Attachment 4

Review of International and Domestic Activities
Related to Decision-making on Control of Solid Materials

A. PURPOSE

The purpose of this attachment is to provide information on activities being conducted by international agencies, U.S. Federal and State agencies, and other organizations for consideration in NRC's decision-making process on the control of solid materials.

B. INTRODUCTION

On August 18, 2000, the Commission directed the staff to stay informed of international initiatives in the area of clearance and on related U.S. Environmental Protection Agency (EPA), Department of State (DOS), and Department of Energy (DOE) activities.

Both international and domestic (including other Federal and State agencies) initiatives include technical and policy issues that have played, and will continue to play, an important role in decision-making process on the control of solid material. Sections C and D discuss international and domestic initiatives in this area, respectively, and Section E specifically discusses the relationship of these activities to NRC efforts.

C. INTERNATIONAL INITIATIVES

Individual countries have developed national guidance for the release of solid material with small amounts of radioactivity, including Belgium, Finland, France, Germany, Japan, Sweden, Taiwan, and the United Kingdom. The activities of two major international radiation protection organizations, the Commission of European Communities (EC) and the International Atomic Energy Agency (IAEA), are attempting to harmonize international clearance standards and implementing guidance. Both organizations have developed standards containing clearance levels for individual radionuclides, which share three conceptual bases: (1) the term "clearance" means the total cessation of radiological control; (2) annual doses on the order of 10 μSv (1 mrem) for a practice is considered a trivial dose; and (3) a committed dose equivalent of 1 man-Sv (100 man-rem) per year of practice or less requires no further analysis for optimization. Although these harmonization efforts have focused on clearance, both organizations also provide for "authorized releases" of solid materials on a case-by-case basis.

C.1 Status of IAEA Efforts to Develop and Implement Clearance Levels

The IAEA established the concept of clearance based on "established trivial doses and risks" described in IAEA's "Principles for the Exemption of Radiation Sources and Practices from Regulatory Control" (Safety Series No. 89, 1988). This document, which was also sponsored by the Nuclear Energy Agency (NEA) of the Organisation for Economic Cooperation and Development (OECD), is based on the principles that (1) individual risk must be sufficiently low as not to warrant regulatory concern and (2) radiation protection,

including the cost of regulatory control, must be optimized.
The term “trivial” is used by the IAEA and the EC to describe an individual effective dose equivalent in the range of 10 to 100 µSv/yr (1 to 10 mrem/yr). In IAEA’s Safety Series No. 89, a level of risk or dose is “trivial” based on (1) the risk and corresponding dose is considered of no significance to individuals (annual risk of death of 10^{-5} to 10^{-6}) and (2) a reference level of dose from natural background radiation (a few percent of natural background, or 20 to 100 µSv/yr (2 to 10 mrem/yr).

Similarly, the National Council on Radiation Protection and Measurements (NCRP) refers to these levels as a "negligible individual dose" in its report, “Limitation of Exposure to Ionizing Radiation” (NCRP-116, 1993). The International Commission on Radiological Protection (ICRP) does not explicitly quantify trivial risk or doses. Rather, ICRP’s “Recommendations of the International Commission on Radiological Protection (ICRP-60, 1990) notes that “the basis for exemption on the grounds of trivial dose is much sought after, but very difficult to establish.” However, the ICRP recommends that in exemption of scenarios and event sequences, the grounds for exemption are that the source gives rise to small individual doses (of the order of 10 µSv (1 mrem) per year) and the protection is optimized; i.e., regulatory provisions will produce little or no improvement in dose protection.” This is reiterated in ICRP’s “Protection from Potential Exposure: A Conceptual Framework” (ICRP-64, 1993), which further explains that optimization is achieved by demonstrating that the collective dose is small; e.g., on the order of 1 man-Sv (100 person-rem) per year.

Following the publication of Safety Series No. 89, the IAEA prepared a Safety Practice document, entitled “Application of Exemption Principles to the Recycle and Reuse of Materials from Nuclear Facilities” (Safety Series 111-P-1.1, 1992). At the time of publication, the scope of the document included “clearance” or unconditional release of materials and equipment, as well as controlled reuse. The document provides dose to source ratios in terms of annual committed effective dose equivalent per either Bq/g (pCi/gm) or Bq/cm^2 (pCi/cm^2). The intent of the document was to provide implementation guidelines to evaluate compliance with the safety guidance in Safety Series No. 89. The recycle materials were limited to steel, aluminum and concrete, but dose to source ratios were also provided for various tools and equipment. The NEA and the EC participated in the preparation of this document. A number of subsequent analyses utilized the calculations from this document in evaluating various materials and scenarios involving reuse and recycle of metals, concrete, slags, tools, equipment and structures. It should be noted that a Safety Practice is a lower level document than a Safety Guide (e.g., Safety Series No. 89), which is, in turn, a lower level document than a Safety Requirement (e.g., “International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources,” Safety Series No. 115, 1996).

Since 1993, NRC and EPA staff have participated with IAEA Member States on the development of the assumptions and parameters used to derive the IAEA's clearance levels. In 1996, the IAEA published an interim report, “Clearance Levels for Radionuclides in Solid Materials, Application of Exemption Principles, Interim Report for Comment ” (TECDOC-855) that related a 10 µSv/yr (1 mrem/yr) level to concentrations of radioactivity distributed on surfaces and throughout volumes of selected materials and radionuclides.

This document provided a compendium of action levels based on the available relevant sources at that time, including NRC's "Residual Radioactive Contamination from Decommissioning*" (*NUREG/CR-5512, 1992) and IAEA's Safety Series 111-P-1.1. Since publication of TECDOC-855, the IAEA has held a series of Technical Consultants meetings to further develop the technical bases contained in the report. This work has included the development of clearance values for solid materials and the role of exclusion and exemption as they pertain to commodities. In the past two years, the IAEA has included in its clearance efforts the development of a Draft Safety Guide and associated supporting technical documents on specification of radionuclide content in commodities requiring regulation for purposes of radiological protection. Draft Safety Guide DS-161, "Specification of Radionuclide Content in Commodities Requiring Regulation for Purposes of Radiological Protection," (DS-161) is being developed with participation of the European Commission, Pan American Health Organization (PAHO), International Labor Organization (ILO), World Health Organization (WHO), and Food and Agricultural Organization (FAO), and representatives from IAEA Member States.

Included in the criteria for commodities in the current version of DS-161 is a dose criterion of 10 µSv/yr (1 mrem/yr) for artificial radionuclides, which could be used to establish clearance values for solid materials. The technical approach for establishing clearance values for natural radionuclides differs from the approach used for artificial radionuclides, as the former are based on a worldwide distribution of natural radioactivity, which results in "scope-defining levels" ranging from 0.5 to 5 Bq per gram (14 to 135 pCi per gram). The IAEA provided tables of scope defining levels for both artificial and natural radionuclides. A value of 1 Bq per gram (27 pCi per gram) had been suggested previously by the IAEA. This value is considered relatively high by some representatives of international regulatory authorities.

Currently, there are concerns about the parameters, modeling, scenarios, and the overall scope of the document. U.S. Federal agencies participating in this activity recommend the continuation of the coordination process to better align the fundamental approaches being pursued by the IAEA, the EC, and other stakeholders, such as the NEA, WHO, FAO, and ILO. The IAEA is working with the FAO and WHO to revisit technical and policy issues associated with other commodities such as foodstuffs and drinking water. This effort should begin in 2003 and may take more than one year to complete. DS-161 has been transmitted to Member States for comment, review and approval by September 15, 2002.

C.2 Status of EC Efforts to Develop and Implement Clearance Levels

Recommendations of the EC are followed by nations that are members of the European Union, which has promulgated Council Directive 96/29/EURATOM (May 13, 1996) which lays down basic safety standards for the protection of the health workers and of the general public against the dangers arising from ionizing radiation. It can be confusing that the EC refers to this directive also as the "Basic Safety Standards (BSS)." The scope of the EC/BSS is defined in terms of "practices" which involve a risk from ionizing radiation emanating from an artificial source or from a natural radiation source in cases where natural radionuclides are or have been processed in view of their radioactive, fissile or fertile properties. The EC's standards also require justification of the use of radioactivity.

In cases where certain practices result in radiological risks to individuals which are sufficiently low as to be of no regulatory concern, then the subject practice can be *exempt* from the EC/BSS system of reporting and prior authorization.

Once a practice has been placed in the regulatory system, the activities and movement of materials are controlled, but these materials can be released using a case-by-case procedure under the responsibility of the competent national authorities. The removal from regulatory control of a material that has radionuclide levels below the recommended limits is defined as clearance. Materials that are cleared are then considered exempt from the EC/BSS requirements of reporting and authorization. This Directive required Member States to bring into force the laws, regulations and administrative provisions necessary to comply with this Directive before May 13, 2000.

Recently, the EC has been developing implementing recommendations that translate the applicable clearance dose criteria to radionuclide concentrations. The first EC publication of this type is “Recommended Radiological Protection Criteria for the Recycling of Metals from the Dismantling of Nuclear Installations, (Radiation Protection 89, 1998), which provides clearance levels for recycling of metals from dismantled nuclear installations. The basis for the recommendations is the radiological protection criteria contained in IAEA Safety Series No. 89 by adopting for a given practice an individual dose criterion of 10 µSv/yr (1 mrem/yr) and a collective dose criterion of 1 man-Sv/yr (100 man-rem/yr) with a skin dose limit of 50 mSv/yr (5 rem/yr). The clearance levels for radioactivity in recycled and directly reused metal were derived by constructing and analyzing a set of hypothetical exposure scenarios and then selecting the most critical scenario. The technical basis for the calculation of mass specific clearance levels published in Radiation Protection 89 is documented in the EC report entitled ”Methodology and Models used to Calculate Individual and Collective Doses from the Recycling of Metals from the Dismantling of Nuclear Installations” (Radiation Protection 117, 2000).

Two related EC publications, “Recommended Radiological Protection Criteria for the Clearance of Buildings and Building Rubble Arising from the Dismantling of Nuclear Installations“ (Radiation Protection 113, 2000), and “Definition of Clearance Levels for the Release of Radioactively Contaminated buildings and Building Rubble (Radiation Protection 114, 1999), provides clearance levels for the release of buildings and building rubble, which are based on IAEA Safety Series radiological protection criteria. Another EC document is “Practical Use of the Concepts of Clearance and Exemption Part I” (Radiation Protection 122, 2000), which provides general clearance levels that are applicable to all materials and are usually more restrictive than the specific clearance levels also provided in the document. The underlying assumption is that the destination of the material is not defined in the case of general clearance. Part II of this document addresses general clearance and exemption levels for work activities involving materials arising from industries which mine or process ores or other materials for which the presence of naturally occurring radionuclides are of concern. These levels refer to NORM materials, which are addressed in Title VII of the EC/BSS.

Table 1 of this attachment provides the status of a number of nations in implementing clearance standards, including the status of several European Union (EU) member nations

in implementing the Directive.

C.3 United Nations Economic Commission for Europe

In May 1999, the United Nations Economic Commission for Europe (UN/ECE) organized a seminar on "Radioactive Contaminated Metal Scrap" to develop and maintain a partnership between government authorities, the metal scrap recycling and steel industries, and competent authorities in the field of atomic energy. A recommendation of the seminar was the establishment, under the auspices of the UN/ECE, of a Team of Specialists on Radioactive Contaminated Metal Scrap that would serve to harmonize the legislation, the levels of investigation concerning radioactivity content of metal scrap, the system of measurement, and possibly develop codes of practice/conduct in this area.

The Team of Specialists produced a document entitled, "Report for the Improvement of the Management of Radiation Protection Aspects in the Recycling of Metallurgical Scrap," which was co-sponsored by the IAEA and EC. The fifth draft of the report (March 2001) contains the following recommendations for managing materials that have been properly released from the nuclear industry: (1) the regulatory framework associated with the clearance of material should include provisions for prior notification to the receivers of the material that of the origin of the material and the regulatory framework under which it was released; (2) this information should be conveyed with the released material to the successive suppliers and buyers of the scrap metal, as part of contractual provisions; and (3) cleared material with radioactivity other than natural background should be identified and kept separate from the normal scrap recycling circuit so as not to enter unrestricted metal products. These recommendations are also applicable to extraction industries where naturally occurring radioactive materials may concentrate and for activities involving the use of radioactive sources for medical, industrial and research purposes.

D. DOMESTIC INITIATIVES

There are several Federal and State agencies, and other organizations, involved in activities related to control of solid materials. Some of these activities do not directly involve potential standards-setting for solid materials with low amounts of, or no, radioactivity, for example those that involve orphan sources or radiation monitoring efforts to detect radioactivity in solid materials entering U.S. borders. Nevertheless, it is important to be aware of the range of related activities and how they can be factors that need to be considered by NRC in its decision-making on the control of solid materials.

D.1 EPA

D.1.1 Activities related to Development of a Standard on Control of Solid Material

EPA has responsibility for setting generally applicable environmental standards under the Atomic Energy Act, but is not pursuing a rulemaking in this area at this time. Instead, currently EPA is focusing on orphan source issues and on the interception of imports with

sufficient radioactive content to warrant regulatory control (see Section D.1.2).

Although EPA has suspended development of a domestic standard for clearance, it has continued to develop dose factors for translating radioactivity in cleared metal to the dose a person would receive. This is a continuation of the collaborative work between NRC and EPA staff in developing technical information bases on scenarios and pathways related to potential exposures. The EPA staff and its contractor presented technical information to the NA, including a summary of EPA's ongoing technical basis work on scenarios, pathways, and parameters and comparisons of domestic and international clearance studies. The summary focused on the EPA 1997 analysis contained in the Technical Support Document on the Evaluation of the Potential for Recycling of Scrap Metals from Nuclear Facilities and more recent EPA efforts to add analyses of copper and aluminum to the existing analysis of carbon steel. EPA has completed its analysis and the revised Technical Support Document is posted on EPA's Clean Materials Program website.

D.1.2 EPA Activities Related to Monitoring of Imported Scrap Metal

As noted above, EPA has been focusing its activities on review of potential imports of solid materials containing radioactivity. Such imports can be either orphan sources or the result of materials containing small amounts of radioactivity cleared from other countries.

With regard to this effort, EPA, at the request of the U.S. Customs Service, initiated a pilot study in August 2001, at the Cooper/T. Smith Stevedoring Company port in Darrow, Louisiana to collect data on the frequency with which radioactively contaminated scrap metal is imported into the United States. EPA installed radiation detection systems in grapples used by cranes to provide for continuous radiation monitoring of ships offloading either scrap ferrous metal or stainless steel. A goal of this study was to investigate the need for, and feasibility of, safeguarding against illicit or inadvertent inclusion of radioactive contamination in imported scrap metals. Inclusion of radioactive materials with scrap metal can have major economic consequences, as well as health risks for workers and the public. EPA planned to complete the study by December 15, 2001, and report its findings to the U.S. Customs Service. However, an abrupt decline in scrap steel imports through the Port of New Orleans in 2001 and early 2002 severely limited opportunities for data collection. As of May 2002, four shipments (two barges and two vessels) of scrap steel totaling 74,000 tons were monitored and there were no detections of contaminated steel or sources by the grapple monitors in any of these shipments. In May 2002, the EPA submitted a report with the study results for the U.S. Customs Service to provide to Congress. The current plan is to continue monitoring efforts at this port for an indefinite period of time. The EPA is considering expansion of this type of monitoring at other U.S. ports, subject to the availability of funds.

Independent of the EPA effort, a similar scrap steel monitoring program began operating in 2001 at the Port of Moorehead City, North Carolina. The Port of Moorehead City purchased and installed a radiation detection system in cranes that unload scrap metals in an agreement with the Nucor Steel in Hertford, North Carolina, and the David J. Joseph Company (a scrap metal broker). As of April 2002, there have been 12 cargoes unloaded at this port with no detected radioactivity above background. Almost all of the cargoes

unloaded since the installation of the detectors were grades of scrap metals that seldom yield a radioactive device, such as metal from demolition projects. At this port, scrap metals are purchased as being free of radioactive materials, which is construed as material that has no radioactivity greater than normal background levels. This is consistent with scrap metal specifications, such as the European EFR-

EUROFER, which generally stipulates that all (scrap) grades shall exclude hazardous radioactive material.

For activities conducted by the EPA at the Darrow, Louisiana port and the scrap steel monitoring activities at the Port of Moorehead City, notification protocols were developed to inform State and Federal regulatory authorities of the detection of radioactivity in a scrap steel shipment. For activities at the Port of Moorehead City, protocols were coordinated between the Port Authority of North Carolina, North Carolina State Division of Radiation Protection, NRC, EPA, the U.S. Coast Guard, U.S. Department of Commerce (if the scrap metal is to be returned to the foreign port), DOS (if the scrap metal is to be returned to certain countries), and the U.S. Department of Transportation (if material is to be transported by truck or rail). For activities at the port in Darrow, Louisiana, the NRC staff met with EPA staff on May 17, 2001, to discuss the respective roles of both agencies if AEA material were to be discovered during the EPA's pilot study. Additional notification protocols were coordinated between EPA, the Cooper Smith Stevedoring Company, Louisiana Department of Environmental Quality, U.S. Customs Service, and the David J. Joseph Company. Other domestic ports are currently in the process of installing monitoring systems to detect radioactivity in imported materials.

D.2 DOE Activities

D.2.1 DOE activities related to handling of, and setting criteria for, solid materials

DOE has a large inventory of stored solid material having low amounts of radioactivity from its various defense activities. In handling of these materials, DOE has established requirements in DOE Order 5400.5, "Radiation Protection of the Public," for allowable radioactivity levels on solid materials and for surveying those solid materials for unrestricted release. In general, these limits are comparable to those in use at NRC-licensed facilities and Agreement States, e.g., Regulatory Guide 1.86.

In 1999 industry groups and some members of the public expressed concern with the potential impacts from radioactivity in or on material released from DOE facilities. In response to stakeholder concerns, on January 12, 2000, the DOE established a moratorium on the release of volumetrically contaminated metal from any DOE location. Another DOE action, taken on July 13, 2000, was the establishment of a suspension of the unrestricted release of scrap metal from radiological areas within DOE facilities for recycling. At that time, the DOE also initiated a process to improve its release limits and enhanced its criteria for controlling the release of metal for recycling.

Following these actions, DOE proposed revisions to DOE Order 5400.5 that would allow the unrestricted release of scrap metal for recycling if the metal had no residual radioactivity as determined by process knowledge or measurement. The proposed

revision was made available for public comment on October 12, 2000 (65 FR 60653) and posted on the DOE website. NRC staff prepared comments on the proposed revision, provided to the comment to the Commission for review, and sent them to DOE on December 4, 2000. The NRC position noted in the letter is that a detectability based standard is inconsistent with a risk informed approach.

On January 19, 2001, the DOE decided to suspend work on the proposed revision to DOE Order 5400.5 and, instead, prepare a programmatic environmental impact statement (PEIS) on the disposition of scrap metals to allow for a more open discussion of the issues associated with scrap metal releases from the DOE complex. Although the moratorium and suspension have remained in effect, certain DOE release procedures were not affected by the January 19, 2001, decision - metals and all other materials located outside a radiological area can be reused or recycled if DOE Order 5400.5 requirements are met.

On July 12, 2001, DOE published in the Federal Register a Notice of Intent to prepare a PEIS that will address policy options for managing metals located in radiological areas on DOE sites, and any other scrap metals at DOE sites that might have some potential for residual surface radioactivity. The metals being evaluated are aluminum, copper, carbon steel, gold, iron, lead, platinum, silver, and stainless steel. Nickel was not originally proposed in the scope of the PEIS because it was volumetrically contaminated, however, the DOE is currently considering nickel and volumetrically contaminated material in the draft PEIS scope. The Notice of Intent proposes four disposition alternatives: (1) continuation of an existing suspension on the release of scrap metals from DOE radiological areas for unrestricted use in recycling, which is the no-action alternative; (2) release of scrap metals for recycling under existing DOE requirements; (3) release of scrap metals for recycling under alternative requirements; and (4) no release for recycling of scrap metals with any potential for residual surface radioactivity.

Beginning on July 31, 2001, the DOE conducted public scoping meetings at locations across the country and obtained comments on the Notice of Intent until November 9, 2001. Of the approximately 4,000 written comments received from stakeholders, more than 3,500 were opposed to release of metals to consumer products and requested that the DOE maintain its moratoriums on the release of scrap metal from its facilities. Currently, DOE staff are preparing the draft PEIS and intend to publish it for public comment later this year. The DOE plans to hold additional public meetings approximately 45 days after the publication of the draft PEIS and then prepare a final PEIS by the end of 2002. A Record of Decision would be issued by DOE no sooner than 30 days after publication of the final PEIS.

DOE staff intend to use the RESRAD-RECYCLE code for dose assessments in their draft PEIS. A training workshop on the RESRAD-RECYCLE code was held on March 15, 2001 which was attended by NRC and DOE staff. Also discussed in this workshop were the results of an international validation study of the RESRAD-RECYCLE code at a Swedish metals processing facility. The NA's report did not evaluate the RESRAD family of codes, including RESRAD-RECYCLE.

D.2.2 DOE Efforts Related to Enhanced Monitoring of Radiation in Solid Materials

Recently, DOE has been involved in developing sophisticated sensors for radiation detection. Relatively simple radiation detection equipment has been used by the U.S. Customs Service for some time and there are newer devices that have been emplaced at fixed locations and temporarily at national security special events. Currently, there is a concerted effort at three national laboratories to build more advanced radiation detectors.

DOE and U.S. Customs Service staff have participated in studies organized by the IAEA to determine the effectiveness of radiological monitoring equipment in detecting illicit trafficking of radioactive materials. This work has included field testing of large portal monitors at national borders and evaluation of hand-held radiation survey meters. NRC met with U.S. Customs staff on February 27, and March 28, 2002 to discuss issues of the U.S. Customs Service's Automated Export System and NRC licensing regulations for import and export.

In a separate effort begun since September 11, 2001, DOE, the U.S. Department of Justice Office of Domestic Preparedness Office, and the Health Physics Society recently began an equipment reuse program in response to radiological terrorist threats. In this program, the nation's emergency response organizations will reuse excess DOE radiological detection instruments, which may be supplemented with additional equipment from new Homeland Defense funds in 2003. Emergency response police and fire departments in ten metropolitan areas will be receiving refurbished equipment for the pilot program, including hand-held dose rate meters, electronic pulsers, microrem meters, and other radiation detection equipment. Additional equipment may be added to the program, such as weapons detection systems, glove boxes, and air samplers.

D.3 U.S Department of Transportation

On April 30, 2002, the NRC and the U.S Department of Transportation (DOT) published proposed rules (67 FR 21390 and 67 FR 21328, respectively) to make their regulations for the domestic transportation of radioactive material compatible with the latest revision of the IAEA regulations (TS-R-1), "Regulations for the Safe Transport of Radioactive Material." Revision of TS-R-1 includes the replacement of the 70 Bq/g (2000 pCi/g) radioactivity concentration threshold for determining whether radioactive material is subject to the radioactive material transport regulations. The new IAEA regulations provide nuclide-specific exemptions values that take into account both the nuclide-specific activity concentration and the total activity of the consignment in determining whether radioactive material to be transported would be exempt from the provisions of the radioactive material transport regulations. The revised values consider both the individual and collective doses from radioactive material transport under representative use and accident scenarios. The total annual effective dose from the exempted practice or source should be of the order of 10 μSv (1 mrem) or less for an individual member of the public and the collective dose should be no greater than 1 man-Sv (100 person-rem).

The basis for these revisions is IAEA's BSS, which provides exemption values for activity concentrations and total activities related to practices involving radioactive materials and to sources of radioactive material infixed facilities. However, the BSS did not explicitly address radioactive material transport, so additional calculations were performed for transport scenarios, which also served as a verification of the adequacy of the IAEA's BSS

exemption values for exposure scenarios involving radioactive materials transportation. For commodities not including food or water, the suggested thresholds for establishing radiation protection measures are from 10 to 100,000 smaller than the IAEA's BSS exemption concentrations.

D.4 Other Related Domestic Activities

D.4.1 Information on NRC's Current Approach for Control of Solid Materials and Related Agreement State Activities

The NRC staff and Agreement States continue to receive requests from licensees to recycle, reuse, or dispose of solid material when it becomes obsolete or otherwise unuseable during operations or when their facility is being decommissioned. These requests are reviewed on a case-by-case basis using a set of current practices and guidelines. To aid in use of the current approach while the NA' study was in progress, the NRC staff issued two memoranda, dated August 7, 2000, and July 27, 2001, clarifying the use of these practices and guidelines for licensing decisions involving the control of solid materials. The memoranda indicated that requests for release of solid materials should be handled on a case-by-case basis using existing guidance, i.e., Regulatory Guide 1.86 and its equivalent, Fuel Cycle Policy and Guidance Directive FC 83-23, for materials licensees and Office of Inspection and Enforcement Circular 81-07 and Information Notices 85-92 and 88-22 for reactor facilities. The second memorandum provided some clarification with regard to disposition of soil from licensed facilities and noted that requests for such approvals should be coordinated with staff contacts on a case-by-case basis. These memoranda are consistent with information in the Issues Paper and were provided to the Agreement States as information in an All Agreement States Letter No. STP-00-0070, dated August 22, 2000 and No. STP-01-081, dated November 28, 2001.

NRC staff obtained information from the Agreement States on their practices with respect to the release of surficial and/or volumetrically contaminated materials for unrestricted use. The responses indicate the States vary in their approaches. The types of criteria applied on a case-by-case basis include use levels that are indistinguishable from background, use of guidelines similar or equivalent to Regulatory Guide 1.86 and other NRC guidance documents and use of dose based analyses with maximum doses of 1, 10, 15 and 25 mrem/year.

At the annual meeting of the Conference of Radiation Control Program Directors (CRCPD) on May 8, 2002, the CRCPD passed a resolution recommending that NRC move forward with a rulemaking process for developing national standards for the control of solid materials from nuclear facilities, that the standards include a prohibition against the importation of solid materials exceeding the US standard, and that the technical bases developed by NRC include considerations for naturally occuring and accelerator produced radioactive material (NARM) and technologically enhanced naturally occurring radioactive material (TENORM).

D.4.2 ANSI and HPS Surface and Volume Radioactivity Standards for Clearance

A standard issued jointly by the American National Standards Institute (ANSI) and the Health Physics Society (HPS) (ANSI/HPS N13.12-1999), contains guidance on the clearance of solid materials based on a individual dose limit of 10 µSv/yr (1 mrem/yr) or higher dose levels when justified on a case-by-case basis, taking into account exposures to multiple sources will be maintained ALARA and will provide an adequate margin of safety below the public dose limit of 1 mSv/yr (100 mrem/yr) TEDE. The screening levels for solid materials or items containing surface or volume activity concentrations of radioactive materials are tabulated into four groups based on similarity of exposure scenario results. The screening levels range from 0.1 to 100 Bq/cm^2 (or Bq/g), depending on the group considered. This standard also contains guidance on an approach for applying collective dose to case-by-case clearance requests.

Previously, NRC deferred judgement on the adoption of the ANSI/HPS standard while the NA's study was under way or while it was considering rulemaking on the control of solid materials. The NA's report states that the ANSI/HPS standard was not being evaluated because the method for deriving the screening levels was not traceable by independent reviewers. Thus, the ANSI/HPS standard was not judged and ranked by the NA's committee, but was noted to contain useful information and addressed implementation protocols. Based on the NA's evaluation of the ANSI/HPS standard, the NRC staff plans to take the information in this standard into consideration on the path forward for the control of solid materials.

D.4.3 American Nuclear Society

The American Nuclear Society (ANS) Special Committee on Site Cleanup and Restoration Standards is responsible for reviewing draft regulations from federal organizations related to the decommissioning of nuclear facilities and providing ANS input to the rulemaking process. The ANS is currently preparing a position paper on the endorsement of ANSI N13.12, which is expected to be released later this year.

D.4.4 ANSI Standard on TENORM

Since 1993, ANSI has been working through the HPS on a national standard to provide general guidance and numerical criteria for the control and release of TENORM. Although NRC does not regulate TENORM, this proposed standard represents another industry effort to establish "administrative release levels" or clearance levels for solid material with surface or volume contamination. Similar to the previously described ANSI/HPS effort in developing ANSI/HPS N13.12-1999, the concentrations of TENORM that are exempted from controls in this proposed standard are based on an annual dose of less than or equal to 10 µSv/yr (1 mrem/yr). In fact, the administrative release levels in the proposed standard are identical to the clearance screening levels contained in ANSI/HPS N13.12-1999 for natural uranium, radium, thorium and associated decay products. The administrative release level for potassium-40 was also benchmarked to the results of ANSI/HPS N.13.12-1999.

The proposed standard is concerned with practices and operations that might concentrate

or relocate radioactivity such that members of the public may receive doses that would warrant the application of appropriate protective measures and corrective actions. The activities considered by this standard include mining and beneficiation of ores; processing of ore material, gangue, and wastes; feedstock used in the manufacture of consumer and industrial products; and distribution of products containing TENORM. The proposed dose criteria for members of the public exposed to TENORM are: (a) 1 mSv/yr (100 mrem/yr) for site and facility operations and effluent discharges into the environment; (b) 0.25 mSv/yr (25 mrem/yr) from lands and facilities that have been remediated and released for unrestricted use; (c) dose constraints for a

practice or source to ensure that dose limits are not exceeded when individual dose contributions are added in determining the total dose; and (d) referral to Maximum Contaminant Levels for ground water impacts.

This proposed standard, ANSI/HPS N13.53-2002, is currently under review by the Health Physics Standards Committee and is expected to go to the N13 committee for balloting this spring. The standard would apply to industries or activities that are not covered by existing Federal or State regulations, but could also be applied in foreign countries where such guidance is unavailable.

Independent of the ANSI/HPS effort in this area, the EC is also developing guidance on this subject. A draft report has been prepared, entitled “Practical Uses of the Concepts of Clearance and Exemption - Part II, Application of the Concepts of Exemption and Clearance to Natural Radiation Sources, Recommendations of the Group of Experts set up under the terms of Article 31 of the Euratom Treaty.”

D.4.5 NCRP Report on Managing Potentially Radioactive Scrap Metal

The National Council on Radiation Protection and Measurements is preparing a report on managing potentially radioactive scrap metal by Scientific Committee 87-4. A draft report was posted on the NCRP website for comment earlier this year.

E. RELATIONSHIP OF INTERNATIONAL AND DOMESTIC INITIATIVES TO NRC EFFORTS

E.1 Differences between International and NRC technical approaches

The IAEA and EC technical approaches for deriving clearance levels differs from the approaches used by organizations within the United States. The IAEA and EC approaches incorporate dose conversion factors from ICRP (ICRP-60, ICRP-68, and ICRP -72) whereas the U.S. agencies use Federal Guidance Report Nos. 11 and 12, which are based on ICRP-26 and ICRP-30 (1977-82). The IAEA and EC analyze external exposure, inhalation, and ingestion pathways, evaluate skin exposure, and separately analyze doses to children. IAEA and EC do not sum the pathways because the exposure scenarios are conservative and most of the dose typically comes from only one pathway. In comparison, the technical approaches used by NRC and EPA sum the external exposure, inhalation, and ingestion pathways, but do not evaluate skin exposure or separately analyze doses to

children.

There are differences amongst each agency's selection of the scenarios for representing hypothetical exposure conditions that an individual may come in contact with cleared materials, as well as the assignment of parameter values used in the scenarios. Some of these variations are due to real differences between exposure conditions in the United States and other countries, e.g., the size of trucks that are used to transport cleared material or materials used for the construction of dwellings. Other differences are due to decisions on what scenarios are realistic across all IAEA Member States as compared to realistic scenarios in the U.S., e.g., use of a slag dump as a sports playing field.

E.2 International Trade Policy Issues

As noted in Section C, international organizations are active in establishing clearance initiatives. A factor in the relationship of those activities to NRC decision-making is that potential differences in clearance policies can have ramifications on commercial trade involving domestic exports and international imports. For example, the ability of exported DOE materials may be affected by the development of a national standard on clearance. It seems reasonable to expect that trade of cleared materials and equipment could take place at least among EU countries. The impacts of cleared materials and equipment on trade outside the EU, including the U.S., are not predictable at this time. Although many of the national and proposed international clearance levels are within reasonable agreement, an overlying concern is that, by defining the legal acceptance of exports and imports, different standards amongst organizations could adversely impact international trade because there would not be a common set of values to determine whether solid materials could be accepted in trade.

Another key factor of practical importance is international agreement on the amount of radioactivity that corresponds to any dose standard. For compliance purposes, it is the amount of radioactivity, in terms of radioactivity concentration or dose rate from the radioactivity in the solid material, that would be measured by persons in the field. Thus, international agreement on dose modeling approaches remains an important technical issue with significant policy implications should differing levels of radioactivity or measurement protocols be assigned to the same clearance standard. International agreement on a dose standard for clearance standard, as well as the corresponding radioactivity levels and measurement protocols, would be beneficial for the domestic activities discussed previously.

E.3 Monitoring of radioactive materials at U.S. borders

Several Federal agencies have coordinated on activities related to the international aspects of clearance, the management of orphan sources, and illicit trafficking of radioactive material across national borders. There are overlapping technical and policy issues on these activities, as well as those related to the commercial trade of metal produced with either a discrete radioactive source or contamination from an uncontrolled release of naturally occurring or man-made source of radioactivity.

A common aspect is the detection of radioactivity in solid material and the related disposition decisions. An essential difference, however, is that clearance is a release of solid material from regulatory control based on an individual receiving a "trivial" dose, whereas the other activities are not authorized releases of solid materials and can involve larger doses.

Detection of unauthorized radioactive material in imported solid material can require evaluation of alarm levels, assessment of the radiation hazard, coordination of any emergency response, identification of options for disposition, and clearance and exemption determinations. The jurisdictional issues associated with unauthorized import of solid materials containing radioactive material can involve NRC, EPA, DOS, DOT, U. S. Customs Service, U. S. Coast Guard, U.S Commerce Department, and State agencies.

In cases involving the import of solid materials containing radioactive material, the NRC is responsible for licensing the import of byproduct, source, and special nuclear material, as stipulated in Section 274 of the Atomic Energy Act. However, the recipient of the material would likely not possess a NRC general license under 10 CFR Part 110 for domestic possession of the imported radioactive material. The general license applies only if the recipient, at the time the material enters the U.S., is authorized for domestic possession of the imported radioactive material under either a specific or general license, an exemption, or a DOE contract. The general license does not apply to most radioactive waste imports.

The Federal Radiological Emergency Response Plan (FRERP) may be activated if an unauthorized import of radioactive was determined to be a radiological emergency involving radioactive material of foreign or unknown origin, or is not licensed by the NRC or an Agreement State. The FRERP designates EPA as the lead federal agency responsible for coordinating with the State for the initial response to a radiological threat involving the unauthorized import of radioactive material. The NRC retains its regulatory responsibility for imported material, but in such cases, licensing and inspection activities are typically deferred until the response under the FRERP has ended. NRC would assume its traditional regulatory role of determining the appropriate licensing requirements for any radioactive material that is to remain in the U.S. When unauthorized imports of AEA material have occurred in the past, the NRC has worked with the EPA to safely disposition the material. However, absent an established national clearance standard that can be applied to these circumstances, each occurrence has been evaluated on a case-by-case basis, which can require significant resources.

E.4 DOE preparation of a PEIS

As noted in Section D.2.1, DOE is preparing a PEIS on scrap metal. Results and decisions regarding this action are factors which NRC should consider in its decision-making. NRC staff has maintained communication with DOE on this activity, but NRC is not currently involved in a more active manner such as a cooperating agency on the PEIS, as noted under NEPA implementing regulations in 40 CFR 1500. Currently, DOE intends to publish the PEIS for public comment later this year.

E.5 DOE development and use of more sensitive detection equipment

DOE's current initiative to enhance radiological monitoring of radiation in solid materials, discussed in Section D.2.2, may also affect NRC activities, as it could lead to identification of more solid materials with small amounts of radioactivity. Many of these identifications may be associated with authorized transfers of radioactive materials, naturally occurring radioactive materials, NARM, and TENORM, rather than terrorist activities. The extent of this occurrence would be dependent on several factors, such as the sensitivity of the detectors, the ability of the detector to distinguish different types of radioactive materials, and the reliability of accurately interpreting the radiation detector's signal. NRC would continue its existing practice of reviewing such events on a case-by-case basis in cooperation with the EPA, absent a national standard on clearance. The U.S. Customs Service, when working with the DOE on this activity, would be impacted in their decisions to allow or reject imports with detected radioactivity at national borders if a national standard were to be developed.

E.6 State issues

Differing standards amongst the NRC and Agreement States discussed in Section D.4 have implications with regard to consistency of approach by the various regulatory bodies and in explaining such differences in replies to Congressional inquiries on activities involving solid materials with slight amounts of contamination. Previous responses to such inquiries have expended large amounts of staff resources in discussing the varied current approaches. The recent resolution of the CRCPD will need to be addressed, which recommends that NRC move forward with a rulemaking process for developing national standards for control of solid materials, that the standards include a prohibition against the importation of solid materials exceeding the US standard, and that the technical bases developed by NRC include considerations for NARM and TENORM.

E.7 Domestic Consensus Standards

As discussed in Section D.4, there are domestic consensus standards that have been prepared by ANSI/HPS. According to the National Technology Transfer and Advancement Act of 1995, Federal agencies are to use technical standards that are developed or adopted by voluntary consensus standards bodies unless the use of such standards is inconsistent with applicable law or otherwise impractical. There are also recommendations on metal scrap management that have been under development by NCRP, that should be taken into account in moving forward with decisions on the control of solid materials. Harmonization amongst Federal and international regulatory agencies would simplify the management of these materials.

Table 1. Comparison of International Clearance Standards

Country	Clearance Levels Surface	Clearance Levels Volumetric	Based on	Situation	Remarks
Belgium	0.4 Bq/g (11 pCi/g) for ß-? and low toxicity a emitters; 0.04 (1 pCi/g) for all other a emitters	EP RP 122 (rounded values)	IAEA Transport Regulations exemption levels for surfaces 10 µSv/yr (1 mrem/yr) for an exposure pathway	Regulations in force	Effective September 2001
France	Nuclear power industry moratorium on generic levels; case-by-case allowed	Nuclear power industry moratorium on generic levels; Case-by-case allowed	Waste Stream analysis, QA, impact study, presentation to public, specific authorization	Incorporations of Directive 96/29/Euratom is in preparation incorporation planned mid-2001	Ministerial order issued Dec 31, 1999, requesting the nuclear industry to implement waste stream analysis Generic Clearance levels may be required for non-nuclear power very low level waste Authorized release is possible, through rarely used
	Non-nuclear power industry: case-by-case	Non-nuclear power industry: case-by-case			

Country	Clearance Levels Surface	Clearance Levels Volumetric	Based on	Situation	Remarks
Germany	Nuclide specific based on 10µSv (1mrem) to a person in a year [generally higher than RP 122]	Nuclide specific based on 10µSv (1 mrem) to a person in a year e.g., 0.1 Bq/g (2.7 pCi/g) ^{60}Co [generally in agreement with RP122]	SSK [Commission on Radiological Protection] recommendations	Ordinance (regulations) is in force	Effective July 26, 2001 Authorized release is possible, e.g., 4Bq/g (108 pCi/g) ^{60}Co for landfill or incineration; 0.6 Bq/g (16.2 pCi/g) ^{60}Co for metals to be melted Clearance of sites based on 10 µSv (1 mrem)
Italy	Applied domestically: ≤EC guidance RP122; for metals Imported metals meet environmental levels	Applied domestically; ≤EC guidance RP122; for metals Imported metals meet environmental levels		10 µSv/yr (1 mrem/yr)	
Japan	No general criteria	No general criteria	Ongoing discussions among government organizations		Nuclear Safety Commission based clearance calculations on 10 µSv (1 mrem) criterion; these agree well with TECDOC-885 with a few exceptions
The Netherlands				10 µSv/yr (1 mrem/yr)	Modified EC exemption levels used for clearance

Country	Clearance Levels Surface	Clearance Levels Volumetric	Based on	Situation	Remarks
Spain	Generic clearance level 1.3 Bq/cm^2 (35 pCi/cm^2) approved industry plan for surface clearance			10 µSv/yr (1 mrem/yr)	
U.K	Case-by-case basis	0.4 Bq/g (10.8 pCi/g) for non-naturally occurring radionuclides Naturally occuring radionuclides range from 0.37 to 11.1 Bq/g (10 to 300 pCi/g) depending on the element	Implementation of Directive 96/29Euraton by incorporation of existing regulations, except disposal of waste in a few months	*Status quo*, except disposal of waste regulation is expected in a few months	Basis for clearance is 10 µSv (1 mrem) criterion Exemption Orders exist that allow less restrictive clearance levels for naturally occurring radionuclides