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AUTH.NAME AUTHOR AFFILIATION
PARRISH,J.V. Washington Public Power Supply System
RECIP.NAME RECIPIENT AFFILIATION
PERKINS,K.E. Region 5 (Post 820201)

SUBJECT: Forwards response to concerns communicated in ltr dtd 931103 re potential for core instability in event of ATWS followed by trip of recirculation pumps.

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WASHINGTON PUBLIC POWER SUPPLY SYSTEM

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December 8, 1993
G02-93-285

Docket No. 50-397

Mr. K. E. Perkins, Jr.
Director, Division of Reactor Safety and Projects
USNRC Region V
1450 Maria Lane
Walnut Creek, California 94596-5368

Dear Mr. Perkins:

Subject: **WNP-2, OPERATING LICENSE NPF-21**
INFORMATION ON POTENTIAL FOR CORE INSTABILITY IN THE EVENT OF AN ANTICIPATED TRANSIENT WITHOUT SCRAM (ATWS) FOLLOWED BY A TRIP OF THE RECIRCULATION PUMPS

Reference: Letter, dated November 3, 1993, K.E. Perkins, Jr. (NRC) to J.V. Parrish (SS), same subject,

Attached for your information is the Washington Public Power Supply System ("Supply System") response to the concerns communicated in the referenced letter.

Should you have any further questions, please contact me.

Sincerely,

J.V. Parrish

J. V. Parrish (Mail Drop 1023)
Assistant Managing Director, Operations

Attachment

cc: NS Reynolds - Winston & Strawn
NRC Site Inspector - 927N
DL Williams - BPA/399
Document Control Desk - NRC
JW Clifford - NRC

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ATTACHMENT

On November 8, 1993, the Supply System received from the Nuclear Regulatory Commission (NRC) a request for information concerning the potential for core instability in the event of an anticipated transient without scram (ATWS) followed by a trip of the recirculation pumps. The Supply System is aware of this generic concern that could impact all Boiling Water Reactors (BWRs). We have been actively working with the Boiling Water Reactor Owners Group (BWROG) to resolve issues associated with this topic. As discussed in more detail below, we believe that the matter does not raise plant specific issues.

The following provides a specific response to each item identified in the request for information:

REQUEST 1

When you were made aware of this concern, and how it was addressed by the Supply System?

RESPONSE

Prior to 1990, the BWROG was involved in addressing specific issues related to the ATWS rule. Sometimes, these issues were raised by the NRC and in others by the BWROG or individual members. The Supply System, as did other BWROG members, regularly participated in the review and resolution of these issues.

Beginning around early 1990, the issue of tripping the recirculation pumps and its impact on core stability was emerging. During a meeting of the BWROG Emergency Procedures and Stability committees held with the NRC on February 14, 1990, the matter was specifically raised and discussed. Based on our best recollection, this was the first opportunity for the issue to be clearly defined and, thus, the first time that the Supply System became fully aware of the matter.

Following the February 14th meeting, the BWROG held many meetings to evaluate the matter. The Supply System participated in many of these meetings.[1] The BWROG Emergency Procedures Committee (EPC) specifically identified the matter for review and resolution as EPG Issue No. 8953. The issue was stated as follows:

> Step RC/Q-4 instructs the operator to trip recirculation pumps. This may make the plant more unstable and result in oscillations which might not otherwise occur. The Emergency Procedures Committee is requested to determine if RC/Q-4 should be changed to not trip recirculation pumps under some conditions.

This issue was of generic significance to all BWROG members. The Supply System, as a member of the BWROG Stability and Emergency Procedures Committees, closely followed and participated in the activities of the BWROG on this matter.

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[1] The Supply System participated in BWROG meetings on March 7, May 11, June 27, July 17, September 20, September 25, and November 13, 1990.

REQUEST 2

Actions taken by the Supply System, or any other information that may be pertinent regarding the short-term and long-term resolution of the related technical issues.

RESPONSE

The Supply System continued working on this issue as a member of the BWROG Stability and Emergency Procedures Committees in 1991 and 1992.[2] The principle focus of this effort was to resolve EPG Issue No. 8953. Among the resolution options reviewed, consideration was specifically given to Emergency Operating Procedure changes which would decrease reactor power by flow control valve closure instead of recirculation pump trip for ATWS conditions with the turbine available. The option of a single recirculation pump trip was specifically evaluated. In addition, for ATWS events with the turbine/condenser isolated, changes were considered that would provide immediate Reactor Pressure Vessel (RPV) water level reduction. Eventually, the BWROG, with Supply System participation, concluded that these particular solutions were not the best choices.

Nevertheless, by June 17, 1992, the BWROG Emergency Procedure Committee (EPC) had thoroughly discussed the full range of options and developed a position on tripping the recirculation pumps. The Supply System commissioned a consultant to evaluate this position which was to trip the recirculation pumps under all ATWS conditions.[3] The disadvantages of not tripping the recirculation pumps were listed as follows:

1) It would adversely impact the fuel zone RPV water level indication,

2) It would prohibit use of alternate rod insertion for some plants,

3) It would produce a higher heat load on the containment possibly requiring emergency depressurization and venting,

4) There was no additional increase in boron mixing, and

5) It would introduce an additional procedural complication requiring a new decision based on a yet to be defined recirculation flow.

The final conclusion was that lowering RPV water level would mitigate the event and prevent fuel damage over the short term and injecting Standby Liquid Control (SLC) would assure long-term mitigation of core oscillations.

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2 The Supply System attended BWROG meetings on January 16, May 28, and December 11, 1991. Meetings were also attended on January 15, February 18, May 5, June 17, and July 27, 1992.

3 Reference letter, "WNP-2 EOP ATWS Actions," Michael C Daus (Ceil Consultants) to Loren Sharp (Supply System), dated September 28, 1992.

The Supply System believes the EPC has thoroughly considered the issue of the recirculation pump trip and agrees the disadvantages of not tripping the pumps outweigh the advantages -- principally avoiding core oscillations. This topic has also been thoroughly discussed with the NRC. A December 1992 letter[4], for example, provides a response to the NRC regarding the possibility of tripping only one recirculation pump for turbine trip ATWS scenarios.

In light of the core oscillations that occurred at WNP-2 on August 15, 1992[5], the Supply System has considered the question of whether there was a need for plant-specific analyses. It was concluded that this was not required since the BWROG studies performed to support this issue have enveloped the whole BWR fleet. This conclusion was drawn from the NEDO-32047[6] and 32164[7] reports prepared by General Electric in support of the BWROG.

Supply System management also performed its own internal evaluation of the ATWS/Stability issue in January 1993. This evaluation concluded that the existing direction in the Emergency Operating Procedures was the most appropriate response to an ATWS event and that modifying the Supply System approach (i.e., deviating from the BWROG and NRC approved strategy) was not justified.

REQUEST 3

If you consider core instability following an ATWS/recirculation pump trip to be credible, whether procedures and training have been provided to operators on how to diagnose and respond to the event.

RESPONSE

10 CFR 50.62, Requirements for Reduction of Risk from Anticipated Transients Without Scram (ATWS) Events for Light-Water Cooled Nuclear Power Plants, states, "Each boiling water reactor must have equipment to trip the reactor coolant recirculating pumps automatically under conditions indicative of an ATWS." The Supply System believes the probability of an ATWS is extremely low as described in the WNP-2 Individual Plant Evaluation. However, given an ATWS followed by a recirculation pump trip, as required by 10 CFR 50.62, core instabilities are considered "credible."

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4 Letter, C.L. Tully (BWROG) to A.C. Thadani (NRC-NRR), "ATWS Issues Related to Core Thermal-Hydraulic Stability," December 2, 1992.

5 WNP-2 Licensee Event Report 93-037.

6 Reference General Electric Report NEDO-32047, "ATWS Rule Issues Relative to BWR Core Thermal-Hydraulic Stability," February 1992.

7 Reference General Electric Report NEDO-32164, "Mitigation of BWR Core Thermal-Hydraulic Instabilities in ATWS," December 1992.

Current WNP-2 procedures and training are based on Revision 4 to the Emergency Procedure Guidelines (EPG-4).[8] These guidelines were approved by a NRC Safety Evaluation in September 1988.[9] WNP-2 plant operators have the flexibility in the Emergency Operating Procedures to control water level between the top of the active fuel and the turbine high level trip. Lowering reactor water level will mitigate core oscillations if they occur. In addition, they have the option of injecting SLC early to minimize suppression pool temperature. Injecting SLC provides for long term mitigation of instabilities. The Supply System and BWROG position is that current Emergency Operating Procedures provide adequate ATWS guidance. Event diagnoses is not pertinent to BWR symptom based EPGs. Operator response in the EPGs is based on BWR symptoms, not event diagnoses.

As discussed previously, various actions have been considered by the BWROG committees to address what procedure enhancements should be implemented for ATWS/Instability events. At the present time, the BWROG recommends lowering RPV water level to mitigate and prevent fuel damage and injecting SLC to assure long-term mitigation of core oscillations. The BWROG is working closely with the NRC to answer the remaining questions associated with this issue. Enhanced EPG steps are scheduled to be submitted for NRC approval during the Spring of 1994. Assuming no adverse plant specific implication, the Supply System plans to incorporate enhanced EPG steps into the plant procedures once NRC issues the Safety Evaluation Report on the BWROG proposed EPG changes for ATWS. The Supply System views the future changes as enhancements of the existing procedures.

More aggressive action to deviate WNP-2 procedures is not appropriate at this time. In 1991, a NRC Emergency Operating Procedure Inspection Report[10] was critical of the Supply System for implementing deviations that were not adequately justified. Since the analysis necessary to justify an EPG change for ATWS/stability is being prepared by the BWROG to obtain NRC review and concurrence, WNP-2 acceptance of interim BWROG strategy positions is not appropriate. WNP-2 has no plant specific analysis to defend or support such a deviation. BWROG analysis is relied upon for this issue due to the complex computer code analysis and significant costs associated with that analysis.

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8 General Electric Topical Report NEDO-31331, "Emergency Procedure Guidelines," Revision 4, March 1987.

9 Reference Letter "Safety Evaluation of BWR Owners Group Emergency Procedure Guidelines, Revision 4, NEDO-31331," from A. C. Thadani (NRC) to D. Grace (BWROG), dated September 12, 1988.

10 Reference letter "NRC Emergency Operating Procedure Inspection (Report No. 50-397/91-27)," from R.P. Zimmerman (NRC) to G.C. Sorensen (Supply System).