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JAN 06 1988

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

Gentlemen:

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

SEQUOYAH NUCLEAR PLANT (SQN) UNITS 1 AND 2 - CRITERIA CHANGES TO OUTSIDE CONTAINMENT PIPE RUPTURE REPORT CIVIL ENGINEERING BRANCH (CEB) 72-22

In the course of reviewing pipe rupture documentation for the SQN Integrated Design Inspection, NRC noted in Deficiency D2.4-1 that Final Safety Analysis Report (FSAR) section 3.6 references CEB report 72-22 as the source of pipe rupture information outside containment. Inside containment information is addressed in the FSAR only. The concern is that revisions to the outside containment design criteria, SQN-DC-V-1.1.11 (while equal to or more conservative than current standard review plant requirements), are not being included in the licensing document (i.e., CEB 72-22). While it is intended that CEB 72-22 always reflects updates to this design criteria document, a considerable amount of time has currently elapsed between revisions.

A comprehensive revision to CEB 72-22--to include the results of both units 1 and 2 baseline reviews, Sargent and Lundy flooding evaluations, and other general updates of the plant status--is scheduled before unit 1 startup. In the interim, as part of the unit 2 restart action, revised criteria section 3.0 of CEB 72-22 is being forwarded to you to update your existing file (enclosure 1). This revised criteria will be incorporated into revision 4 of CEB 72-22 by unit 1 restart, at which time a copy will be formally transmitted to you to replace the current contents of the binders for CEB 72-22.

The commitments are contained in enclosure 2.

If any questions exist, please telephone M. R. Harding at (615) 870-6422.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

R Gridley

R. Gridley, Director
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Enclosures
cc: See page 2

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U.S. Nuclear Regulatory Commission

JAN 06 1988

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ENCLOSURE 1

"Evaluation of the Effects of Postulated Pipe Failures Outside of Containment for Sequoyah Nuclear Plant, Units 1 and 2, CEB 72-22 (Revised Section 3.0, Criteria For Postulation Of Pipe Failure)

3.0 CRITERIA FOR POSTULATION OF PIPE RUPTURE

The following criteria and definitions govern the selection of the locations and types of postulated pipe ruptures outside containment, and the required extent of evaluation of potential consequences of these ruptures.

3.1 High Energy Piping Systems

High energy piping systems are defined as those in which the maximum temperature and pressure are equal to or greater than 200°F and 275 lb/in^2g, respectively (both conditions must exist) during normal plant operation. High energy piping systems have been evaluated for the pipe whip, jet impingement and environmental conditions resulting from postulated design basis ruptures (see subsection 3.3) at selected locations and for the jet impingement and environmental conditions resulting from lesser magnitude postulated critical crack breaks (see subsection 3.4), at all adverse locations. The following qualifications apply to the selection of high energy systems. R4 R4 R4

a. Normal plant operation includes any condition in the course of nuclear system startup, operation in the design power range, refueling, hot standby, shutdown cooling, cold shutdown, and operation of specific items of equipment under such as may be permitted and/or required by the technical specifications for the plant. R4

b. Piping either encased in concrete, separated by barriers or physically remote from safety related systems or components, such that unrestrained motion (pipe whip) about a plastic hinge could not result in damage to safety-related systems shall not be evaluated for pipe whip. However, at least one break shall be postulated in the most adverse location to verify adequacy of design for concrete encasements or barriers.

c. Piping which exceeds the specified maximum normal operating temperature and pressure criteria less than 1 percent of the expected plant operating lifetime shall be considered as low energy piping.

d. Piping 1 inch or less in diameter shall not be evaluated for postulated pipe ruptures.

Table 3-1 presents a list of high energy piping systems greater than 1-inch nominal size outside containment, derived in accordance with the above criteria, along with the operating conditions, safety classification and in-plant locations identified for these systems. A pipe rupture evaluation has been performed, in accordance with the criteria and methods described herein, for the systems listed in this table. R4 R4

3.2 Low Energy Piping Systems

Low energy pipes are defined as those pipes which are in normal plant operation at a maximum temperature that is less than 200°F or a maximum R4

pressure that is less than 275 psig. All low energy piping systems greater than 1-inch in diameter have been evaluated for jet impingement and environmental effects resulting from lesser magnitude critical crack breaks at any adverse location along the pipe. Table 3-2 presents a list of low energy piping systems outside containment, along with the maximum normal operating conditions, safety classification and in-plant location for these systems. R4 R4

3.3 Design Basis Ruptures R4

Design basis ruptures in straight or curved piping 4 inches in diameter and greater may be circumferential or longitudinal with the break area equal to the flow area of the pipe. Design basis ruptures in straight or curved pipe over 1 inch but less than 4 inches in nominal diameter shall be circumferential only, with the break area equal to the flow area of the pipe. R4

Circumferential ruptures were assumed to result in guillotine severance of the pipe with the plane of the break being normal to the pipe flow axis and with the effects of flow from both sides of the broken pipe being considered in the evaluation. Longitudinal splits were assumed to have a length of two nominal inside pipe diameters with the long dimension oriented parallel to the pipe flow axis. Splits may occur at any orientation about the circumference of the pipe. R4

Design basis ruptures at piping branch points may be circumferential or longitudinal in accordance with the pipe size criteria stated above, with break area equal to the flow area of the branch.

3.3.1 Location of Design Basis Ruptures | R4

Locations of postulated design basis ruptures in piping which has been analyzed for the effects of thermal expansion, deadweight, pressure, and earthquake in accordance with USAS B31.1.0 Code of Power Piping (section 7.0, reference 3) shall be determined in accordance with the | R4
results of these stress analyses, as follows:

a. Design basis ruptures were postulated at all piping terminals | R4
(anchors, rigid equipment, and branch points).

b. Design basis ruptures were postulated at intermediate locations | R4
between terminals where primary stress (due to pressure, weight, operating basis earthquake inertia loading) plus secondary stress (due to temperature and seismic displacement of support points) exceeds 0.8 ($S_A + S_h$) or secondary stress alone exceeds 0.8 S_A.

c. Under regulatory requirements in effect prior to issuance of reference 40 in section 7.0, the following criteria governed the postulation of arbitrary intermediate breaks.

R4

If two intermediate break locations were not established on the basis of step b, then the two points of highest combined stress were selected as postulated break locations.

In accordance with the revised requirements of reference 40, postulation of break locations is now required only at terminal ends and at intermediate locations where the calculated stress exceeds the limits noted in step b. above. These revised criteria will be implemented at Sequoyah on a case-by-case basis where some benefit may be realized from the elimination of a previously postulated arbitrary intermediate break (AIB). The potential for greatest benefit exists inside containment and the valve rooms since the limited extent of rigorously analyzed, high energy piping outside containment resulted in no postulated AIBs. R4

Locations of postulated design basis ruptures in nonnuclear safety class piping which has not been seismically qualified were determined as follows: R4

a. Design basis ruptures were postulated at all piping terminals, (anchors, rigid equipment, and branch points). R4

b. Design basis ruptures were postulated at intermediate locations between terminals at each change in pipe cross section or deviation from ordinary straight pipe (elbow, tee, cross, nonstandard fitting, etc.). R4

The latter criteria are applicable for main steam and feedwater outside containment, since these lines are nonnuclear safety class piping and have not been subject to seismic qualification. The latter criteria may also be used as an alternate method for postulating breaks in nuclear safety class piping. R4

3.4 Critical Crack Breaks

R4

Critical crack breaks are defined to have an opening area equal to one half the pipe inside diameter by one half the pipe wall thickness. Critical crack breaks are postulated in piping with a nominal diameter greater than 1 inch at any adverse location along the pipe and at any orientation about the pipe circumference. It is applicable to high and low energy piping regardless of the type of safety class or piping analysis. However, for low energy piping seismically analyzed in accordance with USAS B31.1.0 Code of Power Piping, critical cracks may be excluded where the following rules apply.

R4

1. The piping systems are located in or adjacent to areas containing structures, systems, and/or components important to safety provided they are enveloped by previously postulated high energy breaks in the same region, or

2. Where the primary plus secondary stress as defined in subsection 3.3.1.b does not exceed 0.4 ($S_h + S_a$).

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35. R. J. Wagner, L. L. Wheat, CONTEMPT-LT Users Manual, Aerojet Nuclear Company Interim Report No. I-214-74-12.1, August 1973.

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37. Tennessee Valley Authority, "Piping Bill of Material," Drawing Series 47BM400.

38. Tennessee Valley Authority Construction Specification No. N2M-865 "Field Fabrication, Assembly, Examination and Tests for Pipe and Duct Systems," July 18, 1974.

39. Tennessee Valley Authority, "Electrical Equipment Environmental Qualification Report (in accordance with NUREG 0588) for Sequoyah Nuclear Plant Unit 1." R4

40. USNRC Generic Letter 87-11 "Relaxation in Arbitrary Intermediate Pipe Rupture Requirements," June 19, 1987.

ENCLOSURE 2

TVA Commitment
Sequoyah Nuclear Plant (SQN) Units 1 and 2

CRITERIA CHANGES TO OUTSIDE CONTAINMENT PIPE RUPTURE REPORT CIVIL ENGINEERING BRANCH (CEB) 72-22

A comprehensive revision to CEB 72-22 is scheduled before unit 1 startup. This revision will include the results of both units 1 and 2 baseline reviews, Sargent and Lundy flooding evaluations, and other general updates of the plant status. This revised criteria will be incorporated into revision 4 of CEB 72-22 by unit 1 restart, at which time a copy will be formally transmitted to NRC to replace the current contents of the binders for CEB 72-22.