Commonwealth Edison Company
1400 Opus Place
Downers Grove, IL 60515-5701

May 23, 1997

ComEd

United States Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Document Control Desk

Subject: Byron Nuclear Power Station, Units 1 and 2
Facility Operating Licenses NPF-37 and NPF-66
NRC Docket Numbers: 50-454 and 50-455

Braidwood Nuclear Power Station, Units 1 and 2
Facility Operating Licenses NPF-72 and NPF-77
NRC Docket Numbers: 50-456 and 50-457

Primary Containment and Reactor Coolant System Amendment RAI Response

Reference: 1. J. Hosmer (ComEd) Letter to USNRC, Primary Containment and Reactor Coolant System Amendment, dated January 30, 1997.

2. NRC Request for Additional Information Regarding Primary Containment and Reactor Coolant System, dated February 10, 1997.

In Reference 1, ComEd submitted a License Amendment Request to the NRC to incorporate the effect of the increased reactor coolant system volume resulting from the planned replacement of the steam generators at Byron, Unit 1 and Braidwood, Unit 1. In Reference 2, NRC requested additional information regarding the engineering methodologies and analyses. To expedite the review of Question 1-3 enclosed is our response. Question 4 will be provided under separate cover.

Please address any questions or comments to this office.

Sincerely,

John Hosmer

John B. Hosmer
Engineering Vice President

A001
1/1

Attachments

cc: A. B. Beach, Regional Administrator - RIII
G. Dick, Byron/Braidwood Project Manager - NRR
C. Phillips, Senior Resident Inspector - Braidwood
S. Burgess, Senior Resident Inspector - Byron
Office of Nuclear Safety - IDNS

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING THE PRIMARY CONTAINMENT AND REACTOR COOLANT SYSTEM VOLUME BYRON/BRAIDWOOD NUCLEAR POWER STATIONS

NRC Question 1:

Was the Updated Final Safety Analysis Report (UFSAR) analytical methodology used for the mass and energy analyses? If not, provide an UFSAR-quality description of the methodology and confirm that the UFSAR will be updated with that information. Also confirm that the methodology is conservative with respect to the original licensing methodology or conforms to the Standard Review Plan (SRP), Section 6.2.1.3.

Response to Question 1:

The UFSAR methodology was used for the short-term (blowdown and reflood phases) mass and energy releases. The mass and energy release data in the UFSAR was used as the basis for all LOCA containment response mass and energy release calculations. To determine the short-term mass and energy releases with the replacement steam generators (RSGs), the increases in mass and energy values due to the RSGs were applied to the UFSAR mass and energy releases. Specifically, 54,256 lbm and 33.085 Mbtu were added to the UFSAR blowdown mass and energy releases, respectively, to account for the larger primary side volume of the RSGs. To account for the higher operating pressure of the RSGs, the enthalpy of the steam entering containment during the reflood stage was increased by 3 Btu/lbm. Additionally, the mass and energy releases were conservatively increased to represent a containment temperature of 130°F which is 10°F above the current Technical Specification limit.

The post-reflood mass and energy releases due to the RSGs were also based on the UFSAR mass and energy releases. The 3 Btu/lbm, due to the higher operating pressure of the RSGs, was also added to the mass and energy releases during the post-reflood phase. In addition, the time for the SGs to depressurize down to ambient was extended (to approximately 1.5 hours from 1 hour) for the purpose of dissipating the additional stored energy due to the RSGs.

Detailed UFSAR marks-ups which describe the RSG mass and energy increases that were added to the UFSAR mass and energy releases will be included in the UFSAR revision package for the SGR project.

NRC Question 2:

Provide a discussion of results of the CONTEMPT analysis using the mass and energy inputs associated with the replacement SGs. If the peak accident pressures exceed the value that results from adding the incremental increase to the current 44.4 psi TS figure, explain the difference.

Response to Question 2:

To determine the increase in maximum calculated primary containment pressure, P_a, associated with the RSGs, a baseline analysis was performed using the CONTEMPT-B&W model and the UFSAR mass and energy releases to demonstrate that an accurate CONTEMPT-B&W model for the original steam generators (OSGs) had been developed. Revised mass and energy releases for the RSGs (see response to 1, above) were then input to the CONTEMPT-B&W baseline model and the results of the two cases (OSG and RSG) were compared in order to predict the net change in containment pressure.

This baseline calculation comparison showed that the peak pressure predicted by CONTEMPT-B&W for the OSGs was 0.2 psi higher than for the limiting case predicted by the Westinghouse COCO code (used in the UFSAR analysis) for the OSGs. The differences between the two codes, such as the equation used to calculate the condensing heat transfer coefficient (Uchida) and the treatment of the blowdown mass and energy at the break exit point, account for the slightly higher pressure calculated by CONTEMPT-B&W. Therefore, 0.2 psid is considered to be good agreement between CONTEMPT-B&W and COCO. In addition, since the goal of the analysis was to determine the incremental difference between the OSGs and the RSGs, the slightly higher pressure calculated by CONTEMPT-B&W for the OSGs is not considered significant.

NRC Question 3:

Provide a discussion of the potential main steamline break (MSLB) containment temperature profile effect of the replacement SGs, and the need to address the environmental qualification of equipment in containment and steamline spaces.

Response to Question 3:

The increased secondary side mass and energy released due to the RGSs were evaluated for the effect on peak containment temperature. A spectrum of MSLB cases were analyzed to verify that use of the RSGs does not adversely affect the environmental qualification of equipment. Mass and energy releases were calculated using RELAP5/MOD2-B&W computer program (BAW-10164P-A) which is approved for LOCA and non-LOCA analysis of pressurized water reactors. The method used to generate the mass and energy releases is consistent with the methodology approved in BAW-10169P-A. The containment responses were calculated using CONTEMPT-B&W with strict adherence to NUREG-0588, Appendix B, requirements for heat transfer coefficients. Also, consistent with NUREG-0588, zero percent condensate revaporization was conservatively assumed. The analysis results demonstrate that the peak containment temperature remains below the environmental qualification envelope for equipment in the containment EQ zones. Therefore, the RSGs have no adverse affect on the environmental qualification of equipment inside the Byron/Braidwood containments. This conclusion was stated in Attachment A (Section F) of the proposed Technical Specification change submittal.

The impact on the environmental qualification of equipment for a steamline break outside containment is currently being evaluated as part of the steam generator replacement project. The mass and energy releases for the analysis have been calculated using RELAP5/MOD2-B&W and the temperature responses in the main steam safety valve enclosures and the main steam tunnel have been calculated by ComEd using RELAP4/MOD6. The temperature profiles for the RSGs indicate a reduction in the temperature affecting automatic safe shutdown functions in the steam spaces located outside containment. These lower temperatures are a result of a combination of improved modeling of mass and energy calculations from RELAP5/MOD2-B&W and a smaller flow restricting orifice in the outlet nozzle of the RSGs.

The evaluation in process is determining any necessary actions to ensure adequate environmental qualification of all required equipment in the steamline spaces outside containment. Following completion of this evaluation, ComEd will provide the staff with an update on this matter. Ultimately, a detailed description of the methodology used for MSLB mass and energy releases and for the containment/steam spaces temperature calculations will be provided in the UFSAR revision package for the SGR project.