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

Docket Nos.: 50-369, 50-370
50-413, 50-414

25 SEP 1986

Mr. H. B. Tucker, Vice President
Nuclear Production Department
Duke Power Company
422 South Church Street
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SUBJECT: REQUEST FOR ADDITIONAL INFORMATION AND RECORD OF TELEPHONE CONVERSATION REGARDING REACTOR COOLANT PUMP TRIP - McGUIRE AND CATAWBA NUCLEAR STATIONS, UNITS 1 AND 2

Dear Mr. Tucker:

The NRC staff is reviewing your response of August 22, 1985 to Generic Letter 85-12, "Implementation of TMI Action Item II.K.3.5, Automatic Trip of Reactor Coolant Pumps." In response to my letter of June 10, 1986, related telephone conversations were held August 7 and 14, 1986, with members of your Company. Enclosed is a report of those conference calls. We request that you confirm, or correct as necessary, our understanding of these conversations as reflected in the enclosure under the headings "Duke Response".

The enclosure also includes requests for additional information under the headings "Staff Response" or (in the case of paragraph A) "Staff Comment". These requests are based upon our review of your prior written submittals, as well as the information provided during the telephone conversations.

Your comments and responses to the enclosure are requested within 45 days of this letter. Should you have questions, contact your respective Project Manager, Darl Hood or Kahtan Jabbour at (301) 492-8961 or (301) 492-7367.

Sincerely,

DLWigginton, act

B.J. Youngblood, Director
PWR Project Directorate #4
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Enclosure: As stated

cc: See next page

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ENCLOSURE

REQUEST FOR ADDITIONAL INFORMATION AND

REPORT OF CONFERENCE CALL CONCERNING REACTOR COOLANT PUMP (RCP) TRIP AT MCGUIRE UNITS 1 AND 2, AND CATAWBA UNITS 1 AND 2

SUMMARY

We reported in Reference 1 that the information provided by the Westinghouse Owners Group (WOG) in support of alternative Reactor Coolant Pump (RCP) trip was acceptable on a generic basis. The review noted that a number of considerations were assigned plant-specific status. Accordingly, we requested that operating reactor licensees and applicants select and implement an appropriate RCP trip criterion based upon the WOG methodology.

Reference 1 required owners of Westinghouse Nuclear Steam Generating Systems to evaluate their plants with respect to RCP trip. The objective was to demonstrate that their proposed RCP trip setpoints assure pump trip for small break LOCAs, and in addition to provide reasonable assurance that RCPs are not tripped unnecessarily during non-LOCA events. A number of plant specific items were identified which were to be considered by applicants and licensees, including the selected RCP trip parameter, instrumentation quality and redundancy, instrumentation uncertainty, possible adverse environments, calculational uncertainty, potential RCP and RCP associated problems, operator training, and operating procedures.

Duke Power Company has addressed each of the Reference 1 criteria. We have studied this information and have discussed RCP trip with Duke personnel. The remainder of this Enclosure provides background pertinent to the RCP trip issue, the acceptance criteria, the basis for the discussion with Duke, and our summary of the results of that discussion.

BACKGROUND

TMI Action Plan Item II.K.3.5 of NUREG-0737 (Ref. 2) required all licensees to consider solutions pertinent to tripping RCPs under transient and Loss of Coolant Accident (LOCA) conditions. A summary of the industry and NRC programs concerning RCP trip was provided in SECY-82-475 (Ref. 3). Reference 3 also provided NRC guidance and criteria for resolution of II.K.3.5, and enclosed Generic Letters 83-10 (Ref. 4). The significant information provided by these references was summarized as follows:

"... appropriate pump trip setpoints can be developed by the industry that would not require RCP trip for those transients and accidents where forced convection circulation and pressurizer pressure control is a major aid to the operators, yet would alert the operators to trip the RCPs for those small LOCAs where continued operation or delayed trip might result in core damage."

"The resolution ... is intended to ensure that for whatever mode of pump operation a licensee elects,

a) a sound technical basis for that decision exists,

b) the plant continues to meet the Commission's rules and regulations, and

c) as a minimum, the pumps will remain running for those non-LOCA transients and accidents where forced convection cooling and pressurizer pressure control would enhance plant control. This would include steam generator tube ruptures (SGTR) up to approximately the design basis event (one tube)."

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 design basis accidents.) 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.

The WOG developed a set of three alternative RCP trip criteria to meet the intent of Reference 4 (Refs. 5 - 7):

1. Reactor Coolant System (RCS) pressure with normal instrument uncertainties. This criterion uses RCS pressure with normal instrument uncertainties as the criterion for RCP trip under normal containment conditions. The secondary pressure is assumed to be at the lowest secondary safety valve set pressure to provide conservatism. Instrument uncertainties associated with post-accident containment conditions are used for RCP trip under adverse containment conditions.

2. Reactor coolant subcooling. This method provides a direct indication for RCP trip since RCPs can continue to operate as long as sufficient subcooling margin is available. The trip criterion is established as zero subcooling in the RCS hot legs, with allowance for instrumentation uncertainties which exist for normal and abnormal containment conditions.

3. Secondary pressure dependent RCS pressure. This method differs from method 1 in that actual secondary side pressure is used in conjunction with RCS pressure. (The secondary side pressure may be significantly lower than the value obtained via method 1, such as when the atmospheric dump valve is open.) Instrumentation uncertainties are treated as in the other two methods.

A methodology was provided whereby each licensee or applicant could determine RCP trip setpoints for each of the three criteria. Each licensee or applicant could then perform a plant-specific evaluation and could select a criterion which is best with respect to prevention of RCP trip for SGTRs and non-LOCA transients.

Overall, the staff found that for most plants, each of the criteria was adequate to provide an indication for RCP trip under small break LOCA conditions, and selection of an RCP trip criterion could be based on the capability to preclude pump trip for SGTRs and non-LOCA transients. However, the criteria may be marginal for some plants under some conditions since the uncertainty analysis provided by the WOG may not be bounding for all plants. Further, the RCS pressure set point criterion appeared to have the least potential to reduce unnecessary RCP trips. Consequently, the staff determined that each licensee or licensee must consider the instrument and calculational uncertainties when selecting a criterion, and must be prepared to explain how they were considered during future inspections. The staff further described those plant specific items required from each licensee or applicant in order to complete the response to Generic Letter 83-10. These are reproduced below, in some cases with additional guidance (provided in Ref. 1), and define the basis for the staff review.

Organization of the sections which follow is essentially identical to that of the Generic Letter (Ref. 1) to which the Duke Power Company responded. A statement is first presented which describes the Generic Letter request. This is followed by a staff prepared discussion.

INTRODUCTION

The staff has completed a review of the Reference 8 and 9 submittals from the Duke Power Company pertaining to RCP trip, and has discussed the results of the review during a telephone conference calls with personnel representing Duke Power. This Enclosure documents hoth the review (Ref. 10) and the results of the discussions with Duke Power personnel.

The purpose of the review was to evaluate the information provided in the original response to Reference 1, to identify any areas where additional information was needed for the staff to complete its evaluation of RCP trip, and to provide guidance pertinent to submittal of additional information where appropriate. The telephone conference calls were conducted to obtain clarification and additional information. One call took place on August 7, 1986. Duke Power was represented by Bob Gill, Jackie Lee, and Favaf Ozmelek. The staff was represented by John Thompson and Warren Lyon. An additional call occurred on August 14, 1986. Duke Power was represented by Bob Gill,Len Fireball, and Jackie Lee. Staff participants were as before.

Organization of the remainder of this Enclosure is essentially identical to that of the Generic Letter (Ref. 1) to which Duke responded. A statement is first presented which describes the Generic Letter request. This is followed by a staff summary and critique. The staff understanding of the Duke response is then given, followed by an additional staff response where appropriate.

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.

<u>Staff Evaluation.</u> Duke has selected Reactor Coolant System (RCS) subcooling as the criterion for tripping the Reactor Coolant Pumps (RCP). The subcooling option was previously identified by the staff as the

second choice of the three options described by the Westinghouse Owners Group (WOG) in their evaluation of RCP trip. It is also a choice that few other plants are making. Although it is an acceptable selection, the staff requests additional brief background pertinent to this selection.

The quantitative value associated with subcooling that is to be used as the trip criterion is not identified. Are the RCPs to be tripped on loss of subcooling or of subcooling margin and, if the latter, what is the margin?

Staff Note. Since performing the Catawba and McGuire reviews, the staff has encountered several other plants in which subcooling has been selected.

Duke Response. RCP trip is to be performed on subcooling margin. This is determined as zero subcooling plus instrument error. Instrument error is a function of RCS conditions and is automatically incorporated into the subcooling monitor display, which indicates a value with instrument error added to the measured value. Alternate means to determine subcooling margin are available to the operator if the primary means should be unavailable.

Staff Comment. It would be helpful to the staff review if Duke could provide a brief review of the selection process. Why was the selected RCP trip criterion chosen as opposed to alternate criteria?

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. Duke has elected to use subcooling as determined by the plant computer as the primary indicator of the need to trip RCPs. If the plant computer is not available, they will use instrumentation readings available to the operator on control room indicators, and will apply graphs containing pressure and temperature information to determine the subcooling.

Input to the plant computer consists of wide and low range RCS pressure, a hot leg temperature from each of the hot legs, and core exit thermocouples. Low range pressure is used, if valid, since this is stated to have a smaller uncertainty than wide range. If one indication is unavailable, the other is used alone. The highest of five valid thermocouple readings are used to determine an average. This average is compared with the four loop wide range temperatures, and the highest valid indication from this comparison is used as the temperature input.

The quality level and bases for these pressures and temperatures are not identified, nor are the specific instruments. In the case of the core exit thermocouples, the identity is obvious, and no further information is necessary. Are the hot leg temperatures RTD readings from manifolds which are connected to the hot legs? Where are the pressure determinations made (i.e., are they pressurizer connections or connections to some other part of the RCS pressure boundary)?

What constitutes a "valid" reading and how is validity determined? How is the influence of adverse conditions factored into the decisions?

Duke Response. The instrumentation is classified as Category 1 and full redundancy is provided. It meets the criteria provided in Regulatory Guide 1.97 with the exception that indicators are connected to nonseismically qualified equipment. This is to be upgraded to be in full compliance during the next refueling outage.

The transmitters are being changed, and transmitters that are located outside of containment will be used. This will eliminate differences between normal and adverse containment insofar as RCP trip parameters are concerned.

RCS wide range pressure indication ranges from zero to 3000 psi, and low range from 0 to 800 psi. Low range is used as input for RCP trip if the RCS pressure is within its range because the uncertainty is smaller. Otherwise, high range is used. The highest of the temperature readings are used.

Hot leg wide range temperature is sensed via wells in the hot legs. (Narrow range temperature is determined via wells in the bypass manifolds. These are not used for RCP trip input.)

Staff Response. If RCS temperature is selected as 530 °F, the wide range pressure uncertainty is 63 psi. This corresponds to a temperature uncertainty of about 8.7 °F. The total uncertainty if the uncertainties are added is 8.7 + 8.1 = 16.8 °F. This would be the RCP trip point if Duke Power follows this calculational procedure. Many utilities use a sum of the squares technique when summing uncertainties. This would decrease the 16.8 °F. The staff requests that the approach followed at Duke be fully defined, and that Duke provide a representative value if it differs from the one calculated above by the staff. The Duke provided uncertainty value is also somewhat low in the staff's experience. We therefore request that Duke provide sufficient information pertinent to its determination that the uncertainty is verified as correct.

The staff was referenced to the Catawba response to NUREG-0588 for the effect of local conditions (Ref. 11). This document is roughly an inch and a half thick, and the staff reviewer is not familiar with its contents. It would be helpful if Duke could respond to the request with a brief comment, as contrasted to the staff having to study the document.

The staff notes that two pressure signals are utilized in the information presented to the operator, and that if one fails, the information available to the staff is that the operator is to rely upon the remaining instrument. Is this correct? If so, please provide justification in light of a general philosophy that one should not rely upon single sources of information.

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. Instrumentation uncertainty for normal and adverse environmental conditions is listed as follows:

Instrument	Normal Conditions	Adverse Conditions
RCS Wide Range Pressure	63	213
RCS Low Range Pressure	29	125
Loop Wide Range Hot Leg Temperature, ^{o}F	8.1	8.5
Core Exit Thermocouple Temperature, ^{o}F	7.2	8.5

where the core exit temperature error increases with temperature, the error shown is for 530^{o}F, and this error is assumed applicable below 530^{o}F.

A value of 3 psig is used as the basis for selection of adverse containment parameters. This approximately corresponds to the high-high containment pressure setpoint.

Local conditions which might influence instrument reliability are stated as addressed in the Catawba response to NUREG-0588 (Ref. 11). It would be helpful if this were summarized with respect to RCP trip, including consideration of conditions outside of containment that may influence uncertainty. For example, has Duke surveyed the wiring and connections between the pressure transmitters and the control room to assure that a steam line break inside or outside of containment will not introduce problems with the pressure readings in the control room?

Are any of the pressure transmitters located outside containment, and, if so, what is the instrument response time?

Staff Note. The question pertinent to instrument response time for transmitters outside containment was withdrawn. The staff now has sufficient information to establish that this is not a concern for RCP trip application.

Duke Response. These topics have been covered above.

Staff Response. Note also the request for Duke to simplify the response is covered above.

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 licensee 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. Calculations of instrument uncertainties are summarized, and comparisons are discussed between plant data and calculations in the Westinghouse Owners Group (WOG) information. Duke states that the calculated overall uncertainty for Catawba is from -10^{o}F to +10^{o}F for the subcooling trip point.

The licensed Westinghouse LOFTRAN computer code is referenced for performance of the non-LOCA analyses. 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 stated to be break flow rate, SI flow rate, decay heat generation rate, and AFW flow rate. Parametric studies are summarized in which the major uncertainties are stated to be due to the break flow model and SI flow inputs.

Duke 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.

Staff Note. The staff noted during the telephone conference that generic analyses with the licensed Westinghouse LOFTRAN computer code are referenced as the analysis basis for Catawba and McGuire plant behavior under non-LOCA conditions. Therefore, the staff requested information pertinent to applicability to the plants.

Duke Response. The generic analyses are applicable to Catawba and McGuire. The uncertainties pertaining to the WOG generic analyses were determined by taking the results for a group of nuclear plants (as represented in the WOG results), and determining the variation on the calculated results due to plant specific differences. This evaluation resulted in an uncertainty of +/- 10 ^{o}F, including the effect of uncertainty in break flow and safety injection flow. Since LOFTRAN calculations established a subcooling of 52 ^{o}F, the actual value could be as low as 42 ^{o}F or as high as 62 ^{o}F.

Staff Response. The staff notes that McGuire operates with Upper Head Injection (UHI) disabled, whereas Catawba operates with UHI enabled. We request that Duke confirm that differences associated with these operations are contained within the above uncertainty.

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. The Duke response is essentially that either seal injection or thermal barrier cooling will continue regardless of the status of containment isolation, and therefore, there is no problem with seal damage. Component Cooling Water (CCW) and service water are isolated on Phase B isolation (high-high containment pressure). RCPs are tripped promptly under these conditions.

- The staff requests a small amount of additional information pertinent to these points. For example, do the conditions which lead to containment isolation result in termination of any portion of the Chemical and Volume Control System (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 restoration of services leading to a trip. Items such as trip parameters, operator response and timing of operations should be identified.

Duke Response. The only influence of a Phase A containment isolation insofar as RCP operation is concerned is that normal charging and RCP seal injection return are isolated. Isolation of charging will increase pressure on the upstream side of the seal injection point, which will tend to increase seal injection rate. Isolation of the seal return flow will cause the pressure relief valves on the seal return line to lift, which will result in the return flow being diverted into the pressurizer relief tank.

A Phase B containment isolation will result in loss of component cooling water to the RCPs. The operator will trip RCPs under this condition.

Existing plant procedures cover RCP operation, including trip for operational reasons and restart. For example, bearing and motor winding temperatures are alarmed, and the procedures cover operator response to assure that RCPs are not damaged. These procedures also cover restart under a range of conditions, including recovery from a loss of cooling which has left the RCP seal region at an elevated temperature. In that case, operators are instructed to recover cooling slowly while monitoring temperatures so as to avoid thermal shock.

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 major components associated with RCP trip are identified, as is their location.

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 outside of containment 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 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? (See Item C1, below.)

RCP operation in a voided system is not mentioned.

Staff Note. Operation in a voided system is generally eliminated when the proposed trip criteria are applied. The staff elected not to pursue this item.

Duke Response. Steam lines are not enclosed downstream of the doghouse. There are some high energy lines inside buildings outside containment, but pipe breaks involving these lines would not influence the equipment pertinent to RCP operation and trip. In general, the only adverse impact upon plant equipment outside containment under accident conditions is due to radiation associated with operation in the recirculation mode.

Normal operator action to trip RCPs is via controls located on the control console to trip the RCP breakers. There are two breakers connected in series, and tripping one of the two is sufficient to trip the RCPs. If this were attempted unsuccessfully, plant procedures direct the operators to accomplish plant trip locally. This can be accomplished by actuating a button located at the breaker, or by locally pulling control power at the breaker. These operations would take less than five minutes.

An alternate to local operation of the breakers is removal of bus power. This would require reliance on Diesel emergency power, which is considered undesirable if the desired trip can be obtained via local breaker operation.

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, although NRC will accept conservative estimates in the absence of justifiable most probable conditions.

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 discussion of training is presented, but the background philosophy is not clearly described, and some of the above points are not addressed. For example, what is the general need to trip RCPs as contrasted to keeping them running? What is the RCP restart philosophy? If one has tripped RCPs, and desires to restart them for control purposes and to aid in plant cooldown, what requirements must be met?

Staff Note. There was considerable discussion on the topic of operator training, and Duke read portions of applicable training documentation to establish that the necessary background information is provided to the operators. In general, the information covers the topics as previously identified by the staff. We have not described this portion of the response since we are convinced that adequate attention is provided to operator training pertinent to the background for RCP trip.

Duke Response. See above.

In regard to operation outside the design basis (one of the topics raised by the staff during the discussion), the operator is instructed not to trip RCPs if there is no high or intermediate head safety injection available. If an operator were to fail to trip RCPs as described in the Duke response to Generic Letter 85-12, they would be left running if the reactor vessel liquid level instrumentation system indicated that inventory was insufficient to exclude an Inadequate Core Cooling (ICC) condition if they were tripped. If tripping the RCPs would not put the core in an ICC condition, they would be tripped.

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. Duke has presented a listing of selected procedures and provides discussions which address these topics.

REFERENCES

1. Thompson, Hugh L. Jr., "Implementation of TMI Action Item II.K.3.5, 'Automatic Trip of Reactor Coolant Pumps' (Generic Letter No. 85-12)," Letter from Director, Division of Licensing, NRC, to all applicants and licensees with Westinghouse (W) designed nuclear steam supply systems (NSSSs), June 28, 1985.

2. "Clarification of TMI Action Plan Requirements," NUREG 0737, US NRC, November 1980.

3. Dircks, William J., "Staff Resolution of the Reactor Coolant Pump Trip Issue," Policy Issue for the Commissioners from the Executive Director for Operations, NRC, SECY-82-475, November 30, 1982.

4. Eisenhut, Darrell G., "Resolution of TMI Action Item II.K.3.5, 'Automatic Trip of Reactor Coolant Pumps,' (GENERIC LETTER No. 83-10)," Letter to all applicants with (PWR vendor) designed nuclear steam supply systems from Director, Division of Licensing, NRC.

5. Westinghouse Owners Group, Letter OG-110, "Evaluation of Alternate RCP Trip Criteria," December 1, 1983.

6. Westinghouse Owners Group, Letter OG-117, "Justification of Manual RCP Trip for SBLOCA Events," March 9, 1984.

7. Westinghouse Owners Group, Letter OG-137, "Response to NRC Questions on RCP Trip," October 25, 1984.

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