Commonwealth Edison
1400 Opus Place
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February 22, 1990

Dr. Thomas E. Murley, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Dresden Nuclear Power Station Units 2 and 3
Extended Exposure Limits for 8 x 8 Fuel Assemblies
NRC Docket Nos. 50-237 and 249

References:
(a) Generic Letter 88-16, "Removal of Cycle-Specific Parameter Limits from Technical Specification" dated October 4, 1988.

(b) Letter from J.A. Silady to T.E. Murley, dated October 30, 1989 submitting proposed amendment to remove core limits per GL 88-16.

(c) Letter from J.A. Silady to T.E. Murley, dated February 5, 1990 providing Core Operating Limits Reports for Dresden Units 2 and 3.

(d) Letter from B.L. Siegel to T.J. Kovach, dated February 8, 1990 transmitting Amendments 110 and 105 for Dresden Units 2 and 3, respectively.

(e) Teleconference between CECo (J. Silady) and NRR (B. Siegel, D. Fieno) on October 23, 1989.

Dr Murley:

The enclosures to this letter are provided in support of a proposed extension of the maximum assembly exposures (burnup) for which Advanced Nuclear Fuels Corporation (ANF) 8 x 8 fuel designs have been NRC reviewed and approved to operate in Dresden Units 2 and 3.

Although ANF has provided technical support for allowable 8 x 8 assembly average exposures to 39 GWd/MTU, the ANF 8 x 8 fuel in Dresden is not anticipated to reach an assembly average value significantly greater than 35 GWd/MTU. Therefore, a conservative limit on the peak assembly exposure of 36.5 GWD/MTU is proposed. This limit more closely corresponds to current industry experience with BWR fuel burnup.

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As a result of the Reference (a) Generic Letter, CECo proposed the Reference (b) Dresden license amendment which was approved in Reference (d). These changes removed cycle-specific core limits, including their dependency on fuel burnup, from Technical Specifications and placed them in the Core Operating Limits Report (COLR). This report is updated for each unit at the beginning of each operating cycle and, if needed, during the cycle.

Reference (c) provided the COLRs for the Dresden units which reflect the previously approved maximum burnup values for ANF 8 x 8 fuel. Although no license amendment is necessitated in order to increase these values, your staff provided guidance in Reference (e) concerning the appropriate mechanism for NRC review of the proposed change. This submittal therefore provides the technical justification for the proposed burnup extension and corresponding changes to the current COLR for each unit. For convenience, the proposed changes are provided in the form of COLRs reissued in their entirety as "Revision 1". These reports will not, however, be implemented at the station until your staff has reviewed and concurred with this submittal. The enclosures include both a safety evaluation and a significant hazards evaluation although, as indicated above, no license amendment is involved.

Please contact this office should further information be required.

Very truly yours,

J A Silady

John A. Silady
Nuclear Licensing Administrator

Enclosures: See attached Table of Contents

cc: A.B. Davis - Regional Administrator, Region III
B.L. Siegel - Project Manager, NRR
S.G. DuPont - Senior Resident Inspector, Dresden

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Extended Exposure Limits for 8 X 8 Fuel Assemblies

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Enclosure A

References

1. XN-NF-85-67(P)(A), Revision 1, "Generic Mechanical Design for Exxon Nuclear Jet Pump BWR Reload Fuel", September 1986.

2. ANF-89-80(P), "Dresden Unit 2 and Unit 3 8x8 Extended Burnup Design Report", May 1989.

3. XN-NF-81-75(P), "Dresden Unit 3 LOCA Analysis Using the ENC EXEM Evaluation Model", November 1981.

4. JMR:126:89, J. M. Ross to D. F. Kelter, "8x8 Extended Burnup MAPLHGR for D2 and D3", June 1, 1989.

Enclosure B

Attachments

1 ANF-89-80(P), "Dresden Unit 2 and Unit 3 8x8 Extended Burnup Design Report", May 1989.

2 JMR:126:89, J. M. Ross to D. F. Kelter, "8x8 Extended Burnup MAPLHGR for D2 and D3", June 1, 1989.

Enclosure C

Safety Evaluation

This summary describes the extended burnup analysis for the ANF 8x8 fuel design and the required Core Operating Limits Report changes for both Dresden Units 2 and 3. The evaluation is divided into sections as follows:

1. Background
2. ANF Extended Burnup Analysis - LHGR Curves
3. ANF Extended Burnup Analysis - MAPLHGR Curve
4. Edison Application of ANF Extended Burnup Analysis
5. Description of Core Operating Limits Report (COLR) changes
6. Summary

The extended burnup analyses performed by ANF are applicable to ANF 8x8 fuel in both Dresden units.

In order to increase the allowable burnup on an assembly, several curves in the COLR have to be modified to incorporate the analyzed exposure extensions. These include the Steady State Linear Heat Generation Rate (SLHGR) Limit, the Transient Linear Heat Generation (TLHGR) Limit, and the Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) Limit. The purpose of these limits and the results of the extended burnup analysis are discussed later in this enclosure.

1. Background

ANF 9x9 fuel is currently being utilized as a reload fuel for both Dresden Units, but there is still a considerable percentage of irradiated ANF 8x8 fuel in each core. This fuel is experiencing a higher peak-to-average exposure ratio than that used by ANF in determining the required maximum planar exposure limit in XN-NF-85-67(P)(A), Reference 1. In light of this, ANF performed calculations to justify extension of the allowable burnup range. ANF had previously performed such an analysis for ANF 8x8 fuel for another utility, and used the maximum exposure ranges for peak average exposure and peak planar exposure from that analysis as the basis for this analysis.

2. ANF Extended Burnup Analysis - LHGR Curves

ANF had previously justified irradiation up to a peak assembly average exposure of 35.0 GWd/MTU and a peak planar exposure of 42.0 GWd/MTU in the NRC-approved topical XN-NF-85-67(P)(A), Reference 1. ANF has performed calculations to justify a higher peak assembly average exposure of 39.0 GWd/MTU and a higher peak planar exposure of 50.7 GWd/MTU for Steady State LHGR and 50.0 GWd/MTU for Transient LHGR. The results are included as Attachment 1 (Reference 2). The analyses used the same design criteria and methodology as was discussed in Reference 1 and justified extrapolation of the LHGR curves required to ensure against fuel failure during steady state operation and anticipated operational occurrences. In cases where end of life was not the limiting point in the analyses in Reference 1, the detailed calculations were not repeated in this analysis.

A. Steady State Linear Heat Generation Rate (SLHGR) Limit Analysis

The SLHGR limit assures that the maximum cladding strain and stress limits are met during steady state operation. ANF analyzed these parameters with the same methodology as in the NRC-approved topical, XN-NF-85-67(P)(A), Reference 1. The ANF results in Attachment 1 show that an extrapolation of the current SLHGR curves to 50.7 GWd/MTU peak planar exposure yields adequate margins to limits.

ANF evaluated the maximum cladding strain at a maximum planar exposure of 50.7 GWd/MTU and assuming a linear extrapolation of the current SLHGR curve. ANF demonstrated that the strain at these conditions is below the 1% threshold which is required to avoid ductile cladding failure.

The fuel rod cladding stresses during steady state operation were calculated using linear elasticity theory in accordance with the ASME pressure vessel code. In Attachment 1, ANF states that the analyses in Reference 1 are applicable since conservative estimates of internal pressure at end of life were used and the maximum pressure differential across the tubewall is obtained at beginning of life.

B. Transient Linear Heat Generation Rate (TLHGR) Limit Analysis

The TLHGR limit assures that fuel failures, during power changes caused by anticipated operational occurrences, do not occur by limiting cladding strain to less than 1% and by maintaining the maximum pellet temperature below melting.

The ANF analysis in Reference 1 shows that the limiting condition is at beginning of life, not at end of life, and consequently the analyses performed in support of References 1 are applicable to this design.

C. Other Analyses to Support Extension of the LHGR Curves

Several other parameters were studied to determine the impact of increased exposure on the results. These include:

1. Fuel rod internal pressure,
2. Fuel rod cladding fatigue,
3. Cladding collapse,
4. Fuel rod spacing,
5. Cladding corrosion and hydrogen concentration,

6. Structural strength, and
7. Assembly growth.

ANF states that all design goals are met at the higher assembly exposures. This is discussed in greater detail in Attachment 1.

3. ANF Extended Burnup Analysis - MAPLHGR Curve

ANF has evaluated the impact of an extension of the allowable assembly average exposure limit to 39.0 GWd/MTU on the MAPLHGR limit. This is included as Attachment 2. The analyses were performed with NRC-approved methodology and meets the required design criteria at the higher assembly average exposure. The results are in compliance with Appendix K criteria for peak cladding temperature and maximum percentage of metal-water reaction. ANF extrapolated the MAPLHGR curve linearly to a limit of 9.85 kw/ft at 39.0 GWd/MTU.

4. Edison Application of ANF Extended Burnup Analysis

Edison currently is utilizing ANF 9x9 fuel in the Dresden reloads and does not anticipate loading any fresh ANF 8x8 assemblies. Fuel cycle projections indicate that the peak assembly average exposure of the ANF 8x8 fuel will remain significantly below 36.0 GWd/MTU. In light of this, Edison proposes to limit the peak assembly average exposure limit to 36.5 GWd/MTU, rather than the 39.0 peak assembly exposure limit evaluated by ANF. The higher peak assembly average exposure limit is not required for Dresden, so Edison has decided to conservatively limit the allowable exposure to a value closer to the current licensing limit of 35.0 GWd/MTU.

The peak planar exposure limits analyzed by ANF will be incorporated in the COLR up to the maximum evaluated exposure point. The ANF 8x8 fuel in the Dresden units is running at a higher peak-to-average ratio than that originally used by ANF to determine the appropriate relationship between assembly and planar exposure limits. To ensure that the peak planar exposure limit does not interfere with current cycle operating strategies, the actual evaluated value for planar burnup is proposed to be incorporated into the Dresden COLR.

5. Description of Core Operating Limits Report Changes

Enclosure E provides the COLR changes to support the extended burnup limit for the ANF 8x8 fuel design for Dresden 2; Enclosure F provides the COLR changes for Dresden 3. There is a small difference between the graphs due to the presence of GE fuel in Dresden 2 and hence the requirement for a GE Steady State Linear Heat Generation Rate curve on Figure 3.5-1A. All changes are only to the ANF 8x8 curves and all changes are identical between the two units.

The following outlines the major areas requiring revision and identifies the associated sections of the COLR.

Section	Description
All	COLR Date and Revision Updated
2.0	ANF 8X8 MAPLHGR Curve Extension to 36.5 GWD/MT
3.0	ANF 8X8 SLHGR Extension to 50.7 GWD/MT
4.0	ANF 8X8 TLHGR Extension to 50.0 GWD/MT

6. Summary

The preceding discussions have addressed all major features of the extended burnup analyses for ANF 8x8 fuel for Dresden Units 2 and 3. Commonwealth Edison concludes that operation of Dresden Units 2 and 3 with ANF 8x8 fuel up to the extended burnup limits is safe and acceptable provided the attached COLR changes are NRC-approved and incorporated into the POWERPLEX core monitoring code at Dresden Station.

Based on the above discussion, the analyses in Attachments 1 and 2, and the Significant Hazards Evaluation in Enclosure D, and in accordance with 10CFR50.59, operation of Dresden Units 2 and 3 with ANF 8x8 fuel operating up to the proposed extended burnup limits does not represent an unreviewed safety question.

Enclosure D

Significant Hazards Evaluation

Commonwealth Edison proposes to modify the Core Operating Limits Reports (COLRs) for Dresden Units 2 and 3 to incorporate an extended burnup analysis for the ANF 8x8 fuel design. This change is required to allow cycle length flexibility and ease of operation. Although a general description of the changes follows, more detailed discussion of the changes and their technical bases can be found in Enclosure C.

Description of COLR Changes

The proposed COLR changes are as follows:

1. Extension of the MAPLHGR curve for the ANF 8x8 fuel design to a bundle average exposure of 36.5 GWd/MTU from 35.0 GWd/MTU.

2. Extension of the Steady State Linear Heat Generation Rate (SLHGR) curve for the ANF 8x8 fuel design to a maximum planar exposure of 50.7 GWd/MTU from 42.0 GWd/MTU.

3. Extension of the Transient Linear Heat Generation Rate (TLHGR) curve for the ANF 8x8 fuel design to a maximum planar exposure of 50.0 GWd/MTU from 42.0 GWd/MTU.

Basis for Proposed No Significant Hazards Consideration Determination

Although no license amendment is required, Commonwealth Edison has evaluated the proposed COLR changes and determined that they do not represent a significant hazards consideration. Based on the same criteria for defining a significant hazard established in 10CFR50.92 as applied to license amendments, operation of Dresden Unit 2 and Dresden Unit 3 in accordance with the proposed changes will not:

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

   The proposed MAPLHGR and LHGR limits continue to establish limits on reactor operation to ensure thermal-mechanical integrity of the fuel and cladding is protected. Neither the consequences nor the probability of an accident is affected by these changes because the design basis transients and accidents were considered when establishing these operating limits.

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

   The proposed MAPLHGR and LHGR limit changes establish limits on core power distribution which do not directly affect the operation or function of any system or component. Additionally, the fuel will continue to operate within the NRC-approved design criteria. As a result, there is no impact on any systems or equipment whose failure could initiate a new or different kind of accident.

3. Involve a significant reduction in the margin of safety.

   The changes have been analyzed to demonstrate that the consequences of transients or accidents are not significantly increased and all NRC-approved design criteria are met. The analyses show that the fuel thermal-mechanical limits are not violated during postulated transients. The revised curves are incorporated into the Dresden COLRs to ensure than an adequate margin of safety continues to exist.

Based on the above discussion, Commonwealth Edison concludes that the proposed amendments do not represent a significant hazards consideration.

Enclosure E

Core Operating Limits Report

Dresden Unit 2