



**Entergy
Operations**

Entergy Operations, Inc.
Route 3 Box 137G
Russellville, AR 72801
Tel 501-964-8888

Neil S. "Buzz" Carns
Vice President
Operations AND

February 25, 1991

2CAN029101

U. S. Nuclear Regulatory Commission
Document Control Desk
Mail Station P1-137
Washington, D. C. 20555

Subject: Arkansas Nuclear One - Unit 2
Docket No. 50-368
License Nos. NPF-6
Minimum Flow for Boron Dilution
Technical Specification Change Request

Gentlemen:

Attached for your review and approval are proposed changes revising section 3/4.1.1.3 of the ANO-2 Technical Specifications (TS) and the Bases for this specification. Entergy Operations has determined that a reduction in the minimum flow rate of reactor coolant through the reactor coolant system (RCS) from 3000 gpm to 2000 gpm will provide adequate mixing to satisfy the safety analysis. This proposed change will reduce the potential for vortexing as described in Generic Letter 88-17, Loss of Decay Heat Removal. In our response to the Generic Letter we identified a change to the TS for Mode 6 RCS flow, however we did not at that time identify this change. Additionally we propose to change the applicable pump for this specification from low pressure safety injection pump to either low pressure safety injection or containment spray pump for use as a shutdown cooling pump.

In accordance with 10CFR50.91(a)(1), and using the criteria in 10CFR50.92(c), Entergy Operations has determined that the change involves no significant hazards consideration. The basis for these determinations are included in the enclosed submittal. Although the circumstances of this proposed amendment is not exigent or emergency, your prompt review and approval is requested.

We request that the effective date for this change be 30 days after NRC issuance of the amendment to allow for procedure changes and distribution of this change.

Very truly yours,

NSC/sgw
Attachment

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cc: Mr. Robert Martin
U. S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 1000
Arlington, TX 76011

NRC Senior Resident Inspector
Arkansas Nuclear One - ANO-1 & 2
Number 1, Nuclear Plant Road
Russellville, AR 72801

Mr. Thomas W. Alexion
NRR Project Manager, Region IV/ANO-1
U. S. Nuclear Regulatory Commission
NRR Mail Stop 13-D-18
One White Flint North
11555 Rockville Pike
Rockville, Maryland 20852

Ms. Sheri Peterson
NRR Project Manager, Region IV/ANO-2
U. S. Nuclear Regulatory Commission
NRR Mail Stop 13-D-18
One White Flint North
11555 Rockville Pike
Rockville, Maryland 20852

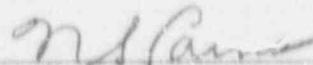
Ms. Greta Dicus, Director
Division of Radiation Control
and Emergency Management
Arkansas Department of Health
4815 West Markham Street
Little Rock, AR 72201

STATE OF ARKANSAS)
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COUNTY OF LOGAN)

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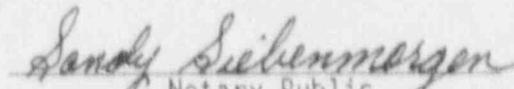
AFFADAVIT

I, N. S. Carns, being duly sworn, subscribe to and say that I am Vice President, Operations AND for Entergy; that I have full authority to execute this affadavit; that I have read the document numbered 2CAN029101 (minimum flow for boron dilution) and know the contents thereof; and that to the best of my knowledge, information and belief the statements in it are true.



N. S. Carns

SUBSCRIBED AND SWORN TO before me, a Notary Public in and for the County and State above named, this 25th day of February, 1991.



Notary Public

My Commission Expires:

May 11, 2000

ENCLOSURE
PROPOSED TECHNICAL SPECIFICATION
AND
RESPECTIVE SAFETY ANALYSES
IN THE MATTER OF AMENDING
License No. NPF-6
ENERGY OPERATIONS, INC.
ARKANSAS NUCLEAR ONE, UNIT 2
Docket No. 50-368

PROPOSED CHANGE

This change to the ANO-2 Technical Specification 3/4.1.1.3 reduces the required minimum flow rate of reactor coolant through the reactor coolant system (RCS) from ≥ 3000 gpm to ≥ 2000 gpm. Additionally a change to the bases for this specification is included to change the flow rate from 3000 gpm to 2000 gpm and the number of cubic feet of reactor coolant circulated in 25 minutes from 9,975 to 6,650. Also being proposed is the change from "low pressure safety injection pump" to "low pressure safety injection pump or containment spray pump as shutdown cooling pump".

BACKGROUND

ANO's 90-day response to Generic Letter 88-17 described our plans for addressing the six programmed enhancements recommended by the NRC concerning the loss of decay heat removal (DHR) issue. Item 5 of the Generic Letter programmed enhancements recommended identification of Technical Specifications that restrict or limit the safety benefit of the actions identified in the Generic Letter, and submittal of appropriate changes. Our response identified that the minimum Shutdown Cooling (SDC) loop flow rate of 3000 gpm, required to be periodically verified by TS surveillance 4.9.8.1, was not always appropriate, and stated that we anticipated proposing a change to that requirement. On December 15, 1989, ANO submitted a change to that requirement to reduce the minimum flow rate to 2000 gpm (2CAN128903). It was shown that this flow rate provides adequate mixing of the RCS to ensure a dilution accident would not occur. On April 30, 1990, the Staff approved the change and issued Amendment number 104 to the Facility Operating License.

Since that time, ANO has identified another condition, Mode 5 Operations, during which reactor coolant system flow rate can be reduced and the potential for loss of DHR further diminished.

Reduction of the required RCS flow rate specified in Technical Specification 3/4.1.1.3 to a value consistent with that of Specification 4.9.8.1 will allow reductions in boron concentration during reduced inventory operations without the need to increase RCS flow rate. During refueling, the RCS can be at higher boron concentrations than the Refueling Water Tank (RWT). When RCS levels are raised with the RWT as a makeup source, a small dilution within allowable limits of the required shutdown margin can occur. Other planned level changes may require some dilution. Requiring the flow rate through the RCS to be unnecessarily increased during these evolutions, in order to comply with Technical Specification 3/4.1.1.3, will increase the potential for vortexing. This is an unnecessary risk in that an RCS flow rate of 2000 gpm provides adequate mixing to preclude a dilution event.

The piping configuration for ANO-2 allows use of either the low pressure safety injection pump or containment spray pump for decay heat removal. The change to 4.1.1.3(b) is to reflect the option of using either shutdown cooling pump for decay heat removal.

DISCUSSION

Entergy Operations has determined that a reduction in the minimum reactor coolant system (RCS) flow from 3000 gpm to 2000 gpm is appropriate and proposes to modify TS 3/4.1.1.3 and its basis accordingly. This change was determined to be acceptable by conservative evaluations for the SDC pump long term minimum flow requirements, and the minimum flow requirements for RCS mixing as related to the ANO-2 Safety Analysis Report RCS Boron Dilution Accident Analysis (Section 15.1.4.2.2.2). Entergy Operations and the pump vendor evaluated the long term minimum flow requirements for the low pressure safety injection pump and containment spray pump and determined that 2000 gpm was adequate to prevent abnormal pump wear. Entergy Operations and Combustion Engineering evaluated the effect of a reduced RCS flow rate on the SAR Boron Dilution Accident Analysis and have determined that the reduction in flow rate does not impact the result of the analysis. This flow rate affects the amount of mixing which occurs in the RCS during a postulated boron dilution event. Adequate RCS mixing is provided by any flow rate which is significantly larger than the dilution flow, which is analyzed to be 132 gpm from all three charging pumps. Conservatively assuming no mixing due to turbulence or diffusion through the core, a reduced flow rate results in a larger step change in boron dilution with each loop transport cycle. However the average rate of decrease in boron concentration is unaffected by reactor coolant system loop flow. Therefore, the specific reactor coolant system flow is not an input parameter to this analysis. The 4000 gpm reactor coolant system flow rate suggested in the ANO-2 SAR comes from a generic Combustion Engineering presentation on the boron dilution accident and is not directly related to ANO-2. The proposed 2000 gpm minimum flow will continue to provide adequate RCS mixing and will meet the acceptance criteria for the present boron dilution analysis.

The proposed reduced minimum flow will also continue to provide adequate flow for core cooling during shutdown conditions using either the low pressure safety injection pump or containment spray pump, while providing the benefit of greater margin to SDC line vortexing and subsequent air entrainment during operation at reduced inventory conditions, a principle concern of Generic Letter 88-17. ANO-2 performed a vortexing test during the 2R7 Refueling Outage to determine the level at which vortexing would occur at various flow rates. This test verified that the proposed 2000 gpm was acceptable with a minimum of ten inches above the bottom of the RCS hot leg. An RCS level of nineteen inches is the procedurally required minimum level for SDC operations.

DETERMINATION OF SIGNIFICANT HAZARDS

An evaluation of the proposed change has been performed in accordance with 10CFR50.91(a)(1) regarding no significant hazards consideration using the standards in 10CFR50.92(c). A discussion of those standards as they relate to this amendment request follows:

Criterion 1 - Does Not Involve a Significant Increase in the Probability or Consequences of an Accident Previously Evaluated.

The RCS flow rate affects the amount of reactor coolant circulating through the core during Mode 5 operations. This flow rate determines the amount of mixing which occurs in the RCS during a postulated boron dilution event. The boron dilution event analyses are well understood, and adequate mixing is provided by any flow rate which is significantly larger than the dilution flow, which is analyzed to be 132 gpm from all three charging pumps. In fact the specific RCS flow is not an input parameter to these analyses. The proposed 2000 gpm minimum flow from either the low pressure safety injection pump or containment spray pump will continue to provide adequate RCS mixing and will maintain the acceptance criteria of the present analyses. The 2000 gpm minimum flow is adequate to prevent premature pump failure. Therefore this change does not involve an increase in the probability or consequences of an accident previously evaluated.

Criterion 2 - Does Not Create the Possibility of a New or Different Kind of Accident from any Previously Evaluated.

The reduced flow rate has been evaluated and found acceptable for the SDC pump minimum continuous flow requirements, therefore no possibility of a different kind of accident related to equipment failure is created. The reduced flow requirement from either shutdown cooling pump provides sufficient flow for core cooling during Mode 5 operations, therefore this change does not create the possibility of a new or different kind of accident from any previously evaluated.

Criterion 3 - Does Not Involve a Significant Reduction in the Margin of Safety.

The NRC evaluated various improvements in equipment and procedures relating to SDC operation from a balanced risk perspective during preparation of Generic Letter 88-17. It was identified that during certain plant conditions, i.e. reduced inventory, the potential for vortexing in the SDC suction drop line was increased significantly at higher RCS flow rates. This has been verified by ANO's own vortexing test during the 2R7 Refueling Outage. When the cooling requirements are met with either shutdown cooling pump, as in the proposed change, a reduction in the required flow rate has been determined to significantly improve the margin to safety with respect to potential loss of DHR events.

The Commission has provided guidance concerning the application of the standards for determining whether a significant hazards consideration exists in 51 F.R. 7750, dated March 6, 1986. The proposed amendment does not closely match the examples provided. The proposed change, however, reflects an improvement identified during NRC and utility response to, and resolution of, a technical issue (Loss of Decay Heat Removal).

Based on the above evaluation it is concluded that the proposed Technical Specification change does not constitute a significant hazards concern.