OCT 19 1989

Charles Bechhoefer
Administrative Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Jerry R. Kline
Administrative Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555

In the Matter of
COMBUSTION ENGINEERING, INC.
Hematite Fuel Fabrication Facility
Docket No. 70-36-MLA
ASLBP No. 89-593-01-MLA

Dear Administrative Judges:

On September 25, 1989, you issued a Memorandum and Order (Additional Intervention Petitions, Issues and Schedules) which contained Questions for Applicant and Staff (Section 5). Enclosed are the staff's responses.

Sincerely,

Original Signed By:

Leland C. Rouse, Chief
Fuel Cycle Safety Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

Enclosure: As stated

cc: ASLAP (3)
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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of COMBUSTION ENGINEERING, INC. (Hematite Fuel Fabrication Facility License No. SNM-33)	Docket No.(s) 70-36-MLA

CERTIFICATE OF SERVICE

Administrative Judge
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Staff Question 1: What is your current policy for permitting a K_{eff} less conservative than 0.95?

Response: The fundamental staff requirement for assuring nuclear criticality safety for fuel cycle operations is implementation of the Double Contingency Principle, i.e., "Process designs should, in general, incorporate sufficient factors of safety to require at least two unlikely, independent, and concurrent changes in process conditions before a criticality accident is possible."[1] To implement the Double Contingency Principle, two independent sets of limits and controls are required to maintain the factors of safety and to prevent unlikely changes in process conditions.

There is no numerical value specified for the maximum K_{eff} value in 10 CFR Part 70 or in NRC Regulatory Guide 3.4, "Nuclear Criticality Safety in Operations With Fissionable Materials at Fuel and Materials Facilities," Rev. 2, March 1986, which endorses ANSI/ANS-8.1-1983. Because the staff normally requires licensees to adhere to the Double Contingency Principle, the Office of Nuclear Material Safety and Safeguards has not established K_{eff} limits in Regulatory Guides or Standard Review Plans. The Office of Nuclear Reactor Regulation has established K_{eff} limits of 0.95 for fuel storage at reactors, except that, with the assumption of optimum moderation for fresh fuel in storage racks, K_{eff} may not exceed 0.98 (Ref. NUREG-0800, Standard Review Plan, Section 9.1.1).

The K_{eff} limit in fuel cycle licenses varies, deperding upon each applicant's request and demonstrated ability to accurately reproduce data from critical experiments. For example, one licensee has K_{eff} limits of 0.90 and 0.97 in the license. The larger K_{eff} limit corresponds to an abnormal situation where one

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[1]Extracted from American National Standard ANSI/ANS-8.1-1983 with permission of the publisher, the American Nuclear Society.

of at least two required sets of limits and controls is assumed to fail, with a consequent increase in the effective neutron multiplication factor. The failure of one set of limits and controls decreases the margin of safety, but the system remains subcritical because the second set of limits and controls prevents another unlikely, independent, and concurrent change in process conditions. Accordingly, the Double Contingency Principle in ANSI/ANS-8.1-1983 is satisfied.

The staff imposed a maximum K_{eff} limit of 0.95 as a license condition on Combustion Engineering for licensee-approved changes to existing plant operations because Combustion Engineering did not propose any limit for changes in the oxide conversion facility. The licensee can make these changes in operations without NRC review and approval provided such changes are made in accordance with a license-required internal review procedure.

The staff has authorized a calculated K_{eff} of 0.951 ± 0.0055 for a chemical reactor in the Combustion Engineering process area for converting uranium hexafluoride to uranium oxide. The array of process equipment which includes the chemical reactor in this area has a calculated K_{eff} of 0.971 ± 0.0058. The K_{eff} values for the reactor and the array correspond to an assumed loss of one of at least two required sets of limits and controls. Moderation control was assumed to be lost and the effects of moderator material (e.g., water) were evaluated in the reactor. There are at least two independent controls which make the introduction of moderation unlikely. These include low temperature controls and alarms (to ensure that steam does not condense) and high pressure controls and alarms (to ensure that the fluid bed chemical reactor does not fill with uranium oxide). If the normal condition of dry (unmoderated) operations had been evaluated, K_{eff} would have been shown to be well below 0.95.

Staff Question 2: Do you plan to include a provision comparable to ¶ 31 of the current license to cover the K_{eff} included in the May 1, 1989, application or the August 18, 1989, statement of additional information?

Response: License Condition 31 states that "Notwithstanding the statement in Section 4.2.3 of the application, the k-effective of a unit or an array of units shall not exceed 0.95 unless specifically authorized by the license." While this condition was imposed on Combustion Engineering as part of a licensing action for the oxide conversion facility, it was made applicable to the entire facility. This condition will remain in effect and will not be changed by the license amendment, if issued, to authorize the proposed activities requested in the May 1 and August 18, 1989, submittals. The intent of this condition is to prohibit Combustion Engineering from making changes in process operations based only on results of the licensee's required internal review procedure when the calculated K_{eff} is greater than 0.95. When the proposed change has a K_{eff} greater than 0.95, the change must be approved in accordance with the licensee's change review procedure and also explicitly by amendment of the NRC license.

The staff has not completed the review of the amendment request, which includes the request for approval of the proposed operation with a calculated K_{eff} greater than 0.95. During the staff review of this proposed operation, the staff will review the independent sets of limits and controls which the licensee must implement to satisfy the Double Contingency Principle (discussed in the response to Question 1). This review will be documented in the staff's Safety Evaluation Report. If the staff concludes that the process design incorporates sufficient factors of safety so that a criticality accident is not considered to be possible, the proposed operations will be specifically authorized by the amended license.