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DENTON, H. R. Office of Nuclear Reactor Regulation, Director (post 851125

SUBJECT: Responds to 851205 request for addl info re degraded core hydrogen program, including reassessing fog formation studies, results of MARCH-2 calculations & LOCA w/ECCS failure determination. W/o MARCH-2 output.

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January 31, 1986
AEP:NRC:0500U

Donald C. Cook Nuclear Plant Unit Nos. 1 and 2
Docket Nos. 50-315 and 50-316
License Nos. DPR-58 and DPR-74
HYDROGEN CONTROL PROGRAM, FOG REMOVAL INFORMATION

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

Dear Mr. Denton:

During a meeting held on December 5, 1985 with I&MECo to discuss our degraded core hydrogen control program, your staff requested additional information on a number of items. Those items included:

1) providing the staff with a microfiche copy of the results of the MARCH-2 calculations.

2) reassessing the fog formation studies to determine the impact of a reduced spray drop removal efficiency on the CLASIX hydrogen combustion ignition limits.

3) determining whether a small or intermediate break LOCA with failure of the ECCS in the recirculation mode (S2H or S1H) may produce a challenge to the containment beyond that produced by the accident scenario proposed.

In response to Item (1), we have enclosed mircofiche copies of the MARCH 2.152 output for the TMLU, S1D, and S2D accident scenarios.

In reponse to Item (2), we held discussions with your staff on January 14, 1986. During these discussions, our consultant, Battelle Columbus Laboratories, advised your staff that there are two key reasons we should be allowed to use a spray efficiency of 100% in CLASIX. These reasons are as follows:

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NOTE: ENCL IN MICROFICHE FORM, RETAINED IN CENTRAL FILES (TITLED MARCH 2 OUTPUT FILE)

A. A fundamental element of the severe accident analyses is consistency; programmatic consistency in overall approach and physical consistency in sequence definition and modeling. The CLASIX analyses are being performed in a manner consistent with corresponding MARCH analyses. The MARCH analyses are being performed in a manner consistent with prior licensing submittals, modified as necessary to reflect improvements in the state of knowledge of severe accident phenomena.

The CLASIX hydrogen combustion parameters are, therefore, influenced by prior analyses regarding the effects of fogs in suppressing hydrogen ignition in ice condenser containments. We have selected hydrogen ignition criteria that we believe are consistent with the results presented in the fog inerting report in the form of curves of estimated fog concentrations in various containment compartments.

B. The presence of fogs (or any water droplets) in the containment atmosphere provides a significant heat sink for combustion energy. Small-diameter airborne water droplets vaporize readily during hydrogen burns, absorbing energy that would otherwise be manifested as an increase in pressure. Droplet vaporization during combustion was not considered in the previous analysis as a fog removal mechanism. A simple hand calculation has shown that approximately 10 times the energy required to vaporize all of the airborne water droplets at their peak concentration is available during a single hydrogen burn. The first combustion event would, therefore, reduce the fog concentration essentially to zero. The fog generation rates during later portions of the accident are not large, and significant concentrations would not redevelop, particularly since subsequent hydrogen burns would continually remove the fog.

The effect of fog on hydrogen ignition is then only valid for the first combustion event, and irrelevant for the vast majority of the accident analysis. Since the combustion-related pressures and temperatures in containment that impose the most significant challenge to containment integrity and equipment survivability do not result from the first hydrogen burn, but the subsequent succession of burns that typically occur, the fog inerting criteria should not significantly influence our combustion assumptions.

Following the January 14, 1986 discussions, members of your staff advised us that they would like us to incorporate Item B above specifically into our analytical models, either by model changes or by assumptions. We informed them that we would review both options and propose a course of action following that review. We pointed out to them that until this issue was resolved, the schedule presented in the December 5, 1985 meeting would be delayed. Your staff indicated that such a delay would be acceptable.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Item (3) will be discussed with your staff at an upcoming meeting that will include presentation of CLASIX results.

This document has been prepared following Corporate procedures which incorporate a reasonable set of controls to ensure its accuracy and completeness prior to signature by the undersigned.

Very truly yours,

M. P. Alexich RBL 1/31/86
Vice President

cm

Enclosure

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