

ONGOING NRC EFFORTS ON REGULATORY APPROACHES FOR CONTROL OF SOLID MATERIALS

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ABSTRACT

Specific requirements for the release of solid materials with small or no amounts of radioactivity are not currently contained in 10 CFR Part 20, which constitutes the U.S. Nuclear Regulatory Commission's (NRC's) regulations that set standards for protection of the public against radiation. NRC has approached these matters on a case-by-case basis, in the absence of a national standard for the release of solid materials. Currently, NRC is examining its approach for the control of solid material, including the development of a technical information base for decision-making purposes. As part of this process, NRC has sponsored a National Academy of Sciences (NAS) study to review technical bases, policies, and precedents for controlling the release of solid materials, and to recommend whether NRC should continue its existing approach, establish a national standard by rulemaking, or consider other alternatives. This paper explains the status of NRC's technical basis and the next steps in NRC's decision-making process, as they relate to the NAS study.

INTRODUCTION

U.S. Nuclear Regulatory Commission (NRC) regulations for protection of the public against radiation are codified in 10 CFR Part 20 and limit the radiation dose that a member of the public can receive from the operation and decommissioning of a nuclear facility (1). There are currently no generally applicable NRC regulations in Part 20 for the control of the majority of solid materials that contain small or no amounts of radioactivity. However, solid material releases may be sought by licensees during operations, at the time of decommissioning, or when material and equipment need to be taken out of the restricted area and used elsewhere.

Absent established criteria for controlling the release of solid materials, NRC currently addresses the release of solid material on a case-by-case basis, using license conditions, existing regulatory guidance, or other case-specific criteria (2). Guidance documents, such as Regulatory Guide 1.86 and Policy and Guidance Directive FC 83-23, are used for licensing decisions involving the release of solid material, but do not contain dose criteria and apply to solid materials with surface contamination only (3,4). Release of volumetrically contaminated solid material may be allowed if survey instrumentation does not detect radioactivity levels above background, based on the measurement capability of survey instruments (5,6). Licensees may also seek NRC authorization

for disposal of materials with low levels of volumetric contamination, in accordance with the requirements in 10 CFR 20.2002 (7). The approach used by NRC staff in reviewing such requests is that annual doses for members of the public and workers should not exceed a small fraction of the annual public dose limit, which is 1 millisievert per year (100 millirem per year). Although this case-by-case approach is protective of public health and safety, the existing criteria were not developed using a consistent dose basis and the lack of established criteria could result in inconsistent release levels because of differences between licensees' radiological survey instruments and procedures for monitoring solid material releases.

SOLICITATION OF PUBLIC INPUT ON APPROACHES FOR CONTROLLING SOLID MATERIAL RELEASES

NRC has been engaged in a process to examine its approach for the control of solid material and to involve the public in that examination. As a first step in soliciting public input on this matter, an Issues Paper was published for public comment in June 1999 (8). This paper presented alternative courses of action, including continuation of current practice (i.e., no rulemaking) and issuance of a proposed rule to establish a new standard. If a rule were to be developed, rulemaking alternatives identified in the Issues Paper are: (a) permit release of material for unrestricted use if it meets certain dose levels; (b) prohibit release of material that had been in an area in a licensed facility where radioactive material was used or stored; and (c) restrict release to only certain authorized uses.

Information presented in the Issues Paper was discussed at facilitated public meetings held at locations around the country from September through December 1999. Public comments were discussed in a paper from the NRC staff to the Commission (SECY-00-0070) and were subsequently published in report NUREG-/CR-6682 (9,10). In May 2000, the Commission held two open meetings on the contents and recommendations in SECY-00-0070 and obtained directly the views of representatives from stakeholder groups.

In general, metals and cement industry representatives were opposed to unrestricted release of solid materials because of the potential for this material entering their facility and creating a large economic impact if consumers do not buy their products because of concerns with the presence of radioactivity. Similarly, citizens groups and individuals generally indicated that they were opposed to releasing materials that could end up in consumer products, citing health, fairness, and uncertainty concerns. In contrast, licensees and the Health Physics Society stated that the doses being considered in a potential rulemaking are very low and that scientific bodies, such as the National Council on Radiation Protection and Measurements and the International Commission on Radiological Protection, indicate that levels around 10 microsieverts per year (1 millirem per year) present negligible risk.

Regarding restricted use, many commenters indicated that this alternative had merit as a means of keeping solid materials out of consumer use, but there were concerns about whether a large-scale restriction on recycled solid material in the public sector would be practicable. Some commenters suggested restricting recycle to within the nuclear industry, whereas others suggested restricting material to a landfill. An additional alternative identified was segregation requirements for solid materials, which would entail different release strategies for different types of solid materials.

Solicitation of public input on this issue was successfully obtained using various forums, including the establishment of a dedicated website for this activity, which has been maintained to keep the public informed of continuing developments (11). There have been more than 800 written and e-mail comments received on the Issues Paper, and public views remain diverse on the acceptability of establishing a national standard for the release of solid materials.

STATUS OF NRC STAFF ACTIVITIES

In an effort to continue the process of moving discussions forward on this issue, in August 2000 the Commission directed the staff to proceed with a National Academy of Sciences (NAS) study on possible alternatives for the control of solid materials. At that time, the Commission also decided to defer a final decision on whether to proceed with rulemaking on control of solid materials (12). The committee for the NAS study was formally approved in February 2001 and the NAS conducted information-gathering meetings with a variety of stakeholders throughout 2001. Information on stakeholder meetings can be obtained from the NAS website dedicated to this effort (13). The final report from the committee is expected in early 2002.

During the time the NAS is conducting its study, the Commission directed its staff to continue development of a technical information base necessary to support a future Commission policy decision on the control of solid material. Consistent with this directive, the staff has conducted a number of activities, which have been chronicled in Quarterly Reports sent to the Commission in 2000 and 2001. Each Quarterly Report was placed on NRC's website dedicated to this effort. A summary of the technical basis areas under development follows.

Individual dose assessments (Draft NUREG-1640)

A method for estimating the hypothetical dose an individual might receive from residual radioactivity in solid materials is needed for evaluating alternatives contained in the Issues Paper. The types of solid materials that have been analyzed as part of this effort are metals, concrete and, more recently, soils. A draft report, "Radiological Assessments for Clearance of Equipment and Materials from Nuclear Facilities," NUREG-1640, was published for public comment in March 1999 (14). The report described scenarios, models, calculation methods, and results of analyses for individuals exposed to iron, steel, copper, aluminum, concrete and equipment

released to general U.S. commerce from a nuclear facility. The report identified individuals reasonably likely to receive the highest dose and contained draft dose factors for members of the critical group.

Public comments were received on this draft report and an independent review of its technical contents was conducted by the Center for Nuclear Waste Regulatory Analyses (CNWRA). This review concluded the draft analyses were of high quality and there has been continued development of this report since its publication. This work has included evaluation of additional scenarios, consideration of cupola and induction furnaces, review of non-geometry factor parameters, and reevaluation of the draft individual dose factors. A revised NUREG-1640 is expected to be published in mid-2002.

Additional dose analyses

The technical analysis contained in NUREG-1640 is limited to the estimation of hypothetical doses to an individual based on exposure to a single item containing radioactive material. It is useful, however, to have supporting information on several additional factors that were not addressed in NUREG-1640 to aid in evaluating the various alternatives contained in the Issues Paper. These include the estimation of hypothetical dose to an individual based on exposure to multiple items containing radioactive material; collective doses to populations; and inventories of material potentially available for release at NRC-licensed facilities.

Currently, NRC is analyzing the potential for an individual to receive exposures from more than one item made from recycled materials and is estimating the inventories of materials that are potentially available for release from licensed facilities. NRC is also evaluating individual dose factors for additional materials that could be available for release as part of routine operations at facilities such as hospitals; clinics; research, medical, and industrial laboratories; power plants; university reactors; and fuel facilities. These materials include items made of wood, paper, and glass; separate pieces of equipment; rubble; sediments; and other materials that are candidates for release from the facility. The analysis of additional materials is expected to continue during 2002.

Regarding analyses of collective population dose, it is anticipated that preliminary work for the alternatives described in the Issues Paper will continue throughout 2002.

Technical-basis development for soil

NRC is developing technical bases for estimating exposures as a result of potential licensee requests for release of soil. Development of scenarios, parameters, and assumptions, and the bases for specific parameters and distributions has been performed with assistance from the National Agricultural Library to identify relevant information sources. A draft report entitled, "Human Interaction with Reused Soil: A Literature Search," Draft NUREG-1725, was issued for public comment in July 2000 (15). Based on public comments received and the

recommendations contained in the draft report, a focused information search was conducted to assist in estimating parameter distributions for the soil scenarios. This effort is expected to result in the publication of a final version of NUREG-1725 in early 2002.

Development of a technical basis for soil reuse has included a scoping analysis of reuse scenarios for soils released from NRC-licensed facilities. Preliminary exposure scenarios for scoping analyses are being developed in concert with dose modeling efforts for sewage sludge and those contained in draft NUREG-1640 for metals and concrete. The four scenarios evaluated for individuals exposed to reused soils are a rural resident, a farm/field worker, a truck operator, and an individual exposed through recreational activities. It is anticipated that additional soil-reuse scenarios need to be evaluated, and a revision to the scoping analyses is expected in 2002. Following the scoping analyses, the NRC staff will consider the need for further analyses for soil reuse.

Radiological surveys

Technical information is being developed to extend the approach used in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), NUREG-1575, for conducting radiological surveys for the control of solid material (16). MARSSIM has been adopted nationally for conducting radiological surveys of building surfaces and surface soils, but it was not designed to address subsurface contamination measurements and volumetric contamination in soils, materials, and equipment. NRC's ongoing effort includes assessment of clearance survey procedures, using common off-the-shelf instrumentation, as well as advanced instrumentation and analytical approaches for the assay of residual radioactivity in, and on, solid materials. Preliminary results of this effort should be published as a draft NUREG report in 2002 and may be considered by the MARSSIM committee for possible updating of MARSSIM. Independent of whether a rulemaking alternative is pursued, the results of this work on radiological surveys may be useful to the NRC staff and other Federal agencies in resolving existing and potential inconsistencies in the approaches and procedures for measuring low levels of radioactivity in or on contaminated equipment and material. Although clearance survey design and conduct may differ based on a variety of factors, such as material type, available survey equipment, and cost, all clearance surveys share a common objective - - protection of public health and safety by assuring that criteria for controlling solid material are met.

Other factors affecting decision-making

In August 2000, the Commission directed the staff to continue to stay informed of international initiatives in this area, potential import and trade issues, and related activities of the U.S. Environmental Protection Agency (EPA) and the U.S. Department of State (DOS). The Commission also directed the staff to work with the U.S. Department of Energy (DOE) to better understand and collect information and data on various aspects of DOE's current and future

metals recycling program and thereby assess how various DOE scenarios might be considered by the NRC staff when estimating potential doses. The staff has participated actively in International Atomic Energy Agency consultant meetings; hosted meetings of the Recycle subcommittee of the Interagency Steering Committee on Radiation Standards; and maintains cognizance of DOE staff actions on its Programmatic Environmental Impact Statement on alternatives for disposition of DOE scrap metals. The DOS was active with the International Radioactive Source Management Initiative, which began in 1997. NRC and EPA staff have coordinated efforts on developing technical information bases on clearance for several years, and, as part of its Clean Metal Program, EPA is focusing its efforts on orphan source issues and on the interception of imports with sufficient radioactive content to warrant regulatory control (17).

In response to the Commission directive of August 2000, the staff will provide the Commission a paper approximately three months after receipt of the NAS study. This staff paper will inform the Commission of the results of the NAS study, the status of technical analyses supporting decision-making, and provide recommendations for proceeding on alternatives for control of solid materials.

CONCLUSION

NRC staff has been conducting a variety of activities in response to an August 2000 Commission directive, including support of a NAS study, continued development of a technical basis that has included initiation of technical analyses and completion of reports for public comments, and participation in national and international activities in this area. The technical information being developed, along with the NAS study and the public comments, will be used by the NRC staff to provide recommendations to the Commission for proceeding on alternatives for control of solid materials.

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