Commonwealth Edison
One First National Plaza, Chicago, Illinois
Address Reply to: Post Office Box 767
Chicago, Illinois 60690

January 27, 1983

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 Operating
Licensing DPR-30 Concerning the
LHGR Limit During the Cycle 6
Barrier Fuel Ramp Test
NRC Docket No. 50-265

References (a): T. J. Rausch letter to D. G. Eisenhut dated November 1, 1982.

(b): J. S. Abel letter to D. G. Eisenhut dated January 23, 1981.

(c): R. L. Tedesco letter to R. E. Engle (General Electric) dated November 12, 1980.

Dear Mr. Denton:

Pursuant to 10 CFR 50.59 Commonwealth Edison hereby proposes to amend Facility Operating License DPR-30 for Quad Cities Station Unit 2. The reason for the amendment is to increase by 10% the allowable linear heat generation rate (LHGR) limit for the barrier fuel assemblies scheduled to undergo a control rod withdrawal ramp test at Quad Cities Unit 2 in late February, 1983. This Barrier Fuel Ramp Test, reveiwed along with the barier fuel reload program by the NRC in Reference (c), is an important aspect of the overall Barrier Fuel Demonstration Program.

In Reference (a), we provided information about the proposed ramp test which indicated that maximum linear heat generation rates of approximately 13 kw/ft are predicted to occur during the test. These projections were based on General Electric's 3-dimensional core simulator results and therefore represent our most reliable indication of the actual LHGRs to be experienced during the test. However, indication of the actual LHGRs during the test will be calculated by the process computer program P-1, which is susceptible to additional uncertainties resulting from indicated asymmetries in the Transversing Incore Probe

A001
3/40 w/check
$4,000

measurements. This uncertainty may result in an indicated LHGR in excess of the Technical Specification limit of 13.4 kw/ft during the test. We are requesting this change to 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 process computer. Without this change there is a strong possibility that the Barrier Fuel Ramp Test will have to be severely compromised because the control rods would have to be reinserted.

We are proposing a new license condition 3.k to DPR-30 as follows:

3.K Relaxation of LHGR Limit for the Barrier Fuel Ramp Test

For the purpose of the end-of-cycle 6 Barrier Fuel Ramp Test, the steady-state LHGR for the Barrier Ramp Cell fuel may exceed the maximum allowable LHGR identified in specification 3.5.J by no more than 10% (14.7 kw/ft). Accordingly, the design LHGR used in the calculation of MFLPD in specifications 2.1.A.1, 2.1.B and table 3.2-3 shall be increased by 10% for the Barrier Ramp Cell fuel only. If the steady state LHGR for the ramp cell fuel exceeds the maximum allowable LHGR by greater than 10%, the corrective actions identified in specification 3.5.J will be taken. This provision therefore supercedes T.S.3.5.J for the Barrier Ramp Cell Fuel, effective from the initiation of the test until the end-of-cycle 6 shutdown.

This proposed change has received On-site and Off-site review and approval with the conclusion that the change has no impact on the safe operation of Quad Cities station. The attachment to this letter provides a further discussion of this change and its safety aspects.

Your immediate attention to this amendment is requested because Quad Cities Unit 2 is expected to reach the desired test conditions (end of full power reactivity) in mid to late February, 1983. We have discussed this change with members of your staff informally several times and will be in close communication with the Quad Cities NRC Project Manager to keep him appraised of our schedules.

We have reviewed 10 CFR 170 and have determined that this request is one (1) Class III request. As such, a fee remittance of $4,000 is enclosed.

Three (3) signed originals and thirty-nine (39) copies of this transmittal are provided for your use.

Very truly yours,

Thomas J. Rausch

Thomas J. Rausch
Nuclear Licensing Administator

lm

Attachment

cc: Region III Inspector - Quad Cities
Roby Bevan - NRR

SUBSCRIBED AND SWORN to
before me this 27th day
of January, 1983.

Notary Public

5875N

ATTACHMENT

Proposed License Condition To Relax The Technical Specification LHGR Limit for the Q2 EOC6 Barrier Fuel Ramp Test

BACKGROUND

As part of the testing program and in response to previous NRC requests, General Electric has performed calculations to determine the expected peak local powers (linear heat generation rates) and the power changes for the barrier fuel to be subjected to power ramps in the Q2EOC6 Barrier Fuel Ramp Test. The expected peak powers and power changes were calculated with General Electric's 3-D Core Simulator. The 3-D simulator results are considered to be the most accurate indications of the actual peak powers to be experienced during the test. The results of GE's calculations which were provided in Reference (a), indicate a maximum expected LHGR of 13.02 kw/ft in the barrier ramp cell fuel if the test is performed to the end of full power reactivity (EOFPR).

Due to the effects of TIP measurement asymmetries and other uncertainties on the power distribution calculated by the process computer program P-1, the peak LHGRs calculated by P-1 are typically greater than 3-D simulator results. Due to this conservatism, the LHGRs in the barrier fuel calculated by P-1 during the barrier ramp test may indicate a violation of the Technical Specification limit of 13.4 kw/ft. Therefore, we are proposing a relaxation of the Technical Specification limit to allow a 10% increase in the maximum allowable LHGR for the barrier fuel during the test and for the duration of the subsequent cycle 6 coastdown. 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 above 13.4 is expected to be less than 2 months due to local and core-wide fuel depletion as the coastdown progresses. Permission to exceed the Technical Specification limit by 10% for the duration of the coastdown (i.e. till EOC6 shutdown) is being requested for simplicity, since the actual rate of local power coastdown is difficult to predict precisely.

Since only the sixteen bundles in the four ramp cells are expected to reach LHGR values near 13.4 kw/ft (actually only the sixteen wide-wide corner pins in these bundles) the relaxation need only apply to these bundles. The Minimum Critical Power Ratio (MCPR) and Maximum Average Planner 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. The basis for setting the LHGR operating limit is that the peak LHGR during the normal or abnormal transient be less than or equal to the LHGR at which 1% plastic strain is calculated to occur. For P8x8R fuel (UO_2 rods) this corresponds to a LHGR value of 22.7 kw/ft for exposures up to 25,000 Mwd/mt (Table 2-3 of NEDE-24011). The ramp cell fuel will have nodal exposures in the range of 3000-6000 Mwd/mt at the time of the demonstration. The following sections address specific events.

Rod Withdrawal Error (RWE)

The RWE is not really applicable to an all rods out condition for the remainder of the cycle. The expected peak LHGR as analyzed for the actual test is 13.02 kw/ft.

Fuel Loading Error

For the rotated fuel loading error, a 180° misloading would result in the higher enriched narrow-narrow corner pin being located at the wide-wide corner. Since the fuel in question has a specifically designed higher than normal wide-wide pin enrichment this accident is less severe than a normal fuel bundle. The peak LHGR is calculated to be less than 16.0 kw/ft assuming the bundle was on limits (14.7 kw/ft) when properly oriented. This is less severe than the value reported in the QC2 Cycle 6 License Supplement for a fuel bundle o rating at 13.4 kw/ft.

Presurization Transients

The worst pressurization transient with respect to peak heat flux based on the results reported in the QC2 Cycle 6 License Supplement is the Load Rejection without Bypass. This results in a peak heat flux increase of 119% of the initial heat flux. Assuming the fuel in the ramp cell is on limits at the start of this event the resulting peak LHGR would be less than 17.9 kw/ft.

Cold Water Events

The worst cold water event with respect to peak heat flux reported in the License Supplement is the Loss of Feedwater Heaters. This results in a peak heat flux of 119% 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 less than 17.9 kw/ft.

Based on these results, the worst transient event would result in a peak LHGR of 17.9 kw/ft, well below the 22.7 kw/ft limit. Therefore, the increase of the LHGR operating limit to 14.7 kw/ft for the demonstration is acceptable within the approved licensing basis.

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 tech spec limits for these demonstration bundles (even with the corner rod operating 14.7 kw/ft) insures compliance with the 10 CFR 50 Appendix K limits.

---

* This and all following values of peak LHGR shown include 2.2% peaking for fuel densification.

Stability Considerations

The thermal hydraulic stability margins may be impacted if the high LHGR was achieved by an increase in bundle total power (by radial peaking, RPF). However, for the barrier fuel ramp test the high LHGR will be achieved by local and axial peaking. For the bundles in question, the RPF 1.35, which is lower than the 1.4 value used in the stability is not of concern, particularly since the decay ratio margin to the licensing limit of 1.0 is large for QC2.

Based on the above evaluation it can be concluded that increasing the Technical Specification value of LHGR from 13.4 kw/ft to 14.7 kw/ft is really an administrative change to preserve the margin typically maintained between the process computer and design methods. The evaluation results show that the expected LHGR will not exceed 13.4 kw/ft and that if it did reach 14.7 kw/ft none of the previously established safety limits would be exceeded. Thus, a temporary change in Technical Specification LHGR limit for this specific event is reasonable.