



Commonwealth Edison

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December 4, 1984

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Quad Cities Station Unit 2
Proposed Amendment to the
Technical Specifications LHGR
Limit During Cycle 7 Barrier
Fuel Ramp Test
NRC Docket No. 50-265

References (a): T. J. Rausch letter to H. R. Denton
dated January 27, 1983.

(b): R. B. Bevan letter to D. L. Farrar
dated March 3, 1983.

Dear Mr. Denton:

Pursuant to 10 CFR 50.59, Commonwealth Edison herein proposes to amend Appendix A to the Technical Specification of Facility Operating License DPR-30. The purpose of this proposed amendment is to increase by 12 percent the LHGR limit for Barrier Fuel Assemblies in the Barrier Demonstration Cells from 13.4 kw/ft to 15.0 kw/ft. The LHGR increase is necessary to properly perform a control rod withdrawal ramp test at the end of Cycle 7. Currently the test is scheduled for late February, 1985. A similar request was made during Cycle 6, per Reference (a), and approved by Amendment No. 79, per Reference (b). Without this change there is a strong possibility that the Barrier Fuel Ramp Test will be severely compromised because control rods would have to be reinserted in order not to exceed the current LHGR limits.

Our justification for the increase LHGR for specific barrier fuel bundles is provided in Attachment 1. This proposed change has received On-Site and Off-Site review and approval, and is submitted in Attachment 2.

We have reviewed this amendment request and find that no significant hazards consideration exists. Our review is documented in Attachment 3. Commonwealth Edison is notifying the State of Illinois of our request for this amendment by transmittal of a copy of this letter and its attachments to the designated State Official.

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Your immediate attention to this request is required as Quad Cities Unit 2 is projected to reach the proper test conditions, end of full power reactivity, in late February, 1985.

Pursuant to 10 CFR 170, a fee remittance of \$150.00 is enclosed.

Three (3) signed originals and thirty-seven (37) copies of this letter and its attachments is provided for your use.

Very truly yours,



B. Rybak

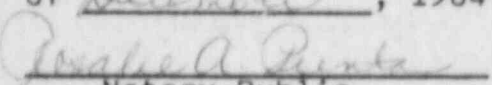
Nuclear Licensing Administrator

lm

cc: R. Bevan - NRR
NRC Senior Resident Inspector - Quad Cities

Attachments (1): Safety Evaluation
(2): Proposed Change to DPR-30
(3): No Significant Hazards Consideration

SUBSCRIBED AND SWORN to
before me this 4th day
of December, 1984


Notary Public

ATTACHMENT 1

SAFETY EVALUATION FOR INCREASED LINEAR HEAT GENERATION RATE

QUAD CITIES 2 CYCLE 7 BARRIER FUEL RAMP TEST

Background

The purpose of this attachment is to provide a technical basis for temporarily increasing the Technical Specification limit on linear heat generation rate (LHGR) from 13.4 kw/ft to 15.0 kw/ft on specified barrier fuel bundles at the end of Cycle 7 (EOC7). The specific barrier fuel bundles are those located in the demonstration ramp cells. The ramp demonstration involves control rod withdrawals which will significantly increase the LHGR of the corner fuel rods in the ramped fuel bundles. The effect on the limiting LHGR transients has been examined for this situation. This evaluation found that the ramp cell fuel would experience peak LHGRs well below the safety limits specified in Reference 1. Provided below is a summary of the items addressed in reaching this conclusion.

The design of the barrier ramp demonstration for EOC7 is predicted to achieve a peak LHGR of 13.4 kw/ft on the ramp cell fuel based on General Electric's 3-dimensional simulator calculations. This peak LHGR occurs in the wide-wide corner rod of the ramp cell bundles (16 rods). Monitoring of the actual LHGR's during the demonstration will be performed by the process computer (P/C) program P-1. Due to uncertainties in both the 3-D simulator prediction and in the in-core instrumentation and P-1 power solution, the peak LHGR's calculated by P-1 will not agree exactly with the 3-D simulator results. The LHGR's in the barrier fuel calculated by P-1 during the barrier ramp demonstration may indicate a violation of the Technical Specification limit of 13.4 kw/ft. We are therefore proposing a relaxation of the Technical Specification limit to allow a temporary increase to 15.0 kw/ft for the maximum allowable LHGR for the barrier fuel during the demonstration and for the duration of Cycle 7 operation subsequent to the test. This change will allow the entire test to be performed without having to reinsert the control rods to fulfill the Technical Specification action statements if 13.4 kw/ft should be exceeded by a small amount as measured by the P/C.

This request is consistent with that made for the end of Cycle 6 ramp demonstration (Reference 2). Without this change, there is a possibility that the Barrier Fuel Ramp Test rods will have to be reinserted. However, it should be noted that if the P-1 calculated LHGR does exceed the current 13.4 kw/ft Technical Specification limit, the duration of operation with the calculated value above 13.4 is expected to be less than a month due to local and core-wide fuel depletion as the core passes through the end of full power reactivity.

Since only the sixteen wide-wide corner pins in these four ramp cells are expected to reach LHGR values near 13.4 kw/ft, the relaxation need only apply to these bundles. The Minimum Critical Power Ratio (MCPR) and Maximum Average Planar Linear heat Generation Rate (MAPLHGR) values are calculated to remain well below the operating limits during the demonstration and therefore no waiver of these limits is necessary. A review of the limiting LHGR events was performed to assure that no violation of licensing safety limits would occur. That is, the peak LHGR during any normal or abnormal transient (if initiated with a ramp cell rod at 15.0 kw/ft) will be less than the LHGR at which 1% plastic strain is calculated to occur. For BP8x8R fuel (UO₂ rods) this corresponds to a LHGR value of 23.1 kw/ft for exposures up to 25,000 MWD/ST (Table 2-3 of Reference 1). The ramp cell fuel is predicted to have nodal exposures in the range of 7000-16000 MWD/ST at the time of the demonstration. The following sections address specific events.

Rod Withdrawal Error (RWE)

The only transient associated with the ramp cell control rod withdrawal would be if a single ramp cell control rod was completely removed after a peak pin power of 15.0 kw/ft is achieved. Assuming this inadvertent RWE is initiated at the beginning of the ramp withdrawals, at rated core conditions, the maximum core power achieved would be less than 103% of rated power. The expected peak LHGR for the RWE would be less than 15.5 kw/ft.

Rod Drop Accident (RDA)

The RDA is initiated with the core in a cold condition, where cold excess reactivity is a maximum for the cycle. For QC2 C7, the RDA was evaluated at the beginning of cycle (BOC7). The RDA at the end of full power would be less severe than the RDA reported in the reload licensing submittal.

Fuel Loading Error (FLE)

For the rotated FLE, a 180° misloading would result in the higher enriched narrow-narrow corner pin being located at the wide-wide corner. The peak LHGR is calculated to be less than 17.1 kw/ft if the unrotated bundle is at 15.0 kw/ft.

Pressurization Transients

The worst pressurization transient with respect to peak heat flux based on the results reported in the QC2 Cycle 7 License Supplement is the Load Rejection Without Bypass. This transient also yields the worst peak nodal heat flux of 122% of the initial heat flux. Assuming the ramp cell fuel is on limits at the start of this event the resulting peak LHGR would be 18.3 kw/ft.

Cold Water Events

The worst cold water event with respect to peak heat flux reported in the Licensing Supplement is the Loss of Feedwater Heaters. This results in a peak heat flux of 120% of the initial heat flux. Assuming the ramp cell fuel is on limits at the start of this event, the resulting peak LHGR would be 18.0 kw/ft.

ECCS Considerations

General Electric has evaluated the effects of the special bundle enrichments on the ECCS analysis and has determined that observance of the current MAPLHGR technical specification limits for these demonstration bundles (even with corner rod operating at 15.0 kw/ft) ensures compliance with the 10 CFR 50 Appendix K limits.

Stability Considerations

Stability is of concern at low flow and high radial peaking. The ramp demonstration will occur at or near full flow and with a less than design radial peaking factor. The core-wide response remains the same as that used in the licensing analyses. Therefore, the current core stability analysis is applicable for the proposed Technical Specification waiver.

Conclusion

Based on the above evaluation, it can be concluded that increasing the Technical Specification value of LHGR from 13.4 to 15.0 kw/ft is really an administrative change to preserve the margin typically maintained between the process computer and design methods. Evaluation results show that the expected LHGR will not exceed 13.4 kw/ft and that if it did reach 15.0 kw/ft none of the previously established safety limits would be exceeded. Thus, a temporary change in the Technical Specification LHGR limit for this specific event is reasonable and technically justified within all safety criteria.

References

1. "General Electric Standard Application for Reactor Fuel," NEDE-24011-P-A-6.
2. "Quad Cities Station Unit 2, Proposed Amendment to Operating Licensing DPR-30 concerning the LHGR Limit during the Cycle 6 Barrier Dual Ramp Test," NRC Docket No. 50-265, Transmittal of T. J. Rausch to H.R. Denton, January 27, 1983.