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ATTACHMENT 1 TO SCRSQNNEB8617RO

A combination of inadequately specified interdivisional responsibilities and lack of vialbility of the need to perform the analysis. More specifically the pipe break shelysis report identified the need for the flooding study via a single seatence which read "... shall be evaluated for jet impact and environmental effects..." (see section 3.2, CEB-72-22). No specific mention was made of thooding. As a result, CEB, the lead organization for tipe break analysis, evaluated jet and temperature affects of MELBs. They did not evaluate flooding affects as MEB, had via informal agreement accepted the responsibility for these. As issued GEB-72-22 appeared to be complete, however, the flooding evaluation either was not performed or insufficiently documented. The omission of MELB flooding was not recognized until a documentation apprade to assure compliance with environmental qualification requirements discovered the oversight.

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ATTACHMENT TO SCR SQN NEB8617 (R1) CORRECTIVE ACTIONS FOR MELS FLOODING

Purpose

The purpose of this report is to provide an updated listing of all corrective was action required to mitigate moderate energy line breaks (MELBs). It also analidentifies which of these corrective actions must be completed prior to evaluate and which may be delayed into the next fuel cycle (cycle 4). This response supersedes all previous memorandums enothis subject it.e., reference 2 noweeld it's references and reference 3) was the next fuel cycle (cycle 4).

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The revised recommendations from the Sargent and Lundy Engineers (S&L) flooding evaluation for MELBs (reference 1) are given in Attachment A. Attachment B defines the complete set of corrective actions that remain to be implemented to address these recommendations. Corrective actions that have already been implemented are not listed in Attachment B. The corrective actions are divided into actions required for unit restart and post restart items. Justifications for decoupling the post restart items are given in Attachment C of the Engineering Report. The post restart items should be addressed as soon as practical. Corrective action (if any) needs to be completed prior to the startup for fuel cycle 5.

Additional corrective actions may be identified when S&L issues the revised power system analysis portion of the MELB flooding evaluation.

The results of the corrective action are to be documented in either (1) a QIR, if appropriate, or (2) a memorandum to H. L. Jones with copies to RIMS and H. G. O'Brien. This will then be referenced in a summary report which will document all corrective actions as indicated in Attachment A.

References

- Sargent and Lundy Report SL-4424, Moderate Energy Line Break Flooding Evaluation revision dated August 29, 1986 (845 861217 218)
- 2. D. W. Wilson's memorandum to Those listed dated October 3, 1986 (825 861003 023)
- 3. D. W. Wilson's memorandum to H. L. Abercrombie dated September 10,1986 (825 860910 006)
- 4. D. W. Wilson's memorandum to SQEP Files dated December 12, 1986 (825 861222 008)
- 5. D. W. Wilson's memorandum to DNE Files dated October 14, 1986 (825 861014 001).

SARGENT & LUNDY

7-1 SL-4424 08-29-86 Rev. 12-12-36

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restart an which CONCLUSIONS AND RECOMMENDATIONS

The ability to achieve safe shutdown was demonstrated for postulated MELB flooding events provided the following recommendations are implemented:

- revised to include the requirement for both Division A and Division B safety are injection pump cubicle doors to be open during functional testing of either accompump. This is only required during surveillance testing of the safety injection pumps and not during plant-wide SI signal tests. This requirement ensures that design basis MELB flood loads in these cubicles are less than the accomplished live loads provided by TVA.
- The auxiliary building/turbine building and control building/turbine building wall should be flood protected to elevation 706 feet 0 inches.
- HPFP lines in Zones 749.0-A6, 749.0-A7, 749.0-A10, and 749.0-A11 should be shown to be equivalent to Seismic Category I(L) Pressure Boundary Retention. This may require sprinkler head modifications.
- Conduit containing cables required for MELB safe shutdown that are located below MELB flood levels should be sealed. Alternatively, the cables may be shown to be qualified for submergence.
- Conduit containing cables connected to safe shutdown power supplies that
 are located below MELB flood levels in areas affected by borated water
 should be sealed. Alternatively, the cables may be shown to be qualified for
 submergence.
- Revise the protective device settings for the following main circuit breakers
 in accordance with the recommendations contained in Sargent & Lundy
 Calculation No. SQN-EPS-001-1:

		k	Boar	d			Breaker L	ocatio	n
C	&A	Building	Vent	Board	IAI-A	480-V	Shutdown	Board	IAI-A
C	&Α	Building	Vent	Board	181-8	480-V	Shutdown	Board	181-8
C	&Α	Building	Vent	Board	2A1-A	480-V	Shutdown	Board	2A1-A

- Verify the structural adequacy of walls and floors in Zones 669.0-A15, 669.0-A16, 714.0-A7, and 714.0-A8 for the flood levels provided in NSLD Calculation 3037-2686-201, Revision 3, 444-2
- P * Flooding in the reactor building annulus must be limited to 2 inches by providing free flow in the drain system or modification to the detection and the about visuation-system undown was demonstrated to the detection and
- The test return header to the refueling water storage tank and certain component cooling system piping in Zones 714.0-A7 and 714.0-A8 are assumed to meet the crack exclusion criteria.

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/O * Spurious operation of associated equipment that might prevent safe shutdown was not evaluated in this report.

PROGRAM FOLLOWUP

Sargent & Lundy recommends that TVA summarize implementation of the above recommendations through issuance of a TVA calculation "MELB Flooding-Summary of Corrective Actions."

This calculation will document corrective actions taken by TVA to ensure that the intent of the Sargent & Lundy recommendations is met.

ATTACHMENT B SEQUOYAH NUCLEAR PLANT MELB FLOODING - ACTION ITEMS

from those in reference 2. The recommendation numbers correspond to those in Attachment A.

This attachment reflects a decision to (1) stop work on the "active" approach for turbine building flooding and (2) implement the "passive" approach of sealing theusentrol and auxiliary boundaries for turbine building flooding to elevation 706. These two alternative approaches are described in reference 2.

After remtert, EEB will determine which of the parallel efforts on conduit sealing/cable submergence in actions items 2.2.7 and 2.2.3 will be pursued.

The revision of the protective device settings per recommendation 6 is a generic issue that is broader than MELB events. This will be handled separately. The protective devices for C&A Building Vent Boards 1A1-A and 2A1-A are being addressed in SCR SQN EEB 86124 RO. The revision of the protective device settings for C&A Building Vent Board 1B1-B is an enhancement and does not involve an SCR or PIR.

1. ACTION ITEMS REQUIRED BEFORE UNIT 2 RESTART

- 1.1. Mechanical Discipline Action Items
- Close the drain path from the turbine building to the control building as defined in J. C. Key's memorandum to V. A. Bianco dated December 17, 1986 (825 861217 005). Assure that the current sealing provisions of the doors potentially subjected to turbine building flooding meets the design.
- 1.2 Electrical Discipline Action Itoms
- 1.2.1 Turbine Building Flooding Barrier Integrity (Recommendation 2) Seal conduit PL 3057 in accordance with existing drawing requirements as defined in C. R. Brimer's memorandum to H. G. O'Brien dated January 26, 1987 (B25 870126 001) (reference Work Request WR B218260).
- 1.2.2 Flooding Electrical Equipment on Flevations 734 and 749 Expand the evaluation in QIR SQN EEB85003 (B25 850701 002) to verify that the electrical equipment in all of the electrical boards on elevations 734 and 749 are above the MELB flood levels defined in the flood level calculation SQN-SQS4-056 (B45 870106 428).

1.3 Civil Discipline - Action Items

1.3.1 Turbine Building Flooding - Barrier Integrity - (Recommendation 2) Assure that existing sealing of turbine building to control building
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Alterires: Review of Unimplemented ECNs - Update the previous review of section caunimplemented ECNs to determine if subsequent ECNs impact the flooding evaluation.

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sandreces Plant Managor's voffice Action Items

cat Sol : vo Anaulus Flooding - (Recommendation 8) - Develop an instruction to provide operating surveillance of the annulus drain sump alarm system (associated with LS-40-12A and LS-40-12B). Develop provisions for inspection of annulus for flooding if the alarm system is inoperable. Revise system operation instructions SOI-55-1-1M15 and SOI-55-2M15 to add an action to open valve 77-920 to drain the annulus sump to the auxiliary building passive sump. The time margins for inspection if the system is inoperable and to open valve 77-920 is about 4 hours. These provisions may be discontinued upon completion of action item 2.2.3.

2. POST RESTART ACTION ITEMS

2.1 Mechanical Discipline Action Items

Turbine Building Flooding - tarrier Integrity - (Recommendation 2)
Implement improved sealing of mechanical penetrations in control and auxiliary building boundaries as defined in part of ECM 16790, and J. C. Key's memorandum to SQEP Files dated October 1,2986 (825 861001 064). Improve the discharge path and capabilities of the control building sump pumps for turbine building flooding conditions. Add a sump pump (if required) to the south mechanical equipment room, elevation 669 in the turbine building. Provide the information on the barrier leakage during turbine building flooding as requested in QIR NEB86244. (Bas 861126 252). Obtain supporting information as

- 2.1.2 HPFP Seismic 1(1.) Capability (Recommendation 3) Document that the SPFP lines in zones 749.0 -A6, -A7, -A10, and -A11 will not have a loss-of-pressure boundary in an earthquake. The HPFP modifications related to these zones as defined in ECN L6770 and J. C. Key's memorandum to SQEP Files dated October 1, 1986 (B25 861001 064), are field completed.
- 2.1.3 Annulus Flooding (Recommendation 8) Develop methods of providing free flow in drain system similar to WBN. (A possible alternative if this approach is not practical is to upgrade the flood alarm system see action item 2.2.5).
- 2.2 Electrical Discipline Action Items
- 2.2.1 Turbine Building Flooding Barrier Integrity (Recommendation 2) Perform the electrical penetration sealant modification for the conduits entering the control/auxiliary building from the south mechanical equipment room elevation 669 in the turbine building as defined in ECN 6828. Document the adequacy of electrical penetrations for turbine building flooding to elevation 706 for the "passive" approach and quantify any estimated leakage. (Reference Wyle Test Reports No. 17333-01 and -02.)
- 2.2.2 Cable Submergence (Recommendations 4 and 5) Develop an engineering justification that cables will operate satisfactorily under MELB submergence conditions. See inputs from reference 5, S&L (B45 860905 218), SQN EQP, and WBN EQP. Document the justification. This is an alternative to action item 2.2.3.
- 2.2.3 Conduit Sealing - (Recommendations 4 and 5) - Seal the conduits for (1) cables required for MELB safe shutdown which are located below the MELB flood levels and (2) cables connected to safe shutdown power supplies that are located in areas affected by borated water. This should be combined to the degree practical with the conduit sealing for the flooding from high energy line breaks (HELB) to resolve SCR SQN EQP8621. EQP has conducted testing of conduit couplings for MELB conditions and the additional field inspections, or verifications, to identify the conduits below MELB flood levels. EEB has conducted more formal testing of the conduit coupling and condulet sealing (see Wyle Test Reports No. 17833-01 and -02). If there are large number of conduits involved, it may be cost effective for NEB to arrange for S&L assistance in reducing the set below the size of the (1) S&L safe shutdown set of August 12, 1986, and (2) set of cables connected to safe shutdown power supplies that are located in areas affected by borated water. If problom areas arise where the flood depth or duration exceeds the MELB conduit coupling test conditions. (such as in the UHI zone), NEB can assist in developing alternate approaches (such as curbs, door modifications, etc.). Document the adequacy of the conduit sealing. This is an alternative to action item 2.2.2 (see reference 5).

- 2.2.4 Conduits Acting as Water Pipes Evaluate the TVA concern on the acceptability of water, which may leak through fittings on flooded conduits, being routed via the conduit to essential equipment at other locations. These conduits are being sealed or rerouted for the HELB effort. S&L did not consider this failure mechanism in their study. Seal the conduits if needed. Document the resolution of this concern.
- 2.2.5 Annulus Flooding (Rocommendation 8) Upgrade the annulus drain sump alarm system if required. See action item 2.1.3.
- 2.3 Civil Discipling Action Items
- 2.3.1 Turbine Building Flooding Barrier Integrity (Recommendation 2) Provide the information on the barrier leakage during turbine building flooding as requested in QIR NEB86242 (B45 861126 253).
- 2.4 Nuclear Discipline Action Items
- 2.4.1 Turbine Building Flooding (Recommendation 1) Evaluate estimated inleakages through the control and auxiliary building boundaries to determine if these are within the design capability of the sump and sump pumps. Develop additional methods of handling the inleakage if needed.
- 2.4.2 Evaluate Unintended (Spurious) Operations (Recommendation 10) Evaluate unintended operation per section 5.5 of Project Instruction PI-SQ-5 in reference 1.
- 2.4.3 <u>Isolation Valves with Power Removed</u> Develop methods of addressing the use of motor operated valves with power removed for isolation of pipe breaks in a timely manner. See punch list item 1 in the system isolation calculation, SQN-SQS4-O55 (B45 870106 426).
- Non-Seismic Piping Evaluation The analysis in section 6.4 (page 25), and Appendix B of the safe shutdown analysis calculation, SQN-SQS4-057 (B45 870106 427), needs to be expanded from the MELB safe shutdown set of equipment to the full set of Seismic Category I equipment per section 7.1 of the project instruction PI-SQ-5 in

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- 2.4.5 Backflow Through Drains The treatment of backflow from higher floors through drains into lower floors in Appendix H in the flood level calculation, SQN-SQS4-056 (B45 870106 428) will be expanded per item I in the punch list for this calculation.
- 2.4.6 Revision of MELB Calculations The calculations will be revised to address the punch list items and the unverified assumptions. The more significant items and assumptions are listed as separate action them in this listing. The use of any non-QA inputs such as telecons will be upgraded to QIRS if needed.
- 2.4.7 Addition of Flood Levels to Environmental Drawing Add the MELB flood levels to environmental data drawing series 47E235.
- 2.4.8 Input to Operations Provide input to ONP-SDO for their use for either (1) procedures, (2) training, and/or (3) background. This will be design output (or functional information output).
- 2.4.9 Summary of Corrective Actions Document the final corrective actions in a calculation that is referenced in the summary report as indicated in Attachment A.
- 2.4.10 Licensing Documentation Revise FSAR Section 3.6 to reference flooding study in next FSAR revision. It has been determined that a separate submittal to NRC is not needed.
- 2.5 Plant Kanager's Office Action Items
- 2.5.1 Safety Injection Test Mode (Recommendation 1) Revise test procedure per recommendation 1 in Attachment A.
- 2.5.2 Surveilance on Flood Alarms Develop a procedure for surveilance testing of the turbine, auxiliary and reactor building flood alarm (detection) system, turbine building station sump level alarm, etc. See TVA commitment in section 6.3.2.11 of the FSAR.

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Sargent and Lundy (S&L) has prepared a comprehensive safety evaluation of MELB flooding for SQN composed of evaluation criteria, data packages, calculations, and an evaluation report. This calculation documents the evaluation report, Moderate Energy Line-Break Flooding Evaluation Report, SL-4424, revision 2 dated March 6, 1987. The S&L report summarizes work performed by S&L to evaluate MELB flooding events for SQN and serves as a guide that shows the relationships among the supporting calculations produced in the evaluation. The design criteria for the evaluation are provided in Appendix A of SL-4424. Section 3 of SL-4424 summarizes the methodology, the major elements, and the individual calculations in the evaluation. Section 3 of SL-4424 indicates that the evaluation demonstrates the ability to achieve safe shutdown for postulated MELB flooding even's provided that the recommendations listed are implemented. This calculation consists of this coversheet and Attachment A.

The TVA corrective actions to address the S&L recommendations (unverified assumptions) will be summarized in TVA calculation, MELB Flooding Summary of Corrective Actions, SQN-SQ\$4-59 (to be issued).

() Microfilm and store calculations in RIMS Service Center (x) Microfilm and return calculations to: R. S. McKeehan

Microfilm and destroy.

Address: WIO A52 C-K

cc: RIMS, SL 26 C-K

C. R. Brimer, DNE DSC-E, SQN

R. O. Barnett, W9 D224 C-K

C. A. Chandley, W7 C126 C-K

H. L. Jones, DNE DSC-A, SQN

W. S. Raughley, W8 C126 C-K

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Sheet 1 of 1 Prepared by/Date 201 4/22/87 MELB FLOODING EVALUATION REPORT SON-SOS4-126 Checked by/Date CRU 4/22/87 ATTACHMENT A Contents: Attachment A Cover Sheet --- 1-page-Report Signout Log 1 page MELB Flooding Evaluation report SL-4424, Revision 2, March 6, 1987 ----34 pages-----SL-4474 Appendix A - Cover page ---and 17 pages ible has a concrete no house. with a way to the MEST moranded a service and

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