



# Duquesne Light

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April 18, 1983

• Director of Nuclear Reactor Regulation  
United States Nuclear Regulatory Commission  
Attn: Mr. Darrell G. Eisenhut, Director  
Division of Licensing  
Washington, DC 20555

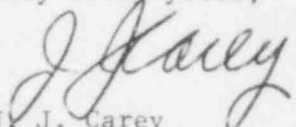
Reference: Beaver Valley Power Station, Unit No. 1  
Docket No. 50-334, License No. DPR-66  
Generic Letter 83-10d; Resolution of TMI Action Item II.K.3.5  
Automatic Trip of RCPs

Gentlemen:

In response to your letter of February 8, 1983, Generic Letter 83-10d, the following information is submitted regarding the reactor coolant pump (RCP) trip issue. This task is being addressed by the Westinghouse Owner's Group (WOG) in an effort to determine what are the specific criterion to be considered when deciding whether to trip RCPs or to leave them in operation. The information contained in the attachment to this submittal represents the WOG plan for resolution of TMI Action Item II.K.3.5. We intend to evaluate the results of this effort in order to develop plant specific RCP trip criteria.

If you have any questions regarding this submittal, please contact myself or members of my staff.

Very truly yours,

  
J. J. Carey  
Vice President, Nuclear

Attachment

cc: Mr. W. M. Troskoski, Resident Inspector  
U. S. Nuclear Regulatory Commission  
Beaver Valley Power Station  
Shippingport, PA 15077

U. S. Nuclear Regulatory Commission  
c/o Document Management Branch  
Washington, DC 20555

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COMMONWEALTH OF PENNSYLVANIA)

COUNTY OF BEAVER )

SS:

On this 18th day of April, 1983, before me, Sheila M. Fattore, a Notary Public in and for said Commonwealth and County, personally appeared J. J. Carey, who being duly sworn, deposed, and said that (1) he is Vice President of Duquesne Light, (2) he is duly authorized to execute and file the foregoing Submittal on behalf of said Company, and (3) the statements set forth in the Submittal are true and correct to the best of his knowledge, information and belief.

Sheila M. Fattore

SHEILA M. FATTORE, NOTARY PUBLIC  
SHIPPINGPORT BORO. BEAVER COUNTY  
MY COMMISSION EXPIRES SEPT. 16, 1985  
Member, Pennsylvania Association of Notaries

ATTACHMENT  
Response to Generic Letter 83-10d

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 a letter from Mr. Darrel G. Eisenhut of the Nuclear Regulatory Commission to all Licensees with Westinghouse designed Nuclear Steam Supply Systems (83-10d) 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 83-10d 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 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 the NRC in letter 83-10d. 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-LCCA 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 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 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 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 83-10d 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.

That 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 10 CFR 50.46 will be made to allow continued RCP operation during a small break LOCA.

#### DETAILED RESPONSE TO NRC LETTER 83-10D

Each of the requirements stated in the attachment to NRC letter 83-10d 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 83-10d.

#### 1. 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. We are presently developing symptom oriented Emergency Operating Procedures (EOPs) in response to Supplement 1 to NUREG-0737. When Rev. 1 to the ERGs is issued, they will be included in the development of our plant specific EOPs. Our schedule for implementing the new EOPs is identified in our response to Generic Letter 82-33 dated April 15, 1983.

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 RCP 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 transient. 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. Operators have been trained to detect the presence of voids in the RCS and emergency procedures address actions to be taken in the event voiding is suspected in the reactor vessel head.
- e. In the event a Containment Isolation Phase "A" (CIA) signal occurs, all cooling water to the RCPs will remain in service, therefore, continued RCP operation would not lead to seal or pump damage or failure. Cooling water to the RCPs is automatically isolated on a (CIB) Containment Isolation Phase "B" signal.
- f. Discussed in 1a and 1c.

2. 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. We will review the WOG report when received and evaluate the RCP trip criteria as it applies to Beaver Valley, Unit 1.



- 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 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.

3. Other Considerations

- a. Current emergency procedures require the operator to trip the reactor coolant pumps after high head safety injection pump operation has been verified and when the wide range reactor coolant pressure is at 1350 psig. The wide range RCS pressure indicators are safety grade quality and redundancy exists. For steam generator tube ruptures, our emergency procedures permit the continued operation of RCPs if the above conditions have not been realized after the RCS temperature has been reduced to assure adequate subcooling exists. Instrument error due to abnormal environmental conditions are factored into the selected temperature and pressure limits for the determination of adequate subcooling.
- b. The Emergency Response Guidelines (ERGs) contain guidance for the timely restart of the reactor coolant pumps when conditions which will support safe pump start-up and operation are established. Our new EOPs are being prepared following the Westinghouse ERGs.
- c. Our operators are trained to trip the RCPs when plant conditions indicate the need to trip them. Current EOPs identify the engineering safety features which are initiated for various accident scenarios. EOPs are included in each requalification training program conducted at BVPS Unit 1.

II. Pump Operation Criteria Which Will Not Result in RCP Trip 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.