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Standard Guide for Preparing Waste Management Plans for Decommissioning Nuclear Facilities¹

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1. Scope

1.1 This guide addresses the development of waste management plans for potential waste streams resulting from decommissioning activities at nuclear facilities, including identifying, categorizing, and handling the waste from generation to final disposal.

1.2 This guide is applicable to potential waste streams anticipated from decommissioning activities of nuclear facilities whose operations were governed by the Nuclear Regulatory Commission (NRC) or Agreement State license, under Department of Energy (DOE) Orders, or Department of Defense (DoD) regulations.

1.3 This guide provides a description of the key elements of waste management plans that if followed will successfully allow for the characterization, packaging, transportation, and off-site treatment or disposal, or both, of conventional, hazardous, and radioactive waste streams.

1.4 This guide does not address the on-site treatment, long term storage, or on-site disposal of these potential waste streams.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

¹ This guide is under the jurisdiction of ASTM Committee E10 on Nuclear Technology and Applications and is the direct responsibility of Subcommittee E10.03 on Radiological Protection for Decontamination and Decommissioning of Nuclear Facilities and Components.

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2. Referenced Documents

2.1 ASTM Standards:²

D5283 Practice for Generation of Environmental Data Related to Waste Management Activities: Quality Assurance and Quality Control Planning and Implementation

D5792 Practice for Generation of Environmental Data Related to Waste Management Activities: Development of Data Quality Objectives

E1892 Guide for Preparing Characterization Plans for Decommissioning Nuclear Facilities

2.2 Code of Federal Regulations:³

10 CFR 60 Disposal of High-Level Radioactive Wastes in Geologic Repositories

10 CFR 61 Licensing Requirements for Land Disposal of Radioactive Waste

10 CFR 71 Packaging and Transportation of Radioactive Materials

10 CFR 830.120 Nuclear Safety Management, Subpart A, "Quality Assurance Requirements"

29 CFR Subpart H, "Hazardous Materials: Section 1910.120, "Hazardous Waste Operations and Emergency Response"

40 CFR 261 Identification and Listing of Hazardous Waste

40 CFR 262 Standards Applicable to Generators of Hazardous Waste

40 CFR 761 Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions

40 CFR 763 Asbestos

49 CFR 172 Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements

49 CFR 173 Shippers—General Requirements for Shipments and Packagings

49 CFR 397 Transportation of Hazardous Materials; Driving and Parking Rules

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401.

2.3 DOE Documents:³

DOE Order 460.1A Packaging and Transportation Safety
DOE Order 460.2A Departmental Materials Transportation
and Packaging Management
DOE Order 414.1C Quality Assurance
DOE Manual M 435.1-1 Radioactive Waste Management
Manual

2.4 United States Code:³

USC 2014 Definitions

2.5 NRC Standards and Guides:³

NUREG-1575 Multi-Agency Radiation Survey and Site In-
vestigation Manual (MARSSIM)
NUREG-1575, Supplement 1 Multi-Agency Radiation Sur-
vey and Assessment of Materials and Equipment (MAR-
SAME)
NUREG-1576 Multi-Agency Radiological Laboratory Ana-
lytical Protocols (MARLAP)

2.6 Other Documents:

EPA QA/R-2 Requirements for Quality Management Plans⁴
EPA QA/G-4 Guidance on Systematic Planning Using the
Data Quality Objectives Process⁴
NQA-1-2000 American Society of Mechanical Engineers,
2008⁴

3. Terminology

3.1 Definitions:

3.1.1 *documents*—instructions, procedures and drawings that control policy, administrative, and technical information.

3.1.2 *records*—electronic, written, printed, microfilm, photographs, radiographs, or optical disks that contain data that are retained for their future value.

3.1.3 *waste acceptance requirements*—criteria and all other requirements that a facility receiving waste for treatment, storage, or disposal must meet to receive waste.

3.1.4 *waste acceptance criteria*—the technical and administrative criteria that a waste must meet to be accepted at a treatment, storage, or disposal facility.

4. Significance and Use

4.1 A waste management plan based on the contents of this guide will provide for the successful identification of potential waste streams anticipated from decommissioning activities, and provide a clear and concise methodology for the handling of identified waste from generation to final disposition.

4.2 The waste management plan will identify the general waste types, characterization, packaging, transportation, disposal, and quality assurance requirements for potential waste streams.

5. General Waste Types

5.1 *Radioactive*—Radioactive wastes are defined as discarded material in any form that must be managed for its

radioactive content per federal or agreement state regulations. Radioactive wastes are further categorized into the following subclasses.

5.1.1 *High Level*—High level wastes are irradiated reactor fuel (spent nuclear fuel) and the highly radioactive material resulting from the reprocessing of irradiated reactor fuel, including liquid waste and any solid material derived from such liquid (10 CFR 60, DOE Manual M 435.1-1).

5.1.2 *Transuranic*—Transuranic wastes are any material containing alpha-emitting transuranic nuclides with half-lives greater than 20 years and in concentrations greater than 100 nanocuries per gram (3.7 kBq g^{-1}) ($1 \times 10^{-7} \text{ Ci/g}$) (DOE Manual M 435.1-1).

5.1.3 *By-Product Material*—By-product material wastes are any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material, and the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content (42 USC 2014(e)).

5.1.4 *Naturally Occurring and Accelerator Produced Radioactive Materials*:

5.1.4.1 *NORM (Naturally Occurring Radioactive Material)*—Any material that contains naturally occurring radionuclides. By-product material and the natural radioactivity of rocks, soils, or background radiation are not to be included (DOE Manual M 435.1-1).

5.1.4.2 *NARM (Naturally Occurring or Accelerator Produced Radioactive Material)*—Any material that contains NORM or accelerator-produced radioactive materials.

5.1.4.3 *TENORM (Technologically Enhanced Naturally Occurring Radioactive Materials)*—NORM whose composition, radionuclide concentrations, availability, or proximity to man have been increased by or because of human practices.

5.1.5 *Low Level*—Low level wastes are radioactive wastes that are not spent fuel, high level radioactive wastes, transuranic radioactive wastes, by-product material, or naturally occurring radioactive materials. Low level wastes are defined into categories per 10 CFR 61.55(a)(2)(i) and accompanying tables. Those categories include:

5.1.5.1 *Class A*—Class A wastes contain the lowest concentrations of radioactivity and typically are composed of short-lived radionuclides that generate no decay heat, do not need to be shielded, and decay to levels posing minimal potential human dose within 100 years. Class A wastes typically have an average concentration less than 100 GBq m^{-3} (2.7 Ci m^{-3}) and constitute the majority of generated radioactive waste.

5.1.5.2 *Class B*—Class B wastes contain the next lowest concentrations of radioactivity and typically are composed of greater quantities of short-lived radionuclides than Class A. Class B wastes typically have an average concentration of 3 TBq m^{-3} (81 Ci m^{-3}).

5.1.5.3 *Class C*—Class C wastes contain the highest concentrations of radioactivity acceptable for near-surface disposal. Class C wastes are typically composed of greater concentrations of short-lived radionuclides than Class A or B wastes, and may contain long-lived radionuclides.

⁴ U.S. Environmental Protection Agency, Quality Staff (281 1R), 1200 Pennsylvania Ave., NW, Washington, DC 20460. E-mail: quality@epa.gov