CENTERIOR ENERGY

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License Number NPF-3

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United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Subject: Davis-Besse Nuclear Power Station Resolution of Nuclear Regulatory Commission Information Notice 91-66 Regarding Spent Fuel Pool Criticality Analysis

Gentlemen:

The subject Nuclear Regulatory Commission (NRC) Information Notice (IN) 91-66 (Log Number 1-2560) identified that erroneous data exists in the "Nuclear Safety Guide, TID 7016, Revision 2" (NUREG/CR-0095, ORNL/NUREG/CSD-6/1978). Toledo Edison's review has determined that this error is not applicable to the Davis-Besse Nuclear Power Station (DBNPS). IN 91-66 also identified that a temperature dependency discrepancy exists between KENO-V.a and CASMO-3 calculations for light-water reactor fuel assemblies in a storage configuration. Toledo Edison's review indicates that this error does not affect the criticality analysis performed for the DBNPS new fuel storage facility, however it does affect the criticality analysis performed for the DBNPS spent fuel pool (SFP).

The criticality analysis performed by Babcock & Wilcox Fuel Company (BWFC) for fuel storage in the DBNPS SFP utilized the KENO computer code. Toledo Edison performed a review of the analyses based on the information provided in IN 91-66 and found that the temperature dependence of k-effective was not correctly determined and that the final values of k-effective were, therefore, erroneously low. BWFC intended to perform its KENO spent fuel rack calculations at the water temperature which produced the highest value of k-effective. Due to the discrepancy described in IN 91-66, this temperature was erroneously determined to be 90°F.

Toledo Edison used the CASMO-3 code to determine the magnitude of the error in the values of k-effective calculated by B&W using KENO. CASMO-3 was the same code that was used to determine the errors in the KENO cross section sets noted in IN 91-66. Also, CASMO-3 has been





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extensively benchmarked by Toledo Edison against cold, critical experiments, and has produced excellent results. CASMO-3 predicts a continuous increase in k-effective with water temperature, which is consistent with calculations referred to in IN 91-66. It is inferred that it is more conservative to assume a higher water temperature. Therefore, Toledo Edison determined the reactivity difference between 90°F and the maximum possible temperatures that could exist in the SFP. A temperature of 240°F was assumed, which is approximately the highest saturation temperature that could exist at the depth of the spent fuel racks. This value exceeds the design basis maximum temperature for the SFP (assuming no heat removal capability), which has been calculated to be 206°F. The resulting reactivity difference, or "temperature penalty", using a SFP temperature of 240°F, was determined to be +0.00650 $\Delta k$.

As documented in the NRC Safety Evaluation dated April 13, 1989, relating to License Amendment Number 130 to the DBNPS Operating License, the SFP criticality analyses included a dropped fuel assembly lying horizontally on top of the vertical stored fuel assemblies. In addition, the spent fuel pool was assumed to be simultaneously infinitely diluted (i.e., no soluble boron). Having to assume two simultaneous accidents (dilution accident and dropped assembly accident) was beyond regulatory requirements. Therefore, the dilution accident, which is more severe than the dropped assembly accident, should be considered separately.

The magnitude of the reactivity penalty associated with the dropped assembly accident was 0.01319 $\Delta k \pm 0.00595$ $\Delta k$, with the uncertainty being due to the statistical (Monte Carlo) methodology used to calculate this penalty. Since the uncertainties were always applied in a conservative fashion by statistically combining them and adding the result to the base k-effective to obtain the final k-effective, the net penalty associated with the dropped fuel assembly accident amounted to about 0.016 $\Delta k$.

The temperature penalty magnitude (0.00650 $\Delta k$) is less than half of the magnitude of the dropped assembly penalty (0.016 $\Delta k$). Therefore, removal of the dropped fuel assembly accident penalty will more than offset the temperature penalty that must be applied to compensate for the ENO cross section error. Toledo Edison concludes that the DBNPS SFP fuel storage design remains safe and that the design continues to meet all acceptance criteria.

Toledo Edison requests your written concurrence by November 2, 1992, that the basis of your previous approval of License Amendment Number 130 remains valid. Should further information be required, please contact Mr. R. W. Schrauder, Manager - Nuclear Licensing, at (419) 249-2366.

Very truly yours,

MKL/wab

Attachments

cc: A. B. Davis, Regional Administrator, NRC Region III
J. B. Hopkins, NRC/NRR DB-1 Senior Project Manager
W. Levis, NRC Senior Resident Inspector
J. R. Williams, Chief of Staff, Ohio Emergency Management Agency, State of Ohio (NRC Liaison)
Utility Radiological Safety Board