

TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401

400 Chestnut Street Tower II

April 22, 1983

Director of Nuclear Reactor Regulation
Attention: Ms. E. Adensam, Chief
Licensing Branch No. 4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Ms. Adensam:

In the Matter of the Application of) Docket Nos. 50-390
Tennessee Valley Authority) 50-391

Generic Letter 83-10c dated February 8, 1983 from D. G. Eisenhut to "All Applicants With Westinghouse Designed Nuclear Steam Supply Systems" requested information on Watts Bar Nuclear Plant. The enclosed response discusses the program for resolving NUREG-0737 item II.K.3.5, "Automatic Trip of Reactor Coolant Pumps," in conjunction with the Westinghouse Owner's Group.

If you have any questions concerning this matter, please get in touch with Dave Ormsby at FTS 858-2681.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills
L. M. Mills, Manager
Nuclear Licensing

Sworn to and subscribed before me
this 22nd day of April 1983

Paulette H. White
Notary Public
My Commission Expires 9-5-84

Boo!

Enclosure

cc: U.S. Nuclear Regulatory Commission
Region II
Attn: Mr. James P. O'Reilly Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30303

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A PDR

ENCLOSURE

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2

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,' was stated in the letter from Darrell G. Eisenhut of the Nuclear Regulatory Commission to All Applicants and Licensees with Westinghouse Designed Nuclear Steam Supply System (83-10c) 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 letter 83-10c 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 Electric Corporation and the Westinghouse Owners' Group (WOG) have held steadfastly to several positions relative to postaccident 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 zircaloy-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 10 CFR 50.46. The currently approved Westinghouse evaluation model for small-break LOCAs was used to perform these analyses and found acceptable for use by NRC in letter 83-10c; 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 offsite 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 LOCAs 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 low RCS pressure RCP trip criterion has already been incorporated into our present Watts Bar emergency operating instructions (EOIs). These procedures have been reviewed by the NRC. 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 (STGR) for low head safety injection (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. The existing emergency operating procedures reflect this design approach.

Lastly, it remains the position of Westinghouse and 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 LOCAs 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 to determine 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 letter 83-10c 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 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 10 CFR 50.46 will be made to allow continued RCP operation during a small-break LOCA.

DETAILED RESPONSE TO NRC LETTER 83-10c

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

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

A. 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. TVA's plans and schedule for implementing revision 1 WOG ERGs at Watts Bar are provided in an April 15, 1983 letter from L. M. Mills to E. Adensam regarding supplement 1 to NUREG-0737 - Requirements For Emergency Response Capability (Generic Letter 82-33).

1. As stated above, Westinghouse and the Westinghouse Owners' Group are developing revised RCP trip criteria which will ensure 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:
 - a. Steam generator tube rupture (up to the design bases, double-ended tube rupture),
 - b. The other more likely non-LOCA transients where forced circulation is desirable (e.g., steam line breaks equal to or smaller than one stuck-open PORV).
2. The criteria being considered for RCP trip are:
 - a. RCS wide-range pressure $<$ constant,
 - b. RCS subcooling $<$ constant,
 - c. 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.

3. The RCP trip criteria selected will be such that the operator will be instructed to trip the RCPs before voiding occurs at the RCP.
4. The criteria developed in item A1 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.
5. The new generic revision 1 WOG emergency response guidelines will 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. TVA's plans and schedule for implementing revision 1 WOG ERGs at Watts Bar are provided in an April 15, 1983 letter from L. M. Mills to E. Adensam regarding supplement 1 to NUREG-0737, Requirements for Emergency Response Capability (Generic Letter 82-33).

The present Watts Bar emergency and abnormal operating instructions contain specific guidance on establishment of natural circulation and natural circulation cooldown upon loss of RCPs. These present procedures are written to avoid the establishment of voids in the reactor pressure vessel head.

6. TVA has previously provided a response to item II.E.4.2 of NUREG-0737 on containment isolation dependability. We view the component cooling water system essential for RCP operation and as a desirable system for accident mitigation. Desirable systems are systems that, while not required for accident mitigation, significantly increase the plant's ability to cope with a small steam line break, small LOCA, or steam generator tube rupture. The systems falling into this category are essential raw cooling water to the reactor coolant pumps and containment coolers, component cooling water to the RCPs and control air. The systems are

automatically isolated upon the receipt of a phase B isolation signal. Phase B is either manually or automatically initiated by 2 out of 4 logic on high-high containment pressure. The present emergency operating procedures require that the RCPs be tripped within five minutes after containment phase B isolation occurs. We believe the present design and procedures to be adequate in this area since containment phase B isolation is indicative of either a LOCA or steam line break.

The reactor coolant pump seal injection is supplied from either the positive displacement (PD) pump or centrifugal charging pumps at Watts Bar. The centrifugal charging pumps are the high head emergency core cooling system (ECCS) pumps and are described in section 6.3 of the FSAR. RCP seal injection is therefore provided for all design basis accidents.

7. Discussed in A1 and A3.

B. Guidance for Justification of Manual RCP Trip

The Westinghouse Owners' Group response to this section of requirements will be reported separately at the end of 1983. TVA will review the WOG generic report and submit it after our review.

1. 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 LOCAs. This evaluation model uses the WFLASH Code. These analyses demonstrate for small-break LOCAs of concern that the predicted transient is nearly identical to those presented in the safety analysis reports for all Westinghouse plants if the RCPs are tripped 2 minutes following the onset of reactor conditions corresponding to the RCP trip setpoint. Thus, the safety analysis reports for all plants demonstrate compliance with this requirement. The analyses performed for the Westinghouse Owners' Group will be used to demonstrate the validity of this approach.
2. Better estimate analyses will be performed for a limiting Westinghouse designed plant using the WFLASH computer code with best 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 10 CFR 50.46 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.

C. Other Considerations

- a) The following table indicates the design provisions which apply to the instrumentation to be used to assess the need for RCP trip.

	<u>RCS Subcooling</u>			
	<u>RCP Wide*</u> <u>Range Press.</u>	<u>Sat.**</u> <u>Meter (Process Computer)</u>	<u>Subcooling Margin**</u> <u>Monitor Indication</u> <u>SG Press**</u>	
Seismic qual.	Yes	Yes	No	Yes
Env. qual.	Note 1	Note 1	No	Note 2
Redundancy	3 channels	2 trains	No	2 channels
Power source	1E	1E	Non-1E	1E
QA applied	Yes	Yes	No	Yes
Recording provided	Yes	Yes	Yes (printout)	No
Testability during operation	Note 3	Note 3	Yes	Yes

Note 1: The existing equipment has not been shown to be environmentally qualified under the requirements of 10 CFR 50.49. The details of establishing the qualification of this equipment will be identified after the TVA's review has been completed.

Note 2: Channels I and II associated with steam generators 1 and 4 are qualified since the respective transmitters are not located in a high energy pipe break area. Note 1 applies to channels I and II associated with steam generators 2 and 3.

Note 3: Channel check - yes; transmitter test - No

*Used as a basis for existing EOIs

**Not used as a basis for existing EOIs (see item I.A.1.a)

2. The revision 1 WOG emergency response guidelines contain guidance for the timely restart of the reactor coolant pumps when conditions which will support safe pump startup and operation are established. TVA's plans and schedule for implementing revision 1 WOG ERGs at Watts Bar are provided in an April 15, 1983 letter from L. M. Mills to E. Adensam regarding supplement 1 to NUREG-0737 - Requirements For Emergency Response Capability (Generic Letter 82-33).
3. Before initial startup of unit 1 at Watts Bar, all licensed employees will receive emergency operating instruction (EOI) training. Since the RCP trip is already integrated into our EOIs, the training will also include the RCP trip step. The present EOIs are based upon the Westinghouse emergency operating instructions. All licensed employees will periodically receive requalification training on the current EOIs which includes RCP trip. New licensees will receive license certification training on the current EOIs which includes RCP trip.

II. Pump Operation Criteria Which Will Not Result in RCP During Transient 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.