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RECIP.NAME RECIPIENT AFFILIATION
DENTON,H.R. Office of Nuclear Reactor Regulation, Director

SUBJECT: Forwards description of coding errors recently discovered in CLASIX computer program.Errors associated only w/modeling of flame propagation between containment compartments.Coding errors do not effect previously transmitted analyses.

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December 17, 1982
AEP:NRC:0500L

Donald C. Cook Nuclear Plant Unit Nos. 1 and 2
Docket Nos. 50-315 and 50-316
License Nos. DPR-58 and DPR-74
REPORT OF CODING ERRORS IN CLASIX COMPUTER CODE;
REVISION TO AEP:NRC:0500J RESPONSE ITEM 9

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

Dear Mr. Denton:

Attachment 1 to this letter contains a description of coding errors which were recently discovered in the CLASIX computer program. This computer code has been used in the generation of containment response analyses under postulated hydrogen burn conditions, previously transmitted to the NRC via Attachment 1 to our AEP:NRC:0500H submittal, dated September 30, 1982.

More specifically, the recently discovered coding errors are associated only with the modeling of flame propagation between containment compartments. For the reasons presented in Attachment 1 to this letter, we have concluded that these coding errors have not affected the previously transmitted analyses referenced above.

Attachment 2 to this letter contains a revision to our response to Question 9 of Mr. S. A. Varga's July 30, 1982, request for additional information on hydrogen control. We are revising our original response, previously submitted via our letter AEP:NRC:0500J, dated October 15, 1982, to reflect the use of an "effective" heat of fusion of ice in our CLASIX calculations. This effective heat of fusion results in an ice bed melting rate which is consistent with the Waltz Mill test series drain temperature of 130°F. Our previous response to this item was based on a drain temperature of 32°F, which is the "hard-wired" temperature at which CLASIX adds drain water to the sump.

A001

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,

R. S. Hunter
Vice President

/emc

cc: John E. Dolan - Columbus
M. P. Alexich
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G. Charnoff
NRC Resident Inspector at Cook Plant - Bridgman

Attachment 1 to AEP:NRC:0500L
Donald C. Cook Nuclear Plant Unit Nos. 1 and 2
Report of Coding Errors in the CLASIX Computer Code

Item 6 of Mr. S. A. Varga's letter of July 15, 1981, requested that we provide the NRC staff with a topical report on the CLASIX computer code. As we noted in Attachment 1 to our letter dated February 17, 1982 (AEP:NRC:0500G), TVA had already transmitted the requested Report No. OPS-07A35 to the NRC via their letter of December 1, 1981 (L. M. Mills (TVA) to E. Adensam (NRC)).

As a result of recent work on the CLASIX code, it has been discovered that Sections IV. and V.D of the above referenced report contain possibly misleading information regarding the code's capability to model hydrogen flame propagation between containment compartments. This situation is a result of eight incorrectly coded cards in CLASIX's subroutine BURN.

The eight coding errors result in testing for propagation along imaginary flow paths and/or to imaginary volumes, in allowing for propagation directly between the upper plenum and lower compartment volumes, and in testing of only eight out of ten flow paths for expiration of propagation delay times. We have notified Offshore Power Systems, TVA, and Duke Power Company of these errors, and expect to jointly correct the code.

We note, however, that these coding errors do not invalidate the D. C. Cook Nuclear Plant CLASIX analyses which were submitted via our letter dated September 30, 1982 (AEP:NRC:0500H). The reason for this is the consistent usage of identical hydrogen concentrations for spontaneous ignition in, and propagation to, any single volume. Thus, if a compartment could have been a receiver volume for a propagated burn from an adjacent compartment in a given time step, that same compartment would still spontaneously ignite in the very same time step, regardless of any propagation coding errors. We thus conclude that the coding errors have no effect upon any of the conclusions drawn from CLASIX analyses about the safety of the Cook Plant during hydrogen combustion events.

Attachment 2 to AEP:NRC:0500L
Donald C. Cook Nuclear Plant Unit Nos. 1 and 2
Revision to AEP:NRC:0500J Response Item 9

The following is a revision to our response to Question 9 of Mr. S. A. Varga's July 30, 1982, letter requesting additional information on hydrogen control for ice condenser plants. Our original response was submitted via the Attachment to our letter dated October 15, 1982 (AEP:NRC:0500J).

Response to Questions 9(a), 9(b), and 9(c):

The total energy removed by the ice condenser is converted into a mass of ice melted by dividing by an "effective" heat of fusion of the ice. As noted in Attachment 2 to our AEP:NRC:0500E submittal, dated July 2, 1981, this effective heat of fusion consists of 150 Btu/lbm (actual heat of fusion) plus another 98 Btu/lbm which would raise the ice condenser drain temperature from 32°F to 130°F (the Waltz Mill test series drain temperature). Since the ice bed is initially at 32°F, no additional heat is removed from the flowing gas mixture to bring the ice to its melting point.

The mass of ice melted is converted into a volume by dividing by the ice density. This volume is added as free space to the lower plenum of the ice condenser. The free space of the lower containment is likewise reduced by a volume equal to the mass of ice melted divided by the density of water. This models the volumetric flow of melted ice out of the ice condenser and into the lower containment.

The CLASIX sump model, however, is "hard-wired" to represent all added drain water as being at 32°F, no matter how much heat is transferred from the flowing gas mixture to the ice. Even though this does not conserve energy, we note that further thermal interactions between the sump and the containment atmosphere are precluded by the CLASIX version used by the ice condenser utilities. Thus, the CLASIX analyses performed to date have not taken a "double savings" on heat transfer to melted ice, such as would occur if low temperature sump water were used in a recirculation mode.

The volume reduction of the lower compartment due to added drain mass is realistically modeled by CLASIX, with the rate of volume reduction consistent with the ice bed heat transfer model developed from the Waltz Mill test series and a 130°F drain temperature.