



February 6, 1995

Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Re: Report of Changes from the Safety Analysis Report of the Penn State Breazeale Reactor,
License No. R-2, Docket No. 50-05

Dear Sir or Madam:

This is a report of changes from the Safety Analysis Report (SAR) of the above referenced facility being reported in accordance with Technical Specification 6.6.2.b.(2). This report is to inform the Nuclear Regulatory Commission of interim justification for continued operation within current licensing bases. An action plan is proposed to restore operation to the licensed reactor power of 1 MW.

Background

The staff at PSBR have been concerned that the peak measured fuel temperature while operating at maximum licensed power (1 MW) with our present instrumented element has increased. In addition it came to the attention of the staff that the containment volume used in the SAR was somewhat higher than actual. In the process of investigating the change in the fuel handling accident consequences as a result of using a more accurate containment volume (1900 m³ vs. 2500 m³) the staff determined that the higher fuel temperatures were of more importance than the change in volume. The decision was made to review the entire SAR before making any new changes. The SAR states that by following the specific requirements stated in the Technical Specifications (i.e. Tech. Spec. Docket 50-005, amendment 23 section 3.1.5) that the maximum power density would not exceed 23.2 kW per element. As long as this power density is not exceeded the conclusions of the SAR fuel handling accident analysis are correct. The staff repeated the experiments that were used as the basis for the SAR analysis and found that the maximum power density during 1 MW operation with the present core loading (Loading 47) does exceed 23.2 kW per element. After this discovery on January 9, 1995, power was reduced to 570 kW which lowers the operating temperature and power density below that analyzed in the SAR. At this power level, the maximum power density is approximately 14 kW per element.

Analysis of the Fuel Handling Accident

In the SAR some very conservative assumptions were made in analyzing the fuel handling accident.

1. The PSBR weekly operating history was assumed to be 98 hr shutdown and 70 hr of 1 MW operation.
2. Immediately after the operation the element operating at the highest power density and the highest temperature (since temperature is dependent on the heat flow resistance, i. e. fuel cladding gap size, as well as the power density) is mechanically ruptured in a handling accident.

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3. The rupture occurs in air.
4. There is no plateout of fission products.
5. No credit is taken for filtration by the emergency exhaust system.
6. The release fraction equation (PSBR SAR chapter 9, equation 41) is assumed to be correct even though the experimental evidence indicates that it is high by a factor of 4 (The U-ZrH_x Alloy: Its Properties and use in TRIGA Fuel, M. T. Simnad, General Atomics Project No. 4314, February 1980).

The use of assumption 1 rather than a more realistic (but still much more intensive than the operation to date) daily operating history of 16 hr of shutdown followed by 8 hr of full power operation results in consequences that are more conservative by a factor of 1.4.

The combination of the assumptions 2, 3, 4, and 5 "... lead to computed doses principally resulting from iodines that may be at least a factor of 100 higher than in more realistic scenarios, for example, those in which the cladding fails while the element is immersed in pool water" (Safety Evaluation Report related to the renewal of the operating license for the Research Reactor at Pennsylvania State University, NUREG-1158, USNRC, January 1986).

The net effect of the overly conservative assumptions (i. e. assumptions 1-6) is consequences that are higher by a factor of 500. Even so the consequences are less than the 10 CFR 20 limit for an unrestricted area by a factor of 30.

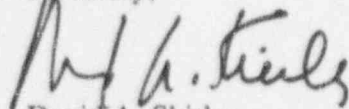
Action Plan

Our intermediate action will be to relax the power restriction to 750 kW which allows a maximum power density of approximately 18.3 kW per element. It was determined that at this power level, the fuel handling accident consequences will still be within those of the SAR. This can be done while maintaining all of the above overly conservative assumptions except for assumption 1 which will be changed to a more realistic daily operating history of 16 hr of shutdown followed by 8 hr of full power operation. This operational schedule as well as the 750 kW power restriction will be maintained with administrative controls.

Our next action will be to change the SAR to allow variations in core loading to reduce the maximum power density and fuel temperature. With those changes the staff can justify return to full power operation. This action will be delayed until further analysis can be done to support the change.

If you have questions on this matter, please refer them directly to Marcus H. Voth or Daniel E. Hughes at (814) 865-6351.

Sincerely,



David A. Shirley
Senior Vice President for Research
and Graduate Education

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pc: Region I Administrator