

April 30, 2014

MEMORANDUM TO: Bill Von Till, Chief
Uranium Recovery Licensing Branch
Decommissioning and Uranium Recovery
Licensing Directorate
Division of Waste Management
and Environmental Protection
Office of Federal and State Materials
and Environmental Management Programs

FROM: Amy M. Snyder, Team Leader **/RA/**
Uranium Recovery Licensing Branch
Decommissioning and Uranium Recovery
Licensing Directorate
Division of Waste Management
and Environmental Protection
Office of Federal and State Materials
and Environmental Management Programs

PURPOSE: MEETING SUMMARY FOR MARCH 2, 2014, WORKSHOP ON
FSME-ISG-01, REVISED DRAFT REPORT FOR COMMENT- MARCH
2014, EVALUATIONS OF URANIUM RECOVERY FACILITY
SURVEYS OF RADON AND RADON PROGENY IN AIR AND
DEMONSTRATIONS OF COMPLIANCE WITH 10 CFR 20.1301

DISCUSSION:

On April 2, 2014, a category 3 public meeting was held between the U.S. Nuclear Regulatory Commission (NRC) staff and representatives of the National Mining Association (NMA) at the NRC Headquarters in Rockville, MD. For this meeting, public participation was actively sought to fully engage the public in a discussion of regulatory issues associated with public dose compliance at uranium recovery facilities. The purpose of the meeting was: 1) to review the revised draft Interim Staff Guidance (ISG), FSME-ISG-01, "Revised Draft Report for Comment - March 2014, Evaluations of Uranium Recovery Facility Surveys of Radon and Radon Progeny in Air and Demonstrations of Compliance with 10 CFR 20.1301," 2) to answer questions about the guidance; and 3) for NMA to present the challenges that industry is facing with regard to measuring radon that NMA believes may impact the final issuance of ISG. The meeting notice and agenda are provided as Enclosure 1, as well as through the Agencywide Documents Access and Management System (ADAMS) under Accession No. ML14091A405. This system provides text and image files of NRC's public documents. A list of attendees of this meeting is provided as Enclosure 2. This meeting was not transcribed.

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Ms. Katie Sweeney, representing NMA, gave opening remarks. She thanked the NRC for holding this workshop and expressed her appreciation for the opportunity to discuss this complex subject.

Mr. Larry Camper, NRC, gave the opening remarks for the NRC. Mr. Camper pointed out that in the executive summary of the March 2014 draft ISG that there is a statement about the staff's review of environmental monitoring reports. He said that it is important to note that the NRC believes that there is not a health and safety issue because these facilities were licensed based on calculations estimating the expected releases due to operations. In the past, the inspection staff primarily reviewed the required semiannual environmental and effluent monitoring reports. However, in the last few years, headquarters staff is also reviewing these reports. Regulations do not require licensees to submit to NRC their public dose compliance demonstrations. In some cases, licensees have elected to include their dose compliance demonstrations in their semiannual environmental and effluent monitoring reports. In some of these compliance demonstrations submitted as part of the semiannual environmental and effluent monitoring reports, staff is seeing inconsistencies and in these cases, NRC is issuing RAIs or is addressing the issue through reviewing the licensee's amendment requests that are related to radon and dose compliance issues.

In addition, Mr. Camper explained that NRC recognized that there was inadequate guidance on how to address radon and radon progeny for public dose compliance. Staff developed draft guidance (as ISG) for staff in this regard and issued the draft for public comment. Staff has recently revised the ISG (as a revised draft for public comment) taking into consideration public comments. He indicated the staff was holding this workshop on this guidance to review the changes made and answer questions from the public. Mr. Camper emphasized that the NRC is meeting its mission of protecting public health, safety, and the environment. The NRC is correctly applying requirements and properly characterizing the relevant issues.

Mr. Duane Schmidt, NRC, gave the first presentation which provide an overview of the March 2014 Draft ISG (Accession No. ML14091A459). He also summarized the key differences between the September 2011 draft ISG (Accession No. ML112720481) and the March 2014 draft ISG (Accession No. ML13310A198), which included many clarification changes based on public comments; revision of the flowchart; additional information on the option of using calculations to determine the radon concentrations to which people are exposed; and uncertainties.

Also, Mr. Schmidt noted that the regulations (10 CFR Part 20) changed in 1991 (effective January 1993), including a significant reduction to the Appendix B, Table 2, value for radon-222 in air with daughters present. The Statement of Considerations for the 1991 revision are clear on the need for uranium recovery licensees to account for radon progeny and acknowledged difficulties for the uranium mills specifically and discussed some flexibility inherent in the regulation. He noted that in staff evaluations of the most recent semiannual effluent monitoring reports submitted by licensees, it appears that in some cases licensees are still comparing radon in air concentrations to an incorrect Appendix B, Table 2, value which does not account for radon progeny dose. He also noted that this does not mean that doses exceed the limit, but that demonstration of compliance may be insufficient. He said that the March 2014 draft ISG was recently published in the *Federal Register* and the public comment period ends May 27, 2014. He explained that if anyone has comments on the March 2014 draft ISG, he/she should submit them in writing by the end of the comment period.

Next, Mr. Doug Chambers, Ph.D. of SENSES Consultants gave a presentation on long-term average radon levels (Accession No. ML14091A254). He did not discuss the ISG, but instead chose to present a short commentary on natural levels of ambient radon (Rn-222), as well as selected comments on the challenges of measuring small incremental (above background) levels of Rn-222. Dr. Chambers said that background levels of ambient Rn-222 are quite variable. He said that radon levels change diurnally and by the season. He also showed a graphic of how Rn-222 concentrations greatly vary with time in one day (slide 4 of his presentation). He described the variation in background levels of Rn-222 > 0.1 pCi/L at uranium recovery facilities. He noted that the detection level of track etch detectors > 0.1 pCi/L. He concluded that it is challenging, perhaps not possible, to measure such small increments with any precision. He suggests that industry and the NRC consider a combination of modelling (using MILDOS – a computer program for calculating environmental radiation doses from uranium recovery operations) with “appropriate” confirmation by measurement acknowledging that there are limitations and the use of statistical testing.

Ms. Kari Toews of Cameco Corporation gave a presentation (Accession No. ML14090A106) describing her experience with measuring and distinguishing naturally occurring radon in background from radon from a licensed uranium recovery in-situ facility. She informed everyone that the variability of background at a uranium recovery facility can be much greater than the values one is trying to measure. She said that the difficulty lies in the amount of incremental radon permitted to remain below dose limits. This value is small and as a result there is a small margin for error. Therefore she concluded that a high level of accuracy and certainty about measurements is needed under this circumstance. She believes that a system based solely on measurements is not practical. Ms. Toews suggests that a combination of measurements and modeling provides the best path forward. She suggested that models need to be verified to ensure reasonable and accurate results. She referred to her approach as “verified modeling.”

Oscar Paulson, Kennecott Uranium on behalf of NMA gave a presentation (Accession No. ML14090A109) on the analysis of data from co-located Landauer, Inc. Radtrak® detectors. He summarized data collected by two companies, Cotter Corporation (Canon City Mill) and Kennecott Uranium Company, to verify the airborne radon activity data collected using Landauer Radtrak® detectors. Both companies used Landauer Radtrak® detectors. Both companies included co-located detectors as part of their sampling protocols. Mr. Paulson commented that the variability of Cotter Corporation’s results for their co-located Radtrak® units that he presented was large. He said that the Cotter Corporation submitted this data to the Colorado Department of Public Health and Environment (CDPHE) as part of its required semiannual effluent compliance reporting. Mr. Paulson quoted the November 2013 CDPHE letter regarding CDPHE conclusions about the use of the data. Mr. Paulson then noted that the Kennecott Uranium Company also experienced similar problems with these detectors in the past and briefly explained the details of problems at the Kennecott Sweetwater site, including false positive results and large variability among co-located detectors.

Mr. Paulson, on behalf of the NMA, concluded that the Radtrak® detectors have at times provided false positives; co-located Radtrak® detectors have provided differing results and that such problems have existed for a period of over twenty years; the State of Colorado has stated that the data collected by the Radtrak® detectors “... are not quantitatively reliable and not acceptable for regulatory purposes” (quoting from Ms. Jennifer Opila’s November 20, 2013 letter); and that the Cotter Corporation and Landauer are working to resolve the problems with

these detectors. Mr. Paulson noted that the lower limit of detection (LLD) for Landauer Radtrak® detectors read to high sensitivity equates to three net tracks on the detector. Mr. Paulson compared this LLD to an effluent concentration limit for Radon-222 with daughters present of $1\text{E-}10$ microCurie/milliliter (at 100% equilibrium) or is 0.1 pCi/L representing a dose of 50 mrem/year. Mr. Paulson concluded that this value is only 0.04 pCi/L higher than the detector's LLD.

Next, Mark Salasky, Landauer® Global Technology, gave a presentation on the manufacture, calibration and detection limits of the Landauer Radtrak® radon detectors (Accession No. ML14091A298). Before he started his presentation, Mr. Salasky noted that regarding the co-located Cotter Canon Mill Radtrak® detectors that Mr. Paulson noted in his presentation, Landauer now believes that the issue was more than likely due to a leak in the bag used to seal the Radtrak® detectors before use. Mr. Salasky began his presentation describing how the Radtrak® detectors are manufactured. He then gave a general description of how they work, the quality control they undergo before being shipped for use, and their detection capability. He said that, in general, the measurement uncertainty with the Radtrak® detectors varies with the total number of tracks counted. The more tracks counted, the less measurement uncertainty will result. To illustrate, he noted that in using the Radtrak® detectors, a concentration of 0.1 pCi/L radon in air over 100 days is equal to $10 \text{ pCi-d/L} \pm 25\%$ and a concentration of 0.1 pCi/L of radon in air over 180 days is equal to $18 \text{ pCi-d/L} \pm 18\%$. Mr. Salasky then reviewed the ways in which one could “decrease the [lower limit of detection] LLD of average radon concentration.” He explained that one could reduce the background track density by use of “just in time” manufacturing (make and then in a short time deploy in the field) because one cannot turn off the detectors once they are made; increase the total radon concentration by increased exposure time (use 180 days instead of 90 days for example); and increase the calibration factor by switching to another detector (Rapidus radon monitor).

Dr. Robert Meyer, Keystone Scientific on behalf of AUC, LLC gave a presentation (Accession No. ML13338A253) that focused on how to solve problems related to the uranium facility radon decay product 100 mrem/year public dose limit. He said that the dose is quite difficult to measure for uranium recovery facilities and inaccuracies can lead to reporting an exceedance. He said that radon dose is a function of two key factors: the measured radon concentration in air and the equilibrium factor relative to air concentration of short-lived radon decay products. He continued his presentation by saying that it is complicated to measure radon in air because the concentration of Rn-222 decreases by dispersion with time as the gas moves away from the source and the required minimum detectable concentration can exceed Radtrak® detector limits unless changes are implemented. He also noted that the equilibrium factor increases with time, as radon decays to the radon progeny, the rate of increase is complex, and field measurement is not feasible at low concentration. Dr. Meyer suggests that to better measure Rn-222 in air, NMA, NRC, and Landauer, LLC should support a working group to study better measurements, whether more measurements are needed, whether longer measurements periods will achieve the objective of accurately measuring public dose, and whether pre-operational data to establish long-term (background) radon variability would be beneficial. Dr. Meyer also suggests that the use of site-specific meteorological data and MILDOS-AREA (or a new model) to calculate weighted equilibrium factors and all sources, at key locations on and near a site be used. Dr. Meyer would like NMA, NRC, and Landauer, Inc. to agree to jointly design and perform a field study to improve, then re-validate Radtrak monitoring and to agree on a method using MILDOS-AREA (or a newer model) to estimate weighted equilibrium fractions at key uranium facility locations.

Ms. Sarah Fields, Uranium Watch, gave a presentation on the March 2014 draft ISG (Accession No. ML14090A100). She thanked the NRC for developing the ISG and for providing responses to the comments on the 2011 draft ISG. She noted that the ISG will be beneficial to citizens in states with either NRC or Agreement State regulated uranium recovery operations. Ms. Fields commented that the Agreement State Programs also must comply with the public dose limits and that the Agreement States will likely rely on the NRC radon ISG. She emphasized that the NRC must consider Agreement State use of the ISG in Agreement State uranium recovery licensing decisions and should not exclude something in its ISG because it might only apply to uranium recovery operation in an Agreement State. Ms. Fields explained that the U.S. Environmental Protection Agency asked that the use of the term "radon" also include radon-220 (Rn-220 or thoron), a decay product of thorium-232. Ms. Fields said that the NRC should include radon-220 in its definition of "radon." She believes that if NRC does not consider Rn-220, Radon-220 emissions might not be included in dose assessments at uranium mills regulated under the Atomic Energy Act and subject to NRC and EPA standards. Finally, Ms. Fields said that documentation of licensee compliance (with public dose limits) should be submitted to the agency and made publicly available, so the public would be able to evaluate compliance determinations. She pointed out that this documentation should include the data and information that was used by the licensee to demonstrate compliance through the methods described in 10 CFR 20.1302. For example, she explained that the data and assumptions entered into the MILDOS-AREA computer code used to determine compliance via calculation should be clearly documented and available for public review.

James Webb, NRC, gave a presentation on the Revision of Regulatory Guide (RG) 4.14 (Revision 1), Radiological Effluent and Environmental Monitoring at Uranium Mills (Accession No. ML14091A445). Mr. Webb explained that Revision 1 of RG 4.14 was designed primarily for the conventional uranium mill and since it was first published there has been an introduction of new technologies, namely in-situ and heap leach uranium recovery. Furthermore, he explained that in-situ facilities do not normally have a single point source due to a central processing facility, multiple well fields and header houses, and in some cases satellite facilities. As a result, the NRC saw a need to update RG 4.14. Mr. Webb gave an overview of the changes made to the draft RG. He explained that in addition to including other types of uranium recovery facilities other than conventional mills, the draft RG now addresses the following topics: non-radiological contaminant monitoring for surface and groundwater; removal of radon flux monitoring as a recommendation for environmental monitoring; land use census for the identification of new or modified exposure pathways during the operational life cycle; consideration of the risk-informed decision-making process; and the incorporation of current regulatory practices and regulations. Mr. Webb informed everyone to expect to see the draft RG to be issued for public comment in the summer of 2014. He also noted that an updated version of MILDOS will be released soon. The new version of the code will include Rn-220 or thoron and there will be training classes for NRC staff at the NRC's technical training center in Chattanooga, TN.

Members of the public were present at the meeting via teleconference. Time was provided at the end of the meeting for public comment and questions for the staff. A summary of public comments and questions with responses are found in Enclosure 3.

Ms. Katie Sweeney gave closing remarks for NMA. She said that NMA and NRC do not always see eye to eye on things and NMA and NRC do not agree on a path forward. However, she

said that she thought this workshop was productive. She commented that NMA would be submitting written comments to the draft radon ISG in the near future.

Mr. Drew Persinko gave closing remarks for the NRC. He said there was stimulating discussion at the workshop, as well as lots of good information that was presented. He thanked everyone for their presentations. He said that he heard that NRC should consider a combination of measurements and calculations in public dose compliance demonstrations. He also noted that he heard many times that there is difficulty in measuring radon due to background variability and low levels being measured relative to background. Mr. Persinko summarized the recommendations that he heard as follows: Use a surrogate for radon in a proposed field study; continue the ongoing Cameco long term field measurements and statistical evaluation approach; develop a newer code than MILDOS; use weighted equilibrium factors; and address the public's desire for the use of plain language in its guidance documents. Mr. Persinko commented that the staff will meet internally to go over what was learned today. Mr. Persinko said that the NRC is still looking for suggestions regarding the use of measurements and calculations to demonstrate public dose compliance and reminded everyone that comments on the draft ISG are welcome. He noted that the Office of Research is working on updating the MILDOS computer code and to expect to see the update in the near future. He thanked everyone for their participation and for their ideas that made this workshop interesting and useful.

There were no action items as a result of this meeting.

Enclosures:

1. Agenda
2. Participant List
3. Summary of Comments/Questions and Answers

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Enclosures:

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3. Summary of Comments/Questions and Answers

DISTRIBUTION:

Meeting Attendees LHowell/RIV PMNS

ML14112A309

Office	DWMEP	DWMEP	DWMEP	DWMEP	DWMEP	DWMEP
Name	ASnyder	DSchmidt	SAchten	BVonTill	BWatson	ASnyder
Date	4/15/14	4/21/14	4-25-14	4/29/14	4/29/14	4/30/14

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REVISED MEETING AGENDA
PUBLIC MEETING ANNOUNCEMENT

Title: Workshop on FSME-ISG-01, REVISED DRAFT Report for Comment- March 2014, EVALUATIONS OF URANIUM RECOVERY FACILITY SURVEYS OF RADON AND RADON PROGENY IN AIR AND DEMONSTRATIONS OF COMPLIANCE WITH 10 CFR 20.1301

Date(s) and Time(s): April 02, 2014, 08:30 AM to 04:00 PM

Location: NRC Two White Flint North, T-2B1
11545 Rockville Pike
Rockville, MD

Category: This is a Category 3 meeting. Public participation is actively sought for this meeting to fully engage the public in a discussion of regulatory issues.

Purpose: To review the revised draft Interim Staff Guidance and to answer questions about the guidance

Contact: Amy Snyder
301-415-6822
Amy.Snyder@nrc.gov

Participants: NRC
Office of Federal and State Materials and
Environmental Management Program

Participants: External
National Mining Association

Comments: A teleconference bridge line will be available. Please contact the meeting contact no later than March 31, 2014. If any member of the public would like to present or speak at the workshop, please contact the meeting contact no later than March 31, 2014. Otherwise, the public will be afforded the opportunity to provide comments at specified times on the agenda. Information and presentations associated with this meeting can be found at <http://www.nrc.gov/materials/uranium-recovery/public-meetings/2014>

PUBLIC MEETING AGENDA
Workshop on FSME-ISG-01, REVISED DRAFT Report for Comment- March 2014,
EVALUATIONS OF URANIUM
RECOVERY FACILITY SURVEYS OF RADON AND RADON PROGENY IN AIR AND
DEMONSTRATIONS OF COMPLIANCE WITH 10 CFR 20.1301

April 02, 2014, 08:30 AM to 04:00 PM

NRC Two White Flint North, T-2B1
11545 Rockville Pike, Rockville, MD

8:30 a.m. – 8:45 a.m. –	Introductions, Opening Remarks, and Statement of Purpose
8:45 a.m. – 10:00 a.m. –	Overview of March 2014 FSME-ISG-01 Draft - Discussion and Questions Duane Schmidt, Senior Health Physicist, NRC (Accession No. ML14091A459)
10:00 a.m. – 10:15 a.m. –	Break
10:15 a.m. – 11:00 a.m. –	Implementation Issues- Industry Presentations-Doug Chambers, SENSES Consultants (Accession No. ML14091A254) - Kari Toews, Cameco Corporation (Accession No. ML14090A106)
11:00 a.m. – 11:30 a.m. –	Public Comments on the March 2014 FSME-ISG-01
11:30 a.m. – 12:30 p.m. –	Lunch Break
12:30 p.m. – 2:30 p.m. –	Implementation Issues- NMA Presentations and Discussions -Oscar Paulson, Kennecott Uranium on behalf of National Mining Association -Mark Salasky, Landauer Inc. (Accession No. ML14091A298) - Robert Meyer, Keystone Scientific on behalf of AUC, LLC (Accession No. ML13338A253)
2:30 p.m. – 2:45 p.m. –	Comments on the draft Interim Staff Guidance, FSME-ISG-01- Presentation and Discussion -Sarah Fields, Uranium Watch (Accession No. ML14090A100)
2:45 p.m. – 3:00 p.m. –	Break
3:00 p.m. – 3:15 p.m. –	Reg Guide 4.14, Environmental Monitoring Update (Accession No. ML14091A445)
3:15 p.m. – 3:45 p.m.–	Public Comments
3:45 p.m. – 4:00 p.m. –	Action Items, and Closing Remarks
4:00 p.m. –	Adjourn

The time of the meeting is local to the jurisdiction where the meeting is being held. The NRC provides reasonable accommodation to individuals with disabilities where appropriate. If reasonable accommodation is needed to participate in this meeting, or if a meeting notice, transcript, or other information from this meeting is needed in another format (e.g., Braille, large print), please notify the NRC meeting contact. Determinations on requests for reasonable accommodation will be made on a case-by-case basis.

ADAMS Accession Number: ML14085A092

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Link to meeting details: <http://meetings.nrc.gov/pmns/mtg?do=details&Code=20140559>

Participant List

Nuclear Regulatory Commission

Larry Camper, FSME
Andrew Persinko, FSME
Aby Mohseni, FSME
Bill Von Till, FSME
Bruce Watson, FSME
Amy Snyder, FSME
Duane Schmidt, FSME
Tracey Stokes, OGC
Ron Burrows, FSME
James Webb, FSME
Alan Bjornsen, FSME

Casper Sun, RES
Richard Chang, FSME
Lloyd Desotell,
Robert Evans, RIV
Linda Gersey, RIV
Don Lowman, FSME
Varughese Kurian, FSME
John Clements, FSME
Jack Parrott, FSME
Body Eid, FSME

National Mining Association

Katie Sweeney, National Mining Association, KSweeney@nma.org>
Anthony J. Thompson, Thompson & Pugsley, PLLC ajthompson@athompsonlaw.com>
Oscar Paulson, Kennecott Uranium Company, Oscar.paulson@riotinto.com

Members of the Public present at the meeting

Sarah Fields, Uranium Watch (via teleconference), sarah@uraniumwatch.org
Jan Johnson, Tetra Tech, janetj@sopris.net
Doug Chambers, Ph.D., SENES Consultants Ltd., dchambers@senes.ca
Steven Cohen, Senior Project Manager, SENES Consultants Ltd., scohen@senesusa.com
Steven Brown, SENES Consultants Ltd., sbrown@senesusa.com
Kari Toews, Cameco Corporation, Kari_Toews@cameco.com
Josh Leftwich, Cameco, josh_leftwich@cameco.com
Dr. H.R. Meyer, Keystone Scientific
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Phil Egidi, EPA, Egidi.Philip@epa.gov>
Mark Salasky, Landauer, msalasky@landauerinc.com

Members of the Public who asked for the call in number

Jennifer Thurston, Information Network for Responsible Mining, jennifer@informcolorado.org
Darrell Liles, SENES Consultants Ltd., dliles@senesusa.com
Jaime Massey, Energy Fuels Resources, JMasse@energyfuels.com
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Summary of Comments/Questions and Answers

Duane Schmidt's Presentation, NRC:

Oscar Paulson, Kennecott Corporation, asked if the unrestricted boundary is where background needs to be measured. Also, he asked how are licensees going to measure variable background then the regulations require us to measure 0.1 pCi/L radon. NRC staff said that licensees do not have to use an equilibrium factor of 1 and 10 CFR 20.1302 provides options for demonstrating compliance with the dose limit. 10 CFR 40.65 requires licensees to report quantities of radioactivity released to unrestricted areas in liquid and gaseous effluents and it also requires the licensee to report such other information as the Commission may require to estimate maximum potential annual radiation doses to the public resulting from effluent releases.

Mr. Steve Brown, SENES Consultants Ltd., commented that he believes that the NRC has recognized difficulties in measuring background as reflected in some of the related regulatory guides.

Mr. Steve Cohen, SENES Consultants Ltd., asked if approval of an equilibrium factor other than 1 means approval by amendment or some other means. NRC staff answered it depends on what is stated in each individual license.

Ms. Sarah Fields, Uranium Watch, asked for clarification of 40 CFR 190, the environmental protection agency's 25 mrem/yr dose limit and 10 mrem/yr limit in 10 CFR 20.1101. NRC staff said that the EPA dose limits do not include radon and that the 10 mrem/yr constraint in 10 CFR 20.1101 also does not include radon. NRC staff pointed out that the 10 mrem/yr value in 10 CFR 20.1101 is a constraint, beyond which actions must be taken, and is not a limit.

Dr. Doug Chambers' Presentation, SENES Consultants Ltd.:

Mr. Duane Schmidt, NRC, commented that because of flexibility in demonstrating compliance, the limiting concentration of radon is higher than the 0.1 pCi/L value that had been presented.

Mr. Robert Evans, NRC, asked Dr. Chambers' opinion regarding his preference regarding the use of background measurements obtained during operations versus those obtained during the preoperational baseline. Dr. Chambers said that establishing baseline background is important. However, he noted that there are factors such as geology and topography that are important in determining background and concluded that he would have several background stations established and operated in parallel with those located at measurements stations.

Mr. Larry Camper, NRC, asked Dr. Chambers about use of measurements versus calculations. Dr. Chambers indicated that there should be some measurements to validate calculations. Dr. Chambers also said he believes that measuring background is challenging and believes that some decision rule on statistical analysis needs to be discussed.

Ms. Kari Toews' Presentation, Cameco Corporation:

Dr. Meyer, AUC LLC, asked Ms. Toews to explain how environmental data could be used to validate the data when earlier in her presentation she said that the environmental data has a lot of uncertainty associated with it and was unreliable. Ms. Toews said that she believes measurement of radon alone is not a solution. She explained that she believes that

measurement as well as modeling is needed. She said that looking at one year of data shows a lot of uncertainty and if data with large uncertainty is used, she believes will create “distrust and confusion.” She said that to gain certainty a large number of samples would be needed and this in her view, is not practical. She suggests that licensees try to measure at the source and model out to the receptor locations or vice versa. However, she stated the model needs to be validated with environmental measurements.

Mr. Camper, NRC, asked her a similar question regarding the use of environmental data. The NRC commented that in the beginning of her presentation she indicated that environmental measurement was unreliable, but yet at the end of her presentation she suggests to use environmental data to validate modeling. Ms. Toews explained that she does not believe that a single data point should be used for compliance purposes, rather that the data set collected over a period of more than one year should be statistically evaluated and then used to validate the modeling.

Mr. Schmidt, NRC, asked over what period of time Ms. Toews was referring to regarding statistically evaluating data. Ms. Toews responded that radon data over several years appears to be pretty stable.

Mr. Eid, NRC, asked how Ms. Toews is addressing indoor radon. Ms. Toews stated she would use the appropriate assumptions and input parameters in MILDOS and then determine the concentration that would provide a dose for occupational exposure.

Dr. Meyer commented that instead of relying only on measurements, perhaps a use of a surrogate could be used that behaves like radon could be used to validate radon modeling.

Oscar Paulson’s Presentation, Kennecott Uranium on behalf of NMA:

Mr. Webb, NRC, asked what the net tracks in the plastic media of the Radtrak® detectors represent before they are deployed. Mr. Paulson deferred the question to Mr. Mark Salasky of Landauer Global Technology. Mr. Salasky said that they are artifacts in the plastic itself or laboratory background.

Jennifer Thurston, Information Network for Responsible Mining, commented that in her view, Mr. Paulson took the State of Colorado letter out of context.

Mark Salasky’s Presentation, Landauer® Global Technologies:

Mr. Salasky was asked to clarify what type of background he was discussing in his presentation. He responded that the background that he was referring to is laboratory background.

Staff from Region IV asked what the Radtrak® detectors measures. Mr. Salasky said that only radon gas enters the detector, not the progeny.

Mike Schierman, CHP, Environmental Restoration Group, Inc., asked in general what range of the level of radon did Landauer expose the detectors to for calibration. Mr. Salasky said that the detectors were exposed to between 40-10,000 pCi-d/L.

NRC staff asked Mr. Salasky if he had a preference for grab or integrated sampling. Mr. Salasky said that there are benefits in both methods and it depends on one’s objectives.

Ms. Jan Johnson, Tetra Tech, commented that co-locating detectors from RSSI [a different manufacturer] with Radtrak® detectors may be a good practice to use in the field. She stated that she instituted using them after she determined that a leaky bag was the cause of elevated results.

One NRC staff member, Mr. Casper Sun, commented that he visited the Landauer facility and observed its manufacturing and counting operations. He suggested that others visit if they can.

Ms. Toews, Cameco Corporation, commented that the uncertainty in the instrument is much less than the uncertainty/variability in the environment. She said that she examined her data and she is seeing variability at individual sampling locations and she suggests that the use of long term data and statistics is a solution to the problem of accurately determining radon concentrations at uranium recovery sites.

When asked if the Landauer Radtrak® detector could measure concentrations much lower than 0.1 pCi/L, Mr. Salasky stated he believes that counting 3-4 tracks is about the limit of this detector.

Dr. Robert Meyer's Presentation, Keystone Scientific on behalf of AUC, LLC

Mr. Jim Webb, NRC, asked Dr. Meyer to elaborate on his proposed field study. Dr. Meyer described a study that would include measuring effluents at the source and also using MILDOS modeling with the results of a surrogate material that mimics radon.

Mr. Richard Blubaugh, Powertech (USA) Inc., asked if Dr. Meyer considered using RapiDOS monitors in his study design. Dr. Meyer said that is an option.

Ms. Toews, Cameco Corporation, commented that Cameco is measuring radon progeny using long-term instrument measurements and hopes to decouple the progeny from facility sources and the background progeny.

Mr. Bobby Eid, NRC, commented that perhaps International Atomic Energy Agency safety standards could be considered in such a study.

Ms. Sarah Fields of Uranium Watch commented that Rn-220 (thoron) should also be addressed in such a proposed study.

Mr. Duane Schmidt, NRC, commented that the proposed study should consider the different types of uranium facilities as opposed to in-situ uranium recovery facilities only.

Sarah Fields' Presentation, Uranium Watch:

NRC staff clarified some points regarding whether Rn-220 (thoron) is being addressed in its ISG and evaluations. Staff acknowledged that the current draft of the ISG does not specifically address thoron. Staff said that the regulations apply to all radionuclides released from licensed sites, so thoron is addressed by the regulations, if it is a source term.

Ms. Fields asked if NRC takes into consideration thoron. The staff said that the new MILDOS code now takes into account thoron and that licensees with thoron would have to account for it in their dose compliance, as applicable.

James Webb's Presentation, NRC:

General questions were asked about the timing of when the draft regulatory guide (4.14) would be available. Mr. Webb said to expect this guidance later this summer as a draft.

General Comments before the close of the meeting:

Mr. Phil Egidi, EPA, made the following comments: In his view, the use of operational background should be used over baseline (preoperational background) to ensure that you are accounting for any changes in operations.

He was glad to see that MILDOS is being updated and also mentioned the possible applicability of the AERMOD code. He suggested that the locations of the radon monitors could be placed in the breathing zone as opposed to waist level to be more representative of exposure. He stated that he believes that Rn-220 is an issue in some cases and the regulations could be changed to clearly define requirements for Rn-220. He stated that licensees may need to use more statistics and that a guidance document on how to evaluate radon data may be useful.

Mr. Ron Burrows, NRC, commented that staff is using its current guidance to evaluate applications. Further, he said that the use of modeling only as the primary means of compliance would be contrary to the Commission's current guidance. Also, he noted that there are reporting requirements per 10 CFR 40.65 that would not be met by using MILDOS with no accompanying monitoring. In addition, he said that licensees are required to have an operational monitoring program per Criterion 7 of Appendix A of 10 CFR 40.

Ms. Sarah Fields, Uranium Watch, asked that the draft and final rules for the 1991 Part 20 update rule be made publicly available. NRC staff said that they would provide the references to Ms. Fields. [NRC staff did not answer at the meeting, but now provides the following references to the statements of consideration (SOC) and rule language: (1) NRC published the proposed revision of the 10 CFR Part 20 rule in the *Federal Register* on January 9, 1986 (51 FR 1092). (2) NRC published the final revision to the 10 CFR Part 20 rule in the *Federal Register* on May 21, 1991 (56 FR 23360).]