

REVISED REQUIREMENTS FOR RECYCLING METAL AT USDOE

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ABSTRACT

Within the last year, the Secretary of Energy has issued directions to the Department of Energy (DOE) that affect DOE's policies concerning the conditions that must be met before scrap metals can be released from DOE sites for recycle. The Secretary called for improvements in monitoring and reporting on DOE releases of personal property. The Secretary also directed DOE's Office of Environment, Safety, and Health to develop directives or guidance so that only scrap metals with no detectable radioactive material content can be released for unrestricted recycle. This policy was instituted to ensure that any metal released from DOE facilities for recycle could enter general commerce. The limits of detectability associated with most scanning and static measurement techniques are generally below any levels for permissible release established from health protection considerations. In addition to discussing the metal recycle policy and its implementation, this paper summarizes DOE, public and industry comments received on the policy and its proposed implementation.

BACKGROUND

Materials or equipment that have radioactive materials distributed throughout their mass are considered "volumetrically contaminated." On January 12, 2000, Secretary of Energy Bill Richardson announced a moratorium on the release from Department of Energy (DOE) facilities of volumetrically-contaminated metals (1). This moratorium was to last until the Nuclear Regulatory Commission (NRC) made a decision whether or not to establish national standards for releases of radioactive materials in recycled metals. Subsequently, the NRC contracted with the National Academy of Sciences-National Research Council for the Academy to study the issue and make recommendations to the NRC.

Secretary Richardson issued a further pronouncement on July 13, 2000 (2) that suspended the unrestricted release of metals from radiation areas until DOE could develop criteria for ensuring that releases of scrap metal from DOE facilities contained no detectable levels of radioactive materials. This suspension differed from the existing moratorium in that the suspension included metals that had only surface contamination as well as metals that were volumetrically-contaminated. The Secretary also directed actions to be taken in four areas: 1) improvement of the Department's release criteria and monitoring practices, 2) expansion of efforts to promote reuse and recycling within the complex of DOE facilities, 3) improvement of the Department's management of information about material inventories and releases, and, 4) accelerated recovery of sealed sources.

The regulatory requirements for implementing a "zero-detectable" release policy will be in the form of amendments and additions to DOE Order 5400.5, "Radiation Protection of the Public and the Environment" (3). The draft changes to Order 5400.5 were placed on the Department's

Environment, Safety and Health web site (4) and a notice of availability of the material on the web site was placed in the Federal Register (5). This notice stated a public comment deadline of December 4, 2000. A Fact Sheet providing additional information was also placed on the EH web site (6).

PREVIOUS DOE REQUIREMENTS FOR CONTROLLING RELEASES OF METALS AND OTHER MATERIALS

DOE has requirements for the release of “real” property (land and structures) in Chapter IV of Order 5400.5. Additional requirements pertaining to the release of “personal property” (essentially everything except real property, including equipment and materials) were issued in a guidance memorandum of November 17, 1995 (7). The DOE procedures for control of equipment and materials that have only surface contamination require the derivation of *authorized limits* for each radionuclide released. The development of authorized limits and the procedures for their approval have been discussed in several previous papers (8,9,10).

Chapter IV of Order 5400 contains a Figure IV-1 specifying allowable surface contamination levels for various classes of radionuclides. These surface levels were generally consistent with the levels then in use by the Nuclear Regulatory Commission (11) and were acceptable for use as authorized limits with a showing that they were “as low as is reasonably achievable” or “ALARA.” DOE field offices had authority to approve these authorized limits.

The release of volumetrically-contaminated materials requires special considerations because of issues concerning the ability to measure radionuclides distributed in depth in the material. Under the existing DOE procedures, release of volumetrically-contaminated materials into the general environment requires review by the Office of Environmental Policy and Guidance and approval by the DOE Assistant Secretary for Environment, Safety and Health. As with surface-contaminated materials, applications for approval of the release of volumetrically-contaminated materials have to demonstrate that the proposed authorized limits are ALARA.

PROPOSED DOE PROCEDURES FOR AUTHORIZATION OF METAL RELEASES

To implement the new policy on recycling of metals DOE is in the process of issuing a revision to DOE Order 5400.5. As noted above a draft of the proposed revisions has been prepared and comments on it have been considered. The draft adds a new Chapter V titled “Control and Release of Personal Property Including Metal for Recycling” and a new Chapter VI titled “General Requirements for Release of Property.” The draft revisions are as follows.

DOE contractors must establish programs that comply with Chapter V and applicable parts of Chapter VI of Order 5400.5. The unrestricted release for recycling of scrap metals from radiological areas will not be permitted until these programs are in place. The DOE Field Office Manager (FOM) must certify to the appropriate Program Secretarial Officer (PSO) that: (1) a process is in place to implement these procedures; (2) the Field Office has coordinated the process with the public through local public participation programs; and (3) the Program Office verifies and concurs with the Field Office Manager’s certification.

Control of Metal Potentially Containing Residual Radioactivity.

Scrap metal, which is suspected of containing residual radioactive material may not be released for recycling into general commerce unless it has been surveyed and residual radioactive material is not detectable on the metal (i.e., residual activity is indistinguishable from background, based on measurements using appropriate commercially available technology and a comparison with activity levels of similar unaffected materials).

If surveys detect residual radioactive material the metal may not be released unless the residual radioactive material is removed or the portion of the scrap metal with detectable activity above background is separated from those portions with no such activity.

Scrap metal that does not meet these requirements may be, 1) disposed of at a low-level radioactive waste disposal facility, 2) disposed of at permitted waste landfills if the material meets DOE authorized limits for that use.

Authorized limits.

Authorized limits govern the release of sites, structures, or materials (personal and real property). DOE authorized limits govern the release of property from DOE control and are consistent with DOE's framework for radiation protection standards for general employees, members of the public, and the environment. Authorized limits must be selected in accordance with DOE's ALARA process such that potential doses do not exceed and are as far below applicable dose limits and operating dose constraints as is practicable. It must be demonstrated that the release of material or equipment will not cause the dose limits and constraints to be exceeded for current and future use of the property.

For real property (e.g., land and structures), the maximum individual dose shall not exceed to 0.25 mSv (25 mrem)(1) in any year (excluding indoor radon and radon decay products) considering both actual and likely future uses of the property. For surface activity on structures, DOE Field Offices may approve the use of the surface activity guidelines (Table VI-1) to cap the ALARA selection process in lieu of the dose constraint. For surface activity on personal property, DOE field offices may approve the use of the surface activity guidelines. For scrap metal that will be recycled, activity levels must not be detectable above background using DOE-approved measurement protocols.

Authorized limits must include any restrictions or conditions necessary to meet the dose limits and ALARA goals and the means by which these restrictions will be implemented. The derivation of the authorized limits must be documented and submitted to the DOE Operations Office for approval and must be made available as part of the public record. Each application for Departmental approval of authorized limits must address the following:

1. The nature of the property and its potential restricted or unrestricted uses;
2. Information related to the ALARA evaluation including—

- the dose to those individual members of the public most likely to receive the highest dose in the actual and likely use scenario and the worst plausible use scenario;
- the potential collective dose to the exposed population;
- the cost and impact of actions necessary to reduce levels of residual radioactive material and the dose reduction (collective and individual) resulting from these actions;
- other factors supporting the ALARA process evaluation; and
- the authorized residual radioactive material limits requested for the property.

Process knowledge.

The property clearance evaluation process shall include procedures for certifying that property can be released from DOE control based on the following factors:

- operating history and records and process knowledge reflect that the property has never been used for radiological activities or in areas that could have resulted in the radiological contamination or activation of material; or
- contaminated property has been decontaminated to meet DOE authorized limits and has not been used in a manner or in areas that could have resulted in it being recontaminated.

If records and process knowledge are not fully adequate to certify the property for release, then a supplemental survey of the property should be conducted.

Verification

Verification monitoring may employ direct surveys or the use of bulk (e.g., portal-type) monitors to confirm that property meets the requirements of the Order. However, if the basis of certification is bulk monitoring, verification surveys must employ direct measurements or sampling for confirmation of bulk monitoring techniques. Personnel involved in verification must be independent of the operating contractor.

Documentation of Releases

Documentation of the release is required under the Order. This documentation includes the authorized limits and other data supporting the release of property such as radiological certification and independent verification results. The documentation describes:

- the property;
- the radiological history of the property;
- the criteria for release of the property and the bases for the criteria,

- any restrictions on use or disposition of the property, the survey of the property, the date of the survey, the identity of the surveyor, the types and identification numbers of the instruments used, and the results of the survey,
- the recipient of the property, the property destination, or the property's disposition and
- the quantity and disposition of any radioactive waste resulting from decontamination.

The documentation also must contain the Department's approval of the release criteria and a showing that the release criteria are not inconsistent with applicable State and Federal requirements.

Certification

The Field Office Managers or their designees ensure the preparation and maintenance of certification documentation that property being sold or otherwise transferred from DOE radiological control:

- meets all DOE radiological protection requirements,
- is not controlled for national security reasons, and
- meets DOE property control requirements.
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This documentation also identifies the specific DOE review and approval responsibilities for the certification documentation.

Table I provides a concise summary of the proposed requirements controlling the release of metals and other materials from DOE facilities.

Implementation Guidance

The difficulty of differentiating between "background" radiation levels and levels associated with very small quantities of radioactive materials was appreciated by DOE staff. Two guidance documents (12,13) have been prepared that contain measurement procedures and statistical analysis techniques to aid in applying the "zero-detectable release" policy.

DOE INTERNAL COMMENTS ON THE PROPOSED REQUIREMENTS

In addition to being placed on a DOE web site, the proposed changes to Order 5400.5 were also placed on an internal DOE standards dissemination and comment network (REVCOM). The REVCOM is a network linking pre-designated field and program office personnel, contractor personnel, subject matter experts and the standards developers within DOE. This network permits rapid and widespread dissemination of proposed requirements and standards, collection of the comments and their resolution. REVCOM was used to acquire internal DOE comments on the proposed order changes.

The principal DOE and DOE contractor comments focused on five major issues: 1) alternatives to the metals recycle policy, 2) technical feasibility of a "non-detectable" policy, 3)

implementation cost, 4) record-keeping burden , and 5) detailed comments on the draft page changes.

Alternatives.

One alternative to the “zero-detection policy” that was identified was the use of the recent ANSI standard N13.12-1999 (14). The application of this standard was recommended because it is a consensus standard, is based upon a uniform dose level (10 : Sv or 1 mrem per year), contains both surface and volumetric contamination guidelines, and that U.S. government policy favors the use of consensus standards whenever possible (15,16,17).

A second alternative that was suggested by the DOE and DOE contractor comments was to use a multiple (twice or three times) of the background counting rate as the release criterion. This was favored because these levels were more likely to be measurable without the use of specialized equipment.

Technical Feasibility.

Problems in differentiating counting rates from “background” levels were noted in some of these comments. One set of comments noted a problem in acquiring uncontaminated samples of the material to be measured for use in a “background” determination. It was suggested that an alternative would be to use an “empty detector” background.

Implementation Cost.

A number of the internal comments noted that the proposed criteria would result in a large cost without commensurate benefit in public protection. Estimates of the cost of demonstrating compliance with a “zero detectable” release criterion ranged up to \$4 million initially and \$1 million annually thereafter per site. The large initial cost was related to the purchase of more sensitive radiation detection instruments and the annual costs reflected the more extensive survey and documentation procedures with their associated manpower requirements.

COMMENTS FROM THE GENERAL PUBLIC

Approximately 70 comments were received from members of the general public. Thirteen comments from special interest groups and thirty-two from members of the general public focused on the release policy rather than the proposed implementation procedures. These comments were strongly opposed to the release of any radioactive materials or equipment. They opposed even the release of “suspect” materials that might have been exposed to radioactive materials. A similar position was also voiced by 3 comments from the general metal recycle industry. In the few cases where these comments mentioned the proposed order changes, they were against their adoption.

Primary Comment.

The principal concern expressed in these comments was that no contaminated metal or potentially contaminated metal should be released into general commerce for recycle. This

position stemmed from fear that such metals would find their way into medical devices (e.g., braces for teeth, prosthetic parts) or food processing industries.

Other comments were against the proposed recycle policy because it was believed to be overly restrictive and prevented the release of metals from DOE facilities. Some of these comments (3) came from radiation protection professionals who thought that the current release levels were adequate and the "non-detectable" activity requirement was unnecessary. Other comments (7) came from industrial organizations, government bodies and a congressman in the Oak Ridge, Tennessee area. These comments concerned the impact that added restrictions in planned DOE metal recycle activities might have on the local economy.

There were four comments from the general public that supported the DOE policy and the proposed changes to Order 5400.5.

SECRETARIAL DIRECTION

On January 19, 2001, after consideration of both public and internal comments on the proposed order, the Secretary of Energy issued a memorandum (16) providing further direction on the management of scrap materials. In light of the significant and substantive issues raised by the comments, the Secretary deferred issuance of the order pending additional deliberation. In particular he determined that an environmental impact statement should be prepared.

Both the moratorium on unrestricted release of volumetrically contaminated metals and the suspension of the unrestricted release for recycling of all metals from radiation areas within DOE remain in effect. The Secretarial memorandum also contained guidance, described below, to help sites improve monitoring and release practices. This guidance is similar to the requirements in Chapter VI of the proposed Order and is consistent with the existing provisions of DOE Order 5400.5. This guidance directs that the following steps should be incorporated into existing release programs.

Clearly define areas and activities that can potentially contaminate property.

Activities and areas should be evaluated for potential radiological contamination before property is released from them. For releases that have no such potential it is necessary to establish and document clear process knowledge based procedures.

Clearly define release criteria, including measurement and survey protocols, for property released from areas or activities that have potential to contaminate.

Property that cannot be certified for release through process knowledge must be reviewed using the authorized limit release procedures in DOE Order 5400.5. All such property must be appropriately surveyed, in its compliance with DOE-approved authorized limits confirmed. Documentation for authorized limits should address the rationale for selecting them, the scope of their applicability, and measurement procedures and protocols for demonstrating compliance. Such documentation is necessary even if the surface activity guidelines of DOE Order 5400.5 are being used.

Ensure that released property meets DOE requirements.

Line management, in particular the Field Offices, has the responsibility to ensure that contractors and DOE personnel comply with DOE requirements. It should be clear that DOE contractors or DOE elements are responsible for conducting final surveys and the preparing documentation demonstrating compliance. DOE field offices, working with their lead program office should establish independent verification programs to further confirm that survey and evaluation processes are in place, are being appropriately implemented and that property released from DOE radiological control meets authorized limits. The level and scope of the verification effort should be commensurate with the potential for contamination, as well as the complexity and hazard, and should address both real and personal property releases. If DOE personnel responsible for independent verification use contractors, the contractors must be independent of the operating contractor managing the property or responsible for the release survey or decontamination of the property.

Better inform and involve the public and improve DOE reporting on releases.

Field Office Managers should incorporate information on property control and release programs, including information on authorized limits, certification and verification survey programs, and process knowledge decisions into site public involvement and communications programs. Site release policies and protocols should be coordinated with the public, and public input considered in development and approval of site release programs. Documentation on releases must be made available to the public and those receiving the property. Field Office Managers are directed to ensure that they include information of the authorized limits being used at their facilities, and surveys and independent verification program results in the site's annual environmental reports which are required by DOE Order 5400.5.

CONCLUSIONS

The Secretary of Energy made a policy decision to suspend the unrestricted recycling of scrap metal from radiological areas and directed DOE to modify its directives and guidance to accommodate specific improvements in its release and control program. The Department is in the process of revising DOE Order 5400.5 to implement these changes. A proposed order revision has been issued and public and internal comments received and reviewed. In the light of significant and substantive comment, issuance of the revised order has been deferred pending further deliberation. The next step in this process will be the preparation of an environmental impact statement. At this time, schedules have not yet been established for preparation of the EIS. However, this is typically a long process. The moratorium on the release of volumetrically-contaminated metals and the suspension of the unrestricted release of scrap metals for recycling remain in effect.

REFERENCES

(1) The Secretary of Energy, Memorandum for Heads of All Department Elements, "Release of Materials for Re-use and Recycle", February 14, 2000.

- (2) The Secretary of Energy, Memorandum to Heads of Departmental Elements, "Release of Surplus and Scrap Metals", July 13, 2000. *
- (3) Department of Energy, DOE Order 5400.5, "Radiation Protection of the Public and the Environment.", February 8, 1990, Revised June 5, 1990 and September 4, 1999.
- (4) U. S. Department of Energy, "Draft Page Changes to Order 5400.5," October 3, 2000. *
- (5) U. S. Department of Energy, "Control of Releases of Materials with Residual Radioactive Contamination from DOE Facilities," 63 *Federal Register* 60653 (October 12, 2000).
- (6) U. S. Department of Energy, "FACT SHEET" U.S. Department of Energy (DOE) Directives Development Initiative Concerning the Management and Release of Surplus Materials," July 2000. *
- (7) R. Pelletier, "Memorandum to Distribution: Application of DOE 5400.5 Requirements to Release and Control of Property Containing Residual Radioactive Material." Office of Environmental Policy and Assistance, U.S. Department of Energy, November 17, 1995.
- (8) S. Domotor, H. Peterson, Jr. and A. Wallo, "DOE's Process and Implementation Guidance for Decommissioning, Deactivation, Decontamination and Remedial Action of Property," presented at the IAEA International Symposium on Restoration of Environments with Radioactive Residues, Arlington, VA., Abstract p. 205-208, December 1999..
- (9) A. Wallo III and H. T. Peterson, Jr., "DOE Role in Developing Cleanup Criteria for Nuclear Facilities," Paper presented at the American Nuclear Society Winter Meeting, Topical Meeting on Decommissioning, Decontamination and Environmental Restoration, Washington DC. Abstract in *Trans. Amer. Nucl. Soc.* **71**, 649, November 16, 1994.
- (10) A. Wallo III and H. T. Peterson, Jr., "DOE Requirements for Release and Control of Property with Residual Radioactive Material," Chapter 14 in *Decommissioning and Restoration of Nuclear Facilities*, (M. J. Slobodien, ed.) Madison, WI: Medical Physics Publishing Company, p. 277-296 1999.
- (11) Nuclear Regulatory Commission, Regulatory Guide 1.86, "Termination of operating licenses for nuclear reactors.", 1974.
- (12) U. S. Department of Energy, "Guidance for the Control of Releases of Metals for Recycling from Radiologically Controlled Areas — for use with Title 10, Code of Federal Regulations, Part 834, 'Radiation Protection of the Public and the Environment' and Order DOE 5400.5, 'Radiation Protection of the Public and the Environment,'" March 2001.
- (13) U. S. Department of Energy, "Implementation Guide for the Control and Release of Property with Residual Radioactive Material", October 2000.

WM'01 Conference, February 25-March 1, 2001, Tucson, AZ

(14) Health Physics Society, “American National Standard – Surface and Volume Radioactivity Standards for Clearance, “ ANSI/HPS N13.12-1999, August 31, 1999.

(15) National Technology Transfer and Advancement Act of 1995, Public Law 104-113, 110 STAT 775.

(16) OMB Circular A-119; Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities; Notice. February 19, 1998.

(17) DOE Order 252.1, Technical Standards Program, November 19, 1999.

* This is available on the Office of Environmental Policy and Guidance Web site:
<http://www.eh.doe.gov/oepa> “Focus Areas.”

FOOTNOTES

(1) This is consistent with Subpart E of 10 CFR Part 20. “Standards for Protection Against Radiation,” of the Nuclear Regulatory Commission, which applies to decommissioning and decontamination of NRC-licensed nuclear facilities.

Table I. Disposition of Potentially Contaminated Materials from DOE Sites

A. Scrap Metals for Recycle		
Material has been surveyed and residual radioactive material is not detectable on the metal	Certification or verification surveys detect residual radioactive material	Scrap metal that does not meet the requirements for unrestricted release
Material may be released subject to certification of the measurement and verification surveys performed to carry out the quality assurance provisions of Section X, Appendix A to 10 CFR Part 820.	Metal may not be released unless: (1) the residual radioactive material is reduced to levels that are no longer detectable, or (2) the portion of the scrap metal with detectable activity is separated from those portions for which no activity above background was measured.	Metal may be (1) disposed of at a licensed or authorized low-level radioactive waste site; (2) disposed of in permitted waste landfills if the metal meets DOE approved authorized limits for such disposal; or (3) released for restricted recycling with a designated use (e.g., waste containers) that has little potential for the metal entering general commerce.
B. Metals and Other Materials		
Requirements for controlling the release of real or personal property (including material and equipment) from DOE control	Property meets 10 CFR Part 835 Appendix D levels, but does not meet the surface guidelines in Order 5400.5 or Authorized Limits	Property Subject To Nuclear Regulatory Commission Or Agreement State Licensing
The property is measured and the level of residual radioactive material meets DOE authorized limits. All property releases are appropriately certified, verified, documented, and Reported. Public involvement and notification are carried out and appropriate records are maintained.	Appendix D to 10 CFR Part 835 sets surface activity limits for transferring material out of radiological areas. If such materials do not meet the requirements for unrestricted release, they should remain under DOE radiological control .	Personal property having activity levels that would require the person receiving it to have an NRC or NRC Agreement State license shall not be released from DOE control unless the person receiving it is licensed to possess this material.