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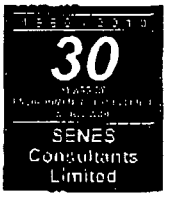

January 16, 2012

Cindy Bladey,
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Subject: Comments on the Draft Interim Staff Guidance: Evaluations of Uranium Recovery Facility Surveys of Radon and Radon Progeny in Air and Demonstrations of Compliance with 10 CFR 20.1301 Docket ID: [NRC-2011-0266 – (Federal Register / Volume 76, Number 224 / Monday, November 21, 2011 / Notices)

Dear Ms. Bladey:

We are pleased for the opportunity to submit the following comments on the subject draft interim NRC staff guidance.

General Comments In Regards to Organization and Content

The document could benefit from some reorganization. It could be beneficial to begin with a brief discussion of the physics of radon / radon progeny, followed by an explanation of the basis of the regulatory limits for exposure to radon / radon progeny and the associated regulatory framework. The explanation could include a discussion of the current state of the art of methods of measurement and assessment (modeling) and the problems inherent in measurement and assessment, particularly as related to an existing and highly variable ubiquitous background.

The document does provide a fairly comprehensive recognition of the factors which can affect and impact measurement and calculation of radon / progeny exposure conditions in the environment (effects of indoor vs. outdoor environments, equilibrium factors, meteorology, distance from source, etc). However, the document does not seem to adequately recognize the fundamental difficulty presented by NRC's requirement to demonstrate compliance via measurement of radon in the environment, which overrides the detail and effects of these other factors.

Given that:

(1) The 10 CFR 20, Appendix B concentration limit is 0.1 pCi/l (based on an annual exposure limit of 50 mrem)

(2) The highly variable nature of background and

(3) The limited sensitivity of state-of-the-art measurement methods at or near this annual average concentration limit

all suggesting that the ability to demonstrate compliance via "measurement" is quite problematic if not impossible.

Accordingly, it appears that compliance could, under these circumstances, only be demonstrated via "survey by calculation", i.e. using an appropriate computer code such as MILDOS – AREA (NUREG 1569, Appendix D) or another accepted air dispersion model (USEPA's AIRMOD dispersion model for example) combined with an equation to model the ingrowth of radon (progeny) decay products (which MILDOS does). Although NRC recognizes calculation as an acceptable method for demonstrating compliance to the limits of 10 CFR 20.1301, the requirement to validate via measurement may not be achievable given the current state of art of monitoring technology combined with relatively elevated background radon concentrations (compared to expected incremental radon levels) and the inherent variability in background radon levels.

Although it may be necessary and certainly would be of value to investigate methodologies and protocols to design and potentially implement such measurement programs, it is probably not practical, efficient nor appropriate that individual licensees should be required to do this as NRC suggests. Rather, we suggest that NRC should consider sponsoring such studies (i.e., to evaluate the feasibility of such measurements) given that NRC has established a fundamental exposure limit for which "survey via measurement" may not be achievable.

The remainder of this document provide detail in support of the above suggestions via the specific comments below:

Specific Comments:

1. Page 2, second bullet in box: It should be recognized here that NRC will consider for approval adjustment of 10 CFR 20, Appendix B, Table 2 values per 10 CFR 20.1302 and as discussed in Section 4.5 of this document. (e.g., relative to reasonable equilibrium factors since the 10 CFR 20, Appendix B value assumes 100% equilibrium).

2. Page 3 Flow Chart, Part 20 Appendix B approach: Recognizing that Section 4.7.2 allows adjustment of the Part 20, Appendix B values in consideration of equilibrium factors, a footnote should be added here to recognize this is acceptable if using this approach.

3. Page 7, Section 4, Item 4: Note that reference to 10 CFR 20.1101(b) is incorrect and should be 20.1101(d).

4. Page 8, Section 4, Item 5 – 40 CFR 190 public dose limits: It should be recognized and explained that these EPA public exposure limits are expressions of Dose Equivalent (DE) to the whole body and specific organs (ICRP 2, 1959) and cannot be directly compared to the public dose limits of 10 CFR 20.1301 which are Total Effective Dose Equivalents (ICRP 26 and ICRP 30, 1977 - 1982).

5. Page 8, Sections 4.1 and 4.2, Definition of "Surveys" in 20,1003: NRC recognizes here that the conduct of surveys as defined @ 10 CFR 20.1003 includes "measurements or calculations".

However:

- The fundamental 10 CFR 20. Appendix B annual average concentration limit is 0.1 pCi/l, based on an annual exposure limit of 50 mrem.
- NRC recognizes in Section 4.5.2 that the NCRP has stated a range of background out of doors to be 0.2 – 1.0 pCi/l and typical value indoors to be 1.2 pCi/l.
- The minimum detectable concentration (MDC) required by Regulatory Guide 4.14 is 0.2 pCi/l.
- NRC correctly explains in Section 4.2.5 that the sensitivity (MDC) of the current state-of-the-art for environmental radon measurement using passive alpha - track detectors is of concern for concentration levels at the 10 CFR 20, Appendix B value. In fact, existing track etch measurement technology has a minimum level of detection of about 0.3 pCi/l based upon a 90 day exposure. Additionally, as regularly indicated on typical vendor reports for environmental radon measurements using alpha - track detectors, 95 % confidence level uncertainty ranges of 0.05 – 0.1 pCi/l or wider are not unusual for exposure periods of about 90 days.

Accordingly, given the above limitations, it should be recognized that the ability to detect radon below or even at the 10 CFR 20, Appendix B average annual concentration via survey by "measurement" is problematic if not impossible at the current state of art. Of particular concern is the ability to separate the incremental radon from a facility from that due to background as NRC regulations only apply to incremental dose and not that due to total radon (and progeny). Accordingly, it appears that compliance under these circumstances can only be demonstrated via "survey by calculation", i.e. using an appropriate computer code such as MILDOS – AREA (NUREG 1569, Appendix D) or equivalent.

6. Section 4.2.1 – relationship between indoor and outdoor concentrations of radon due to licensed activities: NRC explains in this section that based on documented information in the professional literature, it is reasonable to assume that the indoor and outdoor concentration of radon due to license activities can be considered equivalent. For the typical resident receptor who spends the majority of time in the home, this is very helpful. However, since NRC recognizes in section 4.5.2 that the NCRP considers the average background concentration indoors in homes to be 1.2 pCi/l and in NRC explains in several sections that such average values can exhibit considerable diurnal and seasonal variability (e.g., Sections 4.5, first paragraph and Section 4.5.3.2), it is unclear by what methods the 10 CFR 20, Appendix B annual average concentration limit of 0.1 pCi/l can be measured within a variable background concentration ten times or more larger. (See also the discussion on sensitivity limitations of the current state-of-the-art measurement technology in comment 5 above)

7. Section 4.2.2 and 4.2.3 references use of a "graded approach" to ensure that the licensee has used measurements of radon to verify compliance. Some additional explanation of what is meant by a "graded approach" here would be helpful since it has been noted previously that the concentration limits of interest are typically, much less than background, even within the natural variation of background, and may be less than the MDC of existing measurement technology.

8. Section 4.2.5, general discussion of sensitivities of track-etch detectors: NRC appropriately recognizes and raises concerns about the ability of the state of art of radon measurement via track – etch detectors to "see" (adequate sensitivity, low enough MDC) the 10 CFR 20, Appendix B limit.

The NRC has indicated in this document that either measurement is to be used for demonstrating compliance or, if calculations are used, measurements must be performed for "verification" (e.g., table in section 4.2.3). As a result of the limitations of measurement as previously described in this section, NRC suggests, "licensees should evaluate improvements to monitoring techniques". Although it may provide considerable value to investigate opportunities for improvement of the physics associated with the state-of-the-art of radon monitoring techniques, it would be inappropriate and may be impractical to assign this responsibility to individual licensees.

Given the severe limitations placed on the ability to measure radon at levels below and within the variability of background relative to the concentration limits that NRC has established, it is suggested that NRC consider sponsoring such research and studies to assess if compliance to current 10 CFR 20 limits can in fact be demonstrated via measurement of radon in the environment and what, if any, practical improvements can be made in the physics of radon monitoring at these very low levels.

9. Section 4.2.4: NRC suggests that although Regulatory Guide 4.14 provides guidance on numbers and locations of preoperational monitoring locations, licensees may want to use more locations and longer monitoring periods to enhance ability to assess background. This is certainly true; however it must be recognized that for the operational need of the licensee to demonstrate compliance to the 10 CFR 20.1301 and Appendix B limits, additional locations are not

necessarily helpful by themselves. There are practical limits on exposure time relative to the need for the data within a reasonable period of time (e.g., quarterly which is the typical current approach for environmental track-etch exchange frequency – see fourth bullet in comment 5 above). Doubling the exposure time to 6 months may be a practical limit for assessment and reporting purposes (e.g., semi annual effluent monitoring reports per 10 CFR 40.65), but it is unlikely that this would enhance sensitivity of the track-etch detectors sufficiently given the reported 90 day MDC of 0.3 pCi/l with associated confidence level uncertainty ranges of 0.05 – 0.1 pCi/l or wider.

10. Section 4.3 – discussion on measurement locations for demonstrating compliance to 10 CFR 1301 limits: NRC has identified the potential conflict between the recommendations of Regulatory Guide 4.14 regards to use of "the site boundary" and circumstances in which members of the public may have access to controlled areas within that boundary at some uranium recovery (UR) facilities. It is suggested that the concept of "points of compliance" be introduced here such that the licensee has the responsibility to establish where are these locations, what public exposure scenarios are credible at these locations and therefore who are the members of the public that could receive the highest dose from licensed activities.

11. Section 4.3 – discussion on meteorological monitoring and representativeness for placement of radon detectors: The licensee should be provided the flexibility to demonstrate to NRC staff that the on-site meteorological data is consistent with long term conditions via comparison to data from other regional meteorological stations. This data can be used in lieu of more expansive radon monitoring networks and relatively complex meteorological modeling.

12. Section 4.3, bottom of page 13 – need to measure concentrations close to facilities to distinguish from backgrounds measured at a distance: It should be recognized that the public typically does not have access for extended periods next to UR facilities. However, such measurements may be necessary and appropriate for worker dose assessment.

13. Section 4.5 Radon Equilibrium Factor – a few comments are applicable:

We agree that the simplest approach would be to assume a 100% equilibrium factor; however, that would invariably overestimate the exposure due to radon as such a high factor is not achievable.

- We agree that the NCRP's values are reasonable default values for indoor equilibrium factors and suggest that a nominal equilibrium factor of 0.4 for indoor exposure is reasonable.

- The assumption of an outdoor equilibrium factor of 0.7 does not apply to mining or industrial sources but rather reflects the age of continental air. Rather, as suggested in Section 4.5.3.1, radon is initially released without progeny. Out of doors, radon decay products will grow in from "pure" radon released to the environment in accordance with

the Bateman equations and the "equilibrium fraction" will increase from zero close to the source increasing with travel time (often taken as distance from source/mean wind speed). Of course, the radon concentrations will decrease through natural air dispersion processes at the same time

Our comments are intended to be constructive and we hope are considered by the NRC's staff. We would be pleased to elaborate on our comments and to try to respond to any questions that NRC staff may have on our comments.

All of which are respectfully submitted

Sincerely,

Steven H Brown, CHP