

July 28, 2016

Dr. Timothy W. Koeth, Director
Nuclear Reactor and Radiation Facilities
Chemical and Nuclear Engineering Building 090
University of Maryland
College Park, MD 20742

SUBJECT: UNIVERSITY OF MARYLAND - REQUEST FOR ADDITIONAL INFORMATION
REGARDING THE REVIEW OF LICENSE RENEWAL FOR THE MARYLAND
UNIVERSITY TRAINING REACTOR (TAC NO. ME1592)

Dear Dr. Koeth:

The U.S. Nuclear Regulatory Commission (NRC) is continuing its review of your application for the renewal of Facility Operating License No. R-70, for the Maryland University Training Reactor, dated May 12, 2000 (a redacted version of the application is available on the NRC's public Web site at www.nrc.gov under the Agencywide Documents Access and Management System Accession No. ML052910399), as supplemented.

During our review, questions have arisen for which additional information 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 within 30 days from the date of this letter.

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 50.30(b), "Oath or affirmation," you must execute its 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 review of your renewal request.

T. Koeth

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If you have any questions, or need additional time to respond to this request, please contact me at 301-415-4246, or by electronic mail at Eben.Allen@nrc.gov.

Sincerely,

/RA/

Eben Allen, Project Manager
Research and Test Reactors Licensing Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No. 50-166
License No. R-70

Enclosure:
As stated

cc: See next page

University of Maryland

Docket No. 50-166

cc:

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Test, Research, and Training
Reactor Newsletter
University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32611

T. Koeth

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If you have any questions, or need additional time to respond to this request, please contact me at 301-415-4246, or by electronic mail at Eben.Allen@nrc.gov.

Sincerely,

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Eben Allen, Project Manager
Research and Test Reactors Licensing Branch
Division of Policy and Rulemaking
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Docket No. 50-166
License No. R-70

Enclosure:
As stated

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ADAMS Accession No.: ML16144A537 *concurrence via e-mail NRR-088

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OFFICE OF NUCLEAR REACTOR REGULATION
REQUEST FOR ADDITIONAL INFORMATION
REGARDING THE RENEWAL OF
THE MARYLAND UNIVERSITY TRAINING REACTOR
LICENSE NO. R-70; DOCKET NO. 50-166

The U.S. Nuclear Regulatory Commission (NRC) is continuing its review of your application for renewal of Facility Operating License No. R-70, for the Maryland University Training Reactor (MUTR), dated May 12, 2000 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML052910399), as supplemented. During our review, questions have arisen for which additional information 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 within 30 days from the date of this letter.

The NRC staff's review used the guidance provided in NUREG-1537, Part 2, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non Power Reactors: Standard Review Plan and Acceptance Criteria," and supporting information from American National Standards Institute/American Nuclear Society (ANSI/ANS)-15.1-2007, "The Development of Technical Specifications for Research Reactors."

- University of Maryland – "University of Maryland - Request for Additional Information Re: For the Renewal of Facility Operating License No. R-70 the Maryland University Training Reactor Docket No. 50-166," dated February 29, 2016 (ADAMS Accession No. ML16061A003)
1. The regulations in 10 CFR 70.32 "Conditions of licenses," provide the regulatory requirement related to conditions of licenses for the possession of special nuclear material (SNM). The regulations in 10 CFR 70.32(b) states, in part, that the Commission may incorporate in any license such additional conditions and requirements with respect to the licensee's ownership, receipt, possession, use, and transfer of special nuclear material as it deems appropriate or necessary. However, the NRC staff review of the license renewal application does not find a possession limit for SNM.

Provide a propose limit for the possession of SNM for irradiation, including a mass (gram) limit and a description of the material form, as needed for operation of the reactor and its experimental programs.
 2. MUTR safety analysis report (SAR) Sections 5.2 and 5.3 as supplemented by responses to RAI Nos. 19.a and 19.d (ADAMS Accession No. ML16083A222) describes the secondary cooling system, and failure of the secondary heat exchanger.

Enclosure

The regulations in 10 CFR Part 20, "Standards for Protection Against Radiation," requires that dose to members of the public be limited. To support meeting the public dose limits, 10 CFR Part 20 also limits the release of radioactive materials (e.g., 10 CFR Part 20, Appendix B, Table 3.) NUREG-1537, Part 1, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors: Format and Content," Section 5.3 states, in part, that "Isolation of the heat exchanger during shutdown periods is an acceptable method to control potential primary-to-secondary system leakage if secondary coolant system pressure is lower than primary coolant system pressure."

In the event of a primary coolant system heat exchanger tube leak, describe how MUTR staff would detect, contain, isolate, or prevent the release of primary coolant across the primary to secondary coolant heat exchanger boundary if the secondary cooling water pressure becomes less than the primary coolant pressure.

3. MUTR SAR Section 7 describes the instrumentation and control systems. Figure 7.5 in this section shows a Power Regulation System for automatic mode; Section 7.3.3 describes interlocks that exist while in the steady state (manual) and automatic modes; and Section 7.4.1.1.3 describes the period amplifier and its relationship to calibrate and operate mode. Section 7.6 describes a mode switch on the control console and display panel for the Manual/Automatic Mode Switch. The response to RAI No. 27 (ADAMS Accession No. ML101970211) describes changing between automatic and steady state positions.

NUREG-1537, Part 2, Section 7.4, states, "The reactor should have operable protection capability in all operating modes and conditions, as analyzed in the SAR. For example, at low reactor power, a reactor period scram may be needed to ensure that inadvertent transients could not propagate risks to personnel or the reactor." It appears there are three separate modes of operation: automatic, steady state, and calibration, but only steady state and automatic mode positions are on the control console. While this section does describe interlocks between the separate modes it is not clear if the reactor can be operated in all the modes identified above.

- a. How many separate modes can the MUTR be operated in, and what if, any protective functions, and interlocks exist for each mode?
 - b. What is the significance of defining the STEADY STATE MODE in the TSs and not the others?
4. The license renewal application is required by 10 CFR 50.34, "Contents of applications; technical information," paragraph (b)(2) to include information that provides a description and analysis of the structures, systems, and components of the MUTR, with emphasis upon performance requirements, the bases, with technical justification upon which such requirements have been established, and the evaluations required to show that safety functions will be accomplished. The description shall be sufficient to permit understanding of the system designs and its relationship to safety evaluations.

MUTR SAR Section 13.2.3, as supplemented by responses to RAI Nos. 62 and 14 (ADAMS Accession Nos. ML101970210 and ML16083A222, respectively) describe how the loss of coolant and leakage would be observed by MUTR staff and security patrols; and the

expected area radiation detector alarms. Based on the information submitted to date, it is unclear if there is instrumentation that would annunciate a low reactor pool level and/or reactor area high radiation alarms at a manned remote locations outside the MUTR facility.

- a. Provide a description of what instrumentation (e.g. pool level or radiation detectors) is provided that is capable to provide a remote alarm(s) outside of the facility.

While responses to RAI Nos. 62 and 14 (ADAMS Accession Nos. ML101970210 and ML16083A222, respectively) describe how only a minimum amount of coolant can siphon from the pool, and a ten day period is the longest it may go unnoticed. It is not clear if there is radiological effect of this leakage or the contamination that primary coolant may cause to the facility or the environment. Also, the responses describe how make up water is tracked and compared to the usage of the reactor.

- b. Describe the consequences during the ten day period that the loss of coolant or pool leakage would go unnoticed.
- c. Quantify the minimum detectable leakage rate of coolant from the reactor pool that MUTR staff could differentiate from normal losses.

The following applies to RAI Nos. 5 through 11. Technical Specifications (TSs) are fundamental criteria necessary to demonstrate facility safety and are required by 10 CFR 50.36, "Technical specifications," for each license authorizing operation of a production or utilization facility of a type described in 10 CFR 50.21, "Class 104 licenses; for medical therapy and research and development facilities." TSs are derived from the analyses and evaluation included in the SAR and submitted pursuant to 10 CFR 50.34. Due to the importance to overall facility safety of a uniform interpretation by both the licensee and regulator of terms and phrase used in TS, definitions shall be included where necessary to ensure that the TS criteria necessary for compliance with regulatory requirements is uniformly understood by the licensee and regulator. Guidance pertaining to the format and content of TS previously found acceptable by the NRC staff is provided in NUREG-1537 Part 1, and ANSI/ANS-15.1-2007.

5. MUTR proposed TS 1.15, "Isolation," may contain a grammatical error. Provide a definition removing the "leads to," or justify why no change is necessary.

MUTR proposed TS 1.29, "Reactor Secured," item 2d., describes conditions when combined would ensure the reactor is secured. ANSI/ANS-15.1-2007, definition for "reactor secured," item (2)(d) describes two separate reactivity values: "maximum value allowed for a single experiment, or one dollar." It appears from proposed TS 3.1, "Reactor Core Parameters," that the maximum allowed value for a single experiment at the MUTR is one dollar. Provide a definition by removing the redundant requirement, or justify why no change is necessary. For example, "No experiments in or near the reactor are being moved or serviced that have, on movement, the smaller of: a reactivity worth exceeding the maximum value allowed for a single experiment, or a reactivity of one dollar." to "no experiments are moved or serviced that have, on movement, a reactivity worth exceeding \$1.00."

6. MUTR proposed TS 1.30, "Reactor Shutdown," describes two conditions which when met ensure the reactor is shutdown. Two separate reactivity values are described in proposed TS 1.30, item b, "maximum allowed value for a single experiment, or one dollar." Revise the definition for proposed TS 1.30 by removing the redundant requirement, or justify why no change is necessary. For example, "No experiments are being moved or serviced that have, on movement, a reactivity worth exceeding the maximum value allowed for a single experiment, or one dollar, whichever is smaller." to "no experiments are moved or serviced that have, on movement, a reactivity worth exceeding \$1.00."
7. MUTR proposed TS 1.31, "Reference Core Condition," provides a definition for the reference core. ANSI/ANS-15.1-2007 definition reference core condition states, "The condition of the core when it is at ambient temperature (cold) and the reactivity worth of xenon is negligible (<0.30 dollar)." While proposed TS 1.31 does define the temperature and xenon values, it is not clear how the core could be critical if xenon were zero.

Revise the definition for proposed TS 1.31 to clarify what conditions are used for the reference core or justify why no change is necessary. For example, "The reference core condition is the reactivity condition of the core when it is at 20 °C and the reactivity worth of xenon is zero (i.e., cold, clean, and critical)." to "The reference core condition is the reactivity condition of the core when it is at 20 °C and the reactivity worth of xenon is negligible."

8. MUTR proposed TS 1.32, "Reportable Occurrence," item 3 describes when malfunctions in reactor safety system are required to be reported. ANSI/ANS-15.1-2007, Section 6.7.2, item (c)(iii), states, in part, that "If the malfunction or condition is caused by maintenance, then no report is required." However, proposed TS 1.32, item 3, states, in part, that "unless the malfunction or condition is discovered during maintenance tests." The guidance excludes reports when malfunctions are due to maintenance. The NRC staff believes that the condition of being "caused by maintenance" per ANSI/ANS-15.1-2007, Section 6.7.2, item (c)(iii) and the condition of being "discovered during maintenance tests" per TS 1.32, item 3 are not equivalent and therefore, the discovery of a problem during a maintenance test is not necessarily exempt from reporting.

Revise the definition for proposed TS 1.32," that is either consistent with the guidance provided in ANSI/ANS-15.1-2007, Section 6.7.2, item (c)(iii) for the reporting of malfunctions in the reactor safety system, or explain why "discovered during maintenance tests" and "caused by maintenance" are equivalent and should share the same reporting exemption.

9. MUTR proposed TS 1.39, "Senior Reactor Operator," describes a individual who is licensed to direct activities of reactor operators (ROs). It is not clear from this definition if a Senior Reactor Operator (SRO) may also manipulate reactor controls and as such appears to be inconsistent with the definition of SRO provided in 10 CFR 55.4, "Definitions."

Revise the definition for proposed TS 1.39 to be consistent with that provided in the regulatory requirement 10 CFR 55.4 or justify why the no change is necessary.

10. MUTR proposed TS 1.41, "Shutdown Margin," appears to incorporate MUTR proposed TS 1.42, "Shutdown Reactivity." Shutdown Margin defines the most reactivate rod being fully withdrawn, and Shutdown Reactivity defines rod positions as being fully inserted. It

appears these different control rod positions have different reactivity values and would cause a discrepancy in the definitions.

Revise proposed TS 1.41 or 1.42, as applicable, to correct the differences in these definitions for consistency, or justify why no change is necessary.

11. MUTR proposed TS 1.42, "Shutdown Reactivity," describes reactivity value based on ambient conditions.

Revise proposed TS 1.42 to provide a defined value for "ambient conditions," as found in the definition for reference core condition, or justify why no change is necessary.

The following applies to RAI Nos. 12 through 20. TSs are fundamental criteria necessary to demonstrate facility safety and are required by 10 CFR 50.36 for each license authorizing operation of a production or utilization facility of a type described in 10 CFR 50.21. The TSs are derived from the analyses and evaluation included in the SAR and submitted pursuant to 10 CFR 50.34. TSs will include items in the following categories: *safety limits (SLs)*, *limiting safety system settings (LSSS)*, and *limiting conditions for operation (LCO)*. TSs LCO of a nuclear reactor must be established for each item meeting one or more of the criteria provided in 10 CFR 50.36(c)(2)(ii).

12. MUTR proposed TS 2.2, "Limiting Safety System Settings," describes the LSSS of the fuel temperature, location of the instrumented fuel element (IFE), and associated analyses. However, the IFE location is an administrative constraint on the geometric arrangement of core components, and the analysis is a surveillance of the core's thermal hydraulic parameters and is not a safety limit setting. Guidance provided in NUREG-1537, Part 1, Chapter 14, Appendix 14.1, "Format and Content of Technical Specifications for Non-Power Reactors," Section 3.1, item (4) provides for limiting the core configuration so that the position of certain fuel elements, such as, the IFE would not cause power peaking concerns.

Revise proposed TS 2.2 to only describe the LSSS by removing the reference to the IFE location or justify why no change is necessary.

13. MUTR proposed TS 3.1, "Reactor Core Parameters," Specification 1 describes the excess reactivity, however, the term "cold critical condition" is ambiguous.

Revise proposed TS 3.1, Specification 1 to replace the term "cold critical condition" with a defined term, or justify why change is necessary.

14. MUTR TS 3.1, Specification 3, item b, states "No fuel should be inserted or removed from the core unless the reactor is subcritical by more than the worth of the most reactive fuel element."

Provide a reference to the analyses and/or evaluation as required by 10 CFR 50.36 and submit pursuant to 10 CFR 50.34 which establishes subcriticality criteria for this specification related to fuel bundle insertion and removal at MUTR, or justify why the proposed specification meets the requirements of 10 CFR 50.36.

15. MUTR proposed TS 3.1, Specification 3, item c, states “No control rods shall be removed from the core unless a minimum of four fuel bundles are removed from the core.” While NUREG-1537, Part 1, Chapter 14, Appendix 14.1, Section 3.1, item (4), states “If control rods need to be removed from the reactor core for inspection, an LCO should state the negative reactivity necessary in the core before a control rod can be remove.” It is not clear if the four fuel bundles have a reactivity greater than the control rod.

Provide a reference to the analyses and/or evaluation as required by 10 CFR 50.36 and submit pursuant to 10 CFR 50.34 which demonstrates that the removal of a minimum of four fuel bundles maintains the minimum shutdown margin per MUTR proposed TS 3.1, Specification 2 with the most reactive control rod withdrawn, or justify why the proposed specification meets the requirements of 10 CFR 50.36

16. MUTR proposed TS 3.1, Specification 4 provides operating restrictions on suspected damaged fuel, which states, in parts, “No operation with damaged fuel,” It is necessary to use consistent terminology when delineating between recommendations and requirements. The definitions in ANSI/ANS-15.1-2007 provide guidance that the word “shall” is used to denote a requirement. MUTR proposed TS 1.40 define “shall” as identifying a requirement.

- a. Revise proposed TS 3.1, Specification 4 using consistent terminology to make clear the condition of operation of the reactor with fuel damage or justify why no change is necessary. For example, “No operation with damaged fuel (defined as a clad defect that results in fission product release into the reactor coolant) except to locate such fuel.” to “The reactor shall not be operated with damaged fuel (defined as a clad defect that results in fission product release into the reactor coolant) except to locate such fuel.”

TSs required by 10 CFR 50.36 provides limitations and operational criteria intent on protecting the integrity of certain of the physical barriers that guard against the uncontrolled release of radioactivity. The first of these barriers and the most important is the fuel cladding. Therefore, it is necessary to have criteria for fuel damage. NUREG-1537, Part 1, Chapter 14, Appendix 14.1, Section 3.2, item (6) provides industry accepted recommendations for TRIGA fuel damage. While TS 3.1, Specification 4, basis do specify an exceeded temperature and positive air or water samples, these basis should be included as part of the specification. In addition, there are other observed conditions that can be indicative of TRIGA fuel damage which are not included such as length growth, bending, corrosion, visual pitting, visual bulges, or fuel burnup greater than 50 percent.

- b. Revise proposed TS 3.1 to include criteria for damaged fuel, or justify why no change is necessary.

17. MUTR proposed TS 3.1, Specification 5 list the three reactivity coefficients for the reactor, when surveillance shall be conducted, and record keeping of the results. The MUTR TSs include LCO in Section 3 consistent with the requirements of 10 CFR 50.36. The regulations in 10 CFR 50.36 also require the inclusion of surveillance requirements that prescribe the frequency and scope of the surveillance necessary to demonstrate the required performance in Section 4 of the TS. It is not clear why the surveillance requirements for proposed TS 3.1, Specification 5 are included in Section 3.

- a. Provide a companion surveillance specification in MUTR proposed TS Section 4, addressing MUTR proposed TS 3.1, Specification 5, or justify why no change is necessary. The reactivity coefficients appear to have an exact value. Consider describing them as a nominal value for operational flexibility

Guidance provided in ANSI/ANS-15.1-2007 definitions provides that the word “shall” is used to denote a requirement. MUTR TS definitions define “shall” as identifying a requirement.

- b. Revise proposed TS 3.1, Specification 5 using consistent terminology defined in the MUTR TSs to clearly identify that the reactivity values shall be the listed values, or justify why no change is necessary.
18. MUTR proposed TS 3.2, “Reactor Control and Safety Systems,” Specification 1, states “The drop time of each of the three standard control rods from the fully withdrawn position to the fully inserted position shall not exceed one second.” However, ANSI/ANS-15.1-2007 defines scram time as “Scram time is the elapsed time between the initiation of a scram signal and a specified movement of a control or safety device.” The proposed TS 3.2, Specification 1 currently does not include time with the initiation of the signal.

Revise proposed TS 3.2, Specification 1 to include the time interval from the initiation of a scram signal to the control rods fully inserted position, or justify why no change is necessary. For example, “The drop time of each of the three standard control ...” to “The drop time from the initiation of scam signal of each of the three standard control ...”

19. MUTR proposed TS 3.2, Specification 6 contains the words “must be.” The definitions in ANSI/ANS-15.1-2007 definitions provide guidance that the word “shall” is used to denote a requirement. MUTR TSs definitions define “shall” as identifying a requirement.

Revised proposed TS 3.2, Specification 6 using consistent terminology defined in the MUTR TSs to clearly identify a requirement or justify why no change is necessary. For example, “A minimum of one reactor power channel, calibrated for reactor thermal power, must be attached to a ...” to “A minimum of one reactor power channel, calibrated for reactor thermal power, shall be attached to a....”

20. MUTR proposed TS 3.2, Table 3.1 “Reactor Safety Channels: Scram Channels,” provides seven scram channels and their associated setpoints. While the setpoints of the scram channels are provided, further clarification is needed.

In Table 3.1, the channel for “Reactor Power Channel Detector Supply,” appears to provide a scram signal (trip) upon loss of power to a chamber. It is not clear as to which of detectors (chambers) provide a scram signal (trip) on a loss of supply voltage. Additionally, the scram setpoint refers to a trip on “loss of power.” This appears be inaccurate when compared to the SAR, Chapter 7, which discusses a trip resulting from detector low-high voltage. If the scram signal is generated from a low-high voltage to the neutron detector then it will have a voltage setpoint for that trip (i.e., 70 percent) which has not been provided. Revise proposed TS 3.2, Table 3.1 scram setpoint for the “Reactor Power Channel Detector Supply,” channel to describes a specific type of detector/chamber (i.e., fission chamber, compensated ion chamber, or other), the affected channel(s) (i.e., Log Safety Channel,

linear, or other), the initiator for any scram signals (loss of detector voltage, detector low-high voltage, or other), and any related scram set points, or justify why no change is necessary.

21. MUTR proposed TS 3.3, "Primary Coolant System," Specifications 2 and 3 describes the limits of activity in the primary coolant. The regulations in 10 CFR 50.36 also require the inclusion of surveillance requirements that prescribe the frequency and scope of the surveillance necessary demonstrate the required performance in Section 4 of the TSs. NUREG-1537, Part 1, Chapter 14, Appendix 14.1, Section 4, states, in part, that "Certain LCOs established in Section 3 of the technical specifications should be accompanied by surveillance requirement in Section 4."

- a. Since proposed TS 4.3, Specifications 2 and 3, provide surveillance intervals (frequency), it is unnecessary to include in proposed TS 3.3, Specifications 2 and 3.

Revise proposed TS 3.3 Specifications 2 and 3 to delete the surveillance interval, or justify no change is necessary.

- b. Proposed TS 3.3, Specification 3 states "Gross gamma measurement shall be less than two times historical data measurements." NUREG-1537, Part 1, Chapter 14, Appendix 14.1, Section 3.3, item (8) provides guidance that minimum operating limits be in place to detect and quantify radioactivity of the primary coolant as such indications can be indicative of early fuel cladding failure, heat exchange failure, or the introduction of potentially corrosive contaminants to the primary coolant.

Revise proposed TS 3.3, Specification 3 to specify fission product activities detection. For example, "The concentration of radionuclides in the bulk pool water shall be no higher than the values presented for water in 10 CFR Part 20, Appendix B"

22. MUTR proposed TS 3.4, "Confinement," Specification 1 states "Confinement shall be considered established when the doors leading from the reactor bay area leading into the balcony area on the top floor, and the reception area as well as the building exterior are secured." Guidance provided in ANSI/ANS-15.1-2007, Section 3.4.2 item (1), states "The minimum equipment (such as fans, filters, isolation valves, dampers) and doors operating or operable, or both;" should be specified.

Revise proposed TS 3.4, Specification 1 to include ventilation system, or justify no change is necessary.

23. MUTR proposed TS 3.4, Specification 2, states, in part, that "Confinement shall be established whenever the reactor is in an unsecured mode..." However, "unsecured mode" is not defined. Also, proposed TS 3.4, Specification 2 does not have a requirement to establish confinement when there is a potential for release of radioactive material (e.g. experiments or fueled devices.) MUTR TS 1.29, item 2 does address experiments which could affect the subcriticality state of a secured reactor but fails to consider the potential release of radioactive materials from experiments external to the core.

- a. Revised proposed TS 3.4, Specification 2 using TS consistent terminology defined in MUTR TSs, or justify no change is necessary.
- b. Provide a specification that address the need for confinement when the reactor is secured but a potential for release of radioactive material from sources external to the reactor core are present, or justify why the current requirements for confinement is adequate. For example, "Handing of radioactive materials with the potential for airborne release."

24. MUTR proposed TS 3.5, "Ventilation Systems," Specification 1, states "[The] air within the reactor building shall not be exchanged with other occupied spaces in the building." The SAR as supplemented by responses to RAI No.1A (ADAMS Accession No. ML14332A300) shows that reactor room air will leak into spaces of the Chemical and Nuclear Engineering Building. It appears that proposed TS 3.5, Specification 1 states "air within the reactor building shall not be exchanged..." which implies there is no leakage from the reactor room to other occupied spaces in the building. The NRC staff does not believe that a criteria of zero leakage between the reactor area and other occupied areas is the intent of the TS given that confinement (and even containment) structures and ventilation systems are typically subject to some leakage.

Revise proposed TS 3.5, Specification 1 to clarify as to what "shall not exchange air with other occupied spaces in the building means (i.e., reactor building ventilation system or other), or justify why no change is necessary.

25. MUTR proposed TS 3.6.1, "Radiation Monitoring System," Specification 1 states "The reactor shall not be operated unless a minimum of one of the two radiation area monitor channels listed in Table 3.5 are operable." In accordance with 10 CFR 50.36, TSs are to be derived from the analyses and evaluation included in the SAR and submitted pursuant to 10 CFR 50.34.

Guidance provided in NUREG-1537, Part 1, Chapter 14, Appendix 14.1, Section 3.7.1, item (3), states, in part, that "Alarm and automatic action setpoints should be specified to ensure that personnel exposures and potential doses remain well below limits of 10 CFR Part 20."

Revise proposed TS 3.6.1, Specification 1 to clarify either monitor is capable of assuring that personnel exposures and potential doses remain below occupational and public exposure limits of 10 CFR Part 20. Provide analysis/evaluation that demonstrates that in the event that if only one operable radiation monitor (as permitted by TS 3.6.1 Specification 1, how it will be assured that personnel exposures and potential doses remain below occupational and public exposure limits of 10 CFR Part 20 and support timely notification of ROs for the need to implement protective action for events such as Nitrogen-16 (N-16) diffuser failures, experiment failures, loss of coolant, or other accidents, or justify why no change is necessary.

26. MUTR proposed TS 3.6.1, Specification 2, contains the words "will be." MUTR TSs definitions define "shall" as identifying a requirement.

Revise proposed TS 3.6.1, Specification 2 using consistent terminology defined in the MUTR TSs (e.g., shall) to clearly identify, as a requirement. For example, "...the intent of specification 3.6.1 shall be satisfied if ...," or justify why no change is necessary.

27. MUTR proposed TS 3.6.1, Specification 4 states "The campus radiation safety organization shall maintain an environmental monitor at the MUTR site boundary." The responses to RAI Nos. 47 and RAI No.13, (ADAMS Accession Nos. ML042940317 and ML16061A003, respectively) describe environmental monitoring at various places in the unrestricted areas, and in particular the east and west side of the facility boundary. It is not clear how the TS requirement which permits only a single environmental monitor will ensure compliance with the regulations in 10 CFR 20.1101, "Radiation protection programs," paragraph(d) or 10 CFR 20.1301, "Dose limits for individual members of the public."

Revise proposed TS 3.6.1, Specification 4 to clarify that the environmental monitor(s) are at the high effluence release point to conform to 10 CFR Part 20 requirements, or justify why no change is necessary. For example, "The campus radiation safety organization shall maintain environmental monitors at the greatest point of release."

28. MUTR proposed TS 3.7, "Limitations on Experiments," states, in part, that "The reactor shall not be operated unless the following conditions governing experiments exist." Clarification or additional information is needed on those following conditions. The regulations in 10 CFR 50.36 provides the requirement for TSs for production and utilization facilities, including research reactors. The regulations in 10 CFR 50.36(c)(ii) states that a TS limiting condition for operation of a nuclear reactor must be established for each item meeting one or more of following criteria (10 CFR 50.36(c)(ii) (A)-(D)). Experiments require limiting conditions for operation which provide the lowest functional capability or performance levels of equipment (in this case, the experiment) required for safe operation of the facility. These conditions provide assurance that experiment failures are rare and if they do occur that safety of the facility is not compromised. Therefore, if an experiment does fail, inspection of reactor structures and components shall be performed in order to verify that the failure did not cause damage to the facility and appropriate corrective actions shall be taken to prevent recurrence. The necessity for such actions is recognized and appears in the Bases 3 and 4 of MUTR TS 3.7. However, it is not appropriate to include "shall" statements (a requirement) in the bases.

Revise proposed TS 3.7, Specification 3 and 4 to capture the requirements (shall statements) previously included in TS 3.7, Bases 3 and 4, respectively. For example, "if an experiment fails, inspection of reactor structures and components shall be performed in order to verify that the failure did not cause damage. If damage is found, appropriate corrective actions shall be taken."

Also, proposed TS 3.7, Specification 3 describes requirements to double encapsulate of certain materials. It is not clear if double encapsulation provides protection to the reactor in the event of an explosion from potential explosive experiments. Proposed TS 3.7, Specification 4 does not include potential explosive materials.

Revise either proposed TS 3.7, Specification 3 or proposed TS 3.7, Specification 4 to ensure potential explosive materials are sufficiently encapsulated, or justify why no change is necessary. For example:

Specification 3 – “Experiments containing materials corrosive to reactor components, compounds highly reactive with water, potentially explosive materials, and liquid fissionable materials shall be doubly encapsulated.” To “Experiments containing materials corrosive to reactor components, compounds highly reactive with water and liquid fissionable materials shall be doubly encapsulated.”

Specification 4 – “Explosive materials ... ” to “Explosive materials or potential explosive materials....”

29. The regulations in 10 CFR 50.36(c)(3) require TSs to have surveillance requirements. MUTR proposed TS 4.0, “Surveillance Requirements,” provides the general surveillance requirements. It states, in part, that “In the event that the reactor is not in an operable condition, such as during periods of refueling, or replacement or repair of safety equipment, surveillances may be postponed until such time that the reactor is operable.” ANSI/ANS-15.1-2007, Section 4, states “For each surveillance requirement (SR), it should be specified if the surveillance activity can or cannot be deferred during reactor shutdown. It should also be specified for those that can be deferred, which must be performed prior to reactor operations. Further, the technical specification SRs must specify which activities can only be performed with scheduled surveillances that will become due during planned periods of operation and should be performed before the operational period. Periodic surveillance activities should be done before maintenance is performed.” Surveillance not required for safety while the reactor is shutdown may be deferred. However, some surveillances (e.g. fuel elements, scram times, radiation monitoring, pool water purity/level/leak detection, etc.) are important to safety and cannot be deferred during extended shutdown. Surveillances that may be deferred and the reasons for deferment should be clearly stated in the TS, analyzed in the SAR, and noted in the basis of the specification.

Provided a specification(s) that list surveillances important to safety that cannot be deferred during extended shutdown, or justify why one is not necessary.

30. MUTR proposed TS 4.1, “Reactor Core Parameters,” Specification 4 appears to provide a duplicate surveillance requirement with that of proposed TS 4.3, “Primary Coolant System,” Specification 3 for gross gamma measurement.

Revise proposed TS 4.1, Specification 4 to remove the redundant surveillance, or justify why no change is necessary.

31. MUTR proposed TS 4.1, Specification 5, states, in part, that “fuel elements shall be visually inspected annually.” The responses to RAI Nos. 9 and 4 (ADAMS Accession Nos. ML16083A222 and ML110320459, respectively) provided a technical basis for not measuring length and bend but did not address visually inspecting for other types of damage (e.g. mechanical (impact or fretting) or corrosive (chemical or galvanic damage)). The regulations in 10 CFR 50.36 provide requirement for TSs for production and utilization facilities, including research reactors. The regulations in 10 CFR 50.36(c)(2)(ii) states that a

TS limiting condition for operation of a nuclear reactor must be established for each item meeting one or more of four criteria (10 CFR 50.36(c)(2)(ii) (A)-(D)). *Criterion 4* of 10 CFR 50.36(c)(2)(ii)(D) states that “a structure, system, or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety.” Operating experience has shown that there are multiple mechanisms that can result in fuel or fuel cladding damage. Such damage would put the integrity of the primary fission product barrier in question and as such periodic inspection of the fuel is required. Surveillances assess the necessary quality of structures systems and components, in this case the fuel.

Revise proposed TS 4.1, Specification 5 to identify inspection criteria necessary to establish that the fuel retains the necessary quality for continued use, or justify why the no change is needed. For example, “Twenty percent of the fuel elements shall be visually inspected annually, not to exceed 15 months, such that the entire core is inspected over a five year period.” to “Twenty percent of the fuel elements shall be visually inspected for damage or deterioration annually, not to exceed 15 months, such that the entire core is inspected over a five year period.”

32. The regulation in 10 CFR 50.36(c) states TSs will include Surveillances. The regulation in 10 CFR 50.36(c)(3) 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.” MUTR proposed TS 4.1, Specification 6 states “Burnup shall be verified in the Annual Report.” MUTR TS 3.1, Specification 6 states “The burnup of U-235 in the UZrH fuel matrix shall not exceed 50% of the initial concentration.”

Revise proposed TS 4.1, Specification 6 to include a surveillance requirement describing the determination/measurement of fuel element burnup that ensures that fuel will be removed from service prior to exceeding 50 percent burnup of U-235 in the UZrH fuel matrix, or justify why no change is necessary.

33. The regulation in 10 CFR 50.36(c) states TSs will include Surveillances. The regulation in 10 CFR 50.36(c)(3) 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.” This requirement is applicable to the MUTR reactor control and safety systems. MUTR proposed TS 4.2, “Reactor Control and Safety Systems,” Specification 4 describes the surveillance requirements for scram and power measuring channels. Guidance provided in NUREG-1537, Part 1, Chapter 14, Appendix 14.1, Section 4.2, states, in part, that “Channel tests of all scram and power measuring channels required by technical specifications, including scram actions with safety rod release and interlocks.” While proposed TS 4.2, Specification 4 does describe the surveillance requirements for scram and power measuring channels it is not clear what channels will receive the channel test.

Revise proposed TS 4.2, Specification 4 referencing the tables for scram channels in TS 3.2, Tables 3.1 and 3.2), or justify why no change is necessary.

Also, proposed TS 4.2, Specification 4 describe “safety rod” but “safety rod” is not define in MUTR proposed TS Definition.

Revise proposed TS 4.2, Specification 4 using the defined term, such as “Rod-Control” defined in TS 1.33, or justify why no change is necessary.

34. MUTR TS 4.2, Specification 5 states “Operability tests shall be performed on all affected safety and control systems after any maintenance is performed.” The regulations in 10 CFR 50.36(c)(3) states TSs will include Surveillances. The regulation in 10 CFR 50.36(c)(3) 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.” When a structure, system or component has been declared inoperable, that is not capable of performing its intended function maintenance is required. In most cases, surveillances such as channel tests or channel calibrations are an appropriate means to demonstrate the restoration of structure, system or component to an operable condition. It is not clear as to the meaning of “Operability Test.”

Revise proposed TS 4.2, Specification 5 using a defined term, such as surveillance requirement (per 10 CFR 50.36(c)(3), or channel test or channel calibration (per MUTR proposed TS Definitions) or justify why the current specification is acceptable.

35. The proposed specification in TS 4.5 states that “The ability to secure the ventilation system shall be verified before the first reactor operation of the day.” The regulations in 10 CFR 50.36 require the inclusion of surveillance requirements that prescribe the frequency and scope of the surveillance necessary demonstrate the required performance in Section 4 of the TS. It is unclear as to what are the required system responses to demonstrate system operability.

Revise proposed TS 4.5 to provide the active response of the specific ventilation system components (e.g., automatic closure of reactor building dampers and the automatic trip of reactor building fans on high radiation, as applicable) that demonstrate the system is operable, or justify why no change is necessary.

36. The regulations in 10 CFR 50.9, “Completeness and accuracy of information,” require that information provided to the Commission by a licensee shall be complete and accurate in all material respects. Proposed TS 4.6.2, Objective states “The objective of these specifications is to that releases to the environment are kept below allowable limits.” The TS as written contains typographical errors.

Revise proposed TS 4.6.2, Objective to correctly state the intended objective.

37. The regulations in 10 CFR 50.9 require that information provided to the Commission by a licensee shall be complete and accurate in all material respects. Proposed TS 4.7, “Experiments,” Specification 2 describes the experimental review prior to being placed in the reactor and states that “An experiment shall not be installed in the reactor or its irradiation facilities unless a safety analysis has been performed and reviewed for compliance with Section 3.7 by the Reactor Safety Committee (RSC) (new experiment) or by the Facility

Director (modified routine experiment), in full accord with Sections 6.1.2 and 6.2.1 of these Technical Specifications and the procedures which are established for this purpose.” The specification references TSs 6.1.2 and 6.2.1, based on the content of these TS sections. However, TS 6.5 “Experiment Review and Approval,” should also be included as a reference.

Revise proposed TS 4.7, Specification 2 to include the reference to proposed TS 6.5, or justify why no change is necessary.

38. MUTR proposed TS 5.1, “Design Features,” Specification 1, states, in part, that “The reactor shall be housed in a closed room designed to restrict leakage.” Other features associated with the reactor building are also important to analyses and evaluations necessary for radiological safety of the facility. Information such as free air volume, effluent release points, and other information should be presented in this section if not provided elsewhere in MUTR TS. For example, the design of the confinement include a minimum free air volume important for radiological safety.

Revise proposed TS 5.1, Specification 1 to include design features (DFs) such as or the volume of the reactor room and any other values related to the site or facility description that are used as input data to analyses and evaluations required for facility licensing, or justify why the current specification is acceptable.

39. The requirement in 10 CFR 50.36(c)(4) requires the inclusion of DFs of those features of the facility such as materials of construction and geometric arrangements, which, if altered or modified, would have a significant effect on safety and are not covered elsewhere in the specifications. MUTR proposed TS 5.1, Specification 2 states that “The reactor site boundary shall consist of the outer walls of the reactor building and the area enclosed by the loading dock fence.” It is not explicitly stated in the TSs where the boundaries in which activities under Operating License R-70 take place.

Provide a specification describing “the licensed area” or justify why no change is necessary.

40. TSs are fundamental criteria necessary to demonstrate facility safety and are required by 10 CFR 50.36 for each license authorizing operation of a production or utilization facility of a type described in 10 CFR 50.21. TSs are derived from the analyses and evaluation included in the SAR and submitted pursuant to 10 CFR 50.34. Additionally, 10 CFR 50.36 (c)(4) requires the inclusion of DFs of those features of the facility such as materials of construction and geometric arrangements, which, if altered or modified, would have a significant effect on safety and are not covered elsewhere in the specifications.

MUTR proposed TS 5.2, “Reactor Primary Coolant System,” Specification 2 states “The pool water inlet pipe is equipped with a siphon break at the surface of the pool.” The “surface of the pool” is ambiguous as the level of the pool varies and is not a good indication for a specification. Also, the responses to RAI No 19c. (ADAMS Accession No. ML16083A222) regarding the N-16 diffuser piping states, in part, that “any protrusion that exceeds twenty inches below the water line must be equipped with a siphon break. Therefore the maximum water loss that could possibly occur would be limited to twenty inches.” MUTR proposed TS Section 5 is intended to provide information on DFs of the facility describing the

arrangement of the coolant system, which, if altered or modified, could significantly affect safety. Figure 5.1 of SAR Section 5.2, shows that there are five pipes below the pool water level, including the water inlet pipe.

- a. Revise proposed TS 5.2, Specification 2 to provide that is consistent with the reference pool water level. For example, "The pool water inlet pipe is equipped with a siphon break at the surface of the pool." to "The pool water inlet pipe is equipped with a siphon break below the overflow pipe."
 - b. Revise proposed TS 5.2, Specification 2 to clearly describe all piping, as describe in Figure 5.1 of SAR Section 5.2 that would require siphon break protection or piping length restrictions to maintain the minimum TS level of water above the core; or justify why the current specification is acceptable.
 - c. Revise proposed TS 5.2, Specification 3, to be consistent with TS 5.2, Specification 2 with regard to all piping that require siphon break and piping length restrictions.
41. The regulations in 10 CFR 50.36(c)(4) require the inclusion of DFs of those features of the facility such as materials of construction and geometric arrangements, which, if altered or modified, would have a significant effect on safety and are not covered elsewhere in the specifications. MUTR proposed TS 5.3.1, "Reactor Fuel," Specification 2 states, "Zirconium hydride atom ratio: nominal 1.5 - 1.8 hydrogen-to-zirconium, ZrHx." TSs are fundamental criteria necessary to demonstrate facility safety and are required by 10 CFR 50.36 for each license authorizing operation of a production or utilization facility of a type described in 10 CFR 50.21. The TSs are derived from the analyses and evaluation.

MUTR proposed TS 2.1, "Safety Limit," provides the SL of 1,000 degrees Celsius. Per NUREG-1282, "Safety Evaluation Report on High-Uranium Content, Low-Enriched Uranium-Zirconium Hydride Fuels for TRIGA Reactors," (ADAMS Accession No. ML050480199), at 1,000 degrees Celsius, the corresponding hydrogen-to-zirconium ratio is 1.7. Proposed TS 5.3.1, Specification 2, provide the ratio of 1.5 -1.8. At 1.8, it would allow for a possibility of buildup of excessive hydrogen and subsequent damage of the fuel cladding.

Revise proposed TS 5.3.1, Specification 2 to specify a ZrHx ratio for the SL, or justify why no change is necessary. For example, "1.5 -1.8" to "1.5 – 1.7."

42. The regulations in 10 CFR 50.36(c)(4) require the inclusion of DFs of those features of the facility such as materials of construction and geometric arrangements, which, if altered or modified, would have a significant effect on safety and are not covered elsewhere in the specifications. MUTR proposed TS 5.4, "Fissionable Material Storage," Specification 1 describe the safe storage of fuel elements. MUTR license requires compliance with applicable 10 CFR Part 70, Domestic Licensing of Special Nuclear Material," requirements. The regulations in 10 CFR Part 70 require that the licensee protect the health and safety of the public and occupational workers from accidental criticality. The guidance provided in ANSI/ANS- 15.1-2007, Section 5.4, states, in part, that "fuel, including fueled experiments and fuel devices not in the reactor, shall be stored in a geometric array where k_{eff} is no

greater than 0.90.” While TS 5.4, Specification 1 has a k_{eff} value more conservative than the guidance, it fails to include fueled experiments and devices in the k_{eff} in storage.

Revise proposed TS 5.4, Specification 1, to include all fissile materials (e.g., fuel, fueled experiments, and fuel devices that are not in the reactor) in the calculation of the storage location k_{eff} , or justify why no change is necessary.

43. The regulation in 10 CFR 50.36(c)(4) requires the inclusion of DFs of those features of the facility such as materials of construction and geometric arrangements, which, if altered or modified, would have a significant effect on safety and are not covered elsewhere in the specifications. MUTR proposed TS 5.4, Specification 3 states, “When fuel is in storage in any area other than the grid plate, that area must be equipped with monitoring devices that both measure and record the radiation levels and temperature of the region surrounding the fuel.” MUTR TS Definition define “shall” as identifying a requirement.

Revise proposed TS 5.4, Specification 3 to use terminology consistent with the term defined in the MUTR TS Definitions or justify why no change is necessary. For example, “...that area must be equipped with monitoring devices...” to “that area shall be equipped with monitoring devices....”

44. The regulations in 10 CFR 50.36(c)(5) require administrative controls necessary to assure operation of the facility in a safe manner. MUTR TS 6.1.1, Figure 1 shows the University of Maryland organization structure. The regulations in 10 CFR 50.9 require that information provided to the Commission by a licensee shall be complete and accurate in all material respects. While this figure provides the administration and communication between the groups. It appear that the name for the Department of Environmental Safety has changed.

Revise TS 6.1.1, Figure 1 to clarify the current name for the Department of Environmental Safety, or justify why no change is necessary.

45. The regulations in 10 CFR 50.36(c)(5) require administrative controls necessary to assure operation of the facility in a safe manner. The regulations in 10 CFR 50.9 require that information provided to the Commission by a licensee shall be complete and accurate in all material respects. MUTR proposed TS 6.1.2, “Responsibility,” states, in part, “Senior Reactor Operators (SRO) are individuals who are licensed by the NRC to direct the activities of reactor operators.” This is contrary to the definition in 10 CFR 55.4 for Senior Operator which means any individual licensed under this part to manipulate the controls of a facility and to direct the licensed activities of licensed operators.”

Revise proposed TS 6.1.2 to be consistent with 10 CFR 55.4 for the responsibility of an SRO, or justify why no change is necessary.

46. The regulations in 10 CFR 50.36(c)(5) require administrative controls necessary to assure operation of the facility in a safe manner. MUTR proposed TS 6.1.2 describes the responsibilities of the MUTR staff, additional information and clarification is needed in the following areas. It appears from proposed TS 6.1.2 that position title is “Dean College of Engineering.” However, in TS 6.1.2, Figures 6.1 and 6.2, it is shown as “Dean Clark School of Engineering.”

Revise proposed TS 6.1.2 or TS 6.1.2, Figures 6.1 and 6.2, to be consistent with the official name of the college of engineering, or justify why no change is necessary.

47. In proposed TS 6.1.2, describes the responsibility for the “Dean College of Engineering,” and “The Chair of the Department of Materials Science and Engineering. However, the responsibilities described are not consistent with the ANSI/ANS-15.1-2007 guidance. ANSI/ANS-15.1-2007, Section 6.1.2, states that these responsibilities “shall be responsible for safeguarding the public and facility personnel from undue radiation exposures and for adhering to all requirements of the operating license or charter and technical specifications.”

Revise proposed TS 6.1.2 to specify who is responsible for adhering to all requirements of the operating license, or reactor facility operation and TSs, or justify why no change is necessary. For example:

- a. Level I position are responsible for adhering to all requirements of the operating license
 - b. Level II position are responsible for reactor facility operation and shall report to Level I
48. The regulations in 10 CFR 50.36(c)(5) require administrative controls necessary to assure operation of the facility in a safe manner. MUTR ROs and SROs are licensed pursuant to 10 CFR Part 55, “Operator Licenses,” and as such must comply with the applicable sections of 10 CFR 50.54, “Conditions of licenses,” (j) – (m). The NRC staff has found acceptable TS that are consistent with the guidance provided in ANSI/ANS 15.1-2007, Section 6.1.3. Guidance provided in ANSI/ANS 15.1-2007, Section 6.1.3 item (3), states that the SRO supervise “initial startup and approach to power.” MUTR proposed TS 6.1.3, item 3a describes operations that shall be supervised by a SRO. However, it appears that the SRO need only to supervise a startup following a fuel manipulation.

Revise proposed TS 6.1.3, item 3a to specify when a SRO is required to supervise a reactor startup following all initial startups after the reactor has been placed in a secured condition, or justify why no change is necessary. For example, “Initial startup and approach to power following new fuel loading or fuel Rearrangement” to “Initial startup and approach to power”

49. The regulations in 10 CFR 50.36(c)(5) require administrative controls necessary to assure operation of the facility in a safe manner. MUTR ROs and SROs are licensed pursuant to 10 CFR Part 55 and as such must comply with the applicable sections of 10 CFR 50.54 (j) – (m). The NRC staff has found acceptable TS that are consistent with the guidance provided in ANSI/ANS-15.1-2007, Section 6.1.3. MUTR proposed TS 6.1.3, item 3d, states “Resumption of operation following an unplanned or unscheduled shutdown or any unplanned or unexpected significant reduction in power.” The “reduction in power” is not defined in MUTR Definition TS.

Revise proposed TS 6.1.3, item 3d to include the criteria for a significant reduction in power, or justify why no change is necessary.

50. The regulations in 10 CFR 50.36(c)(5) require administrative controls necessary to assure operation of the facility in a safe manner. MUTR TS 6.1.4, "Selection and Training of Personnel," states the following:

The selection and training of operations personnel should be in accordance with the following:

1. Responsibility - The Facility Director or his designated alternate is responsible for the training and requalification of the facility reactor operators and senior reactor operators. This selection shall be in conjunction with the guidelines set forth in ANSI/ANS 15.1 and 15.4.

MUTR TS Definition define "shall" as identifying a requirement. In addition, TSs should be gender neutral and a specific reference to ANSI/ANS 15.1 and 15.4 that is used at the facility for the operator requalification program.

Revise proposed TS 6.1.4.1 to:

- a. Use the terminology consistent with the MUTR TS Definitions to describe and clearly identify the selection and training criteria as a requirements (e.g., the selection and training shall be in accordance with...), or justify why no change is necessary.
 - b. Clarify the version (e.g., ANSI/ANS-15.4-2007) of the guidance for selecting and training of personnel, or justify why the current specification is acceptable. For example, "The selection, training, and requalification of operations personnel shall meet or exceed the requirements of American National Standard "Selection and Training of Personnel for Research Reactors," ANSI/ANS-15.4-1988 (R1999)."
 - c. Change "selection" to "selection training and requalification"
 - d. Change "is responsible" to "shall be responsible"
 - e. Change "his designated" to "the designated"
51. The regulations in 10 CFR 50.36(c)(5) require administrative controls necessary to assure operation of the facility in a safe manner. Proposed TS 6.2.1.1, "Reactor Safety Committee Charter and Rules," item 3, states "Minutes of all meetings will be retained in a file and distributed to all RSC members." Guidance provided in ANSI/ANS-15.1-2007, Section 6.2.2 item (4), provides that review and audit functions be conducted for the "dissemination, review, and approval of minutes in a timely manner."

Revise proposed TS 6.2.1.1, item 3 to provide a time criteria (such as semi-annual) for distributing the meeting minutes, or justify why no change is necessary.

52. MUTR proposed TS 6.2.1.2, "Reactor Safety Committee Review Function," item 1, states "Determinations that proposed changes in equipment, systems, test, experiments, or procedures are allowed without prior authorization by the responsible authority, e.g. 10 CFR 50.59." The guidance provided in ANSI/ANS-15.1-2007, Section 6.2.3, item (1) is

generic and a specification specific to the facility is required. Changes in procedures and conducting testing and experiments not described in the SAR require a screening, or evaluation in accordance with 10 CFR 50.59, "Changes, tests and experiments."

Revise proposed TS 6.2.1.2, item 1 to be consistent with the language in 10 CFR 50.59, or justify why no change is necessary.

53. The regulations in 10 CFR 50.36(c)(5) require administrative controls necessary to assure operation of the facility in a safe manner. MUTR proposed TS 6.2.1.2 states "A written report of the findings and recommendations of the RSC shall be submitted to Level 1 management, the Facility Director, and the RSC members in a timely manner after the review has been completed." While the specification does follow guidance provided in ANSI/ANS-15.1-2007, Section 6.2.3, the term "timely manner" is a generic term to the guidance but not defined in the MUTR TSs.

Revise proposed TS 6.2.1.2 to provide a time criteria (such as semi-annual) for the written report, or justify why no change is necessary.

54. The regulations in 10 CFR 50.36(c)(5) require administrative controls necessary to assure operation of the facility in a safe manner. MUTR proposed TS 6.2.1.3, "Reactor Safety Committee Audit Function," item 1, states, in part, that "An annual audit and review of the reactor operations will be performed." MUTR proposed TS Definition define "shall" as identifying a requirement. Also, MUTR proposed TS 6.2.1.3, item 2, states, in part, that "The following shall be reviewed." However, this section pertains to audits.

- a. Revise MUTR proposed TS 6.2.1.3, item 1 to use consistent terminology defined in TS Definitions, or justify why no change is necessary. For example, "An annual audit and review of the reactor operations shall be performed."
- b. Revise proposed TS 6.2.1.3, item 2 to specify the audit function, or justify why no change is necessary. For example, "The following shall be audited."

55. The regulations in 10 CFR 50.36(c)(5) require administrative controls necessary to assure operation of the facility in a safe manner. MUTR proposed TS 6.4, "Operating Procedures," states, in part, that "Written procedures, reviewed and approved by the Reactor Safety Committee, shall be in effect and followed for the following items prior to performance of the activity. The procedures shall be adequate to assure the safety of the reactor, but should not preclude the use of independent judgment and action should the situation require such." Guidance provided in ANSI/ANS-15.1-2007, Section 6.4, states, in part, "Written procedures shall be...approved by Level 2 management or designated alternate." It does not appear that TS 6.4 is consistent with the guidance as it did not address approval by a Level 2 or his alternate. Also, guidance provided in ANSI/ANS-15.1-2007, Section 6.4, states, in part, that and such reviews and approvals shall be documented in a timely manner." MUTR proposed TS 6.4 does not include timeliness requirement for review, approval, and documentation of procedures.

Revise proposed TS 6.4 to identify the responsibility for the approval of MUTR written procedures and or justify why the no change is necessary. For example, "Written

procedures, reviewed and approved by the Reactor Safety Committee, shall be in effect and followed for the following items prior to performance of the activity. The procedures shall be documented and distributed in a timely manner. The procedures shall be adequate to assure the safety of the reactor, but should not preclude the use of independent judgment and action should the situation require such.”

56. The regulations in 10 CFR 50.36(c)(5) require administrative controls necessary to assure operation of the facility in a safe manner. MUTR proposed TS 6.4, item 9 provides a radiation protection plan and include a reference to ANSI/ANS-15.11-1993. However, there is no revision number included for the ANSI/ANS-15.11-1993.

Guidance provided in ANSI/ANS-15.1-2007, Section 6.4, item (5), states “personnel radiation protection, consistent with applicable regulations or guidelines. The procedures shall include management commitment and programs to maintain exposures and releases as low as reasonably achievable in accordance with the guidelines of ANSI/ANS-15.11-1993 (R2004) [3].”

Revise proposed TS 6.4 to provide a specific reference to ANSI/ANS 15.11-1993, or justify why no change is necessary.

57. The regulations in 10 CFR 50.36(c)(5) require administrative controls necessary to assure operation of the facility in a safe manner. MUTR proposed TS 6.4, item 6 describes the procedures to be made for shipping, possession, and transfer of radioactive material, to be in conjunction with and approved by the radiation safety office.

Guidance provided in ANSI/ANS-15.1-2007, Section 6.4 item (8), states “use, receipt, and transfer of by-product material, if appropriate.” It appears proposed TS 6.4, item 6 meets the intent of item 8 of the guidance, if so there is redundancy between proposed TS 6.4, item 6 and proposed TS 6.4, item 10.

Explain the differences in between proposed TS 6.4, item 6 and TS 6.4, item 10 and revise proposed TS 6.4 to remove redundancy, or justify why no change is necessary.

58. The regulations in 10 CFR 50.36(c)(5) require administrative controls necessary to assure operation of the facility in a safe manner. The paragraph following MUTR proposed TS 6.4 item 10, states, in part, that “would cause a credible risk to the public or the facility. If such a case exists as determined by the Facility Director, temporary approval may be granted by the Director but must be approved by the Reactor Safety Committee within thirty days.”

The regulations in 10 CFR 50.54(x) states “A licensee may take reasonable action that departs from a license condition or a technical specification (contained in a license issued under this part) in an emergency when this action is immediately needed to protect the public health and safety and no action consistent with license conditions and technical specifications that can provide adequate or equivalent protection is immediately apparent.” It is not clear if the intent of this portion is to invoke the regulations in 10 CFR 50.54(x).

- a. Revise proposed TS 6.5 to clarify who has (by title or level) the authority to take immediate actions as stated in the 10 CFR 50.54(x), or justify why no change is necessary.

Also, the paragraph following MUTR TS 6.4, item 10, states, in part, that “would cause a credible risk to the public or the facility. If such a case exists as determined by the Facility Director, temporary approval may be granted by the Director but must be approved by the Reactor Safety Committee within thirty days.” MUTR TSs Definitions define “shall” as identifying a requirement.

- b. Provide a revised specification with terminology consistent with the MUTR proposed TS Definitions to describe and clearly identify as a requirement that “temporary approval may be granted by the Director but ~~must~~ shall be approved by the Reactor Safety Committee,” or justify why the current specification is acceptable.
59. The paragraph following MUTR TS 6.4, item 10, states, in part, that “The Reactor Director shall have the power to approve minor changes such as phone number changes, typographical error correction or any other change that does not change the effectiveness or the intent of the procedure”

The regulations in 10 CFR 50.59(c)(1) state, in part, that “A licensee may make changes in the facility as described in the final safety analysis report (as updated), make changes in the procedures as described in the final safety analysis report (as updated), and conduct tests or experiments not described in the final safety analysis report (as updated) without obtaining a license amendment” The MUTR proposed TS provides examples of items that would be screened out of the 10 CFR 50.59 review process. It is not clear if the wording effectiveness or intent constitutes a minor change.

Revise MUTR to conform to the 10 CFR 50.59 change process, or justify why no change is necessary.

60. The regulations in 10 CFR 50.36(c)(5) require administrative controls necessary to assure operation of the facility in a safe manner. MUTR proposed TS 6.5, “Experiment Review and Approval,” item 2, states “Modified routine experiments shall be reviewed and approved in writing by the Facility Director, or designated alternate.” However, the responses to RAI No. 13 (ADAMS Accession No. ML16061A003) describes modified routine experiments as new experiments and as such require review by the RSC as described in TS 6.2.1.2, Specification 3, which states, in part, that “the RSC shall review the following: All new experiments or classes of experiments that could affect reactivity or result in the release of radioactivity.”

Revise proposed TS 6.5, item 2 as necessary, to clarify if a modified routine experiment is actually a new experiment and require the RSC rather than the facility director, or justify why no change is necessary.

61. MUTR proposed TS 6.5, item 4, states “The review of an experiment listed in subsections 6.5.2 and 6.5.3 above, shall consider its effect on reactor operation and the possibility and consequences of its failure, including, where significant, chemical reactions, physical

integrity, design life, proper cooling, interaction with core components, and any reactivity effects.” It is not clear if the review of an experiment is governed by the 10 CFR 50.59 review process.

Revise proposed TS 6.5, item 4 to clarify if the special experiment is done in accordance 10 CFR 50.59 review proves, or justify why no change is necessary. For example, “The review of an experiment listed in subsections 6.5.2 and 6.5.3 above, shall follow a performance of a 10 CFR 50.59 evaluation, and shall consider its effect on reactor operation and the possibility and consequences of its failure, including, where significant, chemical reactions, physical integrity, design life, proper cooling, interaction with core components, and any reactivity effects.”

62. MUTR proposed TS 6.6.2, “Actions to Be Taken In The Event of a Reportable Occurrence,” states, in part, that “In the event of a reportable occurrence, as defined in Section 1.32 of these Technical Specifications, the following actions will be taken:.” MUTR proposed TS define “shall” as identifying a requirement.

Revise proposed TS 6.6.2 to using terminology consistent with the MUTR proposed TS Definitions to describe and clearly identify, as a requirement, or justify why no change is necessary. For example, “... In the event of a reportable occurrence, as defined in Section 1.32 of these Technical Specifications, the following actions shall be taken:.”

63. The regulations in 10 CFR 50.9 require that information provided to the Commission by a licensee shall be complete and accurate in all material respects. MUTR proposed TS 6.7.1, “Annual Operating Report,” item 2 appears to contain a typographical error. The total generation is Mw-hr but appears to be written as Mw hr⁻¹ [megawatts per hour]. Revise proposed TS 6.7.1, item 2 to correct the typographical error (e.g., removal of the superscript), or justify why no change is necessary.

64. The regulations in 10 CFR 50.36(c)(5) require administrative controls necessary to assure operation of the facility in a safe manner. MUTR proposed TS 6.7.2, “Special Reports,” states, in part, that “Notification shall be made within 24 hours by telephone to the NRC Operations Center, followed by a written report faxed within 14 days in the event of the following.” However, guidance provided in ANSI/ANS-15.1-2007, Section 6.7.2, item (1), states in part, that “There shall be a report not later than the following working day by telephone and confirmed in writing by facsimile or similar conveyance to licensing authorities, to be followed by a written report that describes the circumstances of the event within 14 days of any of the following:.” While the specification does describe the telephone call, it is missing that a confirmation writing by facsimile is required.

Revise proposed TS 6.7.2 to include a confirmation of the telephone call in writing, or justify why no change is necessary.

65. The regulation in 10 CFR 50.36(c)(5) requires administrative controls necessary to assure operation of the facility in a safe manner. MUTR TS 6.7.3, states, in part, that “...A written report shall be forwarded within 30 days to the NRC Document Control Desk, with a copy to the Regional Administrator, Region I, NRC, in the event of:...” Guidance provided in ANSI/ANS-15.1-2007 Section 6.7.2, item 2, states, in part, that “There shall be a written

report within 30 days to the chartering or licensing authorities.” However, 10 CFR Appendix D to Part 20 consists of a table with the first column “Region,” under which is a separate row for Region I, Region II, Region III, and Region IV, as well as a separate row for “NRC Headquarters Operations Center.” The NRC staff requests that non-power reactor licensees make notifications to NRC Headquarters because all inspections, licensing, and operating licensing programs are centralized at NRC Headquarters (ADAMS Accession No. ML092680467) and is the point of contact as the licensing authority.

Revise proposed TS MUTR TS 6.7.3 to only provide reports to the NRC Document Control Desk, or justify why the inclusion of Region I in current specification is necessary.

66. The regulations 10 CFR 50.36(c)(5) requires administrative controls necessary to assure operation of the facility in a safe manner. MUTR proposed TS 6.7.3, “Unusual Event Report,” item 4 describes reporting of changes in Level 1 or Level 2 personnel. TS 6.7.3, Specification 4, states “A permanent change in the position of Department Chair or Facility Director.” Guidance provided in ANSI/ANS-15.1-2007, Section 6.7.2, item 2(a), states, in part, that “a written report be made within 30 days of permanent changes involving Level 1 or Level 2 personnel.” While proposed TS 6.7.3, item 4 does describe reporting changes to Level 1 and 2 personnel, it does not appear to address all Level 1 personnel as shown in proposed TS 6.1.1, Figure 1 and Figure 2.

Revise proposed TS 6.7.3, item 4 to include all Level 1 and 2 positions, or justify why no change is necessary. For example, the Dean Clark School of Engineering