DCS MS-016

MAY 25 1982

Docket No. 50-368

DISTRIBUTION
Docket File
Local PDR
ORB Rdg
D.Eisenhut
JHeltemes
RAClark
PKreutzer (3)
OELD
NSIC
I&E (2)
ACRS (10)
RMartin
Gray File+4
D. Powers
[illegible]
C. Trammell
SECY
TBarnhart-4
LSchneider
DBrinkman
OPA-CMiles
RDiggs
ASLAB

Mr. William Cavanaugh, III
Senior Vice President, Energy
Supply Department
Arkansas Power & Light Company
P. O. Box 551
Little Rock, Arkansas 72203

Dear Mr. Cavanaugh:

The Nuclear Regulatory Commission has issued the enclosed Amendment No. 32 to Facility Operating License No. NPF-6 for the Arkansas Power & Light Company for the Arkansas Nuclear One Unit 2 plant. The amendment consists of changes to the Technical Specifications (TS) in response to your application dated March 5, 1981 as supplemented on May 3, 1982.

The ANO-2 Technical Specifications have included since issuance of the license, a conservative penalty to be applied to the calculation of the departure from nucleate boiling ratio (DNBR) to account for the effects of rod bowing. Since the staff has now completed its review of rod bowing as related to the ANO-2 16x16 fuel assemblies the penalty may be reduced to be consistent with the findings of the staff's review. Accordingly the TS are changed in this amendment to reflect the lower values of the penalty on DNBR due to rod bowing.

During our review of your proposed amendments we found that certain modifications were necessary to meet our requirements. Your staff has agreed to these modifications and they have been incorporated in this amendment.

Copies of the Safety Evaluation and the Notice of Issuance are also enclosed.

Sincerely,

Original signed by

Robert E. Martin, Project Manager
OPerating Reactors Branch #3
Division of Licensing

Enclosures:
1. Amendment No. 32 to NPR-6
2. Safety Evaluation
3. Notice of Issuance

~~cc w/enclosures:~~
See next page

no legal objection to amdt & FRN

OFFICE	ORB#3:DL	DL:ORB#3	DL:ORB#3	AD:OR:DL	OELD
SURNAME	PMKreutzer	RMartin/dyc	RAClark	TMNovak	Jones
DATE	4/ /82	5/05/82 5/24/82	5/6/82	5/10/82	5/11/82

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

DISTRIBUTION:
Docket File
ORB#3 Rdg
PMKreutzer

Docket No. 50-368

Docketing and Service Section
Office of the Secretary of the Commission

SUBJECT: ARKANSAS POWER AND LIGHT COMPANY, Arkansas Nuclear One, Unit No. 2

Two signed originals of the Federal Register Notice identified below are enclosed for your transmittal to the Office of the Federal Register for publication. Additional conformed copies (12) of the Notice are enclosed for your use.

☐ Notice of Receipt of Application for Construction Permit(s) and Operating License(s).

☐ Notice of Receipt of Partial Application for Construction Permit(s) and Facility License(s): Time for Submission of Views on Antitrust Matters.

☐ Notice of Availability of Applicant's Environmental Report.

☐ Notice of Proposed Issuance of Amendment to Facility Operating License.

☐ Notice of Receipt of Application for Facility License(s); Notice of Availability of Applicant's Environmental Report; and Notice of Consideration of Issuance of Facility License(s) and Notice of Opportunity for Hearing.

☐ Notice of Availability of NRC Draft/Final Environmental Statement.

☐ Notice of Limited Work Authorization.

☐ Notice of Availability of Safety Evaluation Report.

☐ Notice of Issuance of Construction Permit(s).

☐ Notice of Issuance of Facility Operating License(s) or Amendment(s).

☒ Other: Amendment No. 32

Referenced documents have been provided PDR.

Division of Licensing
Office of Nuclear Reactor Regulation

Enclosure:
As Stated

OFFICE	ORB#3:DL						
SURNAME	PMKreutzer/pn						
DATE	5/25/82						

NRC FORM 102 7—79

Arkansas Power & Light Company

cc:

Mr. John Marshall
Manager, Licensing
Arkansas Power & Light Company
P. O. Box 551
Little Rock, Arkansas 72203

Mr. James P. O'Hanlon
General Manager
Arkansas Nuclear One
P. O. Box 608
Russellville, Arkansas 72801

Mr. Robert B. Borsum
Babcock & Wilcox
Nuclear Power Generation Division
Suite 220
7910 Woodmont Avenue
Bethesda, Maryland 20814

Nicholas S. Reynolds, Esq.
c/o DeBevoise & Liberman
1200 Seventeenth Street, N.W.
Washington, D. C. 20036

Arkansas Polytechnic College
Russellville, Arkansas 72801

Mr. Charles B. Brinkman
Manager - Washington Nuclear
Operations
C-E Power Systems
4853 Cordell Avenue, Suite A-1
Bethesda, Maryland 20014

Regional Administrator
Nuclear Regulatory Commission, Region IV
Office of Executive Director for Operations
611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 76011

Mr. W. Johnson
U.S. NRC
P. O. Box 2090
Russellville, Arkansas 72801

U.S. Environmental Protection Agency
Region VI Office
ATTN: Regional Radiation
Representative
1201 Elm Street
Dallas, Texas 75270

cc w/enclosure(s) and incoming
dated: 3/5/81

S. L. Smith, Operations Officer
Arkansas Nuclear Planning &
Response Program
P. O. Box 1749
Russellville, Arkansas 72801

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

DESIGNATED ORIGINAL
Certified By Patricia J. Noonan

ARKANSAS POWER AND LIGHT COMPANY

DOCKET NO. 50-368

ARKANSAS NUCLEAR ONE, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 32
Licnese No. NPF-6

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Arkansas Power and Light Company (the licensee) dated March 5, 1981, as supplemented by letter dated May 3, 1982 complies with the standards and requirements of the Atomic Energy Act of 1954 as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   The facility will operate in conformity with the applications, the provisions of the Act and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be condurcted without endangering the health and safety of the public, (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and;

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and by amending paragraph 2.C.(2) of Facility Operating License No. NPF-6 to read as follows:

   (2) <u>Technical Specifications</u>

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 32 are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective within 30 days of the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert A. Clark, Chief
Operating Reactors Branch #3
Division of Licensing

Attachment:
Changes to the
Technical Specifications

Date of Issuance: May 25, 1982

ATTACHMENT TO LICENSE AMENDMENT NO. 32

FACILITY OPERATING LICENSE NO. NPF-6

DOCKET NO. 50-368

Replace the following pages of the Appendix "A" Technical Specifications with the enclosed pages. The revised pages are identified by Amendment number and contain vertical lines indicating the area of change. Corresponding overleaf pages are provided to maintain document completeness.

Pages - Appendix A

3/4 2-8

B3/4 2-3

B 3/4 2-4

DNBR MARGIN

LIMITING CONDITION FOR OPERATION

3.2.4 The DNBR margin shall be maintained by operating within the region of acceptable operation of Figure 3.2-3 or 3.2-4, as applicable.

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER.

ACTION:

With operation outside of the region of acceptable operation, as indicated by either (1) the COLSS calculated core power exceeding the COLSS calculated core power operating limit based on DNBR; or (2) when the COLSS is not being used, any OPERABLE Low DNBR channel exceeding the DNBR limit, within 15 minutes initiate corrective action to reduce the DNBR to within the limits and either:

a. Restore the DNBR to within its limits within one hour, or

b. Be in at least HOT STANDBY within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.2.4.1 The provisions of Specification 4.0.4 are not applicable.

4.2.4.2 The DNBR shall be determined to be within its limits when THERMAL POWER is above 20% of RATED THERMAL POWER by continuously monitoring the core power distribution with the Core Operating Limit Supervisory System (COLSS) or, with the COLSS out of service, by verifying at least once per 2 hours that the DNBR, as indicated on all OPERABLE DNBR channels, is within the limit shown on Figure 3.2-3.

4.2.4.3 At least once per 31 days, the COLSS Margin Alarm shall be verified to actuate at a THERMAL POWER level less than or equal to the core power operating limit based on DNBR.

SURVEILLANCE REQUIREMENTS (Continued)

4.2.4.4 The following DNBR penalty factors shall be verified to be included in the COLSS and CPC DNBR calculations at least once per 31 days:

Burnup $(\frac{GWD}{MTU})$	DNBR Penalty (%)
0-30	2.0
30-40	3.5
40-50	5.5

The penalty for each batch will be determined from the batch's maximum burnup assembly and applied to the batch's maximum radial power peak assembly. A single net penalty for COLSS and CPC will be determined from the penalties associated with each batch, accounting for the offsetting margins due to the lower radial power peaks in the higher burnup batches.

P_{tilt}/P_{untilt} is the ratio of the power at a core location in the presence of a tilt to the power at that location with no tilt.

3/4.2.4 DNBR MARGIN

The limitation on DNBR as a function of AXIAL SHAPE INDEX represents a conservative envelope of operating conditions consistent with the safety analysis assumptions and which have been analytically demonstrated adequate to maintain an acceptable minimum DNBR throughout all anticipated operational occurrences, of which the loss of flow transient is the most limiting. Operation of the core with a DNBR at or above this limit provides assurance that an acceptable minimum DNBR will be maintained in the event of a loss of flow transient.

Either of the two core power distribution monitoring systems, the Core Operating Limit Supervisory System (COLSS) and the DNBR channels in the Core Protection Calculators (CPCs), provide adequate monitoring of the core power distribution and are capable of verifying that the DNBR does not violate its limits. The COLSS performs this function by continuously monitoring the core power distribution and calculating a core operating limit corresponding to the allowable minimum DNBR. Reactor operation at or below this calculated power level assures that the limits of Figure 3.2-3 are not violated. The COLSS calculation of core power operating limit based on DNBR includes appropriate uncertainty and penalty factors necessary to provide a 95/95 confidence level that the core power at which a DNBR of less than 1.24 could occur, as calculated by COLSS, is less than or euqal to that which would actually be required in the core. To ensure that the design margin to safety is maintained, the COLSS computer program includes an F_{xy} measurement uncertainty factor of 1.053, an engineering uncertainty factor of 1.03, a THERMAL POWER measurement uncertainty factor of 1.02 and appropriate uncertainty and penalty factors for flux peaking augmentation and rod bow.

Parameters required to maintain the margin to DNB and total core power are also monitored by the CPCs. Therefore, in the event that the COLSS is not being used, operation within the limits of Figure 3.2-4 can be maintained by utilizing a predetermined DNBR as a function of AXIAL SHAPE INDEX and by monitoring the CPC trip channels. The above listed uncertainty and penalty factors are also included in the CPC.

The DNBR penalty factors listed in section 4.2.4.4 are penalties used to accommodate the effects of rod bow. The amount of rod bow in each assembly is dependent upon the average burnup experienced by that assembly. Fuel assemblies that incur higher average burnup will experience a greater magnitude of rod bow. Conversely, lower burnup assemblies will experience less rod bow. The penalty for each batch required to compensate for rod bow is determined from a batch's maximum average assembly burnup applied to the batch's maximum integrated planar-radial power peak. A single net penalty for COLSS and CPC is then determined from the penalties associated with each batch, accounting for the offsetting margins due to the lower radial power peaks in the higher burnup batches.

3/4.2.5 RCS FLOW RATE

This specification is provided to ensure that the actual RCS total flow rate is maintained at or above the minimum value used in the LOCA safety analyses.

3/4.2.6 REACTOR COOLANT COLD LEG TEMPERATURE

This specification is provided to ensure that the actual value of reactor coolant cold leg temperature is maintained within the range of values used in the safety analyses.

3/4.2.7 AXIAL SHAPE INDEX

This specification is provided to ensure that the actual value of AXIAL SHAPE INDEX is maintained within the range of values used in the safety analyses.

3/4.2.8 PRESSURIZER PRESSURE

This specification is provided to ensure that the actual value of pressurizer pressure is maintained within the range of values used in the safety analyses.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

DESIGNATED ORIGINAL

Certified By Patricia J. Noonan

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 32 TO FACILITY OPERATING LICENSE NO. NPF-6

ARKANSAS POWER & LIGHT COMPANY

ARKANSAS NUCLEAR ONE, UNIT NO. 2

DOCKET NO. 50-368

Introduction

In Supplement No. 1 to the Safety Evaluation Report (SER) (Ref. 9) for the issuance of the ANO-2 operating license we stated the following:

> ANO-2 is the lead plant with Combustion Engineering 16x16 fuel; therefore, there is no data base for direct evaluation of rod bowing as a function of burnup. Consequently, rod bow measurements on 14x14 fuel have been extrapolated, by the staff, to 16x16 fuel with methods which are generally conservative. This extrapolation was based on methods described in the staff's revised interim evaluation for rod bowing and combines the Combustion Engineering, Inc., data on the effect of rod bow on departure from nucleate boiling with rod bow magnitude versus exposure. Credit has been given for thermal margin due to a multiplier of 1.05 on the hot channel enthalpy rise used to account for pitch reduction due to manufacturing tolerances. The resultant in departure from nucleate boiling ratio due to rod bow is given by:

Burnup*	Departure From Nuclear Boiling Ratio Penalty (points)**
0-2.1	0
2.1-5	4.0
5-10	5.9
10-15	8.8
15-20	11.4
20-25	13.6
25-30	15.6
30-35	17.4

*In units of Giga watt days per metric ton of uranium.

**Points subtracted from a departure from nucleate boining ratio value. For example, a penalty of 4.0 points subtracted from 1.34 would result in a penalized value of 1.30.

The licensee proposed in the Reload Report submittals dated February 20, 1981 and March 5, 1981 for Cycle 2 operation to delete TS 4.2.4.4 on the basis that a two percent rod bow penalty factor was already accounted for in the minimum DNBR trip limit value of 1.24. The position was based on the generic consideration of both fuel and poison rod bowing in Combustion Engineering Nuclear Steam Supply Systems which is documented in the topical report CENPD-225 (Ref. 1), "Fuel and Poison Rod Bowing," and the accompanying Supplements 1, 2, and 3 (Refs. 2, 3 and 4).

The staff evaluated the licensee's proposal and reported its findings in Section 2.1.3 of the SER enclosed with Amendment No. 24 to the license wherein it is stated:

> "The staff has not yet approved the CENPD-225 report. Accordingly it is the staff position that the rod bow compensation currently specified in Technical Specification 4.2.4.4 shall remain applicable for initial Cycle 2 operation."

Evaluation

The staff has retained a contractor, The Brookhaven National Laboratories (BNL) to review the CENPD-225 reports. This review is nearing completion and BNL has prepared a preliminary conclusion on their evaluation of the CENPD-225 reports and CE response (Refs. 11 and 12) to questions generated during BNL's review. We have subsequently received the BNL response (Ref. 13), which concluded that all but 2 questions generated during the review have been satisfactorily resolved. The two issues, as stated in the BNL review, are described and evaluated in the following paragraphs.

Rod Bowing Statistical Methodology

"The statistical methodology is considered incomplete because it accounts for bowing on only 2 of the 8 fuel rods that surround the core's hot rod. The accounting for all rods in the neighborhood of the hot rod would increase the calculated fuel rod bowing DNBR penalty by a factor of about 2."

Fuel Assembly Bowing

"The widening of the designed inter-assembly gap increases the local neutron moderation and results in an increase in the power of fuel assembly peripheral rods. Significant assembly bowing on the order of several hundreds of mils has been measured out-of-pile, and an additional F_Q penalty may be warranted."

We have reviewed these issues and agree with the technical merits of each. However, because of mitigating effects that are described below, we have determined that these 2 issues are sufficiently accommodated in, and hence resolved for, the ANO-2 safety analysis.

Rod Bowing Statistical Methodology

With regard to the first issue on the DNBR statistical methodology, the essence of this concern is that the CENPD-225 method used to calculate the reduction in DNBR on a fuel rod due to the bowing of its neighbors is one dimensional and not two dimensional. Hence, the CE method considers the effect due to bowing on only the 2 rods adjacent to and in the same plane as the central rod of interest and, therefore, does not account for the remaining 6 adjacent rods (third and farther nearest neighbors are believed to have no significant influence). As stated above, BNL has found that a two dimensional model would predict an increase in the CE proposed DNBR penalty by a factor of about 2. The CE proposed penalty (shown in the revised TS 4.2.4.4) applicable to the ANO-2 fuel design, increases with burnup up to a value of about 5.3% at a burnup of 50 GWD/MTU. However, there are several DNBR conservatisms in the CE bowing analysis that together constitute a margin sufficient to offset the underestimated penalty; therefore the value of the penalty proposed by CE is appropriate for the ANO-2 plant. Some of these conservatisms are:

1. Combustion Engineering has analyzed the worst span bow for each fuel assembly used to obtain the closure correlation coefficients. In many cases, the worst span is in the lowermost region of the fuel assembly, where minimum DNBR is not likely to occur.

2. The DNBR penalty will increase with burnup because of the associated reduction in gap spacing. Conversely, nuclear peaking tends to decrease with burnup. Combustion Engineering has conservatively not accounted for this fuel depletion effect.

3. The DNB experiments, which employed a displaced rod and which were designed to assess the effect of bowing of one specific rod, had generalized bowing (though small) throughout on all of the other simulated fuel rods. This bowing was attributable to 2 factors: (a) the simulated fuel rods were not manufactured perfectly straight and (b) when power was applied to the ferromagnetic cartridge inserts, magnetic forces between rods were induced thus creating widespread bowing of small magnitudes. Hence, the DNB experiments and the respective analyses of the DNBR penalties are not strictly applicable to only situations involving one large bow. Rather, these penalties are more applicable to actual and more probable inpile situations and associated analyses involving a large bow in a field of several lesser bows. Consequently, this aspect, though unquantifiable, will partially compensate for the use of a 2 rather than an 8 bowed-rod DNBR penalty calculation in the CENPD-225 methodology.

4. There is modeling conservatism in the treatment of reduction-in-DNBR as a function of gap closure. As shown in Figure 1, the proposed CE licensing curve (depicted by the solid linear line) bounds the expected behavior (hypothesized by the dashed curve).

5. Experimental techniques used to measure rod bowing yield projected gap closures (i.e., those components of the actual gap closures that are parallel to the face of the fuel assembly). The use of projected gap closure is conservative because the magnitude of a projected gap closure is always greater than or equal to the magnitude of the actual gap closure.

6. The CE augmentation factor of F_r (radial peaking factor) was assumed to be equal to the augmentation factor for F_Q (total peaking factor). Actually, the augmentation factor on F_r should be the statistical average of the heat generation augmentation factors of the 4 fuel rods which comprise the coolant channel and thus must be less than the augmentation factor for any one fuel rod.

7. There are 2 effects that rod bowing has on DNBR. The first is to alter the local flow area, and this effect is relatively small. However, the second effect, which can be quite significant, is the perturbation of the fluid boundary layer on the hot rod. From partial-closure DNB tests, we know that this effect is nil for closures less than 50%. The probability of having more than one large gap closure of greater than 50% in one central region (3x3 array) of interest is low, and certainly when such a low probability is convoluted with the additional small probability that one of the core's hot rods is present in this central region of interest, is then even lower. Consequently, the construction of an 8-bowed rod DNBR penalty analysis would not likely yield a significant impact when actual gap closures are used. This is clearly true for the 4 second-nearest neighbor rods, because they are 2.5 times farther from the central rod than the nearest neighbor rods. Therefore, the probability of having the gap spacing to a second-nearest neighbor rod being less than the gap spacing to a nearest-neighbor rod is negligible.

8. All CE calculations were performed assuming no boron concentration in the coolant. Thus, CE maximized the rod bow augmentation factors on F_r and F_Q by using the most negative moderator temperature coefficient.

9. An area reduction in a coolant channel will result in a reduction in the heat generated in that coolant channel. Combustion Engineering took no credit for this phenomenon. Instead, the channel heat generation rate was conservatively assumed to increase by the magnitude of the augmentation factor on F_r.

10. Cladding creepdown increases the nominal rod-to-rod spacing. This phenomenon was not modeled in the CE analysis.

Fuel Assembly Bowing

Out-of-pile inspections (Refs. 14, 15, and 16) at several plants have detected large fuel assembly bowing on the order of several hundreds of mils. Such large assembly bowing is an order of magnitude greater than that of fuel rod bowing and can primarily affect both DNB and LOCA margins of peripheral fuel rods.

The DNBR of peripheral rods is significantly higher than that of interior rods of equal power. This is because peripheral rods (a) have no adjacent unheated surfaces (i.e., CEA guide tubes) to cause a reduction in DNBR and (b) are subjected to greater cooling even when assemblies bow to contact because of the minimum inter-assembly rod spacing afforded by the grid straps and spring offsets. Consequently, the interior fuel rods, which are essentially unaffected by fuel assembly bowing, will remain the most limiting (that is, with respect to DNB).

The impact of assembly bowing on the LOCA margin arises due to the increased local neutron moderation and concurrent power increase that accompanies the widening of the inter-assembly gap. Consequently, assembly bowing is mostly influential on peripheral rods. For the CE NSSS design, the power limiting rods are located next to CEAs and not on the fuel assembly periphery.

In order to investigate the effect of assembly bowing on peripheral rod power, CE performed sensitivity calculations. In these calculations, CE employed a time-dependent assembly bow model and assessed the effects out to an inter-assembly gap spacing greater than that experimentally observed in CE designed fuel. It was found for the maximum gap spacing assumed that the location of the most peaked rod (i.e., with respect to the average power density) moved to a peripheral location, but that the power density in the peak peripheral rod was about the power density in the peak interior rod if assembly bowing had not been present.

We desired to extend the CE analysis to yet a greater inter-assembly gap spacing; hence, the NRC staff extrapolated the CE results out to a gap of 800 mils (about 4 times the normal spacing). We have found that the new power density in the peaked peripheral rod was only 5% greater than that found in the CE analysis, and likewise 5% greater than that assumed in the general CE rod bowing analyses, which do not account for assembly bowing.

Nevertheless, we recognize several conservatisms that we believe to be of sufficient magnitude to individually, or certainly collectively, offset the detrimental effect of assembly bowing. Those conservatisms are:

1. See conservatisms numbers 2 and 8 listed in the previous section on Statistical Methodology.

2. The CE sensitivity analysis conservatively assumed that the fuel assemblies were unzoned; however, actual assemblies are zoned and have a lower enrichment in the corner regions.

3. Assembly bow measurementshave been made out-of-pile under relatively unrestrained conditions. In pile, there are physical constraints imposed on the assembly by the upper and lower core plates as well as neighboring assemblies or the core shroud. The effect of these restraints on assembly bowing is presently unquantified, though it probably is significant.

Based on our review of these offsetting conservatisms we conclude that no F_Q penalty is required to account for fuel assembly bowing.

We have reviewed the BNL preliminary evaluation of the CE fuel rod bowing analysis as described in CENPD-225 topical report, its supplements, and responses to questions generated during BNL's review. In response to the licensee's supplemental request dated May 3, 1982, for change to the Technical Specifications we have concluded that the fuel rod bowing DNBR penalty currently in the TS may be amended to reflect the values of the penalty proposed by the licensee (i.e. CENPD-225 Supplement 3 values). We have determined that the penalty values proposed in the licensee's May 3, 1982 submittal are consistent with the those in CENPD-225 Supplement 3 and are acceptable.

At the present time a rod bow penalty of two percent is included in the Core Protection Calculator System software. Implementation of penalties beyond two percent is expected to be accomplished by modifying the value of the addressable constant for the power uncertainty factor, BERR1, according to the following formula which was also discussed in reference 18, page 37.

$$BERR1 = 1.065 \times \{1 + (RB + C - 2) \times D/100\} \cdot B$$

where RB is the rod bow compensation (percent of DNBR) corresponding to the maximum fuel burnup of the limiting fuel batch; C (percent of DNBR) is any additional compensation to the DNBR limit; B is the uncertainty compensation directly affecting BERR1; D is the absolute value of the most negative derivative from the response to 492.66.

For information and clarification purposes it is noted that the DNBR trip limit value specified in the Technical Specifications and contained within the CPCS programming is 1.24. This value includes the rod bowing compensation of two percent on DNBR. For reasons which are stated in detail in reference 18 the staff review as reported in reference 18 resulted in the conclusion that the approved DNBR limit should be 1.26. As stated on pages 36 and 37 of reference 18 the difference between 1.24 and 1.26 in accounted for by increasing the minimum value of BERR1 from 1.055 to 1.065. The value of 1.065 is included in the Technical Specifications Table 2.2-1.

Environmental Consideration

We have determined that the amendment does not authorized a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that the amendment involves an action which is insignificant from the standpoint of environmental impact and, pursuant to 10 CFR §51.5(d)(4), that an environmental impact appraisal need not be prepared in connection with the inssuance of this amendment.

Conclusion

We have concluded, based on the considerations discussed above, that: (1) because the amendment does not involve a significant increase in the probability or consequences of accidents previously considered and does not involve a significant decrease in a safety margin, the amendment does not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Date: May 25, 1982

Principal contributors to this SER were D. Powers and Y. H. Hsii, CPB.

References For Safety Evaluation

1. "Fuel and Poison Rod Bowing," CE Report CENPD-225, October 1976.

2. "Fuel and Poison Rod Bowing," CE Report CENPD-225, Supplement 1, February 1977.

3. "Fuel and Poison Rod Bowing," CE Report CENPD-225, Supplement 2, June 1978.

4. "Fuel and Poison Rod Bowing," CE Report CENPD-225, Supplement 3, June 1979.

5. Letter from D. Trimble (AP&LCo) to R. A. Clark (NRC), Subject: Cycle 2 Reload Report, February 20, 1981.

6. Memorandum from D. F. Ross and D. G. Eisenhut (NRC) to D. B. Vassallo and K. R. Goller, "Interim Safety Evaluation Report on the Effects of Fuel Rod Bowing in Thermal Margin Calculations for Light Water Reactors," December 8, 1976.

7. Memorandum from D. F. Ross and D. G. Eisenhut (NRC) to D. B. Vassallo and K. R. Goller, "Revised Interim Safety Evaluation Report on the Effects of Fuel Rod Bowing in Thermal Margin Calculations for Light Water Reactors," February 16, 1977.

8. Memorandum from R. O. Meyer (NRC) to D. F. Ross, "Revised Coefficients for Interim Rod Bowing Analysis," March 2, 1978.

9. "Staff Evaluation Report Related to Operation of Arkansas Nuclear One, Unit 2," NRC report NUREG-0308, Supplement No. 1, p. 4-1, June 1978.

10. Letter, J. R. Marshall, AP&L Co. to R. A. Clark, NRC, dated May 3, 1982 providing proposed penalty on DNBR to account for rod bowing effects.

11. Letter from A. E. Scherer (CE) to R. L. Tedesco (NRC) Subject: Responses to First Round Questions on CENPD-225, "Fuel and Poison Rod Bowing," Number LD-81-073, October 23, 1981.

12. Letter from A. E. Scherer (CE) to J. R. Miller (NRC), Subject: Revised Responses to Second Round Questions on CENPD-225-P, Number LD-82-021, February 19, 1982.

13. Letter from J. Carew (BNL) to D. A. Powers (NRC), Subject: Fuel Rod Bowing Topical Report CENPD-225, February 26, 1982.

14. "Interim Report: Surry Unit 2 End-of-Cycle 2 Onsite Fuel Examination of 17x17 Demonstration Assemblies After One Cycle of Exposure," Westinghouse report WCAP-8873, January 1978.

15. "Pool Side Examination of PWR Demonstration Fuel Assemblies and Creep Specimens: End-of-Cycle 2, Babcock & Wilcox report LRC-4733-5, August 1978.

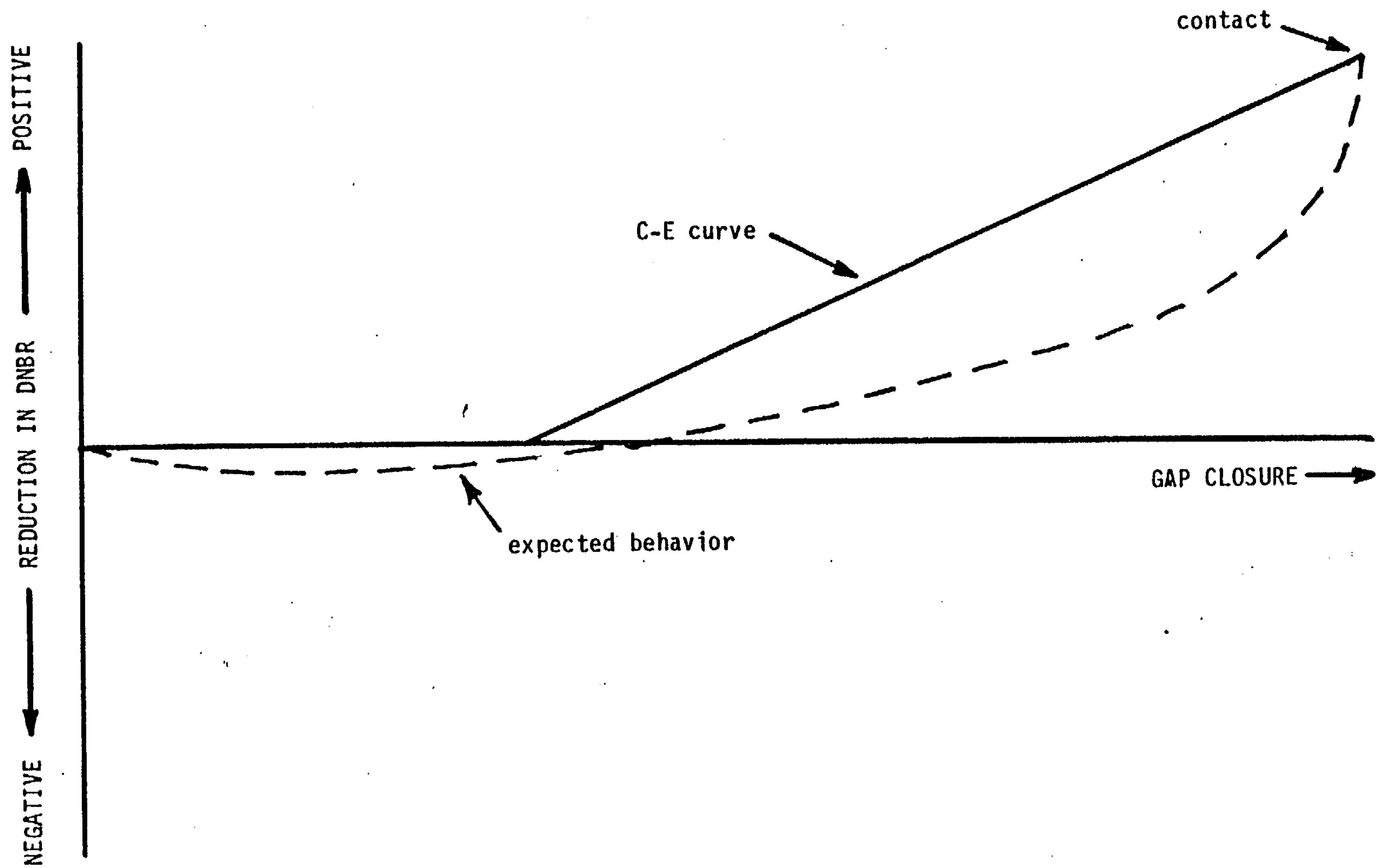
16. "Examination of Calvert Cliffs 1: Test Fuel Assembly After Cycle 3," CE/EPRI Report RP 586-1, September 1979.

17. Amendment No. 24 to License No. NPF-6 and accompanying safety evaluation, issued June 19, 1981.

18. Amendment No. 26 to License No. NPF-6 and accompanying safety evaluation, issued July 21, 1981.

Figure 1

DNBR PENALTY DEPENDENCE ON ROD BOW



DESIGNATED ORI[illegible]

Certified By Patricia J. Noonan

7590-01

UNITED STATES NUCLEAR REGULATORY COMMISSION

DOCKET NO. 50-368

ARKANSAS POWER AND LIGHT COMPANY

NOTICE OF ISSUANCE OF AMENDMENT TO FACILITY OPERATING LICENSE

The U. S. Nuclear Regulatory Commission (the Commission) has issued Amendment No. 32 to Facility Operating License No. NPF-6 issued to Arkansas Power and Light Company (the licensee), which revised the Technical Specifications for operation of Arkansas Nuclear One, Unit No. 2, located in Pope County, Arkansas. The amendment is effective within 30 days of its date of issuance.

The amendment modifies the ANO-2 Appendix A Technical Specifications dealing with the penalty applied to the calculationof the departure from nucleate boiling ratio (DNBR) to account for rod bowing.

The application for the amendment complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission;s rules and regulations. The Commission has made appropriate findings as required by the Act and the Commission's rules and regulations in 10 CFR Chapter I, which are set forth in the license amendment. Prior public notice of the amendment was not required since the amendment does not involve a significant hazards consideration.

The Commission has determined that the issuance of the amendment will not result in any significant environmental impact and that pursuant to 10 CFR §51.5(d)(4) an environmental impact statement or negative declaration and environmental impact appraisal neen not be prepared in connection with issuance of the amendment.

For further details with respect to this action, see (1) the licensee's application dated March 5, 1982 as supplemented May 3, 1982 (2) Amendment No. 32 to License No. NPF-6, and (3) the Commission's related Safety Evaluation. All of these items are available for public inspection at the Commission's Public Document Room, 1717 H Street, N.W., Washington, D. C. and at the Arkansas Tech University, Russellville, Arkansas. A copy of items (2) and (3) may be obtained upon request addressed to the U. S. Nuclear Regulatory Commission, Washington, D. C. 20555, Attention: Director of Licensing.

Dated at Bethesda, Maryland this 25th day of May, 1982.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert A. Clark, Chief
Operating Reactors Branch #3
Division of Licensing