December 22, 1999

Secretary
US Nuclear Regulatory Commission
Washington, DC 20555

Attention: Rulemaking and Adjudications Staff

Subject: Comments on the NRC Issues Paper on Release of Solid Materials at Licensed Facilities

I am pleased to have the opportunity to comment on the Nuclear Regulatory Commission's (NRC) issues paper regarding the release of solid materials from nuclear facilities. I feel that a standard for the release of materials from nuclear facilities in the United States is long overdue. While encouraged that a release standard may be forthcoming, the extremely low annual dose factors could create clearance values that are unachievable. The attached comments will provide insight to the problems with current release methodologies and potential problems that may arise from a clearance standard.

Issue No. 1—Should the NRC Address Inconsistency in its Release Standards by Considering Rulemaking on Release of Solid Materials?

The issues paper does not describe the current methods for release of solids and non-effluent liquids currently used by NRC licensees. Alternatives (1) implies that the NRC reviews each release of solid materials from licensees on a case by case basis. While this may be true for materials with detectable levels of contamination, licensees utilize the first sentence in A.1.3 (b) as the criteria for material release. Licensees develop material release programs to verify the absence of loose or fixed residual radioactivity using state of the art instruments. These instruments are capable of detecting residual radioactivity to values at or below those specified in Regulatory Guide 1.86; however, the Regulatory Guide 1.86 values are not considered release limits. If residual radioactivity is detected, the material is not released. Volumetric releases are performed by analyzing representative samples to the environmental LLDs[1]. Again, the material is not released if residual radioactivity is detected. As written, the issues paper implies that the evaluation and release of materials by licensees is something new, when licensees actually evaluate and release materials at nuclear facilities every day.

The "no detectable" residual radioactivity release criteria currently used by licensees

[1] As specified in NUREG-1301 or the licensees ODCM.

can produce inconsistent results. Factors such as fluctuations in background, geometry changes, or slight differences in detection levels between instruments can influence the detection of residual radioactivity. These differences often cause confusion regarding proper material release and raise questions about the appropriate detection levels. The development of clearance values would eliminate these factors and allow licensees to produce consistent material releases to a known standard.

The NRC's practice of evaluating material releases on a case-by-case basis for releasing residual radioactivity does not provide a logical regulatory framework. Since each case repeats previous efforts, the method is not considered cost beneficial and may lead to inconsistencies. The current method also does not provide clear guidance for all licensees. Since seeking approval for small volumes of materials is considered cost prohibitive, small articles or quantities are generally disposed of as low level radioactive waste.

A release standard is needed to provide licensees with measurable limits for unrestricted releases. Since licensees must demonstrate compliance with the limit, the values must be detectable using cost effective survey techniques. Clearance values that are below the detection threshold of standard field instrumentation would cause an undue regulatory burden on licensees without adding to the protection of the public or environment.

The issues paper specifically addresses "solids"; however, all materials should be included. Although solids do account for the majority of materials, low volumes of non-effluent liquids and aggregate solids (soils and sludge) are produced during licensed activities. Currently these materials are analyzed to environmental LLDs and released if no residual radioactivity is detected. As a result of chemical interference, some liquids cannot be analyzed to environmental LLD. Although the overall volume is quite low, they represent potential mixed wastes. Hence, the NRC and EPA need to agree on when radiological regulatory controls end to allow licensees to dispose of chemical waste that cannot meet the "no detectable" residual radioactivity release criteria.

Analyzing the release of materials from regulatory control is complex because the current regulatory frame work is flawed. Without a written standard stating when regulatory controls end, the licensee is left with a big question – "How hard do I have to look?" This type of question should not exist in a regulated environment.

Issue No. 2 – If NRC Decides to Develop a Proposed Rule, What are the Principal Alternatives for Rulemaking that Should be Considered, and What Factors Should be Used in Making Decisions Between Alternatives?

Alternate #1, allowing the release of materials for unrestricted use provided the potential dose to the public is maintained below an annual exposure level, is the logical choice for establishing a clearance standard. The ranges specified for potential dose levels[2] are all considered extremely low. It should also be noted that only the 1 mrem/yr and the 10 mrem/yr values fall within the trivial range as defined in IAEA in Safety series 89. The National Council of Radiation Protection and Measurements (NCRP) does define a Negligible Individual Dose as 1 mrem/yr; however, this is not a recommended limit. The NCRP recommends[3] a limit of 100 mrem/yr for sources other than medical exposures and natural background and 500 mrem/yr for infrequent exposure. The NCRP also recommends limiting the exposure to an individual to 25 mrem/yr from a given source if an assessment of the individuals collective annual exposure is not performed.

The dose limits for members of the public in 10 CFR part 20 are consistent with the recommendations of the NCRP. 10 CFR 20.1301 requires licensees to operate such that an individual member of the public will not receive more that 100 mrem/yr (500 mrem/yr with special provisions) and no more than 2 mrem in any one hour. These values can be measured using standard instrumentation and monitoring devices and can be traced to a NIST traceable. Depending on exposure times, 0.1 mrem/yr, 1 mrem/yr, or 10 mrem/yr would not be considered measurable dose rates. Instead these doses are calculated estimates based on assumptions and computer models.

Limits consistent with the NCRP recommendation can also be found in 10 CFR part 35.75. 10 CFR part 35.75 states that a licensee can release an individual who was administered radiopharmaceuticals or radioactive implants provided the total effective dose equivalent to any other individual does not exceed 500 mrem, but must provide the patient with instructions on how to maintain doses to another individual ALARA if an exposure will exceed 100 mrem. In fact, no guidance on the interruption or discontinuation of breast feeding is required until the dose to the breast feeding infant could exceed 100 mrem. While the benefits of releasing a patient can be recognized in terms of recovered wages, productivity, and reduced hospital expenses, the resulting exposures to members of the public are real and quite measurable.

The term "dose-based" regulations is somewhat of a misleading statement. Computer models can produce estimated exposures, but the assumptions used to develop the models and input parameters must be realistic. If these values are unrealistic or overly conservative, a dose-based regulation loses credibility. For example, an input of 1 Bq/g produced a 25 mrem/yr output for one agency's model, but only 0.0048 mrem/yr from another agency (NUREG-1640 vs. IAEA Safety Series 111-P-1.1 models for transporting steel contaminated with Co-60). However, if both drivers were monitored

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[2] No dose above background, 0.1 mrem/yr, 1 mrem/yr, and 10 mrem/yr

[3] These recommendations are consistent with those provided by the International Commission on Radiological Protection (ICRP) in publication 60.

using thermoluminescence dosimeters, their reported annual dose would most likely be zero[4]. Hence, careful planning and good engineering judgment is essential to producing realistic dose based clearance values.

Generic clearance values should not be viewed as a limit, but as a method for demonstrating compliance with the limit. Materials with residual radioactivity at or below the clearance value would require no further consideration or evaluation. Since clearance values are established using generic assumptions with respect to the materials future use, a licensee should have the ability to evaluate materials that exceed a generic clearance value based on site specific conditions. This process would afford the licensee the opportunity to correct or adjust a limiting assumption used during the development of the generic value that did not apply to the specific release scenario. Therefore, it is recommended that a regulatory guide also be developed to provide guidance on how to comply with the standard. The regulatory guide should include the generic values and methods of calculating site specific values. An approved computer code, similar to RESRAD-Recycle, would be beneficial for analyzing site specific reuse or recycle values.

In accordance with IAEA Safety Series 89, derived clearance values should be based on the average dose to the member of a critical group, not the maximally exposed individual. This provides some assurance that clearance values are realistic and not driven by a hypothetical worst case scenario which has an extremely low probability of occurring. A review of NUREG-1640, EPA TSD, and IAEA Safety Series 111-P-1.1 indicated that each standard had models that were based on the worst case scenario instead of the average dose to a member of the critical group. For example, the transportation scenarios in NUREG-1640 assume an annual exposure duration of 1000 hours. Although the authors, attempted to justify the 1000 hours, it is not an accurate reflection of a realistic exposure time for the average scrap hauler.

Similar assumptions are made by the IAEA when producing its limiting model for energetic gamma emitting nuclides – the use of large equipment made from recycled steel. The case involves an industrial size lathe made from 100 percent cleared steel assuming no dilution or partitioning factors[5]. The lathe operator is assumed to work 2000 hours per year at a distance of 1 meter from the lathe. A lathe operator milling stock for 2000 hours in a year is somewhat optimistic for the owner of the machine shop but lacks good judgment. The EPAs most limiting model for external exposures is also a lathe operator and makes the same poor assumptions by using a dilution factor of 1 and an unrealistic exposure time of 1750 hours. These are considered examples of calculating doses to the maximally exposed individual rather than the average dose to a

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[4] Based on the lower limit of detection for standard NVLAP certified TLD processor

[5] IAEA-TECDOC-855 and IAEA Safety Series No. 111-P-1.1

member of the critical group.

ANSI Standard N13.12 (1999) and the European Commission (EC) values for volumetric releases of principle gamma emitters commonly found at pressurized water reactors were in agreement. ANSI N13.12 was more conservative for electron capture and low energy beta emitters, radium, thorium and transuranics. Also, the surface screening values listed in the ANSI standard did not agree with the EC values. This discrepancy stems from the ANSI standard assuming a 1 cm^2/g surface to mass ratio. For steel, this would assume steel items are 18 gauge sheet steel with a nominal thickness 0.05 inches (0.127 cm). While this might be a good assumption for office furniture, it is a poor assumption for power plant equipment. Pipe supports, rebar, pipes, pump blocks, valves, beams, angle iron, hand rails, nuts and bolts, etc., are examples of steel items having nominal thickness much greater than 0.05 inches. For concrete having a density of 2.3 g/cm^3, the surface to mass ratio would be 0.04 cm^2/g assuming a typical 4 inch thick slab. Therefore, the ANSI standard's 1 cm^2/g surface to mass ratio does not produce realistic surficial clearance values.

Based on the problems associated with each standard, the NRC should not simply adopt a previously performed standard. The values produced in each standard should be compared and the differences resolved. Any unrealistic assumptions should be corrected to create derived clearance values based on the average dose to a member of a critical group and not the maximally exposed individual. If a release standard is derived from models or scenarios that lack good engineering judgment, the resulting clearance values will overestimate the dose and cause the clearance values to be overly conservative. Therefore, careful consideration and review of all input parameters must be performed to ensure the output values are credible, measurable, and represent the average dose to a member of the critical group

While alternate course of action A.2.2(3) may draw support from some members of the public, it is not a reasonable alternative. To dispose of materials as low level radioactive waste simply because the article was used in an area where radioactive materials are handled or stored would create an undue regulatory burden on licensees. This option lacks sound judgment and is considered inconsistent with other sections of the 10 CFR.

Issue No. 3--If NRC Decides to Develop a Proposed Rule Containing Criteria for Release of Solid Materials, Could Some Form of Restrictions on Future Use of Solid Materials be Considered as an Alternative?

Alternate course of action A.2.2 (2) would not prove feasible alone but it could prove beneficial for materials that exceed the limitations of A.2.2 (1) and have a high recycling value. Since the limiting dose to a member of the public is based on assumptions, implementing controls that would increase mixing, reduce exposure times, or control over the end product could produce materials that are within an acceptable standard. While A.2.2 (2) would require additional controls, it has the potential to recover resources that otherwise would be lost by burial as low level waste.

Issue No. 4--If NRC Decides to Develop a Proposed Rule, What Materials Should be Covered?

The release of materials from licensed facilities is not limited to solids, such as steel or concrete. Licensees must evaluate all materials that may have become contaminated as a result of licensed activities. Therefore, a clearance standard should provide a method for evaluating the release of all types of materials for reuse, recycle, and disposal.

Summary:

I believe that a standard is needed to ensure consistency between licensees when releasing materials from nuclear facilities. Clearance levels should be developed as a method of complying with the release standard. The clearance values for both volumetric and surficial radioactive concentrations should be based on sound engineering judgment and the dose to the average member of the critical group. If done correctly, the standard will provide an adequate margin of safety for members of the public and will not create an undue regulatory burden for licensees.

Sincerely,
Craig Podgurski