Statutory Language and Regulatory History of Greater-Than-Class C Low-Level Radioactive Waste Disposal

BACKGROUND:

The Commission's licensing requirements for the land disposal of Low-Level Radioactive Waste (LLRW) reside in Part 61 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Licensing Requirements for Land Disposal of Radioactive Waste." Part 61 defines LLRW as "radioactive waste not classified as high-level radioactive waste [HLRW], transuranic [TRU] waste, spent nuclear fuel, or byproduct material as defined in paragraphs (2), (3), and (4) of the definition of *Byproduct material* set forth in § 20.1003 of this chapter." In 10 CFR § 61.55, the U.S. Nuclear Regulatory Commission (NRC) has developed a classification system for LLRW which categorizes waste as Class A, B, C, or Greater-Than-Class C (GTCC). GTCC is LLRW with concentrations of radionuclides that exceed the limits established by the Commission for Class C LLRW. GTCC waste is generated by nuclear power reactors and other supporting nuclear fuel cycle facilities and also other facilities and licensees outside of the nuclear fuel cycle and includes: (1) Plutonium-contaminated nuclear fuel cycle wastes; (2) Activated metals; (3) Sealed sources; and (4) Radioisotope product manufacturing wastes (i.e., wastes "occasionally generated as part of manufacture of sealed sources, radiopharmaceutical products and other materials used for industrial, education, and medical applications").[1]

In addition, the U.S. Department of Energy (DOE) has created a term, "GTCC-like waste," which refers to DOE owned and generated LLRW and non-defense-generated TRU waste, which have characteristics similar to those of GTCC waste. DOE also includes within the definition of GTCC-like waste recovered orphaned sealed sources to which it has taken title, even though those sources were originally licensed under the Atomic Energy Act of 1954, as amended (AEA).

STATUTORY LANGUAGE HISTORY:

The Low-Level Radioactive Waste Policy Act of 1980 assigned responsibility for the disposal of LLRW to the States. Responsibility for the disposal of GTCC LLRW was assigned to the Federal Government under Section 3(b)(1)(D) of the Low-Level Radioactive Waste Policy Amendments Act of 1985 (Amendments Act). The Amendments Act defined LLRW as "radioactive material that (A) is not high-level radioactive waste, spent nuclear fuel, or byproduct material (as defined in section 11e.(2) of the [AEA] (42 U.S.C. 2014(e)(2)); and (B) the Nuclear Regulatory Commission, consistent with existing law and in accordance with paragraph (A), classifies as low-level radioactive waste."

Furthermore, the Amendments Act states that GTCC wastes resulting from activities licensed by the NRC, "shall be disposed of in a facility licensed by the NRC that the Commission determines is adequate to protect human health and safety." The Amendments Act also required the Secretary of Energy to submit a comprehensive report with recommendations on the safe disposal of GTCC waste no later than 1 year of its enactment. In February 1987, the DOE issued a report to Congress entitled, "Recommendations for Management of

[1] *See* "Definition of High-Level Radioactive Waste," 52 FR 5992, 6001 (February 27, 1987).

Greater-Than-Class C Low-Level Radioactive Waste" DOE/NE-0077, in which DOE acknowledged its responsibility for the waste designated in Section 3(b)(1)(D) of the Amendments Act. Section 631 of the Energy Policy Act of 2005 contains a section entitled, "Safe Disposal of Greater-Than-Class C Waste." The Secretary of Energy "shall submit to Congress a report containing an estimate of the cost and a proposed schedule to complete an environmental impact statement [EIS] and record of decision for a permanent disposal facility for greater-than-Class C radioactive waste." The Secretary is further required to submit a report to Congress on disposal alternatives under consideration and await Congressional action before issuing a Record of Decision before making a final decision on the disposal alternative or alternatives to be implemented for GTCC waste.

The provision in the Amendments Act, which specifies that GTCC waste is to be disposed of in an NRC-licensed facility, raises a question about how such a provision would be applied in the case of disposal of GTCC waste in a DOE facility. Unless specifically provided by law, NRC does not exercise licensing and related regulatory authority over DOE facilities. If DOE selects a DOE facility for disposal of GTCC waste, clarification from Congress will be needed to determine NRC's role in licensing such a facility and related issues.

REGULATORY HISTORY:

The 10 CFR Part 61, promulgated in 1982, contained provisions related to GTCC disposal. Specifically, 10 CFR § 61.7(b)(5) states there may be some instances in which waste with radionuclide concentrations greater than permitted for Class C would be acceptable for near-surface disposal with special processing or design and these instances would be evaluated on a case-by-case basis. NUREG-0782—the draft Part 61 EIS for this rule—discussed near-surface disposal, as well as briefly discussed the land disposal alternatives to near-surface disposal including intermediate depth disposal, which was assumed to mean disposal of waste at depths greater than 15 m (49 ft). The final rule defined a near-surface disposal facility as a land disposal facility in which radioactive waste is disposed of in or within the upper 30 meters of the earth's surface. In addition, 10 CFR § 61.55(a)(2)(iv) stated, at the time, that proposals for disposal of this waste may be submitted to the Commission for approval pursuant to § 61.58, "Alternative requirements for waste classification and characteristics." Subpart D of Part 61 also reserves development of technical requirements for land disposal facilities other than near-surface disposal facilities.

In 1987, the NRC published an Advance Notice of Proposed Rulemaking (ANPR), "Definition of High-Level Radioactive Waste."[2] The Commission suggested a revision to the definition of HLRW in 10 CFR Part 60 and to classify waste as HLRW and non-HLRW. As a part of this rulemaking, the Commission was considering that wastes, which could be safely disposed of in a hypothetical intermediate disposal facility, would be classified as LLRW rather than as HLRW. The ANPR also acknowledged the possibility that no alternative disposal facility would ever be needed for GTCC wastes other than disposal in a repository. Overhead costs of developing and licensing new facilities, the relatively small volumes of such wastes, and the low heat generation rates of some of these wastes meant that the most economical disposal of such wastes would be disposal in a repository. The ANPR also noted the NRC staff was exploring the suitability of using alternative near-surface disposal systems (e.g., concrete bunkers, augered holes, and deeper disposal) for the disposal of GTCC waste including developing

[2] *Id*.

improved methods for radiological and economic impact analysis. However, based on stakeholders' comments and a review of available technical information related to waste classification and intermediate disposal facilities, the Commission took a different approach than that proposed in the ANPR.

In 1988, the NRC published a proposed rulemaking requiring disposal of GTCC waste in a deep geologic repository unless disposal elsewhere has been approved by the Commission.[3] The amendments were proposed in lieu of revising the definition of HLRW and classifying waste as HLRW and non-HLRW as proposed in the ANPR. Recognizing that intermediate disposal facilities were not sufficiently developed, no intermediate disposal facility for GTCC waste was proposed or planned by DOE, and the small volume of GTCC waste would not make such a separate intermediate facility cost effective, the Commission chose to take an "alternative, technically conservative approach."[4]

SECY-88-51, "10 CFR 60 and 61—Disposal of Radioactive Waste," discussing the proposed rule, noted that in 1987 the NRC staff detailed the advantages of repository disposal of GTCC waste in its comments on the DOE report, "Recommendation for Management of Greater-Than-Class C Low-Level Radioactive Waste" (Letter to Mr. A. David Rossin, Assistant Secretary for Nuclear Energy, DOE from Hugh L. Thompson, Director, Office of Nuclear Material Safety and Safeguards, April 30, 1987). In its comments on the DOE report, the NRC staff suggested that DOE consider disposal of all GTCC waste in a HLRW repository for several reasons including: disposal in a repository would provide the required degree of isolation; technical requirements for GTCC disposal in a repository, for the most part, already existed in NRC and U.S. Environmental Protection Agency (EPA) regulations; and the small quantity of GTCC waste expected would not make a separate facility economically attractive. The staff did recognize that it may be feasible that GTCC waste could be disposed at a LLRW disposal site with greater confinement techniques.

In the proposed rule, the Commission recognized the possibility that DOE could choose to develop an intermediate facility and did not want to foreclose this option.[5] The proposed rule noted that should DOE develop such a facility, it would be evaluated against the performance objectives in 10 CFR Part 61 and any EPA radiation safety standards. To implement the performance objectives in 10 CFR Part 61 and EPA environmental standards, the Commission would develop technical requirements "after DOE had completed its conceptual design and selected a site for a specific type of facility."[6] The Commission concluded that, "in the absence of an approved alternative, a geologic repository is the only currently authorized facility acceptable for GTCC disposal without further review by the Commission."[7] This minor amendment specified the "more stringent" methods are to include geologic repository disposal along with the explicit previous provisions that "proposals for other methods of disposal may still be submitted to the Commission for approval."[8]

---

[3] *See* "Disposal of Radioactive Wastes," 53 FR 17709 (May 18, 1988).
[4] *Id.* at 17710.
[5] *Id.*
[6] *Id.*
[7] *Id.* at 17711.
[8] *Id.*

The Commission received 35 comment letters on the proposed rule. These included comments on: restricting the disposal alternatives for GTCC waste; licensing under 10 CFR Part 61; applicability of standards; effects of repository program; relationship to defense wastes; restricting DOE options for GTCC management; and limiting state responsibility. Comments by States and a regional State LLW compact argued for restricting the alternatives to geologic repository disposal. These comments were concerned that GTCC waste would be disposed of in State or State compact operated facilities. However, in the statement of considerations for the final rule, the Commission had noted that it found no health and safety basis to limit GTCC disposal to Federal facilities to the exclusion of other facilities licensed under the AEA (which would include facilities licensed by Agreement States), and that the Amendments Act appeared to recognize the continued authorities of States to accept GTCC waste for disposal.[9] In responding to comments on effects on a repository program, the Commission stated that GTCC is generally not acceptable for near-surface disposal, GTCC disposal must be more stringent than near-surface disposal, the amendments allowed for a range of GTCC disposal methods, and that 10 CFR Part 61 prevents DOE from routinely using near-surface disposal.

On May 25, 1989, the Commission amended its regulation at 10 CFR § 61.55 (a)(2)(iv) to require disposal of all GTCC waste to be disposed of in a geologic repository unless an alternative proposal is approved by the Commission.[10] In the *Federal Register* for the final rule, the NRC noted that "It is the Commission's view that intermediate disposal facilities may never be available…[and] a repository would be the only type of facility generally capable of providing safe disposal for GTCC wastes." In a July 23, 1990, letter from the Office of Nuclear Material Safety and Safeguards' Director, Robert Bernero to DOE, the NRC stated "the Commission recognized the possibility of proposals for at least some categories of GTCC waste that suitable processing and packaging could make such waste approvable for disposal in near-surface facilities under Part 61. However, recognizing that such waste is not generally acceptable for near-surface disposal, the Commission called for disposal in a geological repository licensed under one regulation for HLRW disposal, Part 60." Since promulgation of the regulation, there have been a few discrete cases of GTCC waste disposal, specifically at the Barnwell LLRW Disposal Facility (NRC's Agencywide Documents Access and Management System Accession No.: ML15162A084).

In 2001, the Commission amended its regulations to allow licensing for the interim storage of GTCC waste in a manner that is consistent with current licensing for the interim storage of spent fuel.[11] The final rule only applies to the interim storage of GTCC waste generated or used by commercial nuclear power plants. The Commission referred to 10 CFR § 61.55 (a)(2)(iv) and stated that "GTCC waste could become eligible for disposal in a geologic repository in the future."

DOE'S ACTIVITY RELATED TO GTCC WASTE DISPOSAL

In its report, "Recommendations for Management of Greater-Than-Class-C Low-Level Radioactive Waste," DOE proposed several actions to ensure the safe disposal of GTCC waste including the completion of appropriate National Environmental Policy Act review. In 2011, DOE published its "Draft Environmental Impact Statement for the Disposal of Greater-Than-Class C

[9] *See* "Disposal of Radioactive Waste," 54 FR 22578, 22579 (May 25, 1989).
[10] *See* "Disposal of Radioactive Waste," 54 FR 22583, (May 25, 1989).
[11] See "Interim Storage for Greater Than Class C Waste," 66 FR 51823 (October 11, 2001).

(GTCC) Low-Level Radioactive Waste and GTCC-Like Waste," in accordance with the Energy Policy Act of 2005. The EIS considered the potential environmental impacts associated with constructing and operating a new facility or facilities, or using an existing facility, for the disposal of GTCC and GTCC-like waste. The draft EIS analyzes methods (geologic repository, above grade vault, enhanced near-surface trench, and intermediate depth borehole), and locations for the disposal of such waste. The proposed disposal locations analyzed in the draft EIS include the Hanford Site, Idaho National Laboratory, Los Alamos National Laboratory, Nevada National Security Site, Savannah River Site, Waste Isolation Pilot Plant (WIPP), and WIPP vicinity. In addition, the draft EIS evaluates generic commercial disposal sites in four regions of the U.S. The DOE did not identify a preferred alternative in the draft EIS.

The DOE is in the later stages of finalizing the EIS, including considering stakeholder comments such as the NRC's. As noted above, prior to making a final decision on the disposal alternatives, DOE is required to (i) submit a report to Congress that describes the disposal alternatives and includes all of the information required in the comprehensive report DOE submitted to Congress in February 1987, and (ii) await action by Congress.

In its 1987 ANPR for the rulemaking regarding the HLRW definition, the Commission noted the absence of prescriptive requirements for GTCC waste disposal because the regulation allows for evaluation of specific proposals for GTCC waste disposal on a case-by-case basis. In the 1988 proposed rulemaking to amend 10 CFR Part 61, the Commission stated it would develop technical requirements for GTCC waste disposal "after DOE had completed its conceptual design and selected a site for a specific type of facility."[12] In the DOE's draft EIS, DOE provides conceptual designs for all four disposal methods and evaluates the methods of disposal for the possible sites.

If DOE selects the aboveground vaults, trenches or intermediate boreholes methods of disposal, the NRC will need to develop technical requirements consistent with the performance objectives in 10 CFR Part 61 Subpart C. If DOE selects the geologic repository method of disposal, the NRC will need to update the technical requirements in 10 CFR Part 60. Additional activities that NRC may need to undertake could involve a rulemaking or development of criteria that would be a part of a site-specific license. Thus, the selection of a preferred alternative(s) will influence the development and implementation of these technical requirements.

ALTERNATIVE METHODS OF DISPOSAL FOR THE VARIOUS TYPES OF GTCC WASTES

The DOE draft EIS analyzes a combined GTCC LLRW and GTCC-like waste total inventory of about 12,000 m^3 (420,000 ft^3) and contains a total activity of about 5.92 x 10^6 TBq (160 MCi). DOE divided GTCC LLRW and GTCC-like waste into three waste types: activated metals, sealed sources, and other waste. The analyzed wastes include wastes already generated and wastes that are expected to be generated in the future.

The activity levels of GTCC waste span a wide range. Some of the radionuclide concentrations in GTCC waste will be close to the Class C concentration limits while some portion of the GTCC waste is greater than the activity range for high-level waste. The variety in the characteristics of GTCC waste results in disposal challenges.

[12] *See* "Disposal of Radioactive Wastes," 53 FR 17709, 17710, (May 18, 1988).

Based on the concentration of radioactivity in the waste and the length of time the waste poses a significant hazard, DOE could recommend different alternative methods of disposal based on the types of GTCC waste. DOE could possibly recommend disposal of the GTCC waste with concentration of radioactivity closer to HLRW to be disposed of in a geologic repository, as defined under 10 CFR Part 60 or 63. On the other hand, DOE could recommend an alternative waste disposal facility licensed under 10 CFR Part 61 such as an intermediate depth facility (e.g., intermediate boreholes) or near-surface facility (e.g., above grade vaults or near-surface enhanced trenches) with greater confinement techniques.

As noted above in the discussion on the ANPR, the NRC staff was working on developing improved methods for radiological and economic impact analysis. In 1986, the NRC published NUREG/CR 4370, "Update of Part 61 Impacts Analysis Methodology," which considers the radiological, physical, and chemical characteristics of LLRW in more precise detail, giving special emphasis to GTCC waste and a number of potential near-surface disposal methods that might be suitable for such waste including trench disposal plus a number of alternatives such as concrete structures. The NRC staff would consider this NUREG in developing the technical requirements for GTCC waste disposal.

REFERENCES:

DOE, DOE/EIS-0375-D, "Draft Environmental Impact Statement for the Disposal of Greater-Than-Class C (GTCC) Low-Level Radioactive Waste and GTCC-Like Waste," February 2011.

DOE, DOE/NE-0077 "Recommendations for Management of Greater-Than-Class C Low-Level Radioactive Waste," February 1987.

NRC, NUREG-0782, "Draft Environmental Impact Statement on 10 CFR Part 61 Licensing Requirements for Land Disposal of Radioactive Waste," September 1981.

NRC, 1986. U.S. Nuclear Regulatory Commission, "Update of Part 61 Impacts Analysis Methodology," NUREG/CR-4370, 2 Vols., January 1986.