PROPOSED CHANGE RTS-178
TO THE DUANE ARNOLD ENERGY CENTER
TECHNICAL SPECIFICATIONS

The holders of license DPR-49 for the Duane Arnold Energy Center propose to amendment Appendix A (Technical Specifications) to said license by deleting the current pages and replacing them with the attached, new pages. A list of the affected pages is provided below.

The current fuel storage rack Technical Specifications are written in terms of effective multiplication factors (k_{eff}). In the past, there has been enough margin that compliance with these limits has not been a concern. However, as fuel designs are improved to allow longer fuel cycles this margin will be reduced, necessitating stricter administration of these specifications. In their present form, these specifications are difficult to administer, as complex calculations are required to ensure compliance. These changes to the Technical Specifications will add bundle k_∞ values which correspond to the rack k_{eff} limits. By using bundle k_∞ values, which are readily available, the compliance check process will be greatly simplified.

For the GE-designed new fuel racks, the equivalent bundle k_∞ limit is 1.31 and is described in the GE Standard Application for Reactor Fuels, NEDE-24011-P-A, Section 3.3.2.1.4.

For the PARR-designed spent fuel racks, the present limit of 15.3 grams U-235 per axial centimeter of fuel is being replaced with an equivalent k_∞ value of 1.35. This axial enrichment corresponds to a uniform lattice enrichment of 3.1 weight percent U-235, assuming no burnable poison. This lattice design was used in the original Monte Carlo analysis to license the high density racks. Thus, this same lattice design was used to derive the equivalent bundle reactivity limit (k_∞) being proposed here. The attached GE letter describes this latest analysis.

The changes being made are as follows:

1) Add bundle k_∞ limit to the new fuel rack specifications in Section 5.5.1

2) Replace current axial enrichment criteria with an equivalent bundle k_∞ value in the spent fuel storage rack specifications of Section 5.5.2.

3) Add Bases and References to Section 5.5, which describe the basis for the storage rack specifications and detail how to perform the compliance check.

LIST OF AFFECTED PAGES

5.5-1
5.5-2*

*new page

5.5 SPENT AND NEW FUEL STORAGE

1. The new fuel storage facility shall be such that the effective multiplication factor (k_{eff}) of the fuel, dry is less than 0.90 and flooded is less than 0.95. These k_{eff} values are satisfied if the maximum infinite lattice multiplication factor (k_∞) of the individual fuel bundles is $\leq$ 1.31.

2. The k_{eff} of the fuel in the spent fuel storage pool shall be less than or equal to 0.95. This k_{eff} value is satisifed if the maximum, exposure-dependent k_∞ of the individual fuel bundles is $\leq$ 1.35.

3. Spent fuel shall only be stored in the spent fuel pool in a vertical orientation in approved storage racks.

Bases

The basis for the k_∞ limit is described in Section 3.3.2.1.4 of Reference 1 for the GE-designed new fuel storage racks. Compliance with this specification is demonstrated by comparing the beginning-of-life, uncontrolled k_∞ values for the fuel type of interest to the 1.31 limit. For GE-supplied fuel, k_∞ values can be found in Table 3.3-1 of Reference 1. The k_∞ values found in Table 3.3-1 represent the maximum, exposure-dependent lattice reactivity and can be conservatively applied to the new fuel limit.

An infinite lattice, Monte Carlo analysis was performed to determine the maximum permissible bundle reactivity (k_∞) which satisfies the k_{eff} limit for the PARR-designed spent fuel racks.[2] This analysis was performed assuming a uniformly enriched U-235 lattice of 3.1 weight percent, with no burnable poison, i.e., gadolinia, and is considered very conservative relative to actual fuel designs. Compliance to this k_∞ limit is performed in an identical manner to the new fuel rack compliance check, except that peak exposure-dependent uncontrolled k_∞ values are used instead of beginning-of-life values. Again, for the GE-supplied fuel these k_∞ values can be found in Table 3.3-1 of Reference 1.

References

1) General Electric Standard Application for Reactor Fuel, NEDE-24011-P-A.*

2) Letter, B.F. Rubin to D.L. Wilson, "Fuel Storage Rack Technical Specifications to Apply to LTA's," BFR: 84-086, October 25, 1984.

*Latest NRC-approved revision.

EVALUATION OF CHANGE WITH RESPECT TO 10 CFR 50.92

Summary

This application, RTS-178, proposes to revise the Duane Arnold Energy Center Technical Specifications regarding the spent and new fuel storage racks. These revisions will clarify the basis for the existing specifications, thereby making them easier to administrate. This will be accomplished by adding bundle reactivity limits (k_∞) to the existing new fuel rack reactivity limits (k_{eff}) and replacing the existing axial enrichment limit (gm/cm U-235) with an equivalent bundle reactivity (k_∞) for the high-density spent fuel storage racks.

In accordance with the requirements of 10 CFR 50.92, the enclosed application is judged to involve no significant hazards based upon the following information:

(1) Does the proposed license amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: Revising the existing fuel storage rack Technical Specifications to include bundle reactivity limits (k_∞) does not involve a physical change to the facility. In addition, these bundle k_∞'s represent the equivalent fuel reactivity limits to the existing storage rack reactivity limits (k_{eff}), which are not being modified. Therefore, the probability of occurrence or the magnitude of the consequences of a criticality accident in the storage racks will not be changed over that previously analyzed by adding bundle k_∞ values to the new fuel rack limits and replacing the axial enrichment limit with an equivalent bundle k_∞ value to the spent fuel storage specifications.

(2) Does the proposed license amendment create the possibility of a new or different kind of accident than any accident previously evaluated?

Response: The reactivity limits for the fuel storage racks provide protection against inadvertant criticality events, which have previously been analyzed in the UFSAR. Adding corresponding fuel reactivity limits to the existing rack limits and replacing the axial enrichment limit with an equivalent bundle k_∞ value will, therefore, not introduce the possibility of a different accident or malfunction than any previously considered.

(3) Does the proposed amendment involve a significant reduction in a margin of safety?

Response: The margin of safety for the fuel storage racks is defined by the existing rack reactivity limits, which are not being revised. Therefore, the addition of bundle reactivity limits and the replacement of the axial enrichment limit with an equivalent bundle k_∞ value will not reduce the margin of safety.

In the April 6, 1983, Federal Register, the NRC published examples of license amendments that are not likely to involve a significant hazards concern. Example number (ii) of that list states:

> "A change that constitutes an additional limitation, restriction, or control not presently included in the technical specifications: for example, a more stringent surveillance requirement."

As this submittal adds bundle reactivity limits, which are not presently included in the fuel storage rack Technical Specifications, this example is judged to apply.

Based upon the above evaluation, this application is judged not to involve a significant hazards consideration.

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