MAY 02 1986

Docket Nos.: 50-445
and 50-446

Mr. W. G. Counsil
Executive Vice President
Texas Utilities Generating Company
400 North Olive Street, L.B. 81
Dallas, Texas 75201

Reference: Letter to V. S. Noonan (NRC), from W. G. Counsil (TUGCO), Subject: Response to NRC Generic Letter 85-12, Implementation of TMI Action Plan Item II.k.3.5, Automatic Trip of Reactor Coolant Pumps, dated February 17, 1986.

Dear Mr. Counsil:

The staff has completed its initial review of the above referenced submittal and held a conference call on March 19, 1986, with representatives of Texas Utilities to obtain further clarification. The enclosed document summarizes the questions and comments made by the staff, as well as the staffs understanding of the responses obtained from Texas Utilities during the conference call.

In order for the staff to complete the review, we recommend:

1. That Texas Utilities confirm, or correct as necessary, our understanding of Texas Utilities comments, and

2. That Texas Utilities provide supplementary information as discussed during the conference call and as documented in the enclosure.

Should you have any questions or need further clarification, contact Annette Vietti-Cook, Project Manager on Telephone number (301) 492-8525.

Sincerely,

Vincent S. Noonan, Director
PWR Project Directorate #5
Division of PWR Licensing-A

Enclosure: Summary of NRC and Texas Utilities Conference Call on March 19, 1986.

cc: See next page

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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INTRODUCTION

Listed below are the evaluation criteria the staff is applying to the RCP trip review and our preliminary appraisal of whether sufficient information was provided for the staff to complete its review. The information covered in the evaluation includes that submitted by the applicant in Reference 1, and the results of a telephone conference call conducted between applicant and NRC personnel on March 19, 1986. Participants in the conference call from Comanche Peak were Ron Hoskovac, John Marshall, Fred Madden, Tony Engel, and George Wilkenson. The staff was represented by Annette Vietti-Cook and Warren Lyon.

This enclosure contains staff provided guidance or an evaluation criterion, generally followed by a staff critique of the applicant's initial submittal (Ref. 1). The staff perception of the telephone conference call is then summarized.

The staff plan to complete the review, as described to the applicant, is to document the results of the preliminary review and the telephone conference call, and to provide the documentation to the applicant. (This Enclosure is that documentation.) Then the applicant can provide a written response regarding the accuracy of the staff perception of the telephone conference call, together with any desired corrections and supplemental information. This will allow the staff to complete the review and prepare a Safety Evaluation Report (SER). An alternate, if the applicant desires (and which is not presently contemplated), is for the staff to prepare formal questions for applicant consideration.

OVERALL GUIDANCE PERTINENT TO RCP TRIP

During a small break accident in certain break size ranges, there exists a window in time during which tripping RCPs will make the accident worse. Therefore, in a small break situation, one must trip RCPs prior to entering the window. If one wishes to depend upon manual trip, two criteria are applicable:

1. One must show that at least 2 minutes exist within which to trip RCPs following "receipt of a trip signal" using licensing calculations as a basis.

2. One must show that at least 10 minutes exist within which to trip RCPs following "receipt of a trip signal" using best estimate calculations as a basis.

If, for some reason, the RCPs have not been tripped within 10 minutes of the time at which plant conditions indicate trip should be performed, they are to be left running until after the window is closed. Closure can be indicated by parameters such as regaining both adequate subcooling margin and pressurizer level after they have been lost.

Analyses are required to establish timing relative to items 1 and 2, as well as to establish the dimensions of the window.

It is desirable to leave pumps running for control purposes during other transients and accidents, including steam generator tube rupture accidents of sizes up to one tube broken. Therefore, insofar as is practical, procedures and criteria should be developed to attain this goal. Note that leaving pumps running during "non-break" transients and accidents is not a 100% requirement, as contrasted to the small break, where trip must be accomplished to remain in compliance with the regulations. (Failure to trip as required could lead to exceeding Appendix K specified temperatures.) For "non-break" transients and accidents, RCPs may be tripped when desirable. If in doubt, the small break criteria are to be applied.

New plants coming on line should have dealt with RCP trip prior to power operation.

Note much of the work pertinent to the above criteria has been done on a generic basis, and is applicable to individual plants. Where this is the case, it is sufficient to establish applicability, and the generic work need not be repeated on a plant specific basis.

SPECIFIC EVALUATION CRITERIA AND COMMENTS

The evaluation criteria are generally those provided in Reference 2, including the Safety Evaluation and its appendices, which were an enclosure to Reference 2.

A. Determination of RCP Trip Criteria

Demonstrate and justify that proposed RCP-trip setpoints are adequate for small-break LOCAs but will not cause RCP trip for other non-LOCA transients and accidents such as SGTRs. This is to include performance of safety analyses to prove the adequacy of the setpoints.

Consider using partial or staggered RCP-trip schemes.

A1. Identify the instrumentation to be used to determine the RCP trip set point, including the degree of redundance of each parameter signal needed for the criterion chosen. Establish the quality level for the instrumentation, identify the basis for the sensing-instruments' design features, and identify the basis for the degree of redundance.

Staff Evaluation. The total CPSES response on this item is as follows:

"Reactor coolant pressure and steam generator pressure instrumentation are used to determine the Reactor Coolant Pump (RCP) trip setpoint at CPSES. Redundancy of measurement and indication is accomplished for both reactor coolant pressure and steam generator pressure."

This response is lacking in quantitative and specific information that is needed for staff evaluation. For example, is it the pressure difference between the Reactor Coolant System (RCS) and the Steam Generator (SG) secondary side that is being used? What is the value? What specific instrumentation is utilized? What is the quality level associated with the instrumentation? What is the redundancy and basis for the redundancy? What portions of the instrumentation are located within containment and what portions are outside? Has the instrumentation been reviewed with respect to function, location, and environmental conditions so that availability is adequately assured for RCP associated responses? If the pressure transmitters are located outside containment, and they are connected to the RCS via long tubes and probably isolation devices, what is the instrument response time for the configuration?

Applicant Supplemental Information. Texas Utilities Generating Company based their investigation on the WOG generic work as referenced in GL 85-12 (Ref. 2). They analyzed the three methods recommended by the WOG, and found generically acceptable by the staff, and determined that any one could be used for Comanche Peak. Operations personnel then selected the RCS to SG pressure differential as best, which is consistent with the staff recommendation. Steam generator tube rupture was found to be the most difficult item to differentiate from a small break LOCA, and this resulted in a pressure differential of 452 psi as contrasted to the RCP trip setpoint of 164 psi. (These values include all instrumentation and code inaccuracy uncertainties.)

The RCS pressure is based upon Channels 403 and 405, which are used for wide range pressure indication. The instrumentation is considered as important to safety, and meets the requirements for accident monitoring.

The SG pressure is determined by three sets of instrumentation for each steam generator (514, 524, 534, 544; 515, 525, 535, 545; 516, 526, 536, 546). The normal function of this instrumentation to to provide low

pressure indications for safety injection initiation and main steam line break response. The bases are described in FSAR Sections 7.1, 7.2, 7.3, and 7.5.

The RCS pressure transmitters are located inside containment. All other components, except for connecting wiring, are located inside the control room. The SG pressure transmitters are located outside containment, and the remaining components are inside the control room. All instrumentation associated with the RCP trip setpoint has been evaluated for LOCA and steam line break environmental conditions.

Staff Comment. This is sufficient information for completion of the review.

A2. Identify the instrumentation uncertainties for both normal and adverse containment conditions. Describe the basis for the selection of the adverse containment parameters. Address, as appropriate, local conditions, such as fluid jets or pipe whip, which might influence instrumentation reliability.

Staff Evaluation. The total CPSES response for this item is:

"Instrumentation uncertainties for both normal and adverse containment conditions were addressed in the RCP trip setpoint calculation. An evaluation of local conditions has shown that fluid jets from two postulated piping breaks would impinge upon the common tubing for one RCP instrument and a locally mounted test gauge (which is not used for plant operations). However, the resulting loads have been evaluated and are acceptable. Review of the instrument locations and charactertistics indicate that the concerns of Section IV.A.1 and IV.A.2 have been considered and addressed."

As in the first response, specific and quantitative information is necessary. What is the instrumentation uncertainty for normal environmental conditions? For adverse conditions? How was it determined? Was consideration of local conditions such as fluid jets

and pipe whip limited to postulated design basis pipe breaks of the type considered for FSAR analyses or was a general consideration applied to all sources of fluid jets and pipe whip? In the case referred to with interaction with two pipe breaks, what was the influence on instrumentation readings and was this reflected in the uncertainties? Were conditions outside of containment that may influence uncertainty addressed? Were wiring and connections between the transmitters and the control room reviewed to assure that an accident such as a steam line break outside of containment would not introduce problems with pressure readings in the control room? What is operator response to instruments under normal and abnormal conditions when one instrument is inoperative?

The staff does not require a large quantity of information in response to the request. However, plant specific information is necessary to complete this review. The above are the types of questions one might pose. Not all are applicable to all plants.

Applicant Response. Uncertainties in the RCS pressure technique for RCP trip were found to be 90 psi for normal containment conditions, and 390 psi for an adverse containment condition. The pressure differential resulted in 92 psi and 391 psi, respectively, and the subcooling monitor provided 14 ^{o}F and 45^{o}F.

Uncertainty values for the pressure instrumentation were based on a Comanche Peak study performed by Westinghouse. (The methods used are described in material Westinghouse has submitted to the Commission.) The transmitters were considered in terms of design function, calibration, and the environment. Electronic components were handled statistically and included both independent and inter-dependent effects. Indicators were considered as separate components.

Steam generator pressure transmitter inaccuracies were evaluated for normal environmental conditions, and were found to be less than those associated with the RCS pressure transmitters. Comanche Peak personnel have evaluated the regions outside of containment with respect to possible impact of an adverse environment outside containment. The SG

pressure transmitters are the only components which could be affected. Additional information will be provided to the staff on the results of the SG transmitter evaluation.

Reactor Coolant System pressure instrumentation was evaluated with respect to pipe whip and jets. The only adverse condition identified pertained to a local pressure guage and sensing line associated with channel 403, which could be subjected to a jet. The load was evaluated and found to be acceptable.

Conditions which initiate an adverse containment environment are a pressure of 5 psig, a radiation level of 10^5 R/hr, or a dose of 10^6 Rad, whichever is reached first.

Staff Response. Provision of the additional information as discussed with the applicant and summarized above should be sufficient for completion of the staff review.

A3. In addressing criterion selection, provide consideration of uncertainties associated with the WOG supplied analyses values. These uncertainties are to include uncertainties in computer program results and uncertainties resulting from plant specific features not representative of the generic data group.

If a license (or applicant) determines that the WOG alternative criteria are marginal for preventing unneeded RCP trip, it is recommended that a more discriminating plant-specific procedure be developed. Licensees (or applicants) should take credit for all equipment (instrumentation) available to the operators for which the licensee (or applicant) has sufficient confidence that it will be operable during the expected conditions.

Staff Evaluation. The CPSES response to this item is:

"The plant specific RCP trip setpoint calculation includes consideration of computer code uncertainties associated with the WOG supplied analyses values."

What are the instrument uncertainties? Where are the comparisons to the Westinghouse Owners Group (WOG) information? What are the WOG analyses and how were they verified? How are they applicable to CPSES?

Applicant Response. The CPSES work was based upon the WOG information, and no significant differences were found between Comanche Peak and the WOG.

The WOG analyses were performed with the licensed Westinghouse LOFTRAN computer code for plants under non-LOCA conditions.

The computer program result uncertainties evaluation is based on the assumption of no changes in initial plant conditions (such as full power, pressurizer level, all Safety Injection (SI) pumps running, and all Auxiliary Feed Water (AFW) pumps running). The major contributors to uncertainty are break flow rate, SI flow rate, decay heat generation rate, and AFW flow rate. Parametric studies established that the major uncertainties were due to the break flow model and SI flow inputs.

The applicant has not directly addressed such topics as the accuracy of the numerical solution scheme or of nodalization. Further, there is no determination of the influence of equipment or operational failures. Information pertinent to the former result from comparisons of the LOFTRAN code to operational and experimental data, and as a result will have been included in the uncertainty number. Determination of equipment or operational failures is not a necessity as long as the expected configuration of the plant is addressed since the objective of RCP trip is to provide reasonable assurance of not tripping for transients for which a trip is undesirable. It is not necessary to establish that one will never trip since the plant is capable of being safely controlled if an unnecessary trip does occur. Thus, no additional information is needed for the staff to complete review of this item.

B. Potential Reactor Coolant Pump Problems

B1. Assure that containment isolation, including inadvertent isolation, will not cause problems if it occurs for non-LOCA transients and accidents. Demonstrate that, if water services needed for RCP operations are terminated, they can be restored fast enough once a non-LOCA situation is confirmed to prevent seal damage or failure. Confirm that containment isolation with continued pump operation will not lead to seal or pump damage or failure.

Staff Evaluation. CPSES states that a Phase B (Hi-3) containment isolation signal would have to be generated before the Component Cooling Water (CCW) cooling to the RCP thermal barrier is terminated. Seal cooling is still maintained via the Chemical Volume and Control System (CVCS). The submittal continues with:

"A Phase B Containment Isolation signal can be reset, after a minimal time delay, and the CCW supply to the RCP thermal barrier can be quickly reestablished. The RCPs are not expected to be damaged while operating during this short period without CCW cooling."

What steps are required to restore CCW and how long does that take? Are there restrictions on the restoration of CCW to an RCP and, if not, what is the thermal response of the RCP when it encounters a sudden flow of cold water from the CCW? What other aspects of RCP operation are dependent upon CCW and how are these impacted by its loss while operation of RCPs continues? What are the timing requirements pertinent to such operation?

Another portion of the response contains:

"Continued operation of the RCPs during a SLB (Steam Line Break) is not required, and the operator has sufficient control capabilities to ensure that a RCP trip can be initiated in a timely manner."

The objective of Generic Letters 83-10 and 85-12 is not the requirement or non-requirement of continued RCP operation during accidents such as SLBs. The intent is to provide a means to exclude RCP operation during certain portions of a LOCA so that the RCPs can be left running under other conditions when RCP operation can be of benefit in mitigation of an event. Note the staff cannot accept a plan where the pumps are to be left running if this leads to a violation of Appendix K criteria. (But the staff will accept, and in fact will insist upon, an approach that responds to a situation where the pumps have been left running when they should have been tripped.) The staff will accept situations where the pumps have been tripped when it is desirable that they be left running since it is a goal, not a requirement, that RCPs be left running under non-LOCA conditions. The requirement is that leaving RCPs running for non-LOCA events be accomplished insofar as is practical.

There are aspects of RCP support equipment operation which are not mentioned, and for which there is a need for clarification. For example, do the conditions which lead to containment isolation result in termination of any portion of the CVCS and is there an indirect effect upon RCP seal injection? If CCW pump operation is terminated, how long does it take for the pump to be restarted and flow restored to the thermal barrier heat exchangers and other RCP associated components? What are the implications? Information should be provided pertinent to restart of RCPs following correction of the conditions which led to the trip. Items such as trip parameters, operator response and timing of operations should be identified. The staff does not need a large volume of material on these topics, but it does need a brief mention with perhaps reference to procedures in the list provided with the submittal.

Applicant Response. Seal injection is not terminated unless there are unanticipated failures, such as loss of all charging pumps. CCW is terminated on receipt of a Phase B containment isolation signal, which corresponds to a nominal pressure of approximately 20 psig (approximately 18.6 psig trip setting).

Specific restart criteria exist, and have been reviewed by the staff (S. McKay). Requirements pertaining to CCW and seal injection are a part of the restart criteria.

Applicant Response. All equipment has been reviewed with respect to location and the potential for an adverse environment. All is located outside of containment, and none is located where an adverse condition would reasonably be expected to exist under accident conditions.

Comanche Peak personnel will provide brief information pertinent to operation response and alternate actions, including travel time.

Staff Response. This should be sufficient for completion of the review.

C. Operator Training and Procedures (RCP Trip)

C1. Describe the operator training program for RCP trip. Include the general philosophy regarding the need to trip pumps versus the desire to keep pumps running. Also cover priorities for actions after engineered safety features actuation.

Assure that training and procedures provide direction for use of individual steam generators with and without operating RCPs.

Assume manual RCP trip does not occur earlier than two minutes after the RCP-trip set point is reached.

Determine the time available to the operator to trip the RCPs for the limiting cases if manual RCP trip is proposed. Best Estimate calculational procedures should be used. Most probable plant conditions should be identified and justified by the licensee (or applicant), although NRC will accept conservative estimates in the absence of justifiable most probable conditions.

Staff Response. This discussion led to a staff conclusion that the applicant has a clear understanding of the background pertinent to RCP operation and restart. Therefore, no further information is necessary for the staff to complete its review.

B2. Identify the components required to trip the RCPs, including relays, power supplies and breakers. Assure that RCP trip, when necessary, will occur. Exclude extended RCP operation in a voided system where pump head is more than 10% degraded unless analyses or tests can justify pump and pump-seal integrity when operating in voided systems. If necessary, as a result of the location of any critical component, include the effects of adverse containment conditions on RCP trip reliability. Describe the basis for the adverse containment parameters selected.

Staff Evaluation. The CPSES response to this item is:

"The components required to trip the RCPs have been identified. The primary instrumentation (used to insure an RCP trip) is located outside of the primary containment. Therefore, this equipment is not significantly affected by the in-containment environment."

The major components associated with RCP trip are not identified, nor is their location. For practical purposes, the subjects defined in this item are not addressed.

A brief consideration should be given to the potential for adverse conditions outside containment and the implications, if any. For example, can a steam line break in the turbine building introduce difficulties with respect to the equipment of interest here?

The timing of operations associated with alternate operator actions required to trip the RCPs should also be mentioned. For example, if the operator attempts a trip from the control room and fails, how long will it take to trip from an alternate location, including travel time?

Justify that the time available to trip the RCPs is acceptable if it is less than the Draft ANSI Standard N660. If this is the case, then address the consequences if RCP trip is delayed. Also develop contingency procedures and make them available for the operator to use in case the RCPs are not tripped in the preferred time frame.

Staff Evaluation. A brief general outline of training is presented, and some of the background philosophy is presented, but some of the above points are not addressed. The staff is not clear as to whether the approach is entirely consistent with the licensing requirements which underlay this TMI Action Item. For example, what is the general need to trip RCPs as contrasted with keeping them running? (A broad reference to "consequences" doesn't answer this question.) If one has tripped RCPs, and desires to restart them for control purposes and to aid in plant cooldown, what requirements must be met?

Applicant Response. The requested information will be provided.

C2. Identify those procedures which include RCP trip related operation:

(a) RCP trip using WOG alternate criteria
(b) RCP restart
(c) Decay heat removal by natural circulation
(d) Primary system void removal
(e) Use of steam generators with and without RCPs operating
(f) RCP trip for other reasons

Ensure that emergency operating procedures exist for the timely restart of the RCPs when conditions warrant.

Staff Evaluation. CPSES has presented a listing of selected procedures which address RCP trip. No additional information is required.

REFERENCES

1. Counsil, W. G., "Comanche Peak Steam Electric Station (CPSES), Docket Nos. 50-445 and 50-446, Response to NRC Generic Letter 85-12, Implementation of TMI Action Plan Item II.K.3.5, `Automatic Trip of Reactor Coolant Pumps'", Log # TXX-4703, File # 10035, Letter to Vince S. Noonan, NRC, from Texas Utilities Generating Company, Feb. 17, 1986.

2. Thompson, Hugh L. Jr., "Implementation of TMI Action Item II.K.3.5, `Automatic Trip of Reactor Coolant Pumps' (Generic Letter No. 85-12)", NRC Letter Addressed to All Applicants and Licensees with Westinghouse (W) Designed Nuclear Steam Supply Systems (NSSSs), Jun. 28, 1985.