Commonwealth Edison
1400 Opus Place
Downers Grove, Illinois 60515

December 16, 1994

Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Document Control Desk

Subject: Response to Request for Additional Information Regarding a Proposed License Amendment Involving Design Features - Fuel Storage

Byron Station Units 1 and 2
(NPF-37/66; NRC Docket Nos. 50-454/455)

Braidwood Station Units 1 and 2
(NPF-72/77; NRC Docket Nos. 50-456/457)

References: 1) G.F. Dick letter to D.L. Farrar dated December 6, 1994, transmitting a Request for Additional Information

2) D.M. Saccomando letter to Office of Nuclear Regulatory Commission dated November 7, 1994, transmitting a proposed Byron and Braidwood license amendment involving Design Features Fuel Storage

In Reference 2, Commonwealth Edison Company (ComEd) submitted a proposed Technical Specification amendment involving a revision to Section 5.6, Design Features - Fuel Storage, which would allow for the use of higher enrichment fuel and specify the spent fuel storage requirements for Regions 1 and 2 of the spent fuel pool.

After the initial review of the submittal, the Nuclear Regulatory Commission transmitted a request for additional information via Reference 1. The attachment provides ComEd's response to the requested information.

Please address any comments or questions regarding this matter to this office.

Sincerely,

Terrence W. Simpkin
for Denise Saccomando
Nuclear Licensing Administrator

Attachments
cc: G. F. Dick, Byron Project Manager - NRR
R. R. Assa, Braidwood Project Manager - NRR
H. Peterson, SRI - Byron
S. G. DuPont, SRI - Braidwood
J. Martin Regional Administrator - Region III
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ATTACHMENT

NRC Question 1

Please describe the boral inserts mentioned on Page 8 of the criticality analyses in more detail. How and when were these inserted?

Response

The boral inserts were put into both the Byron and Braidwood Spent Fuel Pool Region 1 racks prior to initial installation of the two region high density racks. The boral poison plates were inserted into each of the Region 1 flux trap gaps. Specifically, each Region 1 cell contains one boral poison plate per fuel assembly face (two per flux trap). This was done to use boral as a supplemental poison to address boraflex poison sheet shrinkage. The boral poison is 7.5 inches in width with a nominal thickness of 0.075 inches. The boral poison has a boron density of 0.02 g B10/cm^2. The boral inserts are nominally 148 inches long. The licensing reports, which include a description of the boral poison sheets, were submitted in August 1988 for both the Byron and Braidwood High Density Racks and approved by the NRC for Byron in Amendment 25, dated March 17, 1989, and for Braidwood in Amendment 20, dated July 20, 1989.

NRC Question 2

In determining the Integral Fuel Burnable Absorber requirements as a function of initial enrichment, it is stated that the fuel assembly is modeled at its most reactive point in life. At what point is this?

Response

Based on the Integral Fuel Burnable Absorber (IFBA) requirement needed for the Byron/Braidwood Region 1 spent fuel storage racks, the most reactive point in time is at fresh, zero burn up conditions. A more reactive condition other than at beginning of life can occur in burned fuel assemblies containing IFBA, but this occurs for assemblies containing significantly more IFBA than that required for Byron/Braidwood Region 1 storage. For assemblies using more IFBAs than the minimum required reference case, the reactivity will be less even after burn up is incurred, as burn up will remove not only poison, but fissile uranium from the fuel assembly. So, for the same burn up, the assembly with the greater number of IFBAs will still have a lower K-eff than the minimum IFBA case for the criticality analysis. Therefore, these cases would still be bounded by the minimum IFBA requirement since the minimum IFBA cases would be overall more reactive due to less reactivity hold down effect.

NRC Question 3

Section 4.2 states that the burnup credit curve shown in Figure 7 on Page 36 includes a reactivity uncertainty of 0.015 Δk. The corresponding Technical Specification Figure 5.6-1 appears to include an additional 3% penalty factor. What is the reason for this?

Response

The 3% penalty factor included in revised Technical Specification Figure 5.6-1 is the calculational uncertainty of fuel assembly burnup calculated using the TOTE code. The TOTE code is part of the Westinghouse OCAP code package and is used by ComEd to determine individual fuel assembly isotopic inventories and burn ups using data gathered from incore flux maps. The 3% penalty factor is therefore included in the burnup versus enrichment curve to conservatively account for the uncertainty in measured burnup for each individual assembly.

NRC Question 4

How do the K-eff values determined with KENO Va compare to those determined with the PHOENIX code?

Response

Comparison of large K-eff changes between KENO and PHOENIX have always shown favorable results. Typical differences in K-eff between PHOENIX and KENO are always less than 0.01 Δk.

K-effs calculated by PHOENIX and KENO, however, are not directly comparable since KENO uses a three-dimensional Monte Carlo evaluation and PHOENIX uses a two-dimensional transport calculation. The PHOENIX and KENO codes are used to calculate the rack K-eff differently. KENO is used to establish a reference condition to show an acceptable K-eff value for the spent fuel racks. PHOENIX is used to calculate the change in K-eff caused by some change in the reference condition. These changes to the reference condition include material and construction tolerances, gross sensitivities, burnup effects, and addition of IFBA. For small changes in reactivity, Monte Carlo methods will not predict the changes well based on the stochastic nature of the method. Also, most Monte Carlo methods are not capable of modeling fuel assembly burnup. A code like KENO can predict large changes in K-eff, like gross sensitivities, and have been used for these calculations in the past.

Therefore, KENO is used to establish the base K-eff for the spent fuel rack and PHOENIX is used to predict the change in K-eff for each of the desired new conditions. Comparing the absolute K-eff calculated by each code does not produce any desired result. The quantity of interest is the change in K-eff.

NRC Question 5

Technical Specification 5.6.1.2 applied only to fresh fuel for the initial core stored dry in the spent fuel storage racks and is no longer applicable. Has the criticality analysis for storage of fresh 5.0 weight percent fuel in the new fuel vault been submitted and reviewed by the NRC?

Response

The Criticality Analysis of Byron and Braidwood Station Fuel Storage Racks is addressed in Technical Specification Section 6.9, "Reporting Requirements." In particular, Technical Specification 6.9.1.10, "Criticality Analysis of Byron and Braidwood Station Fuel Storage Racks", requires that the Criticality Analysis of Byron and Braidwood Station Fuel Storage Racks report be provided upon issuance of any changes to the NRC Document Control Desk, with copies to the Regional Administrator and the Resident Inspector. In accordance with this Technical Specification, a copy of the "Criticality Analysis of the Byron/Braidwood Fresh Fuel Racks" dated June 1989 was submitted to the NRC in a letter dated August 15, 1989, from S.C. Hunsader (ComEd) to T.E. Murley (NRC). This analysis was performed to increase the storage enrichment of the new fuel storage vault to 5.0 w/o U-235. The Byron/Braidwood Updated Final Safety Analysis Report (UFSAR) was revised accordingly in Revision 1 dated December 1989. A discussion of the new fuel vault was provided on page 9 of the proposed Fuel Enrichment Technical Specification Amendment which was transmitted in Reference 2.