



TRISO-X, LLC  
801 Thompson Avenue  
Rockville, MD 20852  
+1 301.358.5600

TX0-REG-LTR-0031

---

~~THE ENCLOSURES TO THIS LETTER CONTAIN SECURITY RELATED INFORMATION~~  
~~WITHHOLD IN ACCORDANCE WITH 10 CFR 2.390~~

---

*ELECTRONIC DELIVERY*

December 15, 2023

Director, Office of Nuclear Material Safety and Safeguards  
U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555-0001

References: 1) Docket No. 70-7027  
2) TRISO-X letter from Jennifer Wheeler to Director, Office of Nuclear Material Safety and Safeguards, "TRISO-X Fuel Fabrication Facility License Application Submittal," dated April 5, 2022  
3) NRC letter from Matthew Bartlett, Senior Project Manager, Fuel Facility Licensing Branch, to Jennifer K. Wheeler, Director, Regulatory Affairs "Request For Additional Information Set Six For The Material Control And Accounting, Fire Safety, And Structural Review Regarding The TRISO-X, LLC License Application For A New Fuel Fabrication Facility (Enterprise Project Identification Number L-2022-NEW-0005)," dated November 17, 2023

Subject: **Response to Request for Additional Information Set 6 (Structural, Material Control and Accounting, and Fire Safety) for the TRISO-X License Application**

TRISO-X, LLC (TRISO-X) hereby submits responses to the subject Request for Additional Information (RAI), regarding the review of the License Application for the TRISO-X Fuel Fabrication Facility (Reference 2). The enclosed responses are for the RAI Set 6 transmitted by letter dated November 17, 2023 (Reference 3).

**Request for Withholding**

Portions of the enclosed submittal contain information that TRISO-X requests be withheld from public disclosure. The following regulations and guidance were consulted to develop the

---

~~THE ENCLOSURES TO THIS LETTER CONTAIN SECURITY RELATED INFORMATION~~  
~~WITHHOLD IN ACCORDANCE WITH 10 CFR 2.390~~

---

~~WHEN DETACHED - HANDLE THIS PAGE AS DECONTROLLED~~

---

---

~~THE ENCLOSURES TO THIS LETTER CONTAIN SECURITY RELATED INFORMATION –  
WITHHOLD IN ACCORDANCE WITH 10 CFR 2.390~~

---

document markings and specific withholding requests as noted in the description of each enclosure's contents.

- 10 CFR 2.390, *Public inspections, exemptions, requests for withholding*
- NRC Regulatory Issue Summary 2005-31, Revision 1, *Control of Security-Related Sensitive Unclassified Non-Safeguards Information Handled by Individuals, Firms, and Entities Subject to NRC Regulation of the Use of Source, Byproduct, and Special Nuclear Material*

### **Summary of this Submittal**

The following Enclosures are included with this letter.

#### **Enclosure 1 – Structural Review (Programmatic) RAI Responses – Part 2**

##### **Attachment to Enclosure 1 – Structural Review (Programmatic) RAI Responses – Part 2 (Security-Related Information)**

#### **Enclosure 2 – Fundamental Nuclear Material Control Plan RAI Responses (Security-Related Information)**

#### **Enclosure 3 – Fire Safety RAI Responses (Security-Related Information)**

If there are questions or if additional information is required, please contact me at (865) 850-0893 or [jwheeler@triso-x.com](mailto:jwheeler@triso-x.com).

Sincerely,



Jennifer K. Wheeler, P.E.  
Vice President, Regulatory Affairs

TRISO-X, LLC  
801 Thompson Avenue  
Rockville, MD 20852

Copy: Mr. Matthew Bartlett, US NRC, NMSS  
TRISO-X Regulatory Records File

---

~~THE ENCLOSURES TO THIS LETTER CONTAIN SECURITY RELATED INFORMATION –  
WITHHOLD IN ACCORDANCE WITH 10 CFR 2.390~~

---

~~WHEN DETACHED – HANDLE THIS PAGE AS DECONTROLLED~~

---

## Enclosure 1 - Structural Review (Programmatic) RAI Responses for the TRISO-X License Application – Part 2

### RAI-1 Follow-up Flooding

#### Regulatory Basis:

This information is necessary to demonstrate compliance with the regulations in Title 10 of the *Code of Federal Regulations* (10 CFR) Section 70.64(a)(2), which states, in part, that the design must provide for adequate protection against natural phenomena with consideration of the most severe documented historical events for the site, as well as 10 CFR 70.61(b) and 10 CFR 70.61(c) which state, in part, that the risk of credible high- and intermediate- consequence events must be limited. Per 10 CFR 70.61(e) also requires the identification and implementation of items relied on for safety (IROFS).

#### Guidance:

The guidance in NUREG-1520, Revision 2, Appendix D, “Natural Phenomena Hazards,” states in part, “In addition to the facility’s location relative to the 100-year or 500-year flood plains, the effects of local intense precipitation and snow load should be considered. Local intense precipitation, especially in the form of snow, can result in roof collapse and localized site flooding.”

#### Describe Issue:

In response to the request for additional information (RAI) 3-2 (Agencywide Documents Access and Management System Accession Number ML23230B200), TRISO-X (the applicant) submitted calculation no. XE-C-CE-008, Revision 0, “Local Intense Precipitation (LIP) Analysis,” via the TRISO-X portal for staff review. This analysis concludes that the maximum water level due to local intense precipitation (LIP) at the TRISO-X Fuel Fabrication Facility will be above the 811 ft floor elevation credited for flooding in the license application and integrated safety analysis (ISA) summary. The analysis further states that openings in the building (e.g., door opening) will allow for flood water to enter the building, but found the higher flooding water levels acceptable after considering a new permissible water level threshold of 813 ft. However, the license application and ISA summary do not address the external event described in this analysis and the new permissible water level threshold of 813 ft.

The staff notes that Section 1.4.1, “Flood,” and Section 4.2.5.5, “Design Basis Flood,” of the ISA summary and Section 1.1.1.3, “Hydrology,” and other related sections in the license application only describe the flood hazard for the TRISO-X site in terms of its location relative to flood plains from nearby water bodies (e.g., rivers, streams), see NUREG-1520, Appendix D, “Natural Phenomena Hazards.”

When flooding is considered a credible event, an evaluation of the effectiveness of proposed protection and/or action(s) will need to be provided and should consider the effects of inundation, hydrostatic loading, erosion, and sedimentation. However, the application does not address flooding hazards from other applicable flood related events as part of the safety analysis of the site (e.g., a description of the LIP analysis), its methodology, and how the effects of inundation will be managed or prevented to ensure safe operation of the fuel facility and the safety of its workers). The ISA summary also does not describe how the consequences of this external event are being prevented or mitigated to demonstrate compliance with the performance requirements in the regulation.

#### Information Needed:

Update the application to include the site’s evaluation of other flood-related hazards (e.g., local intense precipitation) and a description of the design basis flood level credited for the facility. The information should include, in part, a general description of the analyses performed, the methodology followed, and an evaluation of the effectiveness of proposed protection and/or

**Enclosure 1 - Structural Review (Programmatic) RAI Responses  
for the TRISO-X License Application – Part 2**

action(s) that will be implemented to address the effects of inundation, hydrostatic loading, erosion, and sedimentation. The ISA summary should also be updated to include analyses and/or IROFS relied upon to demonstrate compliance with 10 CFR 70.61.

**TRISO-X Response to RAI-1:**

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

**License and ISA Summary Changes:**

License Chapter 1, Section 1.1.2, *Facility Buildings and Structures*, will be revised as follows in the subsection *Rain Load* (changes in red).

**Rain Load:** The design rain load for the TRISO-X Facility is 6.14 in/hr (15-min duration) and 3.24 in/hr (60-min duration). These rainfall intensities have a corresponding annual probability of exceedance of once in 100 years. ~~Rain loads are assumed to be bounded by snow or live loads, pending the finalized design of the roof drainage system. This assumption will be evaluated once the roof drainage details are finalized and if the assumption turns out to be invalid, rain loads will be explicitly considered.~~ Chapter 8.3 of ASCE 7-16 requires that each portion of a roof shall be designed to sustain the load of all rainwater that will accumulate on it if the primary drainage system for that portion is blocked plus the uniform load cause by the water that rises above the inlet of the secondary drainage system at its design flow.

NUREG/CR-7046 was used to estimate a design basis flood due to local intense precipitation (LIP) and local storm runoff. NUREG/CR-7046 defines LIP as a measure of the extreme precipitation at a given location. National Oceanic and Atmospheric Administration (NOAA) Hydrometeorological Report No. 56 (HMR 56) recommended

**Enclosure 1 - Structural Review (Programmatic) RAI Responses  
for the TRISO-X License Application – Part 2**

probable maximum precipitation (PMP) values were used to determine LIP values. The design basis flood for the TRISO-X facility is an LIP event based on a 1-hour PMP of 17.61 inches and a 6-hour PMP value of 36.30 inches.

ISA Summary Section 4.2.5.5, *Design Basis Flood*, will be revised following the fourth paragraph (changes in red).

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

**Enclosure 1 - Structural Review (Programmatic) RAI Responses  
for the TRISO-X License Application – Part 2**

[REDACTED]

[REDACTED]

## **RAI-2 Risk Category**

### **Regulatory Basis:**

This information is necessary to demonstrate compliance with the regulations in 10 CFR 70.64(a)(2), which states, “(2) Natural phenomena hazards. The design must provide for adequate protection against natural phenomena with consideration of the most severe documented historical events for the site.”

### **Describe Issue:**

As stated in the license application, the design of the structures and facilities complies with the 2018 Edition of the International Building Code and American Society of Civil Engineers (ASCE) 7-16, “Minimum Design Loads and Associated Criteria for Buildings and Other Structures,” as appropriate for the geographic location of the site. To apply its provisions, ASCE 7-16 states that buildings and other structures shall be classified based on the risk to human life, health, and welfare associated with their damage or failure. ASCE 7-16 table 1.5-1 provides for this classification in terms of “Risk Category” based on the nature of use or occupancy of the buildings and other structures.

ISA summary section 4.2.5.3 states that a Risk Category III was selected for the TRISO-X fuel fabrication facility (FFF), based on considering that the building could “pose a substantial risk to human life with potential to cause a substantial economic impact and/or disruption to day-to-day civilian life in the event of a failure.” However, ASCE 7-16, table 1.5-1, categorizes facilities that manufacture, process, handle and/or store highly toxic substances (e.g., hazardous fuels and/or hazardous chemicals) as “essential facilities” with a Risk Category IV level. Similarly, per U.S. Department of Energy DOE-STD-1020-2016, a Risk Category IV is assigned to facilities that results in lower radiological or chemical consequences to the worker and the public (i.e., a SDC2 facility) than those specified in 10 CFR 70.61. Therefore, the selected Risk Category III for the determination of the design-basis criteria for the TRISO-X FFF is inconsistent with the criteria specified in ASCE 7-16 due to the nature of the hazardous materials that are manufactured, processed, handled, and stored at the proposed facility.

### **Information Needed:**

Update the information in the license application and ISA summary (including the design-basis values) to be consistent with the corresponding risk category for a hazardous FFF as identified in ASCE 7-16 (i.e., Risk Category IV structure as discuss above) or justify the use of Risk Category III.

**Enclosure 1 - Structural Review (Programmatic) RAI Responses  
for the TRISO-X License Application – Part 2**

**TRISO-X Response to RAI-2:**

The TRISO-X Facility is classified properly as a Category III facility based on the ASCE 7-16 Risk Category III classification (shown in red outline below) for buildings that could pose a substantial risk to human life with potential to cause a substantial economic impact and/or disruption to day-to-day civilian life in the event of a failure. Risk Category III also encompasses the manufacturing, processing, use, and storage of hazardous and toxic chemicals where the quantity of material exceeds the threshold quantity. Category IV buildings involve the handling of highly toxic materials where the quantity of material exceeds the threshold quantity (highlighted below). The TRISO-X facility will not contain highly toxic materials above the maximum allowed quantity per the International Building Code and NFPA 400. As such, the TRISO-X Facility meets the ASCE 7-16 criteria for a Category III facility.

**Enclosure 1 - Structural Review (Programmatic) RAI Responses  
for the TRISO-X License Application – Part 2**

**Table 1.5-1 Risk Category of Buildings and Other Structures for  
Flood, Wind, Snow, Earthquake, and Ice Loads**

Use or Occupancy of Buildings and Structures	Risk Category
Buildings and other structures that represent low risk to human life in the event of failure	I
All buildings and other structures except those listed in Risk Categories I, III, and IV	II
Buildings and other structures, the failure of which could pose a substantial risk to human life	III
Buildings and other structures, not included in Risk Category IV, with potential to cause a substantial economic impact and/or mass disruption of day-to-day civilian life in the event of failure	
Buildings and other structures not included in Risk Category IV (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, hazardous waste, or explosives) containing toxic or explosive substances where the quantity of the material exceeds a threshold quantity established by the Authority Having Jurisdiction and is sufficient to pose a threat to the public if released <sup>a</sup>	
Buildings and other structures designated as essential facilities	IV
Buildings and other structures, the failure of which could pose a substantial hazard to the community	
Buildings and other structures (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, or hazardous waste) containing sufficient quantities of highly toxic substances where the quantity of the material exceeds a threshold quantity established by the Authority Having Jurisdiction and is sufficient to pose a threat to the public if released <sup>a</sup>	
Buildings and other structures required to maintain the functionality of other Risk Category IV structures	

<sup>a</sup>Buildings and other structures containing toxic, highly toxic, or explosive substances shall be eligible for classification to a lower Risk Category if it can be demonstrated to the satisfaction of the Authority Having Jurisdiction by a hazard assessment as described in Section 1.5.3 that a release of the substances is commensurate with the risk associated with that Risk Category.

**STANDARD ASCE/SEI 7-16**



**Enclosure 1 - Structural Review (Programmatic) RAI Responses  
for the TRISO-X License Application – Part 2**

**License and ISA Summary Changes:**

None.