



## The Long-Term Control of Property: Overview of Requirements in Orders DOE 5400.1 & DOE 5400.5

**Forward:** This information brief summarizes DOE requirements for radiation protection of the public and environment, with the intent of assisting DOE elements in planning and implementing programs for the long-term control (stewardship) of property.

The Atomic Energy Act (AEA), the Department of Energy Organization Act (DOA), and related statutes assign to the Department the responsibility to protect the public, the environment, and property from the hazards associated with its research, development, production, or other activities. This responsibility, which lacks any limit in time, includes protecting the public and environment from radiation or radioactive material. DOE requirements mandate continued control of property until the radiological hazard associated with this property is reduced to levels at which regulation under the AEA is no longer needed to ensure protection of the public and environment.

The Department and its predecessor agencies have conducted activities in accordance with this responsibility for several decades, using land ownership and access control, environmental monitoring and surveillance, and other techniques at operational and inactive facilities, including radioactive waste burial grounds. For example, DOE continues oversight and care of the Piqua nuclear reactor which was begun in 1968 by the Atomic Energy Commission (AEC) when this reactor was decommissioned and entombed. The current restructuring of the DOE mission provides greater emphasis to environmental restoration programs, and long-term stewardship of property containing radioactive material, and less emphasis to industrial-type programs. Yet despite this shift in mission emphasis, DOE's responsibility and requirements under the AEA remain fundamentally unaltered.

**Statutes:** Atomic Energy Act of 1954, Energy Reorganization Act, DOE Organization Act, Nuclear Waste Policy Act, Uranium Mill Tailings Radiation Control Act, Low-level Radioactive Waste Policy Act, Waste Isolation Pilot Plant Land Withdrawal Act, and the Energy Policy Act of 1992, as these statutes have been amended.

**Regulations:** 10 CFR 835, 10 CFR 820, 10 CFR 834 (proposed).

**Orders:** [DOE 5400.5, Radiation Protection of the Public & the Environment](#), DOE 5400.1, General Environmental Management Program, DOE O 435.1, Radioactive Waste Management (revision of DOE 5820.2A), DOE M 231.1-1, Environment, Safety and Health Reporting Manual.

This information brief is meant to assist those making plans and decisions about the long-term control of DOE property<sup>1</sup> that contains radioactive waste or residual radioactive material (RRM). Examples of property covered under this summary include active and inactive radioactive waste disposal facilities, inactive soil columns, sites containing contaminated tailings or soils, contaminated process buildings, and contaminated historic properties.

Statutes leading to the creation of the Department have bestowed it with broad responsibilities and authorities to ensure long-term protection of property, the public, and the environment at its facilities. Most DOE facilities carry out activities authorized pursuant to the AEA, which entrusts the AEC (DOE) to "govern any activity authorized pursuant to...[the AEA], including standards and restrictions governing the design, location, and operation of facilities used in the conduct of such activities in order to protect health and

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<sup>1</sup>Property means materials, equipment, land or structures to which a person or DOE has a legal title -- i.e., all real or personal property.

minimize danger to life and property" (AEA Section 161(i)).<sup>2</sup> The Energy Reorganization Act of 1974 (ERA), which created NRC and the Energy Research and Development Administration (ERDA) from the AEC, includes the goal of "restoring, protecting, and enhancing environmental quality, and...[assuring]...public health and safety" (ERA Section 2(a)). Creating DOE from ERDA and other agencies, the DOA includes the same environmental quality and public health and safety goals as does the ERA (DOA Section 102).<sup>3</sup>

Departmental directives issued pursuant to this authority include DOE 5400.1, General Environmental Protection Program, and DOE 5400.5, Radiation Protection of the Public and the Environment. These directives apply to any site operated or controlled by the Department pursuant to the AEA, including research or production operations, radioactive waste disposal facilities, property containing residual radioactive material from DOE site activities, and areas remediated, or disposal facilities constructed, in accordance with the Comprehensive Environmental Restoration, Compensation, and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), or other statutes.<sup>4</sup>

These two directives are summarized below. Also addressed are several specific issues pertaining to the two directives, the need to integrate DOE requirements under the AEA and DOA with other applicable requirements for the long-term control of property, and principal guidance and analytical tools for demonstrating compliance with DOE 5400.1 and DOE 5400.5.

### **DOE 5400.1, General Environmental Management Program**

This directive establishes environmental protection program requirements, authorities, and responsibilities for DOE operations for assuring compliance with applicable Federal, State, and local environmental protection laws and regulations, executive orders, and internal Department policies. Because of the environmental significance of Departmental activities authorized under the AEA, it emphasizes

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<sup>2</sup>The authority of the Nuclear Regulatory Commission (NRC) under the AEA is generally limited to licensing safe use of source, byproduct, and special nuclear material. DOE's AEA authority is broader; it encompasses any activity authorized under the AEA at any of its facilities. For example, Section 161(i) provides DOE with the authority to regulate the use and disposal of naturally occurring or accelerator produced radioactive materials, or other hazardous substances, at its AEA-authorized facilities, or to protect DOE property for its resource or historical values.

<sup>3</sup>These goals are applicable at all DOE facilities, not just those authorized under the AEA.

<sup>4</sup>The applicability of DOE requirements to activities conducted under the authority of the Director, Naval Nuclear Propulsion Program, as described in Pub. L. 98-525 and Executive Order 12344, is limited. Hence, requirements in DOE Orders 5400.1 and 5400.5 do not apply to activities conducted under the authority of the Director, Naval Nuclear Propulsion Program.

requirements for radiation protection.

DOE environmental management activities are extensively, but not entirely, regulated by the Environmental Protection Agency (EPA), State, and local environmental agencies. Where these agencies clearly exercise environmental protection authority through permitting and compliance administrative procedures applicable to DOE, they establish and regulate required performance for environmental protection. This directive, and others, provide requirements for satisfying these externally imposed regulations, as well as requirements for those environmental protection programs that are not externally regulated.

In particular, DOE 5400.1 requires an annual site environmental report,<sup>5</sup> as well as plans and programs for groundwater protection, waste minimization, and pollution prevention awareness. An environmental monitoring program is also required that addresses: preoperational monitoring; environmental monitoring, including effluent monitoring and environmental surveillance; meteorological monitoring; radiological and non-radiological monitoring; air and groundwater monitoring; and quality assurance and data verification.

DOE plans to eventually replace DOE 5400.1 with DOE O 450.1.

### **DOE 5400.5, Radiation Protection of the Public and the Environment.**

This directive establishes standards and requirements for DOE operations for ensuring protection of the members of the public and the environment against undue risk from radiation. DOE's objectives through this directive are to maintain radiation exposures to members of the public within established limits, to control radioactive contamination through the management of real and personal property, to maintain potential exposures to members of the public as far below the established limits as is reasonably achievable, to assure that DOE facilities have the capabilities, consistent with the types of operations conducted, to monitor routine and non-routine releases and to assess doses to members of the public, and to protect the environment from radioactive contamination to the extent practical.

Property that can not or will not be released pursuant to DOE's requirements must be maintained by DOE or another authorized party pursuant to the AEA.<sup>6</sup> While DOE control

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<sup>5</sup>This requirement has been moved to DOE Manual 231.1-1, Environment, Safety and Health Reporting Manual.

<sup>6</sup>DOE will not release to another unlicensed or unauthorized party any property which would be subject to licensing under NRC or Agreement State regulations. Transfer of property containing radioactive material between DOE sites may occur, provided that the receiving site is so authorized consistent with DOE requirements. Similarly, transfer of radioactive material or property to another agency authorized under the AEA to receive the material is permissible, as is transfer to an NRC or Agreement State licensee provided that the license authorizes acceptance of

continues, radiological protection activities must be conducted under programs that address the applicable requirements in DOE 5400.5. In addition to complying with requirements governing total doses from all pathways, compliance must be demonstrated with dose limits or constraints that are established for a specific activity or pathway.

The scope and extent of the activities performed to ensure public and environmental radiological protection is subject to a graded approach, depending on the conditions at a site and its operations. Fundamentally, DOE's approach is to establish limits or constraints on the amount of radiation dose that members of the public or other biota can receive, and to impose whatever controls are needed on the property it possesses to ensure that the dose limits or constraints are not exceeded.

Controls that may be imposed on an inactive or closed facility (e.g., a waste disposal site) to ensure public and environmental protection have been traditionally termed "institutional controls." These controls are similar to those that are imposed on an active facility or operation, although the scope and extent of the activities that are performed may be different.<sup>7</sup> Controls may include, for example, limitations on release of radionuclides, control of access to or use of property, surveillance, monitoring, markers, documentation, or other measures.

The primary DOE dose limit from all sources of radiation is a total effective dose equivalent (TEDE) of 100 millirem in a year, except for radon and its decay products.<sup>8</sup> A 10-millirem (TEDE) limit is imposed on annual doses from air pathways, except for radon and its decay products.

Furthermore, doses to members of the public must be reduced to low levels consistent with a documented ALARA process, and generally not exceeding a dose constraint of one-quarter of the primary dose limit, or 25 millirems (TEDE) in a

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the material or property.

<sup>7</sup> Although for purposes of EPA's CERCLA program "institutional controls" may be considered largely in terms of legally enforceable administrative measures, such as deed restrictions, the concept is much broader for purposes of long-term management of property containing radioactive waste or RRM. For purposes of the AEA and DOA, the term is considered to apply to all active and passive measures required to maintain an adequate level of protection to the public and the environment, consistent with the common understanding of the term as it has long existed for radioactive waste management. Succinct definitions of active and passive institutional controls are provided in 40 CFR 191.12 for disposal of high-level and transuranic wastes and spent nuclear fuel. When issued in 1985 by EPA, the definitions reflected the common understanding of the terms for purposes of radioactive waste management. They should be considered generally applicable to RRM and to other types of radioactive waste.

<sup>8</sup> This dose limit applies to the combination of public exposures caused by all DOE activities (operations, waste disposal, etc.), as well as all other non-DOE activities involving radioactive material, except for doses from medical sources, consumer products, global fallout from past nuclear accidents and weapons tests, and naturally occurring radiation sources (unless the naturally occurring radiation sources were enhanced by DOE activity for which a case by case determination will be made).

year. DOE expects that in the great majority of situations, annual doses to real persons from all DOE sources should not exceed a few millirems (TEDE) in a year.

Discharge of radioactive materials to soil columns and as liquid waste (as effluent or to sanitary sewerage) must comply with ALARA, best available technology, and other requirements. An interim dose limit of 1 rad per day to native aquatic animal organisms is imposed for liquid wastes discharged to natural waterways. Liquid effluent from DOE activities may not cause private or public drinking water systems downstream of the facility discharge to exceed the drinking water radiological limits in 40 CFR 141.

Environmental monitoring and surveillance programs must be conducted. Property known or suspected of residual activity must be appropriately surveyed or characterized. Individual and collective doses to members of the public must be assessed. To the extent practicable, direct measurements should be used to obtain information characterizing source terms, exposures, exposure modes, and other information needed to evaluate public dose. Approved computer codes and other analytical tools may be used as appropriate and needed to estimate doses and to determine compliance with DOE and external requirements.<sup>9</sup>

The results of site environmental monitoring and surveillance programs, as well as maximum doses to members of the public, must be documented in annual reports. Events that result in a dose to member of the public exceeding 10 millirems (TEDE) in a year must be reported, as should collective doses exceeding 100 man-rem in a year. Corrective actions must be carried out as needed to ensure compliance with dose limits.

Records developed must include information and data necessary to identify and characterize releases of radioactive material to the environment, their fate in the environment, and their probable impact or radiation doses to humans. Basic information used to assess compliance with requirements with dose limits and constraints, and the results of such assessments, must be included as part of the record. The records must be retained consistent with the requirements of DOE 1324.2A (replaced by DOE 1324.5B, Records Management Program) and other legally applicable requirements.

Chapter IV of DOE 5400.5 includes requirements for long-term management of radioactive wastes. Control and stabilization features, access control, and other requirements comparable to those under 40 CFR 192 are imposed for materials similar to 11e.(2) byproduct material (uranium, thorium, and their decay products). Otherwise, long-term

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<sup>9</sup> DOE's primary dose limit (and dose constraints) apply to actual or anticipated exposures and calculated doses to real members of the public. As part of DOE planning activities for property under long-term control, DOE may project doses to hypothetical members of the public over extended periods of time, as is the case for performance assessments for LLW disposal facilities. These performance assessments do not normally constitute a demonstration of compliance with DOE's primary dose limits and constraints, but may be used to project the ease or difficulty of future compliance.

management of other radionuclides must be in accordance with DOE 5820.2A, or its replacement (Order and Manual 435.1).

DOE plans to replace DOE 5400.5 with the regulation 10 CFR 834. As proposed, this regulation includes essentially the same requirements as does DOE 5400.5, plus some radiation-oriented requirements (e.g., groundwater protection program) currently addressed in DOE 5400.1.

### Specific issues

**No time limit on DOE responsibility.** There is no time limit on DOE's AEA and DOA responsibilities, nor on the applicability of DOE's radiation protection criteria. With respect to radiation protection, the only consideration is whether the risks presented by the radioactive material may eventually be sufficiently low that continued protection would not be necessary. Nonetheless, the scope and extent of a program for ensuring continued protection will depend on the situation and may change with time. In some cases, because of remediation, natural processes, or radioactive decay, DOE control may be required for a limited amount of time. But in most cases, because of the nature of the hazard, statutory language, or for other reasons, DOE control may be required permanently.

In any event, DOE's responsibilities under the AEA and DOA are independent of analytical assumptions for purposes of prospective assessment or design decisions with respect to engineered or physical barriers. For example, for operation of LLW disposal facilities, field offices must conduct studies of the potential radiological impacts to an inadvertent intruder into the disposal facility assuming temporary breakdowns in institutional controls.<sup>10</sup> But these analytical assumptions signify neither an actual end to institutional controls nor an end to DOE's responsibility under the AEA. As another example, 40 CFR 192 includes standards for long-term control of 11e.(2) byproduct material that are expressed in terms of longevity of engineered barriers, as does Chapter IV of DOE 5400.5 for control of similar radioactive material. The barrier specification reflects a regulatory risk management decision and does not correlate to radiation hazard nor an end to DOE's statutory responsibility to protect the public and the environment. If the engineered barriers require future repair to protect the public and the environment, then it is DOE's responsibility to conduct these repairs for the facilities subject to DOE's oversight.

**Relationship of DOE requirements to RCRA and CERCLA requirements and agreements.** DOE requirements under the AEA and DOA apply irrespective of any requirements or agreements made under RCRA, CERCLA, or the Federal Facilities Compliance Act. Nonetheless, to avoid duplication of effort, DOE may determine that

compliance with other applicable agreements or requirements, such as an EPA general environment standard or a CERCLA ROD, may be sufficient to discharge DOE's AEA responsibilities. In these cases, DOE must make specific determinations of compliance with AEA requirements because DOE lacks the authority to delegate its regulatory responsibility under the AEA to non-DOE organizations or individuals.

**Relationship of DOE 5400.5 to facilities or sites licensed by NRC.** DOE activities subject to licensing by the Nuclear Regulatory Commission include:

- o Long-term control and maintenance of uranium and thorium mill tailings repository sites pursuant to Titles I and II of the Uranium Mill Tailings Radiation Control Act (UMTRCA).
- o Disposal of greater-than-Class C LLW generated by NRC licensees pursuant to the Low-Level Radioactive Waste Policy Amendments Act.
- o Disposal of high-level waste, spent nuclear fuel, or other material in a repository licensed by NRC pursuant to the ERA, the Nuclear Waste Policy Act (NWPA), and the Energy Policy Act.
- o Operation of facilities such as certain retrievable surface storage facilities as provided for in Section 202 of the ERA.

To the extent that a DOE activity complies with an applicable NRC license, and NRC requirements provide equivalent or greater protection than do those of the Department's, DOE will normally regard NRC-licensed activities to be in compliance with DOE requirements. In some cases, NRC regulations or authorizing statutes (e.g., UMTRCA, NWPA) establish design, operating, or institutional control requirements that may be more specific or extensive than those in DOE directives. Some requirements, however, such as internal DOE reporting requirements, would still need to be addressed separate from the NRC license.

**Relationship of DOE 5400.5 to facilities or sites operating in accordance with 40 CFR 191.** In addition to design and procedural requirements, 40 CFR 191 imposes several long-term institutional control requirements, including:

- o permanent land and access control;
- o provision of active institutional controls for as long after disposal as is practicable;
- o recordkeeping, permanent markers, and other passive institutional control provisions; and
- o performance monitoring.

Compliance with these requirements is normally considered sufficient to comply with comparable requirements in DOE 5400.5. Internal reporting requirements, among other requirements, would still need to be addressed.

**Property transferred to DOE under Section 151 of the Nuclear Waste Policy Act.** Low-level waste disposal sites transferred to DOE under Section 151 of the NWPA is

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<sup>10</sup>The assumption is usually that breakdowns can occur at some time after about 100 years of institutional control following disposal facility closure.

subject to the provisions of DOE 5400.1 and DOE 5400.5 upon DOE acceptance of property title and custody.

**Release of property.** DOE requirements for release of property are mainly in Chapter IV of DOE 5400.5 but are also in Chapter II, Section 5. To help implement these requirements, DOE has prepared guidance about release<sup>11</sup> and control of all types of real and non-real property, including soils, structures, and personal property (see below). The Department requires case-by-case derivation of authorized limits in the form of concentration limits (e.g., activity (Ci) per unit of mass (g), volume (m<sup>3</sup>), or area (100 cm<sup>2</sup>)) or other measurable quantities. Authorized release alternatives must be evaluated using DOE's ALARA process. Authorized limits should not exceed a dose constraint of 25 mrem (TEDE) in a year. Specific concentration guidelines have been approved for release of property having residual radioactive material on property surfaces. In most situations, because they meet the requirements for derived authorized limits, these guidelines may be used in lieu of derived authorized limits. Generic concentration limits are provided for radium and thorium in soil; authorized limits must be derived considering the ALARA process for other radionuclides in soil. DOE ALARA requirements apply for the radium and thorium soil concentration limits.

#### **Integration of DOE AEA and DOA Requirements with Other Applicable Requirements for Long-Term Control of Property**

Programs for long-term control of DOE property should integrate controls and activities conducted to meet all AEA and DOA requirements with those prescribed in or derived from other applicable statutes. Of interest is the Department's program for managing cultural resources. Information about DOE's cultural resources program, including DOE's Environmental Guidelines for Development of Cultural Resource Management Plans (DOE/EH-0501, August 1995), can be obtained at <http://tis.eh.doe.gov/oeпа/cultural/mission.html>. Also of interest are two additional DOE directives issued under DOE's AEA and DOA authorities -- i.e., DOE O 435.1, Radioactive Waste Management, and 10 CFR 835, Occupational Radiation Protection. Information about these directives may be obtained, respectively, at <http://www.em.doe.gov/em30> and <http://tis.eh.doe.gov/nsps/rules/rules.html>.

Numerous externally imposed requirements may pertain to long-term control programs, including those derived from:

- o Nuclear Waste Policy Act;
- o Uranium Mill Tailings Radiation Control Act;

- o Energy Policy Act of 1992;
- o Waste Isolation Pilot Plant Land Withdrawal Act;
- o Federal Facility Compliance Act;
- o Resource Conservation and Recovery Act;
- o Comprehensive Environmental Response, Compensation, and Liability Act;
- o Toxic Substances Control Act;
- o Clean Air Act;
- o Clean Water Act;
- o Archeological Resources Protection Act;
- o Native American Graves Protection and Repatriation Act; and
- o National Historic Preservation Act.

This is only a partial list. Information about many of these statutes, the requirements deriving from the statutes, and guidance for implementing the requirements, is available at <http://www.tis.eh.doe.gov/oeпа>.

#### **Principal Guidance and Analytical Tools**

Guidance about compliance with Orders DOE 5400.1 and DOE 5400.5 can be obtained through the Office of Environmental Policy and Assistance (OEPA). Many documents are available using the "Policy & Guidance" button, "Radiation Protection" subject area, on the OEPA website (<http://www.eh.doe.gov/oeпа>). Guidance includes:

11/17/95 memo from Pelletier to Distribution, "Application of DOE 5400.5 requirements for release and control of property containing residual radioactive material."

Addresses relationship of DOE standards to NRC and State requirements, use of surface contamination guidelines, and requirements for tritium. (<http://tis.eh.doe.gov/oeпа>)

1/7/97 memo from M. Frei, EM-30, to Distribution, "Establishment and Coordination of Authorized Limits for Release of Hazardous Waste Containing Residual Radioactive Material."

Addresses coordination of authorized limits for non-real property with Federal, State, and local regulations. It is supported by the TSD-dose computer code for estimating potential doses associated with such release activities.

RESRAD family of codes and associated manuals:

- o RESRAD (for soils);
- o RESRAD Build (for structures); and
- o RESRAD Recycle (for recycle of non-real property).

The codes are available to calculate hypothetical doses from residual radioactive material. The manuals describe the use of the codes and also provide guidance about the disposition of property containing residual radioactive material. (<http://www.ead.anl.gov/~web/resrad>)

Draft Handbook for Controlling Release for Reuse or Recycle of Non-Real Property, June 1997.

<sup>11</sup>Release of property means the transfer of real or personal property from DOE control by sale, lease, gift, grant or any other temporary or permanent disposition.

Describes the step-by-step DOE process for releasing non-real property for reuse or recycle. (<http://tis.eh.doe.gov/oepea>)

DOE-STD-ALARA1draft, "Applying the ALARA Process for Radiation Protection of the Public and Environmental Compliance with 10 CFR 834 and DOE 5400.5 ALARA Program Requirements," April 1997.

For real and non-real property, it describes the application of ALARA in environmental protection, including use of the ALARA process as a critical part of the process for determining authorized limits for release of property. (<http://tis.eh.doe.gov/oepea>)

MARSSIM Manual, "Multi-Agency Radiation Survey and Site Investigation Manual," December 1997.

A joint DOE, NRC, EPA, and DOD effort, the Manual provides guidance on radiological surveys for release of soils and structures. (<http://www.epa.gov/radiation/marssim>)

DOE Survey Manual, "Environmental Implementation Guide for Radiological Survey Procedures," February 1997.

The manual provides DOE methods for radiological surveys for real and non-real property. It has been superseded by MARSSIM for real property and final surveys. (<http://tis.eh.doe.gov/oepea>)

PNL-8724, "Radiation Dose Assessments to Support Evaluations of Radiological Control Levels for Recycling or Reuse of Materials and Equipment," July 1995.

Contains unit dose factors for dose assessments to workers and users of consumer products.

### **Guidance Being Developed**

"Implementation Guide for Decommissioning, Deactivation, Decontamination, or Remedial Action of Property with Residual Contamination."

Umbrella implementation guidance for 10 CFR 834 and DOE 5400.5. (Other Part 834 guidance will tier.) For real and non-real property, it integrates much of the guidance and tools listed above into one implementation guide

Questions of policy or questions requiring policy decisions will not be dealt with in EH-412 Information Briefs unless that policy has already been established through appropriate documentation. Please refer any questions concerning the subject material covered in this Information Brief to G. Roles, EH-412, by phone at 202-586-0289, or by email at [gary.roles@eh.doe.gov](mailto:gary.roles@eh.doe.gov).