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TEXAS UTILITIES GENERATING COMPANY

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July 29, 1986

WILLIAM G. COUNSIL
EXECUTIVE VICE PRESIDENT

Director of Nuclear Reactor Regulation
Attention: Mr. V. S. Noonan, Director
Comanche Peak Project
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)
DOCKET NOS. 50-445 AND 50-446
ARBITRARY INTERMEDIATE PIPE BREAKS

Dear Mr. Noonan:

Attached is the response to your request for additional information dated December 10, 1985, concerning elimination of arbitrary intermediate pipe breaks.

Very truly yours,

W G Counsil

W. G. Counsil

BSD/arh
Attachment

c - NRC (O + 40 copies)
A. L. Cook

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ATTACHMENT 1

RESPONSE TO NRC
REQUEST FOR ADDITIONAL INFORMATION DATED
DECEMBER 10, 1985

210. Mechanical Engineering Branch

Q210.1 Provide a discussion of the extent and usage of welded attachments in high energy piping systems. Include in your discussion a description of the type and the proximity of any welded attachments where arbitrary intermediate pipe breaks are to be eliminated.

R210.1 There are 152 welded attachments on the 70 high energy lines listed in Table 1 of TUGCo Letter TXX-4471 dated May 2, 1985. Of the 126 arbitrary intermediate breaks on these lines, only two occur at the same location as welded attachments. This indicates that stress levels in piping at welded attachment locations are generally not high. Inclusion of local bending stresses at these locations will increase total pipe stress; however, it is not anticipated that total pipe stress at the welded attachment locations will exceed 0.8 $(1.2S_h + S_a)$.

The final postulated break locations (ASME Code Class 2 and 3 piping), as described in the responses to Questions 210.2 and 210.7, will be based on the results from the Stone & Webster Engineering Company (SWEC) requalification program.

Q210.2 Address the design considerations used at welded attachments in ASME Class 2 and 3 piping systems. Specifically address for the main steam and feedwater piping, the measures taken to minimize the potential for fatigue failures at welded attachments which could be caused by excessive localized bending stresses, harmful thermal gradients, or large cyclic stress in the pipe wall.

R210.2 The local bending stresses of integral welded attachments to all ASME Code Class 2 and 3 piping, which include main steam and feedwater piping, are analyzed at each location in the SWEC requalification of CPSES piping. The local bending stress due to thermal and occasional loads (OBE and applicable fluid transients) is included in the total stress used to determine intermediate break locations, in compliance with B.1.c.(2)(b)(ii) of NRC Branch Technical Position MEB 3-1.

For Class 2 and 3 piping, fatigue is considered in the ASME Section III code allowable stress range check for thermal expansion stresses. If the number of thermal stress cycles exceeds 7,000, then the allowable thermal stress is further reduced by the appropriate amount dependent on the number of cycles, as specified by the ASME Section III Code.

Q210.3 Provide a discussion of the specific measures taken to preclude excessive steady-state vibration in those high energy systems where the elimination of arbitrary intermediate breaks will be implemented which are not included in the preoperational steady state vibration test program.

R210.3 Specific measures taken to preclude excessive steady state vibrations in high energy lines are discussed in FSAR Section 3.9B.2.1.1. All high energy lines where elimination of arbitrary breaks is requested are included in the preoperational steady state test program.

Q210.4 Address the design considerations used in those systems where large dynamic transients can potentially occur. Specifically, provide a detailed discussion addressing the specific treatment of the dynamic transient effect in the feedwater piping system (both inside and outside containment) association with a feedwater isolation check valve closure following a postulated feed water line break outside containment. The staff concern is related to the fact that need for pipe whip restraints to satisfy the AIB criteria is independent of the need for restraints for events with transients resulting from a postulated pipe break. Elimination of arbitrary intermediate breaks does not eliminate the need for those pipe whip restraints intended to mitigate the dynamic consequences of a transient from a postulated break.

R210.4 The effects of large dynamic transients, including seismic events, are evaluated in the SWEC requalification program of CPSES piping. The potential CPSES fluid transients are identified by following the guidance provided in NUREG-0578, by using past experiences with other PWRs, and by assessment of CPSES system operation and piping arrangement.

The dynamic transient effects in the feedwater system associated with feedwater (FW) isolation check valve closure following a postulated FW line break outside containment will be evaluated to ensure that the pressure boundary integrity of the FW piping inside containment, extended to and including the FW check valve outside containment, will be maintained. It is to be noted that restraints used in CPSES to mitigate the transient effects following a postulated break are independent of pipe whip restraints. Therefore, the elimination of arbitrary intermediate breaks will not affect the need for any other pipe whip restraints.

Q210.5 Provide a more detailed discussion of the system design and operating procedures that have been implemented to minimize the potential for water hammer in the feedwater and auxiliary feedwater systems. Specifically address 1) the need to maintain steam generator water level above the auxiliary feedwater discharge pipe inside the steam generator, 2) the need for operating procedures at low load or hot stand-by conditions to supply feedwater in the AFW bypass line continuously, and 3) the need for any instrumentation on the piping upstream of the steam generator auxiliary feedwater nozzle to monitor temperature for detecting the onset of steam back leakage.

R210.5 The feedwater and auxiliary feedwater piping system at CPSES is designed and instrumented to minimize the potential for water hammer (See CPSES FSAR Section 10.4.7.5). To ensure that steam does not flow back to the auxiliary feedwater nozzle, the steam generator water level should be above the auxiliary feedwater discharge pipe at all operating levels where steam formation can occur. Therefore, the operator is cautioned to maintain the SG level above the auxiliary nozzle internal pipe extension when the temperature is above 212°F. This pipe is designed with a loop seal immediately upstream of the SG nozzle to prevent steam back leakage. Forward flushing is provided through the auxiliary feedwater nozzle at all loads. During normal operation, approximately 10 percent of the feedwater flow is directed to the auxiliary feedwater nozzle by means of a flow bypass line. During low loads and hot standby operation, all feedwater is sent to the auxiliary feedwater nozzle by means of the Feedwater Preheater Bypass Valve (FPBV). This valve is normally open when the Feedwater Isolation Valve (FIV) is closed. To ensure that the feedwater flow is not transferred too soon to the main nozzle, the FIV cannot be opened until all of the following are met:

1. Steam generator pressure not low.

2. Steam generator level not low.

3. Absence of feedwater isolation signal.

4. No low FW flow signal.

5. FW temperature at the main FW nozzle is not low and the temperature difference between the nozzle and the FIV is within 5°F.

In the event that steam does flow back past the loop seal and the check valves into the feedwater line to the upper nozzle, the temperature of this line will increase. Temperature elements TE-2197-1, TE-2197-2, TE-2197-3, and TE-2197-4 will detect the high temperature and alarm in the control room. This will allow the operator to take actions to resolve the problem.

Q210.6 Provide the preoperational test report demonstrating the adequacy of the feedwater configuration to reduce or eliminate water hammer as stated in Section 10.4.7 of the CPSES SER dated July 1981.

R210.6 As referenced in the CPSES SER, in a letter dated June 16, 1981, TUGCO committed to perform a pre-operational test to demonstrate that no unacceptable feedwater/steam generator water hammer would occur following a limiting transient. In a discussion with the NRC Staff it was agreed that a single test would be sufficient to demonstrate water hammer adequacy for the entire feedwater/auxiliary feedwater/steam generator systems. The NRC specified that this test be the recovery from a low level transient, using the auxiliary feedwater pumps. To ensure a limiting transient the S/G level was required to be below the auxiliary feedwater nozzle, at the start of the transient.

It was agreed that this transient was sufficiently limiting from the stand point of water hammer because:

1. It requires the start of normally not running auxiliary feed pumps.

2. The auxiliary feedwater flow path is through normally unused piping via several check valves which in some plants have been prone to steam back leakage.

3. It feeds water from a source which is below normal feedwater temperature.

4. It injects water through the auxiliary feedwater nozzle which, because of its elevated location on the steam generator, is expected to be more susceptible to water hammer. For this test the S/G level was below the auxiliary feedwater nozzle and thus injection was directly into a steam environment.

As a result of the above discussion with the Staff, FSAR Section 14.2 was amended to include a water hammer test. This test was referred to in both sections 10.4.7 and 10.4.9 of the CPSES SER. The test report demonstrating water hammer adequacy is available on site for review.

Q210.7 In view of the piping stress reanalysis currently being performed by Stone & Webster Engineering Corporation (SWEC) for ASME Code Class 2 and 3 piping systems, provide a discussion of the treatment of these revised piping stresses with respect to the previous stresses calculated by Gibbs & Hill used for postulating pipe breaks. Specifically address the responsibilities of SWEC and Gibbs & Hill relative to a) piping stress analyses used for pipe break postulation, b) high (and moderate) energy line break analyses, c) pipe whip restraints design, and d) procedures used to control the SWEC/Gibbs & Hill interface relative to high (and moderate) energy line break analyses.

R210.7 a. The final postulated break locations of ASME Code Class 2 and 3 high-energy piping, including each intermediate location where the total stress exceeds the MEB 3-1 criterion as described in response to Question 210.2, will be based on the results from pipe stress analyses of the SWEC requalification program.

b. SWEC will transmit to TUGCo Nuclear Engineering the postulated breaks of the high (and moderate) energy CPSES piping, based on the results of reanalyses and in compliance with the acceptance criteria specified in 3.6 of NUREG-0800.

c. The final postulated break locations and thermal movements from the SWEC reanalysis will be incorporated into pipe rupture calculation books to update and/or supersede previous stresses calculated by Gibbs & Hill. The rupture calculation books provide the design basis for the pipe whip restraints. The update of the pipe rupture calculation books will be performed under the direction of the Ebasco Discipline Supervisor of Damage Study.

d. The control process, interface, and detailed responsibilities for high energy (and moderate energy) line break analyses between TUGCo Nuclear Engineering and SWEC are incorporated within the SWEC requalification program project procedure.

Q210.8 In Attachment B-1 to your May 2, 1985 letter, you stated that in the environmental analyses the governing cases for each room were analyzed to determine the worst environmental parameters for equipment qualification. Provide more details addressing how the environmental parameters for EQ were determined to conclude that they are the governing case for each room. Confirm that all equipment in the spaces traversed by the fluid system lines for which arbitrary intermediate breaks are being eliminated is qualified for the environmental (non-dynamic) conditions that would result from a non-mechanistic break with the greatest consequences on surrounding equipment.

R210.8 Break locations for all high energy lines (including arbitrary breaks) were determined for each room. For each break location, mass flow, energy release rates and blowdown duration were computed. On the basis of these parameters a worst case break for each room was selected for input into the environmental analyses. Each worst case break was analyzed to determine the environmental parameters (i.e., pressure, temperature, humidity) of all rooms affected by the break. The worst parameters for each room were used for environmental qualification.

All equipment relied on for safe shutdown as a result of a postulated high energy line break in spaces traversed by the fluid system lines for which arbitrary intermediate breaks are being eliminated, are qualified for the worst case environmental parameters determined by the analyses described above. Elimination of arbitrary intermediate breaks will not reduce the environmental qualification of required equipment.