DOCKET NO: 70-371

FEB 9 1983

LICENSEE: United Nuclear Corporation (UNC)
Montville, Connecticut

SUBJECT: SAFETY EVALUATION REPORT - NEW FUEL PART DESCRIPTION AND CONTROL MEASURES, 07000371050S

## I. Background

On October 26, 1982, UNC submitted an application requesting that the license be amended to authorize fabrication of a new series of uranium bearing parts. The composition and configuration of the parts will be changed, but the existing fabrication process will not change.

The safety evaluation is limited to an assessment of reactivity of individual components as the components are fabricated into completed assemblies. Because the feed materials add the manufacturing processes are unchanged, the radiological and environmental conditions will be unchanged and will not be reviewed further.

On November 24, 1982, UNC requested that this amendment be issued by January 7, 1983, as these components are critical to the needs of the U. S. Navy.

## II. Discussion

UNC has in place a system of controls for assuring subcriticality in the process areas. This system includes limits on the reactivity of individual components or groups of components and limits for minimum spacing between components or groups of components.

UNC has referenced criteria in the license to show that a specified quantity of the basic fabricated parts may be handled as a safe unit. For the intermediate and final assembly of the basic components, UNC referenced two WAPD documents (classified Confidential) for the reactivity analyses ($k_{eff}$). The authors of the WAPD documents used a Monte Carlo code and full density water within the completed units to show that single units are safely subcritical. The authors of the WAPD documents also showed that a planar array of assemblies would be subcritical with a range of water densities between the moderated assemblies. For two different assumed boundary conditions for the planar array, the maximum $k_{eff}$ values were <0.86 and <0.93. Calculations reported in the first WAPD document indicated that $k_{eff}$ was greater than 1.0 (supercritical). The second WAPD document attributes this $k_{eff}$ value to improper modeling of the concrete for the floor and ceiling. It should be noted that WAPD validated the code for a reactor core composed of similar units, but did not validate the calculations for concrete, low-density moderator, or for individual assemblies.

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Because UNC did not assess the modeling problem, the two different boundary conditions, or the validation issues, the NRC staff independently assessed the reactivity of a lattice array of finished assemblies. A finished assembly was simulated by a homogeneous $UO_2$-$H_2O$ mixture having approximately the same physical dimensions and unit reactivity. Keno calculations using Hansen-Roach or 27GROUPNDF4 cross-sections were used to assess the reactivity of an infinite array of finished assemblies with varying degrees of interspersed moderation. The maximum $k_{eff}$ value calculated by the staff for either of the two boundary conditions in the WAPD documents is about 0.83. The staff considers the assumed boundary condition associated with the 0.92 value for $k_{eff}$ reported in the WAPD document to be inappropriate. In future applications, UNC should address validation and issues such as assumed boundary conditions.

## III. Conclusion

Based on the description of fuel bearing parts in the WAPD documents and reactivity calculations performed by the Bettis staff and the NRC staff, the NRC staff has concluded that UNC can safely fabricate the fuel parts without undue risk to the public health and safety and to the environment. Approval of the amendment application is recommended.

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