

US Nuclear Regulatory Commission  
Washington, DC 20555-0001

23 September 2017

**Subject: Addendum to 5/2/2017 Facility Response (Acc. # ML17139C979) to 3/28/2017 Request for Additional Information (Acc. # ML17038A272)**

To Whom It May Concern,

On March 28, 2017, the NRC sent a third Request for Additional Information (RAI) to the Kansas State University (KSU) nuclear reactor facility (license R-88, docket 50-188) regarding a license amendment request (LAR) (originally submitted on April 9, 2012 [Acc. # ML1219A063]) to add up to four 12 wt% uranium fuel elements to the core. Dr. Jeffrey A. Geuther responded to the most recent RAI with amendments to the facility Safety Analysis Report and Technical Specifications on May 2, 2017 (Acc. # ML17139C979). Upon review of the submitted responses, the NRC determined that additional information and document edits were required, communicating these requests to Dr. Amir A. Bahadori, who had assumed the role of Interim Manager of the KSU TRIGA Mark II Nuclear Reactor Facility upon the departure of Dr. Geuther on June 1, 2017. These requested additions and edits were communicated during a teleconference on June 21, 2017, and via various phone conversations and email exchanges thereafter. The purpose of this communication is to officially document changes made to facility documents in response to these requests.

Proposed changes to the facility Safety Analysis Report and Technical Specifications were reviewed and approved by the KSU Reactor Safeguards Committee via email ballot on September 14, 2017, pending minor editorial changes that have been incorporated as recommended. A summary of the NRC requests, along with the associated resolution to each of these requests, is provided below. Markup and clean copies of the documents are provided as attachments; it should be noted that Dr. Geuther's changes submitted on May 2, 2017 (Acc. # ML17139C979), remain in the markup version, as this submission is an addendum to that response.

1. NRC Request: Resolve the apparent conflict with number of control rods required per Chapter 4 of the Safety Analysis Report and the number of control rods required to be operable according to Technical Specifications.

Facility Response: Section 4.2.2, Control Rods, part a, Control Function, states "While three control rods were adequate to meet Technical Specification requirements for reactivity control with the 100 kW and 250 kW cores, reactivity limits for operation at a maximum power level of 1,250 kW requires four control rods (three standard and one transient/pulsing control rod)." The following clarifying statement was added after this sentence: "Although four control rods are required to operate at the maximum power level of 1,250 kW, all Technical Specification requirements are met with a minimum of three operable control rods, provided that the inoperable control rod is fully inserted. Inoperable control rods that are fully inserted do not negatively impact the minimum

safety shutdown margin or maximum core excess reactivity. Furthermore, the reduction in maximum achievable power level associated with the inoperable control rod fully inserted results in a maximum temperature in any fuel element that is less than the highest temperature in a fuel element in the B-ring with all control rods fully withdrawn."

2. NRC Request: Include information regarding the control rod and water channel positioning in the Technical Specification describing 12 wt% uranium fuel element positions.

Facility Response: Technical Specifications section 5.1.3(3) was revised to the following: "A maximum of four fuel elements with greater than 9.0 weight percent uranium may be installed in the core. These elements shall only be placed lattice positions in the E- and F-rings of the core that meet the following condition: using a properly scaled top-view drawing of the reactor core grid plate, a line segment drawn from the center of any lattice position populated with a control rod or a water channel to the candidate lattice position must intersect the boundary of at least one additional lattice position."

3. NRC Request: Update footers for Chapter 4 of the Safety Analysis Report and the Technical Specifications with appropriate date.

Facility Response: The footers for Chapter 4 of the Safety Analysis Report and the Technical Specifications were updated as requested.

4. NRC Request: Add references for the Bernath correlation in the text of Chapter 4 of the Safety Analysis Report.

Facility Response: References for the Bernath correlation were added to the text of Chapter 4 of the Safety Analysis Report as requested.

5. NRC Request: Correct equation numbering in Chapter 4 of the Safety Analysis Report.

Facility Response: Equation numbering in Chapter 4 of the Safety Analysis Report was corrected as requested.

6. NRC Request: Correct minor typographical errors in Chapter 4 of the Safety Analysis Report and Technical Specifications.

Facility Response: Minor typographical errors in Chapter 4 of the Safety Analysis Report and Technical Specifications were corrected as requested.

7. Unrequested Change: Once changes were made to the thermal hydraulics analysis for Steady State Mode of Operation (Section 4.5.3(c) of the Safety Analysis Report), the critical heat flux (CHF) to be used for calculation of the critical heat flux ratio (CHFR) during Pulsed Mode of Operation (Section 4.5.3(d) of the Safety Analysis Report) was not updated accordingly. The CHF was updated from 1.49 MW m<sup>-2</sup> to 1.52 MW m<sup>-2</sup>, and

the CHF<sub>R</sub> values were recalculated in Table 4.10. Additionally, equation references in the first paragraph of Section 4.5.3(d) of the Safety Analysis Report were corrected.

I swear under penalty of perjury that the foregoing is true and correct.

Regards,

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Attachments (4): SAR Ch. 4 markup copy  
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