RAI-6.2

The regulations in 10 CFR 50.59 state, in part, that a licensee may make changes to the facility and procedures as described in the SAR if the licensee makes a determination (documented in a written evaluation) that no TS change is required, and that the changes do not meet any of the criteria in 10 CFR 50.59(c)(2). If the licensee determines that any of the criteria in 10 CFR 50.59(c)(2) are met, the licensee shall obtain an NRC license amendment pursuant to 10 CFR 50.90 prior to implementing the proposed change. (The NRC staff notes that, even if a licensee's evaluation of a change determines that no NRC license amendment is required, the licensee may still choose to request NRC review and approval of the change.)

In its response to RAI-6.1 (ADAMS Accession No. ML17090A348), UML states that it requests that the NRC evaluate its reactor building (which is currently considered to be a containment building) as a confinement building. UML discusses the changes associated with the re-designation of the reactor building as a confinement, and states that the changes include a modification to the operation of the UMLRR emergency exhaust system such that this system will automatically start when normal building ventilation is isolated (i.e., a General Reaction in the Ventilation System, as discussed in the SAR, as supplemented). UML states that this modification will be made, tested, and documented under the 10 CFR 50.59 process for the current UMLRR license.

Based on the response to RAI-6.1, it is not clear whether UML is requesting that the change in the designation of its reactor building from a containment to a confinement, including all associated modifications discussed in the response to RAI-6.1 or other supplements to the SAR, be reviewed by the NRC in conjunction with the UMLRR license renewal, or whether UML plans to evaluate and implement (or already has evaluated and implemented) some of these modifications without prior NRC approval in accordance with 10 CFR 50.59.

Clarify whether UML is requesting that the NRC review UML's proposed change in the designation of its reactor building, and all associated changes discussed in the renewal application, as part of its renewal review, or whether UML plans to make (or has made) certain aspects of these changes under 10 CFR 50.59. If some of the modifications are being (or have been) made under 10 CFR 50.59, describe the specific changes for which NRC review is being requested in conjunction with the license renewal. If any modifications have already been made under 10 CFR 50.59, provide updated SAR sections, as applicable, reflecting those modifications (if not already provided). Alternatively, justify why no additional information is required.

Response to RAI-6.2

The UMLRR requests the change from containment to confinement be evaluated by the NRC.

RAI-11.6

The regulations in 10 CFR 50.34(b)(3) require that the SAR contain information regarding the kinds and quantities of radioactive materials expected to be produced in the operation and the means for controlling and limiting radioactive effluents and radiation exposures within the limits set forth in 10 CFR Part 20.

The regulations in 10 CFR 20.2001(a) state that a licensee shall dispose of licensed material

only by transfer to an authorized recipient, by decay in storage, by release in effluents, or by other methods in certain circumstances.

The regulation in 10 CFR 20.2001(b)(3) states that a person must be specifically licensed to receive waste containing licensed material for decay in storage.

SAR Section 11.1.1.3 states that low-level solid waste generated at the UMLRR "is segregated by material and half-life and disposed of per 10 CFR 20.2001. Solid waste with a half-life greater than 120 days will be transferred to an authorized user and [solid waste with] a half-life of less than 120 days will be allowed to decay-in-storage until statistically indistinguishable from background radiation. Long lived solid waste is stored on site until sufficient volume is generated to warrant removal from a certified radioactive waste broker."

SAR Section 11.2.1 states that "[s]hort-lived (<120d) radioactive waste may be stored by the laboratory for decay. Those sources not meeting this criteria or laboratories which do not wish to store short lived waste shall have the waste collected by a member of the Radiation Safety Office." SAR Section 11.2.1 also states that "[d]ecay-in-storage waste shall be held in either *[sic]* the reactor storage site until the waste is statistically indistinguishable from background as specified above." SAR Section 11.2.1 additionally states that "[a]ll solid waste with a half-life greater than 120 days will be transferred to an authorized recipient for disposal. Such waste shall be stored on site until a sufficient quantity of long-lived material is generated to warrant a transfer. All liquid scintillation waste will similarly be transferred to an authorized recipient for disposal." SAR Section 11.2.1 further states that "[w]hen a radioactive waste container is filled at a radiation laboratory, the reactor staff shall contact the Radiation Safety Office to arrange a pickup."

However, it is not clear whether the disposal of low-level long- and short-lived radioactive waste generated at the UMLRR is controlled under UMLRR Facility Operating License No. R-125, or another UML license (e.g., UML's broad scope material license issued by the State of Massachusetts (License No. 60-0049)).

Provide the following information, or justify why no additional information is required:

a) Clarify whether long-lived radioactive waste (solid waste, as well as any liquid waste that may be disposed of by transfer offsite rather than release as effluents) generated at the UMLRR is disposed of by transfer directly from the UMLRR Facility Operating License No. R-125 to an authorized recipient such as a radioactive waste broker; or, is first transferred from the UMLRR license to the control of another UML license, and then later transferred to an authorized recipient for disposal.

b) Clarify whether short-lived radioactive waste (solid waste, as well as any liquid waste that may be disposed of by decay in storage rather than release as effluents) disposed of by decay in storage remains on the UMLRR license while being stored for decay, or if it is transferred to another UML license for decay-in-storage.

c) If long-lived and/or short-lived radioactive waste (solid waste and any liquid waste not disposed of by release as effluents) is transferred from the UMLRR license to the control of another UML license, clarify if this transfer occurs when the waste is removed from the UMLRR licensed boundary (i.e., the area controlled under the UMLRR license), or at another point in time. Additionally, clarify if these transfers involve any shipping of radioactive material,

or if they are internal to UML and no shipping is involved.

d) If long-lived and/or short-lived radioactive waste (solid waste and any liquid waste not disposed of by release as effluents) is transferred to the control of another UML license, describe how UML ensures that the other license is able to receive and possess the radioactive material in the waste before the material is transferred from the UMLRR license. Additionally, clarify whether another UML license receiving decay in storage waste from the UMLRR license is specifically licensed to receive waste containing licensed material for decay in storage.

Response to RAI-11.6

a) Solid and liquid long lived radioactive wastes generated at the UMLRR is disposed of by transfer from R-125 operating license directly to an authorized recipient if the shipment is not suitable for mixture with the campus byproduct material (e.g not accepted under that license, no waste is being disposed of via the campus license). If the campus byproduct license has waste to dispose of as well, the R-125 UMLRR waste will be transferred to the byproduct license for disposal together.

b) All UMLRR short lived solid and liquid waste is decayed in storage under the UMLRR license.

c) Any transfer of UMLRR long-lived radioactive waste to another UML license occurs when the material leaves the UMLRR licensed boundary. The transfers are internal to UML. No shipping is involved with the transfer.

d) If long-lived radioactive waste (solid waste and any liquid waste not disposed of by release as effluents) is transferred to the control of another UML license. To ensure the other license can handle it, the UMLRR waste, by both isotope and present activity, are checked against limits of said isotope(s) in the other UML license. Also the UML license current inventory is verified to ensure there is sufficient room to handle the isotope(s) activity, prior to transfer, as to not exceed the UML license limits.

RAI-12.1

The regulation in 10 CFR 50.34(b)(6)(iii) requires that the SAR contain information concerning facility operation, including plans for preoperational testing and initial operations.

The guidance in NUREG-1537, Part 2, Section 12.11, states, in part, that licensees should submit a startup plan whenever significant core modifications are being made.

The SAR, as supplemented, discusses UML's request that, in conjunction with license renewal, the UMLRR license be amended to allow the use of aluminide materials test reactor (MTR)-type reactor fuel transferred to UML from the permanently-shutdown Worcester Polytechnic Institute research reactor in conjunction with the current silicide MTR-type fuel. However, the NRC staff

notes that the SAR, as supplemented, does not appear to include a description of UML's plans for initial startup of the reactor with aluminide fuel in the core.

Describe the procedure for the initial startup of the reactor with aluminide fuel in the core, and discuss how this procedure will provide confirmation of modeling and/or analysis predictions for cores containing aluminide fuel. Alternatively, discuss why no additional information is required.

Response RAI-12.1

In the NRC Request for Additional Information dated February 1, 2017, question 4.1 notes that SAR section 4.5 concludes: "…*UMLRR physics and safety analysis studies were performed for a variety of core arrangements containing only UMLRR fuel, only WPI fuel, and for a variety of mixed core configurations. In all cases, the original UMLRR uranium silicide fuel is shown to be more limiting than the WPI fuel primarily because it is more reactive due to its higher U-235 loading and it has a higher average plate power due to the number of smaller fuel plates per element*."

The RAI 4.1 goes on to request additional specific analyses information related to determine if the assumptions and methods used by UML to reach the conclusion are justified and validated. This additional information was provided in UML's response to RAI-4.1 (ADAMS Accession No. ML17090A348). Given the multiple analyses and the conclusions provided, the addition of uranium-aluminide (WPI) fuel to the UMLRR core should not be considered as a "*significant modification*" in the spirit of NUREG 1537-2 Section 12.11 requiring a start up plan. For new core configurations, the UMLRR has an existing standard operating procedure providing detailed instructions for loading the core to a new configuration and performing an approach to critical. Additional existing procedures provide details on performing control blade/rod calibrations and reactivity evaluations. The reactivity evaluations include: differential and integral blade/rod worth; maximum reactivity addition rate; core excess reactivity; and shutdown margin. These procedures have been used for numerous core configuration changes during the current license period, including the HEU to LEU conversion in 2000, and shall be used for any addition of WPI fuel.

RAI-13.9

The regulations in 10 CFR 50.34(b)(2) require that the SAR contain a description and analysis of the structures, systems, and components of the facility, with emphasis upon performance requirements; the bases, with technical justification therefor, upon which such requirements have been established; and the evaluations required to show that safety functions will be accomplished.

The regulations in 10 CFR 50.34(b)(3) require that the SAR contain information regarding the kinds and quantities of radioactive materials expected to be produced in the operation and the means for controlling and limiting radioactive effluents and radiation exposures within the limits set forth in 10 CFR Part 20.

The guidance in NUREG-1537, Part 1, Chapter 13, describes the types of research reactor accidents that should be analyzed in the SAR. These accidents include experiment malfunctions, which are discussed in NUREG-1537, Part 1, Section 13.1.6. As discussed in NUREG-1537, Part 1, Section 13.1.6, initiators of experiment malfunctions can include failures related to fueled experiments, and detonation of explosive experiments.

SAR Section 13.2.6, as supplemented by UML's response to RAI-13.3 (ADAMS Accession No. ML17090A348), states that experiments containing fissile material (fueled experiments) or explosive material are presently not allowed in the UMLRR core.

However, it is not clear whether fueled experiments (any experiments that may contain fissile or fissionable material) or experiments containing explosive material are allowed in ex-core neutron irradiation facilities (e.g., beam tubes or the fast neutron irradiation facility), or gamma irradiation facilities. Clarify whether any fueled experiments and/or experiments containing explosive material are allowed in any UMLRR experimental facility. If such experiments are allowed, provide a safety analysis of the allowed experiments. Alternatively, justify why no additional information is required.

Response RAI 13.9

The proposed Technical Specification 3.7.2(5) has been added to specify a limit on fueled experiments. The limit is based on approximately one-half the activity for iodine radioisotopes used in the maximum hypothetical accident (MHA) analysis in the SAR and as supplemented in the response to RAI 13.5 (ADAMS Accession No. ML18006A005). In the supplemental analysis, both the occupational dose and dose to the public consequences for the MHA are well below 10CFR Part 20 regulatory limits.

RAI-14.1.1

The proposed TSs in SAR Chapter 14 include definitions for "containment" and "containment integrity."

ANSI/ANS-15.1, Section 1.3, provides definitions for "confinement" and "containment."

In its response to RAI-6.1 (ADAMS Accession No. ML17090A348), UML states that it requests that the NRC evaluate its reactor building as a confinement building. UML stated that, in an upcoming submittal associated with revised TSs, the ANSI/ANS-15.1 definitions for "containment" and "containment integrity" shall be deleted, and the definition for "confinement" shall be added.

Provide revised TS pages incorporating this change, or discuss why this change is no longer required.

Response RAI-14.1.1

The proposed technical specification definitions have been modified as requested.

RAI-14.1.2

Section 1.3 of the proposed TSs in SAR Chapter 14 includes a definition for "core configuration" which states, "[t]he core configuration includes the number, type, or arrangement of fuel elements, reflector elements, and regulating / control / transient rods occupying the core grid."

ANSI/ANS-15.1, Section 1.3 contains a similar definition for "core configuration." However, the proposed TS definition for "core configuration" does not appear to be specific to the facility because it does not include all components that are or could potentially be located in the UMLRR core grid, for example, radiation baskets, lead void boxes, and grid plugs. Additionally, "transient rods" does not appear to be a term used to describe control elements at the UMLRR.

Provide a revised, facility-specific TS definition of "core configuration," or discuss why no change is required.

Response RAI-14.1.2

The proposed technical specification definition has been modified as requested.

RAI-14.1.3

Section 1.3 of the proposed TSs in SAR Chapter 14 includes a definition for "excess reactivity" which states, "[e]xcess reactivity is that amount of reactivity that would exist if all activity control devices were moved to the maximum reactive condition from the point where the reactor is exactly critical (k_{eff} = 1) at reference core conditions or at a specified set of conditions."

ANSI/ANS-15.1, Section 1.3 includes a definition for "excess reactivity" which is generally similar to the proposed TS definition, except that the ANSI/ANS-15.1 definition states "…all reactivity control devices...."

However, it is not clear what are the "specified set of conditions" referred to in the proposed TS definition. Additionally, the proposed TS does not appear to be specific to the UMLRR, because it refers generically to "activity control devices" rather than to control blades and the regulating rod, and because it uses "maximum reactive condition" rather than specifying the condition where the control blades and regulating rod are all fully withdrawn. The proposed TS also appears to contain a typographical error in that "all activity control devices" should be "all reactivity control devices."

Provide a revised TS definition of "excess reactivity" that either clarifies what is meant by "or at a specified set of conditions," or deletes this portion of the proposed TS; is specific to the control devices and most reactive condition of the UMLRR; and, corrects the apparent typographical error (or deletes the portion of the proposed TS containing the error). Alternatively, discuss why no change is required.

RAI-14.1.3

The proposed technical specification definition has been modified as requested.

RAI-14.1.4

Section 1.3 of the proposed TSs in SAR Chapter 14 includes a definition for "reactor secured," which states, in part, "[n]o 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."

Proposed TS 3.7.1(1) in SAR Chapter 14 limits the reactivity worth of a single experiment to 0.25% Δk/k for movable experiments, and 0.5% Δk/k for secured experiments. The NRC staff notes that 0.5% Δk/k is equivalent to less than one dollar for the UMLRR.

Therefore, the proposed TS definition for "reactor secured" does not appear to be specific to the UMLRR. Provide a revised, facility-specific TS definition of "reactor secured" that replaces "the maximum value allowed for a single experiment" with the UMLRR-specific value, and deletes the language "or one dollar, whichever is smaller," or discuss why no change is required.

Response RAI-14.1.4

The proposed technical specification definition has been modified as requested.

RAI-14.1.5

Section 1.3 of the proposed TSs in SAR Chapter 14 includes a definition for "rod, control," which states, in part, "[a] control rod is a device fabricated from neutron-absorbing material, or fuel, or both…."

The NRC staff notes that the UMLRR control rods (blades) do not contain fuel.

Therefore, the proposed TS definition for "rod, control" does not appear to be specific to the UMLRR. Provide a revised, facility-specific TS definition of "rod, control" that deletes the language "or fuel, or both," or discuss why no change is required.

Response RAI-14.1.5

The proposed technical specification definition has been modified as requested.

RAI-14.1.6

Section 1.3 of the proposed TSs in SAR Chapter 14 includes a definition for "rod, regulating," which states, in part, "[t]he regulating rod is a low worth control rod, used primarily to maintain an intended power level, that need not have scram capability and may have a fueled follower."

The NRC staff notes that the UMLRR regulating rod does not have a scram capability or a fueled follower.

Therefore, the proposed TS definition for "rod, regulating" does not appear to be specific to the UMLRR. Provide a revised, facility-specific TS definition of "rod, regulating" that specifies that the regulating rod does not have scram capability, and deletes the language "and may have a fueled follower," or discuss why no change is required.

Response RAI-14.1.6

The proposed technical specification definition has been modified as requested.

RAI-14.1.7

Section 1.3 of the proposed TSs in SAR Chapter 14 includes a definition for "shutdown margin," which states, "[s]hutdown margin is the minimum shutdown reactivity necessary to provide confidence that the reactor can be made subcritical by means of control and safety systems starting from any permissible operating condition and with the most reactive rod in the most reactive position, and the non-scramable rods in their most reactive positions and that the reactor will remain subcritical without further operation action."

The proposed TS definition for "shutdown margin" does not appear to be specific to the UMLRR because it does not specify that the most reactive control rod (blade) or regulating rod position is fully withdrawn, or that there is only one non-scramable regulating rod, and because the terminology "non-scramable rods" is not generally used in the UMLRR SAR or defined in the TSs. Additionally, the proposed TS definition appears to contain a typographical error in that "further operation action" should read "further operator action." Provide a revised TS definition of "shutdown margin" that is facility-specific, and correct the apparent typographical error, or discuss why no change is required.

Response RAI-14.1.7

The proposed technical specification definition has been modified as requested.

RAI-14.1.8

Section 1.3 of the proposed TSs in SAR Chapter 14 includes a definition for "site," which states, "[t]he UMLRR site includes the reactor containment building and the attached academic building (Pinanski Hall)."

In its response to RAI-6.1 (ADAMS Accession No. ML17090A348), UML states that it requests that the NRC evaluate its reactor building (which is currently considered to be a containment building) as a confinement building.

Revise the proposed TS definition for "site" to indicate that the reactor building is a confinement, consistent with the response to RAI-6.1, or discuss why no change is required.

Response RAI-14.1.8

The proposed technical specification definition has been modified as requested.

RAI-14.1.9

Section 1.3 of the proposed TSs in SAR Chapter 14 includes definitions for "research reactor" and "research reactor facility." However, the NRC staff notes that the proposed TSs generally appear to use the terminology "reactor" and "facility" in place of the defined terms, and therefore

it is not clear whether the meanings of "reactor" versus "research reactor," and "facility" versus "research reactor facility" are exactly equivalent.

Revise the proposed TS definitions to include definitions for "reactor" and "facility," such that it is clear whether the terminology generally used in the proposed TSs is equivalent to the defined terminology, or discuss why no change is required.

Response RAI-14.1.9

The previously submitted definitions of "Research Reactor" and "Research Reactor Facility" are taken from ANSI/ANS 15.1 with some additional wording specific to the UMLRR. In response, both proposed definitions have been revised using the wording as in ANS/ANSI 15.1.

RAI-14.2.1

The regulation in 10 CFR 50.36(c)(1)(i)(A) states, in part, "[s]afety limits for nuclear reactors are limits upon important process variables that are found to be necessary to reasonably protect the integrity of certain of the physical barriers that guard against the uncontrolled release of radioactivity."

The regulation in 10 CFR 50.36(c)(1)(ii)(A) states, in part, "[l]imiting safety system settings for nuclear reactors are settings for automatic protective devices related to those variables having significant safety functions. Where a limiting safety system setting is specified for a variable on which a safety limit has been placed, the setting must be so chosen that automatic protective action will correct the abnormal situation before a safety limit is exceeded."

The NRC staff notes that research reactor SLs are typically based on a minimum temperature threshold at which fuel cladding could fail and fission products could be released from the fuel. NUREG-1537, Part 1, Appendix 14.1, Section 2.1, states that SLs should be developed to avoid failure of the fuel, and should be a limit that is not to be exceeded under any conditions of operation, and that the NRC staff have found that 530 degrees Celsius (°C) (986 degrees Fahrenheit (°F)) is an acceptable SL for aluminum-clad MTR fuels.

Proposed TS 2.1, which is the UMLRR SL, states that "[t]he reactor fuel clad temperature shall be less than 118°C (244°F)."

SAR Section 4.6.1 states that the SL of 118°C (244°F) is the minimum onset of nucleate boiling temperature for the UMLRR fuel.

UML's reactivity transient accident analyses for the UMLRR are discussed primarily in SAR Sections 13.1.2 and 13.2.2, as supplemented by UML's response to RAI-13.1 (ADAMS Accession No. ML17090A348). UML's analyses show that, although credible reactivity transients would not cause the reactor fuel to reach temperatures at which fuel damage could occur, and the transients analyzed assume LSSSs are set at beyond TS-required values, the reactivity transients analyzed could cause a peak reactor fuel clad temperature that exceeds the SL.

Revise proposed TS 2.1 such that the SL is a minimum temperature threshold at which fuel cladding could fail, that will not be exceeded under any condition of operation; provide analyses

demonstrating that the SL of 118°C (244°F) cannot be exceeded under any credible condition of operation (with LSSSs at TS-limiting values); or, discuss why no TS change or additional information is required.

Response RAI-14.2.1

The proposed technical specification has been modified based upon the parameters specified in NUREG-1313.

RAI-14.2.2

Proposed TSs 2.2.1(1) through 2.2.1(4) and 2.2.2(1) through 2.2.2(3) in SAR Chapter 14 each state, in part, "[t]he Limited Safety System Setting for…."

The proposed TSs appear to contain typographical errors in that "Limited Safety System Setting" should read "Limiting Safety System Setting." Provide revised TSs 2.2.1(1) through 2.2.1(4) and 2.2.2(1) through 2.2.2(3) that correct the apparent typographical errors, or discuss why no change is required.

Response RAI-14.2.2

The typographical errors have been corrected in the proposed technical specifications.

RAI-14.3.1

Proposed TS 3.1.1(1) states that the UMLRR shall not be operated unless "[t]he reactor core is loaded so that the excess reactivity in the cold clean (xenon free) critical condition shall be <4.7% Δk/k."

However, the proposed TS definition for "reference core condition" specifies that "…the reactivity worth of xenon is negligible (<0.2% Δk/k)," which appears to be inconsistent with proposed TS 3.1.1(1).

Revise proposed TS 3.1.1(1) to use the terminology "reference core condition" in order to make the TSs consistent and to clarify that the "xenon free" condition currently referenced in proposed TS 3.1.1(1) is equivalent to the "negligible" xenon condition referenced in the proposed TS definition for "reference core condition." Alternatively, propose alternate consistent language for proposed TS 3.1.1(1) and the proposed TS definition for "reference core condition;" or, discuss why no change is required.

Response RAI-14.3.1

The proposed technical specification 3.1.1(1) has been revised as requested.

RAI-14.3.2

Proposed TS 3.1.1(2) states that the UMLRR shall not be operated unless "[t]he minimum

shutdown margin relative to the cold, clean (xenon free) critical condition, with the most reactive control rod in the fully withdrawn position, shall be >2.7% Δk/k."

However, the proposed TS definition for "reference core condition," specifies that "…the reactivity worth of xenon is negligible (<0.2% Δk/k)," which appears to be inconsistent with proposed TS 3.1.1(2).

Additionally, the proposed TS definition for "shutdown margin," specifies that "[s]hutdown margin is the minimum shutdown reactivity necessary to provide confidence that the reactor can be made subcritical by means of control and safety systems starting from any permissible operating condition and with the most reactive rod in the most reactive position, and the non-scramable rods [i.e., for the UMLRR, the regulating rod] in their most reactive positions…," which also appears to be inconsistent with proposed TS 3.1.1(2) because proposed TS 3.1.1(2) specifies the position of the most reactive control rod (blade), but not the position of the regulating rod.

Furthermore, the guidance in NUREG-1537, Part 1, Appendix 14.1, Section 3.1(2), states that shutdown margin TSs should specify the status of experiments (e.g., movable experiments in their most reactive state). Proposed TS 3.1.1(2) does not appear to specify the status of experiments.

Revise proposed TS 3.1.1(2) to use the terminology "reference core condition" in order to make the TSs consistent and to clarify that the "xenon free" condition currently referenced in proposed TS 3.1.1(2) is equivalent to the "negligible" xenon condition referenced in the proposed TS definition for "reference core condition;" or, propose alternate consistent language for proposed TS 3.1.1(2) and the proposed TS definition for "reference core condition." Additionally, revise proposed TS 3.1.1(2) to specify that the regulating rod is in the fully withdrawn position, and to specify that the minimum shutdown margin requirement is based on all experiments being in their most reactive state(s). Alternatively, discuss why no change is required.

Response RAI-14.3.2

The proposed technical specification 3.1.1(2) has been revised as requested. A revised limit of 1% Δk/k for the shutdown margin is sufficient to assure the reactor remains subcritical under the specified conditions, is easily measurable, and is consistent with other MTR flat-plate fueled reactors (e.g., MIT, RINSC).

RAI-14.3.3

Proposed TS 3.1.1(3) states that the UMLRR shall not be operated unless "[a]ll core grid positions are filled with fuel elements, irradiation baskets, source holders, regulating rod, graphite reflector elements or grid plugs." However, the NRC staff notes that the list of items that may be used to fill core positions does not appear to include all items (for example, lead void boxes) that may be used to fill core positions.

Revise proposed TS 3.1.1(3) to include all items which may be used to fill the core grid positions; revise proposed TS 3.1.1(3) to delete the incomplete list of items; or discuss why no change is required.

Response RAI-14.3.3

The proposed technical specification 3.1.1(3) has been revised as requested.

RAI-14.3.4

Proposed TS 3.1.1(4) states that the UMLRR shall not be operated unless "[a]ll but 5 of the peripheral radiation baskets must contain flow restricting devices. This specification will not apply for low power operation <10 kW without forced flow."

SAR Section 4.5.7 states, in part, "[a] maximum of five open radiation baskets can be present in the core at one time to limit the amount of bypass flow and to assure that there is sufficient flow in the fuel channels…." SAR Section 4.5.7 also provides analyses of flow through the UMLRR fuel that assume a total of five open radiation baskets.

However, the NRC staff notes that the UMLRR core may contain a radiation basket in the center of the core (i.e., flux trap) in addition to peripheral radiation baskets. Therefore, proposed TS 3.1.1(4) appears to be inconsistent with the analyses in SAR Section 4.5.7.

Additionally, proposed TS 3.1.1(4) uses the language "must" and "will not apply" which appears to be inconsistent with the proposed TS definition of "shall" to denote a requirement.

Revise proposed TS 3.1.1(4) such that it would require a maximum number of total open radiation baskets that is consistent with the SAR Section 4.5.7 analyses. Additionally, revise proposed TS 3.1.1(4) to either delete "must" and "will not apply," or revise this language to be consistent with the TS definitions. Alternatively, discuss why no changes are required.

Response RAI-14.3.4

Proposed technical specification 3.1.1 (4) has been revised to remove the word "peripheral" and the conditional statement has been re-worded to remove the term "will not apply" and include the word "shall". In addition, the allowable condition of <10kW has been revised to ≤100kW since force convection flow is required for power levels greater than 100kW, consistent with the safety analyses.

RAI-14.3.5

The guidance in NUREG-1537, Part 1, Appendix 14.1, Section 3.1(6), states that LCOs should include a requirement that a reactor should not be operated with damaged fuel except to locate such fuel.

However, the proposed UMLRR TSs do not appear to include such a requirement. Provide a TS that would require that the UMLRR not be operated with damaged fuel except to locate such fuel, or discuss why no such TS is required.

Response RAI-14.3.5

Proposed technical specification 3.1.1(5) has been added as requested. Damaged fuel in this

regard refers to either physical damage that could affect the mechanical integrity of the fuel element (e.g., a loose or broken end box or side plate) or the actual leakage of fission products.

RAI-14.3.6

The guidance in NUREG-1537, Part 1, Appendix 14.1, Section 3.2(1), states that LCOs should specify the number and type of operable control rods.

Proposed TS 3.2.1 would require that each UMLRR control rod (blade) be able to be 80 percent inserted within one second following a reactor scram. However, the proposed UMLRR TSs do not appear to include a requirement that control rods (blades) and/or the regulating rod be otherwise operable (including, for the control rods (blades), the ability to be banked, such that the reactor would be operating in accordance with analyses in the SAR, as supplemented).

Provide a TS that would require that the UMLRR shall not be operated unless the 4 control rods (blades) and the regulating rod are operable. If such a TS is added, also provide a corresponding surveillance requirement TS. Alternatively, discuss why no such TSs are required.

Response RAI-14.3.6

The proposed technical specification 3.2.1(1) has been added in response to include all control blades shall be operable. The regulating blade was not included as it does not have scram capability.

RAI-14.3.7

Proposed TS 3.2.3 lists “reactor protection system channels” that are required to be operable when the reactor is operating. However, the NRC staff notes that the items listed in TS 3.2.3 appear to be scrams, rather than “channels,” as defined by the proposed TS definitions. Additionally, proposed TS 3.2.5 lists reactor protection and control system “channels” that are required to be operable when the reactor is operating, and it is not clear how the TS 3.2.5 requirements for certain “channels” differ from the TS 3.2.3 requirements for “channels.”

Revise proposed TS 3.2.3 to clarify that the 13 items required by the TS are scrams, rather than channels, or discuss why no change is required.

Response RAI-14.3.7

TS 3.2.3 Specification has been modified to remove the word “channel” and include the word “scram”.

RAI-14.3.8

Proposed TS 3.2.3, items 2 and 8, appear to contain typographical errors in that “Scram at ≥115 MW” should read “Scram at ≥1.15 MW,” and “Mercali” should read “Mercalli,” respectively. Revise proposed TS 3.2.3 to correct the apparent typographical errors, or discuss why no change is required.

Response RAI-14.3.8

The proposed technical specifications have been corrected as requested.

RAI-14.3.9

The table in proposed TS 3.2.4 lists scram "channels" that are required to be operable when the reactor is operating.

However, the NRC staff notes that the items listed in the TS 3.2.4 table appear to be scrams, rather than "channels," as defined by the proposed TS definitions.

Revise the table in proposed TS 3.2.4 to clarify that the 6 items required by the TS are scrams, rather than channels, or discuss why no change is required.

Response RAI-14.3.9

The proposed technical specification has been revised as requested.

RAI-14.3.10

(Note: see also related RAI-14.3.23 on radiation monitoring system LCOs.)

Proposed TS 3.2.4, item 1, would require that the "Area Radiation Monitoring System" provide a "Scram on High Radiation Levels."

SAR Sections 7.7.5 through 7.7.7 discuss scrams associated with the UMLRR radiation monitoring system. The SAR states that a potential local radiation emergency alarm (potential LREA or P-LREA) or potential general radiation emergency alarm (potential GREA or P-GREA) are initiated by high readings on certain combinations of various types of radiation monitors, including area, air, and effluent monitors. The SAR further states that a P-LREA or P-GREA does not result in an automatic reactor scram, and that the reactor operator must press a button on the control room radiation monitoring system cabinet or click on the radiation monitoring system display screen to declare an actual alarm (i.e., an actual LREA or GREA) which results in a reactor scram.

Given that some of the radiation monitors that feed into the radiation alarm logic are not area monitors, and given that radiation monitors or combinations of radiation monitors reaching their setpoints does not result in an automatic reactor scram, it is not clear exactly what equipment is required to be operable by proposed TS 3.2.4, item 1.

Clarify whether proposed TS 3.2.4, item 1, is intended to require the scrams associated with an LREA or GREA that can be manually initiated by the reactor operator following a P-LREA or G-LREA caused by high readings on combinations of radiation monitors (including monitors other than area monitors), as discussed in SAR Sections 7.7.5 through 7.7.7. Include a discussion of whether proposed TS 3.2.4, item 1, is also intended to require the operability of the radiation alarm logic system and all radiation monitors that feed into the alarm logic. Alternatively, either describe the different equipment that proposed TS 3.2.4, item 1, applies to; delete proposed TS 3.2.4, item 1, and discuss why a TS on radiation monitoring scrams is not necessary; or discuss

why no additional information is required.

Response RAI-14.3.10

The existing UMLRR Area Radiation Monitoring (ARM) system includes a large number of area radiation detectors integrated with a complex logic of automated response functions. The complexity of the detector combinations for the alarm and trip functions is a legacy of the original 1974 facility design. Subsequent upgrades to the system in 1999 maintained the original design as described in the 1974 SAR and the 1985 SAR, and as described in the SAR submitted for the current re-licensing effort (SAR section 7.7.5).

The current (1985) technical specifications (section 3.2) for the UMLRR do not include a specification for a radiation monitoring scram as part of the reactor safety system. A review of the technical specifications for several recently relicensed research reactors – NIST Test Reactor (20MW); Missouri University Research Reactor (10MW); MIT Reactor (6MW); Rhode Island Nuclear Science Center (2MW); Texas A&M (1MW); Penn State University Reactor (1MW); Ohio State University Reactor (0.5MW) – indicates only the NIST reactor has technical specification for a radiation monitoring scram associated with the stack effluent radiation monitor.

The proposed UMLRR technical specification for an unspecified ARM scram creates an unintended and unnecessary complexity to the specifications. Given the technical specifications associated with similar research reactors <10MW do not include a specification for a radiation monitoring system associated scram, the proposed UMLRR technical specifications has been modified to delete TS 3.2.4, item 1. The implementation of existing emergency response procedures by the reactor operator, which may include manual scram of the reactor, are considered sufficient for response to a radiation alarm.

RAI-14.3.11

The “Objective” for proposed TS 3.2.6 states, “[t]o stipulate the minimum number of interlocks is provided to inhibit control rod withdrawal if the limiting conditions in Specifications 3.2.3, 3.2.4, and 3.2.5 are not met.”

However, it is not clear what is meant by the language “if the limiting conditions in Specifications 3.2.3, 3.2.4, and 3.2.5 are not met.” Either revise the TS 3.2.6 “Objective” to clarify what is meant by this language; delete this language; or discuss why no change is required.

Response RAI-14.3.11

The language in proposed technical specification 3.2.6 objective has been deleted as requested.

RAI-14.3.12

Proposed TS 3.2.6 requires that certain interlocks to prevent control rod (blade) withdrawal shall be operable.

However, it is not clear for what conditions (e.g., when the reactor is operating) these interlocks are required to be operable. Revise proposed TS 3.2.6 to clarify when these interlocks are required to be operable, or discuss why no change is required.

Response RAI-14.3.12

The proposed technical specification 3.2.6 has been modified as requested.

RAI-14.3.13

Proposed TS 3.2.6(2) requires the operability of an interlock that prevents control rod (blade) withdrawal when the "[s]tart-up neutron count rate is ≤ 2 counts per second via proportional counter or ≤ 10 counts per second via wide range log-power module."

SAR Section 7.3.3 states that the control rod (blade) withdrawal inhibit circuit prevents control rod (blade) withdrawal unless, among other things, source range level indication is greater than 2 counts per second, and "[l]inear power monitors are on-scale and reading above 5% of the selected range." SAR Section 7.4.1.1.5 states that a false downscale signal from a linear channel will activate the control drive inhibit relay. SAR Section 7.4.1.2.4 states that a log-power channel trip contact provides an open relay contact output when power drops below 1×10^{-6} % power (10 counts per second), and SAR Section 7.4.1.2.5 states that a false downscale signal from the log-power channel will activate the control drive inhibit relay.

The NRC staff notes that, while SAR Section 7.4.1 discusses control rod (blade) withdrawal inhibits associated with both the log-power channel and the linear channels, SAR Section 7.3.3 does not appear to list or discuss the TS 3.2.6(2)-required control rod (blade) withdrawal inhibit interlock that prevents withdrawal when the wide range log-power module is indicating equal to or less than 10 counts per second.

Explain the apparent discrepancy between TS 3.2.6(2) and SAR Section 7.4.1, compared to SAR Section 7.3.3, and revise proposed TS 3.2.6(2) if necessary. Alternatively, discuss why no additional information or change is required.

Response RAI-14.3.13

While section 7.3.3 of the SAR does not specify the inhibit function capability of the log power/period channel, as noted in the RAI this function is described in other sections. Section 7.4.1.2 states "The function is to monitor the neutron fluence rate … in ranges that overlap the start-up channel and the linear power channels." Section 7.4.1.3 lists trip 4 as the inhibit function. Section 7.4.1.2.4 item (5) describes the inhibit trip.

In response, Section 7.3.3 item (4) of the SAR shall be revised to include the specification of the

inhibit function value for the log-power channel. Additionally, TS 3.2.6 (2) has been revised to simply state the interlock shall be operable for a start-up count rate ≤2 counts per second. This is the same as now required by the current technical specifications.

The intent of the proposed TS 3.2.6(2) was to provide for one of two start-up neutron measuring channels to be operable – the start-up proportional counter channel or the source range log-power channel. Having redundant channels provides for operational flexibility to allow reactor operation either when both or one of the channels is operable. The logarithmic power/period channel described in SAR 7.4.1.2 was to be installed after the relicensing is completed. It was uncertain if the count rate sensitivity for this channel would be sensitive enough for 2CPS limit and, as a precaution, a higher limit of 10CPS was included in the proposed TS. However, in the interim since the SAR was submitted, the log power/period channel described in the SAR will be replaced by an alternate channel as discussed in the meeting between NRC and UMass on January 9, 2019. The proposed alternate will have the same functionality as the channel described in the SAR. The proposed alternate channel also will have neutron sensitivity such that it will not require a separate technical specification limit. Information on the alternate channel will be provided to the NRC for review under a separate submittal.

RAI-14.3.14

The guidance in NUREG-1537, Part 1, Appendix 14.1, Section 3.2(5), states that LCOs should be specified for interlocks that inhibit or prevent control rod (blade) withdrawal. Table 14.2 in NUREG-1537, Part 1, Appendix 14.1, Section 3.2(5), lists interlocks preventing simultaneous rod (blade) withdrawal as typical required interlocks for research reactors.

SAR Section 7.3.2 states that the control rod (blade) drives are hard wired with mechanical relays, whose logic prevents more than one control rod (blade) from being withdrawn at any time. Proposed TS 3.2.2(1) would require that "[t]he maximum reactivity insertion rate by the most reactive control rod and the regulating rod simultaneously shall not exceed 0.05% Δk/k per second." The analyses of ramp reactivity insertion events in the SAR, as supplemented, assume that reactivity is inserted at 0.07% Δk/k per second.

However, the proposed UMLRR TSs do not appear to include a TS requiring operability of the interlocks preventing withdrawal of more than one control rod (blade) at a time, consistent with the discussions and analyses in the SAR, as supplemented, and the guidance in NUREG-1537. Provide a TS that would require that these interlocks be operable. If such a TS is provided, also provide an associated surveillance requirement TS, or state that surveillance of these interlocks would be part of one of the proposed surveillance TSs, e.g., proposed TS 4.2.2(9). Alternatively, discuss why no such TSs are required.

Response RAI-14.3.14

Proposed TS 3.2.2(3) has been added to state that only one control blade shall be withdrawn at a time. Proposed TS 4.2.2(2) provides for the surveillance requirement.

RAI-14.3.15

Proposed TS 3.3(1) states that "[t]he conductivity of the pool water shall be <10 µmho/cm." Proposed TS 3.3(2) states that "[t]he pH of the pool water shall be between 5.0 and 8.0."

The guidance in NUREG-1537, Part 1, Appendix 14.1, Section 3.3(9), states that acceptable ranges for research reactor pH and conductivity have traditionally been between 5.0 and 7.5, and ≤ 5 µmho/cm, respectively.

The NRC staff notes that the pH and conductivity limits in proposed TSs 3.3(1) and 3.3(2) appear to be less conservative than the recommendation in NUREG-1537. Revise proposed TSs 3.3(1) and 3.3(2) such that they are consistent with NUREG-1537 guidance, or discuss why no such change is required.

Response RAI-14.3.15

The current UMLRR technical specification (1974-present, or 44 years) has required a conductivity of <5 micromhos/cm averaged over one month. No reactor fuel or Co-60 source (1981-present, 37 years) corrosion problems have been observed over these respective time periods. In response to the RAI, the proposed technical specification 3.3(1) has been revised as <5 micromhos/cm averaged over 2 weeks. Two weeks provides adequate time to adjust the conductivity value following regeneration of the primary water demineralizer. The proposed technical specification 3.3(2) has been revised for a pH level between 5 and 7.5.

RAI-14.3.16

Proposed TS 3.3(3) states that:

The pool water shall be analyzed for gross activity and for cobalt-60. Analysis shall be capable of detecting levels of 10^{-7} µCi per milliliter. If a sample analysis reveals a significant increase of activity in the water, with respect to the previous samples, or a contamination level greater than 10^{-6} µCi of cobalt-60 per milliliter of water, prompt action shall be taken to prevent further contamination of the pool water. If the gross activity of the sample is less than 10^{-7} µCi per milliliter, specific analysis for cobalt-60 need not be performed. If remedial action is required by this section, notification will be made to the USNRC as required by Section 6.6.2.

Provide the following, or discuss why no additional information or TS revision is required:

a) The NRC staff notes that it is not clear what is meant by a "significant increase" in the pool water activity. Revise TS 3.3(3) to clarify what is meant by "significant increase," and provide a basis for the meaning that is established.

b) By its letter dated February 1, 2018 (ADAMS Accession No. ML18032A534), UML stated that the tritium concentration in the pool has been measured to be approximately 10 pCi per milliliter (10^{-5} µCi per milliliter). The NRC staff notes that this is significantly greater than the 10^{-7} µCi per milliliter gross activity above which specific analysis for cobalt-60 would be required to be performed. Clarify whether the "gross activity of the sample" includes the concentration of all radioisotopes, including tritium, or whether it is only intended to include certain radioisotopes,

and revise TS 3.3(3) if necessary.

c) The NRC staff notes that the requirement imposed by the statement "notification will be made to the USNRC as required by Section 6.6.2" is not entirely clear. Revise TS 3.3(3) to reference the specific parts of TS 6.6.2 (e.g., TS 6.6.2(2), item c and/or d) that TS 3.3(3) would require to be performed.

d) Proposed TS 3.3(3) uses the language "need not" and "will" which appears to be inconsistent with the proposed TS definition of "shall" to denote a requirement. Revise this language in TS 3.3(3) to be consistent with the TS definitions.

Response RAI-14.3.16

The proposed technical specification 3.3(3) has been revised to state the concentrations of radionuclides in the primary pool water shall be less than the values presented for water in 10 CFR Appendix B to Part 20 Table 2, and if such a condition occurs, the source of the radionuclide(s) shall be identified and corrected. A specification to calculate the sum of the ratios (ratio of the concentration to the concentration limit) if more than one radionuclide is identified, (footnote 4 to 10CFR Part 20 Appendix B) is not necessary due to the further dilution afforded by the volume of water in the secondary system.

RAI-14.3.17

In response to RAI-11.1 (ADAMS Accession No. ML17090A348), UML stated that, in an upcoming submittal associated with a revision to its proposed license renewal TSs, it would add an LCO requiring analysis of the secondary coolant for gross activity, and isolation of the secondary cooling system if the activity of the secondary coolant exceeded the sewer disposal limits in 10 CFR Part 20, Appendix B, Table 3.

Provide the following, or discuss why no additional information is required:

a) Provide revised TS pages incorporating this change, or discuss why this change is no longer required.

b) As discussed in SAR Section 5.3, the UMLRR secondary coolant system dissipates heat, in part, by secondary coolant evaporation to the atmosphere. Given that the secondary coolant is normally released directly to the environment by evaporation, the
10 CFR Part 20, Appendix B, limits for release to the sewer (which are less restrictive than limits for direct liquid effluents releases to the environment) may not be applicable for evaporated secondary coolant. Discuss why the sewer disposal limits are appropriate for secondary coolant radionuclide concentrations, or provide a secondary
coolant activity TS which limits secondary coolant activity to the limits of 10 CFR Part 20, Appendix B, Table 2, Column 2, for liquid effluent releases directly to the environment.

c) The NRC staff notes that it is not clear how gross activity analysis of the secondary coolant would ensure that the activity of individual radioisotopes in the secondary coolant is below 10 CFR Part 20, Appendix B, limits. Clarify how compliance with a secondary coolant activity TS based on 10 CFR, Part 20, Appendix B, limits would be ensured using gross activity analysis.

d) The NRC staff notes that it is not clear what is meant by isolation of the secondary coolant system. Clarify what is meant by secondary coolant system isolation.

Response RAI-14.3.17

The revised technical specification 3.3(3) will eliminate the need for secondary testing and system isolation as any leakage of primary water into the secondary system would be further diluted by the volume of water in the secondary system.

RAI-14.3.18

In response to RAI-13.6.d (ADAMS Accession No. ML18006A003), UML stated that, in an upcoming submittal associated with a revision to its proposed license renewal TSs, it would include LCOs requiring that:

1. The reactor shall not be operated with both the beam port lead shutter in the up (open) position and the beam-port shield plug removed.

2. The shield plug may be substituted or modified so long as the overall open diameter does not exceed 1-in.

3. In order to access the beam ports with both the lead shutter in the up position and shield plug removed, the reactor shall be positioned in the bulk pool.

Provide the following, or discuss why no additional information is required:
a) Provide revised TS pages incorporating this change, or discuss why this change is no longer required.

b) The loss of coolant accident (LOCA) analyses provided in the SAR, as supplemented, calculate that if the UMLRR core remains covered with water for 3,947 seconds following the initiation of a LOCA and a low pool level scram, no fuel damage will occur due to the LOCA. The analyses determine that as long as any break in a beam tube causes a leak through a hole no greater than 4.5 inches in diameter, the core will remain covered with water for at least 3,947 seconds. However, the NRC staff notes that if both the beam port lead shutter were in the open position and the shield plug were removed when a break in a beam tube occurred, there could potentially be a leak through a hole up to 8 inches in diameter. Although proposed TS "1" above would require that this condition not be allowed to occur during reactor operation, it would not prevent the condition from occurring shortly after reactor shutdown, when reactor decay heat could still be significant enough for fuel damage to occur if an 8 inch diameter leak occurred and the core could not remain covered for 3,947 seconds. Provide an analysis demonstrating that, even if an 8 inch diameter leak at the beam tube level occurred immediately following reactor shutdown, no fuel damage would occur; provide a revised TS "1" above that would require that during reactor operation or for at least 3,947 seconds following reactor operation, the beam port lead shutter shall be closed and/or the corresponding beam port shield plug shall be in place; or provide an alternate revised TS "1" that is consistent with the LOCA analyses in the SAR, as supplemented.

c) Proposed TS "2" above uses the language "does not" which appears to be inconsistent with

the proposed TS definition of "shall" to denote a requirement. Provide a revised TS "2" that is consistent with the TS definitions.

d) Provide associated surveillance requirement TSs for any beam port LCOs added to the TSs.

Response RAI-14.3.18

In section 13.2.4 of the SAR, a justification was made that a loss of coolant accident (LOCA) analysis was unnecessary based upon historic data and studies associated with MTR plate fuel LOCA analyses. In addition NUREG 1537 Part 1, 13.1.3 states: "In many non-power reactor designs, the loss-of-coolant accident (LOCA) is of no consequence because decay heat in the fuel is so small as to be incapable of causing fuel failure." The NUREG 1537 goes on to state further that it may be necessary for higher power reactors (greater than 2MW) to have an engineered safety feature to remove decay heat in the event of a LOCA. The NUREG also lists one of the same references cited in the SAR. In the response to RAI 13.2 (ADAMS Ascension No. ML17090A350), the UMLRR submitted a conservative LOCA analysis based upon the LOCA analysis for the Rhode Island Nuclear Science Center. The subsequent RAI 13.6d requested a technical specification related to beam port operations. In the response to the RAI, the proposed technical specifications (noted in RAI 14.3.18 above) were submitted. After further consideration and given the conservative nature of the LOCA analysis, the proposed technical specification 2 submitted in response to RAI 13.6d would be too restrictive and could hamper future usage of the beam ports for education and research.

In response to RAI 14.3.18, the proposed technical specification 3.8 modifies the previous response and shall require that the maximum allowed open area of the beam port with the lead shutter up shall be no greater than the area associated with a 4-inch diameter circle. This value is less than the open area (~4.5-inch diameter) which would lead to the drain time calculated for the LOCA analysis (RAI response 13.2 as revised in letter dated 2/1/2018). Proposed technical specification 4.1(6) shall require verification of the beam ports configuration prior to the first reactor start-up of the day.

RAI-14.3.19

In response to RAI-13.6.e (ADAMS Accession No. ML18006A003), UML stated that, although the LOCA analysis in the SAR, as supplemented, calculates pool drainage time based on the surface area of the entire pool (i.e., both the stall and bulk pool regions), no TS requiring that the pool divider gate be open during (or for any period following) reactor operation is necessary. UML stated that this is because the preferred operating mode for forced convection cooling is the "cross-stall" mode due to vibration of the control blades in the "downcomer" mode, and the "cross-stall" flow pattern will only function with the pool divider gate open.

However, the NRC staff notes that although the UMLRR is normally operated in "cross-stall" mode for forced convection operation, there is no prohibition on "downcomer" mode operation. Because, in "downcomer" mode, coolant leaving the heat exchangers is fed directly into a

plenum above the core (rather than into the pool section not occupied by the reactor), the NRC staff notes that the reactor could potentially be operated in "downcomer" mode with the pool divider gate closed.

Given the above, provide a TS that would require that during reactor operation in "downcomer" mode, the pool divider gate shall be open. Additionally, if such an LCO TS is provided, provide a corresponding surveillance requirement TS. Alternatively, discuss why no such TS(s) are required.

Response RAI-14.3.19

The proposed technical specification 3.3(4) has been added as requested.

RAI-14.3.20

(Note: See also related RAI-14.4.18 on containment building surveillances.)

In response to RAI-6.1 (ADAMS Accession No. ML17090A348), UML stated that, in an upcoming submittal associated with a revision to its proposed license renewal TSs, it would revise proposed TSs 3.4 and 4.4 to reflect its proposed re-designation (also discussed in the RAI-6.1 response) of the UMLRR reactor building from a containment to a confinement in conjunction with license renewal.

Provide revised TS pages incorporating this change, or discuss why this change is no longer required.

Response RAI-14.3.20

The proposed technical specifications have been revised as requested.

RAI-14.3.21

Proposed TS 3.4 would require, in part, that containment (or confinement) integrity be maintained when the reactor is not shutdown, or movement of irradiated fuel is being performed, except when the fuel is in a properly sealed and approved shipping container.

The guidance in ANSI/ANS-15.1, Section 3.4.1, states that LCOs should list the operations that require containment or confinement integrity. These operations include the reactor operating; movement of irradiated fuel or fueled experiments with significant fission product inventory outside of containers, systems, or storage areas; core or control rod work that could cause a change in reactivity of more than one dollar; and movement of experiments that could cause a change in total worth of more than one dollar.

Proposed TS 3.4 does not appear to be consistent with ANSI/ANS-15.1, Section 3.4.1, because it would not require that confinement/containment integrity be maintained during core or control rod work, or movement of experiments, that could cause a significant change in reactivity. Additionally, the NRC staff notes that, although fueled experiments are not performed at the UMLRR, other experiments or materials with significant inventory (e.g., activation products),

which could also have the potential for a release, may be present at the UMLRR, and proposed TS 3.4 would not require that confinement/containment integrity be maintained during movement of such experiments or material.

Revise proposed TS 3.4 to require that confinement/containment integrity be maintained whenever the reactor is operating, movement of irradiated fuel (outside of sealed and approved shipping containers) is being performed, movement or handling of experiments or other radioactive material with the potential for significant airborne release is being performed, or core or control rod work or movement of experiments that could cause a significant reactivity change is being performed. Alternatively, revise proposed TS 3.4 to require that confinement/containment integrity be maintained whenever movement of irradiated fuel (outside of sealed and approved shipping containers) is being performed, movement or handling of experiments or other radioactive material with the potential for significant airborne release is being performed, or the reactor is not secured (given the proposed TS definition of "reactor secured"). If the terminology "significant" airborne release is used, describe what would constitute a significant airborne release; if the terminology "significant" reactivity change (associated with control rod work and/or movement of experiments) is used, describe what would constitute a significant reactivity change. Otherwise, discuss why no change is required.

Response RAI-14.3.21

The proposed technical specification 3.4 has been revised. Technical specification 3.4.1 includes the requested requirement.

RAI-14.3.22

Proposed TS 3.4 would require, in part, that "[c]ontainment integrity shall be maintained for any of the following conditions: (1) … (2) … (3) The reactor shall not be operated unless the following equipment is operable and conditions met: ...."

Proposed TS 3.5(2) would require that "[t]he main exhaust fan automatic and manual isolation controls shall be operable whenever the reactor is operating."

The guidance in ANSI/ANS-15.1, Section 3.4.2, states that LCOs should list the equipment required to achieve containment or confinement.

The guidance in NUREG-1537, Part 1, Appendix 14.1, Section 3.5, states that LCOs should be established to achieve controlled release of effluents, and that ventilation systems should maintain a lower air pressure in the reactor room than in adjacent spaces.

The NRC staff notes that proposed TS 3.4(3), "[t]he reactor shall not be operated unless…" does not appear to be a condition for which containment/confinement integrity shall be maintained. Additionally, although proposed TS 3.4 lists equipment required (and conditions that must be met) related to containment/confinement when the reactor is operating, it does not appear to list equipment required (and conditions that must be met) to achieve containment (confinement), as recommended in ANSI/ANS-15.1.

The NRC staff also notes that proposed TS 3.4 does not appear to require that negative pressure in the UMLRR containment/confinement be a condition to achieve

containment/confinement (or for the reactor to be operating). The NRC staff notes that analyses in the SAR, as supplemented, generally assume that the reactor building has a negative pressure, helping to ensure that releases from the building follow a controlled pathway through the stack, and ground level leakage is minimized. (Additionally, the NRC staff notes that proposed TS 4.4(1) requires surveillance of building differential pressure, but proposed TS 4.4(1) does not appear to have a corresponding LCO.)

The NRC staff further notes that, separately from proposed TS 3.4(3), proposed TS 3.5(2) imposes requirements on main exhaust fan isolation control operability, but it is not clear whether these main exhaust fan isolation controls are separate from equipment required by proposed TS 3.4(3).

Revise proposed TS 3.4 to clarify that proposed TS 3.4(3) is not a condition for which containment/confinement integrity should be maintained (i.e., separate TS 3.4(3) from this list of conditions). Additionally, revise proposed TS 3.4(3) to list all equipment required to be operable and conditions that must be met to achieve containment (confinement), and add negative building pressure with respect to atmospheric pressure as one of these conditions. Also, delete proposed TS 3.5(2) if its requirements related to the main exhaust fan automatic and manual isolation control are added to proposed TS 3.4(3), or its requirements are redundant to proposed TS 3.4(3). Alternatively, discuss why no changes are required.

Response RAI-14.3.22

The proposed technical specification 3.4 has been revised. Technical specification 3.4.2 includes the requested requirements for conditions needed to achieve confinement. The proposed technical specification 3.5 has been revised to include the equipment needed to achieve and maintain confinement, including maintaining a specified negative building pressure. Proposed TS 3.5(4) has been added to provide an LCO associated with proposed TS 4.5(2). The original proposed specifications 3.5(2) & (3) related to the main exhaust fan have been deleted as unnecessary due to the revisions. In addition, the existing technical specification for the vacuum relief valve has been eliminated from the proposed technical specifications. The vacuum relief valve is a passive design feature of the reactor building described in the SAR section 6.2.1. It is not a component needed to achieve and maintain confinement.

RAI-14.3.23

Proposed TS 3.6(1) would require that:

When the reactor is operating, the following minimum radiation monitors shall be operable with readouts in the control room:

(a) A stack effluent radiation monitor.

(b) A constant air monitor, located on the reactor pool level.

(c) An area radiation monitor on the reactor experimental level. (d) An area radiation monitor

over the reactor pool.

Provide the following, or discuss why no additional information or TS revisions are required:

a) The NRC staff notes that proposed TS 3.6(1) would require radiation monitors when the reactor is operating, but radiation monitors could also be necessary to detect high radiation levels or potential releases of radioactive materials that could occur when the reactor is not operating (for example, if fuel is being moved between storage racks, and there is the potential for a fuel handling accident). Revise proposed TS 3.6(1) to require the listed radiation monitors during conditions when the reactor is not operating but there is still a potential for high radiation levels or radioactive release (e.g., conditions when confinement is required (see RAI-14.3.21)).

b) The NRC staff notes that proposed TS 3.6(1) would require that radiation monitors be operable, but not that they be operating. Consistent with the proposed TS definitions, radiation monitors would need to be operating in order to be performing their intended function (i.e., ensuring that reactor staff are aware of any radiation hazard and can take appropriate action). Revise proposed TS 3.6(1) to require that radiation monitors be operating.

c) Proposed TS 3.6(1) would impose requirements for radiation monitors, and require that the required radiation monitors have readouts in the control room.

However, proposed TS 3.6(1) does not appear to require that individual radiation monitors have alarms in the control room, or any local readout or alarm. In addition, SAR Section 7.7.5 discusses alarms which require multiple radiation monitors to reach their respective “high” setpoints, and SAR Section 7.7.2 provides some discussion of individual monitor alarm functions (e.g., local audible and visual alarms for the continuous air and stack exhaust air monitors, and visual alarms on the area radiation monitor ratemeters), but it is not clear whether any individual radiation monitor reaching its setpoint(s) will result in an alarm (that would be sufficient to ensure the operator and other appropriate staff, such as experimenters, are immediately alerted) locally and/or in the control room.

Discuss which of the individual radiation monitors discussed in the SAR, as supplemented, could be used to satisfy the requirements of proposed TS 3.6(1). Additionally, discuss whether all of the specific radiation monitors used to satisfy the TS have individual control room and/or local, audible and/or visual, alarms (in addition to the alarms discussed in SAR Section 7.7, which require multiple radiation monitors to reach their respective setpoints).

If the monitors used to satisfy TS 3.6(1) have such alarms, discuss whether these individual alarms are necessary to ensure reactor and/or personnel safety. If there are no such alarms, discuss how the required monitors are sufficient to ensure reactor and/or personnel safety, given that, based on the radiation alarm logic system discussed in SAR Section 7.7, at least 2 different monitors would need to reach their setpoints to produce an alarm that could alert the operator (or other personnel in the reactor building, for example, personnel near an experimental facility) to take action, and proposed TS 3.6(1) only imposes requirements on a small subset of the monitors which feed into the radiation alarm logic system.

Additionally, for monitors with local readouts, discuss whether these local readouts are necessary to ensure reactor and/or personnel safety.

If additional alarms and/or readouts are necessary to ensure reactor and/or personnel safety,

revise proposed TS 3.6(1) to require the necessary alarms and/or readouts.

d) Proposed TS 3.6(1), item (a), would require a stack effluent radiation monitor.

The guidance in NUREG-1537, Part 1, Appendix 14.1, Section 3.7.1(1), states that there should be LCOs for monitors for both radioactive gas and airborne radioactive particulates. ANSI/ANS-15.1 states that LCOs should specify the minimum numbers of gas and particulate air monitors.

The NRC staff notes that SAR Section 7.7.2.3 states that the UMLRR has both stack gas and stack particulate radiation monitors, but proposed TS 3.6(1), item (a), does not appear to specifically require both stack gas and stack particulate monitors.

Revise proposed TS 3.6(1), item (a), to require stack effluent radiation monitors for both radioactive gas and particulates.

e) Proposed TS 3.6(1), item (b), would require a continuous (constant) air monitor located on the reactor pool level.

SAR Section 7.7.2.2 states that the TSs require that a continuous (constant) air monitor "be functional on the experimental level (3rd Floor) of the facility while operating the reactor." However, the NRC staff notes that, based on SAR Figure 1-1, the third floor of the reactor building appears to be the pool level, while the experimental level is the first floor.

SAR Table 7-8 states that continuous (constant) air monitors are located on both the pool and experimental levels.

Clarify that proposed TS 3.6(1), item (b), would require a continuous (constant) air monitor located on the pool level, which is the third floor of the reactor building, but that there is no TS requirement for the continuous (constant) air monitor located on the experimental level, which is the first floor of the reactor building.

f) Proposed TS 3.6(1), item (c), would require an area radiation monitor on the reactor experimental level.

The SAR, as supplemented, discusses 2 irradiation facilities, the gamma cave and the medical embedment (or "ELDRS"), which are located on opposite sides of the experimental level. The NRC staff notes that, given the location of these facilities relative to each other, a radiation monitor located near one of these facilities may not
necessarily provide an adequate indication of high radiation levels near the other facility. Additionally, the NRC staff notes that there is the potential for high radiation levels near these facilities even when the reactor is not operating, if cobalt-60 sources or irradiated fuel are being used for gamma irradiations.

Revise proposed TS 3.6(1), item (c), to additionally specify that when the gamma cave or medical embedment is in use (even if only for gamma irradiations that do not require reactor operation), an area radiation monitor on the side of the reactor experimental level corresponding to the in-use facility shall be operating.

Response RAI-14.3.23

a) The proposed technical specification 3.6.1(1) has been revised as requested.

b) The proposed technical specification 3.6.1(1) has been revised as requested.

c) The proposed technical specification 3.6.1(1) has been revised as requested.

d) The proposed technical specification 3.6.1(1) item (a) has been revised as requested.

e) The SAR section 7.7.2.2 contains a typographical error indicating the third floor is the "experimental" level, when it is in fact the pool level. This error shall be corrected in an update to the SAR. The proposed technical specification 3.6.1(1) item (b) has been revised to clarify the specified location.

f) The proposed technical specification 3.6.1(2) has been revised to include a requirement for a radiation monitor at each gamma irradiation facility.

RAI-14.3.24

Proposed TS 3.6(2) would require that:

The reactor shall be shut down within 15 minutes upon recognition that any of [the TS 3.6(1) specifications requiring radiation monitors are] unmet, unless a portable instrument having an alarm feature capable of warning personnel of a high radiation level is substituted and readings are physically checked and recorded every 15 minutes.

Provide the following, or discuss why no additional information or TS revisions are required:

a) Proposed TS 3.6(2) requires that the reactor be shut down if the radiation monitor requirements are not met, but does not appear to require that other activities that may require radiation monitors be suspended if radiation monitor requirements are unmet. If proposed TS 3.6(1) is revised in response to RAI-14.3.23.a and/or RAI-14.3.23.f to require radiation monitors for activities other than reactor operation, revise proposed TS 3.6(2) to require that any activities that require radiation monitors be suspended if radiation monitor requirements are unmet.

b) The guidance in NUREG-1537, Part 1, Appendix 14.1, Section 3.7.1, states that for TS-required radiation monitors that become inoperable, if a replacement monitor is substituted, the replacement monitor should perform essentially the same function until the original monitor is repaired or replaced (generally not to exceed 1 work week unless justified in the SAR). The TS allowing the substitution should also state that if the specified monitor was displayed in the control room, the operator on duty should also be able to observe the temporary monitor.

Proposed TS 3.6(2) states that, if a required radiation monitor is not available, a portable instrument having an alarm feature capable of warning personnel of a high radiation level may be substituted, provided readings are physically checked and recorded every 15 minutes.

However, proposed TS 3.6(2) does not appear to require that a replacement monitor provide the

same functionality (including readings and/or alarms in the control room, as applicable) as the monitor being replaced. Additionally, proposed TS 3.6(2) does not appear to include a maximum time duration for which a replacement monitor may be used.

Revise proposed TS 3.6(2) to specify that a replacement monitor shall perform the same function as the original monitor. Additionally, revise proposed TS 3.6(2) to specify a maximum time duration for which a replacement monitor may be used.

Response RAI-14.3.24

The proposed technical specification 3.6.1(2) has been deleted. Proposed technical specification 3.6.1(3) has been added to address the concerns of items (a) and (b) of the RAI.

RAI-14.3.25

Proposed TS 3.6(3) would require that "[t]he facility wide radiation warning alarms shall be operable to ensure that proper emergency action is taken."

However, it is not clear for what conditions (e.g., conditions when confinement is required) the warning alarms shall be operable.

Additionally, it is not clear exactly what equipment proposed TS 3.6(3) imposes requirements on. SAR Section 7.7.5 discusses "squee" alarms and evacuation alarm horns that can sound in the reactor building and the attached Pinanski building, which are activated by combinations of radiation monitors reaching their setpoints (the horns are only activated when the reactor operator takes additional action by pushing a button on the control room radiation monitoring system cabinet or clicking on the radiation monitoring system display screen to declare an actual alarm (i.e., an actual LREA or GREA)).

Revise proposed TS 3.6(3) to clarify the conditions for which the warning alarms shall be operable, or discuss why no changes are required.

Additionally, clarify what equipment proposed TS 3.6(3) imposes requirements on. Specifically, discuss whether all of the alarm functions (associated with a GREA and or LREA, or the ability to activate the "squee" alarms without a GREA or LREA) discussed in SAR Section 7.7.5 are required to be operable, or whether some of these functions (e.g., the alarms outside the reactor building) are not required. Additionally, discuss whether any other radiation alarm functions not specifically discussed in SAR Section 7.7.5 (e.g., an ability to manually activate the evacuation alarm horn to evacuate the reactor building without the occurrence of a GREA or LREA, or any alarm functions of individual radiation monitors separate from a GREA or LREA) are required by proposed TS 3.6(3). Discuss why the radiation alarm functions required by TS 3.6(3) are sufficient to ensure prompt evacuation of the reactor building if necessary following a potential radiation hazard in the building. Alternatively, discuss why such additional information is not required.

Response RAI-14.3.25

As noted in the response to RAI 14.3.10, the existing UMLRR Area Radiation Monitoring

(ARM) system includes a large number of area radiation detectors integrated with a complex logic of automated response functions. The complexity of the detector combinations for the alarm and trip functions is a legacy of the original 1974 facility design. Subsequent upgrades to the system in 1999 maintained the original design as described in the 1974 SAR and the 1985 SAR, and as described in the SAR submitted for the current re-licensing effort (SAR section 7.7.5).

Given that ANSI/ANS-15.1 and NUREG-1537 do not specify the need for building-wide warning alarm, and given the technical specifications associated with similar research reactors do not include a specification for a building-wide alarm, the proposed UMLRR technical specification for a building-wide alarm LCO provides an unnecessary requirement. The proposed technical specification 3.6.1(3) for this LCO has been deleted.

In addition to the alarm system as described in the SAR, the implementation of existing emergency response procedures by the reactor operator, which may include manually initiating an alarm or an announcement, are considered sufficient for alerting personnel to potential radiation hazards.

RAI-14.3.26

The guidance in NUREG-1537, Part 1, Appendix 14.1, Section 3.7.1(4), and ANSI/ANS-15.1, Section 3.7.1, states that LCOs should include requirements for environmental monitors. The guidance in ANSI/ANS-15.1, Section 4.7.2(1), additionally recommends a quarterly to annual interval for reading environmental monitoring dosimeters.

UML's response to RAI-11.5.b (ADAMS Accession No. ML18006A003) describes dosimeters located outside the reactor building (i.e., in and on the attached Pinanski building) that are used for environmental monitoring.

However, the proposed TSs do not appear to include LCO TSs requiring environmental monitors, or surveillance TSs specifying the intervals at which environmental monitors shall be read. Provide an LCO TS requiring the UMLRR environmental monitoring program, and a corresponding surveillance TS, or discuss why no such TSs are required.

Response RAI-14.3.26

The proposed technical specification 3.6.1(4) has been added as requested.

RAI-14.3.27

The regulation in 10 CFR 20.2003 states, in part, that a licensee may discharge licensed material into sanitary sewerage if the material is soluble in water, and the concentration of licensed material does not exceed the limits in 10 CFR Part 20, Appendix B, Table 3.

Proposed TS 3.6.2(1) states that "[t]he concentration of radioactive liquids released into the sanitary sewer shall not exceed the limits specified in 10 CFR Part 20."

The NRC staff notes that proposed TS 3.6.2(1) does not appear to require that radioactive material released into the sewer be soluble, in accordance with 10 CFR 20.2003, and also does not specifically reference the limits of 10 CFR Part 20, Appendix B, Table 3.

Revise proposed TS 3.6.2(1) to require that radioactive material released into the sanitary sewer be soluble, and to clarify that the releases are subject to the limits in 10 CFR Part 20, Appendix B, Table 3. Alternatively, discuss why no changes are required.

Response RAI-14.3.27

The proposed technical specification 3.6.2(1) has been modified to reference 10 CFR 20.2003(a).

RAI-14.3.28

The air radionuclide effluent concentration values in 10 CFR Part 20, Appendix B, Table 2, Column 1, correspond to an annual dose of 100 millirem for submersion radionuclides such as argon-41.

Proposed TS 3.6.2(2) states that "[t]he concentration of argon-41 at ground level below the point of release into the unrestricted area shall not exceed the unrestricted area effluent concentration limit in 10 CFR Part 20 for argon-41 when averaged over 1 year or 10 times the effluent concentration limit when averaged over 1 day."

However, it is not entirely clear which 10 CFR Part 20, Appendix B, limit proposed TS 3.6.2(2) refers to. Revise the 2 references to this limit in proposed TS 3.6.2(2) to clarify that this is the air effluent concentration limit in 10 CFR Part 20, Appendix B, Table 2, Column 1, or discuss why no change is required.

Response RAI-14.3.28

The proposed technical specification 3.6.2(2) has been revised as requested.

Additionally, the proposed technical specification 3.6.2(3) has been deleted. The limits on occupational exposures are specified in the 10CFR Part 20. A technical specification with the objective of maintaining regulatory compliance for occupational exposures is unnecessary.

RAI-14.3.29

The guidance in ANSI/ANS-15.1, Section 3.8.1, states that LCOs should include limits on experiments, including limits on the maximum absolute reactivity worth of individual experiments, and the sum of the absolute values of the reactivity worths of all experiments.

Proposed TS 3.7.1 would impose limits on the worth of single moveable experiments; single secured experiments; all movable experiments; all secured experiments; and all experiments.

However, TS 3.7.1 does not appear to specify that these limits are absolute reactivity values. Revise proposed TS 3.7.1(1) and TS 3.7.1(2) to specify that the single and total experiment

worth limits are limits on absolute values, or sums of absolute values; or, discuss why no change is required.

Response RAI-14.3.29

The proposed technical specifications 3.7.1 has been revised as requested. In addition the table provided in the originally proposed technical specification has been deleted since the headings were not clearly specific. The reactivity limits for experiments are now provided in specifications 3.7.1 (1) – (5).

RAI-14.3.30

The guidance in NUREG-1537, Part 1, Appendix 14.1, Section 3.8.2, states that LCOs should require double encapsulation of potentially corrosive materials, and that the failure of an encapsulation of material that could damage the reactor should require removal and physical inspection of potentially damaged components.

Proposed TS 3.7.2(3) would require double encapsulation of corrosive materials, but would not appear to require inspection of reactor components for potential damage if the encapsulation fails. Revise proposed TS 3.7.2(3) to require inspection of reactor components for potential damage if the encapsulation of an experiment containing corrosive material fails, or discuss why no change is required.

Response RAI-14.3.30

The proposed technical specification 3.7.2(3) has been added to meet the revision as requested for inspection. In addition, reference to the Co-60 sources has been added. While NUREG-1537, Part 1, Appendix 14.1, Section 3.8.2, states that damage should require both removal and physical inspection of a damaged item, radiological conditions may not permit the removal (e.g., irradiated fuel, Co-60 source, etc.)

RAI-14.3.31

In response to RAI-13.3 (ADAMS Accession No. ML17090A348), UML stated that, in an upcoming submittal associated with a revision to its proposed license renewal TSs, it would delete proposed TS 3.7.2(4) allowing explosive material to be irradiated in the UMLRR.

Provide revised TS pages incorporating this change, or discuss why this change is no longer required.

Response RAI-14.3.31

After further consideration, the deletion of proposed technical specification 3.7.2(4) in response to RAI 13.3 would be too restrictive and could hamper future usage for education and research.

Proposed technical specification 3.7.2(4) has been modified with wording similar to that used in the technical specifications of similar research reactors (e.g., MURR, AFRRI).

RAI-14.3.32

The guidance in ANSI/ANS-15.1, Section 3.8.3(1), states that LCOs should require that the credible failure of any experiment shall not result in releases or exposures in excess of 10 CFR Part 20 limits. The guidance in ANSI/ANS-15.1, Section 3.8.3(2), states that LCOs should require that experiments shall be designed such that they will not contribute to the failure of other experiments, core components, or principal physical barriers to uncontrolled release of radioactivity.

However, the proposed renewal TSs do not appear to include such requirements. Provide a TS requiring that experiments shall be designed to ensure that credible failure of any experiment will not result in releases or exposures in excess of limits established in 10 CFR Part 20, and a TS requiring that experiments shall be designed such that they will not contribute to the failure of other experiments, core components, or principal physical barriers to uncontrolled release of radioactivity (e.g., fuel cladding), or discuss why no such TSs are required.

Response RAI-14.3.32

The proposed technical specifications 3.7.2(1) and 3.7.2(2) have been added to meet the revision as requested.

RAI-14.3.33

Current UMLRR TS 3.3 states that:

The reactor shall not be operated unless the reactor safety system channels described in the following table are operable:

ReactorSafetySystem Component/Channel	Minimum Required	Function	OperatingModein WhichRequired
…	…	…	…
Primary Piping Alignment	1	Automatic scram	Forced Convection above 0.1 MW
…	…	…	…

Coolant Gate Opens	2	Automatic scram if either the coolant riser or coolant downcomer gate opens	Forced Convection above 0.1 MW; down comer flow pattern
	1	Automatic scram if the coolant riser gate opens	Forced Convection above 0.1 MW; cross pool flow pattern
…	…	…	…

SAR Sections 5.2 and 7.4.3.2 discuss various limit switch scrams related to primary coolant piping alignment or positioning.

SAR Section 7.4.3.2 also describes a "Primary Plenum Outlet Gate Switch" scram which occurs if the riser plenum coolant gate opens during reactor operation in forced convection mode. SAR Section 5.2 states that this riser gate is located near the top of the coolant inlet channel, and it is designed to open during reactor operation in natural convection mode to facilitate natural convection flow. SAR Section 5.2 also describes the downcomer and cross-stall modes for reactor operation with forced cooling. In downcomer mode, water is supplied to the core by a 10 inch aluminum line connected to the inlet flow channel forming one side of the suspension frame, and fed from the flow channel into a plenum over the core, from which it is forced down into the core. In cross-stall mode, after the primary coolant has left the pump room systems, it is not fed into the inlet flow channel on the suspension frame, but is instead discharged to the bulk pool from the primary coolant connection (10 inch aluminum line) in the section of the pool not occupied by the reactor.

The NRC staff notes that the proposed license renewal TSs do not appear to contain LCO TSs (or surveillance requirement TSs) for any scram functions related to primary piping alignment, or opening of coolant gates, and the SAR does not appear to discuss why TSs for these items are unnecessary. Additionally, the NRC staff notes that the SAR does not appear to discuss the downcomer gate, or downcomer gate scram, included in current TS 3.3. The NRC staff also notes that, based on the wording of current TS 3.3, compared to the descriptions in SAR Sections 5.2 and 7.4.3.2, the locations of the riser gate and downcomer gate with respect to the primary coolant flow pathways for the cross-stall and downcomer forced cooling operation modes, and the operation modes during which each gate would need to be closed, are not entirely clear.

Provide the following, or discuss why no additional information is required:

a) Provide appropriate renewed license TSs (LCOs and corresponding surveillance requirements) for scram functions related to primary piping alignment, or discuss why no such TSs are necessary.

b) Discuss the function of the downcomer gate.

c) Clarify whether, when the reactor is operated in cross-stall forced cooling mode, coolant is drawn from the bulk pool, through the inlet flow channel (which is not connected to the primary coolant connection line), to the inlet plenum, and down through the core; or whether the coolant is drawn directly from the pool into the core (and does not pass through the inlet flow channel or inlet plenum).

d) Clarify the specific locations of the riser and downcomer gates with respect to the primary coolant system flow path components in the pool (e.g., the inlet flow channel, inlet plenum, outlet plenum, and outlet flow channel).

e) Clarify for which mode(s) forced primary coolant flow would occur through the portion of the primary coolant pathway containing each gate, such that the gate(s) would need to be closed.

f) Provide appropriate renewed license TSs (LCOs and corresponding surveillance

requirements) for scram functions related to coolant gate positions, or discuss why no such TSs are necessary.

Response RAI-14.3.33(b – e)

The third paragraph of section 5.2 of the SAR describes the various flow configurations available for forced convection cooling of the reactor core. As noted in the description, the core cooling system consists of two box-shaped flow channels that connect the reactor core box to the primary piping (refer to Fig. 1 next page). The core outlet channel (a.k.a., riser plenum) rises from the bottom of the core box to a primary piping extension which then connects to the 10-inch diameter pool outlet line leading to the pump room. The pool inlet line from the pump room connects to the primary piping extension leading to the core inlet channel (a.k.a., downcomer plenum) extending to the top of the core box. Each flow channel is equipped with a hinged coolant gate that provides an opening between the flow channel and the pool to assist the circulation of pool water through the core under low power (<100kW) natural convection conditions. The gates are located approximately two feet below the couplings to the primary inlet and outlet pipes. The inlet channel (downcomer) gate opens inward into the channel. Under forced convection, the gate is pushed closed by the downward force of the water against it. When flow stops, a counter weight on the pool side of the gate causes the gate to open. The outlet channel gate opens outward from the channel. When coolant is flowing through the channel, the gate is forced closed by the upward flow of water against a paddle connected to the inside portion of the gate. The weight of the paddle causes the gate to swing open when flow stops. Both gates have limit switches connected to the scram chain in the unlikely event a gate fails to close which could then result in some limited amount of flow being diverted from the core during forced convection. Though not specifically purposed as such, the gate limit switches also provide a redundant indication for the presence of coolant flow through the core.

As described in section 5.2, there are two methods of forced convection flow and there are two sets of pool inlet and outlet lines, each on opposite ends of the pool. The first method is referred to as the cross-pool mode (or cross-stall or cross-bulk, depending on the core location). In this method, the primary water enters the pool from the inlet pipe opposite from the core. The water flows across the pool and is drawn through the core to the outlet channel and piping via the primary pump. The second method, referred to as the downcomer mode, has primary water entering through the inlet (downcomer) channel and exiting through the outlet (riser) channel. The downcomer gate limit switch is bypassed when the forced convection method is cross-pool.

Response RAI-14.3.33(a & f)

Technical specifications for piping alignment and coolant gate function as worded in the current license technical specifications have been added to section 3.2.3. In addition, the descriptive

information and the figure provided in the response to RAI 14.3.33 will be added to a future update to section 5.2 of the SAR.

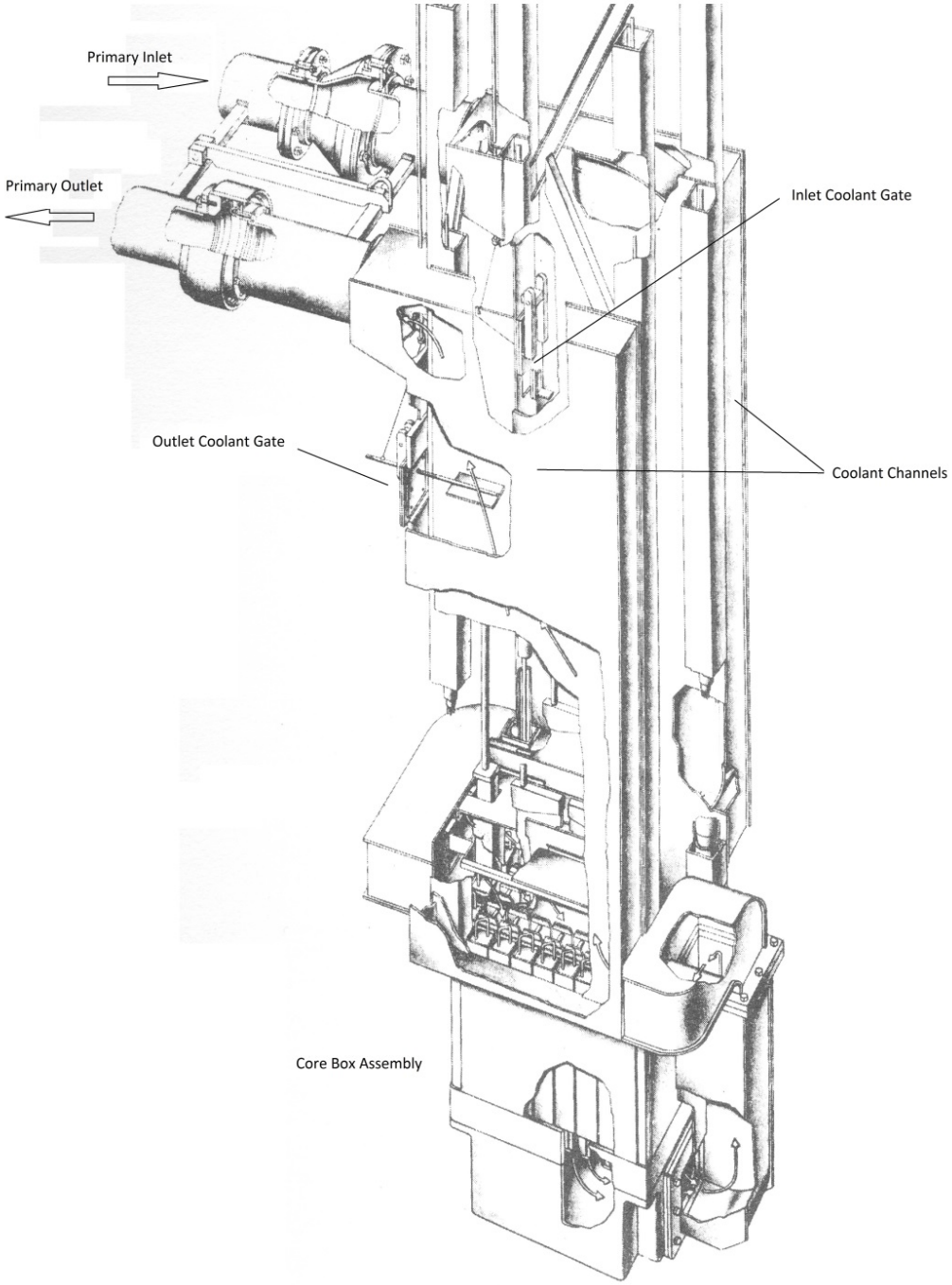

Figure 1

RAI-14.4.1

The guidance in ANSI/ANS-15.1, Section 4, states that TSs should require that appropriate

surveillance testing on any TS-required system shall be conducted after replacement, repair, or modification before the system is considered operable and returned to service.

However, the proposed renewal TSs do not appear to include such a requirement for all LCO-required equipment. Provide a TS requiring that appropriate surveillance testing on any TS-required system shall be conducted after replacement, repair, or modification before the system is considered operable and returned to service, regardless of when the TS-required surveillance for that system was last performed or when it is next due. Alternatively, discuss why no such TS is required.

Response RAI-14.4.1

Technical specification 4B has been added as requested.

RAI-14.4.2

The guidance in ANSI/ANS-15.1, Section 4, states that for TS-required surveillances, it should be specified whether each surveillance activity may or may not be deferred during reactor shutdown. For surveillance activities which may be deferred, it should also be specified which activities shall be performed prior to reactor operation.

However, the proposed renewal TSs do not appear to include any allowances to defer TS-required surveillance activities during reactor shutdown.

Provide TS(s) specifying whether each TS-required surveillance activity may be deferred during reactor shutdown, and, for surveillance activities which may be deferred, specifying which activities shall be performed prior to reactor operation. Alternatively, discuss why no such TS is required.

Response RAI-14.4.2

Technical specification 4A has been added as requested.

RAI-14.4.3

The guidance in ANSI/ANS-15.1, Section 4.1, states that excess reactivity and shutdown margin shall be measured annually to biennially and following significant core configuration and/or control rod changes.

Proposed TS 4.1.1 would require that "[e]xcess reactivity and shutdown margin and shall be determined annually and prior to the routine operation of any new fuel configuration in the reactor core."

The NRC staff notes that proposed TS 4.1.1 would require excess reactivity and shutdown margin to be determined when a new fuel configuration is used, but would not require excess reactivity and shutdown margin to be determined when other changes in core configuration (as defined in the TS definitions), such as control rod changes, are made.

The NRC staff also notes that it is not clear what is meant by "prior to the routine operation" of a new configuration.

Additionally, proposed TS 4.1.1 appears to contain a typographical error in that "shutdown margin and shall be" should read "shutdown margin shall be."

Revise proposed TS 4.1.1 to require that excess reactivity and shutdown margin be determined following significant core configuration changes; include a minimum reactivity change that determines what is "significant." Additionally, discuss what is meant by "prior to the routine operation," or revise proposed TS 4.1.1 to clarify what this language means (i.e., whether this means the reactor will only be operated at low power to make reactivity measurements, or something different). Also, revise proposed TS 4.1.1 to correct the apparent typographical error. Alternatively, discuss why no change or additional information is required.

Response RAI-14.4.3

The proposed technical specification 4.1.1 has been deleted and revised technical specifications 4.1.1 and 4.1.2 have been added to meet the request.

RAI-14.4.4

The guidance in NUREG-1537, Part 1, Appendix 14.1, Section 4.1(4), and ANSI/ANS-15.1, Section 4.1, recommends that TSs should require verification of compliance with LCOs for core configuration.

Proposed TS 3.1.1(3) would require that all core grid positions be filled, and proposed TS 3.1.1(4) would limit the number of peripheral radiation baskets that are not required to contain flow restricting devices. However, the proposed renewal TSs do not appear to include corresponding surveillance requirements for proposed TS 3.1.1(3) and TS 3.1.1(4).

Provide TSs requiring surveillances to verify compliance with core configuration TSs. Alternatively, discuss how UML verifies core configuration changes after the changes are made, to ensure compliance with all LCOs and design features TSs related to core configuration, and why TSs requiring surveillances are not necessary; or, discuss why no additional information or TS changes are required.

Response RAI-14.4.4

Proposed technical specifications 4.1.3 and 4.1.4 have been added as requested.

RAI-14.4.5

Proposed TS 4.1.2 would require that "[v]isual inspection of one-fifth of the in-core reactor fuel elements shall be performed every two years."

However, proposed TS 4.1.2 does not appear to require that a different one-fifth of the fuel elements be inspected at each 2 year interval (such that all fuel elements would be inspected at

least once over a 10 year period).

Revise proposed TS 4.1.2 to require that a different one-fifth of the fuel elements be inspected at each 2 year interval, such that each element is inspected at least once every 10 years. Alternatively, discuss why no change is required.

Response RAI-14.4.5

The proposed technical specification 4.1.2 has been deleted and revised as technical specification 4.1.7 to meet the request.

RAI-14.4.6

The guidance in NUREG-1537, Part 1, Appendix 14.1, Section 4.2(1), recommends that TSs require that integral and differential worths of all control rods should be determined at least annually and after core or control rod changes.

Proposed LCO TSs 3.1.1(1) and 3.1.1(2) impose requirements on excess reactivity and shutdown margin (which the NRC staff notes is calculated using total control blade worths). Proposed LCO TS 3.2.2 imposes requirements on the simultaneous reactivity insertion rate of the most reactive control blade and the regulating rod, and the total worth of the regulating rod.

Proposed TS 4.2.1(1) would require that "[t]he reactivity worth of the regulating rod and each control rod shall be determined annually." Proposed TS 4.2.1(2) would require that "[t]he reactivity worth of all rods shall also be determined prior to routine operation of any new fuel configuration in the reactor core."

However, it is not clear whether proposed TSs 4.2.1(1) and 4.2.1(2) would require determination of both total worth of the regulating rod and each control blade, and maximum reactivity insertion rate (which is related to differential worth) of the regulating rod and each control blade, such that proposed TSs 4.2.1(1) and 4.2.1(2) would provide surveillances for proposed TSs 3.1.1(1), 3.1.1(2), and 3.2.2. Additionally, proposed TS 4.2.1(2) would require worths to be determined when a new fuel configuration is used, but would not require worths to be determined when other changes in core configuration (as defined in the TS definitions), such as control rod changes, are made.

Revise proposed TS 4.2.1(1) and 4.2.1(2) to clearly require measurement of both total worth, and maximum reactivity insertion rate, for the regulating rod and each control blade. Additionally, revise proposed TS 4.2.1(2) to require that worths be determined following significant core configuration changes; include a minimum reactivity change that determines what is "significant." Alternatively, discuss why no change is required.

Response RAI-14.4.6

Proposed technical specifications 4.2.1(1) and 4.2.1(2) have been deleted and replaced with technical specification 4.2.2(1) which incorporates the requested requirements.

RAI-14.4.7

Proposed TS 4.2.1(3) would require that "[c]ontrol rod drop and drive times and regulating rod drive time shall be determined annually, or if maintenance or modification is performed on the mechanism."

Proposed TS 3.2.1 imposes a requirement on control blade scram time, which includes the instrument delay time between the initiation of a scram and when the blade starts to drop, as well as the actual blade drop time.

The NRC staff notes that it is not clear from the proposed TS 4.2.1(3) wording whether control blade drop time only, or total control blade scram time as used in proposed TS 3.2.1 (i.e., "scram time" as used in the proposed TS definitions), is required to be measured.

Revise proposed TS 4.2.1(3) to clarify that control blade scram times are required to be determined, or discuss why no change is required.

Response RAI-14.4.7

Proposed technical specification 4.2.1(3) has been revised for clarification.

RAI-14.4.8

The guidance in ANSI/ANS-15.1, Section 4.2(5), states that TSs should require that scram channels shall be calibrated annually.

Proposed TS 4.2.2(3) would require that "[a] channel calibration of the reactor power level channels (Linear and Log-N) shall be made annually."

However, the NRC staff notes that the Log-N channel is also a reactor period measurement and scram channel.

Revise proposed TS 4.2.2(3) to clarify that the reactor power level and period channels shall be channel calibrated annually, or discuss why no change is required.

Response RAI-14.4.8

The requested change has been added to proposed technical specification 4.2.3(3). Note the revised proposed technical specifications now include three (3) subsections under section 4.2. The previous section 4.2.2 is now section 4.2.3.

RAI-14.4.9

The guidance in ANSI/ANS-15.1, Section 4.2(5), states that TSs should require that scram channels shall be calibrated annually.

Proposed TS 4.2.2(5), item d., would require that a channel calibration of the primary coolant inlet and outlet temperature channels shall be made annually.

The NRC staff notes that proposed TSs 3.2.3 and 3.2.5 refer to the "pool inlet temperature"

channel rather than the "primary coolant inlet" channel. Additionally, the NRC staff notes that the primary coolant outlet temperature channel does not appear to have any corresponding LCO.

Revise proposed TS 4.2.2(5), item d., to use terminology consistent with the corresponding LCOs. Additionally, provide a corresponding LCO TS for the primary coolant outlet temperature channel; or, delete the surveillance requirement TS for this channel. Alternatively, discuss why no TS change is required.

Response RAI-14.4.9

The proposed technical specification 4.2.3(5) has been modified to be consistent with the corresponding LCO by deleting the outlet channel requirement. Only the inlet channel is used in the safety and accident analyses.

RAI-14.4.10

Proposed TS 4.2.2(7) would require, in part, that manual scrams outside of the control room shall be verified operable annually.

SAR Section 7.4.3.2 states that, in addition to the manual scram button in the control room, emergency manual scram pushbuttons are also located in strategic locations in the reactor building, and one is located outside the reactor building.

The NRC staff notes that the manual scram buttons do not appear to have a corresponding LCO. Additionally, it is not clear which of the manual scrams outside the control room are subject to proposed TS 4.2.2(7).

Either provide a corresponding LCO for manual scrams located outside the control room; or, delete the surveillance requirement TS for these scrams, and discuss why no TSs are necessary for these scrams. If the scrams remain in the TSs, clarify which remote scram(s) are subject to the TSs. Alternatively, discuss why no TS change or additional information is required.

Response RAI-14.4.10

Proposed technical specification 3.2.3 item 7 has been modified to specify the manual scram in the control room. Proposed technical specification 4.2.3(6) has been modified to include the same specificity. Proposed technical specification 4.2.3(7) has been modified to remove the testing of manual scrams outside the control room for consistency with the LCO in 3.2.3. While the manual scrams located in various areas around the building provide additional safety functionality, the reactor operator in the control room would be the primary initiator of a manual scram should conditions warrant such action.

RAI-14.4.11

The guidance in NUREG-1537, Part 1, Appendix 14.1, Section 4.2(5), and ANSI/ANS-15.1, Section 4.2(5), recommends that the operability (i.e., scram action with control blade release) of

scram channels be verified before each reactor startup following a shutdown of more than 24 hours or following each secured shutdown.

Proposed TS 4.2.2 includes requirements for channel checks and channel tests of the scram channels required by proposed TS 3.2.5. However, it does not appear to include any requirement to verify the operability of the scram action for the scrams required by proposed TS 3.2.3, items 1 through 6 (which are associated with the channels required by proposed TS 3.2.5).

Revise proposed TS 4.2.2 to include surveillance requirements for the operability of the scram action for the scrams required by proposed TS 3.2.3, items 1 through 6, such that it is clear that TS 4.2.2 provides surveillances for TS 3.2.3, items 1 through 6, as well as TS 3.2.5. Alternatively, discuss why no change is required.

Response RAI-14.4.11

The proposed technical specification 4.2.3(2) has been modified to include scram function where applicable for items 1 through 6.

RAI-14.4.12

Proposed LCO TS 3.2.3, items 7, 8, 9, and 11, would require detector high voltage, seismic disturbance, bridge movement, and reactor on key switch scrams, respectively.

However, the NRC staff notes that these items in proposed LCO TS 3.2.3 do not appear to have corresponding surveillance requirement TSs.

Provide surveillance TSs for proposed TS 3.2.3, items 7, 8, 9, and 11, or discuss why no such TSs are required.

Response RAI-14.4.12

The proposed technical specification 4.2.3(7) has been modified to state the scrams in items 8-15 shall be tested annually. Note the table in proposed TS 3.2.3 has been modified. Item 10 (Manual Scram) has been repositioned as item 7, with the previous items 7-13 renumbered. Previous item 11 (Reactor Key Switch) has been deleted. While this item is in the current (1985) technical specifications, it is not a protective scram. The manual key-locked switch energizes the scram circuit (SAR section 7.4.3). A review of the technical specifications of similar flat-plate fuel facilities (MURR, MIT, RINSC) indicates none of these facilities use the scram circuit power switch as an LCO component of the reactor protection system. New items 13-15 have been added to the table in response to RAI 14.3.33 as indicated previously.

Additionally, the previously submitted proposed technical specification 4.2.2(8) (radiation monitoring system scram) has been deleted consistent with the response to RAI 14.3.10. The previously submitted proposed technical specification 4.2.2(10) has been incorporated in 4.0 B.

RAI-14.4.13

Proposed TS 4.2.2(7) would require, in part, that "all other limit switches in the scram chain including those listed in [TS] 3.2.4" be verified operable annually.

However, the NRC staff notes that is not clear exactly which LCOs this portion of proposed TS 4.2.2(7) is a surveillance requirement for.

Revise proposed TS 4.2.2(7) to clearly and specifically state which limit switches (e.g., the limit switches required by proposed TS 3.2.4, items 2 through 6, or others, if appropriate) shall be verified operable annually. Alternatively, discuss why no change is required.

Response RAI-14.4.13

The response to this RAI is incorporated into the answer for RAI 14.4.12.

RAI-14.4.14

The guidance in NUREG-1537, Part 1, Appendix 14.1, Section 4.3(6), states, in part, that when the reactor is operating on a routine schedule, conductivity and pH should be measured at least weekly.

Proposed TSs 4.3(1) and 4.3(2) would require that the conductivity and pH of the pool water shall be measured quarterly. The NRC staff notes that this surveillance interval does not appear to be consistent with the guidance in NUREG-1537, Part 1, Appendix 14.1, Section 4.3(6).

Revise proposed TSs 4.3(1) and 4.3(2) to require that pool water conductivity and pH be measured weekly, or discuss why no change is required.

Response RAI-14.4.14

The proposed technical specifications 4.3(1) has been revised as requested. Note that 4.3(1) is combined with the original proposed TS 4.3(2).

RAI-14.4.15

Current TS 4.5(2) requires that "[t]he radioactivity in the pool water shall be analyzed weekly." Proposed TS 4.3(3) would require that "[t]he radioactivity in the pool water shall be analyzed monthly."

In its response to RAI-11.1 (ADAMS Accession No. ML17090A348), UML stated that, in an upcoming submittal associated with a revision to its proposed license renewal TSs, it would revise TS 4.3(3) such that it would require quarterly radioactivity analysis of both primary and secondary coolant.

a) Provide revised TS pages incorporating this change, or discuss why this change is no longer required.

b) The NRC staff notes that NRC Facility Operating License No. R-125 Amendment No. 5,

issued January 15, 1982, which authorized receipt, possession, and use of the cobalt-60 gamma irradiation sources in the UMLRR pool, established a required weekly pool water radioactivity surveillance (increased from the previously-required monthly surveillance) to help ensure integrity of the cobalt-60 irradiation source cladding. UML's response to RAI-11.1 states that there is "fixed area radiation monitoring equipment located in proximity to the primary coolant" which would provide "an indication and warning of potential radiological hazards associated with external exposure from the presence of radionuclides in the coolant." However, it is not clear to the NRC staff whether this equipment would be able to provide early indication of a cobalt-60 leak to the pool water with the same effectiveness as pool water radioactivity analyses, and it is also not clear whether a quarterly surveillance interval would be sufficient to continue to ensure that there would be an early indication of any leak.

Provide a revised proposed TS 4.3(3) that would continue to require weekly radioactivity analysis of the reactor pool water, or discuss why such analysis is not required.

Response RAI-14.4.15

The proposed technical specifications have been modified in response. The requirement for surveillance of the secondary has been eliminated as a result of the response to RAI 14.3.16. The frequency for monitoring the primary coolant has been increased to monthly. However, due to the presence of the Co-60 source, the frequency of water sampling would by default revert to a weekly frequency. As a result, the proposed TS 4.3(2) and TS 4.3(3) would separate the primary coolant sampling related to the reactor from that for Co-60. Proposed TS 4.3(3) would provide flexibility to provide either weekly sampling (as is required under the current license) or allow for continuous monitoring. This flexibility will allow a possible future installation a continuous monitor if such a monitor provides the sensitivity necessary to determine if a Co-60 source is leaking. Any such determination and installation will be reviewed in accordance with section 6 these proposed technical specifications.

It should be noted that no Co-60 source corrosion problems have been observe since the source was first obtained in 1981. The current and proposed technical specification limit for conductivity is four times more restrictive than that for pool irradiators (10CFR Part 36.33 (e)). Part 36 does not have a specific regulation regarding a minimum range for pH. In addition, the NRC has made a determination that the UMLRR is not covered by the regulations in 10CFR Part 36 (ADAMS Accession No. ML18331A396).

RAI-14.4.16

Proposed TS 4.4(1) would require that "[b]uilding pressure will be verified prior to reactor operation and at least every eight hours during reactor operation to ensure that it is less than ambient atmospheric pressure."

However, the NRC staff notes that reactor building confinement (including negative building pressure) should be also be achieved for conditions other than reactor operation (see proposed TS 3.4, and RAI-14.3.21 and RAI-14.3.22).

Additionally, proposed TS 4.4(1) uses the language "will" which appears to be inconsistent with

the proposed TS definition of "shall" to denote a requirement.

Revised proposed TS 4.4(1) to require that building pressure be verified prior to reactor operation or any other activity that requires reactor building confinement, and at least every eight hours during reactor operation or other activities that require confinement. Additionally, revise the "will" language in proposed TS 4.4(1) to be consistent with the TS definitions. Alternatively, discuss why no change is required.

Response RAI-14.4.16

The proposed technical specification for building pressure surveillance has been incorporated into proposed TS 4.4(2) with the revisions as requested.

RAI-14.4.17

The guidance in NUREG-1537, Part 1, Appendix 14.1, Section 4.4.2, states that research reactor confinements should have a quarterly functional test of the overall confinement system described in the SAR. The guidance in ANSI/ANS-15.1, Section 4.4.2(1), also states that research reactor confinements should have a quarterly functional test.

Proposed TS 4.4(2) would require that the reactor building containment (confinement) "isolation system including the initiating system shall be tested annually…." The NRC staff notes that this surveillance interval does not appear to be consistent with the guidance in NUREG-1537, Part 1, Appendix 14.1, Section 4.4.2, or ANSI/ANS-15.1, Section 4.4.2(1).

Revise proposed TS 4.4(2) such that it would require a quarterly surveillance interval, consistent with guidance in NUREG-1537 and ANSI/ANS-15.1, or discuss why no change is required.

Response RAI-14.4.17

Proposed technical specification 4.4(2) has been incorporated into proposed TS 4.4(3). An annual frequency is considered adequate given the fail-safe design of the ventilation isolation valves (SAR section 6.2.2). Frequent testing of the pneumatically pressurized and spring loaded valves creates substantial wear of the valve components. In response to the RAI, the proposed surveillance interval has been revised from annually to semi-annually. This frequency is the same as the current (1985) technical specification. The semi-annual frequency is also considered adequate given the fail-safe design of the ventilation isolation valves. Semi-annual functional tests of the isolation system since operations began in 1974 have shown the isolation system performs as designed. In no instance has the initiation system failed to function or an isolation valve failed to close.

RAI-14.4.18

In its response to RAI-6.1 (ADAMS Accession No. ML17090A348), UML states that it requests that the NRC evaluate its reactor building as a confinement building. UML stated that, in an upcoming submittal associated with revised TSs, it would include TSs applicable for a

confinement.

The guidance in ANSI/ANS-15.1, Section 4.4.1(4), states that for a research reactor containment, a leak-tightness test should be required following containment modifications or repair.

Proposed TS 4.4(3) would require that "[a]ny additions or modifications to the containment building or its penetrations shall be tested to verify containment building integrity by performing an integrated leakage rate test of the containment building."

The NRC staff notes that, for a reactor building re-designated as a confinement, it does not appear that proposed TS 4.4(3) would be applicable. Delete proposed TS 4.4(3), or discuss why no change is required.

Response RAI-14.4.18

The proposed technical specification 4.4(3) has been deleted.

RAI-14.4.19

The guidance in ANSI/ANS-15.1, Section 4.5(1), states that research reactor emergency exhaust systems should have a quarterly operability test.

Proposed TS 4.5(1) would require that "[t]he emergency exhaust system including the initiating system shall be verified annually to be operable." However, the NRC staff notes that this surveillance interval does not appear to be consistent with the guidance in ANSI/ANS-15.1, Section 4.5(1).

Revise proposed TS 4.5(1) such that it would require a quarterly surveillance interval, consistent with guidance in ANSI/ANS-15.1, or discuss why no change is required.

Response RAI-14.4.19

Proposed technical specification 4.5(1) has been revised as requested. In addition, proposed TS 4.5(2) has been revised to require the testing of the emergency exhaust carbon filter only. The emergency exhaust carbon filter is considered in the dose assessments for the MHA. The other filters are not considered in any analyses presented in the SAR. Proposed TS 4.5(2) has been deleted as flow rate measurements are not a requirement of ANSI/ANS 15.1.

RAI-14.4.20

Proposed TS 4.5(1) would require that "[t]he emergency exhaust system including the initiating system shall be verified annually to be operable."

Proposed TS 4.5(3) would require that "[t]he air flow rate in the stack exhaust duct shall be measured biennially."

Proposed LCO TS 3.5(1) would require that "[t]he main intake shall be operable whenever the

reactor is operating."

SAR Section 13.2.1, as supplemented by UML's response to RAI-13.5 (ADAMS Accession No. ML18006A003), describes UML's maximum hypothetical accident (MHA) public dose calculations, including doses from a scenario with a release though the UMLRR stack via the emergency exhaust system (designated as "Scenario D" in the response to RAI-13.5). The response to RAI-13.5 states that for "Scenario D," the ventilation and emergency exhaust systems are assumed to operate as designed. The NRC staff notes that, as discussed in SAR Section 6.2.3, when the ventilation and emergency exhaust systems operate normally, the flow from the emergency exhaust system (approximately 320 cubic feet per minute) is mixed and diluted with the air flow from the main intake fan, which continues to operate (with a flow rate of approximately 14,500 cubic feet per minute) to dilute the stack exhaust flow and increase the stack exit velocity after the building isolates and the emergency exhaust system activates. Therefore, the NRC staff notes that the operability of the main ventilation intake appears to be credited in MHA "Scenario D." The NRC staff notes that, although MHA "Scenario C" (as designated in the response to RAI-13.5) considered an alternative radioactive material release scenario in which the emergency exhaust system does not operate, and material leaks slowly from the reactor building, it is not clear whether "Scenario C" would bound a scenario in which the emergency exhaust system operates without the main intake continuing to operate, given that the latter scenario would involve a much more rapid release.

The NRC staff notes that if UML's radioactive material release analyses for a scenario in which the emergency exhaust system operates assumes that the main intake continues to operate, an LCO TS should require operability of the main intake not only when the reactor is operating, but during any activities that could result in a radioactive material release in the reactor building, for example, during conditions where confinement is required such as during irradiated fuel movement (see RAI-14.3.21). The NRC staff notes that proposed LCO TS 3.5(1) appears to require that the main intake be operable when the reactor is operating, but does not appear to require that the main intake be operable during other activities that could result in a radioactive material release.

The NRC staff also notes that proposed LCO TS 3.5(1) does not appear to have a corresponding surveillance requirement TS. Proposed TS 4.5(1) would require that the emergency exhaust system be verified to be operable, but would not require that the main intake be verified to be operable. Proposed TS 4.5(3) would require periodic measurement of
the stack exhaust flow rate, but it is not clear which LCO(s) this TS is a surveillance requirement for (or what the acceptance criteria would be).

Provide the following information:

a) Revise proposed LCO TS 3.5(1) to require that the main intake (including equipment required to ensure its flow is directed through the stack following the activation of the emergency exhaust system) shall be operable during any activities that could result in a radioactive material release in the reactor building (i.e., conditions when confinement is required); provide an analysis of an MHA scenario that assumes the emergency exhaust system operates but the main intake is not operating to dilute emergency exhaust
system effluent; or discuss why no change or additional information is required.

b) Provide a corresponding surveillance TS for proposed LCO TS 3.5(1); revise proposed TSs 4.5(1) and/or 4.5(3) such that they would require surveillance of TS 3.5(1)-required equipment;

or discuss why no change is required.

Response RAI-14.4.20

a) Proposed technical specification 3.5.1 has been revised to require the main intake fan be operating (see also response to RAI 14.3.22)

b) Proposed technical specification 4.4.1 has been revised to include a surveillance requirement (see also response to RAI 14.4.17).

RAI-14.4.21

Proposed LCO TS 3.6.1(3) would require that facility-wide radiation warning alarms be operable.

However, proposed LCO TS 3.6.1(3) does not appear to have a corresponding surveillance requirement TS.

Provide a surveillance TS for LCO TS 3.6.1(3), or discuss why no such TS is required.

Response RAI-14.4.21

The proposed technical specification 3.6.1(3) has been deleted. See also response to RAI 14.3.25.

RAI 14.4.22

Proposed TSs 4.2.2(1), 4.2.2(2), and 4.2.2(3) would require periodic channel checks, channel tests, and channel calibrations, respectively, to ensure that channels used to measure process variables (including the 2 linear power channels) are operable.

As discussed in SAR Section 7.4.1.1.4, the proposed new NMP-1000 linear power channels have an integral touchscreen display that will be available for use. However, the SAR, as supplemented, does not appear to explain how test and calibration operations will be performed. Therefore, it is not clear if tests and/or calibration of the touchscreen are intended to be required by proposed TS 4.2.2.

Discuss the tests and calibrations that will be performed for the NMP-1000 channels in accordance with proposed TS 4.2.2, and discuss whether the testing and calibration of the touchscreens for the NMP-1000 modules is intended to be included in the requirements of proposed TS 4.2.2. Alternatively, discuss why no additional information is required.

Response RAI 14.4.22

Note: the revised proposed technical specifications now include three (3) subsections under section 4.2. The previous section 4.2.2 is now section 4.2.3.

The function of the NMP-1000 touch screen is to provide the user with an interface to the system. The screen also indicates alarms, statuses, data items, history and errors, and also accessing and changing display items provided on the touch screen displays. The NMP-1000 has a factory supplied touch screen calibration feature. The feature requires the operator performing the calibration to touch three points that are then used as references. In addition to the touch screen calibration, the operator can also adjust the "Contrast" and "Backlight" settings. The calibration procedure associated with proposed technical specification 4.2.3(3) and 4.2.3(4) shall include a calibration of the touch screen as described in the manufacturer's operations manual. The calibration procedure will also include items currently performed for the existing channel including a verification of the linearity of the response to an input signal, verification of the set points for the automatic switching of ranges, and verification of the alarm and scram trip set points. The channel test, as part of the reactor startup checklist procedure, shall include the introduction of a signal to verify the expected indicator response and the trip functions. The channel check, as part of the reactor operation procedure, shall include periodic comparison of the indicator response to the other power measuring channels.

RAI-14.5.1

In response to RAI-14 (ADAMS Accession No. ML17090A348), UML stated that bases for Section 5.0 of the TSs shall be included in an upcoming submittal associated with revisions to the TSs.

Provide revised TS pages incorporating this change, or discuss why this change is no longer required.

Response RAI-14.5.1

Bases have been added to the proposed technical specifications Section 5 as requested.

RAI-14.5.2

Certain proposed TSs in TS Section 5.0 appear to use language that is inconsistent with the proposed TS definition of "shall" to denote a requirement. For example (not an exhaustive list), TS 5.1 states "[t]he reactor is housed…"; TS 5.2 states "[t]he reactor coolant system consists…"; and TS 5.3.2 states "[c]ores from 20 elements to 26 elements may be used…."

Revise the proposed TSs in TS Section 5.0 to be consistent with the TS definitions. Alternatively, discuss why no changes are required.

Response RAI-14.5.2

The proposed technical specifications have been revised in response.

RAI-14.5.3

Proposed TS 5.1 states that "[t]he reactor is housed in the reactor building, designed for containment…."

In its response to RAI-6.1 (ADAMS Accession No. ML17090A348), UML states that it requests that the NRC evaluate its reactor building (which is currently considered to be a containment building) as a confinement building.

Revise proposed TS 5.1 to indicate that the reactor building is designed for confinement, consistent with the response to RAI-6.1, or discuss why no change is required.

Response RAI-14.5.3

The proposed technical specification 5.1 has been revised.

RAI-14.5.4

The guidance in ANSI/ANS-15.1, Section 5.1, states that design features TSs should include a general description of the site, including location and exclusion or restricted areas.

Proposed TS 5.1 states, in part, "[t]he reactor building is the restricted area as defined in 10 CFR Part 20." However, the NRC staff notes that proposed TS 5.1 does not appear to clearly define the area under NRC Facility Operating License No. R-125 for the UMLRR.

Revise proposed TS 5.1 to describe the area under the reactor license, or discuss why no change is required.

Response RAI-14.5.4

Proposed technical specification 5.1.2 has been revised as requested.

RAI-14.5.5

The guidance in ANSI/ANS-15.1, Section 5.3, states that design features TSs should include a description of normal core configuration(s).

Proposed TS 5.3.1 states, in part, "[t]he reference core for these Technical Specifications is described in Chapter 4 of the SAR. It consists of 19 standard fuel elements and two half-elements and the central location filled with a flux trap element, as shown in Figure 4.2 of the SAR."

However, it is not clear to the NRC staff what requirement is being imposed by the referenced portion of proposed TS 5.3.1.

Clarify what requirement(s) or limitations the referenced portion of proposed TS 5.3.1 would impose on core configurations that may be operated in the UMLRR; delete the referenced portion of proposed TS 5.3.1; or discuss why no additional information or change is required.

Response RAI-14.5.5

The referenced portion of proposed technical specification 5.3.1 has been deleted as requested.

RAI-14.5.6

The guidance in ANSI/ANS-15.1, Section 5.3, states that design features TSs should include a description of normal core configuration(s).

Proposed TS 5.3.2 states that "[c]ores from 20 elements to 26 elements may be used, consisting of the any combination of fuel elements as described in specifications 5.3.3, 5.3.4, and 5.3.5."

SAR Section 4.5.3, as supplemented by UML's response to RAI-4.1 (ADAMS Accession No. ML17090A348), discusses the limiting core configuration (LCC) for the UMLRR. This core configuration consists of 8 silicide fuel elements surrounded by 13 aluminide fuel elements, for a total of 21 standard UMLRR fuel elements. Proposed TS 5.3.3 describes the standard UMLRR silicide or aluminide fuel elements, while proposed TSs 5.3.4 and 5.3.5 describe partial silicide fuel elements, and removable plate aluminide fuel elements, respectively, which have a lower fuel loading (and, in the case of the removable plate elements, may have fewer fuel plates) than standard elements.

SAR Section 4.5.7 describes UML's flow distribution and fuel element coolant flow rate calculations. For its thermal-hydraulic and accident analyses for the LCC, UML assumed a coolant flow rate through the fuel elements based on a 21 standard element core.

It is not clear to the NRC staff how proposed TS 5.3.2 would require that any allowed core configuration would be bounded by the LCC discussed in the SAR, as supplemented. The NRC staff notes that proposed TS 5.3.2 would allow 20 element cores, which could have higher power peaking than the 21 element LCC. The NRC staff also notes that proposed TS 5.3.2 would allow any number of partial and/or removable plate elements to be used in the core, which could also increase power peaking in the remaining standard fuel elements. Additionally, the NRC staff notes that if removable plate element(s) were used in place of standard fuel elements, it is not clear if additional coolant flow through the removable plate element(s) would result in reduced flow through the remaining standard elements (which would likely have higher power density), potentially resulting in higher temperatures in the standard elements.

The NRC staff notes that proposed TS 5.3.2 also appears to contain a typographical error in that "…consisting of the any combination…" should read "…consisting of any combination…."

Revise proposed TS 5.3.2 such that it would limit allowed core configurations to those that would be bounded by the LCC, as described and analyzed in the SAR, as supplemented. Also, revise proposed TS 5.3.2 to correct the apparent typographical error. Alternatively, discuss why no change is required.

Response RAI-14.5.6

The proposed technical specification 5.3.2 has been corrected to indicate a minimum 21 fuel elements and removed the typographical error. Proposed technical specifications 5.3.4 and 5.3.5 have been modified to limit the numbers of partial and removable plate elements in the core. In

addition, proposed technical specification 5.3.6 has been added to require a safety analysis and reactor safety committee review for use of the removable plate element.

RAI-14.5.7

The guidance in NUREG-1537, Part 1, Appendix 14.1, Section 3.1(6)(c), states that for research reactors with Materials Testing Reactor-type fuel, to prevent fuel swelling, there should be burnup limitations on the fuel.

The guidance in ANSI/ANS-15.1, Section 5.3, states that design features TSs should include limitations on fuel burnup, as appropriate.

However, the NRC staff notes that the proposed UMLRR TSs do not appear to include limits on fuel burnup.

Provide a TS limit on fuel burnup, and discuss the basis for the proposed limit; discuss why no TS limit on fuel burnup is needed (either for prevention of fuel swelling, or for any other reason); or discuss why no change or additional information is required.

Response RAI-14.5.7

Proposed technical specification 5.3.7 has been added as requested.

RAI-14.5.8

The guidance in ANSI/ANS-15.1, Section 5.4, states that design features TSs should include requirements for the storage of fuel, and other fissionable material, including fueled experiments and fuel devices not in the reactor.

Proposed TS 5.4 would designate storage locations for fuel elements, but does not appear to designate storage locations for other fissionable material (for example, fueled devices, such as fission chambers) which may be possessed at the UMLRR.

Revise proposed TS 5.4 to designate storage locations for all fissionable material which may be possessed at the UMLRR, or discuss why no change is required.

Response RAI-14.5.8

Proposed technical specification 5.4 has been revised as requested and uses similar language to ANSI/ANS 15.1 section 5.4.

RAI-14.5.9

Proposed TS 5.4 would require that:

Fuel elements may be stored in any of the following locations:

(1) Un-irradiated fuel may be stored in licensed shipping containers within the restricted area.

(2) …

(3) In licensed shipping containers located in the restricted area or an area designated as a controlled area.

(4) …

However, the NRC staff notes that proposed TS 5.4(1) appears to be redundant to proposed TS 5.4(3), because proposed TS 5.4(3) would allow storage of any fuel in licensed shipping containers in the restricted area. The NRC staff also notes that "controlled area," as used in proposed TS 5.4(3), does not appear to be defined in the TSs.

Delete the redundant proposed TS 5.4(1). Additionally, either define or clarify what is meant by a "controlled area," or revise proposed TS 5.4(3) to remove the reference to a "controlled area." Alternatively, discuss why no changes or additional information are required.

Response RAI-14.5.9

The proposed technical specifications 5.4 (1 – 4) have been deleted and the requested changes incorporated into proposed technical specifications 5.4.1 and 5.4.2.

RAI-14.5.10

UML's response to RAI-9.1 (ADAMS Accession No. ML18006A003) stated that a final draft version of the TSs would include TSs requiring fuel and other fissionable material to be stored in a criticality-safe configuration (the NRC staff notes that ANSI/ANS-15.1, Section 5.4, recommends that TSs should require that fissionable material be stored such that k_{eff} is no greater than 0.90 for all conditions of moderation and reflection using light water), and requiring irradiated fuel and other irradiated fissionable material be stored such that adequate cooling will be ensured.

Provide revised TS pages incorporating these changes, or discuss why these changes are no longer required.

Response RAI-14.5.10

The requested change has been incorporated into proposed technical specification 5.4.1.

RAI-14.6.1

Certain proposed TSs in TS Section 6.0 appear to use language that is inconsistent with the proposed TS definition of "shall" to denote a requirement. For example (not an exhaustive list), TS 6.1.3(2) states "[t]he following events require…" and TS 6.6.2(1) states "[a] reportable occurrence is…."

Revise the proposed TSs in TS Section 6.0 to be consistent with the TS definitions. Alternatively,

discuss why no changes are required.

Response RAI-14.6.1

The language in proposed technical specification section 6 has been modified as requested.

RAI-14.6.2

Certain proposed TSs in TS Section 6.0 appear to require administrative controls that are specific to the reactor and its operation. For example (not an exhaustive list), TS 6.1.2(1) states, "[t]he Reactor Supervisor (Level 2) is directly responsible for the safe operation of the reactor"; TS 6.2 states, "[t]here shall be a Reactor Safety Subcommittee (RSSC) which shall review reactor operations…"; TS 6.2.4(1) states, "[t]he RSSC audit function may be performed by a member of the RSSC who does not have line responsibility for the reactor…"; TS 6.5(1) states, "an experiment using the reactor…"; and TS 6.6.2(1), item g., states "…such that the inadequacy could have caused the existence or development of an unsafe condition in connection with operation of the reactor."

However, the NRC staff notes that activities that may occur at the UMLRR facility, under the NRC Facility Operating License No. R-125 for the UMLRR, such as gamma irradiations using the cobalt-60 sources or irradiated reactor fuel, may not necessarily directly involve the reactor and its operation. The NRC staff further notes that activities conducted under UML's broad scope materials license and not necessarily directly involving the reactor and its operation (but, similarly to the gamma irradiations conducted under the reactor license, having the potential to indirectly affect the reactor because they are conducted within the reactor building), could also occur within the UMLRR facility.

Revise the proposed TSs in TS Section 6.0 such that they require applicable administrative controls for the entire research reactor facility (as used in the TS definitions), and related to all activities that are conducted within the facility under the reactor license (for example, gamma irradiations using the cobalt-60 sources) or that could have the potential to affect the reactor or activities conducted under the reactor license (for example, activities conducted in the reactor building under UML's broad scope materials license), rather than being specific to the reactor and its operation. Alternatively, discuss why no changes are required.

Response RAI-14.6.2

The wording in proposed technical specification 6.1.2.2 has been revised to reflect the entire facility.

RAI-14.6.3

The guidance in ANSI/ANS-15.1, Sections 6.1.1 and 6.1.2, recommends that TSs for organizational structure should require that the Level 1 authority be assigned to the individual responsible for the facility's license, e.g., a unit or organizational head. Proposed TSs 6.1.1 and 6.1.2 (including proposed TS Figure 6-1) would state that the Level 1 authority is the director of the UML Radiation Laboratory. The NRC staff notes that this individual appears to be an official of a UML research laboratory/department, rather than a university-level official (i.e., unit or

organizational head). Therefore, it is not clear to the NRC staff whether the Level 1 authority is an official who would have the immediate authority to divert university resources as needed to ensure reactor safety.

Revise proposed TSs 6.1.1 and 6.1.2 (including proposed TS Figure 6-1) to indicate that the Level 1 authority is a university-level authority; clarify that the UML Radiation Laboratory Director is an official who would have the immediate authority to divert university resources as needed to ensure reactor safety; or discuss why no change or additional information is required. Additionally, if the Level 1 and/or other authority level individuals are changed, make conforming changes throughout TS Section 6.0, as appropriate.

Response RAI-14.6.3

The proposed technical specification 6.1.2.1 has been revised as requested and the organization chart updated.

RAI-14.6.4

The guidance in ANSI/ANS-15.1, Section 6.1.3(2), states that TSs should require that a list of reactor facility personnel by name and telephone number shall be readily available in the control room for use by the operator; the list should include management personnel, radiation safety personnel, and other operations personnel.

However, the proposed renewal TSs do not appear to include such a requirement.

Provide a TS requiring that a list of reactor facility personnel be readily available in the control room, or discuss why no such TS is required.

Response RAI-14.6.4

Proposed technical specification 6.1.3(2) has been added as requested.

RAI-14.6.5

The regulation in 10 CFR 50.54(m)(1) states that a senior reactor operator (SRO) shall be present at the facility during initial startup and approach to power, recovery from an unplanned or unscheduled shutdown or significant reduction in power, and refueling, or as otherwise prescribed in the facility license.

The guidance in ANSI/ANS-15.1, Section 6.1.3(3), states that TSs should require the presence of a SRO at the facility for initial startup and approach to power, all fuel or control rod relocations within the reactor core region, or recovery from unplanned or unscheduled shutdown or significant power reduction.

Proposed TS 6.1.3(2) would require that:

The following events require the presence of a senior reactor operator at the site:

a. ...

b. …

c. Recovery from an unplanned or unscheduled shutdown for which documented verbal concurrence from a senior reactor operator shall be made.

The NRC staff notes that proposed TS 6.1.3(2) would require a SRO at the site, but does not appear to require that the SRO be present at the facility, as required by 10 CFR 50.54(m)(1) and specified in ANSI/ANS-15.1, Section 6.1.3(3). Additionally, the NRC staff notes that proposed TS 6.1.3(2), item c., does not include a significant power reduction, as also required by 10 CFR 50.54(m)(1) and specified in ANSI/ANS-15.1, Section 6.1.3(3).

Revise proposed TS 6.1.3(2) to be consistent with the requirements of 10 CFR 50.54(m)(1) and guidance in ANSI/ANS-15.1, Section 6.1.3(3). If a "significant" power reduction is mentioned in the revised TS, the TS should specify what is meant by "significant." Alternatively, discuss why no change is required.

Response RAI-14.6.5

The proposed technical specification 6.1.3(2) has been renumbered as 6.1.3(3). The term "site" has been changed to "facility" consistent with proposed technical specification 5.1.2. Proposed TS 6.1.3(3) has been revised to include a specified power reduction. In addition, wording allowing a 2 hour absence of the second individual at the facility (TS 6.1.3.1(b)) has been deleted as it is considered as an unneeded allowance and unnecessarily complicates the staffing specifications.

RAI-14.6.6

The guidance in ANSI/ANS-15.1, Section 6.2.2(3), states that TSs should include requirements for the use of subgroups within the reactor safety committee.

SAR Section 12.2.2 states, in part, "[a] quorum of the [Reactor Safety Subcommittee (RSSC)] is an absolute majority of the full [RSSC] and must include the Radiation Safety Officer or his designee and the Chairman or his designee."

Proposed TS 6.2.2(2) states, "[an RSSC] meeting quorum shall consist of at least one-half of the membership where the reactor staff does not constitute a majority."

Proposed TS 6.2.2(3) states, "[t]he RSSC may appoint a subgroup from within its membership to act on behalf of the full committee on those matters that cannot await the next meeting. The RSSC shall review the actions taken by the subcommittee at the next regular meeting."

However, it is not clear whether the quorum requirements of proposed TS 6.2.2(2) for full RSSC meetings would also apply to RSSC subgroup/subcommittee meetings (i.e., whether an RSSC subgroup/subcommittee would need to consist of at least one-half of the membership of the full RSSC, where the reactor staff does not constitute a majority, in order to have a quorum that may act on behalf of the full RSSC).

Revise proposed TS 6.2.2(3) to clarify that proposed TS 6.2.2(2) for full RSSC meetings would also apply to RSSC subgroup/subcommittee meetings, or discuss why no change is required.

Response RAI-14.6.6

The proposed technical specification 6.2.2(3) has been deleted. While this provision in the current technical specifications, the use of committee sub-groups has rarely, if ever, been used and is not considered necessary.

RAI-14.6.7

Proposed TS 6.2.2(4) states, "[m]eeting minutes shall be distributed to RSSC members in a timely manner for review and approval at the next meeting."

Proposed TS 6.2.3(2) states, "[a] written report or minutes of the findings and recommendations of the RSSC shall be submitted to the Director of the Radiation Laboratory and to the RSSC members in a timely manner after a review has been completed."

The NRC staff notes that is it not clear what is meant by "timely."

Revise proposed TSs 6.2.2(4) and 6.2.3(2) to clearly specify a time period that is considered "timely," or discuss why no change is required.

Response RAI-14.6.7

The proposed technical specifications 6.2.2(4) and 6.2.3(2) have been revised to include a 3 month time limit.

RAI-14.6.8

The guidance in ANSI/ANS-15.1, Section 6.2.3(1), states that TSs should require that the review function of the safety committee shall include review of determinations that proposed changes in equipment, systems, tests, experiments, or procedures are allowed without prior authorization by the NRC pursuant to 10 CFR 50.59.

The guidance in NUREG-1537, Part 1, Appendix 14.1, Section 6.2.3, states that "[t]he fact that [Section 6.2.3] of ANSI/ANS 15.1 addresses the review function required by 10 CFR 50.59 should be explicitly stated in the technical specifications."

Proposed TS 6.2.3(1), item a., would require that the RSSC review each "[d]etermination that proposed changes in equipment, systems, tests, experiments, or procedures do not require a license update, as described in 10 CFR 50.59."

However, the NRC staff notes that proposed TS 6.2.3(1) does not clearly specify that the evaluations/determinations that the RSSC shall review are the evaluations, performed as required by 10 CFR 50.59, of whether proposed changes to equipment, systems, tests, experiments, or procedures can be made under 10 CFR 50.59, or would require a license

amendment.

Revise proposed TS 6.2.3(1) to clearly specify that the RSSC shall review evaluations, performed as required by 10 CFR 50.59, of whether proposed changes to equipment, systems, tests, experiments, or procedures can be made under 10 CFR 50.59, or would require a license amendment. Alternatively, discuss why no change is required.

Response RAI-14.6.8

The proposed technical specification 6.2.3(1) has been simplified to state the evaluations shall be performed as required by 10 CFR Part 50.59.

RAI-14.6.9

The guidance in ANSI/ANS-15.1, Section 6.2.4, states, in part, that with respect to the audit function of the RSSC, in no case shall the individual immediately responsible for an area perform an audit in that area.

Proposed TS 6.2.4(1) states that "[t]he RSSC audit function may be performed by a member of the RSSC who does not have line responsibility for the reactor or by a consultant who is knowledgeable of reactor operations and reactor safety."

The NRC staff notes that proposed TS 6.2.4(1) does not appear to require that individuals shall not audit an area that they are immediately responsible for.

Revise proposed TS 6.2.4(1) to specify that individuals shall not audit an area that they are immediately responsible for, consistent with ANSI/ANS-15.1, Section 6.2.4. Alternatively, discuss why no change is required.

Response RAI-14.6.9

The proposed technical specification 6.2.4(1) has been revised as requested.

RAI-14.6.10

The guidance in ANSI/ANS-15.1, Section 6.2.4, states, in part, that TSs should require that audits of facility operations for conformance to the TSs and license, and audits of the results of action taken to correct deficiencies, shall be performed annually.

However, proposed TSs 6.2.4(2) and 6.2.4(3) appear to require that these audits be conducted biennially.

Revise proposed TSs 6.2.4(2) and 6.2.4(3) to require that these audits be conducted annually, consistent with ANSI/ANS-15.1, Section 6.2.4, or discuss why no change is required.

Response RAI-14.6.10

The original proposed technical specification 6.2.4(2) has been deleted. The proposed new technical specification 6.2.4(2) (previously 6.2.4(3)) has been revised consistent with ANSI/ANS-15.1-6.4.

RAI-14.6.11

The regulation at 10 CFR 20.1101(c) requires that a "licensee shall periodically (at least annually) review the radiation protection program content and implementation."

SAR Sections 11.1 and 11.1.2.6 state, in part, that the UML Radiation Safety Committee (of which the RSSC is a subcommittee) is responsible for annual (or more frequent) review and audit of the UML Radiation Safety Program.

Proposed TS 6.2.4(3), item a., would require that the scope of RSSC audits shall include "[f]acility operations for conformance to the technical specifications and license conditions."

However, it is not clear whether the UML Radiation Safety Committee review and audit of the campus-wide UML Radiation Safety Program is intended to ensure compliance with 10 CFR 20.1101(c) for the UMLRR, or whether a separate review (e.g., a review of only the UMLRR-specific aspects of the campus-wide program by the RSSC) is performed to comply with this regulation. Additionally, it is not clear whether proposed TS 6.2.4(3), item a., or another proposed TS, is intended to encompass a requirement for review/audit of radiation protection.

Discuss how UML complies with the regulation in 10 CFR 20.1101(c) for the UMLRR, and clarify whether proposed TS 6.2.4(3), item a., or another proposed TS, is intended to require the review required by 10 CFR 20.1101(c). Alternatively, discuss why no additional information or change is required.

Response RAI-14.6.11

The proposed technical specification 6.3.1 states the Radiation Safety Program shall be designed to achieve the requirements of 10 CFR Part 20. This wording is consistent with NUREG 1537-1, chapter 14, 6.3, and is found in other facility technical specifications (e.g., MURR, MIT). The statement de facto includes the requirements of 10 CFR 20.1101(c). The UML Radiation Safety Committee review and audit of the campus-wide UML Radiation Safety Program complies with 10 CFR 20.1101(c). (See also responses to RAI 14.6.12 and RAI 14.6.15)

RAI-14.6.12

The guidance in ANSI/ANS-15.1, Section 6.3, states that TSs should require that the radiation protection program be implemented using the guidance in ANSI/ANS-15.11, "Radiation Protection at Research Reactor Facilities."

Proposed TS 6.3(1) would require that "[t]he Radiation Protection Program shall be designed to achieve the requirements of 10 CFR 20 and shall generally conform to the guidelines in (most current revision) American National Standard, ANSI/ANS-15.11 "Radiation Protection at

Research Reactor Facilities."

The NRC staff notes that it is not clear what is meant by the statement that the Radiation Protection Program "shall generally" conform to ANSI/ANS-15.11.

Additionally, the NRC staff notes that proposed TS 6.3(1) refers to the "Radiation Protection Program," but the SAR, particularly in Chapter 11, includes references to the "Radiation Safety Program," which encompasses the entire UML campus including the UMLRR.

Revise proposed TS 6.3(1) to delete the language "generally," or revise the TS to clarify what is meant by "shall generally" (i.e., specify which portions of ANSI/ANS-15.11 the Radiation Protection Program shall not need to comply with, or specify that the Radiation Protection Program "should" comply with ANSI/ANS-15.11, consistent with the proposed TS definitions, if that is what is meant). Additionally, clarify whether the "Radiation Protection Program" referred to in proposed TS 6.3(1) and in some places in the SAR is equivalent to the campus-wide "Radiation Safety Program" referred to elsewhere in the SAR, and revise proposed TS 6.3(1) to clarify that the UMLRR is encompassed by a campus-wide program, if appropriate.
Alternatively, discuss why no change or additional information is required.

Response RAI-14.6.12

The references to the Radiation Protection Program (terminology used in NUREG 1537 and ANSI 15.1) and the Radiation Safety Program (used by UMass) are one and the same. The word "protection" has been deleted and the word "safety" added to the proposed technical specification 6.3(1) for consistency with UMass terminology. Further inconsistencies in the SAR shall be corrected in a future update. The phrase "shall generally conform to" has been deleted and the term "should use" has been added to proposed technical specification 6.3(1) as suggested in the RAI.

RAI-14.6.13

Proposed TS 6.4(1) would require that:

Written procedures, reviewed and approved by the Reactor Supervisor or designee, and the RSSC shall be in effect and followed for the following items….
…

e. administrative controls for operations and maintenance and for the conduct of irradiations and experiments that could affect reactor safety or core reactivity;

f. …

g. use, receipt, and transfer of byproduct material, if appropriate.

However, the NRC staff notes that activities and experiments which may not necessarily directly involve the reactor and its operation may occur at the UMLRR facility, under the NRC Facility Operating License No. R-125 for the UMLRR. These activities and experiments (e.g., gamma irradiations using the cobalt-60 sources or irradiated fuel) could affect personnel safety, but not

necessarily directly affect reactor safety or core reactivity. The NRC staff also notes that the use, receipt, and transfer of byproduct material may occur at the UMLRR facility, also under Facility Operating License No. R-125.

The NRC staff also notes that proposed TS 6.4(1) states that procedures are reviewed and approved by the RSSC. However, proposed TS 6.2.3 does not appear to require RSSC approval of new procedures; proposed TS 6.2.3(1), item b., only requires RSSC review of new procedures and major revisions to procedures.

Revise proposed TS 6.4(1), items e. and g., such that they would be specific to the types of activities conducted at the UMLRR. Additionally, revise proposed TS 6.4(1) and/or TS 6.2.3(1) such that these TSs are consistent. Alternatively, discuss why no changes are required.

Response RAI-14.6.13

The proposed technical specification 6.4(1) has been revised to be consistent with proposed technical specification 6.2.3 (and also ANSI/ANS 15.1 6.2.3 and 6.4) for review and approval of procedures, and has been modified by adding item (h) specific to gamma facilities operations. The phrase "if appropriate" has been deleted from item (g).

RAI-14.6.14

Proposed TS 6.4(2) would require that:

Substantive changes to procedures shall be made with the approval of the Reactor Supervisor or designee, and the RSSC. Minor changes to procedures that do not change the original intent may be made by a senior reactor operator, but the change must be approved by the Reactor Supervisor or designee. Temporary deviations from procedures may be made by a senior reactor operator in order to deal with special or unusual circumstances or conditions. Such deviations shall be documented and reported within 24 hours or the next working day to the Reactor Supervisor or designee.

However, the NRC staff notes that proposed TS 6.4(2) does not make clear that all changes to procedures, including minor changes and temporary deviations, shall be evaluated as required by 10 CFR 50.59, to determine whether the changes or deviations can be made under 10 CFR 50.59, or whether they would require a license amendment.

The NRC staff also notes that proposed TS 6.4(2) states that all substantive changes to procedures shall be approved by the RSSC. However, proposed TS 6.2.3 does not appear to require RSSC approval of changes to procedures; proposed TS 6.2.3(1), item b., only requires RSSC review of new procedures and major revisions to procedures.

Revise proposed TS 6.4(2) to clarify that all changes to procedures, including minor changes and temporary deviations, and new procedures, are subject to evaluation as required by 10 CFR 50.59. Additionally, revise proposed TS 6.4(2) and/or TS 6.2.3(1) such that these TSs are consistent. Alternatively, discuss why no changes are required.

Response RAI-14.6.14

The proposed technical specification 6.4(2) has been simplified and clarified to state any procedure deviation, as opposed to minor and/or temporary, shall include a review pursuant to 10 CFR 50.59. The changes also remove the inconsistency related to technical specification 6.2.3(1).

RAI-14.6.15

The guidance in ANSI/ANS-15.1, Section 6.4, states, in part, that written procedures for personnel radiation protection shall be prepared, reviewed, and approved prior to initiating activities for which such procedures would be applicable. The procedures should be reviewed by the safety committee and approved by Level 2 management or designee. ANSI/ANSI-15.1, Section 6.4, also recommends requirements for change control of procedures, including procedures for personnel radiation protection.

Proposed TS 6.4(3) would require that:

Written procedures for personnel radiation protection shall be reviewed and approved in accordance with the Radiation Protection Program (Specification 6.3). The procedures shall be consistent with the applicable regulations or guidelines. The radiation protection program and procedures shall include management commitment to maintain exposures and releases as low as reasonably achievable.

However, the NRC staff notes that proposed TS 6.4(3) does not specify that radiation protection procedures would be approved prior to initiating relevant activities, consistent with ANSI/ANS-15.1, Section 6.4 (or that procedures "shall be in effect and followed," consistent with the language used for other types of procedures in proposed TS 6.4(1)). Proposed TS 6.4(3) also does not appear to clearly require that radiation protection procedures be reviewed by the RSSC and approved by Level 2 management or designee. Additionally, it is not clear whether the change control requirements of proposed TS 6.4(2) for other procedures would apply to the radiation protection procedures required by proposed TS 6.4(3).

Revise proposed TS 6.4(3) to clarify that radiation protection procedures shall be approved prior to initiating relevant activities; revise proposed TS 6.4(3) to clearly require that radiation protection procedures be reviewed by the RSSC and approved by Level 2 management or designee; and revise TS 6.4(2) and/or TS 6.4(3) to clarify that the change control requirements of TS 6.4(2) would apply to the procedures required by TS 6.4(3). Alternatively, discuss why no changes are required.

Response RAI-14.6.15

The proposed technical specification 6.4.3 has been deleted. Item (e) has been added to proposed technical specification 6.4.1. In addition, item (g) has been added for procedures related to the gamma irradiation facilities. The statement of management commitment to ALARA has been added to the proposed technical specification 6.3.

As noted in ANSI/ANS 15.1 section 6.4, the activities listed in section 6.4 may be included

among various procedures. Such is the case related to personnel radiation safety procedures for the UMLRR. Radiation safety procedures (or steps) are included within several operations procedures associated with the reactor and gamma facilities -- for example, requirements for the performance of radiation surveys. In addition, there are specific reactor procedures for daily checks and calibration of the reactor radiation monitoring system. Item (e) includes language that the personnel radiation protection procedures considered under this technical specification are specific to the facility radiation monitoring system and the reactor experimental facilities and the gamma experimental facilities. There are no specific separate UMLRR procedures for personnel radiation safety. However, as noted in the SAR Chapter 11, The UMass Lowell Radiation Safety Program (RSP) has the responsibility for the safety and control of all radioactive and radiation emitting sources at the university, including the reactor facility. The RSP maintains the university's broad scope Type-A license for byproduct material and maintains the procedures required by 10 CFR 33.13(c) and also 10 CFR 20.1101(b) (or the equivalent regulations under Massachusetts statutes as an agreement state). These procedures are generic to the entirety of the RSP. While the UMLRR may be somewhat unique in that the radiation safety program for the reactor falls under the umbrella of the university-wide Radiation Safety Program, ANSI/ANS 15.1 section 1.2.1 recognizes that not all the various requirements of the standard are applicable to every facility. NUREG 1537-2, 14-1 also states the same recognition. It would not be practical for the Reactor Safety Sub-committee and Level 2 to review and approve the generic RSP procedures under the provisions of TS 6.4(1). This does not preclude the procedures specific to the reactor facility as noted above. The RSP and associated procedures have been shown by State and NRC inspections to be sufficient for protecting the environment and the health and safety of the public and radiation workers.

RAI-14.6.16

The guidance in ANSI/ANS 15.1, Section 6.5(1), states that TSs should require that a new experiment or class of experiment shall be reviewed by the reactor safety committee (in accordance with other TS requirements related to reactor safety committee review), and approved in writing by the Level 2 authority or designee. ANSI/ANS 15.1, Section 6.2.3, contains guidance related to areas that should be reviewed by the reactor safety committee, and ANSI/ANS 15.1, Section 6.2.3(3), states that the reactor safety committee should review "[a]ll new experiments or classes of experiments that could affect reactivity or result in the release of radioactivity."

Proposed TS 6.5(1) states, in part, "[a]n experiment using the reactor shall not be conducted until a favorable evaluation indicated in writing is rendered by the RSSC. All proposed experiments using the reactor shall be documented and included a description and a safety evaluation prepared by either the experimenter or individual(s) appointed by the Reactor Supervisor."

SAR Sections 10.3 and 12.2.3 state that the safety evaluation performed for proposed experiments is done by the experimenter and a staff member approved by the RSSC.

The NRC staff notes that proposed TS 6.5(1) appears to be inconsistent with proposed TS

6.2.3(1), item c., which requires that the RSSC review "[a]ll new experiments or classes of experiments that could affect reactivity or result in the release of radioactivity." The NRC staff also notes that proposed TS 6.5(1) would not clearly require that each new experiment or class of experiment shall be reviewed by the reactor safety committee (as applicable), and approved in writing by the Level 2 authority or designee, consistent with ANSI/ANS 15.1, Section 6.5(1).

Additionally, the NRC staff notes that the proposed TS 6.5(1) requirement that experiment safety evaluations be performed by either the experimenter or individual(s) appointed by the Reactor Supervisor appears to be inconsistent with SAR Sections 10.3 and 12.2.3.

Proposed TS 6.5(1) also appears to contain a typographical error in that "documented and included a description" should read "documented and include a description."

Revise proposed TS 6.5(1) to clearly state that each new experiment shall be reviewed by the RSSC as required by proposed TS 6.2.3(1) (such that proposed TS 6.5(1) will be consistent with proposed TS 6.2.3(1), item c.), and approved in writing by the Level 2 authority or designee; revise proposed TS 6.5(1) to be consistent with SAR Sections 10.3 and 12.2.3; and revise proposed TS 6.5(1) to correct the apparent typographical error. Alternatively, discuss why no changes are required.

Response RAI-14.6.16

The proposed technical specification 6.5 included legacy language in the current technical specifications. Proposed specifications 6.5(1), 6.5(2), and 6.5(3) have been deleted. New proposed specifications 6.5(1) and 6.5(2) have been added using language consistent with ANSI/ANS 15.1 section 6.5.

RAI-14.6.17

Proposed TS 6.5(2) would require that, "[p]rior to performing any new reactor experiment, an evaluation of the experiment shall be made by the RSSC and shall consider: …."

However, the NRC staff notes that the proposed TS 6.5(2) language appears to be inconsistent with proposed TS 6.2.3(1), which requires that the RSSC review experiments that could affect reactivity or result in the release of radioactivity.

Revise proposed TS 6.5(2) to state that RSSC's "reviews" (conducted as required by proposed TS 6.2.3(1)) of experiments shall consider certain items, or discuss why no change is required.

Response RAI-14.6.17

Please see response to RAI 14.6.16.

RAI-14.6.18

Proposed TS 6.5(2), item c., would require that the RSSC shall consider "[w]hether or not the experiment, by virtue of its nature and/or design, includes an un-reviewed safety question or constitutes a significant threat to the integrity of the core, the integrity of the reactor, or to the safety of personnel…."

However, it is not clear to the NRC staff what is meant by "includes an un-reviewed safety question" (i.e., whether this is intended to indicate that the RSSC performs a 10 CFR 50.59 review, or something else).

Revise proposed TS 6.5(2), item c., to clarify what is meant by the requirement that the RSSC shall consider whether an experiment "includes an un-reviewed safety question" (and ensure that the revised TS language is consistent with 10 CFR 50.59, as appropriate); delete this language from proposed TS 6.5(2), item c., and discuss why it is not needed; or, discuss why no change or additional information is required.

Response RAI-14.6.18

Please see response to RAI 14.6.16.

RAI-14.6.19

The guidance in ANSI/ANS-15.1, Section 6.5(2), states that TSs should require that substantive changes to previously reviewed and approved experiments shall be made only after a new reactor safety committee review and approval in writing by the Level 2 authority or designee; minor changes that do not significantly alter experiments may be approved by the Level 3 authority or above.

Proposed TS 6.5(3) would state:

An experiment that has had prior RSSC approval and has been performed safely shall be a routine experiment and requires only the approval of the Reactor Supervisor (or designee) and the Radiation Safety Officer (or designee) to be repeated. An experiment that represents a minor variation from a routine experiment, not involving safety considerations of a different kind, shall be considered the equivalent of a routine experiment and may be approved by agreement of the Reactor Supervisor (or designee) and the Radiation Safety Officer (or designee).

The NRC staff notes that proposed TS 6.5(3) appears to be inconsistent with proposed TS 6.2.3(1), item c., which requires that the RSSC review "[a]ll new experiments or classes of experiments that could affect reactivity or result in the release of radioactivity." The NRC staff also notes that proposed TS 6.5(3) would not clearly require that substantive changes to previously reviewed and approved experiments shall be reviewed by the reactor safety committee, and approved in writing by the Level 2 authority or designee, consistent with ANSI/ANS 15.1, Section 6.5(2).

The NRC staff also notes that it is not clear what is meant by "[a]n experiment that represents a minor variation from a routine experiment, not involving safety considerations of a different kind," i.e., whether this is intended to mean an experiment that is a minor variation from a previous experiment, but is still within the scope of a previously reviewed and approved safety evaluation, or whether this is an experiment that is a minor variation but is outside the scope of a previous evaluation.

Revise proposed TS 6.5(3) to clearly state that each substantive change to a previously

reviewed and approved experiment or class of experiments shall be reviewed by the RSSC and approved in writing by the Level 2 authority or designee, and to be consistent with proposed TS 6.2.3(1), item c. Additionally, revise proposed TS 6.5(3) to clarify what is meant by "[a]n experiment that represents a minor variation from a routine experiment, not involving safety considerations of a different kind," and to clarify that all such changes to experiments are subject to the requirements of 10 CFR 50.59, and to RSSC review, if appropriate; or delete the second sentence of proposed TS 6.5(3) and discuss why it is not necessary. Alternatively, discuss why no changes are required.

Response RAI-14.6.19

Please see response to RAI 14.6.16.

RAI-14.6.20

The guidance in ANSI/ANS-15.1, Section 6.7.2, states TSs should require that a violation of a SL, significant release of radioactivity, or certain other reportable occurrences shall be reported to licensing authorities not later than the following working day by telephone, and confirmed in writing by facsimile or similar conveyance.

The guidance in NUREG-1537, Part 1, Appendix 14.1, Section 6.7.2, states that special telephone reports of events should be made to the NRC Headquarters Operations Center.

Proposed TS 6.6.1(3) states that "safety limit violation[s] shall be reported by telephone to the NRC within 24 hours."

Proposed TS 6.7.2 states that "[a] report shall be made by telephone or other communication systems to the U.S. Nuclear Regulatory Commission Headquarters Operations Center within 24 hours of:" a SL violation, significant release of radioactivity, or reportable occurrence.

The NRC staff notes that proposed TSs 6.6.1(3) and 6.7.2 do not appear to require that the initial report be confirmed in writing. Additionally, the NRC staff notes that proposed TSs 6.6.1(3) and 6.7.2 appear to have inconsistent requirements for the reporting of a SL violation. Specifically, TS 6.6.1(3) requires report by telephone to the NRC; TS 6.7.2 specifically requires a report to the NRC Headquarters Operations Center, and states that the report shall be made by telephone or other communication system.

Revise proposed TSs 6.6.1(3) and 6.7.2 to consistently require that SL violations (and significant releases of radioactivity, and other reportable events, in the case of TS 6.7.2) be reported by telephone to the NRC Headquarters Operations Center, and subsequently confirmed in writing, by fax, or by email, within 24 hours. Alternatively, discuss why no change is required.

Response RAI-14.6.20

Proposed technical specifications 6.6.1(3) and 6.7.2 have been revised as requested. In addition, proposed TS 6.7.2(1-b) has been revised to remove unnecessary legacy wording taken from the current technical specifications.

RAI-14.6.21

The guidance in ANSI/ANS-15.1, Section 6.7.2, states that TSs should require that follow-up reports for a violation of a SL, significant release of radioactivity, or other reportable occurrence shall be submitted to licensing authorities within 14 days.

The guidance in NUREG-1537, Part 1, Appendix 14.1, Section 6.7.2, states that special written reports of events should be sent to the NRC Document Control Desk.

Proposed TS 6.7.2(2) would require that such reports be submitted to the NRC Document Control Desk within 14 days.

Proposed TS 6.6.1(5) would require that reports for a SL violation "be submitted to the NRC within 14 working days, and any follow-up report shall be submitted to the NRC when authorization is sought to resume operation of the reactor."

The NRC staff notes that the language and requirement in proposed TS 6.6.1(5) does not appear to be consistent with proposed TS 6.7.2(2), ANSI/ANS-15.1, Section 6.7.2, and NUREG-1537, Part 1, Appendix 14.1, Section 6.7.2. Revise proposed TS 6.6.1(5) to require that reports for a SL violation be submitted to the NRC Document Control Desk, and that the initial report be submitted with 14 (calendar) days. Alternatively, discuss why no changes are required.

Response RAI-14.6.21

Proposed technical specifications 6.6.1(5) has been revised as requested.

RAI-14.6.22

The guidance in ANSI/ANS-15.1, Section 6.7.2(c)(iii), states that reportable occurrences should include a reactor safety system component malfunction that renders or could render the reactor safety system incapable of performing its intended safety function (if the malfunction is caused by maintenance, then it should not be required to be reportable).

Proposed TS 6.6.2(1), item d., states that reportable occurrences include "[a] safety system component malfunction during reactor operation that renders or could render the safety system incapable of performing its intended function."

However, the NRC staff notes that safety system component malfunctions, not caused by maintenance, could also occur (or be discovered) when the reactor is not operating.

Revise proposed TS 6.6.2(1), item d., such that any reactor safety system component malfunction, not caused by maintenance, that renders or could render the reactor safety system incapable of performing its intended safety function, shall be a reportable event, consistent with ANSI/ANS-15.1, Section 6.7.2(c)(iii). Alternatively, discuss why no change is required.

Response RAI-14.6.22

Proposed technical specifications 6.6.2(1-d) has been revised as requested.

RAI-14.6.23

The guidance in ANSI/ANS-15.1, Section 6.7.2(c)(iv), states that reportable occurrences should include an unanticipated or uncontrolled change in reactivity greater than one dollar, but that a smaller quantity should be specified for reactors where this is appropriate.

UML's step reactivity insertion transient analyses, which are discussed primarily in SAR Sections 13.1.2 and 13.2.2, as supplemented by UML's response to RAI-13.1 (ADAMS Accession No. ML17090A348), assume that 0.6% Δk/k of positive reactivity (which the NRC staff notes equals approximately 77 cents of reactivity for the UMLRR) is instantaneously inserted into the reactor.

Proposed TS 6.6.2(1), item e., states that reportable occurrences include "[a]n uncontrolled or unanticipated increase in reactivity in excess of 0.78% Δk/k (one dollar)."

The NRC staff notes that proposed TS 6.6.2(1), item e., appears to be inconsistent with ANSI/ANS-15.1, Section 6.7.2(c)(iv), because TS 6.6.2(1), item e., specifies an "increase" in reactivity instead of any change in reactivity. Additionally, the NRC staff notes that, because any unanticipated or uncontrolled change in reactivity greater than 0.6% Δk/k would be an event beyond the accidents analyzed for the UMLRR, a reactivity change of this magnitude should be a reportable event for the UMLRR.

Revise proposed TS 6.6.2(1), item e., to state that reportable occurrences include any uncontrolled or unanticipated change in reactivity greater than 0.6% Δk/k, or discuss why no change is required.

Response RAI-14.6.23

Proposed technical specifications 6.6.2(1-e) has been revised as requested and with additional language matching ANSI/ANS 15.1 section 6.7.2(iv).

RAI-14.6.24

Proposed TS 6.6.2(1), item a., states that reportable occurrences include a "[r]elease of radioactivity from the reactor containment building above allowed limits."

Proposed TS 6.6.2(1), item f., states that reportable occurrences include "[a]n abnormal and significant degradation in reactor fuel and/or cladding, coolant boundary, or containment boundary (excluding minor leaks)."

In its response to RAI-6.1 (ADAMS Accession No. ML17090A348), UML states that it requests that the NRC evaluate its reactor building (which is currently considered to be a containment building) as a confinement building.

Revise proposed TS 6.6.2(1), items a. and f., to reflect that the reactor building is designed for confinement, consistent with the response to RAI-6.1, or discuss why no changes are required.

Response RAI-14.6.24

Proposed technical specifications 6.6.2(1) items a and f have been revised as requested.

RAI-14.6.25

The guidance in ANSI/ANS-15.1, Section 6.6.2(1), states that TSs should require that in the event of a reportable occurrence, if it is necessary to shut the reactor down to correct the occurrence, operations shall not be resumed unless authorized by the Level 2 authority or designee.

Proposed TS 6.6.2(2), item b., would require that in the event of a reportable occurrence, "[t]he Reactor Supervisor shall be notified as soon as possible and corrective action shall be taken before resuming the operation involved."

The NRC staff notes that proposed TS 6.6.2(2), item b., would require that the Level 2 authority be notified, and that corrective action be taken before resuming the specific operation that resulting in the reportable occurrence, but it would not clearly require that all operations be suspended until authorized by the Level 2 authority or designee.

Revise proposed TS 6.6.2(2), item b., to require that in the event of a reportable occurrence, if it is necessary to shut the reactor down (or stop an experiment or irradiation facility use, if applicable) to correct the occurrence, no reactor (or experiment or irradiation facility operations, if applicable) shall be resumed unless authorized by the Level 2 authority or designee. Alternatively, discuss why no change is required.

Response RAI-14.6.25

The items in proposed technical specifications 6.6.2(2) has been revised as requested.

RAI-14.6.26

The guidance in NUREG-1537, Part 1, Appendix 14.1, Section 6.7.1, states that operating reports should be sent to the NRC Document Control Desk.

The proposed TS 6.7.1 states, in part, "[a]n annual or operating report shall be submitted to the U.S. Nuclear Regulatory Commission within ninety days following the 30th of June of each year."

However, proposed TS 6.7.1 would not specifically require that this report be sent to the NRC Document Control Desk. Revise proposed TS 6.7.1 to require that the annual or operating report be sent to the NRC Document Control Desk, or discuss why no change is required.

Response RAI-14.6.26

Proposed technical specifications 6.7.1 has been revised as requested.

RAI-14.6.27

The regulation in 10 CFR 50.59(d)(2) states, in part, that licensees "shall submit … a report containing a brief description of any changes, tests, and experiments, including a summary of the evaluation of each. A report must be submitted at intervals not to exceed 24 months."

The guidance in ANSI/ANS-15.1, Section 6.7.1(4), states that TSs should require that operating reports should include a tabulation of major changes in the facility and procedures, and of new tests and/or experiments, including a summary of evaluations leading to a conclusion that the changes, tests, and/or experiments did not require a license amendment.

The guidance in NUREG-1537, Part 1, Appendix 14.1, Section 6.7.1, states that the guidance in ANSI/ANS-15.1, Section 6.7.1(4), refers to the reporting required by 10 CFR 50.59, and reporting TSs should specifically reference 10 CFR 50.59.

Proposed TS 6.7.1(4) would require that operating reports include "[a] summary of the safety analyses performed in connection with changes to the facility or procedures, which affect reactor safety, and performance of tests or experiments carried out under the requirements of 10 CFR 50.59."

The NRC staff notes that it is not clear which changes to the facility or procedures are considered to "affect reactor safety," i.e., whether this is referring to changes for which a 10 CFR 50.59 evaluation was performed, or something different. The NRC staff also notes the proposed TS 6.7.1(4) references 10 CFR 50.59 with respect to tests and experiments, but does not clearly and specifically state that 10 CFR 50.59 evaluations related to tests and experiments shall be reported.

Revise proposed TS 6.7.1(4) to clearly require that operating reports shall include a tabulation of changes in the facility and procedures, and of new tests and/or experiments, which required a 10 CFR 50.59 evaluation, including a summary of 10 CFR 50.59 evaluations leading to a conclusion that the changes, tests, and/or experiments did not require a license amendment. Alternatively, discuss why no change is required.

Response RAI-14.6.27

Legacy wording from the current technical specification has been removed from proposed technical specification 6.7.1(4). Wording consistent with that found in other recently re-licensed NPRs (e.g., NIST, MURR, etc.) has been substituted.

RAI-14.6.28

Proposed TS 6.7.1(5) would require that annual or operating reports include:

A summary of the nature and amount of radioactive effluents released or discharged to environs beyond the effective control of the owner or operator, or both, as determined at, or before, the point of such release or discharge. If the estimated average release after dilution or diffusion is <25% of the concentration allowed or recommended, a statement to this effect is sufficient.

However, the NRC staff notes that it is not clear what is meant by the "environs beyond the

effective control of the owner or operator, or both," or "the concentration allowed or recommended."

Revise proposed TS 6.7.1(5) to be facility-specific by clarifying what is meant by the "environs beyond the effective control of the owner or operator, or both" (i.e., clarify that this is the area beyond the UMLRR licensed boundary, or something else). Additionally, revise proposed TS 6.7.1(5) to reference a specific "concentration allowed or recommended" (i.e., proposed TS 3.6.2 and/or regulatory limits). Alternatively, discuss why no changes are required.

Response RAI-14.6.28

The proposed technical specification 6.7.1(5) had removed the legacy wording used in the current technical specification and substituted the wording provided in ANSI/ANS 15.1 section 6.7.1(5). As requested, the wording has been revised to clarify the area under control of the licensee and includes a reference to the regulatory limits.

RAI-14.6.29

Proposed TS 6.7.1(7) would require that annual or operating reports include "[a] summary of exposures received by facility personnel and visitors where such exposures are <25% of that allowed or recommended."

However, the NRC staff notes that it is not clear what is meant by "that allowed or recommended." Additionally, proposed TS 6.7.1(7) appears to contain a typographical error in that "<25%" should read ">25%."

Revise proposed TS 6.7.1(7) to clarify what limit (e.g., regulatory limit, or other UML administrative limit) is being referred to, and to correct the apparent typographical error. Alternatively, discuss why no changes are required.

Response RAI-14.6.29

The proposed technical specification 6.7.1(7) had removed the legacy wording used in the current technical specification and substituted the wording provided in ANSI/ANS 15.1 section 6.7.1(7). As requested, the specification has been revised to include a reference to the regulatory limits and the typographical error has been corrected.

RAI-14.6.30

The regulations in 10 CFR 50.36(c)(1)(i)(A), 10 CFR 50.36(c)(1)(ii)(A), and
10 CFR 50.36(c)(2)(i) require, in part, that research reactors retain the record of the results of each review pertaining to a violation of a SL, LSSS, or LCO until the NRC terminates the license for the reactor.

Proposed TS 6.8.3 would impose requirements for records to be retained for the life of the facility, but does not appear to require retention of records related to reviews of SL, LSSS, or LCO violations.

Revise proposed TS 6.8.3 to require that reviews and reports pertaining to a violation of a SL, LSSS, or LCO be retained for the life of the facility. Alternatively, discuss why no change is required.

Response RAI-14.6.30

The information in proposed technical specification 6.8.3(5) has been moved to the preamble of TS 6.8.3 and information as requested added to TS 6.8.3(5).

RAI-14.6.31

Proposed TS 6.8.3(5) requires that records to be retained for the life of the facility include "Applicable annual reports, if they contain all of the required information, may be used as records in this section."

However, proposed TS 6.8.3 appears to contain an editorial error because proposed TS 6.8.3(5) is not a type of record, but is a statement that annual reports may be used as record.

Revise proposed TS 6.8.3 to correct the apparent editorial error by separating proposed TS 6.8.3(5) from the list of records under proposed TS 6.8.3. Alternatively, discuss why no change is required.

Response RAI-14.6.31

The response to RAI 14.6.30 includes this request.

End of RAI Responses