Perspectives on Fuel Fabrication for Advanced Reactors

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TRISO-X Fuel Fabrication Facility – Oak Ridge, TN

Project Overview:

- 110-acre site
- ~500,000 sq ft nuclear fuel fabrication facility
- Seeking Category II Special Nuclear Material NRC materials license
- 16 MTU/year full capacity (>2 million pebbles/year)
- Operational by end of 2025

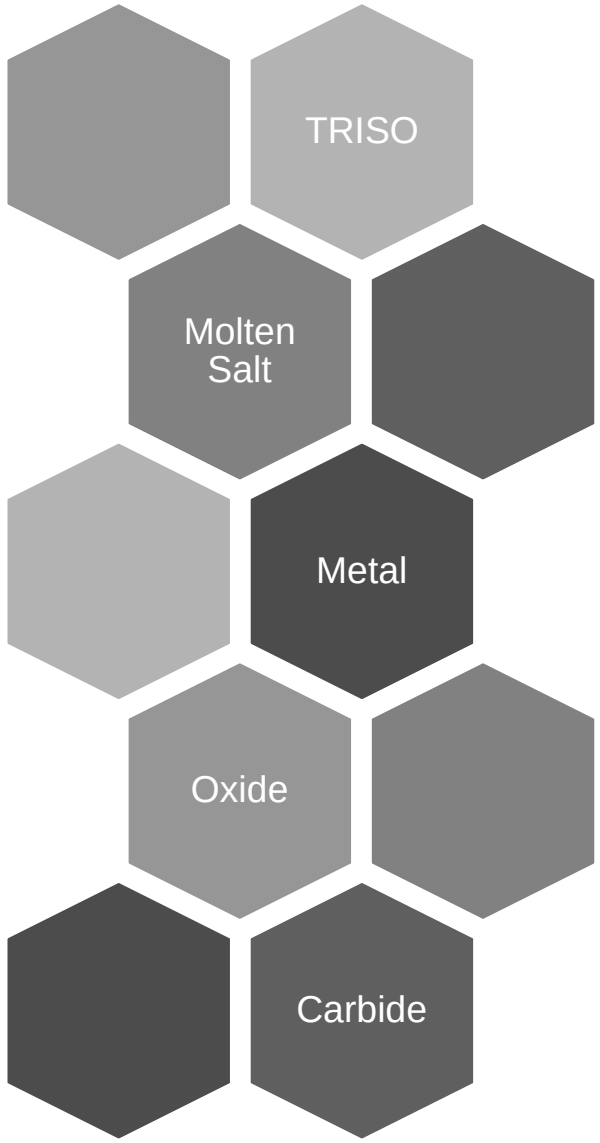
TRISO-X Fuel Fabrication Facility – Licensing Status

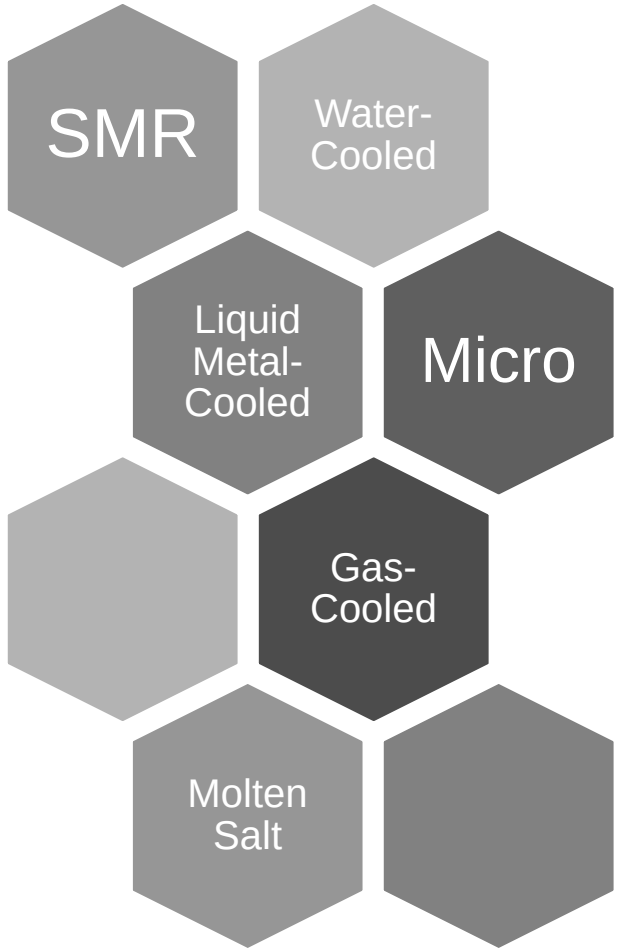
Date	Licensing Activity
2/4/2022	Exemption request submitted to allow submittal of Environmental Report separately from and after the remainder of the license application
3/17/2022	NRC approved exemption request
4/5/2022	License Application submitted to NRC Chapters 1 – 13, Fundamental Nuclear Material Control Plan, Physical Security Plan, Site Emergency Plan, Integrated Safety Analysis (ISA) Summary, Decommissioning Funding Plan, Financial Qualifications
6/7/2022	Site visit by key members of NRC Environmental Review team
8/9/2022	NRC issued Request for Supplemental Information (RSI) questions ISA methods, Items Relied on for Safety (IROFS), structural design, site-specific geotechnical information
9/23/2022	Environmental Report submitted to NRC
10/13/2022	RSI responses submitted to NRC
11/4/2022	Updated ISA Summary and License Chapter 1 submitted to NRC
11/16/2022	Additional information submitted to NRC
11/18/2022	NRC accepted License Application for review with 30-month review schedule

TRISO-X Fuel Fabrication Facility – Acceptance Review Process

- Acceptance review for application elements submitted in April took longer than TRISO-X anticipated when compared to previous licensing actions.
  - National Enrichment Facility: Application submitted 12/12/2003, accepted for review 1/22/2004
  - American Centrifuge Plant: Application submitted 8/23/2004, accepted for review 10/8/2004
  - Eagle Rock Enrichment Facility: Application submitted 12/30/2008, accepted for review 3/12/2009
  - Global Laser Enrichment Facility: Application submitted 6/26/2009, accepted for review 8/6/2009
- NMSS DFM Division Instruction LIC-FM-1, effective 12/3/2021, changed acceptance review standards from previous staff guidance in the Licensing Handbook.
  - RSIs reflected detailed information requests that historically were part of the technical review / RAI process based on TRISO-X staff experience.
  - The design at application submittal depicts system functional levels, whereas some RSIs requested detailed design information about IROFS components that are not identified until future design phases.
- TRISO-X provided feedback on review methods, timing, and level of detail expected in 10/13/2022 RSI response letter (ML22286A145).

Advanced Reactor Fuels – Vary Based on Reactor Design





Advanced Reactor Fuels – Market Demand is Growing

Advanced Reactor Fuels – Predictable Licensing Process

Effective and efficient licensing reviews

- Programmatic review of license application based on stage of design at submittal.
- In-office reviews and technical discussions to enhance NRC reviewer understanding of supporting design and safety basis information.
- Site visits to conduct horizontal and vertical slice reviews of Integrated Safety Analysis and supporting safety bases.
- Requests for Additional Information.
- Operational readiness reviews to evaluate / confirm IROFS detailed final design information and as-built conditions, procedures are complete, and operators are trained.

Risk information for inspection planning

- Plan and prioritize what needs to be inspected and why.
- Identify inspection methods, sample size, and frequency based on risk insights from the Integrated Safety Analysis
    - In person observation of work in progress
    - Documentation audits

Advanced Reactor Fuels – The Future is Now

- If market demand does increase as predicted, more applications will come after TRISO-X.
- Each fuel facility may be unique due to variations in advanced reactor designs and fuel types.
- Use of lessons learned and proven techniques from past reviews will focus resources, improve predictability, and reduce uncertainty.
- At some point it may be appropriate to revisit Division of Fuel Management staffing levels and structure to ensure timely reviews of Advanced Fuel applications.

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