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DENTON,H.R. Office of Nuclear Reactor Regulation, Director
STOLZ,J.F. Operating Reactors Branch 4

SUBJECT: Requests NRC concurrence w/util approach re 820201 agreement w/Westinghouse on performance of spent reactor fuel consolidation svcs w/four 15x15 B&W Fuel assemblies.

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February 22, 1982

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

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U.S. NUCLEAR REGULATORY COMMISSION
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Attention: Mr. J. F. Stolz, Chief
Operating Reactors Branch No. 4

Subject: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287

Dear Sir:

On February 1, 1982, Duke Power Company (Duke) and Westinghouse Electric Corporation entered into an agreement regarding Westinghouse's performance of spent reactor fuel consolidation services with four 15 x 15 B&W fuel assemblies in accordance with the Westinghouse spent fuel consolidation services proposal dated August 1981. A detailed overview of the program and necessary analyses was informally presented to the Commission on January 28 in Bethesda, Maryland. As a followup to that meeting, this letter serves as both a formal notification of Duke's intentions and a request for NRC's concurrence on the approach Duke plans to take in performing this work.

The Duke/Westinghouse agreement requires Westinghouse to design, fabricate and operate the consolidation equipment whereas Duke is required to supply the four spent fuel assemblies as well as the Oconee 1, 2 spent fuel pool and related facilities, equipment and manpower. Each party is also expected to perform selected safety analysis relevent to and necessary for performing the demonstration.

The Westinghouse consolidation system pulls the entire assembly of fuel rods at once. The assembly is held in a "consolidation stand" which sits in the cask loading area. The upper end fitting is removed by inserting a retractable tube cutter into each of the guide tubes and cutting from the inside out. Once the upper end fitting is removed, a multiple rod gripper is lowered onto the now-exposed tops of the fuel rods. After securing all rods, the gripper is raised, pulling all rods at once. The rods are then fed through a transition cannister which puts them into a close packed triangular array from which they are fed into the storage cannister. This process is repeated twice for each cannister resulting in two fuel assemblies consolidated into one storage cannister or a 2:1 consolidation ratio. An end fitting engraved with the two fuel assembly I.D. numbers is secured

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onto the top of the storage cannister. After transferring the storage cannister to a fuel rack storage location the resulting two assembly skeletons are compacted and canned for offsite shipment and burial.

As mentioned above, this demonstration will be performed in the cask handling area of the Oconee 2 spent fuel pool. Equipment and fuel handling will be done using two two-ton auxiliary cranes and one 100 ton crane, all of which are or will be seismically qualified for their respective uses during the demonstration. Duke personnel will assist Westinghouse personnel in equipment set-up, operation, and decontamination. Four fuel assemblies have been chosen for the demonstration from a two cycle batch of fuel discharged from the Oconee 2 reactor on May 28, 1977. The five year decayed fuel will have average burnup, curie content and decay heat loadings of 26,800 MWD/MTU, 208,858 curies and 961 watts respectively.

As presented at the January 28 meeting in Bethesda, various safety reviews have been performed mostly on a preliminary basis. The following is a summary of these reviews and the conclusions reached at this point:

Nuclear Criticality: The acceptance criteria for the nuclear criticality review was to ensure that Keff $\leq$ 0.95 under all conditions with all uncertainties included. The assumptions used in this analysis were that the fuel is fresh (2.75 $^{w}/_{o}$), an infinite pure water reflector is present and that geometry control is used where possible. The worst accident condition is a uniform increase in pitch during fuel rod removal where geometry control is not possible. For the most reactive uniform pitch of about .8 inches, Keff < 0.95. Keff continuously decreases with decreasing pitch from .8 inches. Therefore, this ensures that the storage mode containing the close packed rods is non-reactive.

Structural/Seismic: In the Structural/Seismic review, the areas of concern were local cell assembly stresses and pool floor loads. Under both normal and seismic conditions, the margin of safety for all stress categories of each component were slightly lower for the consolidated fuel as compared to the un-consolidated fuel. These lower margins were still considered as acceptable. The analysis of fuel pool loading showed an increase of less than 1.5% for both types of installed racks under normal and seismic conditions. Cannister sliding and impacting within the storage cell will not be a concern due to the design of the cannister.

Thermal Hydraulic: The acceptance criteria for the thermal-hydraulic evaluation is that local or bulk boiling in the spent fuel pool does not occur under normal conditions and that the design heat load of the spent fuel cooling system is not exceeded under condition I occurrences. The analysis assumes various conservative flow areas and other dimensions, 24 feet of water above fuel, decay heat levels of 961 watts per assembly, inlet temperatures of 150°F, cannister placement in innermost rack location and peak to average pin heat output ratio of 1.6. The analyses performed showed that clad temperature increase with 90% blockage of rack inlet is less than 1°F and that the increase in pool heat load with full storage racks would be less than 0.2%.

Radiological: The radiological review was performed to show that total fuel failure during consolidation would result in doses that are less than previously analyzed accident conditions. This analysis assumed that all 416 rods of one cannister were damaged along with 20% of a nearby freshly discharged fuel assembly (42 rods). Gap activities for the consolidated fuel were assumed to be that of 2 year old fuel whereas the gap activity of the 42 rods was based on FSAR values. The results of this review showed dose levels of 0.038 Rem and 0.33 Rem for the whole body and thyroid respectively. These compare favorably with 2.32 Rem and 36.7 Rem for a 21 assembly cask drop analysis, 4.950 Rem and 78.7 Rem for a 46 assembly cask drop analysis and 10 CFR 100 limits of 25 Rem and 300 Rem.

Although further work is ongoing, a general conclusion from the preliminary results of these and other analyses is that both Duke and Westinghouse feel confident this program can be undertaken without significant impact on plant safety or increase in accident risks.

At present, Duke Power Company is discharging 200 fuel assemblies per year into spent fuel pools of our operating plants. This will increase to about 380 per year by 1986. With this in mind along with the uncertainties in long term away-from-reactor storage or reprocessing by private industry or government, Duke is attempting to investigate all possible spent fuel storage options that have some potential. Rod consolidation appears to have some very strong advantages over other options and therefore Duke would like to investigate its feasibility through this demonstration.

Duke Power Company understands that the requirements for performing spent fuel consolidation on a full scale basis are much more involved and in some areas, much different from the requirements for this demonstration. Therefore, it is important to note that Duke is addressing no more than this demonstration on four fuel assemblies that are five years old.

Duke is confident that all safety questions applicable to this demonstration will be addressed and that the planned approach for performing this work is in agreement with the Nuclear Regulatory Commission requirement. Duke, however, would appreciate a reply from your office expressing agreement with these statements.

Very truly yours,

William O. Parker, Jr.

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