September 15, 2016

Colonel L. Andrew Huff, Director
Armed Forces Radiobiology Research Institute
8901 Wisconsin Avenue
Bethesda, MD 20889-5603

SUBJECT: ARMED FORCES RADIOBIOLOGY RESEARCH INSTITUTE - REQUEST FOR ADDITIONAL INFORMATION REGARDING THE RENEWAL OF FACILITY OPERATING LICENSE NO. R-84 FOR THE ARMED FORCES RADIOBIOLOGY RESEARCH INSTITUTE TRIGA REACTOR FACILITY (TAC NO. ME1587)

Dear Colonel Huff:

The U.S. Nuclear Regulatory Commission (NRC) is continuing its review of the Armed Forces Radiobiology Research Institute (AFRRI) application dated June 24, 2004 (a redacted version of the safety analysis report is available on the NRC's public Web site at www.nrc.gov under Agencywide Documents Access and Management System Accession No. ML101650415), as supplemented, for the renewal of Facility Operating License No. R-84 for the AFRRI TRIGA reactor facility.

During our review, questions have arisen for which additional information and clarification is needed. The enclosed request for additional information (RAI) identifies the additional information needed to continue our review. We request that you provide responses to the enclosed RAI or an extension request within 30 days from the date of this letter.

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.30(b), "Filing of applications for licenses; oath or affirmation," you must execute your response in a signed original document under oath or affirmation. Your response must be submitted in accordance with 10 CFR 50.4, "Written communications." Information included in your response that is considered sensitive or proprietary, that you seek to have withheld from the public, must be marked in accordance with 10 CFR 2.390, "Public inspections, exemptions, requests for withholding." Any information related to security should be submitted in accordance with 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements." Following receipt of the additional information, we will continue our evaluation of your renewal request.

If you have any questions regarding this review, please contact me at 301-415-3398 or by electronic mail at Cindy.Montgomery@nrc.gov.

Sincerely,

/RA/

Cindy K. Montgomery, Project Manager
Research and Test Reactors Licensing Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No. 50-170
License No. R-84

Enclosure:
Request for Additional Information

cc: See next page

If you have any questions regarding this review, please contact me at 301-415-3398 or by electronic mail at Cindy.Montgomery@nrc.gov.

Sincerely,

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Docket No. 50-170
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ADAMS Accession No.: ML16253A234; *concurrence via e-mail **NRR-106**

OFFICE	NRR/DPR/PRLB/PM	NRR/DPR/PRLB/LA*	NRR/DPR	NRR/DPR/PRLB/BC	NRR/DPR/PRLB/PM
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OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR ADDITIONAL INFORMATION

REGARDING THE RENEWAL OF

THE ARMED FORCES RADIOBIOLOGY RESEARCH INSTITUTE

TRIGA REACTOR FACILITY

LICENSE NO. R-84; DOCKET NO. 50-170

The U.S. Nuclear Regulatory Commission (NRC) is continuing its review of the Armed Forces Radiobiology Research Institute (AFRRI) license renewal application dated June 24, 2004 (a redacted version of the safety analysis report (SAR) is available on the NRC's public Web site at www.nrc.gov under Agencywide Documents Access and Management System (ADAMS) Accession No. ML041800067), as supplemented. The NRC staff's review used the guidance in NUREG-1537, Part 1, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors: Format and Content," and supporting information from the American National Standards Institute/American Nuclear Society (ANSI/ANS)-15.1-2007, "The Development of Technical Specifications for Research Reactors." During our review, questions have arisen, for which additional information and clarification is needed. This request for additional information (RAI) identifies the additional information needed to continue our review. We request that you provide responses to this RAI within 30 days from the date of the cover letter.

The NRC staff has reviewed your responses dated August 5, 2016 (ADAMS Accession Nos. ML16232A166 and ML16232A167), to an RAI dated June 17, 2016 (ADAMS Accession No. ML16159A291), and has found the responses that follow to be not acceptable. For each unacceptable response, the staff has provided a follow-up RAI which will provide additional information establishing the basis for the staff's unacceptable determination. Additionally, the staff has provided regulatory basis for each follow-up RAI included in this request.

Generally, Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50 provides the regulatory framework and basis for production and utilization facilities which includes the AFRRI research reactor. Regulations in 10 CFR 50.21, "Class 104 licenses; for medical therapy and research and development facilities," state in part that a class 104 license will be issued to an applicant who qualifies. To qualify for a licensee, 10 CFR 50.34 "Contents of applications; technical information," provides the required technical information content necessary. Regulations in 10 CFR 50.34(2)(vi), require the submittal of technical specifications (TSs) prepared in accordance with 10 CFR 50.36, "Technical specifications." In addition, 10 CFR 50.9, "Completeness and accuracy of information" requires in part, that the submission of information to the Commission by an applicant or licensee be complete and accurate.

Your submittal of license renewal application dated June 24, 2004 (ADAMS Accession No. ML041800067), indicates a desire to renew the operating license for AFRRI reactor facility. It is important to note that your SAR and TS, as supplemented, for the relicensing of your facility

Enclosure

are required to present the technical information necessary to demonstrate that all regulatory requirements applicable to class 104 licenses are met in order to qualify for an operating license.

Follow-Up Requests for Additional Information

RAI 1

In RAI 8A, dated June 17, 2016 (ADAMS Accession No. ML16159A291), we asked the following:

The following questions pertain to the limiting condition for operation, proposed TS 3.3, "Coolant Systems," and the corresponding surveillance requirement, proposed TS 4.3.

Proposed TS 3.3, "Coolant Systems," states, in part, the following:

> *Specifications:*
>
> *a. The reactor shall not be operated above a thermal power of 5 kW when the core outlet temperature exceeds 60°C;*
>
> *b. The reactor shall not be operated if the conductivity of the bulk water is greater than 5 micromhos/cm; and*
>
> *c. Both audible and visual alarms shall be provided to alert the AFRRI security guards and other personnel to any drop in reactor pool water level greater than 6 inches.*

Proposed TS 4.3, "Coolant Systems," states, in part, the following:

> *Specifications:*
>
> *a. The pool water temperature, as measured near the input to the water purification system, shall be measured daily, whenever operations are planned.*
>
> *b. The conductivity of the bulk water shall be measured monthly, not to exceed 6 weeks.*
>
> *c. The reactor coolant shall be measured for radioactivity at least quarterly, not to exceed 4 months.*
>
> *d. The audible and visual reactor pool level alarms shall be tested quarterly, not to exceed 4 months.*

A. The guidance in ANSI/ANS 15.1-2007, Section 3.3, "Coolant Systems," states, "Minimum operating equipment, or operating limits, or both, shall be specified for the following: . . . (5) fission product activity detection; . . ."

However, no TS operating limit has been proposed on coolant radioactivity. Additionally, proposed TS 4.3, Specification c., is a surveillance for radioactivity detection, but no actions are specified to be taken if radioactivity is found to be above the operational limit.

Describe how abnormal coolant radioactivity (indicative of abnormal fission product activity) would be detected by the operator. Provide a TS limit on fission product activity that provides a

maximum upper limit of acceptable activity. This TS should correspond with surveillance TS 4.3, Specification c. Specify the corresponding actions to be taken if the limit is reached. Alternatively, justify why it is not necessary…

In your response dated August 5, 2016 (ADAMS Accession No. ML16232A166), you stated the following:

Abnormally high levels of activity in the water would be detected by the myriad of radiation detection equipment in the reactor room. i.e. RAMS, CAMS, Stack gas monitor etc. Since the water is never directly discharged to the environment it does not pose a risk to either reactor staff, the public or the environment. AFRRI Health Physics Department (HPD) personnel collect and analyze primary and secondary reactor water on a monthly basis. Any radioanalysis result or direct survey that exceeds an Action Level shall be brought to the attention of the RFD within 24 hours of the posting of results.

The following action levels are typical for pool water and secondary cooling water:

Reactor Pool Water

Type Analysis	*AL 1 (pCi/ml)*	*AL 2 (pCi/ml)*
Gross Alpha	*0.1*	*1*
Gross Beta	*0.1*	*1*
Activation Products	*0.1*	*1*
Fission Products	*	*

***** *The presence of any fission product shall be brought to the immediate attention of the RSO and RFD. Fission products include: Kr-85, Sr-89, Sr-90, Sr-91 , Sr-92, Y-90, Y-91, Zr-95, Nb-95, Nb-95m, Nb-97, Mo-99, Ru-103, Ru-106, Rh-103, Rh-106, Ag-111, Sn-125, Sb-125, Sb-127, Te-127, Te-127m, Te-129, Te-129m, Te-132, 1-131, 1-132, 1-133, 1-134, 1-135, Xe-131 , Xe-133, Xe-135, Cs-136, Cs-137, Cs-138, Ba-137, Ba-140, La-140, Ce-141 , Ce-143, Ce-144, Pr-143, Pr-144, Nd-147, Pm-147*

Secondary Cooling Water

Type Analysis	*AL 1 (pCi/ml)*	*AL 2 (pCi/ml)*
Gross Alpha	*0.1*	*0.5*
Gross Beta	*0.1*	*0.5*
Gamma Emitters	*	*

***** *The presence of any gamma emitter other than naturally occurring radionuclides shall be brought to the immediate attention of the RFD.*

No change to TS is warranted.

Your response to RAI 8A indicating that "no change to TS is warranted" is not acceptable to the staff since it does not appear to meet the following regulatory requirements for TS:

(1) 10 CFR 50.36(a)(1) which states in part, "Each applicant for a license authorizing operation of a production or utilization facility shall include in his application proposed

technical specifications in accordance with the requirements of this section [emphasis added]";

(2) 10 CFR 50.36(b) which states in part "Each license authorizing operation of a production or utilization facility of a type described in § 50.21 or § 50.22 will include technical specifications. The technical specifications will be derived from the analyses and evaluation [emphasis added] included in the safety analysis report, and amendments thereto, submitted pursuant to § 50.34";

(3) 10 CFR 50.36(c)(2)(i) which states in part "Limiting conditions for operation are the lowest functional capability or performance levels of equipment required for safe operation of the facility. When a limiting condition for operation of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action [emphasis added] permitted by the technical specifications until the condition can be met.";

(4) 10 CFR 50.36(c)(2)(ii), which states "A technical specification limiting condition for operation of a nuclear reactor must be established for each item meeting one or more of (A) Criterion 1; (B) Criterion 2; (C) Criterion 3; and (D) Criterion 4."; and

(5) 10 CFR 50.36(c)(2)(ii)(B) Criterion 2 which states "A process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

Recognizing the previous regulatory requirements related to TS, (1) Describe how abnormal coolant radioactivity (indicative of abnormal coolant activity) would be detected by the operator. (2) Provide a TS limit on coolant radioactivity that provides a maximum upper limit of acceptable activity. (3) The TS coolant radioactivity LCO limit TS should correspond with surveillance requirement TS 4.3, Specification c and shall specify the corresponding licensee actions to be taken (e.g., reactor shutdown) if the limit is reached. Alternatively, justify why this TS is not applicable, and therefore not necessary for the AFRRI reactor facility.

The content preceding your "no change to TS" statement in your August 5, 2016, RAI response, if included appropriately in your proposed TSs Sections 3.3 and 4.3 may constitute a partial acceptable response to this RAI.

RAI 2

In RAI 8B, dated June 17, 2016 (ADAMS Accession No. ML16159A291), we asked the following:

B. The basis for the proposed TS 3.3 pool temperature limit discusses the protection of the water purification resins. Given that the thermal hydraulic analysis was based on the assumption of a maximum pool temperature of 60 degrees C, and given that reactor operation at temperatures greater than 60 degrees C would be unanalyzed, provide a revision to proposed TS 3.3 that specifies 60 degrees C as the maximum coolant temperature permitted. Provide an appropriate basis for TS 3.3 that considers the results of the thermal hydraulic analysis…

In your response to RAI 8B, dated August 5, 2016 (ADAMS Accession No. ML16232A166), you stated the following:

TS 3.3 Coolant Systems will be changed to read:

Objective:

a. *To ensure the effectiveness of the resins in the water purification system;*
b. *To prevent activated contaminants from becoming a radiological hazard; and*
c. *To protect the integrity of the reactor core*

Specifications:

a. *The reactor shall not be operated above a thermal power of 5 kW when the bulk water temperature exceeds 55° C;*

b. *The reactor shall not be operated if the conductivity of the bulk pool water is greater than 5 micromhos/cm;*

c. *Both audible and visual alarms shall be provided to alert the AFRRI security guards and personnel to any drop in reactor pool water level greater than 6 inches.*

Discussion: With the reactor cooling system secured, the pool temperature rise is 14.1° C per hour at a power level of l MW thermal. At 5 kW, the temperature rise is calculated to be .0705 degrees per hour of operation. At this power level the reactor would need to operate at 5kW for more than 70 continuous hours of operation to reach the 60° C mark. Furthermore, analysis shows that full power operations are safe at 60°. At a power level of l MW thermal, the fuel temperature reaches approximately 400 ° C, a temperature rise of approximately 380 ° C. At a power level of 5kW thermal, the fuel temperature remains at ambient water temperature. TRIGA fuel has been tested to be safe beyond 1000 ° C. The overarching objective is to protect the integrity of the fuel. If the reactor were operated at 5kW indefinitely with the cooling system secured the worst case would be a fuel temperature at the maximum ambient water temperature of 100 ° C. The published safety limit for the AFRRI TRI GA is 1000 ° C. This leaves a safety margin of 900 ° C, assuming that no repairs have been made to the cooling

system during this postulated operation. These TS provides more than reasonable assurance that safe operations are maintained.

The proposed change that you provided in your response to RAI 8B is not acceptable to the staff since it does not appear to meet the following regulatory requirements for TS:

> (1) 10 CFR 50.36(a)(1) which states in part, "Each applicant for a license authorizing operation of a production or utilization facility shall include in his application proposed technical specifications in accordance with the requirements of this section [emphasis added]";
>
> (2) 10 CFR 50.36(b) which states in part "Each license authorizing operation of a production or utilization facility of a type described in § 50.21 or § 50.22 will include technical specifications. The technical specifications will be derived from the analyses and evaluation [emphasis added] included in the safety analysis report, and amendments thereto, submitted pursuant to § 50.34";
>
> (3) 10 CFR 50.36(c)(2)(i) which states in part "Limiting conditions for operation are the lowest functional capability or performance levels of equipment required for safe operation of the facility. When a limiting condition for operation of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action [emphasis added] permitted by the technical specifications until the condition can be met.";
>
> (4) 10 CFR 50.36(c)(2)(ii), which states "A technical specification limiting condition for operation of a nuclear reactor must be established for each item [emphasis added] meeting one or more of (A) Criterion 1; (B) Criterion 2; (C) Criterion 3; and (D) Criterion 4."; and
>
> (5) 10 CFR 50.36(c)(2)(ii)(B) Criterion 2 which states "A process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

The staff does not necessarily disagree with the discussion provided in your response RAI 8B, dated August 5, 2016 (ADAMS Accession No. ML16232A166), but does not find that it addresses the staff concern either. The limiting conditions for operation (LCO) are the lowest functional capability or performance level of equipment required for safe operation of the facility. Since the thermal hydraulic analysis assumed a maximum coolant temperature of 60 degrees C, that temperature becomes the limiting coolant temperature and is required to be an LCO. Therefore, your proposed change to TS of "The reactor shall not be operated above a thermal power of 5 kW when the bulk water temperature exceeds 55 °C, does not meet" regulatory requirements for TS.

Recognizing the previous regulatory requirements related to TS and given that the thermal hydraulic analysis was based on the assumption of a maximum pool temperature of 60 degrees C, the thermal hydraulic analysis is an important input into the accident analyses, and that reactor operation at temperatures greater than 60 degrees C at any reactor power would be unanalyzed, provide a revision to proposed TS 3.3 that specifies reactor operation is not

permitted with coolant temperatures greater than 60 degrees C. Provide an appropriate basis for TS 3.3 that considers the results of the thermal hydraulic analysis. Alternatively, justify why this TS is not applicable and therefore not necessary for the AFRRI reactor facility. (See RAI 9)

RAI 3

In RAI 8C, dated June 17, 2016 (ADAMS Accession No. ML16159A291), we asked the following:

C. The current TS 4.3, Specification b., states that conductivity shall be measured weekly. In your February 9, 2016, RAI responses (ADAMS Accession No. ML 16040A310), you provided a justification for monthly measurement of conductivity, which stated:

> *The stability of conductivity within the AFRRI TRIGA pool water system has been proven by more than 5 decades of operations. Furthermore, experience demonstrates that the conductivity of the pool water not vary with reactor usage. Additionally, corrosion is an extremely slow process, making daily/weekly measurements unnecessary. NUREG-1537, Part 1, Appendix 14.1 , Section 4.3, "Coolant Systems," Item (6) "Conductivity and pH," provides guidance that the conductivity and pH should be measured weekly. Monthly measurements are permitted if the reactor is shutdown for long periods of time and/or if justification is provided in the SAR. Since conductivity is not a function of usage, and NUREG-1537 permits monthly measurements, then it should be acceptable to make measurements on a monthly basis, whether or not operations are planned.*

The regulations in 10 CFR 50.36 cover the protection of fuel cladding. Describe alternate indications available to operators for early detection of ion exchange failure or other inadvertent contamination in the pool water, given a monthly surveillance requirement.

In your response to RAI 8C, dated August 5, 2016 (ADAMS Accession No. ML16232A166), you stated the following:

The AFRRI TRIGA core is comprised of stainless steel clad fuel. Corrosion is generally not an issue with SS clad fuel. Furthermore, corrosion is not a flash process, so that monthly measurements will provide reasonable assurance that the resins are operating within normal parameters. Attachments 1-6 show conductivity vs time over the course of 5 years of normal operations. During the sample 5 year period of time, resins were changed out at intervals ranging from 36 to 99 weeks. During this time frame, the conductivity rarely exceeded 50% of the allowed value. Given the proven stability of the AFRRI system, sampling intervals of 90 days should be sufficient to protect the integrity of the system. The proposed sampling interval of monthly would appear to be excessive; however AFRRI will accept monthly surveillance for conductivity measurements. No change to the proposed TS surveillance is warranted.

The proposed change that you provided in your response to RAI 8C is not acceptable to the staff since it does not appear to meet the following regulatory requirements for TS:

> (1) 10 CFR 50.36(a)(1) which states in part, “Each applicant for a license authorizing operation of a production or utilization facility shall include in his application proposed technical specifications in accordance with the requirements of this section [emphasis added]”;

(2) 10 CFR 50.36(b) which states in part "Each license authorizing operation of a production or utilization facility of a type described in § 50.21 or § 50.22 will include technical specifications. The technical specifications will be derived from the analyses and evaluation [emphasis added] included in the safety analysis report, and amendments thereto, submitted pursuant to § 50.34";

(3) 10 CFR 50.36(c)(2)(i) which states in part "Limiting conditions for operation are the lowest functional capability or performance levels of equipment required for safe operation of the facility. When a limiting condition for operation of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action [emphasis added] permitted by the technical specifications until the condition can be met.";

(4) 10 CFR 50.36(c)(2)(ii), which states "A technical specification limiting condition for operation of a nuclear reactor must be established for each item [emphasis added] meeting one or more of (A) Criterion 1; (B) Criterion 2; (C) Criterion 3; and (D) Criterion 4."; and

(5) 10 CFR 50.36(c)(2)(ii)(B) Criterion 2 which states "A process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

The staff does not necessarily disagree with the discussion provided in your response RAI 8C, dated August 5, 2016 (ADAMS Accession No. ML16232A166), but does not find that it addresses the staff concern either. The LCO is the lowest functional capability or performance level of equipment required for safe operation of the facility and have been derived from analyses and evaluation. The current LCO for conductivity states that the reactor shall not be operated if the conductivity of the bulk water is greater than 5 micromhos/cm. This LCO limit was established as being consistent with fuel vendor recommendations and is intent on preventing the failure of a fission product barrier due to corrosion of the fuel clad, to minimize activated contaminates from becoming a radiological hazard, and for detection of coolant purification system problems. Both the current and proposed surveillance requirements TS 4.3 specification b (ADAMS Accession No. ML16232A167) are inadequate since neither is consistent with TS 3.3, Specification b, LCO. The only acceptable surveillance requirement for the conductivity LCO as currently written would be continuous monitoring of conductivity. To achieve the proposed change to the surveillance requirement, the licensee would need to propose and justify a new LCO consistent with the requirements of 10 CFR 50.36.

Recognizing the previous regulatory requirements related to TS, describe alternate indications available to operators for early detection of conductivity exceeding TS 3.3 specification b of 5 micromhos/cm such as installed conductivity process instrumentation as per the facility design. Alternatively, justify why this TS LCO is not applicable to the AFRRI reactor facility while maintaining compliance with the regulatory requirements of 10 CFR 50.36.

RAI 4

In your RAI response dated August 5, 2016 (ADAMS Accession Nos. ML16232A166), you submitted draft TS 3.5.1, "Monitoring System," which states, in part, the following:

> *Specifications*
>
> *The reactor shall not be operated unless the following radiation monitoring systems are operable:*
>
> *[…]*
> *d. Table 4 specifies the alarm and readout system for the above monitors.*

Table 4. Locations of Radiation Monitoring Systems

Sampling Location	***Readout Location(s) (Audible and Visual)***
RAM	
Reactor Room (2 required)	*Reactor and Control Rooms*
Exp. Room 1 Area	*Prep Area and Control Rooms*
Exp. Room 2 Area	*Prep Area and Control Rooms*
SGM	
Reactor Exhaust	*Reactor and Control Room*
CAM	
Reactor Room	*Reactor and Control Room*

The NRC staff notes that draft TS 3.5.1, Specification d, states that Table 4 specifies the alarm and readout system for the TS-required radiation monitors, but draft TS 3.5.1, Table 4, does not appear to show the alarm system for the monitors. The staff also notes that the meaning of the draft TS 3.5.1, Table 4, column heading, "Readout Location(s) (Audible and Visual)," is not clear, since it is not clear what is meant by an audible readout. Additionally, the staff notes that the SAR, Section 3.6, describes visual readouts, and audible and visual alarms, for the TS-required RAMs, SGM, and CAM that appear to be inconsistent with the readouts listed in the draft TS 3.5.1, Table 4.

The regulations in 10 CFR 50.9(a) require that information provided to the Commission by a licensee shall be complete and accurate in all material respects. The regulations in 10 CFR 50.36(c)(2) require licensees to have TSs on limiting conditions for operation, which are the lowest functional capability or performance levels of equipment required for safe operation of the facility.

ANSI/ANS 15.1, Appendix 14.1, Section 3.7.1, states that a table in the TS should list required radiation monitors and the function(s) each performs. These functions can include alarms or readouts at specific locations, as well as other functions.

a. Revise draft TS 3.5.1, Table 4, to clearly specify the alarms (including the location of each alarm and whether the alarm is audible and/or visual) and readouts (including the location), for each TS-required radiation monitor, or justify why no change is required.

b. Revise draft TS 3.5.1, Table 4, to reflect the descriptions of radiation monitor alarms and readouts provided in the SAR. Provide a revision to the description of radiation monitor alarms and readouts in the SAR that is consistent with what is currently installed at the facility and with draft TS 3.5.1, Table 4; or justify why no change is required.

RAI 5

In RAI 10, dated June 17, 2016 (ADAMS Accession No. ML16159A291), we asked the following:

> *The following questions pertain to proposed TS 3.2.2, "Reactor Safety System," and proposed TS 4.2.2, "Reactor Safety Systems."*
>
> *A. Proposed TS 3.2.2, Table 2, "Minimum Reactor Safety Systems Scrams," requires a preset timer to initiate a scram of the reactor 15 seconds after the initiation of a pulse. Table 3, "Minimum Reactor Safety System Interlocks," requires an interlock to prevent pulsing when the reactor power level is 1 kW or above. This scram and interlock system is described in Section 4.10, "Reactor Control Components," of the SAR.*
>
> *The proposed TSs do not contain surveillance testing of the interlocks for the reactor safety system channels.*
>
> *Provide information on the testing of the pulse timer scram and the pulse initiation interlock. Describe the surveillance testing of the functions and provide a surveillance TS, or justify why no TS is needed.*

In your response to RAI 10, dated August 5, 2016 (ADAMS Accession No. ML16232A166), you stated the following:

> *The 15 second timer is not a safety system and will be removed from table 2. The pulse initiation interlock listed in table 3 is tested each day pulse operations are planned.*
>
> *A footnote to table 3 will be added stating "Reactor safety system interlocks shall be tested daily whenever operations involving these functions are planned."*

The proposed change to remove the 15 second pulse timer scram from TS 3.2.2, Table 2 that you provided in your response to RAI 10A is not acceptable to the staff. Likewise, the addition of a footnote to TS 3.2.2, Table 3 is also not acceptable since neither proposed changes appear to meet one or more of the following regulatory requirements for TS:

> (1) 10 CFR 50.36(a)(1) which states in part, “Each applicant for a license authorizing operation of a production or utilization facility shall include in his application proposed technical specifications in accordance with the requirements of this section [emphasis added]”;
>
> (2) 10 CFR 50.36(b) which states in part “Each license authorizing operation of a production or utilization facility of a type described in § 50.21 or § 50.22 will include technical specifications. The technical specifications will be derived from the analyses and evaluation [emphasis added] included in the safety analysis report, and amendments thereto, submitted pursuant to § 50.34”;
>
> (3) 10 CFR 50.36(c)(2)(i) which states in part “Limiting conditions for operation are the lowest functional capability or performance levels of equipment required for safe

operation of the facility. When a limiting condition for operation of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action [emphasis added] permitted by the technical specifications until the condition can be met.";

(4) 10 CFR 50.36(c)(2)(ii), which states "A technical specification limiting condition for operation of a nuclear reactor must be established for each item [emphasis added] meeting one or more of (A) Criterion 1; (B) Criterion 2; (C) Criterion 3; and (D) Criterion 4."; and

(5) 10 CFR 50.36(c)(2)(ii)(B) Criterion 2 which states "A process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

(6) 10 CFR 50.36(c)(3), "Surveillance requirements," which states "Surveillance requirements are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met."

The 15 second pulse timer scram is a safety function included in the design of pulsing TRIGA reactors and was derived from analysis and evaluation. The proposed action to remove the protective function would require technical justification in the form of a formal safety analysis and evaluation. Your response did not provide such technical justification for your proposed action, and as such, will not be accepted by the staff.

With regard to your proposed action for the inclusion of a footnote TS 3.2.2, Table 3. The staff's concern driving RAI 10A was that proposed TS 4.2.2 did not include companion surveillance requirements for the LCOs presented in proposed TS 3.2.2. A footnote to a table does not constitute a surveillance requirement. In accordance with 10 CFR 50.36(c)(3) an appropriate test, calibration, or inspection (surveillance requirements) to assure that the necessary quality of systems and components (i.e., the 15 second pulse timer scram and pulse initiation interlock) is maintained and that the limiting conditions for operation will be met are required.

The proposed TS dated August 5, 2016 (ADAMS Accession No. ML16232A167), do not contain surveillance testing of the interlocks for the reactor safety system channels. Recognizing the previous regulatory requirements related to TS, please provide information on the surveillance testing of the pulse timer scram and the pulse initiation interlock. Additionally, describe the surveillance testing of the functions and provide companion surveillance requirements in Section 4.2.2 for the TS 3.2.2 LCOs that comply with 10 CFR 50.36(c)(3), or provide technical justification why such actions are not necessary.

RAI 6

In RAI 10B, dated June 17, 2016 (ADAMS Accession No. ML16159A291), we asked the following:

> *In Section 4.11.3 of the SAR, "High Flux Safety Channels 1 and 2," mention is made of the high flux safety channels forming part of the scram logic circuitry. Included is a statement that during pulsing operation, when reactor power level, as measured by the high flux safety Channel 2, reaches the maximum pulse power level specified in TSs, a scram logic circuit is activated which caused an immediate reactor scram. Proposed TS 3.2.2, Table 2, "Minimum Reactor Safety System Scrams," does not provide a minimum performance level for the pulsing power scram. Explain its absence or make appropriate corrections to TS 3.2.2.*

In your response to RAI 10B, dated August 5, 2016 (ADAMS Accession No. ML16232A166), you stated the following:

> *The pulsing operation on a TRIGA is controlled by the physics of TRIGA fuel. The initiation of a scram takes approximately 0.5 seconds from initiation to actuation. The duration of a pulse ranges from 10ms to 100ms depending on the amplitude of the pulse. Since the duration of a pulse is governed by the physics of the fuel, not by a latent scram, this scram has no purpose and is therefore not tested and no credit is claimed for this function.*

The staff has reviewed your response to RAI 10B dated June 17, 2016 (ADAMS Accession No. ML16159A291), and requires additional clarification before they can assess the acceptability of your response. As was stated in the excerpt from the AFRRI SAR, Section 4.11.3, "….*when reactor power level, as measured by the high flux safety Channel 2, reaches the maximum pulse power level specified in TSs,* [emphasis added] *a scram logic circuit…"* However, in reviewing the proposed AFRRI TS, specifically the proposed TS 3.2.2, Table 2, "Minimum Reactor Safety System Scrams," there is no reference to a specified power level for the pulsing power scram. At minimum, the staff is concerned that the SAR is inconsistent with the proposed TS in that it is referencing a TS value that does not exist. The other possibility is that a LCO scram setpoint is missing from the proposed TS which would not comply with 10 CFR 50.36(c)(2)(i). Please provide an appropriate clarification.

RAI 7

In RAI 25, dated June 17, 2016 (ADAMS Accession No. ML16159A291), we asked the following:

> *For proposed TS 3.2.1, "Reactor Control System," explain how the notes to Table 1 apply to the Pulsing Power Channel, or modify the notes to exclude applicability to the Power Pulsing Channel.*

In your response to RAI 25, dated August 5, 2016 (ML16232A166), you stated the following:

> *For all modes of operation the final stage of repair/calibration is a test operation. For the purposes of testing and calibration limited operations must be an allowed condition of operations in order to complete repairs and/or calibrations. For pulse mode operations 3 measuring channels with scram capability are normally available. Under test 2 channels are still operational providing ample redundancy.*

The staff has reviewed your response to RAI 25 dated August 5, 2016 (ML16232A166), and requires additional information before they can assess the acceptability of your response. Please identify the three measuring channels with scram capability that are normally available for pulse mode operation.

RAI 8

In your response to RAI 28, dated August 5, 2016 (ADAMS Accession No. ML16232A166), you provided a TS definition for Emergency Stop. In that definition you referred to the emergency stop function as an interlock. TS 3.2.2, Table 2 clearly refers to the emergency stop function as a scram. Furthermore, TS 3.2.2, Table 3 does not list the emergency stop function as an interlock.

Please provide the necessary clarity, consistency, accuracy between TS definitions and the LCOs provided in TS 3.2.2 “Reactor Safety System,” by defining the emergency stop function as a scram as required by 10 CFR 50.9, or justify the proposed definition in accordance with 10 CFR 50.36(c)(2).

RAI 9

In RAIs 31A–D, dated June 17, 2016 (ADAMS Accession No. ML16159A291), we asked the following:

> *Proposed TS 3.2.2, "Reactor Safety System," does not contain a scram for pool water temperature. Proposed TS 3.3, "Coolant System," has as the basis that the pool temperature limit is designed to protect the demineralizer beds in the water purification system.*
>
> *A. Explain how proposed TS 3.3, "Coolant System," prevents operation if the pool temperature is above 60 degrees C.*
>
> *B. Explain how an automatic or manual scram is initiated for pool temperature, or explain how this TS for pool temperature keeps the reactor within analyzed conditions.*
>
> *C. Explain if the pool temperature protects the core during operations, and is in accord with the assumptions used for the thermal hydraulics analysis.*
>
> *D. Proposed TS 3.3, Specification a., states that the reactor should not be operated above 5 kWt when the coolant temperature measured at the core outlet is greater than 60 degrees C. Explain, analytically, at what coolant temperature above 60 degrees C does 5 kWt operation reach a thermal-hydraulic limit and add that temperature limit to the TS; or remove the ability to operate above 60 degrees C from the TS.*

In your response to RAI 31 A–D, dated August 5, 2016 (ADAMS Accession No. ML16232A166), you referred to your response to RAI 8B also dated August 5, 2016. In that response you stated the following:

> *TS 3.3 Coolant Systems will be changed to read:*
>
> *Objective*
>
> a. *To ensure the effectiveness of the resins in the water purification system;*
> b. *To prevent activated contaminants from becoming a radiological hazard; and*
> c. *To protect the integrity of the reactor core*
>
> *Specifications:*
>
> a. *The reactor shall not be operated above a thermal power of 5 kW when the bulk water temperature exceeds 55° C;*
>
> b. *The reactor shall not be operated if the conductivity of the bulk pool water is greater than 5 micromhos/cm;*
>
> c. *Both audible and visual alarms shall be provided to alert the AFRRI security guards and personnel to any drop in reactor pool water level greater than 6 inches.*

Discussion: With the reactor cooling system secured, the pool temperature rise is 14.1° C per hour at a power level of I MW thermal. At 5 kW, the temperature rise is calculated to be .0705 degrees per hour of operation. At this power level the reactor would need to operate at 5kW for more than 70 continuous hours of operation to reach the 60° C mark. Furthermore, analysis shows that full power operations are safe at 60°. At a power level of I MW thermal, the fuel temperature reaches approximately 400 ° C, a temperature rise of approximately 380 ° C. At a power level of 5kW thermal, the fuel temperature remains at ambient water temperature. TRIGA fuel has been tested to be safe beyond 1000 ° C. The overarching objective is to protect the integrity of the fuel. If the reactor were operated at 5kW indefinitely with the cooling system secured the worst case would be a fuel temperature at the maximum ambient water temperature of 100 ° C. The published safety limit for the AFRRI TRI GA is 1000 ° C. This leaves a safety margin of 900 ° C, assuming that no repairs have been made to the cooling system during this postulated operation. These TS provides more than reasonable assurance that safe operations are maintained.

The proposed change that you provided in your response to RAI 8B was not acceptable to the staff since it does not appear to meet the following regulatory requirements for TS:

(1) 10 CFR 50.36(a)(1) which states in part, "Each applicant for a license authorizing operation of a production or utilization facility shall include in his application proposed technical specifications in accordance with the requirements of this section [emphasis added]";

(2) 10 CFR 50.36(b) which states in part "Each license authorizing operation of a production or utilization facility of a type described in § 50.21 or § 50.22 will include technical specifications. The technical specifications will be derived from the analyses and evaluation [emphasis added] included in the safety analysis report, and amendments thereto, submitted pursuant to § 50.34";

(3) 10 CFR 50.36(c)(2)(i) which states in part "Limiting conditions for operation are the lowest functional capability or performance levels of equipment required for safe operation of the facility. When a limiting condition for operation of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action [emphasis added] permitted by the technical specifications until the condition can be met.";

(4) 10 CFR 50.36(c)(2)(ii), which states "A technical specification limiting condition for operation of a nuclear reactor must be established for each item [emphasis added] meeting one or more of (A) Criterion 1; (B) Criterion 2; (C) Criterion 3; and (D) Criterion 4."; and

(5) 10 CFR 50.36(c)(2)(ii)(B) Criterion 2 which states "A process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier."

For the same reason, the staff did not find this response applicable to RAIs 31A–D either.

The thermal-hydraulic analysis for the AFRRI reactor assumed the maximum bulk coolant temperature was 60 degrees C. This analysis and its assumption are inputs into transient and accident analyses which are used to demonstrate the safety of the AFRRI facility and form the basis for the issuance of an operating license. This is not to say that a bulk coolant temperature of greater than 60 degrees C would be unsafe but would be unanalyzed or indeterminate as to its effect to reactor safety. The proposed change would reduce the maximum bulk coolant temperature from 60 degrees C to 55 degrees C but would continue to allow reactor operation up to 5 kWt with no upper limit specified for the bulk coolant temperature. Absent in your proposal is an upper bulk coolant temperature limit of 60 degrees C or less, regardless of reactor power. Without additional engineering analysis and evaluation to demonstrate otherwise, the limiting conditions for operation for the maximum bulk coolant temperature at which reasonable assurance of safe operation can be provided is 60 degrees C.

Please provide a description as to how operation exceeding TS LCO limit of 60 degrees C for bulk coolant temperature will be prevented. Include any control panel indications, audible alarms, visual annunciators, interlocks, and manual or automatic scrams that will help ensure that the LCO for bulk coolant temperature is not exceeded. If no automatic protective function is provided to prevent the bulk coolant temperature from exceeding 60 degrees C, explain why one is not necessary.

RAI 10

In RAI 32, dated June 17, 2016 (ADAMS Accession No. ML16159A291), we asked the following:

> *Proposed TS 3.4, "Ventilation System," states, in part:*
>
> *The reactor shall not be operated unless the facility ventilation system is operating, except for periods of time not to exceed two continuous hours to permit repair, maintenance, or testing. In the event of a release of airborne radioactivity in the reactor room above routine reactor operation and normal background values, the ventilation system to the reactor room shall be automatically secured via closure dampers by a signal from the reactor deck continuous air particulate monitor.*
>
> *Proposed TS 4.4, "Ventilation System," states, in part:*
>
> *The operating mechanism of the ventilation system dampers in the reactor room shall be verified to be operable and visually inspected monthly, not to exceed 6 weeks."*
>
> *A. Propose a TS requirement to maintain a controlled air pathway (negative pressure) of the reactor room with respect to the adjacent rooms and surrounding building when the reactor is operating and during a postulated accident, or explain why it is not necessary. If a TS requirement to maintain negative pressure in the reactor room by a controlled air pathway is necessary, then propose a surveillance requirement to confirm that negative pressure is present.*

In your response to RAI 32A, dated August 5, 2016 (ADAMS Accession No. ML16232A166), you stated the following:

> *TS 3.4 will be modified to read:*
>
> 1. *The reactor shall not be operated unless the facility ventilation system is operating, except for periods of time not to exceed two continuous hours to permit repair, maintenance, or testing. In the event of a release of airborne radioactivity in the reactor room above routine reactor operation and normal background values, the ventilation system to the reactor room shall be automatically secured via closure dampers by a signal from the reactor deck continuous air particulate monitor.*
>
> 2. *The reactor shall not be operated in exposure room 1 or 2:*
>
>   a) *if the relative air pressure in the exposure room in use is greater than the reactor prep area (room 1105) except for periods of time not to exceed two continuous hours to permit repair, maintenance, or testing when the dampers shall be closed. or;*
>
>   b) *the prep area RAMS E5 and E6 are alarming.*
>
> *The following will be added to TS 4.4:*

The relative air pressure in the exposure room to be used shall be verified to be negative each day operations in the affected exposure room are planned. The reactor exhaust damper flow failure closure system shall be tested each day that reactor operations are planned.

The staff concern intended to be addressed by RAI 32A is that the areas where the potential for a release of radioactive material exist, such as the reactor and exposure rooms, remain at a negative pressure relative to the surrounding rooms. The staff has reviewed your response and has concluded that they require additional clarification to make a determination concerning the acceptability of that response and compliance with the following regulatory requirements for TS:

(1) 10 CFR 50.36(a)(1) which states in part, "Each applicant for a license authorizing operation of a production or utilization facility shall include in his application proposed technical specifications in accordance with the requirements of this section [emphasis added]";

(2) 10 CFR 50.36(b) which states in part "Each license authorizing operation of a production or utilization facility of a type described in § 50.21 or § 50.22 will include technical specifications. The technical specifications will be derived from the analyses and evaluation [emphasis added] included in the safety analysis report, and amendments thereto, submitted pursuant to § 50.34";

(3) 10 CFR 50.36(c)(2)(i) which states in part "Limiting conditions for operation are the lowest functional capability or performance levels of equipment required for safe operation of the facility. When a limiting condition for operation of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action [emphasis added] permitted by the technical specifications until the condition can be met.";

(4) 10 CFR 50.36(c)(2)(ii), which states "A technical specification limiting condition for operation of a nuclear reactor must be established for each item [emphasis added] meeting one or more of (A) Criterion 1; (B) Criterion 2; (C) Criterion 3; and (D) Criterion 4."; and

(5) 10 CFR 50.36(c)(2)(ii)(C) Criterion 3 which states "A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier."

(6) 10 CFR 50.36(c)(3), "Surveillance requirements," which states "Surveillance requirements are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met."

In your response you stated in part that:

"*The reactor shall not be operated in exposure room 1 or 2 if the relative air pressure in the exposure room in use is greater than the reactor prep area (room 1105)."*

It is clear that the proposed TS change will address the pressure differential between the exposure rooms and the rooms that surround; however, what is not clear is how does the propose TS change help to ensure the maintenance of a negative pressure differential between the reactor and control room area and the surrounding rooms when the reactor is operating and during a postulated accident.

Additionally, explain the limitation of reactor operation only in exposure room 1 or 2. Can't the reactor be operated in the center of the pool and not located in either exposure room and if so, wouldn't the proposed TS need to capture the requirement to confirm a negative pressure differential between the reactor and control room area and the surrounding rooms?

If the previously proposed TS requirement concerning the maintenance of a negative pressure in the reactor room when the reactor is operating and during a postulated accident by a controlled air pathway is to be changed, please ensure that appropriate conforming changes are made to the proposed surveillance requirements as well.

RAI 11

In RAI 32B, dated June 17, 2016 (ADAMS Accession No. ML16159A291), we asked the following:

> *B. Explain how continuous air monitor setpoints are determined and verified for operability. Explain if the operating mechanism of the ventilation system dampers is verified to be operable with a valid signal from the radiation monitors to the dampers, causing the dampers to close.*

In your response to RAI 32B, dated August 5, 2016 (ML16232A166), you stated the following:

> *The set points are determined by the Radiation Safety Officer.*
>
> *Damper closure is verified by an alarm signal introduced to the CAM by a check source on each day operations are planned.*

The staff has reviewed your response and has concluded that they require additional clarification to make a determination concerning the acceptability of that response and compliance with the following regulatory requirements for TS:

> (1) 10 CFR 50.36(a)(1) which states in part, "Each applicant for a license authorizing operation of a production or utilization facility shall include in his application proposed technical specifications in accordance with the requirements of this section [emphasis added]";
>
> (2) 10 CFR 50.36(b) which states in part "Each license authorizing operation of a production or utilization facility of a type described in § 50.21 or § 50.22 will include technical specifications. The technical specifications will be derived from the analyses and evaluation [emphasis added] included in the safety analysis report, and amendments thereto, submitted pursuant to § 50.34";
>
> (3) 10 CFR 50.36(c)(2)(i) which states in part "Limiting conditions for operation are the lowest functional capability or performance levels of equipment required for safe operation of the facility. When a limiting condition for operation of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action [emphasis added] permitted by the technical specifications until the condition can be met.";
>
> (4) 10 CFR 50.36(c)(2)(ii), which states "A technical specification limiting condition for operation of a nuclear reactor must be established for each item [emphasis added] meeting one or more of (A) Criterion 1; (B) Criterion 2; (C) Criterion 3; and (D) Criterion 4."; and
>
> (5) 10 CFR 50.36(c)(2)(ii)(C) Criterion 3 which states "A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier."

(6) 10 CFR 50.36(c)(3), “Surveillance requirements,” which states “Surveillance requirements are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met.”

We asked you to explain how continuous air monitor setpoints are determined; however in your response you provided who determined the CAM setpoints, not how. Please provide the methodology used by the RSO to determine the setpoints.

RAI 12

In RAI 32C, dated June 17, 2016 (ADAMS Accession No. ML16159A291), we asked the following:

> *C. Proposed TS 3.4, "Ventilation System," discusses operating conditions for which the facility ventilation system must be operational. Revise the TS to require the ventilation system to be operating when radiation material is being handled in the reactor room with the potential for airborne radioactive material or justify why the TS is not needed.*

In your response to RAI 32C, dated August 5, 2016 (ADAMS Accession No. ML16232A166), you referred to your response to RAI 32A which stated the following:

TS 3.4 will be modified to read:

1. *The reactor shall not be operated unless the facility ventilation system is operating, except for periods of time not to exceed two continuous hours to permit repair, maintenance, or testing. In the event of a release of airborne radioactivity in the reactor room above routine reactor operation and normal background values, the ventilation system to the reactor room shall be automatically secured via closure dampers by a signal from the reactor deck continuous air particulate monitor.*

2. *The reactor shall not be operated in exposure room 1 or 2:*

   a) *if the relative air pressure in the exposure room in use is greater than the reactor prep area (room 1105) except for periods of time not to exceed two continuous hours to permit repair, maintenance, or testing when the dampers shall be closed. or;*

   b) *the prep area RAMS E5 and E6 are alarming.*

The following will be added to TS 4.4:

> *The relative air pressure in the exposure room to be used shall be verified to be negative each day operations in the affected exposure room are planned. The reactor exhaust damper flow failure closure system shall be tested each day that reactor operations are planned.*

The staff has reviewed your response and has concluded that they require additional clarification to make a determination concerning the acceptability of that response and compliance with the following regulatory requirements for TS:

> (1) 10 CFR 50.36(a)(1) which states in part, “Each applicant for a license authorizing operation of a production or utilization facility shall include in his application proposed technical specifications in accordance with the requirements of this section [emphasis added]”;
>
> (2) 10 CFR 50.36(b) which states in part “Each license authorizing operation of a production or utilization facility of a type described in § 50.21 or § 50.22 will include

technical specifications. The technical specifications will be derived from the analyses and evaluation [emphasis added] included in the safety analysis report, and amendments thereto, submitted pursuant to § 50.34";

(3) 10 CFR 50.36(c)(2)(i) which states in part "Limiting conditions for operation are the lowest functional capability or performance levels of equipment required for safe operation of the facility. When a limiting condition for operation of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action [emphasis added] permitted by the technical specifications until the condition can be met.";

(4) 10 CFR 50.36(c)(2)(ii), which states "A technical specification limiting condition for operation of a nuclear reactor must be established for each item [emphasis added] meeting one or more of (A) Criterion 1; (B) Criterion 2; (C) Criterion 3; and (D) Criterion 4."; and

(5) 10 CFR 50.36(c)(2)(ii)(C) Criterion 3 which states "A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier."

(6) 10 CFR 50.36(c)(3), "Surveillance requirements," which states, "Surveillance requirements are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met."

In your response you provided a proposed change to TS 3.4 and TS 4.4 that only specifies applicability during reactor operations and is silent as to ventilation operating requirements when material is being handled in the reactor room or exposure rooms with the potential for airborne radioactive material when the reactor is not operating. As such, the staff has concluded that your response as provided is not acceptable.

Provide a revised TS LCO and applicable surveillance requirements that require the ventilation system to be operating when radioactive materials are being handled in the reactor room or exposure rooms with the potential for airborne radioactive material or provide justification why a TS is not needed.

RAI 13

In RAI 34, dated June 17, 2016 (ADAMS Accession No. ML16159A291), we asked the following:

> *Proposed TS 5.3, "Special Nuclear Material Storage," states, in part:*
>
> *All fuel elements not in the reactor core shall be stored and handled in accordance with applicable regulations. Irradiated fuel elements and fueled devices shall be stored in an array that will (emphasis added] permit sufficient natural convective cooling by water or air, and the fuel element or fueled device temperature will [emphasis added] not exceed design values. Storage shall be such that groups of stored fuel elements will [emphasis added] remain subcritical under all conditions of moderation and reflection in a configuration where k_{eff} is no greater than 0.90.*
>
> *A. Provide TS 5.3 with "shall" statements, or justify why it is not necessary to do so.*

In your response to RAI 34A, dated August 5, 2016 (ADAMS Accession No. ML16232A166), you stated the following:

> *Shall does not make grammatical sense in this context. No change to TS is warranted.*

Your response was reviewed by the staff and was determined unacceptable. TS definitions are included to eliminate uncertainty in the reading of the TS and help ensure common understanding of those specification by both the licensee and the NRC staff. As such, the only verb that defines a requirement or a required action in the TS is “shall.”

The NRC staff could accept the following change to TS 5.3:

> All fuel elements not in the reactor core shall be stored and handled in accordance with applicable regulations. Irradiated fuel elements and fueled devices shall be stored in an array that ~~will [emphasis added] permit~~ *permits* sufficient natural convective cooling by water or air*, and that prevents*~~, and the~~ fuel element or fueled device temperature ~~will [emphasis added] not exceed~~ *from exceeding* design values. Storage shall be such that stored fuel elements ~~will [emphasis added]~~ remain subcritical under all conditions of moderation and reflection in a configuration where k_{eff} is no greater than 0.90.

Provide TS 5.3 with "shall" statements, or justify why it is not necessary to do so.

RAI 14

In RAI 35, dated June 17, 2016 (ADAMS Accession No. ML16159A291), we asked the following:

> *Proposed TS. 6.1.1, "Structure," states, in part:*
>
> *The organization of personnel for the management and operation of the AFRRI reactor facility is shown in Figure 1. Organizational changes may occur based on AFRRI requirements and will be depicted in internal documents.*
>
> *The organization chart is part of the facility operating license, and therefore changes to the organization chart require a license amendment. Provide a TS consistent with 10 CFR 50.36c.(5), or explain why it is unnecessary.*

In your response to RAI 35, dated August 5, 2016 (ADAMS Accession No. ML16232A166), you stated the following:

> *TS 6.1.1 will be changed to read:*
>
> *Organizational changes to the general AFRRI organizational structure may occur based on AFRRI requirements and will be depicted in internal documents, however, organizational changes to the management and operations of the reactor facility organizational structure shall not be made without a change to TS 6.1.1.*

The staff has reviewed your response and has concluded that they require additional clarification to make a determination concerning the acceptability of that response and compliance with the following regulatory requirements for TS:

(1) 10 CFR 50.36(a)(1) which states in part, "Each applicant for a license authorizing operation of a production or utilization facility shall include in his application proposed technical specifications in accordance with the requirements of this section [emphasis added]";

(2) 10 CFR 50.36(c)(5) "*Administrative controls,"* which states in part "Administrative controls are the provisions relating to organization and management [emphasis added], procedures, recordkeeping, review and audit, and reporting necessary to assure operation of the facility in a safe manner."

In your response you stated, in part, that "Organizational changes to the general AFRRI organizational structure may occur based on AFRRI requirements…" Please provide clarification through explanation as to how the "general AFRRI organizational structure" differs from the "management and operations of the reactor facility organizational structure." A brief illustrative example may be useful that demonstrates when a TS change would be required and when not.

RAI 15

In RAI 45, dated June 17, 2016 (ADAMS Accession No. ML16159A291), we asked the following:

> *The following questions pertain to the use of shall statements, or are editorial questions pertaining to grammatical or spelling:*
>
> *B. Proposed TS 6.2.2.1, "Function ," states:*
>
> *The RRFSS is [emphasis added] directly responsible to the AFRRI Licensee. The committee shall review all radiological health and safety matters concerning the reactor and its associated equipment, the structural reactor facility, and those items listed in Section 6.2.4.*
>
> *Propose a modification to proposed TS 6.2 .2.1 in the form of a "shall" statement, or justify why it is not necessary to do so.*
>
> *C. Proposed TS 6.7.1, "Records to be Retained for a Period of at Least Five Years," and proposed TS 6.7.3, "Records to be Retained for the Life of the Facility," are not stated with shall statements.*
>
> *Revise proposed TS 6.7.1 and proposed TS 6.7.3 to include a "shall" statement or state why it is not necessary to do so.*

In your response to RAI 45B and C, dated August 5, 2016 (ADAMS Accession No. ML16232A166), you indicated that shall was not appropriate in the case of TS 6.2.2.1 (RAI 45B). In the case of TS 6.7.1 you made the required change but did not do so for TS 6.7.3 (RAI 45C).

Your responses were reviewed by the staff and was determined to be only partially acceptable. TS definitions are included to eliminate uncertainty in the reading of the TS and help ensure common understand of those specification by both the licensee and NRC staff. As such, the only verb that defines a requirement or a required action in the TS is “shall.”

Please provide a revised proposed TS 6.2.2.1, and TS 6.7.3 with the appropriate inclusion of the word “shall.”