OREGON BUSINESS & INDUSTRY OBI

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February 4, 2022

VIA EMAIL

Maxwell Woods
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Assistant Director
Nuclear Safety and Emergency Preparedness Division
550 Capitol St. NE
Salem, OR 97301

RE: Comments on Radioactive Waste Materials Rulemaking Advisory Committee Meetings 1 and 2

Dear Mr. Woods:

I am writing on behalf of Oregon Business & Industry (OBI), Oregon's most comprehensive statewide business association, representing more 1,600 businesses that employ more than 250,000 people across our state. OBI members are committed to protecting human health and the environment while supporting a vital economy in Oregon.

OBI represents many businesses that rely on reasonable rules providing for safe and cost-effective methods of disposing radioactive materials. OBI appreciates the opportunity to participate in the Radioactive Waste Materials Rulemaking and provide comments on the first two meetings held in October and December of last year.

Our comments are intended to provide constructive technical input to the rulemaking that support the Oregon Department of Energy's (ODOE) development of radioactive waste regulations to protect human health while also establishing clear, reasonable and implementable provisions for disposing naturally occurring radioactive materials (NORM). We are optimistic that these objectives can be achieved in a cost-effective manner for regulated entities.

As you are aware, OBI has engaged Risk Assessment Corporation (RAC), a consulting group with deep experience in radioactive materials and exposure, to represent member companies on the Rulemaking Advisory Committee. RAC and OBI have spent significant time developing technical comments (attached separately) that we encourage you to consider in the rulemaking effort.

Thank you for the opportunity to provide comments on the rulemaking as it moves forward. Please contact me should you have questions about our comments.

Sincerely,

Sharla Moffett

Sharla Moffett
Director
Energy, Environment, Natural Resources & Infrastructure

science › environment › community

February 4, 2022

Radioactive Waste Materials Rulemaking Advisory Committee

Technical Comments of Oregon Business & Industry re Rulemaking Advisory Committee Meetings 1 & 2: October 19, 2021 and December 20, 2021

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RAC
RISK ASSESSMENT
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Technical Comments

The following are technical comments of Oregon Business & Industry (OBI) prepared by Risk Assessment Corporation and provided to the Oregon Department of Energy's (ODOE) Energy Facility Siting Council Radioactive Waste Materials Rulemaking Advisory Committee.

Comment 1: Table 1 values and Exemptions in OAR 345-050-0030

OAR 345-050-0025 Table 1 defines concentrations of individual radionuclides that are exempt from the provisions of ORS 469.525 by the State of Oregon. This means that should a waste stream for disposal contain concentrations of listed radionuclides *less* than the values listed in Table 1, that material is not subject to the disposal prohibition set forth in ORS 469.525 for radioactive waste. If a waste stream for disposal contains concentrations of listed radionuclides *greater* than the values listed in Table 1, either the waste cannot be disposed in Oregon or, in certain circumstances, the waste may be eligible for a different exemption (such as the Specific Exemptions at OAR 345-050-0030 or through additional testing to prove that the waste is not radioactive under the Pathway Exemption process at OAR 345-050-0035).

Not all radionuclides common to potential waste streams are listed in Table 1. In particular, Footnote 1 to Table 1 states that the limit for uranium assumes equilibrium with its decay products. This has been interpreted as meaning that uranium decay products not explicitly listed in Table 1 have the same limit as uranium, which is 10 pCi per gram. Radium-226 (Ra-226) and thorium-232 (using radium-228) are limited to 5 pCi per gram and 20 pCi per gram, respectively, via the Specific Exemptions set forth at OAR 345-050-0030(2) and OAR 345-050-0030(4).

Lead-210 (Pb-210) has a 22.2-year half-life, far shorter than that of radium-226 (Ra-226, 1600 years) and uranium-238 (U-238, 4.5 billion years). Because of its relatively short half-life, the parent radionuclide, Ra-226, must be present for Pb-210 to be present over the long term. When the two are present at the same equilibrium concentration, the production of Pb-210 will continue at this concentration for thousands of years. However, in the event that Pb-210 is present at a higher concentration than Ra-226, the Pb-210 concentration will decrease at an exponential rate for roughly 200 years until equilibrium is re-established and it reaches the same concentration as Ra-226.

Pb-210 is a low energy beta-gamma emitter, and as such risks from external exposure are negligible. Further, Pb-210 has low leachability and is not particularly mobile in groundwater. It has been demonstrated by Argonne National Lab (ANL 2014), the Norwegian Radiation Protection Authority (NRPA 2010), and by the Pennsylvania Department of Environmental Protection (PA DEP 2016) that lead-210 is not a significant contributor to dose from TENORM-bearing materials. This conclusion is consistent with the U.S. Environmental Protection Agency (EPA) Preliminary Remediation Goal (PRG) tool[1]. The EPA's PRG is the average concentration of a radionuclide in an exposure area that will yield the specified target risk to an exposed individual. PRGs are commonly used at Superfund sites to determine clean-up levels. While remediation is not the goal of ODOE's radioactive waste materials rules, the PRGs do provide one basis for determining which radionuclides should be considered relevant in environmental exposure scenarios. Based on the PRG tool, EPA's lead-210 remediation goal for external exposure and inhalation is over 7,000 times higher than that for radium-226, because lead-210 has a much less significant contribution to

[1] https://rais.ornl.gov/cgi-bin/prg/PRG_search?select=rad

dose than does radium-226. This is consistent with the preliminary RESRAD results presented by ODOE in the December 20, 2021 meeting, which demonstrate that Pb-210 is of limited consequence to dose for the air and water pathways.

Given this, we recommend that Table 1 values for uranium decay products be expressly limited to natural uranium (U-238, U-234, and U-235); natural thorium (Th-228 and progeny to Ra-228, Th-232); and radium (Ra-226 and progeny, Ra-228) at concentrations to be discussed in more detail as the rulemaking progresses.

We also support expanding the Specific Exemptions provided at OAR 345-050-0030, e.g., for zircon sands and related products. A list of further suggested additions to the set of Specific Exemptions provided at -0030 may be provided for discussion as the rulemaking progresses.

Comment 2: 500 mrem per year dose limit

OAR 345-050-0036(1), which is used to determine compliance with OAR 345-050-0035 (the Pathway Exemption), requires that the disposed naturally occurring radioactive material (NORM) cannot result in a dose to individuals greater than 500 mrem per year. As stated in OAR 345-050-0036(1)(b), evaluations against the 500 mrem dose limit are completed by taking actual field gamma radiation surveys and comparing the results to the levels provided in OAR 345-050-0036(2). As outlined in OAR 345-050-0036(2), the limiting radiation survey result has been determined to be 18 μR per hr above background and is based on a survey at 1 foot from a standard 55-gallon drum or a box measuring 1.5 x 1 x 2 feet (H x W x L). The underlying assumptions specifically incorporated into OAR 345-050-0036(1)(b) that tie the survey results to the yearly dose limit include: (1) a person lives in a house above the waste; (2) that person spends 90 percent of their time in the house; and (3) the house is built on a homogeneous, semi-infinite slab of NORM with a two-foot crawl space and a two-inch wooden floor. The exposure to individuals inside the house is assumed to occur at a height of one meter above the wooden floor. Given these pessimistic assumptions, the 500 mrem per year dose limit is reasonable.

An alternative would be to reduce the gamma exposure limit to 100 mrem per year with updated exposure assumptions that are more consistent with reality. This could include allowances for the environmental and engineered factors applicable to landfills to be taken into account and applying the concept of a nearest resident rather than a home built on top of the waste. Further, we recommend expanding the geometries included in the regulations from the 55-gallon drum and the box described above to containers that are more representative of those actually used in the state, e.g., supersacks. This can be done by deriving correction factors using software such as MicroShield®[2].

Comment 3: Landfills vs. Land spreading

There has been some discussion of the differences between disposal in a landfill and land spreading. The two disposal methods are different in important ways, insofar as it relates to their relative exposure risks, and that difference should be clearly articulated and factored into ODOE's rules. Landfills are permitted, regulated, have environmental and engineered controls, and perform regular monitoring. Further, materials emplaced in a landfill are mixed and buried with other materials, and eventually covered by an engineered cover or native materials at closure. The depth

[2] https://radiationsoftware.com/microshield

at which exempt materials are disposed impacts the potential dose significantly. This is clearly demonstrated in ODOE's preliminary RESRAD results presented at the December 20, 2021 meeting. Keeping all parameters constant and simply increasing the disposal depth from 0 ft (at the surface) to 1 ft decreases the direct gamma dose by a factor of ~30. Increasing the disposal depth from 0 ft (at the surface) to 6 ft decreases the direct gamma dose to zero, and reduces the dose from radon inhalation by nearly a factor of three. Landfill disposal depths are generally greater than 6 ft, which would reduce exposures still further. Therefore, the proposed rules should make a clear distinction between landfill disposal and land spreading, meaning that each has its own set of underlying dose calculation assumptions (e.g., the presence of a house, occupancy factor, etc.) and applicable dose limits. Under the current rules, these disposal methods are lumped together, creating the false impression that the exposure risk is similar.

References

ANL (Argonne National Laboratory). 2014. Radiological Dose and Risk Assessment of Landfill Disposal of Technologically Enhanced Naturally Occurring Radioactive Materials (TENORM) in North Dakota. ANL/EVS-14/13.

NRPA (Norwegian Radiation Protection Authority). 2010. Radiological Impact of Shore-Based Disposal of Wastes from the Oil and Gas Industry. An assessment carried out for the Norwegian Radiation Protection Authority by GMS Abingdon Ltd and Eden Nuclear & Environment Ltd. 23 September.

PA DEP (Pennsylvania Department of Environmental Protection). 2016. TENORM Study Report, Rev. 1. May. Available at: https://www.dep.pa.gov/Business/Energy/OilandGasPrograms/OilandGasMgmt/Oil-and-Gas-Related-Topics/Pages/Radiation-Protection.aspx.

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