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August 3, 2016

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U. S. Nuclear Regulatory Commission
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Reference: Oregon State University TRIGA Reactor (OSTR)
Docket No. 50-243, License No. R-106
License Amendment Request Letter Dated August 18, 2014
Request for Additional Information Letter Dated June 21, 2016

Subject: Answers to Request of Additional Information

Mr. Balazik:

This letter serves as a response to the Request for additional information (RAI) letter dated June 21, 2016, addressing questions pertaining to a license amendment for the purpose of modifying an existing technical specification (TS) to encompass fueled experiments submitted August 18, 2014. Attached to this letter is an enclosure which provides the questions (**Bold**) and our answers to those questions.

I hereby affirm, state, and declare under penalty of perjury that the foregoing is true and correct.

Executed on: 8/3/16.

If you have any questions, please do not hesitate to contact me.

Sincerely,

Steve Reese
Director

Enclosure

cc: Document Control, USNRC
Dr. Cynthia Sagers, OSU
Dr. Andy Klein, OSU

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Enclosure

Answers to Request for Additional Information
for the Fissile Material Irradiation License Amendment Request
Oregon State University TRIGA® Reactor
Docket No. 50-243

General Corrections:

1. **ANSI/ANS-15.1-2007, Section 3.8.2, "Materials," states that special requirements shall be established for significant amounts of special materials such as fissionable materials.**

   **The proposed addition to OSTR TS 3.8.3, "Failures and Malfunctions," Specification b, is to allow irradiation of fissile material limited to the analyzed amount of iodine-131 during a maximum hypothetical accident as documented in OSTR's safety analysis report (SAR) (ADAMS Accession No. ML073250128), Section 13.2.1. The current OSTR TS 3.8.3, Specifications a through d, are assumptions that ensure conservatism in the safety analysis of experiments.**

   **Justify including the proposed changes in OSTR TS 3.8.3 and not in OSTR TS 3.8.2, "Materials," which limits reactor operation to material specific quantities in experiments or propose changes to TS 3.8.2.**

   As stated in the amendment request letter, the intent of the amendment is to limit the amount of fissile material to be irradiated based upon the amount of I-131 released. The basis for this was that the amount released in the SAR was shown to produce doses well below the values for occupational workers and below the limit for doses to the general public from routine releases. As the release amount deals with the amount released during a failure or malfunction of an experiment, it is more appropriate to place the restriction under TS 3.8.3 Failures and Malfunctions.

2. **NUREG-1537, Part 2, Section 10.3, "Experiment Review," identifies areas to be assessed regarding the release of radioactive material from an experiment. An important factor in determining a potential release is the methodology for calculating a release fraction for a particular fissile experiment.**

   **ANSI/ANS-15.1-2007, Section 6.4, "Procedures," requires written procedures be prepared, reviewed, and approved prior to initiating certain activities. One activity listed is administrative controls for the conduct of irradiation and experiments that could affect reactor safety or core reactivity.**

**Provide the methodology for determining the release fraction for an experiment containing fissile material. Additionally, state which OSTR procedure(s) is used to determine the release fraction for fissile experiments.**

For the OSTR, the procedures which describe the process for review and approval of an experiment can be found in OSTROP 18, *Procedures for the Approval and Use of Reactor Experiments*. This procedure captures the explicit intent of both NUREG-1537, Part 2, Section 10.3 and ANSI/ANS-15.1-2007, Section 6.4 as it relates to experiment review. In summary, the procedure for approving a new experiment first involves submission of a detailed description of the experiment by the researcher. Considerations that must be included in this description include, but are not limited to, the reactor facilities to be used, people involved, estimates of the types and amounts of radioisotopes to be produced, radiological handling, disposal, and other pertinent safety considerations. This is then reviewed by the Reactor Supervisor and the Senior Health Physicist who can outright reject the experiment, request revisions to the experiment, or recommend forwarding the experiment to the Reactor Operations Committee for review and approval. Once approved, it becomes classified as an approved experiment.

The basis for determining the release fraction is not explicitly described in OSTROP 18 nor is there an intent to. Because of the number of different forms a sample to be irradiated can take (as requested by a researcher), approved experiments are written to simply envelope conditions for an irradiation. It is up to the engineering judgment of the OSTR Staff and the ROC to determine whether the estimated release fraction is appropriate for the irradiation conditions described. This may include, but is not limited to, asking for an experiment to be performed to actually measure the release fraction under lower power or sample mass conditions or, when limited or no information on the release fraction is known or provided, it may be reasonable for the OSTR Staff and/or the ROC to require a 100% release assumption.

3. **ANSI/ANS-15.1-2007, Section 6.2.3, "Review Function," lists several items that shall be reviewed by the licensee. Item (3) states that all new experiments or classes of experiments that could affect reactivity or result in the release of radioactivity.**

   **The OSTR SAR states that experiments are classified according to potential impact on the facility and potential radioisotope production. The OSTR SAR identifies three classes of experiments as Class A, Class B, or Class C.**

   **Identify and justify which class of experiments (A, B, or C) applies to experiments containing fissile material.**

   The class of experiments that contain fissile material would be Class B. This classification is most appropriate because Class B experiments are intended for experiments that allow for multiply irradiations and are intended for experiments that

may involve larger changes in reactivity, external shielding changes, and/or larger amounts of radioisotope production.

4. **ANSI/ANS-15.1-2007, Section 3.4.1, "Operations that require containment or confinement," states that movement of irradiated fuel or fueled experiments with significant fission product inventory outside of containers, systems, or storage areas requires confinement be in operation.**

   **The proposed OSTR TS 3.8.3, Specification b, is for irradiation of fissile material, regardless of experimental location in the OSTR. The objective of OSTR TS 3.5, "Ventilation System," is to assure that the ventilation system shall be in operation to mitigate the consequence of possible releases of radioactive materials resulting from reactor operations. TS 3.5, Specification a, restricts reactor operation unless the facility ventilation system is operating.**

   **Justify not having the facility ventilation system in operation, as stated in OSTR TS 3.5, when transferring a fissile experiment from an experimental location or propose a TS to require ventilation operation.**

   We proposed that TS 3.5.c be added to this section:

   > "Irradiated fissile experiments shall not be transferred from an irradiation facility unless the facility ventilation system is operating and the reactor bay pressure is maintained negative with respect to surrounding areas."

5. **NUREG-1537, Part 1, Chapter 14, "Technical Specifications," Appendix 14.1, "Format and Content of Technical Specifications for Non-Power Reactors," Section 3.7.1, "Monitoring Systems," states that the specified fission product monitor could be the continuous air monitor or the primary coolant monitor, depending on the release scenarios analyzed in the safety analysis report. Release of fission products from both fuel and fueled experiments should be included.**

   **The proposed OSTR TS 3.8.3, Specification b, is for irradiation of fissile material, regardless of experimental location. The objective of OSTR TS 3.7, "Radiation Monitoring Systems and Effluents," is to specify the minimum radiation monitoring channels that shall be available to the operator to assure safe operation of the reactor. TS 3.7.1, Specifications, restricts reactor operation unless the minimum number of radiation channels listed in Table 4 are operating.**

   **Justify not having the minimum radiation monitoring channels in operation, as stated in OSTR TS 3.7.1, when transferring a fissile experiment from an experimental location or propose a TS to require minimum radiation monitoring channels.**

   We proposed that TS 3.7.1 be modified from:

"The reactor shall not be operated unless the minimum number of radiation monitoring channels listed in Table 4 are operating."

to:

"The reactor shall not be operated nor shall irradiated fissile experiments be transferred from an irradiation facility unless the minimum number of radiation monitoring channels listed in Table 4 are operating."

Additionally, we propose that the following sentence be added to the end of the Basis of TS 3.7.1:

"Because failure of an irradiated fissile experiment could result in a sudden unexpected release of radioactivity, the above exception does not apply when such experiments are being transferred."