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April 22, 1983

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Mr. Harold R. Denton, Director  
Office of Nuclear Reactor Regulation  
U. S. Nuclear Regulatory Commission  
Washington, D. C. 20555

Attention: Mr. D. G. Eisenhut, Director  
Division of Licensing

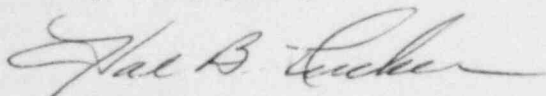
Subject: Catawba Nuclear Station  
Docket Nos. 50-413, -414

Dear Sir:

By letter dated February 8, 1983, the NRC issued Generic Letter No. 83-10c concerning resolution of TMI Action Plan Item II.K.3.5, "Automatic Trip of Reactor Coolant Pumps". In response to your letter, Duke, as a member of the Westinghouse Owner's Group, has authorized generic resolution of this issue, and work is underway. Please find attached detailed plans and schedule for completion of these tasks. The schedule is strongly influenced by the Owner's Group program and implementation will be accomplished in parallel with the symptom-oriented emergency procedures based on Revision 1 to the Westinghouse Emergency Response Guidelines. Operator training and implementation is scheduled for completion by April 30, 1984.

Duke will submit a report which provides the technical justification for the use of reactor coolant pumps during transients and accidents by February 29, 1984.

Very truly yours,



Hal B. Tucker

GBS:jfw  
Attachment

cc: Mr. James P. O'Reilly, Regional Administrator  
U. S. Nuclear Regulatory Commission  
Region II  
101 Marietta Street, NW, Suite 2900  
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Mr. P. K. VanDoorn  
NRC Resident Inspector  
Catawba Nuclear Station

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Duke Power Company  
Catawba Nuclear Station

PLAN FOR RESOLUTION OF TMI ACTION ITEM II.K.3.5  
"AUTOMATIC TRIP OF REACTOR COOLANT PUMPS"

INTRODUCTION

The criteria for resolution of TMI Action Plan Item II.K.3.5, "Automatic Trip of Reactor Coolant Pumps" were stated in letters from Mr. Darrel G. Eisenhut of the Nuclear Regulatory Commission to all Applicants and Licensees with Westinghouse designed Nuclear Steam Supply Systems (83-10 c and d) dated February 8, 1983. The following represents the plan for demonstrating compliance with those criteria. In order to avoid confusion, the overall philosophy and plan will first be stated. Then, each section of the attachment to NRC letters 83-10 c and d will be addressed as to how the overall plan responds to each NRC criteria.

OVERALL PLAN

In the four years that have passed since the event at Three Mile Island, Westinghouse and the Westinghouse Owners Group have held steadfastly to several positions relative to post accident reactor coolant pump (RCP) operation. First, there are small break LOCAs for which delayed RCP trip can result in higher fuel cladding temperatures and a greater extent of zircalloy-water reaction. Using the conservative evaluation model, analyses for these LOCAs result in a violation of the Emergency Core Cooling System (ECCS) Acceptance Criteria as stated in 10CFR50.46. The currently approved Westinghouse Evaluation Model for small break LOCAs was used to perform these analyses and found acceptable for use by the NRC in letters 83-10 c and d. Therefore, to be consistent with the conservative analyses performed, the RCPs should be tripped if indications of a small break LOCA exist.

Secondly, Westinghouse and the Westinghouse Owners Group have always felt that the RCPs should remain operational for non-LOCA transients and accidents where their operation is beneficial to accident mitigation and recovery. This position was taken even though a design basis for the plant is a loss of off-site power. Plant safety is demonstrated in the Final Safety Analysis Reports for all plants for all transients and accidents using the most conservative assumption for reactor coolant pump operation.

In keeping with these two positions, a low RCS pressure (symptom based) RCP trip criterion was developed that provided an indication to the operator to trip the RCPs for small break LOCA but would not indicate a need to trip the RCP for the more likely non-LOCA transients and accidents where continued RCP operation is desirable. The basis for this criterion is included in the

generic Emergency Response Guideline (ERG) Background Document (E-0 Basic Revision, Appendix A). Relevant information regarding the expected results of using this RCP trip criterion can be derived from the transients which resulted from the stuck open steam dump valve at North Anna in 1979, the steam generator tube rupture at Prairie Island in 1980 and the steam generator tube rupture at Ginna in 1982. The RCPs were tripped in all three cases. However, a study of the North Anna and Prairie Island transients indicated that RCP trip would not have been needed based on the application of the ERG trip criterion. The Ginna event, however, indicated a need to review the basis for the RCP trip criterion to allow continued RCP operation for a steam generator tube rupture for low head SI plants.

Thirdly, it has always been the position of Westinghouse and the Westinghouse Owners Group that if there is doubt as to what type of transient or accident is in progress, the RCPs should be tripped. Again, the plants are designed to mitigate the effects of all transients and accidents even without RCP operation while maintaining a large margin of safety to the public. The existing emergency operating procedures reflect this design approach.

Lastly, it remains the position of Westinghouse and the Westinghouse Owners Group that RCP trip can be achieved safely and reliably by the operator when required. An adequate amount of time exists for operator action for the small break LOCA of interest. The operators have been trained on the need for RCP trip and the emergency operating procedures give clear instructions on this matter. In fact, one of the initial operator activities is to check if indications exist that warrant RCP trip.

Westinghouse and the Westinghouse Owners Group will undertake a two part program to address the requirements of NRC letters 83-10 c and d based on the aforementioned positions for the purpose of providing more uniform RCP trip criteria and methods of determining those criteria. In the first part of the program, revised RCP trip criteria will be developed which provides an indication to the operator to trip the RCPs for small break LOCAs requiring such action but will allow continued RCP operation for steam generator tube ruptures, less than or equal to a double-ended tube rupture. The revised RCP trip criteria will also be evaluated against other non-LOCA transients and accidents where continued RCP operation is desirable in order to demonstrate that a need to trip the RCPs will not be indicated to the operator for the more likely cases. Since this study is to be utilized for emergency response guideline development, better estimate assumptions will be applied in the consideration of the more likely scenarios. The first part of the program will be completed and incorporated into Revision 1 of the Emergency Response Guidelines developed by Westinghouse for the Westinghouse Owners Group. The scheduled date for completion of Revision 1 is July 31, 1983.

The second part of the program is intended to provide the required justification for manual RCP trip. This part of the program must necessarily be done after the completion of the first part of the program. The schedule for completion of the second part of the program is the end of 1983.

The preferred and safest method of pump operation following a small break LOCA is to manually trip the RCPs before significant system voiding occurs.

No attempt will be made in this program to demonstrate the acceptability of continued RCP operation during a small break LOCA. Further, no request for an exemption to 10CFR50.45 will be made to allow continued RCP operation during a small break LOCA.

#### DETAILED RESPONSE TO NRC LETTERS 83-10 C AND D

Each of the requirements stated in the attachment to NRC letters 83-10 c and d will now be discussed indicating clearly how they will be addressed. The organization of this section of the report parallels the attachment to NRC letters 83-10 c and d.

#### I. Pump Operation Criteria Which Can Result in RCP Trip During Transients and Accidents

##### 1. Setpoints for RCP Trip

The Westinghouse Owners Group response to this section of requirements will be contained in Revision 1 to the Emergency Response Guidelines scheduled for July 31, 1983. Duke is developing emergency procedures which will include the revised RCP trip setpoints. Development, training, and implementation are scheduled for completion by April 30, 1984.

a) As stated above, Westinghouse and the Westinghouse Owners Group are developing revised RCP trip criteria which will assure that the need to trip the RCPs will be indicated to the operator for LOCAs where RCP trip is considered necessary. The criteria will also ensure continued forced RCS flow for:

- 1) steam generator tube rupture (up to the design bases, double-ended tube rupture)
- 2) the other more likely non-LOCA transients where forced circulation is desirable (e.g., steam line breaks equal to or smaller than 1 stuck open PORV)

NOTE: Event diagnosis will not be used. The criteria developed will be symptom based.

The criteria being considered for RCP trip are:

- 1) RCS wide range pressure < constant
- 2) RCS subcooling < constant
- 3) Wide range RCS pressure < function of secondary pressure

Instrument uncertainties will be accounted for. Environmental uncertainty will be included if appropriate.

No partial or staggered RCP trip schemes will be considered. Such schemes are unnecessary and increase the requirements for training, procedures and decision making by the operator during transients and accidents.

- b) The RCP trip criteria selected will be such that the operator will be instructed to trip the RCPs before voiding occurs at the RCP.
- c) The criteria developed in Item 1a above is not expected to lead to RCP trip for the more likely non-LOCA and SGTR transients. However, since continued RCP operation cannot be guaranteed, the emergency response guidelines provide guidance for the use of alternate methods for depressurization.
- d) The Emergency Response Guidelines contain specific guidance for detecting, managing and removing coolant voids that result from flashing. The symptoms of such a situation are described in these guidelines and in detail in the background document for the guidelines. Additionally, explicit guidance for operating the plant with a vaporous void in the reactor vessel head is provided in certain cases where such operation is needed. The operator training program will include material in these areas.
- e) The high-high containment pressure signal (3.0 psig - ice condenser) isolates component cooling water and service water to the reactor coolant pumps. Seal injection to the pumps is not isolated. If the pumps were not tripped, then the operator would restore cooling water. If the operator failed to restore cooling water, then statalarms would alert the operator to high temperatures in the pump and motor, and immediately indicate a loss of cooling. The operator is instructed by procedure to trip any reactor coolant pump for which loss of cooling may lead to pump damage. Currently all available data indicates that sufficient time for operator action exists for performing these actions, however a confirmatory review of the time available is underway.

Seal integrity is not threatened by containment isolation since seal injection is not isolated, and seal injection can provide seal cooling without component cooling water.

The importance of reactor coolant pump cooling water services is emphasized in operating procedures and training.

f) Discussed in 1a and 1c.

## 2. Guidance For Justification of Manual RCP Trip

The Westinghouse Owners Group program in response to this section of requirements will be completed by the end of 1983. Duke will utilize the results of this program for technical justification of the manual RCP trip. This justification will be included in a Duke submittal by February 29, 1984.

- a) A significant number of analyses have been performed by Westinghouse for the Westinghouse Owners Group using the currently approved Westinghouse Appendix K Evaluation Model for small break LOCA. This Evaluation Model uses the WFLASH Code. These analyses demonstrate for small break LOCAs of concern, if the RCPs are tripped 2 minutes following the onset of reactor conditions corresponding to the RCP trip setpoint, the predicted transient is nearly identical to those presented in the Safety Analysis Reports for all Westinghouse plants. Thus, the Safety Analysis Reports for all plants demonstrate compliance with requirement 2a. The analyses performed for the Westinghouse Owners Group will be used to demonstrate the validity of this approach.
- b) Better estimate analyses will be performed for a limiting Westinghouse designed plant using the WFLASH computer code with better estimate assumptions. These analyses will be used to determine the minimum time available for operator action for a range of break sizes such that the ECCS acceptance criteria of 10CFR50.46 are not exceeded. It is expected that the minimum time available for manual RCP trip will exceed the guidance contained in N660. This will justify manual RCP trip for all plants.

## 3. Other Considerations

- a) Following finalization of the trip setpoint criteria, the required instrumentation will be identified and the level of quality established. This will be provided in the February 29, 1984 submittal.
- b) The Emergency Response Guidelines contain guidance for the timely restart of the reactor coolant pumps when conditions which will support safe pump start-up and operation are established. Duke will incorporate this guidance with the implementation of the symptom-oriented emergency procedures by April 30, 1984.

- c) Emergency procedures will emphasize the importance and immediacy of RCP trip for SBLOCA mitigation. Duke will incorporate this guidance with the implementation of the symptom-oriented emergency procedures.

II. Pump Operation Criteria Which Will Not Result in RCP Trip During Transients and Accidents.

The preferred and safest method of operation following a small break LOCA is to manually trip the RCPs. Therefore, there is no need to address the criteria contained in this section.