

U.S. NUCLEAR REGULATORY COMMISSION STAFF COMMENTS ON
U.S. DEPARTMENT OF ENERGY'S *PRELIMINARY TRANSPORTATION, AGING, AND
DISPOSAL CANISTER SYSTEM PERFORMANCE SPECIFICATION*, REV. B, AS
CONSIDERED FOR USE UNDER 10 CFR PARTS 71 AND 72

1. Section 3.1.1, Items (5) and (6) General Pressurized-Water Reactor & Boiling-Water Reactor Characteristics

- A. During applications for Parts 71 and 72 certification, Transportation, Aging, and Disposal (TAD) vendors will need to clarify the maximum initial enrichments in terms of fuel assembly average, maximum planar, or nominal values, to limit fissile content for criticality analyses. This is not specified in the U.S. Department of Energy (DOE) specification.
- B. During applications for Parts 71 and 72 certification, TAD vendors will need to demonstrate thermal performance, considering both total canister power and peak assembly power. Typical large-capacity storage and transportation cask systems for commercial spent fuel, to-date, have been limited to individual fuel assembly power on the range of 1.5 kilowatt (kW), with total canister power of approximately 35 kW. An individual fuel assembly with 80 Gigawatt-days/Metric Ton Uranium (GWd/MTU) fuel assembly and 5 years cooling (as required in the DOE TAD specification) could have a power of approximately 2.5 kW.
- C. During applications for Parts 71 and 72 certification, vendors will need to address cladding performance and source term issues associated with extreme burnups up to 80 GWd/MTU. These regulatory challenges may include cladding properties and spent fuel mechanical behavior credited during normal and accident conditions, and uncertainties in radionuclide source-term predictions. There are limited data for high-burnup fuels, and NRC has not yet approved burnups up to 80 GWd/MTU.

2. Section 3.1.1, Items (15) and (16) General Service Life in Harsh Marine Environment

The TAD canister specifications require that the TAD canister have a maintenance-free service lifetime of 100 years when subject to a harsh marine environment. There is no existing Part 71 or Part 72 regulatory basis for the review of an applicant's request for a maintenance-free service life of 100 years, when subject to a harsh marine environment. NRC regulations currently have licensing terms of 5 years for transportation certificates and 20 years (renewable for an additional 20 years) for storage. The applicant would have to develop the bases and potential acceptance criteria for demonstrating acceptable storage or transportation cask performance during exposure to a harsh marine environment as part of its subsequent requests for certificate renewals.

3. Section 3.1.3 Thermal

During applications for Parts 71 and 72 certification, TAD vendors will need to assess thermal cycling during loading operations, including cladding temperature changes during vacuum-drying operations. The NRC staff will use review guidance in Spent Fuel Project Office Interim Staff Guidance 11 to assess the acceptability of thermal cycling and cladding stresses. The NRC staff also notes that some storage canister designs have been approved to use helium drying systems versus vacuum drying systems, to meet drying criteria and thermal limits. These considerations do not appear to be addressed in the DOE specification. [See also 3.1.6, Item (4) Comment below.]

4. Section 3.1.6, Item (1) Containment Leak Testing

During applications for Parts 71 and 72 certification, TAD vendors will need to specify leak-testing sensitivities for the welded canister, to the extent it is credited for containment and confinement functions during transportation and storage. Some current commercial spent fuel dual-purpose designs have been approved with required canister leak rates greater than the $1 \times 10^{-7} \text{ cm}^3/\text{sec}$ leak-tight standard defined by American National Standard Institute N14.5-97 (e.g. $\sim 10^{-5}$). This is partially because leak-tight sensitivity testing for welded canisters is often more challenging and costly in high-radiation industrial environments at some reactor facilities, and is not needed to demonstrate adequate confinement protection during storage. As described in SFPO-ISG-18, NRC allows the confinement integrity of austenitic stainless steel canisters to be qualified by compliance with certain design guidelines, as an alternative to ANSI N14.5 testing requirements. These considerations do not appear to be addressed in the DOE specification.

5. Section 3.1.6, Item (4) Containment Vacuum Drying

During applications for Parts 71 and 72 certification, TAD vendors may be able to comply with drying and thermal criteria, using alternate drying technologies, such as helium drying systems. These alternate systems may be needed to accommodate the specific operational needs of some facilities. These considerations do not appear to be addressed in the DOE specification.