



October 4, 2011

CD11-0263

Mr. Bradley Jones
Assistant General Counsel for
Reactor & Materials Rulemaking
Office of General Counsel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Request for Nuclear Regulatory Commission Position on the Definition of Source Material

Dear Mr. Jones:

The purpose of this letter is to obtain the Nuclear Regulatory Commission (NRC) official position as to whether uranium adhering to the interior of piping as pipe scale is source material under the *Atomic Energy Act* of 1954, as amended (AEA). Please consider this a request for an interpretation pursuant to 10 CFR §40.6. The determination of whether this uranium is source material or naturally-occurring radioactive material (NORM) is important for determining compact fees and requirements, as well as Agreement State and NRC regulatory requirements for disposal of low-level radioactive waste.

The origination of the material that led to this question is a water-steam mixture from geothermal wells that contains various elements including uranium. Several scenarios can occur as represented by each of the following real-world situations:

Case 1 – The interior of the piping directly from the well before any filtering or other processing of the natural water-steam mixture is contaminated with uranium that adheres to the piping and this pipe scale has a concentration of less than 0.05% by weight of uranium.

Case 2 – The interior of the piping directly from the well before any filtering or other processing of the natural water-steam mixture is contaminated with uranium that adheres to the piping and this pipe scale has a concentration of 0.05% or more by weight of uranium.

Case 3 – The interior of the piping after some form of processing of the natural water-steam mixture is contaminated with uranium that adheres to the piping and this pipe scale has a concentration of less than 0.05% by weight of uranium.

Case 4 – The interior of the piping after some form of processing of the natural water-steam mixture is contaminated with uranium that adheres to the piping and this pipe scale has a concentration of 0.05% or more by weight of uranium.

Case 5 – The natural water-steam mixture from the well in a storage tank is contaminated with uranium and has a concentration of less than 0.05% by weight of uranium.

Case 6 – A mixture of sludge resulting from the natural water-steam mixture (e.g., in the bottom of the storage tank in case 5) is contaminated with uranium and has a concentration of less than 0.05% by weight of uranium.

Under the AEA and NRC regulations, ore containing 0.05% or more by weight of uranium and uranium that has been processed, refined, or otherwise separated from ore are source materials. The essence of our question is what constitutes processing, refining, or separation, such that uranium is no longer considered to be part of “ore” and is therefore source material regardless of its concentration. A simple answer to that question may be that any process, intentional or otherwise, that separates out uranium such that the material can be captured for purposes of acquiring uranium to make special nuclear material, which is the focus of the definition of source material.

NRC has considered similar issues in the past. For example, a September 12, 2002, letter to the State of California addressed source material issues at a rare earth facility.¹ NRC said:

1. Does NRC exert authority (and if so, what is the regulatory basis for such authority) at facilities such as rare-earth licensed sites (licensed for the possession of source material) over source material that is being processed but that is less than 0.05% by weight uranium and thorium, or does the regulatory control only begin once the material has been processed to the point that the concentration of the uranium or thorium is above 0.05% by weight?

Response: The AEA, provides the NRC with broad authority, including the authority to determine, under Section 62 of the AEA the quantities of source material that are “unimportant,” and the authority to determine the concentration of uranium and thorium in an ore that subjects the ore, *en masse*, to licensing, i.e., ores containing less than 0.05% uranium or thorium by weight do not fall within the definition of “Source Material” in 10 CFR 40.4(2). Therefore, when a rare-earth facility processes an ore that contains less than 0.05% uranium or thorium by weight, that ore, even though it may contain uranium or thorium, is not licensable source material. If during processing, however, uranium or thorium contained in an ore becomes concentrated so that the process material, products, or wastes contain by weight 0.05% or more uranium or thorium, or these materials become concentrated by evaporation so that the concentration of uranium or thorium exceeds the 0.05% threshold, these materials would then contain licensable source material over which the NRC can, and does, exert regulatory authority.

More recently, the NRC addressed the question of uranium found in community water systems (CWS), where during treatment of drinking water naturally-occurring uranium is concentrated in “media, effluents, and other residuals.” NRC Regulatory Issue Summary 2006-20, *Guidance for Receiving Enforcement Discretion When Concentrating Uranium at Community Water Systems* (September 14, 2006), states:

¹ Letter to Edward Bailey, California Radiological Health Branch, from Paul Lohaus, NRC, September 12, 2002 (ML022660607) responding to letter from Edward Bailey to Paul Lohaus, Regulation of Source Material, June 30, 2001 (ML012560140).

The Atomic Energy Act of 1954, as amended, provides the NRC with regulatory authority over source material (which includes uranium and thorium) after its removal from its place of deposit in nature. NRC has issued regulations for source material in Title 10, Code of Federal Regulations (10 CFR) Part 40, "Domestic Licensing of Source Material." Part 40 defines "source material," in part, as meaning uranium "in any physical or chemical form." In accordance with 10 CFR 40.13(a), the NRC regards uranium in any solution (e.g., water) in which the uranium is by weight less than one-twentieth of 1 percent (0.05 percent or 335 picocuries per gram for natural uranium) of the solution as an "unimportant quantity" of source material. Any CWS possessing such unimportant quantities of uranium would not need an NRC license under the 10 CFR 40.13(a) exemption. If a CWS possesses more than an unimportant quantity of uranium, but less than 15 pounds of uranium at any one time and less than 150 pounds of uranium in any one calendar year, the CWS may operate under the existing general license in 10 CFR 40.22, "Small quantities of source material." A CWS operating under the general license in 10 CFR 40.22 is not required to formally notify NRC that it is operating under the conditions of that general license.

However, stating that NRC has authority over source material after its removal from its place of deposit in nature seems inconsistent with the fact that the source of uranium is ore and ore once removed from its place of deposit is still not "source material" and within the NRC authority unless the ore is greater than 0.05% uranium or thorium. It appears to us that the NRC concluded that the uranium in the water solution was already processed, refined, or otherwise separated from ore such that it was source material. The only question would seem to be whether under 10 CFR 40.13(a) the source material was an unimportant quantity.

In our view, one could conclude that since the water being treated at a CWS comes from nature, the water itself is an "ore" with various elements in it, such that the ore is only source material if the uranium in it is 0.05% or greater. Under this view, until the uranium in a natural water solution of less than 0.05% is concentrated so that the solution contains uranium of 0.05% or greater, the solution is not source material. Any uranium that is separated, refined, or processed from the solution, regardless of its concentration, would be source material. We note that the separation process that has produced the pipe scale is not purposeful processing of uranium but nevertheless results in separation of uranium.

Based on our review, we propose the following interpretation of the AEA and Part 40 definitions of source material for the cases described above:

1. The uranium in the pipe scale in Cases 1-4 above would be source material because it has been separated from the natural water solution. Depending on the concentration of uranium, this source material may be an unimportant quantity under 10 CFR 40.13(a) and not require disposal in a Part 61 facility since the material would be exempt from licensing requirements.
2. The water solution in Case 5 would not be source material because it is the natural ore and is less than 0.05% uranium by weight.

3. The sludge in Case 6 also would not be source material because the sludge is still the unprocessed ore and it is less than 0.05% uranium by weight.

We hereby request the NRC's confirmation of the above interpretation. If you have any questions, please contact me at (240) 565-6148 or temagette@energysolutions.com, or Mark Ledoux at (801) 649-2151 or mledoux@energysolutions.com.

Sincerely,



Thomas E. Magotte, P.E.
Senior Vice President
Nuclear Regulatory Strategy

cc: Mark Satorius, FSME