

Division of Spent Fuel Storage and Transportation
Interim Staff Guidance – 2, Revision 1

Issue: Fuel Retrievability

Introduction:

This Interim Staff Guidance (ISG) provides guidance to the staff for determining if storage systems to be licensed under 10 CFR Part 72 allow ready retrieval of spent fuel. This guidance is not a regulation or a requirement.

Discussion:

There is an increasing need to transfer spent fuel from reactor spent fuel pools to dry Independent Spent Fuel Storage Installations (ISFSIs). These ISFSIs generally consist of an array of spent fuel storage casks on a licensee's site and are licensed or approved under the provisions of 10 CFR Part 72 (Ref. 1). The casks are loaded with spent fuel in an existing spent fuel pool at the licensee's site and transferred to the ISFSI storage pad.

There are two aspects of ready retrieval: 1) the ability to transfer a sealed canister from the storage cask to either a) a transportation package without unloading the spent fuel or, b) a spent fuel pool or other facility for unloading and transfer, and 2) if it is not possible to demonstrate that the spent fuel condition is suitable for transportation, then there must be the ability to unload a storage cask and either repackage the fuel into a transportable configuration or to place the fuel in a different storage cask that is appropriate for future transportation. Both conditions must be met for the storage cask design to satisfy the requirement of 10 CFR 72.122(l) (for specific and general licensees) that "storage systems must be designed to allow ready retrieval of spent fuel . . . for further processing or disposal," and 10 CFR 72.236(m) (for Certificate of Compliance holders) that "...consideration should be given to compatibility with removal of the stored spent fuel from a reactor site, transportation, and ultimate disposition by the Department of Energy."

Dual-Purpose (Storage and Transportation) Cask Designs – The U.S. Nuclear Regulatory Commission (NRC) recognized that "in the interest of decreasing radiation exposures, storage casks should be designed to be compatible with transportation and DOE design criteria to the extent practicable... to the extent that cask designers can avoid return of the spent fuel from dry cask storage to reactor basins for transfer to a transport cask before moving it off site for disposal" (55 FR 29187, July 18, 1990). Dual-purpose (storage and transportation) cask designs should have the capability of being prepared for off-site transportation without requiring the repackaging of the spent fuel prior to transport or otherwise having to return the cask to a spent fuel pool.

Ready Retrieval of fuel assemblies, rods, debris - ISG-1(Ref. 2), ISG-2 (Ref. 3), and ISG-3 (Ref 4) all mention "retrieval" (or some variation of the word) of fuel assemblies, but none of them define it. Section 72.122(h)(1) states "The spent fuel cladding must be protected during storage against degradation that leads to gross ruptures or the fuel must be otherwise confined such that degradation of the fuel during storage will not pose operational safety problems with respect to its removal from storage. This may be

accomplished by canning of consolidated fuel rods or unconsolidated assemblies or other means as appropriate.” In addition, section 72.122(l) states “storage systems must be designed to allow ready retrieval of spent fuel . . . for further processing or disposal.” The staff considers a fuel assembly to be “ready retrievable” if it remains structurally sound (i.e., no gross degradation) and could be handled by normal means (i.e., does not pose operational safety problems during removal) or, in the case of a structurally unsound assembly or an assembly that has rods with breaches greater than a pinhole or a hairline crack that could release fuel particulate, if the assembly is placed inside a secondary container (described in ISG-1 as a “can for damaged fuel”) that confines the fuel particulate to a known volume and, that container can be handled by normal means.

Normal Means - ISG-1 indicates the term “normal means” means the ability to move the fuel assembly and its contents by the use of the crane and grapple used to move undamaged assemblies at the point of cask loading. The addition of special tooling or modifications to the assembly to make the assembly suitable for lifting with crane and grapple does not preclude the handling from being considered “normal means.”

When undamaged fuel (as described in ISG-1) is placed in a storage canister, it is retrievable by normal means, i.e. grapple and hook. Those assemblies that cannot meet this criterion should be placed in a can for damaged fuel or otherwise modified, so the assembly or can for damaged fuel can be ready retrievable from the storage canister by normal means.

For removal of spent fuel from storage prior to transport, spent fuel should be retrievable on an assembly basis, in addition to a canister basis. After the storage period, the spent fuel must either remain in: a) a condition, known prior to storage, to be transportable, or b) a known or bounding condition that can be analyzed to determine if the spent fuel is transportable (see 10 CFR 71.33(b)(3) and 71.55(b)(1) of Ref. 5). If the configuration of the spent fuel changed during storage to a point where it could not be retrieved from the storage canister by normal means, and could not be analyzed to determine if it was transportable, it would have to be removed from the canister for analysis to determine suitability for transport. Having the canister retrievable from the storage cask does not, by itself, guarantee that the spent fuel is transportable.

Thus, this guidance defines ready retrieval of spent fuel as the ability to both move the canister containing the fuel to either a transportation package or a location where the fuel can be removed, as well as maintaining the ability to handle individual fuel assemblies or canned fuel assemblies by normal means.

Regulatory Basis:

§71.33(b)(3) states: “The application must include a description of the proposed package in sufficient detail to identify the package accurately and provide a sufficient basis for evaluation of the package. The description must include... (b) With respect to the contents of the package...(3) Chemical and physical form.”

§71.55(b)(1) states: “...a package used for the shipment of fissile material must be so designed and constructed and its contents so limited that it would be subcritical if water were to leak into the containment system, or liquid contents were to leak out of the containment system so that, under the following conditions, maximum reactivity of the fissile material would be attained... (1) The most reactive credible

configuration consistent with the chemical and physical form of the material.

§72.122(h)(1) states the following overall requirement for confinement barriers and systems: “The spent fuel cladding must be protected during storage against degradation that leads to gross ruptures or the fuel must be otherwise confined such that degradation of the fuel during storage will not pose operational safety problems with respect to its removal from storage. This may be accomplished by canning of consolidated fuel rods or unconsolidated assemblies or other means as appropriate.”

§72.122(l) states the following overall requirement for retrievability: “Storage systems must be designed to allow ready retrieval of spent fuel, high-level radioactive waste, and reactor-related greater than class C waste for further processing or disposal.”

§72.236(h) states the following specific requirement: “The spent fuel storage cask must be compatible with wet or dry spent fuel loading and unloading facilities.”

§72.236(m) states the following specific requirement: “To the extent practicable in the design of spent fuel storage casks, consideration should be given to compatibility with removal of the stored spent fuel from a reactor site, transportation, and ultimate disposition by the Department of Energy.”

Applicability:

This guidance applies to reviews of dry cask storage systems conducted in accordance with NUREG-1536, "Standard Review Plan for Dry Cask Storage Systems" (Ref. 6) or NUREG-1567, "Standard Review Plan for Spent Fuel Dry Storage Facilities" (Ref. 7).

This revision of ISG-2 supersedes definitions of retrievability or normal means stated in the above Standard Review Plans. In addition, this revision supersedes the previous revision of ISG-2, in its entirety, and is applicable to both as-built and reconstituted fuel assemblies.

Recommendation:

All facilities that are licensed under 10 CFR Part 72 must include considerations and plans to support ISFSI decommissioning. Following ISG-3 recommendations, if the fuel has experienced only normal or off-normal conditions during storage, the loaded canister should be retrievable from the storage cask and the spent fuel should be ready retrievable by normal means from the storage canister for placement into a transportation package, if necessary.

Section 10 CFR 72.122(l) states that retrievability, including the ready retrieval of spent fuel, is an overall requirement of spent fuel storage systems for specific and general licenses (10 CFR 72.13). This ISG recommends the following definitions be used by staff when evaluating Part 72 applications:

- Ready Retrieval - The ability to move a canister containing spent fuel to either a transportation package or to a location where the spent fuel can be removed. Ready retrieval also means maintaining the ability to handle individual or canned

References:

1. U.S. Code of Federal Regulations, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater than Class C Waste," Part 72, Chapter I, Title 10, "Energy."
2. U.S. Nuclear Regulatory Commission, "Classifying the Condition of SNF for Interim Storage and Transportation Based on Function," ISG-1, Revision 2, Spent Fuel Storage and Transportation Division, May 2007, Agencywide Document Access and Management System (ADAMS) Accession No. ML071420268.
3. U.S. Nuclear Regulatory Commission, "Fuel Retrievability," ISG-2, Revision 0, Spent Fuel Storage and Transportation Division, October 1998, ADAMS Accession No. ML092800367.
4. U.S. Nuclear Regulatory Commission, "Post Accident Recovery and Compliance with 10 CFR 72.122(l)," ISG-3, Spent Fuel Storage and Transportation Division, October 1998, ADAMS Accession No. ML092800380.
5. U.S. Code of Federal Regulations, "Packaging and Transportation of Radioactive Material," Part 71, Chapter I, Title 10, "Energy."
6. U.S. Nuclear Regulatory Commission, "Standard Review Plan for Spent Fuel Dry Cask Storage Systems at a General Facility," NUREG-1536, January 1997, ADAMS Accession No. ML091060180.
7. U.S. Nuclear Regulatory Commission, "Standard Review Plan for Spent Fuel Dry Storage Facilities," NUREG-1567, March 2000, ADAMS Accession No. ML003686776.