

NRC Reviews of HALEU Fuels

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Agenda

- Review process
- Enriched feed material
- Items to note during the NRC review

Key Messages

- Early engagement on design and certification strategy
- Performance-based regulations sufficient to certify transportation packages for new fuel designs
- NRC co-regulates transportation with the U.S. Department of Transportation

NRC's Fuel Transportation Responsibilities

- Co-regulated by NRC and USDOT
 - Memorandum of Understanding lays out the agencies' responsibilities
 - DOT regulates carriers, modes of transport (rail, road, air, etc.)
 - NRC establishes design standards for fuel transportation packages
- Any entity licensed to possess commercial fuel is granted a general license to transport licensed material in an NRC-approved package
- Fuel is transported in packages evaluated against hypothetical accident conditions, including:
 - free-drop onto hard surface, and puncture impact
 - fire and water immersion



Transportation Tests

- Normal conditions of transport (10 CFR 71.71)
 - Hot and cold temperatures
 - Reduced and increased external pressure
 - Vibration
 - Water spray
 - Free drop (1 to 4 feet)
 - Corner drop
 - Compression test
 - Penetration test
- Hypothetical accident conditions (10 CFR 71.73)
 - 30-foot drop test
 - 40-inch puncture test
 - 30-minute fire at 1,475 degrees Fahrenheit
 - Immersion test

Transportation Package Approval Criteria

- Package performance criteria
 - Criticality safety
 - Single package
 - Array of packages
 - Shielding
 - Dose rates in 10 CFR 71.47, “External Radiation Standards for All Packages”
 - Containment—Type B packages only
 - Leakage rate testing for Type B packages (10 CFR 71.51, “Additional Requirements for Type B Packages”)

Transport of Enriched Feed Material

- Uranium Hexafluoride (UF_6)
 - 5B cylinder
 - 30B cylinder
 - New 30-inch cylinder
- Uranium Dioxide (UO_2)/Uranium Metal
 - Pellet and powder packages for low-enriched (non-HALEU) material
 - Low-enriched liquid uranyl nitrate

Building the safety case

- Crediting structural integrity for criticality safety
 - Fuel/fuel assembly structure
- Compensation for lack of critical benchmarks
 - Increased margin for k_{eff} above 5%.
 - Sensitivity/uncertainty analysis tools
 - New critical experiments
- REMINDER: Early engagement on design and certification strategy

Transportation Additional Information

- For additional information or if you have any questions contact Bernie White
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- For reference, see 2019 NRC RIC Presentation:
 - Dry Cask Storage and Transportation Considerations for New Fuel Designs
 - At ADAMS Accession Number: ML20111A297