Environmental Safety Request for Additional Information for the TRISO-X License Application Review

RAI-1 Gaseous Effluent Concentrations in Unrestricted Areas:

Regulatory Basis:

Title 10 of the *Code of Federal Regulations* (10 CFR) section 20.1302(a) states "The licensee shall make or cause to be made, as appropriate, surveys of radiation levels in unrestricted and controlled areas and radioactive materials in effluents released to unrestricted and controlled areas to demonstrate compliance with the dose limits for individual members of the public in § 20.1301." The dose limits in § 20.1301 apply to the "total effective dose equivalent … from the licensed operation."

Describe Issue:

The applicant has proposed to monitor routine gaseous effluents at elevated release points and control concentrations at the points of discharge consistent with the dose limits in § 20.1301. "Section 4.12.2.2.2.2 of the ER states" To ensure regulatory requirements of 10 CFR Part 20.1101, 10 CFR Part 20.1302, 10 CFR Part 70.59 (CFR, 2021b), and 40 CFR Part 190 (CFR, 2021c) are met, gaseous effluent release points (stacks) are monitored." This approach assumes routine releases consist only of stack discharges. The statements in section 4.12.2.2.1 of the ER stipulate "airborne activity concentration limits are … 10 percent of the 10 CFR 20, Appendix B, Table 2 values" and the "dose at the site boundary is limited to 10 mrem per year.

Based on the License Application (LA) and the Environmental Report (ER), the applicant's licensed operations may include radiological environmental emissions due to normal operations or abnormal conditions. Under normal operating conditions, radiological effluents would be released from elevated stack discharge points. Some accident sequence scenarios result in releases from the stacks. The highest environmental concentrations of radioactive material resulting from stack releases are likely to be outside the controlled area.

TRISO-X now proposes to limit emissions based on the conservative assumption that the maximally exposed individual is at the stacks' release points. This ensures that maximum environmental concentrations and the environmental concentrations at the site boundary are well below regulatory limits. However, the new proposals conflict with existing statements in the ER and the LA.

This new approach assumes that the applicant's process and administrative controls prevent significant unmonitored routine emissions and fugitive emissions. Appropriate surveys, in the form of a radiological environmental monitoring program (REMP), in unrestricted and controlled areas, including the controlled area boundary, are necessary to validate this assumption. The REMP must also provide a capability to assist assessments of potential accidental releases.

In addition, the REMP should include appropriate surveys of potential build-up of uranium emissions in soil as a means to support assessments of potential accidental releases and periodic reviews of the decommissioning plans.

Submittals to date by the applicant do not provide sufficient information to evaluate the proposed emissions controls with respect to the adequacy of the REMP.

Information Needed:

- Revise the LA and ER to clarify the applicant's commitment to limit effluent concentrations at the point of stack discharge to values below the 10 CFR 20, Appendix B, Table 2 values.
- Revise the LA to include a map of ambient air sampling locations and specify appropriate analyses and frequencies in the LA that would verify the absence of routine ground level emissions and provide the means to assess releases under off normal conditions.
- Revise the LA to provide a map of locations where stormwater or precipitation is expected to accumulate and specify appropriate sampling, analyses and frequencies in the LA appropriate to monitoring accumulation of contaminants in soil as a result of wet deposition of gaseous radiological effluents.
- Revise the LA to provide sufficient description of methods to distinguish facility emissions from natural or other confounding sources of radioactivity, such as trace contaminants that are identified in feed material assays.

RAI-2 Maximum Exposed Individual

10 CFR 20.1302(b) states that "a licensee shall show compliance with the annual dose limit in § 20.1301 by (1) demonstrating by measurement or calculation that the total effective dose equivalent to the individual likely to receive the highest dose from the licensed operation does not exceed the annual dose limit; or (2) demonstrating that the annual average concentrations of radioactive material … at the boundary of the unrestricted area do not exceed… values specified in table 2 of appendix B to part 20."

Describe Issue:

The proposed facility would generally release radiological effluents from elevated release points. The applicant currently proposes to define the unrestricted area boundary as the point of discharge from the stacks. However, this is not clearly explained in the LA. The use of 10 CFR 20.1302(b)(1) to demonstrate compliance with table 2 of appendix B to part 20 by measuring concentrations at the point of discharge from the stacks is conservative but conflicts with statements in the existing ER.

Information Needed:
Revise the LA to clearly explain that TRISO-X is calculating the maximumly exposed individual to be at the point of discharge from the stacks. Review and update the LA and ER, as needed, to ensure this approach is used consistently with the applicant's current proposal for effluent monitoring and controls. Review ER Table 4.12.2-3 to ensure that units of distance are correctly specified.

RAI-3 Discharges to Sanitary Sewer:

Regulatory Basis:

10 CFR 20.2003, “Disposal by release into sanitary sewerage” states in part that “(a) A licensee may discharge licensed material into sanitary sewerage…” provide they meet certain specific conditions including solubility, concentration, and does not exceed specified quantities or radiological activity limits.

Describe Issue:

The ER indicates no planned liquid discharges to surface water or ground water are expected from the licensed activities. The ER indicates licensed material may be transported outside radiologically controlled areas. In addition, the LA Chapter 1, Section 1.1.4.7, states that bathrooms and showers discharge waste to the sanitary sewer system and thence to the City of Oak Ridge publicly owned treatment works. Chapter 9, Section 9.3.1, states sewer discharges to the City of Oak Ridge sewer system include restrooms and non-radiological process streams. The Safety Analysis Report and the ER do not include provisions to comply with 10 CFR 20.2003. The LA seems to imply that discharges will comply with City of Oak Ridge specifications but does not state the requirements or commit to specific limits. If the applicant is using the discharge requirements of the City of Oak Ridge to demonstrate compliance with the release limits in 10 CFR 20.2003, this assumption is not stated clearly in the application and no corresponding commitment is provided.

If TRISO-X will allow storage, processing or transiting of unsealed sources in areas that have sanitary sewer system drains, controls or monitoring must be implemented to prevent discharges that do not comply with the waste acceptance criteria or permit requirements of the local sewer treatment facility.

The LA is not clear regarding the presence of restrooms within the radiologically controlled area. The application is unclear if restrooms are located within the radiologically controlled area and do not explain how sewer discharges will be sampled and analyzed prior to discharge to the sewer, or how radioactive material discharges to the sewer will be prevented. The application also does not explain how TRISO-X plans to move radioactive material through uncontrolled areas that have connections to the sewer system.

Information Needed:

Revise the LA to provide the following information:

- Update the LA to specify the locations of restrooms and drains that lead to the sanitary sewer in relation to the controlled area and to changeroom facilities.
- Update the LA to describe how TRISO-X will prevent licensed radioactive material discharges to the sanitary sewer in excess of applicable U.S. Nuclear Regulatory Commission (NRC) limitations from restrooms or showers located in the controlled area or in changeroom facilities.
- Clarify whether the commitment to comply with the City of Oak Ridge discharge limits is being used to demonstrate compliance with the NRC release limits. If so, provide sufficient data to describe the waste acceptance criteria and permit limitations of the City of Oak Ridge treatment works to confirm the limits are bounding.

- Update the LA to describe how TRISO-X will prevent transport of dispersible radioactive material through uncontrolled areas that have restrooms or process streams connected to the municipal sewer.

RAI-4 Validation of Gaseous Effluent Concentrations in Unrestricted Areas:

Regulatory Basis:

10 CFR 20.1302(a) states “The licensee shall make or cause to be made, as appropriate, surveys of radiation levels in unrestricted and controlled areas and radioactive materials in effluents released to unrestricted and controlled areas to demonstrate compliance with the dose limits for individual members of the public in § 20.1301.”

Describe Issue:

With respect to environmental monitoring, the LA states (Chapter 9, Section 9.5) the “program provides additional validation of effluent monitoring systems, early detection and response to a negative trend in environmental data, and support data in the event of a release of radioactive material.” The LA further identifies air effluent discharge points and ambient air (Table 9-1) as environmental monitoring parameters. However, the ambient air monitoring described in the LA and the ER does not provide sufficient detail to substantiate the performance of the validation, detection, response and assessments mentioned above. Section 6.2.1.1 of the ER commits the applicant to providing an onsite meteorological tower to support assessments of accidental gaseous releases, but does not commit to utilize this data for long term assessments or trending of environmental data.

Information Needed:

- Revise the LA to explain how the measurements provided by the environmental monitoring program would validate effluent monitoring systems, provide early detection and response to a negative trend in effluent releases, and support assessments in the event of an accidental release of radioactive material.
- Revise ER Section 6.2.1.1 to include application of data provided by the onsite meteorological tower for long term assessments or trending of environmental data.