UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 17 TO FACILITY LICENSE NO. DPR-38
CHANGE NO. 27 TO TECHNICAL SPECIFICATIONS;

AMENDMENT NO. 17 TO FACILITY LICENSE NO. DPR-47
CHANGE NO. 27 TO TECHNICAL SPECIFICATIONS;

AMENDMENT NO. 15 TO FACILITY LICENSE NO. DPR-55
CHANGE NO. 14 TO TECHNICAL SPECIFICATIONS

DUKE POWER COMPANY

OCONEE NUCLEAR STATION, UNITS 1, 2 AND 3

DOCKET NOS. 50-269, 50-270 AND 50-287

Introduction

By letter dated September 12, 1975, Duke Power Company (the licensee) requested a change in the Technical Specifications of Licenses No. DPR-38, DPR-47, and DPR-55 for the Oconee Nuclear Station, Units 1, 2, and 3. The proposed amendments would allow changes in the design of the Unit 3 spent fuel pool from that reviewed and approved in the operating license review and as described in the FSAR. These design changes would provide for the replacement of the existing fuel storage racks with a High Capacity Fuel Assembly Storage Rack. The modified facility would increase the fuel storage capacity of the Unit 3 spent fuel pool from 216 to 474 fuel assemblies. The requested amendments would revise the Technical Specifications to reflect the resultant minimum edge-to-edge spacing between adjacent fuel assemblies and would identify the resultant change in the k effective.

Discussion

The existing spent fuel storage facilities at the Oconee Nuclear Station consist of a common spent fuel pool for Units 1 and 2 and a separate spent fuel pool for Unit 3 with a resultant total storage capacity of 552 fuel assemblies. The common fuel storage pool for Units 1 and 2 could accomodate 336 assemblies whereas the Unit 3 pool capacity is presently 216 fuel assemblies.

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The present spent fuel storage rack design has an assembly center-to-center spacing of 21 inches which assures a k effective of less than 0.9, assuming unborated water in the pools. The existing spent fuel pool cooling system for each pool is designed to maintain the pool water at 150°F or less with the maximum predicted number of spent fuel assemblies discharged to the pool.

The licensee is proposing to increase the spent fuel capacity of the Unit 3 pool from 216 to 474 fuel assemblies. This would be accomplished by replacing the existing storage racks with a new High Capacity Fuel Assembly Storage Rack having a smaller center-to-center fuel assembly spacing. The new rack would consist of an array of one quarter inch thick stainless steel storage cavities having a nominal center-to-center spacing of 14.090 inches; each storage cavity can accomodate one fuel assembly. The fuel assembly storage cavities would be structurally connected to form ten fuel assembly storage modules by means of dimensionally controlled steel channels which would limit the structural deformations and maintain the required center-to-center spacing between adjacent fuel assembly storage cavities. All ten modules would be interconnected and rest on the pool floor. The High Capacity Fuel Assembly Storage Rack and its associated structures are designed to seismic Category I criteria.

Evaluation

Our review of the licensee's proposal consisted of a detailed analysis of each area in which potential safety considerations were involved. Each of these areas is evaluated separately below.

1. Criticality Analysis

The center-to-center spacing of assemblies in the new storage rack would be reduced from 21 inches to a minimum of 14.090 inches nominal. This would tend to increase the effective neutron multiplication factor, k effective, of the array. We have reviewed the licensee's analysis of the proposed fuel storage configuration to determine the margin to criticality afforded by the proposed design. The calculations were performed with a transport theory code DOT-2W which has been qualified by comparison with critical experiments. The calculated value of k effective for the proposed rack design has been determined to be 0.936, including all uncertainties. The effect of credible non-normal distributions of fuel assemblies has been calculated and determined to be 0.002 k effective. We have therefore found the criticality analysis of the proposed storage rack to be acceptable.

2. Rack Structural Design

The licensee submitted a detailed seismic design analysis of the proposed new storage rack which included the use of appropriate codes and floor response spectra. The results of this analysis were combined with those from other suitable loadings and compared against acceptable allowable stress levels and deflection criteria. We have concluded that the procedures used and the results achieved show that the rack design is acceptable.

3. Thermal Considerations

The existing spent fuel pool cooling system is a seismic Category I system with a sufficient cooling capacity to keep the spent fuel pool water temperature to less than 150°F for 216 fuel assemblies. The licensee submitted an evaluation of this system to determine whether it would retain the capability to cool the pool to the design temperature, considering the increased heat load due to the increased storage capacity. We independently reviewed the system and agree with the licensee's conclusion that the existing cooling system has sufficient capacity to maintain the spent fuel pool at less than 150°F for the most adverse loading condition.

We additionally analyzed the spent fuel pool heatup time in the event that the spent fuel pool cooling system should fail. The minimum time to reach the boiling point from a pool water temperature of 150°F was determined to be 6.7 hours under the most adverse conditions. Even in the event of a complete system failure other sources of makeup would be available for addition to the pool. These sources would include the Borated Water Storage Tank, the Reactor Coolant Bleed Tank or the Concentrated Boric Acid Storage Tank. We therefore conclude that in the unlikely event of a complete failure of the spent fuel pool cooling system there would be more than sufficient time for an operator to either effect repairs or connect additional cooling.

4. Radiation Levels

Oconee Unit 3 spent fuel pool is not presently being used for new or spent fuel storage. The unirradiated fuel for the initial cycle of Unit 3 was temporarily stored in the pool prior to loading, however, spent fuel has neven been stored in the Unit 3 pool. In view of this, surface contamination in the pool due to plate out of fission products is non-existant and the work performed by personnel in removing the existing storage racks and installing the proposed racks would not involve any radiological control problems.

The resultant effect on the above pool dose rates to personnel as a result of increasing the number of stored spent fuel assemblies has been determined to be negligible. The basis for this conclusion is the batch manner in which fuel would be added to the pool. Spent fuel assemblies become less significant as a source of radionuclides as time progresses due to the decrease in fission product diffusion as the fuel temperature decreases. In addition, radionuclides present would decay with time and would be removed from the pool by the Spent Fuel Cooling System demineralizers. The contributions of each batch are, therefore, reduced significantly before the next successive batch of spent fuel is placed in the pool. Thus, at the end of the fuel cycle before the next batch is put into the spent fuel pool, the effects of the preceding fuel batches would be minimized. We, therefore, agree that the resulting dose rate due to increased spent fuel pool storage would be negligible and therefore the dose levels described in the Oconee FSAR Section 11.2.1.1 would remain unchanged.

In view of the above, we conclude that the resultant effect on the site radiation levels as a result of the proposed change would be acceptable.

5. Accident Considerations

The potential radiological consequences of a fuel handling accident involving mechanical damage to a fuel assembly are analyzed in the Oconee FSAR Section 14.2.2.1 and in FSAR Supplement 1, page 1-20. Although the new storage rack would accomodate a larger inventory of spent fuel, the rack would extend a sufficient distance above the stored fuel assemblies to protect the fuel from the accidental drop of a single assembly. The consequences of such a postulated accident would therefore be no more severe than those previously analyzed and determined to be acceptable.

6. Postulated Spent Fuel Cask Drop Accident

An analysis of the consequences of a postulated spent fuel cask drop accident was submitted by the licensee as Revision 35 to the Oconee FSAR. In response to a request for additional information, the licensee submitted an additional analysis by letter dated November 3, 1975. The staff review of the spent fuel cask drop analysis for Oconee Units 1, 2, and 3 is scheduled for completion in early 1976.

In view of the current shortage of offsite spent fuel space and spent fuel reprocessing capability, the licensee does not anticipate shipping spent fuel offsite for approximately 5 years. The spent fuel cask may possibly be used to transfer spent fuel from the Unit 1 and 2 spent fuel pool to the Unit 3 spent fuel pool in about 4 years. Prior to the use of the spent fuel cask, the staff will determine the acceptability of the spent fuel cask drop analysis. Based on this fact, we have determined that a completed spent fuel cask drop accident analysis is not a prerequisite for our approval of the proposed modification.

In summary, we have determined that the proposed modifications to the Oconee Unit 3 spent fuel pool are acceptable because: (1) the design would preclude criticality for any moderating condition, (2) the rack structural design has adequately provided for seismic conditions, (3) the existing spent fuel pool cooling system has been analyzed to have sufficient capacity to provide adequate cooling for the increased heat load, and (3) the increased radiation doses both onsite and offsite would be negligible.

Conclusion

We have concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations and the issuance of these amendments will not be inimical to the common defense and security or to the health and safety of the public.

Date: DEC 22 1975