

October 6, 2001

MEMORANDUM TO: SFPO Staff Members

FROM: E. William Brach, Director /RA/
Spent Fuel Project Office, NMSS

SUBJECT: ISSUANCE OF SFPO DIRECTOR'S INTERIM STAFF
GUIDANCE DOCUMENT NO. 17

Attached for your use and information is the Spent Fuel Project Office (SFPO) Director's Interim Staff Guidance Document No. 17 (ISG-17), "Interim Storage of Greater Than Class C Waste." This interim staff guidance provides guidance for reviewers on the interim storage of Greater than Class C waste due to the revision of 10 CFR Part 72. The Commission issued a final rule on this subject in 66FR51823 on October 11, 2001. The rule will be effective November 13, 2001.

This ISG is to be used in conjunction with NUREG-1567, "Standard Review Plan for Spent Fuel Dry Storage Facilities," until such time as this ISG is incorporated into the NUREG. This document is being provided to ensure consistent reviews by the SFPO staff.

If you have any comments or questions about the attached guidance document, please contact your immediate supervisor.

Attachment: ISG-17

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**Spent Fuel Project Office
Interim Staff Guidance - 17
Interim Storage of Greater Than Class C Waste**

Issue:

Guidance is necessary on the interim storage of greater than Class C (GTCC) waste due to the revision of Title 10 of the Code of Federal Regulations (10 CFR) Part 72. The revision to 10 CFR Part 72 is documented in final rule, "Interim Storage for GTCC Waste," and permits the storage of GTCC wastes at independent spent fuel storage installations (ISFSI) or monitored retrievable storage (MRS) facilities. The GTCC wastes, if stored at an ISFSI, must be in solid form, and stored in a separate container (i.e., GTCC waste may not be stored in a cask that also contains spent fuel).

Introduction:

The standard review plan (SRP) for storage of spent nuclear fuel, NUREG-1567, "Standard Review Plan for Spent Fuel Dry Storage Facilities," does not address the interim storage of reactor-related GTCC wastes co-located with spent fuel at an ISFSI or MRS facility. This interim staff guidance (ISG) specifies how the staff should evaluate compliance with 10 CFR Part 72, which has been modified to authorize the storage of GTCC waste within an ISFSI or MRS with a site-specific license.

Discussion:

The final rule for 10 CFR Part 72 will now allow the interim storage of reactor-related GTCC wastes under a 10 CFR Part 72 site-specific license. The final rule applies to the interim storage of GTCC waste generated or used by nuclear power plants at ISFSIs or MRSs with site-specific licenses. It does not permit GTCC waste from any other sources to be stored at an ISFSI or MRS, nor does it include other forms of low-level radioactive waste. Additionally, the rule precludes storage of liquid GTCC waste under 10 CFR Part 72.

In developing the final rule, the NRC was cognizant of both the potential Department of Energy (DOE) disposal criteria for GTCC waste and the potential adverse interaction between spent fuel and various types of GTCC waste. The NRC believes that properly addressing potential adverse conditions for storing certain types of GTCC waste together with spent fuel within the same cask, presents significant safety and technical issues. In addition, because the DOE has not yet identified such criteria for a disposal package, the NRC is concerned that storage of GTCC waste and spent fuel in the same container may be unacceptable for placement in the geologic repository. Therefore, the rule precludes the storage of GTCC waste and spent fuel in the same cask, because the NRC desires to formulate regulations which both reduce radiological exposure and costs associated with repackaging the spent fuel and GTCC waste into two separate containers for disposal. Note that this in no way changes the current NRC and industry practice of allowing the storage of spent fuel and certain specific components associated with, and integral to, spent fuel (e.g., burnable poison rod assemblies, control rod elements, and thimble plugs) in the same cask.

New applicants for a site-specific license to store GTCC waste, and applicants amending their current license to store GTCC waste must provide a safety analysis report (SAR) or an amended SAR describing their programs that will ensure that (1) adequate protective measures are in place to confirm safe storage within the ISFSI or MRS, (2) the co-location of GTCC waste does not have an adverse effect on the safe storage of spent fuel and the safe operation of the ISFSI, and (3) the storage of GTCC waste will not have an adverse effect on public health and safety, and the environment. Based on review of the SAR, the NRC would issue a 10 CFR Part 72 site-specific license, or amended license. This licensing approach will maintain Federal jurisdiction for the interim storage of reactor-related GTCC waste, after termination of the 10 CFR Part 50 license.

Currently, 10 CFR Part 50 licensees are already authorized to possess and store reactor-related GTCC waste under provisions of 10 CFR Part 30 for byproduct material, and under provisions of 10 CFR Part 70 for special nuclear material licenses. A 10 CFR Part 72 general licensee who elects to store spent fuel in an ISFSI at a power reactor site, must conduct an evaluation as described in 10 CFR 72.212. Any impact from the storage of radioactive material (including GTCC waste) on the storage of spent fuel, must be documented in the 10 CFR 72.212 written evaluation. For example, if the GTCC waste contributes any dose to the real individual, the 10 CFR 72.212 evaluation must establish how the requirements of 10 CFR 72.104, have been met.

Technical Review Guidance:

GTCC waste is low-level waste that exceeds the concentration limits of radionuclides established for Class C waste [see 10 CFR 61.55(a)(2)]. Because of the relatively high concentration of long-lived radionuclides (e.g., C-14, Ni-59, Tc-99) in GTCC waste, GTCC waste is generally unsuitable for near-surface disposal. Therefore, because GTCC waste is unlikely to be disposed of at a low-level waste disposal site regulated under 10 CFR Part 61, the GTCC waste must be stored.

Under 10 CFR Part 72, only reactor-related GTCC waste can be licensed to be stored at an ISFSI or MRS. Reactor-related GTCC waste is typically in a solid form (i.e., mostly activated metals) such as reactor vessel internals, and other in-core instrumentation.

There are two general categories of reactor-related GTCC wastes:

Activated metals - These wastes are not integral components of a fuel assembly and include: control rod blades, local power range monitor strings, intermediate range monitor strings, startup range monitor dry tubes, in-core instrument strings, top fuel guide, boiling water reactor (BWR) core shroud, upper core support plate, pressurized water reactor (PWR) core shroud (baffle), lower core barrel, lower core support plate, and primary and secondary neutron sources that are not contained within the fuel assembly.

Process wastes - These wastes are considered process wastes generated from the operation and decommissioning of reactors. These wastes are generated from mechanical filtration operations and can consist of paper, metals and plastics. Process

wastes include control rod drive strainers, fuel pool and vacuum filters, PWR miscellaneous cartridge filters, crud tank filters, and ion exchange resins.

This ISG presents recommendations on how to revise NUREG-1567. NUREG-1567 specifies the methods that could be used to conduct reviews of site-specific license amendments that request the storage of GTCC waste. In general, the guidance focuses the reviewer on assessing the programs in place associated with the storage of GTCC waste at an ISFSI or MRS under normal, off-normal and hypothetical accident conditions. This ISG does not provide new design criteria for approval of the GTCC waste container design (i.e., there are no provisions in 10 CFR Part 72 to license a GTCC waste container).

Recommendation:

NUREG-1567 should be modified to reflect the guidance contained in this ISG. The attachment to this ISG includes specific recommendations for changes to NUREG-1567.

Approved: _____
E. William Brach

November 6, 2001

Date _____

Attachment

Attachment

This attachment includes recommendations for changes to NUREG-1567, "Standard Review Plan for Spent Fuel Dry Storage Facilities," March, 2000.

Add to the "Acronyms and Abbreviations" Section G, on Page xxiv, as shown:

GTCC waste

Greater-Than-Class C waste

Add to the "Glossary" Section C, on Page xxvii, as shown:

Co-locate. To share common facilities. For example, GTCC waste containers and spent fuel storage casks may be co-located at the same ISFSI facility. As another example, under general license provisions, an ISFSI may be co-located at a 10 CFR Part 50 reactor site.

Add to the "Glossary" Section G, on Page xxix, as shown:

Greater-Than-Class-C waste. Low-level radioactive waste that exceeds the concentration limit of radionuclides established for Class C waste in 10 CFR 61.55.

Replace the definition in the "Glossary" Section I, on Page xxix, as shown:

Important to Safety, also "Important to Nuclear Safety". Terms used synonymous in the FSRP. "Important to nuclear safety" is used where there may be a misinterpretation that the classification "important to safety" may also include SSCs which do not have a nuclear safety role but may be important for life safety, fire prevention, prevention or mitigation of property loss, or protection of the environment (from other than radioactive material or radiation). Important to safety can include "safety-related" and "nonsafety-related" SSCs (see definitions). "Structures, system, and components important to safety" mean those features of the ISFSI whose function is: (1) To maintain the conditions required to store spent fuel, **GTCC waste**, or high-level radioactive waste safely, (2) To prevent damage to the spent fuel, **GTCC waste**, or the high-level radioactive waste container during handling and storage, or (3) To provide reasonable assurance that spent fuel, **GTCC waste**, or high-level radioactive waste can be received, handled, packaged, stored, and retrieved without undue risk to the health and safety of the public. (10 CFR 72.3)

Replace the definition in the "Glossary" Section R, on Page xxx, as shown:

Retrievability. Capability to retrieve the stored radioactive material without the release of radioactive materials to the environment or radiation exposures in excess of 10 CFR 20 limits (10 CFR 72.122(h)(5)). ISFSI storage systems must be designed to allow ready retrieval of the stored spent fuel for compliance with 10 CFR 72.122(l).

Retrievability of GTCC waste means that the storage system must be designed to allow ready retrieval of GTCC waste for further processing or disposal.

Replace the definition in the “Glossary” Section S, on Page xxxii, as shown:

Subject radioactive material. The material whose storage is the principal function of the ISFSI. Term includes power reactor, spent fuel, **reactor-related GTCC waste**, and other radioactive material associated with spent fuel storage for an ISFSI.

Replace the fifth paragraph of the “Introduction,” on Page 1, as shown:

Operation Systems Evaluation. This phase of the review evaluates the overall description of the proposed ISFSI, the identification of the major components, and the description of the major spent fuel, high-level waste, **or GTCC waste** handling operations and post-storage inspection and monitoring operations.

Replace the third paragraph of Section 1.5.2., “General Description of Installation,” on Page 1-3, and add a new paragraph, as shown:

The reviewer should verify that the applicant has presented a general description of the fuel, **GTCC waste**, or other contents proposed for storage in the ISFSI. Because a very detailed description of the proposed contents is typically provided in the SAR in Section 3, “Principal Design Criteria,” the information presented in Section 1, “General Description,” is important only to the extent that it permits overall familiarization with the ISFSI. Key parameters for spent fuel include the type of fuel (i.e., pressurized water reactor [PWR], boiling water reactor [BWR]), number of fuel assemblies, and conditions of the fuel assemblies (i.e., intact, consolidated). This section often includes additional characteristics, such as maximum burnup, initial enrichments, heat load, and cooling time, as well as the assembly vendor and configuration (e.g., Westinghouse 17x17). These characteristics may also be repeated in the principal design criteria. The cover gas, if any, should be identified. **Additionally, key parameters for GTCC waste include the form of the GTCC waste (e.g., activated metal, process waste), the maximum quantity of GTCC waste to be stored at the ISFSI, and radionuclide inventory.**

The GTCC wastes, if stored at an ISFSI, must be in solid form, and stored in a separate container (i.e., GTCC waste may not be stored in a cask that also contains spent fuel). Liquid GTCC wastes may not be stored at a site-specific ISFSI or MRS. If the ISFSI is a water-pool type facility, the GTCC wastes must be in a durable solid form with demonstrable leach resistance.

Replace the first paragraph of Section 1.5.3., “General Systems Description,” on Page 1-4, as shown:

The reviewer should verify that a summary description of the storage mode and arrangement of the storage structures has been provided. The reviewer should verify that a brief description of the operating systems, including fuel handling, **GTCC waste handling**, decay heat removal, site-generated waste treatment, and auxiliary systems has been provided. The reviewer should determine if sufficient detail has been provided to result in an understanding of the systems involved.

Replace the Section (2) of the regulatory reference to 72.122 on Page 2-6, as shown:

- (2)(i) SSCs important to safety must be designed to withstand the effects of natural phenomena.... The design bases for these SSCs must reflect:
- (i) (A) Appropriate consideration of the most severe of the natural phenomena reported for the site and surrounding area...
 - (ii) (B) Appropriate combinations of the effects of normal and accident conditions and the effects of natural phenomena.
- (ii) The ISFSI or MRS should also be designed to prevent massive collapse of building structures or the dropping of heavy objects **as a result of building structural failure** on the spent fuel, or high-level radioactive waste, **or reactor-related GTCC waste** or on to structures, systems, and components important to safety."

Replace the first paragraph of Section 3.1., "Review Objective," on Page 3-1, as shown:

The objective of this chapter is to evaluate for clarity and completeness the description of all operations, including systems, equipment, and instrumentation, particularly as they relate to handling and storage of spent fuel, **GTCC waste**, or solidified high-level waste, confinement of nuclear material, and management of expected and potential radiological dose. Sufficient detail should be provided to ensure that reviewers can understand the operations and the operations' effects on the design evaluations. Safety features required to maintain the installation in a safe condition should be described; however, evaluation of those features should be performed in the appropriate technical sections.

Replace the first paragraph of Section 3.2., "Areas of Review," on Page 3-1, as shown:

Operation Description
*Spent Fuel, **GTCC waste**, and High-Level Waste Handling Systems*
Other Operating Systems
Operation Support Systems
Control Room and Control Area
Analytical Sampling
Shipping Cask Repair and Maintenance
Pool and Pool Facility Systems

Replace the ninth paragraph of Section 3.3., "Regulatory Requirements," on Page 3-2, as shown:

72.128 Criteria for spent fuel, high-level radioactive waste, **reactor-related GTCC waste**, and other radioactive waste storage and handling.

- (a) "Spent fuel, high-level radioactive waste, **and reactor-related GTCC waste**, storage and handling systems."
- (1) "A capability to test and monitor components important to safety."
- (2) "Confinement structures and systems."

Replace the first paragraph of Section 3.4.2., "Spent Fuel and High-Level Waste Handling Systems," on Page 3-4, as shown:

3.4.2. Spent Fuel, **GTCC Waste**, and High-Level Waste Handling Systems

The regulatory requirements given in 10 CFR 72.124, 10 CFR 72.128, 10 CFR 72.150, and 10 CFR 72.166 address the information to be included in a license application. The SAR should include information as described in Regulatory Guide 3.48 Section 5.2 on spent fuel (and high-level waste if for an MRS) handling systems. The descriptions of the spent fuel, **GTCC waste**, or high-level waste handling systems must be clear. The functions of transfer from transportation vehicles, receipt inspection, and initial decontamination should be addressed if the operations are performed independently of a 10 CFR 50 license review. The transfer facility and its use should be described, including its use during the stages of operation of the ISFSI. Spent fuel, **GTCC waste** and high-level waste handling systems in a pool facility used for wet transfer is addressed in a following section.

Replace the first paragraph of Section 3.4.3., “Other Operation Systems,” on Page 3-4, as shown:

The scope of this section is taken to be all operating systems important to safety that are not covered in Sections 3.4.1 (Operation Description) and 3.4.2 (Spent Fuel, **GTCC Waste**, and High-Level Waste Handling Systems) except that instrumentation and controls are covered in 3.4.4 and analytical sampling is covered in 3.4.6. “Other operating systems” and “auxiliary systems” that are important to safety should be as described in Regulatory Guide 3.48 Sections 4.3 and 5.3 and noted in the narrative descriptions or flowcharts describing the operation of the ISFSI. 10 CFR 72.122 requires that the SAR include clear descriptions of the systems and system equipment and controls used to assure safety. These items must be consistent with other parts of the SAR.

Replace the first paragraph of Section 3.5.2., “Spent Fuel and High-Level Waste Handling Systems,” on Page 3-7, as shown:

3.5.2. Spent Fuel, **GTCC Waste**, and High-Level Waste Handling Systems

Review procedures for spent fuel handling systems are given in the NUREG-1536, Chapter 8, Section V, items 1, 2, and 3. A review for handling high-level waste follows the same procedure. Because the spent fuel, **GTCC waste**, and high-level waste handling systems have many interfaces with other systems of the facility, verify that these interfaces are addressed and that continuity of operations can occur under all operational conditions.

Replace the first paragraph of Section 4.1., “Review Objective,” on Page 4-1, as shown:

The objective of the review is to ensure that the applicant acceptability defines: (1) the limiting characteristics of the spent fuel, **GTCC waste**, or other high-level radioactive waste materials to be stored, (2) the classification of structures, systems and components (SSCs) according to their importance to safety, and (3) the design criteria and design bases, including the external conditions during normal and off-normal operations, accident conditions, and natural phenomena events.

Add to Section 4.2., “Areas of Review,” on Page 4-1, as shown:

Materials to be Stored:

Spent Fuel

GTCC Waste

High-Level Radioactive Waste

Replace the second and third paragraph of Section 4.3., “Regulatory Requirements,” on Page 4-3, as shown:

72.2 Scope

(a) “Except as provided in Section 72.6(b), licenses issued under this part”

(1) “Power reactor spent fuel **and power reactor-related GTCC waste** to be stored in a complex”

(2) “Power reactor spent fuel **and power reactor-related GTCC waste** to be stored in an [Monitored Retrievable Storage] MRS owned by DOE”

72.3 - Definitions

Structures, systems, and components important to safety

(1) “To maintain the conditions required to store spent fuel, high-level **radioactive waste, or reactor-related GTCC waste...**”

(2) “To prevent damage to the spent fuel, **the** high-level radioactive waste, **or reactor-related GTCC waste...**”

(3) “To provide reasonable assurance that the spent fuel, **high-level radioactive waste, or reactor-related GTCC waste...**”

Replace the ninth paragraph of Section 4.3., “Regulatory Requirements,” on Page 4-3, as shown:

72.120 General considerations

(a) “Pursuant to ... must include the design criteria for the proposed storage installation”

(b) “The MRS **ISFSI** must be designed to store spent fuel **and/or solid reactor-related GTCC waste.** ~~or solid high-level radioactive wastes~~”

(c) “The MRS must be designed to store spent fuel, solid high-level radioactive waste, and/or solid reactor-related GTCC waste.

(d) “The ISFSI or MRS must be designed, made of materials, and constructed to ensure that there will be no significant chemical, galvanic, or other reactions...

Replace Section (2) of the regulatory reference to 72.122 on Page 4-4, as shown:

(2)(i) SSCs important to safety must be designed to withstand the effects of natural phenomena.... The design bases for these SSCs must reflect:

(i) **(A)** Appropriate consideration of the most severe of the natural phenomena reported for the site and surrounding area...

(ii) **(B)** Appropriate combinations of the effects of normal and accident conditions and the effects of natural phenomena.

(ii) The ISFSI or MRS should also be designed to prevent massive collapse of building structures or the dropping of heavy objects **as a result of building structural failure** on the spent fuel, ~~or~~ high-level radioactive waste, **or reactor-related GTCC waste** or on to structures, systems, and components important to safety.”

Replace the thirteenth paragraph of Section 4.3., “Regulatory Requirements,” on Page 4-5, as shown:

72.128 Criteria for spent fuel, high-level radioactive waste, **reactor-related GTCC waste**, and other radioactive waste storage and handling.

(a) Spent fuel, high-level radioactive waste, **and reactor-related GTCC waste**, storage and handling systems. ~~“Spent fuel storage”~~

(1) “A capability to test and monitor components”

(2) “Suitable shielding for radioactive protection under normal and accident conditions”

(3) “Confinement structures and systems”

(4) “A heat-removal capability having testability”

(5) “Means to minimize the quantity of radioactive wastes generated.”

(b) Waste treatment. “Radioactive waste treatment facilities must be provided”

Add a new section to Section 4.4.1., “Materials to be Stored,” on Page 4-8, as shown:

4.4.1.3 - GTCC Waste

The regulatory requirements given in 10 CFR 72.2 (a)(1) and (a)(2) identify GTCC waste as material to be stored. 10 CFR 72.120 (b) discusses the acceptable forms of GTCC waste. Under 10 CFR Part 72, only reactor-related GTCC waste will be allowed to be stored at a site-specific ISFSI or MRS. GTCC waste is in a solid form (i.e., mostly activated metals) such as reactor vessel internals, and in-core instrumentation.

There are two general categories of GTCC wastes:

Activated metals - These wastes are not integral components of a fuel assembly and include: control rod blades, local power range monitor strings, intermediate range monitor (IRM) strings, short range monitor (SRM) dry tubes, in-core instrument strings, top fuel guide, boiling water reactor (BWR) core shroud, upper core support plate, pressurized water reactor (PWR) core shroud (baffle), lower core barrel, lower core support plate, and primary and secondary neutron sources that are not contained within the fuel assembly.

Process wastes - These wastes are considered process wastes generated from the operation and decommissioning of reactors. These wastes are generated from mechanical filtrations operations and can consist of paper, metals and plastics. Process wastes include control rod drive strainers, fuel pool and vacuum filters, PWR miscellaneous cartridge filters, crud tank filters, and ion exchange resins.

Liquid GTCC wastes may not be stored under 10 CFR Part 72.

Replace the second and third paragraph of Section 4.4.3.7., “Retrieval,” on Page 4-10, and add a new paragraph, as shown:

The design criteria and bases for the ISFSI or MRS storage system must recognize the need for facilities, equipment, and procedures for the removal of spent fuel, **GTCC waste**, or solidified high-level radioactive waste from storage systems, and the transfer

of this material into another storage system or a transportation cask. The design developed in compliance with the criteria must be able to retrieve spent fuel, **GTCC waste**, or the solidified high-level waste following normal and off-normal design conditions. Specific retrieval facilities, equipment, and procedures for post accident conditions are not required to be described in the SAR because of the wide variety of possible post-accident conditions that may occur.

The design must accommodate the retrieval of spent fuel, **GTCC waste**, or solid HLW following design basis accidents. The design and procedures for retrieval must be such that the operations can be conducted in compliance with the requirements of 10 CFR Part 20.

Replace the first paragraph of Section 4.5.1., “Materials to be Stored,” on Page 4-11, as shown:

The reviewer should verify that the types of materials to be stored comply with 10 CFR 72.2(a)(1) and (a)(2), and 10 CFR 72.120(b). The reviewer should confirm that the SAR gives spent fuel, **GTCC waste**, or high-level radioactive waste acceptance specifications, including upper or lower bound limits of acceptable variability. The reviewer should verify that these acceptance specifications are incorporated in the facility technical specifications. The reviewer should confirm that the SAR gives the criteria for procedures for testing, inspecting, and verifying wastes received for storage at the facility. The reviewer should verify that the SAR defines criteria for procedures for handling, repackaging, and shipping of out-of-specification wastes.

Add a new section to Section 4.5.1., “Materials to be Stored,” on Page 4-11, as shown:

4.5.1.3 - Reactor-Related GTCC Waste

The reactor-related GTCC waste should be appropriately characterized so that the reviewer has reasonable assurance that storage is in compliance with the regulations. For GTCC waste, the following information should be provided: waste form (e.g., activated metal, process waste); the maximum quantity of waste to be stored at the ISFSI; the radionuclide inventory; and the location and configuration of GTCC waste containers with respect to the spent fuel storage casks. The reviewer should verify that the GTCC waste form is solidified and that there are no liquids present in the container.

Note that the GTCC waste container is not specifically being certified, since there are no provisions in 10 CFR Part 72 to license a GTCC waste container. However, applicants may chose to store GTCC waste in containers designed to store spent fuel. The reviewer should verify that the applicant has evaluated the impact(s) associated with the safe co-location of GTCC waste and spent fuel at an ISFSI or MRS under the normal, off-normal and accident conditions.

Add two new paragraphs to the end of Section 4.5.3.2., “Structural,” on Page 4-14, as shown:

The reviewer should verify that the applicant has evaluated any adverse effects of the GTCC waste storage on the structural integrity of the ISFSI or MRS SSCs

important to safety. Verification of the structural integrity of the spent fuel storage canisters due to the placement of the GTCC waste at an ISFSI or MRS assures there is adequate confinement of radioactive material. Additionally, the applicant must demonstrate compliance with the materials, thermal, criticality, shielding, and confinement requirements, for normal, off-normal and design basis accident conditions.

Replace the first paragraph of Section 4.5.3.7., “Retrieval Capability,” on Page 4-16, as shown:

The reviewer should verify that design criteria for retrieval capability of spent fuel, **GTCC waste**, or other high-level radioactive waste forms considers normal and off-normal events.

Replace the sixth and seventh paragraphs of Section 5.3., “Regulatory Requirements,” on Page 5-4, as shown:

72.106 Controlled area of an ISFSI or MRS.

(a) “For each ISFSI or MRS site, a controlled area must be established.”

(b) “...The minimum distance from the spent fuel, **high-level radioactive waste, or reactor-related GTCC waste**....shall be at least 100 meters.”

(c) “The controlled area may be traversed by a highway....”

72.120 General considerations

(a) “Pursuant to ... must include the design criteria for the proposed storage installation”

(b) “The MRS **ISFSI** must be designed to store spent fuel **and/or solid reactor-related GTCC waste**. ~~or solid high-level radioactive wastes~~”

(c) “**The MRS must be designed to store spent fuel, solid high-level radioactive waste, and/or solid reactor-related GTCC waste.**

(d) “**The ISFSI or MRS must be designed, made of materials, and constructed to ensure that there will be no significant chemical, galvanic, or other reactions...**

Replace Section (2) of the regulatory reference to 72.122 on Page 5-4, as shown:

(2)(i) SSCs important to safety must be designed to withstand the effects of natural phenomena.... The design bases for these SSCs must reflect:

(i) **(A)** Appropriate consideration of the most severe of the natural phenomena reported for the site and surrounding area...

(ii) **(B)** Appropriate combinations of the effects of normal and accident conditions and the effects of natural phenomena.

(ii) The ISFSI or MRS should also be designed to prevent massive collapse of building

Replace the ninth paragraph of Section 5.3., “Regulatory Requirement,” on Page 5-4, as shown:

72.128 Criteria for spent fuel, high-level radioactive waste, **reactor-related GTCC waste**, and other radioactive waste storage and handling.

(a) Spent fuel, high-level radioactive waste, **and reactor-related GTCC waste**, storage and handling systems.

(b) Waste treatment.

[The following regulatory requirements apply to ISFSI and MRS confinement casks, if the design of the confinement cask system has been previously certified under 10 CFR 72 Subpart L].

Replace the first paragraph of Section 5.4.2., “Pool and Pool Confinement Facilities,” on Page 5-12, as shown:

The pool and pool confinement facilities provide a capability that may be essential to the conduct of ISFSI and MRS loading for storage and unloading functions and that may be needed for retrievability (see guidance in SRP Sections 3.4.8 and 4.4.3.7). The pool and pool confinement facilities are considered to include those systems important to safety that provide for wet transfer, loading, unloading, and temporary holding or long-term storage of spent fuel, **GTCC waste**, high-level waste, and/or other radioactive materials associated with spent fuel, **GTCC waste**, or high-level waste storage. Other ISFSI or MRS equipment that may be used within and outside the pool facility, or that are used for lifting or transfer within the facility but are not installed cranes or conveyance systems, are addressed as “other SSCs important to safety” or “other SSCs.”

Replace Section (2) of the regulatory reference to 72.122 on Page 6-3, as shown:

(2) “For underwater storage of spent fuel, high-level radioactive waste, **or reactor-related GTCC waste**... systems for maintaining water purity and pool water level must be designed so that any abnormal operations or failure in those systems from any cause will not cause the water level to fall below safe limits.”

Replace the fourth paragraphs of Section 6.3., “Regulatory Requirements,” on Page 6-3, as shown:

72.128 - Criteria for spent fuel, high-level radioactive waste, and other radioactive waste storage and handling.

(a) Spent fuel, high-level radioactive waste, **and reactor-related GTCC waste** storage and handling systems. “... must be designed to ensure adequate safety under normal and accident conditions...These systems must be designed with”

(4) “A heat-removal capability having testability and reliability.”

Add a third paragraph to Section 6.4.3., “Thermal Loads and Environmental Conditions,” on Page 6-5, as shown:

The reviewer should determine whether the applicant has demonstrated that GTCC waste containers, co-located with spent fuel storage casks at an ISFSI or MRS, are located such that normal, off-normal, and design basis accident conditions will not adversely impact the heat removal capability of the spent fuel storage casks.

Add a new section to Section 6.5.3., “Thermal Loads and Environmental Conditions,” on Page 6-17, as shown:

6.5.3.1 - Considerations for the Storage of Greater-Than-Class C Waste

The reviewer should determine whether the applicant has demonstrated that GTCC waste containers, co-located with spent fuel storage casks at an ISFSI or MRS, are located such that normal, off-normal, and design basis accident conditions will not adversely impact the heat removal capability of the spent fuel storage casks.

Replace the second paragraph of Section 7.1., “Review Objective,” on Page 7-1, as shown:

The scope of this chapter is limited to evaluating the shielding for the spent fuel, or high-level waste, **or reactor-related GTCC waste** to be stored. Other radiation sources at the ISFSI or MRS for which shielding may be required are addressed in Chapters 11 and 14.

Add a fifth area of review in Section 7.2., “Areas of Review,” on Page 7-1, as shown:

- Contained Radiation Sources*
 - Gamma Sources
 - Neutron Sources
- Storage and Transfer Systems*
 - Design Criteria
 - Design Features
- Shielding Composition and Details*
 - Compositions and Material Properties
 - Shielding Details
- Analysis of Shielding Effectiveness*
 - Computational Methods and Data
 - Dose Rate Estimates
 - Confirmatory Calculations
- Consideration of GTCC Waste Storage***
 - Normal Operations**
 - Accident Conditions**
 - Transfer Systems**

Replace the seventh paragraph of Section 7.3., “Regulatory Requirements,” on Page 7-4, as shown:

72.128 Criteria for spent fuel, high-level radioactive waste, **reactor-related greater than class C waste**, and other radioactive waste storage and handling.
(a) "...Spent fuel storage, high-level radioactive waste storage, **reactor-related GTCC waste storage**, and other systems ...must be designed to ensure adequate safety....
These systems must be designed with
(2) Suitable shielding..."

Replace the first paragraph of Section 7.4.1.1., “Gamma Sources,” on Page 7-5, as shown:

A tabulation of radiological characteristics for each gamma-ray source type must be provided, including isotopic composition and photon yields by X- and gamma-ray energy group. The SAR must specify gamma source terms for both spent fuel and activated

materials **associated with the spent fuel**. The energy group structure from the source term calculation must correspond to that of the cross-section set of the shielding calculation. The computer methodology or database application used to compute source term strength must be specifically identified.

Add a new section, Section 7.4.5., “Consideration of GTCC Waste Storage,” on Page 7-8, as shown:

7.4.5. Consideration of GTCC Waste Storage

The applicant should verify that the storage of GTCC waste will not have an adverse affect on the safe storage of spent fuel and high level radioactive waste. The reviewer is not certifying the container used for storing GTCC waste; rather, the reviewer is only verifying that these packages can be safely stored at the same facility.

7.4.5.1. Normal Conditions Analysis

The applicant should provide the reviewer assurance that, during both normal operations and anticipated occurrences, the radiation shielding features of the ISFSI or MRS (including the GTCC waste containers) are sufficient to meet the dose requirements in 10 CFR 72.104 and 10 CFR 20, Subpart C. For example, any one of the following approaches would be acceptable to the staff to meet these requirements:

- The applicant could perform site-specific dose evaluations in accordance with 10 CFR 72.104 for real individuals located at or beyond the controlled area, including the contributions from GTCC waste. These evaluations should include a description of: (1) the form of the GTCC waste (e.g., activated metal or process waste); (2) the most bounding source term of the GTCC waste which was used by the applicant as a basis for the shielding design calculations; (3) the maximum surface dose rates for each type of GTCC waste container; and (4) the general spent fuel storage cask configuration along with the geometrical arrangement of the GTCC waste on the ISFSI or MRS pad.**
- The applicant could perform a bounding analysis of a particular type(s) of GTCC waste which ensures that the limits of 10 CFR 72.104 will be met throughout the license period.**
- The applicant could provide assurance that the offsite dose from the combined storage of spent fuel and GTCC waste is sufficiently low and would not add significant contribution to other facility effluents (e.g., an additional dose of 1 mrem/year which comes from the storage of GTCC waste is not likely to cause the limits of 10 CFR Part 72.104 to be exceeded for the whole facility).**

7.4.5.2. Accident Conditions Analysis

For design basis accident conditions, an individual at the boundary or outside the controlled area shall not receive a dose greater than the limits specified in 10 CFR 72.106. The minimum distance from the spent fuel, high-level radioactive waste, or reactor-related GTCC waste handling and storage facilities must still be at least 100 meters. One way to demonstrate compliance with the 10 CFR 72.106 would include a description of the hypothetical damage to the GTCC waste containers as a consequence of the ISFSI or MRS design-basis accidents. Then, the applicant could use the damage results to re-analyze the accident dose at 100 meters. Alternatively, the applicant may be able to show that with no shielding around the GTCC waste, the dose at 100 meters is in compliance with 10 CFR 72.106.

7.4.5.3. Transfer Systems

Equipment used to transfer the GTCC waste to the ISFSI or MRS should provide suitable shielding under normal and accident conditions, in compliance with 10 CFR 72.128(a)(2). The reviewer should determine whether the applicant provides assurance that the transfer of the GTCC waste is sufficiently shielded. The applicant should provide: (1) a brief description of how the GTCC waste is transferred to the ISFSI or MRS; (2) identification of the transfer operations and associated occupational doses; and (3) identification of potential accidents and the associated doses which could occur during transfer.

Add a new section, Section 7.5.5., “Consideration of GTCC Waste Storage,” on Page 7-16, as shown:

7.5.5. Consideration of GTCC Waste Storage

The reviewer should confirm that the applicant verifies that co-location of GTCC waste will not have an adverse effect on the safe storage of spent fuel and high level radioactive waste. The reviewer is not certifying the container used for storing GTCC waste; rather, the reviewer is only verifying that these packages can be safely stored at the same facility.

7.5.5.1. Normal Conditions Analysis

The reviewer should ensure that the applicant has provided reasonable assurance that, during both normal operations and anticipated occurrences, the radiation shielding features of the ISFSI or MRS (including the GTCC waste containers) are sufficient to meet the dose requirements in 10 CFR 72.104 and 10 CFR Part 20, Subpart C. The reviewer should examine the applicant’s SAR evaluation approach (examples are provided in Section 7.4.5.1), and verify that sufficient information is provided to ensure compliance with the regulations.

7.4.5.2. Accident Conditions Analysis

For design basis accident conditions, an individual at the boundary or outside the controlled area shall not receive a dose greater than the limits specified in 10 CFR 72.106. The minimum distance from the spent fuel, high-level radioactive waste,

or reactor-related GTCC waste handling and storage facilities must still be at least 100 meters. The reviewer should examine the applicant's SAR evaluation approach (examples are provided in Section 7.4.5.2), and verify that sufficient information is provided to ensure compliance with the regulations.

7.4.5.3. Transfer Systems

Equipment used to transfer the GTCC waste to the ISFSI or MRS should provide suitable shielding under normal and accident conditions, in compliance with 10 CFR 72.128(a)(2). The reviewer should determine whether the applicant provides assurance that the GTCC waste is sufficiently shielded during transfer operations. The reviewer should ensure that the applicant has provided: (1) a brief description of how the GTCC waste is transferred to the ISFSI or MRS; (2) identification of the transfer operations and associated occupational doses; and (3) identification of potential accidents and the associated doses which could occur during transfer.

Replace the first paragraph of Section 8.1., "Review Objective," on Page 8-1, as shown:

The objective of the review and evaluation is to ensure that the stored materials **spent fuel and high-level radioactive waste** remain subcritical under normal, off-normal, and accident conditions during all operations, transfers, and storage at the site. **If GTCC waste is to be co-located at the same 10 CFR Part 72 licensed facility, then the review and evaluation should also ensure that the storage of GTCC waste does not adversely affect the safe storage of spent fuel and high level radioactive waste.**

Replace the first paragraph of Section 8.4., "Acceptance Criteria," on Page 8-3, as shown:

This section identifies the acceptance criteria used for the criticality review **of the spent fuel and high-level radioactive waste storage designs**. Four types of criteria are described. The first describes criticality design criteria and features including required conditions, assumptions, and scenarios. The second identifies the requirements for the specifications regarding stored nuclear material that are acceptable to the NRC. The third describes the features of criticality analysis models which are acceptable to the NRC. The fourth identifies the features of applicant criticality analyses including the specific computer program, benchmarks, and multiplication factor determination which constitute an acceptable submittal for criticality safety.

Replace the first paragraph of Section 8.4.1.1., "Criteria," on Page 8-4, as shown:

The regulatory requirements given in 10 CFR 72.40 and 10 CFR 72.124 identify acceptable design criteria. The NRC generally considers the design criteria identified below to be acceptable to meet the criticality requirements of 10 CFR 72 for **spent fuel and high-level radioactive waste** storage confinement casks:

Replace the first paragraph of Section 8.4.1.2., "Features," on Page 8-6, as shown:

The regulatory requirements given in 10 CFR 72.124(b) identify acceptable design criteria for criticality control. The NRC generally considers the design criteria identified

below to be acceptable to meet the criticality control requirements of 10 CFR 72 for **spent fuel and high-level radioactive waste** storage confinement casks.

Replace the first paragraph of Section 8.4.2., “Stored Material Specifications,” on Page 8-7, as shown:

The regulatory requirements given in 10 CFR 72.124(a) identify acceptable design criteria for stored material specifications. The NRC generally considers the design criteria identified below to be acceptable to meet the criticality requirements of 10 CFR 72 for **spent fuel and high-level radioactive waste** storage confinement casks.

Add a new Section 8.5 on Page 8-14, as shown:

8.5 - Acceptance Criteria for GTCC Waste

The applicant must demonstrate that storage of GTCC waste will not adversely affect the safe storage of spent fuel and high level radioactive waste at the 10 CFR Part 72 licensed facility.

For the section entitled, “Review Procedures,” change all headings to Section 8.6.

Add a new Section 8.7, as shown:

8.7 - Review Procedures for GTCC Waste

The reviewer should examine the application and verify that the storage of GTCC waste will not have an adverse affect on the safe storage of spent fuel and high level radioactive waste. The reviewer is not certifying the container used for storing GTCC waste; rather, the reviewer is only verifying that these packages can be safely co-located at the same facility.

In general, containers of GTCC waste located with spent fuel storage casks at an ISFSI or MRS are not expected to increase the reactivity of spent fuel storage casks and are not expected to contain significant amounts of fissile material. The most likely types of GTCC that may contain fissile material are fission chambers, some neutron sources, filters and ion-exchange resins. The reviewer should verify that the applicant has addressed these potential sources of fissile material (if present) and has shown that their quantity is insignificant. If criticality does become a concern for a particular GTCC waste form, the reviewer should verify that the applicant has demonstrated that the most reactive configuration of the GTCC waste containers has been analyzed and that k_{eff} remains below 0.95. In general, the reviewer does not need to perform independent confirmatory analyses.

For the section entitled, “Evaluation Findings,” change all headings to Section 8.8.

For the section entitled, “References,” change all headings to Section 8.9.

Replace the fifth paragraph of Section 9.3., “Regulatory Requirements,” on Page 9-3, as shown:

72.106 - Controlled area of an ISFSI or MRS.

(b) "Any individual located on or beyond the nearest boundary of the controlled area shall not receive a dose greater than 5 rem to the whole body or any organ from any design basis accident. **may not receive from any design basis accident the more limiting of a total effective dose equivalent of 0.05 Sv (5 rem), or the sum of the deep-dose equivalent and the committed dose equivalent to any individual organ or tissue (other than the lens of the eye) of 0.5 Sv (50 rem). The lens dose equivalent shall not exceed 0.15 Sv (15 rem) and the shallow dose equivalent to skin or to any extremity shall not exceed 0.5 Sv (50 rem).** The minimum distance from the spent fuel or, high-level radioactive waste **or reactor-related GTCC waste** handling and storage facilities to the nearest boundary of the controlled area must be at least 100 meters."

Replace the Section (5) of the regulatory reference to 72.122 on Page 9-4, as shown:

(5) "The high-level **radioactive** waste **and reactor-related GTCC waste** must be packaged **in a manner** that allows handling and retrievability."

Replace the eighth paragraph of Section 9.3., "Regulatory Requirements," on Page 9-4, as shown:

72.128 Criteria for spent fuel, high-level radioactive waste, **reactor-related GTCC waste**, and other radioactive waste storage and handling.

(a) "Spent fuel, high-level radioactive waste, **and reactor-related GTCC waste** storage and handling systems"

(1) "A capability to test and monitor components important to safety"

(3) "Confinement structures and systems"

Replace the heading of Section 9.4.1.1., on Page 9-5, as shown:

9.4.1.1 - Confinement Casks or Systems **for Spent Fuel and High Level Radioactive Waste**

Add a new Section 9.4.1.2, as shown:

9.4.1.2 - Confinement of Reactor-related GTCC Waste

If appropriate, the application must also describe the confinement features or system implemented for reactor-related GTCC waste. The staff is not certifying the GTCC waste container, therefore details related to the container design and fabrication requirements are not required. In general, the reviewer should verify that the applicant has provided assurance that the placement of the GTCC waste at the ISFSI or MRS will not impact the ability of the spent fuel storage cask at the site to confine the spent fuel. The reviewer should also verify that the applicant has provided assurance that the GTCC waste will be adequately contained and shielded under normal, off-normal and accident conditions in accordance with the 10 CFR Part 72 dose limits.

For the section entitled, “Pool and Waste Management Facilities,” change the heading to Section 9.4.1.3.

Replace the first paragraph of Section 9.4.2., “Radionuclide Confinement Analysis,” on Page 9-5, as shown:

Confinement analysis is concerned with the release of radioactive materials to the environment for normal operations and anticipated occurrences and for accident conditions including design basis accidents. **For spent fuel and high level radioactive waste**, the SAR must present a clear description of the proposed confinement system as either (1) a sealed system, as is the case in most spent fuel storage systems, or (2) a vented system with off-gas treatment systems, as is often the case in pools or waste management systems. **For GTCC waste, the SAR must, at a minimum, present a clear description of the operating limits regarding the confinement features of the reactor-related GTCC storage design or system.** The description must state how the confinement systems would respond during anticipated occurrences or accident conditions (both design basis and less than design basis). Estimates of releases should be based on the quantity of radioactive material such as vapor pressure, particle sizes, and adsorption kinetics and equilibrium. Data sources that are used to support the physical property estimates or release quantities should be identified in the SAR.

Replace the heading of Section 9.4.2.1., on Page 9-6, as shown:

9.4.2.1 - Confinement Casks or Systems **for Spent Fuel and High-Level Radioactive Waste**

Add a new Section 9.4.2.2, as shown:

9.4.2.2 - Confinement of GTCC Waste

The application should identify the quantity of radionuclides that would be released to the environment from the ISFSI or MRS during normal operations, anticipated occurrences, and design basis accidents. The estimates could be based on evaluation of the GTCC waste form, and the physical process that will move radionuclides into the environment or retain them in the confinement system.

For the section entitled, “Pool and Waste Management Facilities,” change the heading to Section 9.4.2.3.

Replace the heading of Section 9.4.3.1., on Page 9-7, as shown:

9.4.3.1 - Dry Storage Cask Confinement Systems **for Spent Nuclear Fuel and High Level Radioactive Waste**

Replace the first paragraph of Section 9.4.3.2., “Effluents,” on Page 9-8, as shown:

The SAR must describe the monitoring system that provides measurement of releases under normal and accident conditions. The discussion must address all areas of the ISFSI that can release radionuclides **(including GTCC wastes)** into the environment.

NRC accepts the following criteria and guidance for monitoring releases from ISFSI or MRS systems, to the extent applicable:

Replace the heading of Section 9.4.4.1., on Page 9-8, as shown:

9.4.4.1 - Confinement Casks or Systems **for Spent Fuel and High Level Radioactive Waste**

Add a new Section 9.4.2.2, as shown:

9.4.4.2 Confinement of GTCC Waste

The SAR must describe the programs and procedures in place to maintain confinement of the GTCC waste and prevent degradation of the waste form, and containers, as described below. In general, the SAR must describe programs which give full consideration to maximum anticipated storage time for any projected corrosion. Permanent degradation of any confinement barrier should not occur for the anticipated occurrences when considering the cumulative corrosion effects over the proposed licensing period. The confinement barrier of the GTCC waste container may experience some repairable degradation from accident-level conditions. However, the dose limits established in 10 CFR Part 72 must not be exceeded.

For the section entitled, “Pool and Waste Management Facilities,” change the heading to Section 9.4.4.3.

Replace Section 9.5.1., “Review of Design Features,” on Page 9-9, as shown:

9.5.1.1 - Spent Nuclear Fuel and High Level Radioactive Waste

The reviewer should review the principal design criteria and the general description of the cask presented in the SAR. All drawings, figures, and tables describing

confinement features must be sufficiently detailed to stand alone. Verify that the applicant has clearly identified the confinement boundaries. This identification should include, as applicable, the confinement vessel; its penetrations, valves, seals, welds, and closure devices; and corresponding information concerning the redundant sealing.

Coordinate with the structural reviewer to ensure that the applicant has provided proper specifications for all welds and, if applicable, that the bolt torque for closure devices is adequate and properly specified.

9.5.1.2 - GTCC Waste

The reviewer should review the general description of the GTCC waste confinement systems presented in the SAR. The reviewer should verify that the programs and procedures in place concerning the confinement system for GTCC waste is clearly identified in relation to the form of the GTCC waste. Acceptable program descriptions specify maximum leakage rate from each GTCC container or maximum leakage rate permitted from the total GTCC inventory at the ISFSI or MRS.

Replace the heading of Section 9.5.2.2., on Page 9-10, as shown:

9.5.2.2 - Evaluation of Release Estimates for Spent Nuclear Fuel and High Level Radioactive Waste

Add a new Section 9.5.2.3, as shown:

9.5.2.3 Evaluation of Release Estimates for GTCC Waste

The reviewer should evaluate whether the applicant has provided a description of the response of the GTCC waste confinement system under normal and anticipated occurrences as well as design basis accidents. The reviewer should independently assess the potential for a loss of confinement under any of these conditions.

In particular, the staff should verify that the applicant has provided a description of the type of GTCC waste to be stored at the ISFSI or MRS including its form (e.g., solid metal with loose surface contamination) and a description of the radionuclides of the source term. Acceptable methods for determining the source term include: direct analytical measurements of the waste stream; calculation of the effective radionuclide content from direct radiation measurements; or calculation of the effective source based on permissible off-site doses.

The confinement programs and procedures must demonstrate, with reasonable assurance, that the package contents, and assumed nominal meteorological conditions, the requirements of 10 CFR 72.104(a) and 10 CFR 72.106(b) can be met. Acceptable programs which determine that the dose limits are not exceeded may include:

- Calculating dose rates using methods similar to those used for spent fuel evaluations. The applicant may develop a maximum expected leakage rate from each GTCC container or from the entire ISFSI. The reviewer should verify that assumptions used for spent fuel (e.g., meteorological conditions, dose conversion factors, breathing rates, distance of the real individual) are also used for the GTCC storage containers unless the applicant can justify alternative assumptions. The applicant must adequately justify the value of the release fractions based on the form of GTCC waste and the design of the container.
- Calculating the maximum allowable leakage. An applicant may also demonstrate compliance with 10 CFR 72.104 and 10 CFR 72.106 by using the maximum allowable dose limits and the total number of GTCC waste containers expected at the ISFSI or MRS. Using these parameters, a maximum allowable leakage rate could be calculated for either the total amount of GTCC waste at the ISFSI or for an individual container of GTCC waste. Methods similar to those used for spent fuel should be considered for this analysis.

Each ISFSI is required to have a site-specific confinement analysis and dose assessment to demonstrate regulatory compliance. Meteorological conditions similar to those used to perform the confinement analyses for spent fuel or high-level waste should be used in the analysis. For dose conversion factors, the NRC accepts the use of Environmental Protection Agency Federal Guidance Report Nos. 11 and 12.

Replace the heading of Section 9.5.3.1., on Page 9-15, as shown:

9.5.3.1 - Confinement Casks or Systems **for Spent Fuel and High Level Radioactive Waste**

Add a new Section 9.5.3.2, as shown:

9.5.3.2 - Reactor-related GTCC Waste

The reviewer should ensure the applicant's programs and procedures for confinement monitoring are contained in the SAR and are established to meet the regulatory requirements of 10 CFR 72.104(a) and 72.106(b). In general, the applicant should conduct periodic monitoring of GTCC waste containers, or facilities to store those containers, to ensure continued confinement performance in compliance with 10 CFR 72.126(c). The reviewer should verify that leakage requirements, as well as the monitoring or surveillance conditions, are appropriately specified in the SAR.

For the section entitled, "Pool and Waste Management Facilities," change the heading to Section 9.5.3.3.

Replace the heading of Section 9.5.4.1., on Page 9-17, as shown:

9.5.4.1 - Confinement Casks or Systems **for Spent Fuel and High Level Radioactive Waste**

Add a new Section 9.5.4.2, as shown:

9.5.4.2 - GTCC Waste

In general, the reviewer should determine whether, over the licensed period of storage, the GTCC waste is stable and the GTCC waste container materials provide adequate structural integrity.

The reviewer should determine that the applicant has demonstrated that potential gas generation from water or organic materials in the GTCC waste containers does not lead to potentially flammable or explosive conditions. The reviewer should assess whether the applicant has considered the effects of gas generation and the formation of corrosive constituents from radiolysis, biodegradation, or chemical reaction.

The reviewer should determine whether the applicant has used design features to prevent the corrosion of the GTCC waste container integrity caused by the external environment. Accordingly, external weather protection should be included whenever necessary. For example, storage containers could be raised off of the storage pads, where water accumulation can be expected to cause external corrosion and possible degradation of container integrity.

The reviewer should ensure that the applicant has demonstrated that the GTCC waste is compatible with the container or spent fuel cask materials and with the expected external environmental conditions to prevent significant container corrosion. For example, GTCC waste container selection should be based on data that demonstrate minimal corrosion from the anticipated internal and external environment for a period well in excess of the planned storage duration. The reviewer should assess whether the applicant has considered the effects of chemical, galvanic, or thermal interactions between the GTCC waste and container materials.

The reviewer should determine whether the applicant has incorporated a program to conduct periodic visual inspections of GTCC waste container integrity. Inspections should include examination for any degradation (e.g., buildup of corrosion products, holes, swelling) that could affect the structural integrity, shielding effectiveness, or confinement of the GTCC waste. Inspections can be accomplished by: the use of TV monitors; conducting walk-throughs of storage facility layout, shielding, and the container storage array permit; or by selecting waste containers representative of the types of the containers stored in the facility, and placing them in a location specifically designed for inspection purposes under similar environmental conditions. All inspection procedures developed should minimize occupational exposure.

For the section entitled, “Pool and Waste Management Facilities,” change the heading to Section 9.5.4.3.

Change Section (i) of the regulatory reference to 10 CFR 72.24, on Page 10-3, as shown:

(i) “If the proposed Independent Spent Fuel Storage Installations (ISFSI) or Monitored Retrievable Storage (MRS) incorporates [structures, systems, and components (SSCs)] important to safety whose functional adequacy or reliability have not been demonstrated by prior use for that purpose or cannot be demonstrated by reference to performance data in related applications or to widely accepted engineering principles, an identification of these SSCs along with a schedule showing how safety questions will be resolved prior to the initial receipt of spent fuel, high-level radioactive waste, **and/or reactor-related GTCC waste as appropriate** for storage at the ISFSI or MRS.”

Change Section (d) of the regulatory reference to 10 CFR 72.28, on Page 10-3, as shown:

(d) A commitment by the applicant to have and maintain an adequate complement of trained and certified installation personnel prior to the receipt of spent fuel, high-level radioactive waste, **and/or reactor-related GTCC waste as appropriate** for storage.”

Replace the fifth bullet of Section 10.4.3.2., “Records,” on Page 10-10, as shown:

- Receipt, inventory, disposal, acquisition, and transfer of all spent fuel, **GTCC waste**, and high-level radioactive waste in storage, as required by 10 CFR 72.72(a) (including provisions for duplicate records storage at different locations, per 10 CFR 72.72[d])

Replace the third paragraph of Section 10.5.4., “Personnel Selection, Training and Certification” on Page 10-17, as shown:

The reviewer should ensure that the application adequately addresses the implementation of the training program before initiation of operations with spent fuels, **GTCC waste**, or solidified high-level waste, including a commitment to complete most of staff training and certification before receipt of the radioactive material to be stored.

Replace the eighth paragraph of Section 10.6., “Evaluation Findings” on Page 10-18, as shown:

F10.7 - The application includes an acceptable commitment by the applicant to have and maintain an adequate complement of trained and certified installation personnel before receipt of spent fuel, **GTCC waste**, or high-level radioactive waste for storage, in compliance with 10 CFR 72.28(d).

Replace the eleventh paragraph of Section 11.3., “Regulatory Requirements,” on Page 11-5, as shown:

72.106 - Controlled area of an ISFSI or MRS.

(b) “Any individual located on or beyond the nearest boundary of the controlled area ~~shall not receive a dose greater than 5 rem to the whole body or any organ from any design basis accident.~~ **may not receive from any design basis accident the more**

limiting of a total effective dose equivalent of 0.05 Sv (5 rem), or the sum of the deep-dose equivalent and the committed dose equivalent to any individual organ or tissue (other than the lens of the eye) of 0.5 Sv (50 rem). The lens dose equivalent shall not exceed 0.15 Sv (15 rem) and the shallow dose equivalent to skin or to any extremity shall not exceed 0.5 Sv (50 rem). The minimum distance from the spent fuel or, high-level radioactive waste or reactor-related GTCC waste handling and storage facilities to the nearest boundary of the controlled area must be at least 100 meters.”

Change Section (c) of the regulatory reference to 10 CFR 72.140, on Page 12-4, as shown:

(c) “Prior to receipt of spent fuel and/or reactor-related GTCC waste at the [Independent Spent Fuel Storage Installation] ISFSI or spent fuel, high-level radioactive waste, and/or reactor-related GTCC waste at the [Monitored Retrievable Storage] MRS, each licensee shall obtain Commission approval of its quality assurance program.”

Replace the first paragraph of Section 14.1., “Review Objective,” on Page 14-1, as shown:

The purpose of the review is to ensure that the design and proposed operation of the Independent Spent Fuel Storage Installations (ISFSI) or Monitored Retrievable Storage (MRS) provide for safe confinement and management of any radioactive waste generated as a result of facility operations. This review specifically concerns radioactive wastes generated by the handling and storage of spent fuel, GTCC waste, or high-level waste (HLW) at the site. These include (a) gaseous effluents from treatment and ventilation systems, (b) liquid wastes from laboratory, cask washdown, and decontamination activities, and (c) solid or solidified wastes. Neither the actual spent fuel, GTCC waste, or HLW being stored, nor the waste generated by eventual decommissioning of the facility fall within the scope of this review.

Change the title and Section (a) of the regulatory reference to 10 CFR 72.128, on Page 14-5, as shown:

72.128 - Criteria for spent fuel, high-level radioactive waste, reactor-related GTCC waste, and other radioactive waste storage and handling.

(a) “Spent fuel, high-level radioactive waste, and reactor-related GTCC waste storage and handling systems, Spent fuel storage, high-level radioactive waste storage, reactor-related GTCC waste storage and other systems that might contain or handle radioactive materials associated with spent fuel, high-level radioactive waste, or reactor-related GTCC waste must be designed to ensure adequate safety under normal and accident conditions. These systems must be designed with...”

Replace the second bullet of Section 14.4.5., “Radiological Impact of Normal Operations,” on Page 14-12, as shown:

- The amount of each waste type generated per metric ton of spent fuel, GTCC waste, or high-level waste handled and stored per unit of time (e.g., per year)

Replace the first paragraph of Section 14.5.5., “Radiological Impact of Normal Operations,” on Page 14-17, as shown:

Verify that the SAR contains a listing identifying (a) each effluent and waste type (b) the amount of each waste type generated per metric ton of spent fuel, **GTCC waste**, or HLW handled and stored per unit of time (e.g., per year), and (c) the quantity and concentration of each principal radionuclide in each waste stream. Check that these releases apply to operational occurrences (off-normal events and conditions). Verify that a summary of the constraints is imposed for each effluent process system to ensure safe operation.

Replace the seventh paragraph of Section 15.3., “Regulatory Requirements,” on Page 15-4, as shown:

72.106 - Controlled area of an ISFSI or MRS.

(b) "Any individual located on or beyond the nearest boundary of the controlled area ~~shall not receive a dose greater than 5 rem to the whole body or any organ from any design basis accident.~~ **may not receive from any design basis accident the more limiting of a total effective dose equivalent of 0.05 Sv (5 rem), or the sum of the deep-dose equivalent and the committed dose equivalent to any individual organ or tissue (other than the lens of the eye) of 0.5 Sv (50 rem). The lens dose equivalent shall not exceed 0.15 Sv (15 rem) and the shallow dose equivalent to skin or to any extremity shall not exceed 0.5 Sv (50 rem). The minimum distance from the spent fuel or, high-level radioactive waste or reactor-related GTCC waste handling and storage facilities to the nearest boundary of the controlled area must be at least 100 meters.**"

Replace Section (2) of the regulatory reference to 10 CFR 72.122 on Page 15-4, as shown:

(2)(i) Structures, systems, and components important to safety must be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, lightning, hurricanes, floods, tsunamis, and seiches, without impairing their capability to perform safety functions. The design bases for the structures, subsystems, and components must reflect

(i) (A) Appropriate consideration of the most severe of the natural phenomena reported for the site and surrounding area...

(i) (B) Appropriate combinations of the effects of normal and accident conditions and the effects of natural phenomena.

(ii) The ISFSI or MRS should also be designed to prevent massive collapse of building

Replace the eleventh paragraph of Section 15-3., “Regulatory Requirements,” on Page 15-3, as shown:

72.128 - Criteria for spent fuel, high-level radioactive waste, **reactor-related GTCC waste**, and other radioactive waste storage and handling.

(a) “Spent fuel, high-level radioactive waste, **and reactor-related GTCC waste** storage and handling systems, Spent fuel storage, high-level radioactive waste storage, **reactor-related GTCC waste storage** and other systems that might contain or handle radioactive materials associated with spent fuel, high-level radioactive waste, **or**

reactor-related GTCC waste must be designed to ensure adequate safety under normal and accident conditions. These systems must be designed with..."

(2) "Suitable shielding form radioactive protection under normal and accident conditions."

Replace the fifth paragraph of Section 15.4., "Acceptance Criteria," on Page 15-6, as shown:

10 CFR 72.122(l) requires that ISFSI storage systems allow ready retrieval of the stored spent fuel, **GTCC waste**, or high-level waste for normal and off-normal design conditions. Retrieval is the capability of returning the stored radioactive material to a safe condition without endangering public health and safety or causing additional exposure to workers. Any potential release of radioactive materials during retrieval operations must not exceed the radioactive exposure limits in 10 CFR Part 20 or 10 CFR 72.122(h).

Replace the first paragraph of Section 15.4.2., "Accidents," on Page 15-7, as shown:

In addition to the criteria stated in Section 15.4, 10 CFR 72.106(b) requires that any individual located at or beyond the nearest controlled area boundary ~~must not receive a dose greater than 5 rem to the whole body or any organ from any design basis accident.~~ **may not receive from any design basis accident the more limiting of a total effective dose equivalent of 0.05 Sv (5 rem), or the sum of the deep-dose equivalent and the committed dose equivalent to any individual organ or tissue (other than the lens of the eye) of 0.5 Sv (50 rem). The lens dose equivalent shall not exceed 0.15 Sv (15 rem) and the shallow dose equivalent to skin or to any extremity shall not exceed 0.5 Sv (50 rem).**

Replace the first paragraph of Section 15.5.2.12., "Building Structural Failure onto SSCs," on Page 15-32, as shown:

A building that houses the SSCs (contains spent fuel casks, is used for transfer operations, or is used for temporary storage) must be designed to prevent massive collapse due to accident conditions. Although not considered an SSC important to safety, the building must be designed to withstand collapse due to the effects of flood, fire and explosion, lightning, earthquake, tornado and tornado-generated missiles, and accidents at nearby sites. Review procedures for these events have been presented in previous subsections of Section 15.5.2 of this FSRP for SSCs important to safety. The reviewer should verify that the applicant has analyzed the building structure to meet the applicable portions of these procedures. The applicant's analysis should provide evidence that, although equipment or structures may be damaged, the surviving equipment and structures will continue to protect the fuel, **GTCC waste**, and high-level waste and that the radiological consequences are within the acceptable levels.

Add the following citation to the end of Section 17.1.4., "NUREG/CR," on Page 17-5, as shown:

NUREG/CR-6673, "Hydrogen Generation in TRU Waste Transportation Packages," by B.L. Anderson, M.K. Sheaffer, and L.E. Fischer, LLNL. May 2000.

(END)