

**Summary of NRC Staff Responses to Comments on
March 2014 Revised Draft Interim Staff Guidance FSME-ISG-01 (Now DUWP-ISG-01)**

NRC/NMSS/DUWP, May 2018

In March 2014, U.S. Nuclear Regulatory Commission (NRC) staff issued FSME Interim Staff Guidance FSME-ISG-01: *Evaluations of Uranium Recovery Facility Surveys of Radon and Radon Progeny in Air and Demonstrations of Compliance with 10 CFR 20.1301* as a revised draft report for public comment. Comments were received from seven commenters, as summarized in Table 1.

Table 1. Summary of commenters and reference accession number for comments.			
Commenter		Date	ADAMS Accession Number
1	Edgar Ethington, Colorado Department of Public Health and Environment	05/12/2014	ML14148A216
2	Steven Brown, SENES Consultants	05/27/2014	ML14149A363
3	Oscar Paulson, Kennecott Uranium	05/27/2014	ML14149A364
4	Josh Leftwich, Cameco	05/27/2014	ML14149A322
5	Jonathan Downing, Wyoming Mining Association	05/27/2014	ML14160A004
6	Sarah Fields, Uranium Watch, and Jennifer Thurston, Information Network for Responsible Mining	05/27/2014	ML14157A321
7	Daniel Shrum, EnergySolutions	05/27/2014	ML14169A263

Table 2 provides a summary of the comments received and a summary of NRC staff responses to the comments in preparing the final Interim Staff Guidance (ISG), in ADAMS under Accession No.ML15051A002. Because of a reorganization within the NRC in October 2014, the ISG is renumbered as DUWP-ISG-01.

Notes:

- a. Comments are numbered here by NRC staff for convenience using a format of x-y, where x refers to the commenter as given in Table 1; individual comment numbering (the y) is not necessarily consistent with numbering in the actual comment submittal.
- b. Comments that agree with portions of the ISG are not included here, because no changes were made to the ISG document.
- c. Comments that are similar to those received on the previous draft may not be included or addressed here (see previous response to comments, at ML13310A197).

Table 2. Summary of public comments and NRC staff responses to comments		
Commenter -comment #	Comment summary	Resolution of comment
1-1	Re. § 4.3, suggests using the term “baseline” instead of “background,” because “baseline” will account for unlicensed sources of radon not on the facility. Also suggests that seasonality should be considered in evaluating background variability on a quarterly basis.	The term “background” is used for consistency with wording in 10 CFR 20.1301, which excludes dose from background radiation from the dose compared to the public dose limit. NRC staff acknowledges that unlicensed material not on the facility and not under control of the licensee would generally not need to be accounted for in complying with 20.1301 (so such material is essentially considered part of background). However, certain unlicensed material that is under control of the licensee and related to licensed operations may need to be accounted for in complying with 20.1301 (such materials would not be considered part of background). NRC staff has added wording to Section 4.3 to clarify this. See also response to Comment 2-specific-5.

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Commenter -comment #	Comment summary	Resolution of comment
1-2	Re. § 4.5, paragraph 7, disagrees with statement that “NRC staff also considers it inappropriate to represent background concentration by the average plus some multiple of the standard deviation.”	<p>The revised draft ISG did not include the complete recommendation of NRC Health Physics Position 223 (HPPOS-223). In addition to the part that is described in the ISG, HPPOS-223 further states “Conversely, only the measured value (and not the measured values less its uncertainty) need be greater than the value of the limit to demonstrate non-compliance with the limit. To the NRC staff, representing the background concentration by the average plus a multiple of the standard deviation is essentially an attempt to account for uncertainty, but this approach in effect considers the net concentration to be a mean minus an estimate of the uncertainty. Thus, this method is inconsistent with the recommendation in HPPOS-223. In addition, properly determining the uncertainty is more involved than using the standard deviation of the measurements (the typical measurements are less than one year, so the standard deviation captures true temporal variability in addition to measurement uncertainty). NRC staff notes that the same section of the ISG provides an alternative which is to perform statistical comparisons of measured concentrations at background locations and concentrations at other (e.g., receptor) locations.</p> <p>NRC staff has modified the wording in §4.5 regarding the HPPOS-223 recommendation to more completely describe and clarify recommendations based on HPPOS-223.</p>
1-3	Re. §4.9.1, suggests an equilibrium factor of 0.5 is a more realistic value for calculations.	The subject section of the ISG discussed a conservative value of equilibrium factor. As stated, a value of 1.0 is conservative. A discussion on using other values is provided in other sections of the ISG. No changes made.

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1-4	Re. §4.9.1 (NRC staff believes the comment intended to refer to §4.5), paragraph 5, the commenter stated that replicate samples are used to determine experimental precision and questioned whether replicates are useful if there is no increase in measurement reliability.	NRC staff considers that multiple detectors can be used as a method to improve sensitivity (reduce uncertainty) versus measurements using a single detector. Thus, staff considers the referenced discussion to be appropriate. It is up to licensees to determine if this method is useful for their specific conditions. NRC staff changed the subject paragraph slightly, deleting reference to improving the MDC.
1-5	Re. §4.9.1 (NRC staff believes the comment intended to refer to §4.5), suggested that seasonality should be considered when comparing measurements from multiple locations.	NRC staff agrees that potential temporal variability should be considered; the last paragraph of §4.5 briefly mentions this. Staff has added additional wording to provide additional clarification.
1-6	Re. §4.9.1 (NRC staff believes the comment intended to refer to §4.5), asks that NRC staff make it clearer that the comparisons between sample points being discussed is apparent difference between background measurement points. Also suggests that more than one year of data may be needed for a good characterization and that comparison between background and compliance points should not be between different years.	(Assuming NRC staff is correct that the comment intended to refer to §4.5) the discussion of comparisons in §4.5 is applicable to comparisons among multiple background measurement locations and to comparisons between background locations and other (e.g., potential receptor) locations. NRC staff has clarified wording on this point. The ISG already addresses the other suggestions.
2-general-1	States that the guidance appears to state that field measurements must be made to validate any calculations that have been used and is the fundamental method to demonstrate compliance with the public dose limit of 10 CFR 20.1301.	The guidance indicates that if calculations are used, measurements <i>should</i> be made to confirm the calculation results. As noted in Section 1 of the ISG, other methods and approaches may be acceptable if they include a basis for concluding, with reasonable assurance, that licensee operations are in compliance with NRC regulations. No changes made.

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2-general-2	Comment indicates that the guidance is not clear as to whether historical references would be acceptable to NRC staff to demonstrate compliance in the absence of site-specific measurements of progeny equilibrium at numerous locations of interest (points of compliance).	The ISG provides guidance on acceptable values of the radon progeny equilibrium factor that can be used in certain conditions. These include generally acceptable values that do not require site-specific measurements. No changes made.
2-general-3	Comment indicates that the guidance is unclear regarding whether or not a licensee can demonstrate compliance without definitive measurements at the low levels of environmental radon in air.	NRC staff believes that most licensees should be able to demonstrate compliance following the guidance in the ISG. See also response to comment 2-general-1 regarding other methods and approaches. No changes made.
2-general-4	Regarding the issue of “by measurement vs. calculation,” comments describes three documents (one regulation and two NUREG reports) and suggests they should be acknowledged in the ISG. Comment appears to favor use of calculations for compliance with 10 CFR 20.1301.	See response to 2-general-1. Because measurements can be made to confirm calculations, the ISG recommends such, particularly in Sections 4.1 and 4.2 of the ISG.
2-general-4, part 1	10 CFR 20.1302(b)(1). Comment states that the regulation states that calculational methods, without verification by measurement, can be used to demonstrate compliance with the public dose limit of 20.1301.	NRC staff agrees that 20.1302(b)(1) includes use of calculations. NRC staff also acknowledges, as stated in Section 4.1 of the ISG, that 20.1302(a) requires licensees to make surveys of effluents, and such surveys can include measurements or calculations. However, Section 4.2 of the ISG explains the NRC staff practice of recommending measurements as the basis for demonstrations of compliance with 20.1301, which is based on existing NRC guidance. No changes made.

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2-general-4, part 2	NUREG-1556, <i>Consolidated Guidance about Materials Licenses: Program-Specific Guidance About Licenses of Broad Scope</i> , Vol. 11, Appendix Q. Comment states that this document provides detailed guidance for acceptable methods to demonstrate compliance with the public dose limit via both measurement and by calculation.	NRC staff notes that NUREG-1556, Vol. 11, is applicable specifically to licenses authorizing possession and use of a wide range of byproduct radioactive materials, so it is not directly applicable to uranium recovery (UR) licensees. Based on these considerations, NRC staff does not recommend the use of NUREG-1556, Vol. 11, for UR facilities. No changes made.
2-general-4, part 3	NUREG-1501, <i>Background as a Residual Radioactivity Criterion for Decommissioning: Appendix A to the Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for Decommissioning of NRC-Licensed Nuclear Facilities</i> . Comment notes that the document recognizes that in some circumstances the ability to “measure” [sic] very low levels of residual contamination is not technically feasible and calculational methods must be used.	NRC staff notes that NUREG-1501 discusses the possible use of background as a criterion for radiological criteria for decommissioning of sites. The discussions in the report are related to criteria for residual radioactivity remaining in or on real property (i.e., lands or buildings). NRC staff does not consider NUREG-1501 relevant for guidance on determining dose to members of the public from radon and radon progeny in air from UR facility releases. No changes made.
2-general-5	Comment summarizes difficulties associated with demonstrations of compliance by measurement of radon in air in unrestricted areas relative to the 10 CFR 20, Appendix B, Table 2 value of 0.1 pCi/L for radon-222 with daughters present. Comment provides details as follows.	NRC staff notes that the comment appears to indicate that the Part 20, Appendix B, Table 2, value of 0.1 pCi/L is a limit. This is incorrect; the Appendix B value may be used for compliance demonstration for certain situations, but licensees may also calculate dose to show compliance with the public dose limit, which is 100 mrem/yr from all sources from the licensed operations. The ISG provides guidance on methods of compliance and clearly indicates that comparison to the Appendix B value is one method but there are others. No changes made.

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2-general-5, part 1	<p>Comment describes difficulty in measurement of 0.1 pCi/L (radon-222 in air) with the variable natural background. Comment discusses a presentation made by Dr. Douglas Chambers at the NRC's radon workshop April 2, 2014. Included list of some summary and observations from the presentation.</p>	<p>NRC staff notes that this comment is similar to one submitted on the first draft of the ISG. See previous response to comment 5-general-2 at ML13310A197. Staff notes also that other presentations at the April 2014 radon workshop provided suggestions for improving measurements of radon in air with alpha-track detectors. Staff has added mention of these suggestions to Section 4.5 of the ISG.</p> <p>Staff does note that one conclusion stated (in the comment, based on the presentation) is to consider a combination of modelling with appropriate confirmation by measurement, but also notes that limitations and use of statistical tests must be acknowledged. NRC staff agrees in general with the suggestion to combine modelling with appropriate confirmation by measurements. Sections 4.2.2 and 4.2.3 of the ISG recommend that measurements be used to validate modelling (calculated) results. NRC staff also added a paragraph to §4.7 of the ISG that briefly describes one example where use of measurements combined with modelling may be appropriate.</p>

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2-general-5, part 2	Regarding §4.9.3.1, comment states that the ISG “appears to dismiss the acceptability of” calculation of an outdoor equilibrium factor based on ingrowth for the travel time. Also suggests that average annual wind speed is appropriate for use in calculating an equilibrium factor by travel time.	The ISG specifically describes the approach of calculating an outdoor equilibrium factor based on ingrowth and the travel time to a receptor location. So NRC staff has not dismissed acceptability of the method, but rather has found it acceptable. Also, as the comment indicated, the ISG did state that “use of an average wind speed may not provide a reasonable basis for an estimate of travel time and determination of average equilibrium factor.” The basis in the ISG is that the equilibrium factor is not a linear function of (i.e., directly proportional to) wind speed. NRC staff reviewed attachment B to the comment letter, but the attachment did not provide a technical basis for concluding that the use of average wind speed was appropriate. Staff has clarified the discussion in §4.9.3.1, including adding mention of using the MILDOS code to calculate equilibrium factor based on measured wind speeds.
2-general-5, part 3	Comment relates to precision and accuracy of measurements of radon in air using alpha-track detectors at relatively low, environmental levels of radon. Suggests the subject, including potential improvements to be made, is addressed in a presentation made by Dr. Mark Salasky at the NRC’s radon workshop April 2, 2014.	NRC staff agrees with the suggestion that the presentation at the radon workshop in April 2014 provides suggestions for improving the accuracy and precision of radon in air measurements using alpha-track detectors. NRC staff has added discussion of these suggestions and others from the workshop and related discussions to §4.5 of the ISG.
2-specific-1	Re. §3, flowchart, indicates that a default equilibrium factor is inconsistent with comparison of concentrations to the Part 20, Appendix B, Table 2, value of 0.1 pCi/L, which is based on equilibrium factor of 1.	NRC staff agrees that the wording was inconsistent. The flowchart has been revised to indicate the default equilibrium factor value is considered 1.0, but licensees may use lower values, which would include the generically acceptable value of 0.5.

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2-specific-2	Re. §4.1, suggests that the ISG should state that calculations are an acceptable method for demonstrating compliance with the public dose limit of 10 CFR 20.1301.	See responses to Comments 2-general-1 and 2-general-4.
2-specific-3	Re. §4.2, states that NUREG-0859 provides procedures for compliance with the U.S. Environmental Protection Agency's (EPA) regulation at 40 CFR 190 [which includes a dose criterion for fuel cycle facilities], which excludes radon and radon progeny. Thus, comment concludes NUREG-0859 is not relevant to the radon ISG, since it is not applicable to measurement of radon or its progeny in the environment.	Section 4.2 of the ISG explains the NRC staff view that NUREG-0859 is relevant. As stated there: ...However, RG 3.59 refers to NUREG 0859 for guidance on compliance with radiation protection standards; radiation protection standards include 10 CFR 20.1301 and 20.1302. Thus, NRC staff has determined that the general concepts in NUREG 0859 are applicable to compliance with 10 CFR 20.1301 and 20.1302. ... No changes made.
2-specific-4	Re. §4.2.2, comments that the suggestion of the need for measurement of operational process parameters to calculate radon releases can be quite challenging.	NRC staff notes that §4.2.2 does not indicate a <i>need</i> to measure operational process parameters. The section discusses one option that <i>may be used</i> by licensees. In the ISG, NRC staff has not added the references suggested.
2-specific-5	Re. §4.3, suggests that the limitation to licensed operations in 10 CFR 20.1301 is restrictive and only applies to doses from licensed operations. Subject line of comment uses term "unlicensed material."	NRC staff agrees that the dose limit in 10 CFR 20.1301 applies to dose from <i>licensed operations</i> . However, the discussion in §4.3 of the ISG addresses <i>unlicensed material</i> . And it is possible that unlicensed material could be involved in licensed operations. This is discussed in the Commission Memorandum and Order CLI-06-14, and is the reason the ISG suggests such situations be evaluated on a case-by-case basis. From the comment, it appears this might not have been clear, so NRC staff has clarified the relevant paragraph in §4.3 of the ISG.

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2-specific-6	Re. §4.3, suggests that, based on statements in NUREG-1501, calculations are necessary in some cases to demonstrate compliance with the public dose limit.	See response to Comment 2-general-4. No changes made.
2-specific-7	Re. §4.5, suggests that the uncertainty being discussed by the Health Physics Position HPPOS-223 is not relevant to the temporal variability of radon concentrations. Suggests that the distinction (between measurement uncertainty and temporal variability) be clarified in the guidance.	NRC staff agrees that the HPPOS-223 discussion relates to uncertainty, which is distinct from temporal variability. NRC staff has added some wording in §4.5 to clarify that measurement uncertainty is distinct from variability. (Other changes were made to the same discussion based on Comment 1-2.)
2-specific-8	Re. §4.6, comment notes that NRC Regulatory Guide (RG) 8.30 provides methods for determining the lower limit of detection (LLD) for measurements of radon progeny concentration in air with the modified Kusnetz method. Suggests that the information be included in the ISG.	The ISG notes that the Kusnetz method and similar methods typically are used for occupational exposure measurements, where the necessary LLD is higher than for environmental measurements. The ISG then recommends that NRC staff evaluate the sensitivity of licensee measurements using these methods. Because RG 8.30 is for occupational exposures, the discussion in it regarding use of the Kusnetz and similar methods is not directed towards environmental measurements. No changes made.

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2-specific-9	Re. §4.6 (but appears directed as a general comment), comment notes that the MILDOS code calculates progeny concentrations and uses it to estimate dose. The comment further states that the general implication in other parts of the guidance document [ISG] that licensees have been ignoring public dose contributions from radon progeny does not appear to be correct.	In §4.11.1 of the ISG, NRC staff indicates that there appears to have been confusion in the past about which of the two effluent concentration values in 10 CFR Part 20, Appendix B, Table 2, for radon-222 was appropriate for use at UR facilities. This statement was based on NRC staff evaluating semi-annual effluent monitoring reports from the NRC-licensed UR facilities and finding that many of the evaluations of compliance with the public dose limit of 10 CFR 20.1301 used the inappropriate Appendix B value that did not account for any dose from the radon progeny. In general, MILDOS has been used in the past as a licensing tool, not for demonstrations of compliance with 20.1301. No changes made.
2-specific-10	Re. §4.9.2, suggests that the upper range of National Council of Radiation Protection and Measurements (NCRP) recommended equilibrium factor, 0.7, could be used as a default in the absence of site-specific information.	Based on the specifics of the comment, NRC staff presumes this refers to the discussion in §4.9.2 for outdoor exposures. The ISG essentially provides what the comment suggests. In the ISG, NRC staff considers the value of 0.7 equilibrium factor for outdoor exposures to be a generally acceptable value. Staff does not call it a default (the default is still considered to be 1.0), but it would be generally acceptable for use at any site without site-specific information. Staff notes that the table in §4.9.4 summarizes the acceptable values and methods for determining equilibrium factor. No changes made.
2-specific-11	Re §4.13, comment notes that, in the example, the suggestion that radon progeny measurements be made each time the vendor visits the site is not practical or reasonable. Suggests a few representative locations relevant for typical vendor visits could be modeled or measured.	Staff agrees that measurements each time the vendor visits may not be practical and necessary. However, staff does not agree with the suggestion for modeling, since this section of the ISG specifically addresses compliance by measurement. NRC staff has modified wording in the example to suggest that measurements would be representative or conservative.

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3-1	Suggests that the document should be reorganized, in particular to discuss issues regarding minimum detectable concentration (MDC), precision and accuracy of alpha-track measurement devices, and variability of background early in the document and before Section 3.	The present organization of the ISG includes the technical review discussions all in Section 4 of the document. NRC staff considers the present structure of the document adequate. No changes made.
3-2	Includes multiple comments related to MDC for measuring radon in air with alpha-track detectors:	
3-2, part 1	Comment indicates that the number of tracks counted on the alpha-track detector chip is a small number of tracks at a concentration of 0.1 pCi/L, equal to the Part 20, Appendix B, Table 2, value for radon with daughters present. Comment states that in some cases the sum of the lower limit of detection (LLD) (or MDC) and the error estimate may exceed the "effluent limit in 10 CFR part 20 Appendix B Table 2."	NRC staff notes that it is up to licensees to make surveys, including measurements when appropriate, with sufficient quality that can be used to provide reasonable demonstrations of compliance. NRC staff acknowledges that the MDC may be relatively high compared to the effluent concentration value in Part 20, Appendix B, Table 2. However, staff notes that the Appendix B values are not limits; the limit is the public dose limit of 10 CFR 20.1301. Licensees have flexibility in methods used to show compliance, as is described in the ISG. No changes made.
3-2, part 2	Suggests that NRC staff should evaluate the MDC for Radtrak detectors from Landauer, Inc. and for detectors from a competitor, RSSI. Suggests alternatively that a cooperative effort involving detector manufacturers, the NRC, and licensees should be initiated to evaluate detector performance.	NRC staff considers it the responsibility of licensees to evaluate potential vendor products and to ensure that performance of the vendor products is adequate. At this time, NRC staff has not decided to pursue a cooperative effort to evaluate detector performance. No changes made.
3-2, part 3	States that the MDC recommended in RG 4.14 is dated and notes that RG 4.14 is under revision by staff.	NRC staff acknowledges that RG 4.14 is currently under revision by staff. However, until the RG is revised, staff continues to refer to and use the current version of RG 4.14. No changes made.

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Commenter -comment #	Comment summary	Resolution of comment
3-2, part 4	Supports the use of “just in time” manufacturing of radon detectors to improve detector performance, as discussed in a presentation by Mark Salasky at the April 2, 2014, NRC workshop.	Comment is similar to Comment 2-general-5, part 3. See response to that comment; NRC staff has referenced the presentation and other presentations at the April 2014 workshop for suggestions to improve detector performance.
3-3	Includes multiple comments related to precision and accuracy of Landauer Radtrak detectors (alpha-track detectors) for measuring radon in air.	
3-3, part 1	Comment provided data from Cotter Corporation, Canon City facility, and described that in some cases, the discrepancies in results for pairs of detectors at the same location are beyond normal measurement uncertainties and averaging of the results would not be beneficial.	As discussed in response to Comment 3-2, it is the licensee’s responsibility to ensure its measurements are performed with sufficient quality. NRC staff agrees that if individual measurements are of poor quality it is generally not beneficial to average results. The individual measurements need to be reasonable. No changes made.
3-3, part 2	Cites a letter from the State of Colorado dated November 20, 2013 (letter was attached to comment), that stated, in part, “The analytical results for duplicate samples in the above-cited radon data sets are outside acceptable repeatability values.” Suggests that conclusions of the State of Colorado letter should be addressed.	The cited letter was a letter to one of Colorado’s licensees. As such, NRC staff considers it inappropriate to discuss the letter in the ISG. The comment provides additional information which indicates that the vendor may have determined what the cause of the problem was. NRC staff also considers it inappropriate to discuss in the ISG the specific problems found at one time with a specific company’s detector; in part, NRC staff generally avoids discussing specific products. However, in response to Comment 2-general-5, part 1, staff also notes that presentations at the April 2014 radon workshop provided suggestions for improving measurements of radon in air with alpha-track detectors. Staff has added mention of these suggestions to Section 4.5 of the ISG, including a suggestion that licensees institute a quality assurance/quality control program including use of blank detectors and spiked detectors.

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3-4	Re. §4.3, suggests that the ISG may appears to contradict itself and suggests that absent compelling reasons, average background radon concentration in air should not be used to determine dose to members of the public.	NRC staff has made a change to §4.3 of the ISG, where staff believes the apparent contradiction is based.
3-5	States that natural temporal and spatial variability in background [radon in air concentrations] can exceed the 0.1 pCi/L effluent discharge standard for radon at equilibrium and a concentration of 0.1 pCi/L can become lost in the background variability. This issue should be examined in the ISG.	NRC staff believes that the ISG discusses the potentially significant temporal and spatial variability in background radon in air concentrations. NRC staff notes that the 0.1 pCi/L effluent concentration value from 10 CFR Part 20, Appendix B, Table 2, for radon with daughters present, is not a limit. See the response to Comment 2-general-5.
3-6	Re. §4.3, last paragraph, disagrees with statement that cases in which radon concentrations at the “background” location are consistently higher than concentrations at or around the facility may indicate that the “background” location is not representative of the true background concentrations. The comment included substantial site-specific data for the Kennecott Uranium Company’s Sweetwater facility.	NRC staff considers the comment out of scope for the ISG. NRC staff is not responding to comments or parts of comments on existing State-licensed facilities.
3-7	Re. §4.3, discusses that the public dose limit in 10 CFR 20.1301 applies only to doses from licensed operations. Requested that the impact of the Commission decision in <i>Hydro Resources, Inc.</i> CLI-06-14 be clarified in the ISG.	See response to Comment 2-specific-5. NRC staff agrees that the public dose limit of 20.1301 applies only to dose from licensed operations, though such operations could include use of unlicensed materials. NRC staff has clarified wording in §4.3 regarding this, in part clarifying the wording regarding conclusions from the <i>Hydro Resources, Inc.</i> Commission Memorandum and Order CLI-06-14.

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3-8	Re. §4.6, discusses use of the modified Kusnetz method for radon progeny in air measurements. Requested that an example calculation of LLD for the modified Kusnetz method, in Regulatory Guide (RG) 8.30 be included in the ISG. Also requested that the ISG include a recommended LLD for use of the modified Kusnetz method.	See also response to Comment 2-specific-8. In addition, NRC staff considers it inappropriate for the ISG to be the source of recommendations for MDC or LLD values for environmental monitoring. Staff considers it more appropriate for such recommendations to be provided in other guidance, perhaps in the update to RG 4.14. Absent specific recommendations on MDCs/LLDs, licensees are responsible for making measurements with sufficient quality for the purposes of the measurements. No changes made.
3-9	Re. §4.9.4, suggests that the wide range of equilibrium values for residences be discussed and accounted for in the table.	Section 4.9.3.2 of the ISG already addresses the range of expected indoor equilibrium factors (0.2–0.8). NRC staff does not consider it necessary to repeat the information. No changes made.
3-10	Re. §4.12.4, describes the NRC method of determining a dose conversion factor for radon at equilibrium in air as simplistic. Provided a dose conversion factor calculated from International Commission on Radiological Protection (ICRP). Suggests that the dose conversion factor should be checked and based on risk.	NRC staff acknowledges that the method staff used to determine an acceptable dose conversion factor for radon in equilibrium for inhalation is simple. However, as described in §4.12.4 of the ISG, the method is based on requirements in the NRC regulations. The current 10 CFR Part 20 Appendix B values for radon were not based on the ICRP Publication 50 that the comment discusses. However, the basis of the values for radon was risk-informed and determined by the NRC to be consistent with the dose-based values for other radionuclides (see the statements of consideration cited in the ISG (56 FR at 23387)). Taking the basis from Part 20 is also appropriate because the limit being addressed is the public dose limit of Part 20. Thus, NRC staff considers the dose conversion factor as discussed in the ISG appropriate. No changes made.

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4-1	Re. §4.2.2 and §4.2.3, discusses a statement in the ISG that measurements be used to verify predicted concentrations are not exceeded. Recommends adding that a statistical approach to evaluating or comparing measured to modelled concentrations be considered acceptable.	NRC staff agrees that some statistical approaches to comparing measured to modelled concentrations could be acceptable. However, NRC staff does not have specific guidance to provide at this time regarding details of acceptable statistical approaches and proposed approaches would need to be evaluated by NRC staff on a case-by-case basis. Thus, NRC staff has not made changes to the ISG at this time.
4-2	Re. §4.2.4 (NRC staff believes the comment intended to refer to §4.3), discusses a statement in the ISG that background measurements should be made during the same time period as the measurements around the facility. States that at low concentrations some of the year-to-year variability in background concentrations may be due to uncertainty. Recommends that, if a licensee can demonstrate statistically that background measurements from multiple consecutive years can be used to better characterize the background, this option should be considered by the NRC.	NRC staff notes that the public dose limit of 10 CFR 20.1301 is a limit on the dose for a year. Compliance should be based on surveys that are applicable to one year at a time. Thus, NRC staff believes that for use of background concentrations (to subtract from concentrations at a compliance location) in a demonstration of compliance with the public dose limit, the method used must represent the background concentration for the single year; for such demonstrations of compliance, statistical treatment of measurements from multiple years would be inappropriate. For other purposes, use of measurements from multiple years may be acceptable if the data is representative for the purpose. NRC staff has added clarifications in §4.3 that the recommendations (that background is measured over the same time period as measurements around the facility and that measurements should be averaged over a year) apply generally to use of concentrations for demonstrations of compliance with 20.1301. NRC staff has made similar clarifications to §4.8.

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4-3	Re §4.8.1 (NRC staff believes the comment intended to refer to the 4 th paragraph of §4.12.3), describes that this paragraph (regarding use of occupancy factors other than 1 and accounting for the potential relationship of occupancy times, radon concentrations, and lower breathing rate during sleeping) implies a level of accuracy associated with radon measurements that is not realistic and suggests that the paragraph be removed from the ISG. Comment points out that higher radon concentration at night and lower breathing rate during sleep can be offsetting factors [in a dose assessment].	NRC staff has reconsidered the referenced discussion in §4.12.3 of the ISG. NRC staff acknowledges that it would be difficult for a licensee to determine radon concentrations during night time only conditions (whether by measurement or modelling). NRC staff believes that addressing the issues in the referenced discussion are not readily implementable and likely would not significantly improve the calculated dose, especially relative to the uncertainty of the dose calculation. Thus, NRC staff agrees with the suggestion that the referenced discussion be removed from the ISG and staff has done so.
5	Note: The comments from commenter 5 are substantially the same as those from commenter 3 and NRC staff responses would be the same responses. Thus, the comments and responses are not repeated here.	
6-1	Comments that it is unclear why NRC is not addressing evaluations of other radionuclides that must be included in demonstrations of compliance with 10 CFR 20.1301 and suggests that this should be addressed in the ISG.	NRC staff does evaluate all aspects of licensee compliance with the public dose limit of 10 CFR 20.1301 and the constraint on air emissions of 20.1101(d). However, as mentioned in the Executive Summary and Section 1 of the ISG, NRC staff had found significant deficiencies in licensee programs related primarily to radon and radon progeny; thus the ISG has focused on radon and radon progeny. No changes made.
6-2	Suggests that in many respects the ISG only addresses in-situ leach facilities and fails to adequately address conventional and heap-leach UR operations.	NRC staff wrote the ISG to be applicable to all types of UR facilities, including in-situ recovery (ISR, which is the same as in-situ leach), conventional mills, and heap-leach facilities. NRC staff believes that the ISG generally adequately addresses conventional and heap-leach facilities and is applicable to such facilities. No changes made, but also see responses to related, specific comments below.

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Commenter -comment #	Comment summary	Resolution of comment
6-3	States that there is no discussion of measurement of radon emissions from tailings piles after 1989 and EPA's requirements in 40 CFR Part 61, Subpart W. States there also is no discussion of emissions from ore pads, stockpiled ore, and other stockpiled material.	NRC staff agrees that nonpoint emissions sources at conventional and heap-leach facilities had not been sufficiently discussed as example emission sources in the ISG. Staff has added mention of tailings, ore pads or storage areas, and heap-leach piles as nonpoint sources in §4.2, §4.2.2, §4.2.3, and §4.7.
6-4	Comments that NRC has based its standards on certain health and risk assumptions but does not reference actual health assessments in communities near UR facilities.	NRC staff considers the comment out of scope for the ISG. NRC regulations do not provide requirements for health assessments. Thus, this comment is out of scope of the subject ISG. No changes made.
6-5	Re. §1, states that the ISG must also address emission of radon-220 at conventional mills. Describes that NRC approved license amendments that authorized material containing Th-232.	At this time, the ISG does not specifically address surveys for radon-220. NRC staff is not thoroughly updating the ISG to address radon-220, in part because dose from radon-220 generally is much less significant than that from radon-222, for releases from licensed facilities. However, NRC staff acknowledges that some licensee facilities may have significant releases of radon-220 and dose to members of the public from such releases may need to be addressed by licensees. NRC staff believes that some of the technical guidance provided in the ISG is applicable to radon-220, but there also are significant differences between radon-220 and radon-222. Thus, surveys of radon-220 and demonstrations of compliance with the public dose limit for radon-220 will also need to be evaluated on a case-by-case basis. NRC staff has added a note to this effect in §1 of the ISG.
6-6	Comments that emissions of radon-220 are not captured by the usual method of monitoring radon from tailings impoundments and are not included in MILDOS-AREA calculations, but radon-220 emissions should not be ignored.	NRC staff agrees that Rn-220 emissions may have to be addressed for some facilities. But, see response to Comment 6-5. NRC staff also notes that MILDOS 4.1 addresses Th-232 series radionuclides, including radon-220. No changes made to the ISG.

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6-7	[Some comments and parts of comments were specific to an existing State-licensed UR facility, but did not include a comment on the ISG.]	NRC staff considers the comment out of scope for the ISG. NRC staff is not responding to comments or parts of comments on existing State-licensed facilities.
6-8	Re. §1, states that the table of information sources does not include sources for some of the documents. Suggests that NRC should place the referenced documents in ADAMS.	NRC staff understands that most of the documents referenced in the table are not available in ADAMS. Because the references are copyright protected, NRC staff cannot replicate them in ADAMS. However, the documents should be available at college or other libraries and libraries can usually obtain these documents (e.g., on interlibrary loan). No changes made.
6-9	Re. §2, Suggests that NUREG-0859 should be placed in the NUREG series publications area of the NRC website. Also suggests that the ISG should include URLs for the documents.	NRC staff is evaluating placing NUREG-0859 on the NRC public web page per this suggestion. However, for the ISG, NRC staff is not adding URLs for the referenced documents, as the documents are readily available and located. No changes made.
6-10	Comments that the ISG does not explain how measurements of radon would be used to confirm the accuracy of calculations.	NRC staff acknowledges that the ISG does not contain detailed guidance on using measurement results to confirm or validate calculations. It is the licensee's responsibility to demonstrate accuracy of calculations and measurements. NRC staff will evaluate licensee submittals on a case-by-case basis. NRC staff is not adding recommendations on this subject to the ISG.
6-11	Re. §3.3, Recommends that documentation of Part 20 compliance should be submitted to the NRC or Agreement State so that the public would be able to evaluate compliance monitoring and calculations.	As described in §3.3, licensees may not be required to submit all records related to their demonstrations of compliance with 10 CFR 20.1301. However, some licensees may be required by license condition to submit this information. Reports or documents submitted by licensees are made publicly available. No changes made.
6-12	Re. §4.2.2, suggests adding tailings, ore pads and ore piles, and heap leach piles to the types of sources discussed.	See also response to Comment 6-3. NRC staff has modified the wording to include the sources for conventional mill and heap-leach facilities.

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Commenter -comment #	Comment summary	Resolution of comment
6-13	Re. §4.2.2, suggests that NRC must address how a licensee would include doses from radioactive material that has migrated offsite from the licensed facility.	NRC staff notes that §3 of the ISG states that for compliance with 10 CFR 20.1301 and 20.1302, licensees must address all sources of radiation and radioactive effluents. Licensees would need to address dose from licensed radioactive material that has migrated offsite. However, staff considers the requested information to be very site-specific and not appropriate to include in the ISG.
6-14	Re. §4.2.3, suggests the ISG should address tailings, ore storage piles, and heap-leach operations.	See also response to Comment 6-3. NRC staff has modified the wording to include the sources for conventional mill and heap-leach facilities.
6-15	Comment states that there appears to be a conflict between NRC and EPA regarding surveys of emissions from certain sources at conventional mill sites. Also appears to comment on EPA's proposed 40 CFR Part 61, Subpart W, regulation. Also states that NRC (and other regulators) discourage the measurement of radon emissions from tailings impoundments. Also states that EPA does not require monitoring of radon emissions from tailings impoundments in certain cases.	NRC staff considers the comment out of scope for the ISG. Comments about conflicts between the NRC and EPA, an EPA rulemaking, and EPA requirements for monitoring are out of scope for the ISG. Regarding measurement of radon emissions from tailings impoundments, NRC staff disagrees with the suggestion that NRC discourages such measurements. As discussed in §3 of the ISG, NRC licensees must address all sources of radiation and radioactive effluents in demonstrating compliance with 10 CFR 20.1301. NRC staff notes that measurements are one method to perform a survey of emissions, but calculations might be acceptable also (mentioned in §4.1 of the ISG). No changes made.
6-16	Comments that EPA does not require measurement of radon from stockpiled ore and certain other sources. Comments that it does not make sense to have various effluent regulations [from multiple regulatory agencies]. Comments that NRC should have data (and make it available) on correlation of emissions of radon from tailings impoundments with dose to the nearest receptor.	NRC staff considers the comments about EPA and multiple regulatory agencies out of scope for the ISG because the ISG is not intended to address EPA regulation of stockpiled ore and other sources. Also, with regard to NRC having data on correlation of emissions to dose, the ISG explains how licensees may generate this type of site-specific information to make its annual demonstration that 10 CFR 20.1301 is met. It is not feasible for NRC to generate this information for all sites. No changes made.

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Commenter -comment #	Comment summary	Resolution of comment
6-17	Re. §4.7, suggests the ISG should address radon sources at conventional mill and heap-leach operations.	NRC staff agrees with the comment. See also response to Comment 6-3. NRC staff has modified the wording in §4.7.
6-18	Comment suggests change to regulation regarding cleanup of contaminated soils during operations. Also addresses reduction of emissions to as low as reasonably achievable.	NRC staff considers the comment out of scope for the ISG. Changes to the regulations regarding cleanup of contaminated soils and concern related to reduction of emissions to as low as is reasonably achievable are out of scope for the ISG because the ISG's focus is on measuring radon. No changes made.
6-19	Re. §6, states that many of the references cited are not readily available to the public. Suggests that NRC should place the referenced documents in ADAMS.	See response to Comment 6-8. No changes made.
7-1	Re. §1, states that the ISG is applicable to UR facilities. States that it is a misapplication to require the EnergySolutions Clive facility to demonstrate compliance with the ISG. Suggests adding a statement to the Notes on Applicability, that caution should be exercised when applying the ISG to facilities that do not extract uranium, mine uranium, or produce yellowcake.	NRC staff notes that the Notes on Applicability indicate that the ISG is applicable to UR facilities. It is up to NRC and Agreement State regulators to determine appropriate application of the ISG. NRC staff notes that, as stated in the Notes on Applicability, the ISG is not a substitute for NRC regulations and compliance with the ISG is not required.
7-2	Re. §4.9, discusses outdoor equilibrium factor determinations based on travel time. Suggests that the ISG be revised to allow a licensee with site-specific data to use that data to justify use of an equilibrium factor value outside the range derived for the guidance.	NRC staff notes that §4.9 states that reviewers should determine that licensees use one of the approaches that follow (in the ISG) and provide a technical basis for the approach. Section 4.9.3.1 of the ISG describes use of travel time to calculate ingrowth of radon progeny to determine equilibrium factor. This is considered a site-specific method in §4.9.3 of the ISG. Thus, the ISG allows licensees to use site-specific data as recommended in the comment. No changes made.

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7-3	Re. §4.9.2, regarding outdoor exposures, suggests that the average value of the outdoor equilibrium factor used by the NCRP (from NCRP Report 160) of 0.6 is appropriate for use. Suggests that NRC's justification for use of a more conservative value than 0.6 is sufficient to supersede NCRP guidance.	The NCRP, in its report 160, does not make recommendations on using an outdoor equilibrium factor for individual facilities. The NCRP report uses the average value (0.6) to apply to calculations of exposure for the population of the U.S. The ISG, however, provides guidance to determining exposure for individual members of the public near individual facilities. For such cases, the overall average is not appropriate. Thus, NRC staff considered it appropriate to use the upper value of NCRP's central range, as an estimated equilibrium factor that would not underestimate exposure for most individuals and single facilities. The NRC staff has not superseded NCRP guidance. No changes made.
7-4	Re. 4.12.2 (NRC staff believes the comment intended to refer to §4.12.4), suggests the section on the dose conversion factor be updated to reflect ICRP Publication 115.	Licensees must demonstrate compliance with the current NRC regulations. The NRC regulations of 10 CFR Part 20 are not based on ICRP Publication 115. Thus, NRC staff considers the dose conversion factor provided in §4.12.4 to be appropriate. If an individual licensee wished to use the latest dosimetry and dose conversion factor, from ICRP 115, the licensee would need to request an exemption from certain sections of 10 CFR Part 20. No changes made.
7-5	Describes variability in background radon around the EnergySolutions Clive facility. Indicates that variances in excess of 0.2 pCi/L would imply, based on the ISG, variation in background doses to the general public in the range of 100 mrem/yr. Provides further comment specific to regulation of the Clive facility by the Utah Agreement State program.	NRC staff considers the comment out of scope for the ISG. However, NRC staff also notes that based on the generally acceptable equilibrium factors provided in the ISG (and occupancy of 100%), an increase of radon concentration of 0.2 pCi/L would imply an increase in dose of up to about 50 mrem/yr, which is less than stated in the comment. The NRC staff is not responding to comments or parts of comments on existing State-licensed facilities. No changes made.