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SUBJECT: Application for amends to licenses DPR-58 & DPR-74,proposing TS,by modifying TS 4.1.1.4 such that requirement to measure moderator temperature coefficient near end of cycle will become conditional.

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AEP:NRC:1028A

Donald C. Cook Nuclear Plant Units 1 and 2
Docket Nos. 50-315 and 50-316
License Nos. DPR-58 and DPR-74
PROPOSED TECHNICAL SPECIFICATION CHANGES FOR
MODERATOR TEMPERATURE COEFFICIENT MEASUREMENT

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Attn: Mr. W. T. Russell

July 26, 1994

Dear Mr. Russell:

This letter and its attachments constitute an application for amendment to the Technical Specifications (T/Ss) for Donald C. Cook Nuclear Plant Units 1 and 2. Changes are proposed to the Moderator Temperature Coefficient section of the T/Ss. Specifically, we propose to modify T/S 4.1.1.4 such that the requirement to measure the moderator temperature coefficient (MTC) near the end of the cycle will become conditional. The test will not be performed if specified core performance benchmark criteria are met for the operating cycle and the revised predicted MTC is less negative than the MTC surveillance limit presented in the Core Operation Limits Report (COLR). We are also proposing to add T/S 6.9.1.12, which defines a cycle specific "Most Negative Moderator Temperature Coefficient Limit Report" containing information for calculation of the revised predicted MTC. The report will be filed and available for NRC audit.

These changes are requested because it is believed that a relaxation of the existing criteria for performing the MTC measurement near the end-of-cycle (EOC) is justifiable while still ensuring the EOC MTC is within its limits. The 300 ppm MTC measurement is time- and resource-consuming. It disrupts normal operation and decreases the availability of the power plant. Incorporating these changes would eliminate the surveillance when it is certain from other indicators that the EOC MTC limit would not be exceeded.

We previously made a similar submittal via AEP:NRC:1028, dated October 20, 1987. Upon review, however, the NRC concluded that "This type of amendment should be handled as a generic issue due

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to its industry wide implications." As a result, this current submittal is based on the generic investigation performed by Westinghouse Electric Corporation and documented in Reference 1 of Attachment 1. This document was submitted to the NRC for review and approval in Reference 2 of Attachment 1.

A description of the proposed changes and analysis concerning significant hazards consideration pursuant to 10 CFR 50.92 is contained in Attachment 1. Attachment 2 contains the existing T/S pages marked to reflect proposed changes. Attachment 3 contains the proposed, revised T/S pages.

We believe that the proposed T/S changes will not result in (1) a significant change in the amount of effluent that might be released off site, or (2) a significant increase in individual or cumulative occupational radiation exposure.

These proposed T/S changes have been reviewed and approved by the Plant Nuclear Safety Review Committee and by the Nuclear Safety and Design Review Committee.

In compliance with the requirements of 10 CFR 50.91(b)(1), copies of this letter and its attachments have been transmitted to Mr. J. R. Padgett of the Michigan Public Service Commission and the Michigan Department of Public Health.

This letter is submitted pursuant to 10 CFR 50.30(b) and, as such, an oath statement is attached.

Sincerely,

E. E. Fitzpatrick
Vice President

cad

Attachments

cc: A. A. Blind
G. Charnoff
J. B. Martin - Region III
NFEM Section Chief
NRC Resident Inspector
J. R. Padgett

STATE OF OHIO)
COUNTY OF FRANKLIN)

E. E. Fitzpatrick, being duly sworn, deposes and says that he is the Vice President of licensee Indiana Michigan Power Company, that he has read the forgoing PROPOSED TECHNICAL SPECIFICATION CHANGES FOR MODERATOR TEMPERATURE COEFFICIENT MEASUREMENT and knows the contents thereof; and that said contents are true to the best of his knowledge and belief.

E E Fitzpatrick

Subscribed and sworn to before me this 26th

day of July, 19 94.

Rita D Hill
NOTARY PUBLIC

RITA D. HILL
NOTARY PUBLIC, STATE OF OHIO
MY COMMISSION EXPIRES 6-28-99

ATTACHMENT 1 TO AEP:NRC:1028A

DESCRIPTION OF PROPOSED TECHNICAL SPECIFICATION CHANGES AND 10 CFR 50.92 SIGNIFICANT HAZARDS CONSIDERATION ANALYSIS

DESCRIPTION OF CHANGES (both units)

1. It is proposed that surveillance requirement 4.1.1.4.b be changed to allow suspension of the 300 ppm moderator temperature coefficient (MTC) measurement provided the benchmark criteria and the revised prediction, as documented in the Core Operating Limits Report (COLR), are satisfied. The change also specifies that the data required for calculation of the revised prediction is provided in the "Most Negative Moderator Temperature Coefficient Limit Report," per T/S 6.9.1.12.

2. It is proposed that administrative control paragraph 6.9.1.12 be added to define the "Most Negative Moderator Temperature Coefficient Limit Report." The report, which will be maintained on file, includes data required for the determination of the revised prediction of the 300 ppm all rods out (ARO) at rated thermal power (RTP) MTC per WCAP-13749, "Safety Evaluation Supporting the Conditional Exemption of the Most Negative EOL Moderator Temperature Coefficient Measurement," May 1993.

3. It is proposed that WCAP-13749 be added as reference "e" to administrative control section 6.9.1.11.2.

JUSTIFICATION FOR THE CHANGE

Pursuant to 10 CFR 50.92, each application for an amendment to an operating nuclear plant license or construction permit must be reviewed to determine if the proposed change involves a significant hazards consideration. The proposed technical specification amendment for the end of life (EOL) MTC conditional exemption has been reviewed and it is concluded that no significant hazards result from this T/S change.

Background

For FSAR accident analyses, the transient response of the plant is dependent on reactivity feedback effects, in particular, the moderator density coefficient (MDC) and the Doppler power coefficient. Because of the sensitivity of accident analysis results to the MDC value assumed, it is important that the actual core MDC remain within the bounds of the limiting values assumed in the FSAR accident analyses. While core neutronics analyses will confirm that the MDC is within these bounds during an operating cycle, Cook Nuclear Plant T/Ss currently place limits on the MTC during normal operation. MTC measurements are performed at the beginning of cycle (BOC) prior to initial operation above 5% RTP and at RTP conditions within seven effective full power days (EFPD) after reaching an equilibrium boron concentration of 300 ppm.

In order to ensure a bounding accident analysis, the MDC is assumed to be at its most limiting value for the analysis conditions appropriate to each accident. The most positive MDC limiting value is based on the EOL core conditions corresponding to maximum fuel burnup and minimum boron concentration assuming 100% RTP. Two different T/S bases relating the accident analysis MDC to the most negative MTC have been previously licensed for Westinghouse plants as described in Chapter 2 of Reference 1 of this Attachment.

Most accident analyses use a constant MDC designed to bound the MDC at the worst set of initial conditions as well as at the most limiting set of transient conditions. This value of MDC forms the licensing basis for the FSAR accident analysis as well as the bases for the current EOL MTC T/S requirements. Converting the MDC used in the accident analysis to a corresponding MTC requires a calculation which accounts for the rate of change of moderator density with temperature at the conditions of interest.

T/Ss place both limiting condition for operation (LCO) [T/S 3.1.1.4] and surveillance requirement [T/S 4.1.1.4] constraints on the MTC, based on the accident analysis assumptions of the MDC. The most negative MTC LCO limit applies to Modes 1, 2, and 3, and requires that the MTC be less negative than the specified limit value for the ARO/EOL/RTP condition. To demonstrate compliance with the most negative MTC LCO, the T/S surveillance calls for verification of the MTC after 300 ppm equilibrium boron concentration is obtained. Because the hot full power (HFP) MTC value will gradually become more negative with further core burnup and boron concentration reduction, a 300 ppm surveillance requirement value of the MTC should necessarily be less negative than the EOL LCO limit. To account for this effect, the 300 ppm surveillance requirement value is sufficiently less negative than the EOL LCO limit value, which is specified in the COLR, thereby providing assurance that the LCO limit will be met as long as the 300 ppm surveillance criterion is met.

Currently, Cook Nuclear Plant Units 1 and 2 T/Ss require measurements of MTC at beginning of life (BOL) to verify the most positive MTC limit and near EOL to verify the most negative MTC limit. At BOL, the measurement of the isothermal temperature coefficient, and subsequent MTC calculation, is relatively simple to perform. The measurement is done at hot zero power isothermal conditions and is not complicated by changes in the enthalpy rise or the presence of xenon. The measurement made near EOL differs from the BOL measurement as it is performed at or near HFP conditions. MTC measurements at HFP are more difficult to perform due to small variations in soluble boron concentration and changes in xenon concentration and distribution, fuel temperature, and enthalpy rise created by small changes in the core average power during the measurement. Changes in each of these parameters must be accurately accounted for when reducing the measurement data, or additional measurement uncertainties will be introduced. Even though these additional uncertainties may be small, the total reactivity change associated with the swing in moderator temperature is also relatively small. The resulting MTC measurement uncertainty created by even a small change in power level can then become significant and, if improperly accounted for, can yield misleading measurement results. In addition, it should be mentioned that the 300 ppm MTC test is performed at approximately 95% power, which adversely affects plant availability. With respect to human resources, the test takes up to 60 man-hours.

The method proposed here, for determining whether the surveillance is satisfied, is to calculate a revised prediction of the MTC based on the actual core reactivity, actual axial power distribution, and MTC predictive capability of the design model. If the revised predicted MTC meets the surveillance requirement and the performance criteria presented in Table 3-2 of Reference 1 is satisfied, then the measurement is not required.

In summary, the conditional exemption from the measurement is sought to improve plant availability and minimize disruptions to normal operation of the Cook Nuclear Plant units. As documented in References 1 and 2, it has been concluded that plant safety will not be compromised by the conditional exemption of this measurement. As a result, the Significant Hazards Consideration Evaluation below provides justification that the conditional exemption from the measurement of the 300 ppm MTC does not involve any significant hazards consideration.

10 CFR 50.92 SIGNIFICANT HAZARDS CONSIDERATION ANALYSIS

10 CFR 50.92 specifies that the holder of an operating license or construction permit of a nuclear power facility participate in determining whether a change to the T/Ss/current licensing basis (CLB) involves a significant hazards consideration. Prior to implementation of a change to the current licensing basis, the Nuclear Regulatory Commission must review and make a final determination, pursuant to the procedures in 10 CFR 50.91, that a proposed amendment to the operating license involves no significant hazards considerations. In order to satisfactorily complete the review, the proposed amendment to the CLB must not:

1. involve a significant increase in the probability or consequences of an accident previously evaluated,

2. create the possibility of a new or different kind of accident from any accident previously evaluated, or

3. involve a significant reduction in a margin of safety.

The impact of the suggested T/S changes on the MTC surveillance and COLR sections is evaluated below with respect to the acceptance criteria for the accidents addressed in Chapter 14 of Cook Nuclear Plant Units 1 and 2 FSAR.

Nuclear Design Considerations

The conditional exemption of the most negative EOL MTC measurement methodology is described in detail in Reference 1. The T/S Bases of the most negative MTC LCO and surveillance requirement, and the values of these limits, are not altered. Instead, a revised prediction is compared to the MTC surveillance requirement to determine if the surveillance limit is met. The revised prediction is simply the sum of the predicted HFP 300 ppm MTC surveillance requirement plus an axial flux difference (AFD) correction factor plus a predictive correction term. A brief description of each of these terms is given below.

Predicted HFP 300 ppm surveillance requirement MTC

Any misprediction of the core reactivity balance by the core model would cause the core to be at a boron concentration of 300 ppm at a different cycle burnup than actual. This in turn would cause a difference in the actual versus predicted MTC. The sensitivity of MTC at 300 ppm as a function of core burnup is determined and provided as part of the Most Negative MTC Limit Report.

AFD Correction

The MTC is affected by the AFD via the impact the axial flux distribution has on the moderator temperature profile. The more bottom skewed the power distribution, the higher the temperatures near the bottom of the core. Also, the burnup in the bottom half of the core exceeds the burnup in the top half. A higher burnup will result in a more negative MTC. A more bottom skewed axial power shape allocates a greater flux weighting to the lower region of the core where the burnup is greater, thereby accentuating the burnup effect on MTC. The MTC sensitivity to AFD is provided in the MTC limit report. Since measured AFD must be determined every 31 days, the latest measurement can be compared with the prediction and the difference obtained. This difference is then used with the AFD sensitivity to obtain the correction.

Predictive Correction Term

To account for the MTC predictive capability of the design model for a given cycle, an additional correction will be applied to the predicted MTC to determine the final MTC to be compared to the surveillance limit. The predictive correction will be defined as 0 pcm/'F or the difference between the measured and predicted BOC hot zero power MTC, whichever is more negative.

The conditional exemption from the measurement will be determined on a cycle-specific basis.

The core model performance must be benchmarked to the operating core before applying the procedure for determining the revised prediction. The specific parameters chosen and the associated criteria are given in Reference 1. Meeting these criteria demonstrates the core model's capability to accurately predict changes in the core characteristics with depletion, and therefore provide an accurate prediction of the HFP 300 ppm MTC.

Safety Analysis Considerations

The safety analysis assumption of a constant MDC, and the actual value assumed, will not change. Therefore, a conditional exemption from the 300 ppm MTC measurement based on the margin to the surveillance limit will not have an adverse impact on the safe operation of the plant.

Technical Specification Impacts

The proposed T/S surveillance 4.1.1.4 and concomitant COLR changes required to support the conditional exemption are described in Reference 1. These T/S changes will not change the LCO or surveillance requirement MTC limits.

The specific values of the surveillance requirement and LCO MTCs remain unchanged by the conditional exemption methodology documented in Reference 1. An additional T/S will be added (6.9.1.12) which will define the "Most Negative Moderator Temperature Coefficient Limit Report." This cycle-specific report will provide the information required for calculating the margin to the surveillance limit. Reference "e" will also be added to the list of references in T/S 6.9.1.11.2.

DETERMINATION OF NO SIGNIFICANT HAZARDS

Criterion 1

Does the EOL MTC measurement conditional exemption involve a significant increase in the probability or consequences of an accident previously evaluated?

NO. The conditional exemption of the most negative MTC measurement does not change the most negative MTC surveillance and LCO limits in the T/Ss. Since these MTC values are unchanged, and since the basis for the derivation of these values from the safety analysis MDC is unchanged, the constant MDC assumed for the FSAR safety analyses will also remain unchanged. Therefore, no change in the modeling (i.e., probabilities) of the accident analysis conditions or response is necessary in order to implement the change to the conditional exemption methodology. In addition, since the constant MDC assumed in the safety analyses is not changed by the conditional exemption of the most negative MTC surveillance measurement, the consequences of an accident previously evaluated in the FSAR are not increased. The dose predictions presented in the FSAR for a SGTR remain valid such that more severe consequences will not occur. Additionally, since mass and energy releases for LOCA and steamline break are not increased as a result of the unchanged MDC, the dose predictions for these events presented in the FSAR also remain bounding.

Criterion 2

Does the EOL MTC measurement conditional exemption create the possibility of a new or different kind of accident from any accident previously evaluated?

NO. Since the EOL MTC is not changed by the conditional exemption methodology of Reference 1, the possibility of an accident which is different than any already evaluated in the FSAR has not been created. No new or different failure modes have been defined for any system or component nor has any new limiting single failure been

identified. Conservative assumptions for MDC have already been modeled in the FSAR analyses. These assumptions will remain valid since the conditional exemption methodology documented in Reference 1 does not change the safety analysis MDC nor the T/S values of the MTC.

Criterion 3

Does the EOL MTC measurement conditional exemption involve a significant reduction in a margin of safety?

NO. The evaluation of the conditional exemption methodology documented in Reference 1 has taken into account the applicable Cook Nuclear Plant Units 1 and 2 T/Ss and has bounded the conditions under which the specifications permit operation. The applicable T/Ss are surveillance 4.1.1.4, and reference "e" is added to the list of references in Specification 6.9.1.11.2. An additional specification 6.9.1.12 is added to define the requirements for the "Most Negative Moderator Temperature Coefficient Limit Report," which is described in Appendices A, C, and D of Reference 1. The COLR has also been modified as described in Appendix B of Reference 1. The analyses which support these T/Ss have been evaluated. The results, as presented in the FSAR, remain bounding since the MDC assumed in the safety analyses and the LCO and surveillance requirement MTCs in the T/Ss remain unchanged. Therefore, the margin of safety, as defined in the bases to these T/Ss, is not reduced.

Conclusion

It is concluded that operation of Cook Nuclear Plant Units 1 and 2 with a conditional exemption from the most negative MTC measurement, as described in Reference 1 and this evaluation, does not involve any significant hazards as defined in 10 CFR 50.92.

References

1. WCAP-13749-P, "Safety Evaluation Supporting The Conditional Exemption of the Most Negative EOL Moderator Temperature Coefficient Measurement," May 1993.

2. Letter ET-NRC-93-3894, from Nicholas J. Liparulo, Manager Nuclear Safety and Regulatory Activities of Westinghouse Electric Corporation to R. C. Jones, Reactor Systems Branch Chief, Division of Engineering and System Technology of USNRC, dated June 1, 1993.

ATTACHMENT 2 TO AEP:NRC:1028A

EXISTING TECHNICAL SPECIFICATION PAGES
MARKED TO REFLECT PROPOSED CHANGES