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November 7, 1984

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

Attention: Ms. E. G. Adensam, Chief
Licensing Branch No. 4

Re: Catawba Nuclear Station
Docket Nos. 50-413 and 50-414

Dear Mr. Denton:

Ms. Elinor G. Adensam's letter of October 3, 1984 transmitted additional questions concerning the use of distributed ignition for post accident hydrogen mitigation. These questions were based on analyses performed by an NRC contractor, and the scope and extent of these questions would require that a substantial portion of the analysis previously performed by Duke to address this issue be repeated. This additional work is required despite independent confirmation by the NRC contractor that our initial analysis of the effectiveness of distributed ignition is conservative, under the limitations and assumptions with which we first approached the problem of post accident hydrogen control.

We have performed a review of the results of analysis by the NRC contractor upon which these new questions are based and have the following observations:

1. For none of the analyzed degraded core accident sequences not involving core slump is the integrity of the containment building itself threatened, based on the failure pressure previously reported by Duke Power to NRC. Only one such accident sequence produces a pressure in excess of the ASME Service Level C limit for the containment, and this sequence requires additional failures of ESF systems beyond the original loss of emergency core cooling. Indeed, out of 51 analyses and parametric studies by the NRC contractor of the response of the containment to hydrogen burning, only four showed pressures in excess of the containment failure pressure, and all four of these analyses were based on the complete failure of all ESF systems in containment or complete failure of the distributed ignition system along with core melt. For all other accident sequences, including those in which the core melts, the distributed ignition system acts to preserve containment integrity. With respect to the preservation of the integrity of the containment building, therefore, the analysis by the NRC contractor has confirmed what we have contended for the past four years - the distributed ignition system has been demonstrated effective in preservation of containment shell integrity even for the unrealistically conservative

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assumption of 75% metal/water reaction. We therefore conclude that this issue need not be addressed further.

2. The questions posed by NRC also address equipment survivability inside containment. There are three categories of equipment in question - the instrumentation for monitoring the condition of the primary system, the active pressure suppression equipment inside containment such as fans and the hydrogen ignitors themselves, and internal containment structures such as ice condenser doors and decks. Since we have not received the results of the equipment survivability analysis performed by the NRC contractor, we are unable to assess whether additional analysis by Duke is justified. We note that the biggest concern of NRC seems to be for equipment affected by hydrogen burning in the upper compartment. These large upper compartment burns are caused by complete meltout of the ice condenser and subsequent ignition in the upper compartment. It is apparent that the analysis by the NRC contractor significantly overestimates the rate of ice melting when compared to CLASIX, which contains the NRC approved ice condenser model found in LOTIC. In addition, the magnitude of the pressure rise in the upper compartment due to this ignition is dependent on the combustion assumptions, and the NRC contractor's assumptions appear to be overly conservative when compared to test data.

The following action is planned by Duke Power in response to the referenced letter:

1. Additional analysis of accident sequences will be performed to confirm the results reported by the NRC contractor. This work will be done using the MAAP code developed by the IDCOR program. This code has significant advantages over Version 1.1 of MARCH used in the calculation of mass and energy release rates, by the NRC contractor, and is considered to be equivalent to MARCH 2.0 for these calculations.

2. A best estimate set of hydrogen burn characteristics will be developed based on the latest results from the large scale hydrogen burning tests in Nevada combined with earlier test results previously reported to NRC. We believe that these characteristics will result in significantly different responses from those that the NRC contractor found, particularly with respect to hydrogen burning in the upper containment.

3. We will review the work of the NRC contractor on equipment survivability to determine whether additional analysis is necessary. To assist us in performing this work, please send us a copy of the report prepared by your contractor pertaining to equipment survivability which is a companion report to "MARCH-HECTR Analysis of Selected Accidents in an Ice Condenser Containment," by Camp, et al. We will provide additional analysis if our review indicates that it is required to resolve the equipment survivability issue.

4. Depending on the results of our analysis concerning the probability and magnitude of upper compartment hydrogen burning, we will provide additional information on the fan performance. Previous quantitative assessments of fan performance demonstrated that an increase in fan speed beyond synchronous, so that the fan motor becomes an induction generator, is not likely for hydrogen burning at low concentrations. With respect to ice condenser doors, it should be noted that the current version of CLASIX cannot provide realistic estimates of differential pressure across the doors due to the models used. CLASIX will be modified to provide the capability to model ice condenser doors in a realistic manner, if it appears that significant upper compartment burns are possible.

We estimate that the work required to perform the specified analyses will take approximately four months. Accordingly, a reply to the NRC request for additional information will be submitted by April 1, 1985.

Very truly yours,

Hal B. Tucker

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ROS:slb

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