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Via E-Mail and U.S. Mail

Naim S. Tanious,
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Re: Compatibility With IAEA Standards (TS-R-1) and Other
Transportation Safety Amendments (67 Fed. Reg. 21390)

Dear Mr. Tanious:

These comments on the above captioned rulemaking are submitted on behalf of the Zirconium Environmental Committee ("ZEC"), a group of companies that engage in the production, research and development, and commercial distribution of zirconium ores and products, including zircon and zirconia. ZEC member companies engage in intra- and interstate commerce within the United States, as well as foreign commerce worldwide. The ZEC wishes to emphasize that NRC's proposed rulemaking - without appropriate exemptions for natural materials and ores - would extend radioactive materials regulation to ores and natural materials having very low activity levels with resulting increased costs, transportation burdens and liabilities, all without justification. Accordingly, the ZEC offers the following comments on NRC's proposed rulemaking.

All of the information provided below was presented to NRC in the June 24, 2002 public meeting on the proposed rule.

I. NRC Must Consider IAEA's Supporting Documentation to Avoid Ambiguity.

The U.S. Nuclear Regulatory Commission ("NRC"), in announcing its proposed rule to harmonize 10 C.F.R. Part 71 transportation rules with the *International Atomic Energy Agency ("IAEA") Regulations for the Safe Transport of Radioactive Material No. TS-R-1*, should consider that this action could unintentionally increase the variety of materials in transportation that become regulated as "radioactive." IAEA became aware of this concern through comments of interested parties, and took affirmative steps to limit the scope of ST-1. However, as drafted, the limitations on the scope of TS-R-1 are ambiguous and require

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consideration of IAEA's supporting documentation in order to comprehend the intent of the drafters.

The history of IAEA's adoption of the 1996 ST-1 Regulations confirms that the expert Working Group that drafted Paragraph 107 sought to exclude natural materials and ores from the classes of materials to be regulated as "radioactive" for transportation purposes. Paragraph 107, limiting the scope of ST-1, provides:

107. The Regulations do not apply to:

* * *

(e) natural material and ores containing naturally occurring radionuclides which are not intended to be processed for use of these radionuclides provided the activity concentration of the material does not exceed 10 times the values specified in paras 401-406.

Paragraph 107(e) appropriately emphasizes that natural materials and ores that are not part of the nuclear fuel cycle or otherwise processed for their radionuclide content are outside the scope of the regulation. Because most minerals and natural materials contain detectable concentrations of natural radionuclides, the universe of materials that could be considered to be technically "radioactive" -- and potentially subject to regulation -- is very large. Importantly, IAEA recognized that the scope of regulatory control should be limited by excluding ores and natural materials that are not exploited for their radionuclide content, provided a certain activity level is not exceeded.

Second, Paragraph 107(e) expanded the exemption beyond ores to include ores and *natural materials* containing natural radionuclides. There are many materials of natural mineral origin that could not be strictly construed to be "ores," but rather are products made from ores. Examples include high performance refractories used in extreme temperature applications such as foundries or glass furnaces and zirconia specialty ceramics. Moreover, in today's environmentally conscious market, many spent refractory materials retain their value as recyclable natural materials. That IAEA saw fit not to limit the scope of the exemption to "ores" promotes environmentally sound recycling practices for natural materials that incidentally contain natural radionuclides.

Notwithstanding the plain language of Paragraph 107(e), the practical application of this Paragraph remains ambiguous. Referring to Paragraphs 401-406 of ST-1, the Table I

exemption values for natural uranium ("U") is 1 Bq/g¹, and according to Paragraph 107, mineral ores and natural materials would be excluded from the scope of ST-1 provided the specific activity was below 10 Bq/g U. While the Table I listing for natural U refers to footnote (b), which in turn summarizes the decay progeny for natural radionuclides, it is not entirely clear from the language in Paragraph 107 or Table I footnote (b) whether it is the specific activity of the parent nuclide or the total specific activity of the sum of all nuclides in the U decay sequence that is to be considered in determining whether a material is outside the scope of ST-1. The same is true for natural thorium. Fortunately, the record of ST-1's development and subsequent documentation from IAEA make this clarification; unfortunately, the availability of these materials has been very limited and Paragraph 107(e) of ST-1, on its face, is ambiguous.

The *Report From the Special Working Group on Exemption* clarified that:

The factor 10 was selected taking the following considerations into account:

- the exemption values refer to the activity of the parent radionuclide, if daughter products are involved

Notwithstanding the omission of this important clarification in ST-1, IAEA's subsequent *DRAFT ADVISORY MATERIAL FOR THE REGULATIONS FOR THE SAFE TRANSPORT OF RADIOACTIVE MATERIAL (1996 Edition) IAEA Safety Standards Series No. ST-2* (Feb. 19, 1999) makes it clear that the exemptions of Para. 107 are determined on the basis of parent ²³⁸U nuclide activity. The *Advisory Material* was published because "it became increasingly evident that, while the provisions of the [IAEA] Regulations might be essentially clear and unambiguous, nevertheless they would often also be highly technical in nature and unavoidably complex." *Id.* at page 2. The draft ST-2 provided the following important clarifications to ST-1 Section 107, as follows:

107.5. The scope of the Regulations includes those natural materials or ores which form part of the nuclear fuel cycle or which will be processed in order to use their radioactive properties. The Regulations do not apply to other ores which may contain naturally occurring radionuclides, but whose usefulness does not lie in the fissile, fertile or radioactive properties of those nuclides, provided that the activity concentration does not exceed 10 times the exempt activity concentration values. Natural material and ores containing natural occurring radionuclides which are

¹ The SI unit for specific activity Bq/g is equivalent to 27 picoCuries ("pCi")/g.

processed are also exempt from the Regulations (up to 10 times the exempt activity concentration values) where the physical and/or chemical processing is not for the purpose of extracting radionuclides, e.g., washed sands, tailings from alumina refining etc.,

Were this not the case, the Regulations would have to be applied to enormous quantities of material that present a very low hazard. However, there are ores in nature where the activity concentration is much higher than the exemption values. The regular transport of these ores may require a consideration of radiation protection measures. Hence, a factor of 10 times the exemption values for activity concentration was chosen as providing an appropriate balance between the radiological protection concerns and the practical inconvenience of regulating large quantities of material with naturally occurring low activity concentration.

ST-2 at page 2 (emphasis supplied). It should further be noted that ST-2 includes the following important clarification:

401.6. It must be emphasized that, in the case of decay chains, the values in Table I columns 4 and 5 of the Regulations relate to the activity or activity concentration of the parent nuclide.

Thus, the ST-2 explanatory materials are relevant in clarifying the limitations on the scope of ST-1 and cannot be ignored for NRC's purposes. IAEA was clearly aware that the ST-1 regulations could be misapplied to broad classes of minerals and natural materials and sought to provide appropriate safeguards against over-regulation of useful minerals and natural products in commerce.

From the preamble to the proposed rule, we believe that it is NRC's intention to follow the IAEA's guidance in implementing the exemption for natural materials and ores provided in TS-R-1. In the preamble, NRC clarifies that the Table I values apply to *parent* nuclides, where progeny are present:

Note that some nuclides listed in Table I have a reference to footnote (b). These nuclides have the radiological contributions from their daughter products (progeny) already included in the listed value. For example, natural uranium [U(nat)] in Table I has a listed activity concentration for exempt material of 1 Bq/g (2.7×10^{-5} uCi/g). This means the activity concentration of the uranium is limited to 1 Bq/g (2.7×10^{-5}

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uCi/g), but the total activity concentration of an exempt material containing 1 Bq/g 92.7×10^{-5} uCi/g) of uranium will be higher (approximately 7 Bq/g (1.9×10^{-4} uCi/g)) due to the radioactivity of the daughter products.

67 Fed. Reg. 21390 at page 21396. *We wish to point out to NRC that the Table I listings for Th (nat) and U (nat) at page 21482 have omitted reference to footnote b.* Because this is plainly inconsistent with the text of the preamble, we conclude that this is a typographical oversight that must be corrected in the final rule.

II. Failure to Properly Implement IAEA Exemption Values Dramatically Expands the Universe of Regulated Materials

As discussed at the June 24, 2002 public meeting, there are vast quantities of natural materials and ores of critical importance to the U.S. economy that are routinely transported in commerce. Many of these ores exceed 1 Bq/g uranium, and could become “radioactive” materials for transportation purposes if NRC fails to implement IAEA’s exemption provisions. These materials include:

A. Phosphate ore and fertilizer. According to the U.S. Environmental Protection Agency (“EPA”) *Diffuse NORM Wastes – Waste Characterization and Preliminary Risk Assessment(Draft)(Contract No. 68-D20-155, April, 1993)(hereinafter, “EPA NORM Report”)*, phosphate ores range up to 10 Bq/g uranium. The U.S. Geological Survey (“USGS”) reports that 32,800,000 metric tons of phosphate ore were mined in the United States in 2001. (See: U.S.G.S. Mineral Industry Surveys for Marketable Phosphate Rock, March 2002). EPA’s NORM Report relates that “average” phosphate fertilizer contains 4.2 Bq/g uranium isotopes.“

B. Zirconium ores. Zirconium ores in the form of zircon sand typically contain 2.5 to 3.5 Bq/g uranium and 0.5 to 1.0 Bq/g thorium, in equilibrium with decay progeny. U.S.G.S. reports that over 100,000 metric tons of zircon entered into commerce in 2001 (*Id.*).

C. Titanium minerals. The titanium minerals (ilmenite, leucoxene and rutile) are recognized to contain low, but measurable, concentrations of uranium and thorium, at up to 1 Bq/g. U.S.G.S. reports that 300,000 metric tons of titanium minerals were produced in the U.S. in 2001 (*Id.*).

D. Tungsten ores and concentrates. Tungsten mineral ores and ore concentrates are known to contain naturally occurring uranium and thorium up to and, in some cases, exceeding 1 Bq/g concentration. Based on information reported by U.S.G.S, it is estimated that around 10,000 metric tons of tungsten ore entered into commerce in 2001 (*Id.*).

E. Vanadium ores. Vanadium ores may contain up to several Bq/g uranium. U.S.G.S. reports 2001 U.S. consumption of vanadium was 3,600 metric tons.

F. Yttrium and rare earths. Rare earth minerals may contain several Bq/g uranium and thorium, with some exceeding "source material" levels of 10 C.F.R. Part 40. Data available from U.S.G.S. suggests that U.S. yttrium and rare earths ore production totaled less than 100 metric tons in 2001.

G. Bauxite and alumina. EPA's NORM Report identified 2.13 Bq/g total activity concentration for bauxite. According to U.S.G.S., over 12,000,000 metric tons of bauxite and alumina were consumed in the U.S. in 2001.

H. Coal and coal fly ash. U.S.G.S, in *Radioactive Elements in Coal and Fly Ash: Abundance, Forms, and Environmental Significance* (Fact Sheet FS-163-97, October, 1997), reports that while U.S. coals contain 1 to 5 ppm uranium, the element becomes concentrated by at least an order of magnitude in coal fly ash. It is estimated that hundreds of millions of tons of coal fly ash are transported annually in the U.S.

From the above discussion, it can be seen that an immense quantity of mineral ores and products containing low levels of uranium and/or thorium are transported annually in commerce. Many of these materials exceed 1 Bq/g, and failure to implement IAEA's exemption for natural materials and ores would dramatically expand the universe of materials regulated as "radioactive" for transportation purposes.

III. Need for IAEA Transparency

The IAEA document TS-R-1 and its immediate predecessor ST-1 which serve as the basis for NRC's rulemaking were drafted by IAEA nearly six years ago. During the course of this rulemaking, much effort has been expended by both NRC and DOT in explaining the basis of their IAEA harmonization efforts to interested parties and in making underlying IAEA documentation available to the public. Insofar as NRC's rulemaking process is

concerned, it is governed by the Administrative Procedures Act and the Due Process provisions of our Constitution. This is not so for IAEA.

While we recognize that NRC is a limited participant in the IAEA rulemaking process, IAEA's rulemakings are first seen by the regulated community in their final form, without advance notice or opportunity to comment. In fact, IAEA is meeting in September, 2002 to consider revisions to TS-R-1, which will ultimately find their way into U.S. rules. The effect of IAEA's rules, however, is not limited to international transportation, but, when adopted by U.S. agencies, directly affects American companies transporting materials in domestic commerce.

Because of the importance that IAEA's rulemaking process holds for U.S. stakeholders, but without any current opportunity for meaningful comment, we request NRC to put interested parties on notice of impending IAEA rulemaking, and receive comments for its consideration as a participant in IAEA's rulemaking process. Even a limited opportunity for U.S. businesses to comment –through NRC – on IAEA regulations that affect their interests is better than no opportunity at all. To neglect the interests of U.S. stakeholders in the IAEA rulemaking process leaves NRC open to criticism for ill-informed rulemaking that is more in the nature of a legislative fiat from IAEA than a product of the democratic process.

IV. Conclusion

For all of the foregoing reasons, we recommend that NRC consider the following in conjunction with its proposed Part 71 rulemaking:

- Ensure that the scope of materials regulated as “radioactive” for transportation purposes does not extend to ores and natural materials, including products and secondary materials derived from those ores and materials, that are outside the nuclear fuel cycle and do not exceed an appropriate regulatory threshold.
- Clarify that in determining exemptions, consistent with IAEA's intent, it is the specific activity of the parent nuclide to be considered, where naturally occurring radioactive materials are in issue. Ensure that Th(nat) and U(nat) reference footnote (b) in the final rule.

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- Improve communications with the regulated community and the public regarding IAEA activities that will ultimately exert an influence on domestic U.S. rules.

Please do not hesitate to contact the undersigned if there are any questions regarding these comments.

Very truly yours,

A handwritten signature in black ink that reads "Charles T. Simmons". The signature is written in a cursive, slightly slanted style.

Charles T. Simmons
For The Zirconium Environmental
Committee