UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 4, 2021

Dr. Partha Chowdhury, Director
Nuclear Radiation Laboratory
University of Massachusetts-Lowell
One University Avenue
Lowell, MA 01854

SUBJECT: UNIVERSITY OF MASSACHUSETTS LOWELL – REPORT ON THE REGULATORY AUDIT RE: THE RENEWAL OF FACILITY OPERATING LICENSE NO. R-125 (EPID NOS. L-2015-RNW-0001, L-2020-NFR-0008)

Dear Dr. Chowdhury:

By letter dated October 20, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16042A015), as supplemented, the University of Massachusetts Lowell applied for renewal of Facility Operating License No. R-125 for the University of Massachusetts Lowell Research Reactor. The requested licensing action would renew the facility operating license for a period of 20 years.

Enclosed is a report on the regulatory audit conducted by staff of the U.S. Nuclear Regulatory Commission (NRC) in connection with its review of the application. The audit report does not make any licensing conclusions or findings, but it is part of the administrative record of the NRC staff's review of the application and may provide information supporting the NRC staff's safety evaluation. The audit followed the plan provided by letter dated February 4, 2020 (ADAMS Accession No. ML20021A315), unless otherwise noted in the enclosed report.

By letter dated December 17, 2020 (ADAMS Accession No. ML20303A305), the NRC staff had provided an interim report on the regulatory audit, which summarized audit activities up to the date of that letter. As of the date of this letter, based on UML providing supplemental information by letters dated September 30, 2020, January 30, 2021, and February 16, 2021 (ADAMS Accession Nos. ML20274A248, ML21030A004, and ML21047A245, respectively) to address information needs identified by the NRC staff as part of the audit, the NRC staff considers the audit (including audit questions provided in the February 4, 2020, audit plan, and follow-up audit questions provided in the December 17, 2020, interim audit report) closed. The enclosed report constitutes the final report on the audit, and primarily summarizes audit activities after the issuance of the interim audit report.

If you have any questions, please contact me at (301) 415-4067, or by electronic mail at Edward.Helvenston@nrc.gov.

Sincerely,

Signed by Helvenston, Edward
on 03/04/21

Edward M. Helvenston, Project Manager
Non-Power Production and Utilization Facility
Licensing Branch
Division of Advanced Reactors and Non-Power
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Office of Nuclear Reactor Regulation

Docket No. 50-223
License No. R-125

Enclosure:
As stated

cc: See next page

cc:

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Test, Research and Training
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Attention: Ms. Amber Johnson
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SUBJECT: UNIVERSITY OF MASSACHUSETTS LOWELL – REPORT ON THE REGULATORY AUDIT RE: THE RENEWAL OF FACILITY OPERATING LICENSE NO. R-125 (EPID NOS. L-2015-RNW-0001, L-2020-NFR-0008) DATED: MARCH 4, 2021

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ADAMS Accession No.: ML21042B857 **NRR-106**

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DATE	2/18/2021	2/20/2021	2/23/2021	2/24/2021	3/4/2021

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OFFICE OF NUCLEAR REACTOR REGULATION

REGULATORY AUDIT REPORT

REGARDING RENEWAL OF

FACILITY OPERATING LICENSE NO. R-125

UNIVERSITY OF MASSACHUSETTS LOWELL

UNIVERSITY OF MASSACHUSETTS LOWELL RESEARCH REACTOR

DOCKET NO. 50-223

Location:	Offsite (remote audit activities were conducted by teleconference and an online portal for document review)
Dates:	February 10, 2020 – March 2, 2021
Audit Team Members:	Edward Helvenston, U.S. Nuclear Regulatory Commission (NRC) (Project Manager, Audit Leader, and Technical Reviewer)
	Duane Hardesty, NRC (Technical Reviewer)
	Greg Casto, NRC (Branch Chief)
Licensee Representatives:	Leo Bobek, University of Massachusetts Lowell (UML) (Reactor Supervisor)

Background

By letter dated October 20, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16042A015), as supplemented, UML applied for renewal of Facility Operating License No. R-125 for the UML Research Reactor (UMLRR). The requested licensing action would renew the facility operating license for a period of 20 years.

This report summarizes the regulatory audit conducted by staff of the U.S. Nuclear Regulatory Commission (NRC) on February 10, 2020 – March 2, 2021. It primarily summarizes the portion of the regulatory audit following the issuance of the NRC staff's interim audit report dated December 17, 2020 (ADAMS Accession No. ML20303A305).

This audit was conducted in connection with the NRC staff's review of the application. The audit report does not make any licensing conclusions or findings, but it is part of the administrative record of the NRC staff's review of the application and may provide information supporting the NRC staff's safety evaluation. The audit followed the plan provided by letter dated February 4, 2020 (ADAMS Accession No. ML20021A315), unless otherwise noted in this report.

Regulatory Bases for the Audit

The purpose of the audit was to determine if the licensee's license renewal application (LRA) requesting renewal of Facility Operating License No. R-125 for 20 years meets all the applicable regulatory requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) and addresses applicable guidance provided in NUREG-1537, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors," Part 1, "Format and Content," and Part 2, "Standard Review Plan and Acceptance Criteria" (ADAMS Accession Nos. ML042430055 and ML042430048, respectively). The NRC guidance for technical specifications (TSs) is provided in NUREG-1537, Part 1, Appendix 14.1, "Format and Content of Technical Specifications for Non-Power Reactors," and this guidance relies significantly on American National Standards Institute/American Nuclear Society (ANSI/ANS)-15.1-2007, "The Development of Technical Specifications for Research Reactors."

Audit Activities

The following activities were performed during the audit:

1. Entrance Meeting

A summary of the entrance meeting, held by teleconference on February 11, 2020, may be found in the interim audit report dated December 17, 2020.

2. Review of Audit Questions

A full summary of the review of audit questions provided in the February 4, 2020, audit plan through December 2020 may be found in the interim audit report dated December 17, 2020.

As noted in the interim audit report, by letter dated September 30, 2020 (ADAMS Accession No. ML20274A248), UML provided supplemental information in response to the audit and related to the audit questions provided in the audit plan. Based on its review of this information, the NRC staff determined that further supplemental information would be required for the NRC staff to complete its review of the LRA. Therefore, the NRC staff identified follow-up audit questions, which it provided (items 1 through 26) in its interim audit report. Based on the likely estimated issuance date of a renewed license, the NRC staff also noted that it would be necessary for UML to submit updated financial information supporting its renewal application. Therefore, the NRC staff identified an additional follow-up audit question listing the necessary financial information, which it also provided (item 27) in its interim audit report.

UML and NRC staff discussed the follow-up audit questions provided in the December 17, 2020, interim audit report during teleconferences on December 16 and 21, 2020, and January 5, 2021. As noted in the follow-up audit question discussion summaries below, UML stated that it would provide a follow-up TS submittal and other follow-up supplemental information (on docket) addressing open items related to the follow-up audit questions.

By letter dated January 30, 2021 (ADAMS Accession No. ML21030A004), UML provided further supplemental information, including a follow-up TS submittal, in response to the audit and related to the follow-up audit questions. Following further audit discussions (also summarized below) during a teleconference on February 11, 2021, related to the January 30, 2021, supplement and the follow-up audit questions, UML stated that it would submit additional supplemental information, including another updated TS submittal. UML submitted this additional supplement by letter dated February 16, 2021 (ADAMS Accession No. ML21047A245).

As discussed in the audit plan and the interim audit report, the NRC staff conducted document reviews using an online portal as part of the audit. The NRC staff provided a list of the documents reviewed in its summary of audit item 97 in the interim audit report. The NRC staff did not review any additional documents on the portal beyond those listed in the interim audit report. Although the audit plan allowed flexibility for a site visit if necessary, the NRC staff did not need to conduct a site visit as part of the audit.

3. Interim Exit Briefing

A summary of the interim exit briefing, held by teleconference on December 16, 2020, may be found in the interim audit report dated December 17, 2020.

4. Final Exit Briefing

During a teleconference on March 2, 2021, the NRC staff held a final exit briefing with UML to discuss the activities performed during the audit since the interim exit briefing on December 16, 2020. It was noted that during the audit, UML had stated that it would provide supplemental information on the docket to address additional information needs identified by the NRC staff following UML's September 30, 2020, submittal. UML provided supplemental information by letters dated January 30 and February 16, 2021.

The NRC staff stated that based on UML providing supplemental information to address information needs identified by the NRC staff, the NRC staff considers the audit questions (including follow-up audit questions) closed. However, the NRC staff noted that it is still continuing its review of UML's LRA, including the supplemental information.

During the exit briefing teleconference, in response to questions from the NRC staff, UML provided further clarification of some information in its September 30, 2020, and January 30, 2021, submittals related to the radiation monitoring system changes it requested NRC approval of in conjunction with license renewal. In its September 30, 2020, submittal, UML stated (in response to audit item 26) that it would add additional ratemeters for the stack gas and particulate monitors that provide independent readouts and individual audible alarms in the control room. Additionally, UML stated that it will configure the existing ratemeters for the TS-required area monitors to provide for individual audible alarms in the control room (these ratemeters already provide readouts and visible alarm indicators). In its January 30, 2021, submittal, UML stated (in response to follow-up audit item 8) that the new radiation monitor control room audible alarms (for individual radiation monitors reaching their alarm setpoints) will be provided by the existing radiation monitor alarm panel, which currently provides the existing audible alarms when certain combinations of radiation monitors reach their alarm setpoints. During the exit briefing, UML confirmed that the audible alarms for the new and existing ratemeters will be provided by the buzzer in the existing radiation monitor alarm panel (on the control room radiation monitoring cabinet) via a hard-wire connection from the ratemeter relays. The actuation of the audible alarms would not involve the Area Radiation Monitoring Computer Data Acquisition System (ARM CDAS) or human-machine interface described in the safety analysis report (SAR). UML also clarified that 1 additional ratemeter, not 2 separate ratemeters, would be added for the 2 stack monitor channels (gas and particulate), and confirmed that the connection of the additional ratemeter to the stack monitor would not replace the existing separate connection from the stack monitor to the ARM CDAS.

By letter dated January 11, 2021 (ADAMS Accession No. ML21007A172), the NRC staff had stated that based on UML providing supplemental information in response to the audit by January 31, 2021, it expected to complete its review and make a final determination on the renewal request by May 31, 2021. However, the NRC staff had stated that this date could still change due to several factors including a need for further requests for additional information, unanticipated changes to the scope of the review, unsolicited supplements to the application for the renewal, and others. The NRC staff noted during the exit briefing that if the forecasted date changes due to the need for additional supplements after January 31, 2021, or any other reason, the NRC staff will notify UML in writing of the new date and an explanation of the reason for the change.

No disagreements with the audit summary were noted by the licensee during the exit briefing (the NRC staff provided UML with a draft copy of the follow-up audit question (items 1 through 26) discussion summaries on January 5, 2021 (ADAMS Accession No. ML21007A101), prior to the issuance of this audit report). Additionally, no deviations from the audit plan were noted.

Follow-up Audit Questions Related to UML's Supplemental Information Submitted September 30, 2020, and Related to Financial Information

(Note: The audit item numbers referenced in the follow-up audit questions listed below refer to the audit items provided in the February 4, 2020, audit plan, and used in the discussion summaries provided in the December 17, 2020, interim audit report. TSs referenced in the follow-up audit questions and discussion summaries below refer to UML's proposed TSs included in its supplemental information dated September 30, 2020, unless otherwise noted.)

1. Audit item 1: Some of the TS bases still do not appear to be consistent with the revised TSs and/or information in the SAR, as supplemented.

   i. TS 2.2.1 basis: Based on information in UML's response to RAI-13.1 (ADAMS Accession No. ML17090A350), a step reactivity transient is no longer bounding.

      During a teleconference on December 16, 2020, UML stated that it will provide a follow-up TS submittal which deletes the basis language "Of the transient conditions analyzed, the step-reactivity addition is the most limiting condition. […] The ONB limit provides an adequate margin to ensure the SL is not reached."

   ii. TS 3.1.1 basis: A value appears to be missing in the first sentence.

      During a teleconference on December 16, 2020, UML stated that it will provide a follow-up TS submittal which changes "reactivity of provides" to "reactivity provides" in the first sentence of the basis.

   iii. TS 3.2.1 basis: The basis appears inconsistent with information in UML's response to RAI-13.1.

      During teleconferences on December 16 and 21, 2020, UML stated that it will provide a follow-up TS submittal which changes the basis sentence "Analyses in Chapter 13 of the SAR show that for the most limiting transient, the peak clad temperature is well below the ONB point during the 1.0 second scram time interval" to "Analyses in Chapter 13 of the SAR show that for the most limiting transient, the peak clad temperature will not exceed the safety limit during the 1.0 second scram time interval" or similar."

iv. TS 3.2.2 basis: The basis appears inconsistent with information in UML's response to RAI-13.1.

During teleconferences on December 16 and 21, 2020, UML stated that it will provide a follow-up TS submittal which changes the basis sentence "The analyses show that the peak clad temperature would be well below the ONB point even under the conservative assumption that the reactor is operating at the LSSS values for power and temperature when the ramp begins and using a reactivity addition rate greater than that allowed by the specification (SAR 13.2.2.2)" to "The analyses show that the peak clad temperature would not exceed the safety limit using a reactivity addition rate greater than that allowed by the specification (SAR 13.2.2.2)" or similar.

v. TS 3.3 basis: The basis does not appear to reflect UML's proposed TS 5.2 change to allow a titanium heat exchanger.

During teleconferences on December 16, 2020, and January 5, 2021, UML stated that it will provide a follow-up TS submittal which revises the basis to be more general (i.e., summarizing the justification for the water chemistry limits, but avoiding specific reference to particular coolant system materials). UML stated that it would simplify this basis regardless of whether it deletes the "titanium" reference from TS 5.2(3) (see follow-up audit question 15).

vi. TS 3.6.1 basis: The basis states that TS 3.6.1(1) provides minimum equipment when the reactor is operating, but the TS 3.6.1(1) applicability is not limited to reactor operation.

During a teleconference on December 16, 2020, UML stated that it will provide a follow-up TS submittal which revises the language in the second sentence of the basis from "…and within the reactor building when the reactor is operating" to "and within the reactor building during any condition required in specification 3.4.1."

vii. TS 4.3 basis: The basis does not appear to address TS 4.3(4).

During a teleconference on December 16, 2020, UML stated that it will provide a follow-up TS submittal which adds a sentence to the end of the TS 4.3 basis: "Verifying the pool gate not be in position to isolate the bulk and stall pools during reactor operation assures the entire pool volume and surface area is available for cooling in normal and off-normal conditions."

viii. TS 4.4 basis: The first sentence appears to contain a typographical error and does not appear to address the proposed change to TS 4.4(1) to verify intake fan operability at 8 hour intervals.

During a teleconference on December 16, 2020, UML stated that it will provide a follow-up TS submittal which revises the language in the first sentence of the basis from "An initial verification of intake fan is operating assures that…" to "Initial and periodic verification that the intake fan is operating assures that…."

ix. TS 4.6 basis: The basis appears to contain 2 typographical errors (missing space in the first sentence, and "10CRF" in the last sentence).

During a teleconference on December 16, 2020, UML stated that it will provide a follow-up TS submittal which corrects the typographical errors in the basis (adding a space between "the" and "use" in the first sentence, and revising "10CRF" to "10 CFR" in the last sentence).

2. Audit item 10: The revised applicability statement appears to be missing a comma after "reactor."

   During a teleconference on December 16, 2020, UML stated that it will provide a follow-up TS submittal which adds a comma after "reactor" in the TS 3.1.1 applicability statement.

3. Audit item 14: Revised proposed TS 3.2.3 still does not appear to require that at least one of the two required reactor power level channels be the log power/period monitoring channel for natural convection mode. Additionally, supplemental docketed information which clarifies the SAR (including SAR Section 7.4.1.1.5) by stating that the linear channels do not operate in a "1 out of 2 mode," but that only one linear channel is required and the second channel provides redundancy to the required channel, and which states that the required Log PPM channel provides redundancy and diversity to the single required linear channel, does not appear to have been provided.

   During a teleconference on December 16, 2020, UML stated that it will provide a follow-up TS submittal which adds an asterisk after the "2" in the "Reactor Power Level" row of the "Natural Convection Mode" column of TS Table 3.2.3-1. Additionally, UML stated that it will provide follow-up supplemental information (on docket) which either confirms that "the linear channels do not operate in a '1 out of 2 mode,' but only one linear channel is required and the second channel provides redundancy to the required channel" and that "the required Log PPM channel provides redundancy and diversity to the single required linear channel"; or, provides an updated SAR Section 7.4.1.1.5 which includes these statements.

4. Audit item 17: Although references to SAR section that describe primary piping limit switches have been added to the TS bases, it is still unclear which specific switches TS 3.2.3, item 13, applies to.

   During a teleconference on December 21, 2020, UML stated that it will provide follow-up supplemental information (on docket) clarifying and justifying which specific switches the TS applies to. UML stated that its supplemental information may also include further description of the switches.

5. Audit item 21: UML proposed an alternative approach to that discussed during the audit, but it is not clear whether UML's proposed alternative administrative control requiring beam tube shutters be closed when the reactor is in the stall pool with the pool divider gate in place should be added as an additional TS.

   During teleconferences on December 21, 2020, and January 5, 2021, UML stated that it will provide a follow-up TS submittal which adds a TS 3.8(4) (or 3.3(5)) which states "When the pool divider gate is in position to separate the bulk pool and the stall pool, and the reactor is in the stall pool, the beam tube shutters shall be in the down (closed) position," or similar, and adds a TS 4.3(5) which states "Prior to placing the pool divider gate in position to separate the bulk pool and stall pool, when the reactor is in the stall pool, the beam tube shutters shall be verified to be in the down (closed) position," or similar. UML also stated

that it will revise the TS bases accordingly for the addition of these two TSs. Additionally, UML stated that it will add TS 4.3(5) to the TS 4.0, item A., list of TSs that may not be deferred during reactor shutdown.

6. Audit item 23: UML proposed additional changes to TS 3.4.1 (specifically, revising TS 3.4.1(2), and deleting TS 3.4.1(3)) beyond those discussed in audit, but it is not clear whether those changes are appropriate or facility-specific. Additionally, it appears some information added to the basis for TS 3.4.1 (specifically, the references to "significant fission product inventory" and reactivity transients) in conjunction with audit item 23 may not be accurate or appropriate.

   During teleconferences on December 16 and 21, 2020, UML stated that it will provide a follow-up TS submittal which undoes the revision of TS 3.4.1(2) and deletion of TS 3.4.1(3) indicated on the tracked changes version of UML's September 30, 2020, TS submittal (ADAMS Accession No. ML20274A254), and re-numbers the new TS 3.4.1(3) and TS 3.4.1(4) proposed in UML's September 30, 2020, TS submittal to TS 3.4.1(4) and TS 3.4.1(5), respectively. Additionally, UML stated that it would undo the September 30, 2020, TS submittal's additions/deletions/revisions to the TS 3.4.1 basis from "The movement of irradiated fuel…" through the end of the basis.

7. Audit item 25: The revised TS 3.5(2) contains an apparent typographical error (extra period at the end of the TS).

   During a teleconference on December 16, 2020, UML stated that it will provide a follow-up TS submittal which deletes the extra period at the end of TS 3.5(2).

8. Audit item 26: It is not clear whether UML has completed a 10 CFR 50.59 evaluation of its radiation monitoring system changes and has implemented (or will implement) the changes prior to issuance of a renewed license, or whether UML is requesting NRC review and approval of these changes in conjunction with its license renewal review. Also, supplemental docketed information confirming that new radiation monitor alarms will be provided by the existing annunciator panel does not appear to have been provided.

   During a teleconference on December 16, 2020, UML stated that it will provide follow-up supplemental information (on docket) which confirms that, in conjunction with its license renewal request, it is requesting NRC review and approval of the radiation monitoring system changes discussed in its September 30, 2020, supplemental information submitted to address audit item 26. UML also stated that it will provide follow-up supplemental information (on docket) confirming that the new radiation monitor control room alarms (for individual radiation monitors reaching their alarm setpoints) will be provided by the existing radiation monitor alarm panel, which provides the existing audible alarms when certain combinations of radiation monitors reach their alarm setpoints.

9. Audit item 31: The typographical error does not appear to have been corrected.

   During a teleconference on December 16, 2020, UML stated that it will provide a follow-up TS submittal which revises "sewage" to "sewerage" (the eighth word of TS 3.6.2(1)).

10. Audit item 37: It is still not clear that the TS applies for any condition, regardless of whether the beam ports are being "accessed."

During a teleconference on December 16, 2020, UML stated that it will provide a follow-up TS submittal which revises the TS 3.8(3) language "In order to access a beam port with both the lead shutter in the up position and the corresponding shield plug removed…" to "When a beam port lead shutter is in the up position while the corresponding shield plug is also removed…" or similar.

11. Audit item 38: TS 4.0, item A., has been revised, but the revisions to the TS do not appear to reflect other revisions to TS 4.6, and whether it is appropriate for revised TSs 4.6(3) and 4.6(4) to also be included in the list of TSs that may not be deferred. Additionally, TS 4.0, item A., includes the wording, "as soon as practical," but it appears that "as soon as practicable" may have been what was meant.

    During a teleconference on December 16, 2020, UML stated that it will provide a follow-up TS submittal which revises the reference "4.6(1); and 4.6(2)" in TS 4.0, item A., to "and 4.6," and revises the word "practical" to "practicable."

12. Audit item 46: TSs 4.2.3(2) and 4.2.3(6) continue to use the language "or prior to each operation extending more than one day" which is inconsistent with the TS definitions.

    During a teleconference on December 16, 2020, UML stated that it will provide a follow-up TS submittal which deletes the language "or prior to each operation extending more than one day" from TSs 4.2.3(2) and 4.2.3(6).

13. Audit item 49: The revised proposed TS 4.4(3) language "fail-safe condition" does not appear to be consistent with "fail-safe position" used in the corresponding LCO and the TS 4.4 basis.

    During a teleconference on December 16, 2020, UML stated that it will provide a follow-up TS submittal which revises the word "condition" to "position" in TS 4.4(3).

14. Audit item 54: In addition to changes discussed during the audit, the TS 5.1(2) revision added an exclusion describing areas that the reactor licensed boundary does not include, but the specific areas excluded, and the purpose of this exclusion, is not clear.

    During a teleconference on December 21, 2020, UML stated that it will provide a follow-up TS submittal which deletes the language "with the exclusion of spaces and infrastructure in the three-story building delineated and approved under the byproduct materials license," from TS 5.1(2).

15. Audit item 56: Although the proposed TS 5.2(3) and TS 5.2 basis were revised as discussed during the audit, the possible use of a titanium heat exchanger does not appear to be discussed in the SAR, as supplemented, and the justification for the acceptability of titanium is not clear.

    During a teleconference on December 21, 2020, UML stated that it will either provide follow-up supplemental information (on docket) which describes and justifies the possible use of a titanium heat exchanger, or provide a follow-up TS submittal which deletes "or titanium" from TS 5.2(3) and revises the TS 5.2 basis accordingly.

16. Audit item 62: The supplemental information states that 10 CFR 70.24(a) would apply for any SNM stored, handled, or used outside of the pool, but does not appear to confirm that

any fissionable material UML stores, handles, or uses outside of the pool or licensed containers is less than the quantities specified in 10 CFR 70.24(a).

During a teleconference on December 21, 2020, UML stated that it will provide follow-up supplemental information (on docket) which confirms that any fissionable material UML currently stores, handles, or uses outside of the pool or licensed containers is less than the quantities specified in 10 CFR 70.24(a).

17. Audit item 75: The revised proposed TSs include TS 6.4(2) which requires the Reactor Supervisor or Radiation Safety Officer to approve procedures, but it not clear whether their designees may approve procedures. Additionally, the revised proposed TS 6.4(1) requires that RSSC review all procedures, but this appears to conflict with UML's response to RAI-14.6.15 (ADAMS Accession No. ML19064B373). Also, in addition to changes discussed during the audit, UML proposed to delete the requirement that "procedures shall be adequate to ensure the safe operation of the reactor and gamma irradiation facilities" from TS 6.4(1), but the justification for this deletion is not entirely clear.

    During a teleconference on December 21, 2020, UML stated that it will provide a follow-up TS submittal which revises TS 6.4(2) to indicate that the Reactor Supervisor "or designee," and the Radiation Safety Officer "or designee," shall approve procedures. UML also stated that its follow-up TS submittal will undo its September 30, 2020, TS submittal's deletion of the language "The procedures shall be adequate to ensure the safe operation of the reactor and gamma irradiation facilities…" from TS 6.4(1). Additionally, UML stated that it will provide follow-up supplemental information (on docket) updating its response to RAI-14.6.15 by confirming that the RSSC will review all TS-required procedures, including those related to personnel radiation protection.

18. Audit item 78: The revised proposed TS does not appear to require that experiments be carried out using written procedures.

    During a teleconference on December 21, 2020, UML stated that it will provide a follow-up TS submittal which revises the TS 6.5(2) language "…established and approved procedures" to "…established and approved written procedures."

19. Audit item 80: The revised cross-references in proposed TSs 6.6.1(3) and 6.6.1(5) do not appear to be correct.

    During a teleconference on December 21, 2020, UML stated that it will provide a follow-up TS submittal which revises the TS 6.6.1(3) cross-reference from "TS 6.7.2(1) and 6.7.2(2)" to "TS 6.7.2(1)," and revises the TS 6.6.1(5) cross-reference from "TS 6.7.2(1) and 6.7.2(1)" to "TS 6.7.2(2)."

20. Audit item 91: The revised proposed TS 6.8.3(5) appears to refer to "limiting condition for operations" instead of the "limiting condition for operation" used elsewhere in the TSs.

    During a teleconference on December 21, 2020, UML stated that it will provide a follow-up TS submittal which revises the TS 6.8.3(5) language "…limiting condition for operations" to "…limiting condition for operation."

21. Audit item 97.i: The documents provided with UML's supplemental information do not appear to include coversheets for part of item (5) under audit item 97.i, specifically, "supporting documentation (TFS PPM configuration record and test reports)."

    During a teleconference on December 16, 2020, UML stated that these coversheets should not be necessary for docketing, because the configuration record and tests associated with these coversheets are referenced in the Certificate of Conformance memo included in UML's supplemental information dated September 30, 2020 (ADAMS Accession No. ML20274A255).

22. Audit item 97.xvii: The supplemental information states that "similar" information from the 1985 SAR describing the startup counter drive will be added to an updated SAR, but the supplemental information does not provide a specific, current description of the startup counter drive and its configuration.

    During a teleconference on December 16, 2020, UML stated that it will provide follow-up supplemental information (on docket) which includes a specific, current description of the startup counter drive and its configuration.

23. Audit item 97.xix: The supplemental information does not appear to provide the correct nominal value of the regulating rod speed or indicate which section(s) of the SAR have incorrect information.

    During a teleconference on December 16, 2020, UML stated that it will provide follow-up supplemental information (on docket) which corrects/clarifies references to regulating rod speed in the SAR, as appropriate, by stating that the maximum regulating rod speed is 55 inches per minute.

24. TS 6.4(3) (additional TS change separate from audit items): In its revised proposed TSs, UML deleted the requirement that temporary deviations from procedures be documented and reviewed pursuant to 10 CFR 50.59. However, the justification for removing the requirement to document such deviations is not clear. Additionally, the NRC staff notes that all procedure changes, including temporary changes, are potentially subject to 10 CFR 50.59.

    During a teleconference on December 21, 2020, UML stated that it will provide a follow-up TS submittal which revises the TS 6.4(3) language "Such deviations shall be reported with 24 hours…" to "Such deviations shall be documented and reported within 24 hours…"

25. TS 6.8.1(9) (additional TS change separate from audit items): UML revised the proposed TS for greater consistency with ANSI/ANS-15.1-2007, but it is not clear whether the revised TS is appropriately facility-specific, if proposed TS 6.2.4 does not require that all audits be performed by the RSSC.

    During a teleconference on December 21, 2020, UML stated that it will provide a follow-up TS submittal which revises TS 6.8.1(9) to "RSSC meeting minutes and reports of audits required by TS 6.2.4."

26. TS 4.6(1) (inconsistency between clean and tracked changes versions of revised proposed TSs): The clean version of TS 4.6(1) appears to read "…monitoring channels in

Specification 3.6.1(1)…" but the tracked changes version appears to read "…monitoring channels in TS 3.6.1(1)."

During a teleconference on December 21, 2020, UML stated that, in its follow-up TS submittal, it would verify that any versions of the TSs (e.g., clean and tracked changes versions) it provided were consistent.

27. Financial information (if, for any of the questions below, there is no change from previously submitted information, please clearly state no change, or not applicable):

    1. Please provide updates for the following information:

        a. Projected operating costs of the UMLRR for each of the fiscal years (FYs) 2020 through 2025 (or the first five-year period after the projected license renewal).
        b. UML's source of funding to cover the operating costs for the above FYs.

    2. As described above, please provide updates for the following information:

        a. A current decommissioning cost estimate in 2020 dollars for the UMLRR to meet the NRC's radiological release criteria for decommissioning the facility. Accordingly, describe the basis on how the decommissioning cost estimate was developed.
        b. A summary of total decommissioning costs broken down into the categories of labor, waste disposal, other items in current dollars, and a contingency factor.
        c. A statement of the decommissioning method to be used
        d. A description of the means of adjusting the cost estimate and associated funding level periodically over the life of the facility, pursuant to 10 CFR 50.75(d)(2)(iii).
        e. A numerical example showing how the decommissioning cost estimate will be updated periodically in the future.

    3. As described above, please provide updates for the following information:

        a. An updated statement of intent (SOI) which includes the current (2020 dollars) cost estimate for decommissioning, a statement that funds for decommissioning will be obtained when necessary, the typed name and title of the signator, the original signature of the signator, and the signator's oath or affirmation attesting to the information.
        b. Documentation verifying that the signator of the SOI is authorized to execute such a document that binds the applicant financially. For example, provide a copy of UML's governing board or equivalent resolution or a copy of an official UML delegation of authority showing that the signator of the SOI has been authorized by UML to bind the university financially to at least the funding for the decommissioning of the UMLRR.

    During a teleconference on December 16, 2020, UML stated that it will provide follow-up supplemental information (on docket) including the financial information listed in follow-up audit question 27.

<u>Additional Audit Discussion Items Related to UML's Supplemental Information Submitted January 30, 2021</u>

(Note: The follow-up audit question numbers referenced in the additional discussion items listed below refer to the follow-up audit questions which were listed in the December 17, 2020, interim audit report, and for which discussion summaries are provided in this final audit report in the section above. TSs referenced in the discussion items and summaries below refer to UML's proposed TSs included in its supplemental information dated January 30, 2021, unless otherwise noted.)

1. The NRC staff noted that the proposed wording (changed from the proposed wording in UML's September 30, 2020, TS submittal) for TS Table 3.2.3-1, item 13, including the footnote, appears to be overly ambiguous (related to follow-up audit question 4).

   During a teleconference on February 11, 2021, UML stated that it will provide a follow-up TS submittal that undoes its January 30, 2021, TS submittal's change in the "Minimum Required" column of TS Table 3.2.3-1, item 13, from "1" to "All," and removes the footnote to item 13. Additionally, UML stated that it will provide a follow-up TS submittal that revises the second-to-last sentence of the TS 3.2.3 basis to indicate that the required primary piping alignment scram consists of multiple limit switches, described in the SAR, and that the purpose of the scram is to ensure adequate coolant flow is maintained in the reactor core during forced convection operations.

2. The NRC staff noted that, for follow-up audit questions 22 and 23, UML's January 30, 2021, submittal stated that additional information would be provided on the docket, but the information does not appear to have been provided (related to follow-up audit questions 22 and 23).

   During a teleconference on February 11, 2021, UML stated that it will provide this information as follow-up supplemental information (on docket) for its LRA. UML stated that the information will consist of 1) a specific, current description of the startup counter drive and its configuration, and 2) confirmation that the current maximum regulating rod speed is 55 inches per minute, and that that information corrects/clarifies references to regulating rod speed in the SAR, as appropriate.

3. The NRC staff noted that, for follow-up audit question 25, UML's January 30, 2021, submittal stated that proposed TS 6.8.1(9) would be revised to "RSSC meeting minutes…" but it appears to have been revised to "Records of meeting…" in the actual TSs, and the alternate wording "Records of meeting…" is not clear (related to follow-up audit question 25).

   During a teleconference on February 11, 2021, UML stated that it will provide a follow-up TS submittal which revises TS 6.8.1(9) to use the "RSSC meeting minutes…" language.

4. The NRC staff noted several editorial items related to the TSs:

   i. Apparent typographical error (extra period) in TS 3.2.3 applicability
   ii. Apparent typographical error (extra period on second sentence) in TS 3.6.1 basis (related to follow-up audit question 1.f)
   iii. "Sewage" (eighth word of TS) not corrected to "sewerage" in TS 3.6.2(1) (related to follow-up audit question 9)
   iv. Apparent typographical error (missing ")" after "4.6" in TS 4.0, item A. (related to follow-up audit question 11)
   v. TS 4.0, item B., includes the wording "Limiting Condition of Operation" but "Limiting Condition for Operation" is the correct terminology

vi. Apparent typographical error (missing space before “100 kW” in TS 4.1(4)
vii. TS 4.6(1) uses the wording “specification,” but TS 4.6 otherwise appears to use “TS”
viii. TS 6.6.1(2) uses the wording “his,” which may be overly specific

During a teleconference on February 11, 2021, UML stated that it will provide a follow-up TS submittal which revises the TSs to address the above items.