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

Dear Mr. Denton: ULNRC-1416

DOCKET NUMBER 50-483
CALLAWAY PLANT, UNIT 1
CORRECTIONS TO THE SPENT FUEL STORAGE
RACK CRITICALITY ANALYSES AND TO TECHNICAL SPECIFICATION 3/4.9
FIGURE 3.9-1, AMENDMENT 12
Reference: ULNRC-1192, dated October 15, 1985

Fuel management plans for Callaway's next cycle provide for the introduction of Westinghouse Vantage 5 (V5) fuel reload assemblies. In preparation for the introduction of V5 fuel, Pickard, Lowe and Garrick, Inc. (PLG) was requested to perform supplemental calculations to verify criticality limits for storage of V5 fuel in the spent fuel pool and in the new fuel storage pit. PLG performed the original analyses used in the licensing basis FSAR and in support of the storage of Westinghouse Standard Fuel (SFA). PLG also performed a criticality re-analysis in 1985 in order to support the storage of Optimized Fuel (OFA) (see referenced Amendment Request letter ULNRC-1192).

In the course of performing the supplemental analyses to support storage of V5 fuel, inconsistencies were identified between the current work and that provided in 1985. These inconsistencies have been reviewed, and the source of the errors identified. The discrepancies render incorrect both the SFA and OFA curves currently presented in Figure 3.9-1 of the Callaway Technical Specifications 3/4.9 (see Attachment 1). The discrepancies occurred in spite of the fact that, prior to the 1985 criticality re-analysis work, Union Electric personnel performed an audit of PLG which included a technical review of their modeling techniques and computer codes. In addition, in-depth reviews were performed on representative PLG benchmark calculations against critical data. Finally, as part of Union Electric requirements and the PLG Quality Assurance program, PLG provided Union Electric with a Quality Assurance verification

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report at the time they submitted the final results of the criticality analysis. The verification report described their independent reviews to assure the accuracy of the results.

INCORRECT OFA CURVE IN TECH SPEC FIGURE 3.9-1

The discrepancy in the OFA curve was caused by an error in a correction factor used for the detailed modeling of changes in the fission product absorption cross sections with fuel depletion. The error caused an overestimation of fission product absorption and therefore resulted in an underestimation of the required burnup levels. The curve was recalculated using the correct factors on fission product absorption. On the average the difference between the incorrect and correct OFA curves is approximately 2000 MWD/MT.

INCORRECT SFA CURVE IN TECH SPEC FIGURE 3.9-1

The discrepancy in the SFA curve was attributed to an incorrect transcription of data from the original SFA calculated curves which were being used as the base for extending the SFA curve for the 1985 analysis. A review of the original calculation confirmed their correctness. The SFA curve calculated as part of the 1985 analysis was redone again to assure the use of correct values. The differences between the incorrect and correct SFA curves is on the average approximately 1800 MWD/MT. The correct SFA curve also yields required burnup levels above the previously underestimated values.

IMPACT OF CORRECTIONS TO TECH SPEC FIGURE 3.9-1

Attachment 2 provides the corrected SFA and OFA curves that should be incorporated into the Callaway Technical Specifications. Both OFA and SFA curve discrepancies involved errors in implementation of the same modeling techniques and computer codes previously validated, approved, and used in all prior criticality analyses. The corrected analyses confirm that the considerable amounts of margin in the analyses preclude any violations of regulatory limits whether using the incorrect or correct curves. In addition, if credit is given for 2000 ppm soluble boron in the spent fuel pool water, then loading Region 2 to the maximum allowed density with fresh fuel at an enrichment of 4.2 w/o would yield a multiplication factor equal to approximately 0.89 and well below the regulatory limit.

ACTIONS TAKEN TO ASSURE REGULATORY COMPLIANCE AND TO CORRECT FIGURE 3.9-1

Union Electric has undertaken the following activities to assure continued compliance with regulatory limits for storage of

spent fuel and to correct Figure 3.9-1 of the Callaway Technical Specification.

(a) Union Electric is preparing an amendment request to correct Figure 3.9-1 of the Tech Specs and also to update the Tech Specs to include the Vantage 5 fuel upgrades. The amendment request will be submitted to the NRC by the end of December 1986.

(b) On December 4, 1986 Union Electric personnel visited the Washington, D.C. offices of PLG and performed a technical review and verified the current calculational results for the criticality analyses. The modeling techniques and representative computer code inputs/outputs and hand calculations were reviewed in detail.

(c) A review of spent fuel pool storage records confirmed that there are no spent fuel assemblies stored in the Region 2 configuration of the pool. Further review indicates that only four or five fuel assemblies (2.6 w/o SFA Fuel stored in Region 1) attained burnup levels close to the minimums allowed for Region 2 storage. These bundles attained a burnup of 17,600 MWD/MT. Under the incorrect curve the limiting burnup for 2.6 w/o fuel would be 15,000 MWD/MT. Under the corrected curve the limiting burnup for storage of 2.6 w/o fuel in Region 2 is 16,800 MWD/MT. Using the corrected curve the most limiting bundles are 800 MWD/MT above the allowable minimum burnup level. In addition to being above the allowable minimum burnup level, considerable margin also exists due to the conservative practice of excluding from criticality calculations the 2000 ppm soluble boron normally present in the spent fuel pool.

(d) Union Electric has implemented administrative controls to assure that until the Technical Specification Figure 3.9-1 is corrected, all spent fuel assemblies will be stored only in the Region I configuration and density. In effect fuel will not be stored in Region 2 whose boundaries are controlled by storage configuration and burnup restrictions.

CONCLUSIONS

The corrections that were required to the curves of Technical Specification Figure 3.9-1 affected the depleted fuel portions of the 1985 analysis and did not impact the results based on fresh fuel calculations. Therefore, the criticality limit results reported in the referenced letter for Region 1 of

the spent fuel pool, for the new fuel storage pit and for accident considerations remain valid. Furthermore, all spent fuel has been stored in the Region 1 configuration, and administrative procedures have been implemented which require that spent fuel be stored in the Region 1 configuration until the corrected curve has been incorporated in the Technical Specifications.

Very truly yours,

Robert H. Schubert

for Donald E. Schnell

DJW/plh
Attachments