ARKANSAS POWER & LIGHT COMPANY
POST OFFICE BOX 551 LITTLE ROCK, ARKANSAS 72203 (501) 371-4000

February 11, 1983

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Director of Nuclear Reactor Regulation
ATTN: Mr. J. F. Stolz, Chief
Operating Reactors Branch #4
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Director of Nuclear Reactor Regulation
ATTN: Mr. Robert A. Clark, Chief
Operating Reactors Branch #3
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, DC 20555

SUBJECT: Arkansas Nuclear One - Units 1 & 2
Docket Nos. 50-313 and 5C-368
License Nos. DPR-51 and NPF-6
Hot to Cold Shutdown Scenario for
Loss of Offsite Power - Exemption
Request Details from Appendix R
Compliance Submittal

Gentlemen:

Pursuant to telephone conversations between Mr. David Love of AP&L and Messrs. Guy Vissing and Oliver Lynch of your staff, attached is a calculation which illustrates one set of possible constraints affecting ANO-1's ability to achieve cold shutdown with a loss of offsite power condition. As docketed previously, ANO-1 is unable to achieve cold shutdown within the 72 hours specified in 10CFR50 Appendix R when loss of offsite power occurs. The attached calculation from Babcock and Wilcox models the reactor vessel heat transfer processes of a hot to cold shutdown scenario with natural circulation cooldown. The duration of time required to achieve a Reactor Coolant System (RCS) temperature of 280° F under the conditions shown is a minimum of 135 hours. However, several additional assumptions could be factored into the calculation which might yield slightly longer cooldown times.



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For example, while the B&W calculation assumes Decay Heat Removal (DHR) system initiation at a RCS temperature and pressure of 280° F and 291 psig respectively, the actual initiation could occur at a lower pressure, thus extending the cooldown interval. Other factors, e.g., lack of auxiliary pressurizer spray, the inability to achieve a 100° F/hr cooldown rate from 585° F to 310° F (as assumed in the calculation), or hot leg void formation resulting from pressure control problems, could combine to lengthen the time necessary to achieve cold shutdown.

The calculation also assumes the upper reactor vessel head region is maintained in a liquid state, i.e., a steam bubble is not allowed to form in that region. This assumption is conservative with regards to the cooldown process. While operational procedures do not preclude bubble formation, procedures do require operators to interrupt the cooldown process and initiate repressurization in order to collapse any steam bubble prior to continuing cooldown. After repressurizing the RCS, procedures state cooldown can be reinitiated, but will continue at a slower rate in order to inhibit further upper reactor vessel head bubble formation.

After the RCS temperature has reached a range of 280-300° F, DHR will be initiated to maintain cooldown. Per a request from Mr. Guy Vissing, et al., during a February 10 telephone conversation with Messrs. Love and J. Ted Enos of AP&L, the time needed to reduce RCS temperature from 280° F to 200° F (cold shutdown) is insignificant when compared with the time required to attain a RCS temperature of 280° F. Procedures allow a maximum cooldown rate of 50° F/hr when RCS temperature is between 280° and 150° F. Additionally, the FSAR states the DHR system is designed to cool the RCS from 280° F to 140° F in 14 hours. Actual operational experience indicates the actual time required to cool the RCS from 280° to 200° F is somewhere between these two extremes.

From previous conversations, we understand that the attached calculations should provide the needed justification for you to approve this exemption request. If approval is granted prior to February 16, 1983, we request you notify us of such approval and remove this issue from the agenda of the February 16, 1983, appeals meeting.

Very truly yours,

Donald A Ruter

for John R. Marshall
Manager, Licensing

JRM:DLL:sc

Attachments

FORM -148-

2/9/83

TO

Larry Pascale

# MEMORANDUM

BABCOCK & WILCOX

FROM

LYNCHBURG, VA.

Bill Jones

Larry - Here is the internal letter that transmitted the report to me. It has several additional points in it I wanted to make you aware of.

Bill

BLB/pss

cc: C. W. Tally

Utility Power Generation Division

**Babcock & Wilcox**

To: W. F. JONES, CUSTOMER ENGINEERING SERVICES

BWNP-20553-1(1)

From: B. L. BOMAN, OPERATIONAL ANALYSIS UNIT

Customer or File: T3.5

Subject: ARKANSAS RV HEAD COOLDOWN

Date: FEBRUARY 3, 1983

Attached is the report, "Reactor Vessel Head Cooldown During Natural Circulation Transients," 86-1140819-00 for your review. Several points not discussed in the report but worth mentioning are:

- Significant uneven thermal stresses may result if large temperature differences occur between the RV head and the rest of the RCS. This may preclude a 100°F/hr cooldown and may also require the head fluid to be cooled below 419°F ($T_{sat}$ at 291 psig) since the rest of the RCS will be 280°F (DHR cut-in point).

- Installation of a head vent will increase the head fluid cooldown rate and decrease thermal stresses. Also, shorter cooldowns reduce the AFW requirement.

- Installation of a head fluid temperature measurement will aid the operator during natural circulation cooldowns.

BLB/pss

cc: C. W. Tally