

October 6, 1994

Dr. Robert C. Brown
President
Arkansas Tech University
Office of the President
Russellville, Arkansas 72801-2222

Dear Dr. Brown:

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION

We are continuing our review of your application for a construction permit/operating license for the Arkansas Tech University TRIGA Research Reactor which you submitted on November 13, 1989, as supplemented. During our review of your application, questions have arisen for which we require additional information and clarification. Please provide responses to the enclosed Request for Additional Information within 60 days of the date of this letter. Following receipt of the additional information, we will continue our evaluation of your application. If you have any questions regarding this review, please contact me at (301) 504-1127.

In accordance with 10 CFR 50.30(b), your response must be executed in a signed original under oath or affirmation.

This requirement affects nine or fewer respondents and, therefore, is not subject to Office of Management and Budget review under P. L. 96-511.

Sincerely,

Original signed by

Alexander Adams, Jr., Senior Project Manager
Non-Power Reactors and Decommissioning
Project Directorate
Division of Project Support
Office of Nuclear Reactor Regulation

Docket No. 50-606

Enclosure:
As stated

cc w/enclosure:
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UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

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Sincerely,

A handwritten signature in cursive script, appearing to read "Alexander Adams, Jr.", written in dark ink.

Alexander Adams, Jr., Senior Project Manager
Non-Power Reactors and Decommissioning
Project Directorate
Division of Project Support
Office of Nuclear Reactor Regulation

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See next page

Arkansas Tech University

Docket No. 50-606

cc:

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Arkansas Tech University
Russellville, Arkansas 72801

Dr. John Sankoorikal
Assistant Professor of Engineering
Arkansas Tech University
Russellville, Arkansas 72801

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State Capitol
Little Rock, Arkansas 72201

Pope County Judge
Pope County Courthouse
Russellville, Arkansas 72801

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REQUEST FOR ADDITIONAL INFORMATION
ARKANSAS TECH UNIVERSITY TRIGA RESEARCH REACTOR
CONSTRUCTION PERMIT/OPERATING LICENSE
DOCKET NO. 50-606

The staff has reviewed the responses from Arkansas Tech University (ATU) dated May 24, 1994, to our request for additional information (RAI) dated January 28, 1991. Our review has found that most of the responses are acceptable, but some questions require additional information. Furthermore, in a few cases, the responses raised additional questions. For ease in coordination, these additional questions are numbered to match questions from our RAI of January 28, 1991.

Some questions remain open from our RAI of January 28, 1991. Please submit replies to the open questions along with the replies to this RAI.

Before we issue the construction permit, you should submit an updated version of your safety analysis report (SAR) that incorporates your replies to the RAIs. Also, the update to your SAR should be consistent with the revision to 10 CFR Part 20. After all outstanding RAIs have been replied to, we plan to visit your facility. We will contact you to arrange that visit.

- 5.p. The response is not complete. Please discuss the following:
1. Radioactive by-product material made in the reactor is normally possessed under the reactor operating license until it is transferred outside of the authorized area or to another authorized user. Please confirm that a PTS operator in "one of the Lab rooms" will be appropriately authorized to receive and to possess all anticipated by-product material.
 2. Discuss the criteria for acceptability of radiation sources and radiation exposures at the PTS terminals. Reference the analyses and the derivation of any Technical Specifications applicable to PTS use and users.
- 5.u. Please show the analyses and results for radiation shielding and reactivity condition (question 15.b.) of the storage facilities for both new and used fuel. The McClellan Air Force facility is not licensed by NRC, so its documentation is not readily available as a reference.
- 6.b. The response stated that this question would be addressed at a later date. Please address at this time.

- 7.b. The response to this question requires further clarification or changes. The negative reactivity with all control and shim rods inserted is in effect the "shutdown reactivity." The negative reactivity with the most reactive safety rod and any non-scrammable control rods fully withdrawn must be sufficiently large to ensure safe shutdown of the reactor. This latter negative reactivity must be no less than the "shutdown margin" specified in the Technical Specifications, and defined in ANSI/ANS 15.1. The magnitude of the shutdown margin should be derived from safety and technical considerations and justification presented in the SAR. Please provide this information, paying due attention to the definition of "shutdown margin".
- 8.a. In Section 3.3 and Section 3.5 (revised), terms such as "Safety Limit", "Upper Limit", "conservative limit", and "temperature to be allowed" have been used. In all sections of the SAR, when referring to the same limitation, please use the term "safety limit" where applicable, as defined in ANSI/ANS 15.1 and 10 CFR 50.36. Agreed upon values of safety limits for UZrH fuels are given in Chapter 14 of the draft "Format and Content for Applications for the Licensing of Non-Power Reactors" which was sent to you by letter dated July 12, 1993, and in Simnad, M. T., et al, "Fuel Elements for Pulsed TRIGA Research Reactors," Nuclear Technology, Vol. 28, 31-56, January 1976.
- Furthermore, please use the accepted terminology and definitions for "limiting safety system settings" (LSSS), and "limiting conditions of operation" (LCO) in these and other sections of the SAR, where analysis and development of the bases for Technical Specification values of these parameters should be provided.
- 8.b. Answers to the other parts of the original question No. 8 are still required.
- 9.a. 1. Table 4-1; the function of the "2 cps interlock" should be specified.
2. Which channel(s) is (are) planned to be used to ensure and demonstrate compliance with the power level specified in the operating license? Please discuss.
- 9.b. Section 4.4 (revised); the first sentence of this section talks of "deviating beyond safe limits", and "mitigates the consequences if the safe limits are exceeded." Please make any changes necessary in appropriate sections of the SAR to address the following comments:
1. "Safe limits" should be clearly defined. Do you mean "Safety Limits"?
2. Reactor safety systems should be designed to prevent safety limits being reached.

3. Explain what is meant by the first sentence, indicating that reactor safety systems are designed to "mitigate consequences." Engineered safety systems are designed to "mitigate consequences" of potential accidents.
- 9.c. Please describe any changes in design, functions, or components made during refurbishment of the control/console system. Refer to our initial request for this information.
- 11.b. 1. Please discuss how scrams on "peak power" and "energy" are set and verified, since they will vary with pulse size.
2. The answer to this question does not explain how linearity of current from the chamber is verified for all peak powers. Please discuss.
- 12.a. & 12.b.3. Does a primary coolant pump trip result in a reactor scram? Please discuss.
- 12.b.4. 1. High Radiation level. "High radiation area" is specifically defined in 10 CFR 20. Please be sure that your use of the above terms does not inadvertently subject you to 10 CFR 20 requirements when not intended.
2. This section should be more specific. Discussion of such parameters as location of detectors, type of radiation (gamma rays, neutrons, etc.) sensitivity, alarm level, location of read-out devices, calibration procedure and frequency, etc., should be provided in the SAR, as well as the bases for related parameters included in the Technical Specifications.
- 15.b. Please explicitly provide the analyses in your revised SAR, because NRC may not have ready access to documents from a facility that it does not license.
- 16.e. In the last sentence of the second paragraph of your response it is stated that "... peak fuel temperatures of 1250 °C is possible" Please clarify what is meant by this, because 1250 °C exceeds the safety limit of 1150 °C.
- 16.l. 1. In Table 7-4 of Attachment #2, the effectivity factors listed seem to be more consistent with TID 14844, page 25, than with Table E-7 of NRC Reg. Guide 1.109. Please clarify, and provide and use the most up-to-date values.
2. Section 7.3.1 (5) indicates that the computed dose of 4.52 rem would be delivered during the 10 min. exposure. Please clarify by additional discussion whether the computed dose is really the dose commitment, projected to be delivered to the exposed person over a much longer time, such as 50 yrs.

- 16.m.
1. The magnitudes of doses for 1 hour exposures stated in responses (1) and (2) do not seem to be consistent with the results provided in attachment #2, section 7.3.2. Please discuss and resolve the apparent differences.
 2. Section 7.3.2 of Attachment #2, conclusion at top of page 7-20. Even though the methods may be acceptable, the "target guidelines" of R.G. 1.109 might not be applicable to non-power reactors. Therefore, please summarize explicitly what dose values have been calculated, and include the basis for the 10 mrem total body dose and 15 mrem thyroid dose. Please discuss whether this thyroid dose is a long-time dose commitment.
- 16.p. Deletion of previous Section 7.4 is not an acceptable response to this question. Please find and provide answers to the request for additional information, because the material of this section is applicable.

Furthermore, Section 7.4 in attachment #2 is also applicable and should be retained in your revised SAR.

17. The Technical Specifications should be derived from discussions and information provided in the SAR. Therefore, as you have indicated, please discuss reasons and bases of specifications in the appropriate sections of the SAR.
23. Environmental Report
1. This is a substantial improvement over the previous version. Please review this revised version, however, and be sure that all statements of fact are substantiated in the text or by reference to information included in the SAR.
 2. Section D, page 4; please discuss and give the bases for the statement, "Each has a probability of occurrence less than one in one million, ..." To what parameter does the "one million" apply?
 3. Please be sure that definitions of parameters and discussions of radiation exposures and limits are consistent with the new 10 CFR Part 20.