

Response to Public Comments on Draft Regulatory Guide (DG)-1377
“Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste”
Proposed Revision 3 of Regulatory Guide (RG) 1.21

On January 5, 2021, the NRC published a notice in the *Federal Register* (86 FR 326) that Draft Regulatory Guide, DG-1377, (Proposed Revision 3 of Regulatory Guide (RG) 1.21), was available for public comment. The public comment period ended on February 19th, 2021. The NRC received comments from the organizations and people listed below. The NRC has combined the comments and the staff responses in the following table.

<p>Anonymous commenter</p> <p>Comments #1 to #4 below: ADAMS Accession No. ML21050A440</p>	<p>Janet Schlueter Nuclear Energy Institute (NEI), Sr. Advisor, Fuel, LLW and Radiation Safety 1201 F Street, NW, Suite 1100 Washington, DC 20004</p> <p>Comments #5 to #31 below. ADAMS Accession No. ML21050A441</p>
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Commenter	Section of DG-1377	Specific Comments	NRC Resolution
Anonymous	Related Guidance	<p><u>Comment #1.1.</u></p> <p>Consider adding the following (RG 1.184) to Related Guidance section.</p> <p><u>Comment #1.2.</u></p> <p>RG 1.184 for decommissioning. Section 8 (3rd paragraph) implies that continued use of Appendix I is discretionary, which may conflict with some of the language in the draft RG 1.21.</p>	<p><u>Comment #1.1 accepted:</u></p> <p>RG 1.184 has been added to the “Related Guidance” section of RG 1.21.</p> <p><u>Comment #1.2 not accepted:</u></p> <p>This comment pertains to changes to RG 1.184 (i.e., not to RG 1.21).</p>
Anonymous	Related Guidance	<p><u>Comment #2.</u></p> <p>Consider adding the following to Related Guidance section: NUREG-0133, as it has staff positions on methodologies for estimating exposure due to release of effluents</p>	<p><u>Comment #2 accepted:</u></p> <p>NUREG-0133 has been added to the “Related Guidance” section of RG 1.21.</p>
Anonymous	Related Guidance	<p><u>Comment #3.</u></p> <p>Consider adding the following to Related Guidance section: NUREG-0543, as it describes methods for complying with total dose requirement of 40 <i>Code of Federal Regulations</i> (CFR) 190</p>	<p><u>Comment #3 accepted:</u></p> <p>NUREG-0543 has been added to the “Related Guidance” section of RG 1.21.</p>
Anonymous	General	<p><u>Comment #4.1.</u></p> <p>Comment on existing version of RG 1.21 (Rev. 2):</p> <p>There are references to the 10 percent of total dose criteria of Regulatory Position C in Regulatory Guide 1.109 in several places in Reg Guide 1.21. Neither RG 1.109 or RG</p>	<p><u>Comment #4.1 accepted:</u></p> <p>The text in Section 1.10 has been revised as follows</p> <p><i>Licensees are responsible for evaluating any new significant exposure pathway and the resultant radiological hazards associated with the return of</i></p>

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		<p>1.21 clarifies what the total dose reference value is. The concept is to make sure that significant exposure pathways are included in the total dose and to provide a criterion for exempting or including a pathway. If total dose, in this context, was equated to the annual dose limits of Appendix I, then 10 percent would far exceed normal operational doses, or the licensing phase Appendix I doses, as both are typically very small fractions of the As Low As Reasonably Achievable (ALARA) dose limits taken from 10CFR50, Appendix I. Operational doses are a moving target and may get smaller over time, especially during major phases of decommissioning, however a total dose reference value could be derived from a representative operational period. It is suggested that RG 1.21 be clarified to provide guidance on using operational doses or the Licensing phase Appendix I analysis doses to derive a 10 percent reference total dose.</p>	<p><i>radioactive material to the operating facility and its subsequent discharge to the environment. For purposes of estimating dose during operations or decommissioning, a new significant exposure pathway is any pathway that contributes dose that exceeds 10% of the dose criteria in 10 CFR 50 Appendix I, Section II (such that the dose from a new exposure pathway is unlikely to be substantially underestimated). Bounding dose assessments as described in Section 5.1 of this RG may be used in evaluating any new significant exposure pathway.</i></p> <p>The text in Section 5.7 has also been revised as follows:</p> <p><i>For purposes of demonstrating compliance with dose criteria for limiting dose to a member of the public in unrestricted areas in accordance with Technical Specifications conforming to 10 CFR 50, Appendix I, the exposure pathways and routes of exposure identified in RG 1.109 should be considered. An evaluation of other exposure pathways (not included in dose assessments) should be performed and maintained for purposes of demonstrating compliance with the staff position on significant exposure pathways. Computational procedures should be based on models and data such that the actual exposure of an individual through appropriate pathways is unlikely to be substantially underestimated. A new exposure should be included in the demonstration of compliance if the calculated dose from that exposure pathway exceeds 10 percent of the 10 CFR 50 Appendix I, Section II numerical guides on design objectives.</i></p>

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		<p><u>Comment #4.2.</u></p> <p>Additionally, it would be of value to distinguish release pathways from exposure pathways, and to note whether the 10% criteria applies to a new release (sic) (exposure) pathway.</p>	<p><u>Comment #4.2 not accepted:</u></p> <p>The terminology of a “release pathway” is not used. Instead, the terminology of a “exposure pathway” is used in lieu of a “release pathway.” The glossary defines a less-significant release point, a significant release point, and “exposure pathways.” Sections 1.3 and 1.4 provides guidance on monitoring significant release points, and less-signficaint release points. There are several references to exposure pathways and examples given in the RG.</p>
Janet Schlueter	Section C.6	<p><u>Comment #5.</u></p> <p>Page 39, Section 6. “Solid Radioactive Waste Shipped for Processing or Disposal” – Paragraph 1, last sentence should be edited to read: “The data reported should...”.....from a plant site for waste disposal (i.e., shipments directly to disposal and waste processor shipments to disposal).</p>	<p><u>Comment #5 not accepted.</u></p> <p>NRC established precedence RG 1.21, Rev. 1, dated June 1974. The historical guidance is that the volume to be reported is the volume “shipped” (see explanation below).</p> <p>RG 1.21, Rev. 1 (1974) in Appendix A, Section C stated: “<i>The total curie quantity and radionuclide composition of the solid waste shipped offsite (emphasis added) should be determined</i>”.</p> <p>Currently, NRC Standard Technical Specifications (NUREG-1430, 1431, 1432, and 1433) provide guidance that licensees should report ...” <i>solid waste released from the unit.</i>”</p> <p>The 1992 NRC Health Physics position (HPPOS-291) further documents the NRC position on reporting solid waste released from the site. NRC’s position has been</p>

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			<p>that the volume of waste “<i>leaving the licensee’s facility</i>” should be reported.</p> <p>https://www.nrc.gov/about-nrc/radiation/protects-you/hppos/hppos291.html</p>
Janet Schlueter	Section C.6	<p><u>Comment #6.</u></p> <p>Page 39, Section 6. “Solid Radioactive Waste Shipped for Processing or Disposal” – Paragraph 5 should be deleted in its entirety as it is not risk-informed nor does it reflect the accepted practice of off-site processing of such wastes.</p>	<p><u>Comment #6 not accepted.</u></p> <p>See response to Comment # 5 above.</p>
Janet Schlueter	Section C.9.3	<p><u>Comment #7.</u></p> <p>Page 45, Section 9.3 “Solid Waste Shipments” – Paragraph 1 should be edited to read: “Appendix A, Table A-3, provides an acceptable...”.....report the waste shipped for direct disposal (without offsite processing) and waste processor shipments of waste to disposal.</p>	<p><u>Comment #7 not accepted.</u></p> <p>See response to Comment # 5 above.</p>
Janet Schlueter	Appendix A-5	<p><u>Comment #8.</u></p> <p>Appendix A, Page A-5, Table A-3 should be deleted in its entirety and replaced with Table A-3, “Low Level Waste” from Revision 2 (sic) (1) of RG 1.21.</p>	<p><u>Comment #8 partially accepted and partially not accepted.</u></p> <p><u>Accepted:</u> The reporting of “waste classification” has been removed from Table A-3.</p> <p>Explanation:</p> <p>“Waste classification” is a requirement for characterizing waste upon burial, not when shipped for off-site processing. Waste being sent to a processor is not in final form and therefore cannot be</p>

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			<p>classified until after processing when in final form for waste disposal.</p> <p><u>Not accepted:</u></p> <p>The report in Table A-3 on solid waste shipments is required by Technical Specifications (e.g., see NUREG-1431, Rev. 4, Section 5.6.2 (“... <i>solid waste released from the unit.</i>”))</p>
Janet Schlueter	Section C.1.6	<p><u>Comment #9.1.</u></p> <p>Section C.1.6 of the draft guide clarifies requirements for drinking water I-131 sampling. This section does not specify a receptor age group. The section should specify all ages to be considered, just adult age group, etc. It appears from initial calculations that the infant age group actually appears to be the highest dose factor for the iodines and about 3 times higher than adults for I-131. Recommend a basis be included for having only adult dose factors. The critical age group varies by nuclide, with infant apparently predominating the drinking water pathway alone and either adult or child predominating the combined drinking water and ingestion pathways. Recommend some clarification in Section 1.6 to specify that it is considering doses projected to be >1 mrem to the thyroid for any age group over a period of one year.</p>	<p><u>Comment #9.1 accepted:</u></p> <p>The text has been revised in Section B, “Reason for Revision” as follows:</p> <ul style="list-style-type: none"> • Clarifies the existing guidance in NUREG-1301 and NUREG-1302 that environmental monitoring for iodine (I) -131 in drinking water should be performed if a prospective dose evaluation of the annual thyroid dose from I-131 to a person in any age group from the drinking water route of exposure is greater than one mrem. <p>The text has been revised in Section C.1.6 as follows:</p> <p style="text-align: center;"><i>NUREG-1301 and NUREG-1302 provide guidance on the Radiological Environmental Monitoring Program. Table 3.12-1 therein provides guidance on implementing the environmental monitoring program, including an I-131 sampling and analysis on each composite of drinking water.</i></p>

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		<p><u>Comment #9.2.</u></p> <p>Clarification of the different analyses for I-131 being discussed. Specifically, two different I-131 analysis requirements are involved. I-131 is analyzed in effluents to a level of 1E-6 µCi/ml (per NUREG-1301/2 Table 4.11-1) and the effluent concentration is used in calculating doses (NUREG-1301/2 SR 4.11.1.2) and projecting doses (NUREG-1301/2 SR 4.11.1.3.1). The REMP analysis requirement in NUREG-1301/2 Table 3.12-1 3.c. is what is being clarified. There are a few things that may be worth elaborating on in the Reg Guide.</p> <p><u>Comment #9.3.</u></p> <p>Specifically, the wording is ‘dose calculated for the consumption of the water’, which implies that the other dose contributor (specifically, freshwater fish ingestion in this case) is not considered in the determination (it should be noted that depending on the nuclide and age group, fish ingestion by far dominates the combined dose factor). Many sites just follow the NUREG-0133 guidance to include the adult, combined drinking water and fish dose parameter for</p>	<p><i>If a drinking water exposure pathway exists, a prospective dose evaluation should be performed based on I-131 in effluent discharges to determine the maximum likely annual I-131 thyroid dose to a person in any age group. The purpose of the prospective dose evaluation is to determine the environmental sampling and analysis requirements.</i></p> <p><u>Comment #9.2 accepted:</u></p> <p>Text has been revised as follows:</p> <p><i>If the likely dose from I-131 is greater than 1 mrem per year, a composite sample collected over a 2-week period and an I-131 analysis performed with an LLD of 1 pCi/liter. If the likely dose from I-131 is less than 1 mrem per year, a monthly composite sample should be collected and an I-131 analysis performed with an LLD of 15 pCi/liter.</i></p> <p><u>Comment #9.3 accepted:</u></p> <p>Text has been added as follows:</p> <p><i>Note: Freshwater fish ingestion is not included in the prospective dose evaluation of I-131 from the drinking water route of exposure.</i></p>

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		<p>Air and may not currently be determining the drinking water-only doses.</p> <p><u>Comment #9.4.</u></p> <p>A second consideration is that the other ‘projected dose’ requirements from NUREG-1301/2 are 31-day dose projections, while this is an annual dose projection; more discussion/highlighting of this difference may be worthwhile.</p> <p><u>Comment #9.5.</u></p> <p>Finally, clarification that the projected doses are based on the I-131 concentration in effluents seems like it would be helpful. These are things that are easy to read past after you have been doing this work for a while, but will be helpful in clarifying the requirement further and making it more useful for new program owners and for others who are less familiar with the intricacies of the regulatory guidance.</p>	<p><u>Comment #9.4 accepted:</u></p> <p>The following text has been added to Section 1.6:</p> <p><i>In addition, Standard Technical Specifications require determination of the projected dose contributions from radioactive effluents at least every 31 days, and determination of the cumulative dose contributions for the current calendar quarter and current calendar year.</i></p> <p><u>Comment #9.5 accepted.</u></p> <p>The text has been clarified as described in Comment # 9.2 above.</p>
Janet Schlueter	General	<p><u>Comment #10.</u></p> <p>Recommend that the abnormal release definition be changed back to revision 1 terminology (i.e. offsite, change abnormal discharge to onsite release, and change the unplanned release and discharge to match the abnormal terminology.) The swap in Rev 2 changing Abnormal Release to be an</p>	<p><u>Comment #10 not accepted:</u></p> <p>The use of the terms “discharge” and “release” are more accurate and descriptive because the term “discharge” is specified as an effluent disposal into the unrestricted area and the term “release” is used to</p>

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		onsite release seems to be confusing people. Many sites have not adopted Rev 2, and Licensing procedures seem to be written.	define an onsite release of effluent which may or may not reach the unrestricted area.
Janet Schlueter	Appendix A (General)	<p><u>Comment #11.1</u></p> <p><u>Editorials:</u></p> <ul style="list-style-type: none"> • Appendix A – Tables, Page A-1 occurs on the pages with Tables A-1, A-1A, A-2, A-2A, A-4, and A-5. • Appendix A, several of the Tables are difficult to read. Specifically, Tables A-1 and A-2 should be formatted to make grouping clearer. An example of one approach is shown in Table A-4. <p><u>Comment 11.2</u></p> <ul style="list-style-type: none"> • Tables A-1 and A-2, % of limit rows should be deleted or explained (i.e. the fraction of the MPC, fraction of dose limit, etc.) Recommend an explanation be given in Section 9 about how to determine the percentages. <p>• Table A-4 is missing data in the second column. It appears that it would normally hold units; however, the units are provided with the limits across the rows, so the blank column may be able to be deleted.</p>	<p><u>Comment #11 accepted.</u></p> <p>Pages have been renumbered.</p> <p>Tables A-1 has been revised to delete the “average release rate” and the “% of limit.” Table A-2 has been revised to delete the “average concentration” and the % of Limit.” These criteria have been revised to % of dose limit in Tables A-4 and Table A-5.</p> <p>See detailed response in comment #14 below which justifies and explains why the percent of the limit refers to the percent of the Appendix I dose values instead of an average release rate, average concentration, and % of limit.</p> <p>Table A-4, second blank column has been removed.</p>

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Janet Schlueter	Section C.5.5	<p><u>Comment #12.</u></p> <p>Section 5.5 (pg. 35), “These limits apply to doses resulting from licensed and unlicensed radioactive material...” In this case, it seems that ‘unlicensed material’ would be essentially due to activity that had previously been released following licensing requirements. It would be helpful to clarify this, since plants do not dose calculations based on releases from previous years. Similar clarification would be helpful for Section 5.6; given that plants do not calculate doses based on previous year’s effluents that have built up in the environment (for example tritium built up in a lake, or nuclides built up in sediment around the discharge line, etc.). Some of the dose calculations already include the assumption of buildup over a 15 (or 20 or 30) year period; for example, ground plane release from gaseous effluents and shoreline sediment from liquid effluents use a buildup factor for ½ of plant life. The ground plane doses will be accounted for using TLDs. The whole concept of calculating doses based on previous years’ releases is outside of the normal dose calculation methodologies given in RG-1.109.</p>	<p><u>Comment #12 accepted.</u></p> <p>The statement in Section 5.5 regarding dose limits is correct based on 10 CFR 20.1001(b) (i.e., dose limits include doses from both licensed and unlicensed material regardless of the year of discharge).</p> <p>The text in Section 5.5 and 5.6 has been revised to clarify that dose limits include contributions to public doses from (1) current-year effluents, (2) current-year direct radiation from the facility, and (3) accumulated radioactivity from prior-year effluents. The Technical Specifications establish the Radioactive Effluent Controls Program and the Environmental Monitoring Program, which establish effluent control methods sufficient to demonstrate compliance with the NRC public dose limits in 10 CFR 20.1301(a) and the EPA public dose limits in 10 CFR 20.1301(e).</p>
Janet Schlueter	Section C.3.2	<p><u>Comment #13.</u></p> <p>Section 3.2 first paragraph needs editorial clarification regarding the wording for “long-term annual average” atmospheric dispersion values. Recommend aligning wording within first paragraph of the section with the wording in the last paragraph of the section and change, “the use of long-term (5-year) annual-average...” to read, “the use of long-term (5 or more years) annual-average...”</p>	<p><u>Comment #13 accepted.</u></p> <p>The text has been revised as follows:</p> <p>“The use of long-term annual-average meteorological conditions <i>based on 5 or more years of data</i> to determine χ/Q and D/Q is appropriate for continuous releases and for establishing instantaneous release rate set points.”</p>

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Janet Schlueter	Appendix A	<p><u>Comment #14.</u></p> <p>Appendix A, Page A-1, Tables A-1 and A-2. The row, “% of limit” is believed to be a typo which should have been deleted going from revision 1 to revision 2 of this Reg Guide. The directions to populate this row were present in revision 1 but removed in revision 2. It is unclear what the Reg Guide is requesting in this row, i.e. what “limit” is being referenced. Recommend to delete the row “% of limit.”</p>	<p><u>Comment #14 accepted.</u></p> <p>Previously, Tables A-1 and A-2 requested data on the “average release rate” and the “% of limit.” The “average release rate” and “% of limit” are unnecessary because a much more restrictive requirement is imposed on the <u>instantaneous</u> release rate through Technical Specifications (see criteria in NUREG-0133). The NUREG-0133 instantaneous criteria is implemented by establishing an “instantaneous” concentration limit for liquid effluents, and an “instantaneous” dose rate limit for gaseous effluents. Therefore, the instantaneous limit very conservatively assures that the “annual-average” concentration limits in 10 CFR 20, Appendix B will be met.</p> <p>Furthermore, instantaneous radioactive effluent monitoring alarm and trip setpoint (s) are established by NUREG-0133 in Section 4.1.1 for liquid effluents and Section 5.1.1 for gaseous effluents. The NUREG-0133 guidance that radioactive effluent monitoring alarm and trip setpoint (s) provides correspond to a safe margin of assurance that “instantaneous” release limits not be exceeded.</p> <p>Finally, the “% of limit” is a dose limit criteria, not a release rate criteria. This change was made in RG 1.21, Rev. 2 which established two new “dose” reporting Tables A-4 and Table A-5 to explicitly report and demonstrate compliance with dose limits. Table A-4 is used to report compliance with dose limits in Technical Specifications conforming to 10 CFR 50, Appendix I. Table A-5 is used to report</p>

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			compliance with dose limits required by Technical Specifications and EPA 40 CFR 190.
Janet Schlueter	Section C.6 and 9.3	<p><u>Comment #15.</u></p> <p>Sections 6 and 9.3 appear to be inconsistent for reporting potentially contaminated DAW, “green is clean.” Specifically, section 6.0 discusses shipments that do not need to be reported such as potentially contaminated DAW, “green as clean”; however, 9.3 lists “DAW” shipments as reportable.</p> <p>Recommend to change Section 9.3, to clarify that potentially contaminated DAW “green as clean” shipments are not required to be reported.</p>	<p><u>Comment #15 accepted.</u></p> <p>Section 9.3 has been revised to include the exceptions to reporting requirements for solid waste shipped as listed in Section 6, which includes “green-is-clean” waste.</p>
Janet Schlueter	Section C.6 and 9.3	<p><u>Comment #16.</u></p> <p>Sections 6.0 and 9.3 appear to be inconsistent regarding the categories of shipments that should be reported. Specifically, Section 6.0 states that the following shipments must be reported: “1. spent resins, filters, evaporator bottoms, etc., 2. dry active waste, 3. irradiated components, and 4. other waste.” However, Section 9.3 states that the following shipments must be reported: “1. spent resins, filter sludges, evaporator bottoms, etc., 2. dry active waste, contaminated equipment, etc., 3. irradiated components, and 4. other waste.” Section 9.3 includes contaminated equipment; however, Section 6.0 does not include this type of shipment. If a contaminated equipment shipment is required to be reported, clarification is needed, e.g., disposal of contaminated equipment only versus transport for decontamination, or transfer to another site for their use, etc.</p>	<p><u>Comment #16 accepted.</u></p> <p>The waste category shipment categories have been generalized as follows:</p> <ol style="list-style-type: none"> 1. wet radioactive waste, 2. dry radioactive waste, 3. activated or contaminated radioactive material, and 4. other radioactive waste. <p>The generalized waste categories above are consistent with the waste forms listed in previous guidance as described in Sections 6 and 9.3.</p>

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		Also, would this include a shipment of activated but not necessarily contaminated equipment?	
Janet Schlueter	Section B	<p><u>Comment #17.</u></p> <p>Page 12, “compliance with the effluent reporting requirements of 10 CFR 50.36a.”</p> <p>Comment - Deleted text related to 10 CFR 72.44(d) ISFSI effluent reports. Does that mean there is going to be another format or guidance provided for that? If so, should that be referenced here?</p>	<p><u>Comment #17 accepted.</u></p> <p>A footnote has been added (to 10 CFR 36a) on page 13 as a pointer to Section 9.0 which provides guidance on effluent reporting under 10 CFR 72.44(d):</p>
Janet Schlueter	Section C.1.2	<p><u>Comment #18.</u></p> <p>Page 15, “6. the unrestricted area, which may be defined separately for liquid effluents, gaseous effluents, and, if appropriate, other radiological controls such as direct radiation.”</p> <p>Comment - Is this really meant to be an item 6, it appears to be a clarification of what restricted area is, (described under # Section C.1.2.3.c).</p>	<p><u>Comment #18 accepted.</u></p> <p>Item #6 has been removed and changed to a clarifying footnote as follows:</p> <p>The boundaries of the unrestricted areas may be defined separately for liquid effluents, gaseous effluents, and if appropriate, for other radiological controls such as direct radiation..</p>
Janet Schlueter	Section C.1.5	<p><u>Comment #19.</u></p> <p>Page 16 and 17, “e.g., refer to the environmental LLDs in NUREG-1301 and NUREG-1302, Table 4.12-1, “Detection Capabilities for Environmental Sample Analysis,” or LLDs determined by using the methodology outlined in NUREG-</p>	<p><u>Comment #19 not accepted.</u></p> <p>The example provides useful guidance on where licensees can find acceptable LLD values and also offers the alternative of determining LLD values based on NUREG-1576, “Multi-Agency Radiological Laboratory Analytical Protocols Manual.”</p>

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		<p>1576. Additionally, licensees should apply plant-process-system knowledge when evaluating leaks and spills.” Comment - Delete the (following) example “<i>e.g., refer to the environmental LLDs in NUREG-1301 and NUREG-1302, Table 4.12-1, “Detection Capabilities for Environmental Sample Analysis,” or LLDs determined by using the methodology outlined in NUREG-1576. Additionally, licensees should apply plant-process-system knowledge when evaluating leaks and spills.</i>”</p>	
Janet Schlueter	Section C.1.5	<p><u>Comment #20.</u></p> <p>Page 17, “Although prompt remediation is not a requirement (Ref. 54), remediation should be evaluated and implemented, as appropriate, based on licensee evaluations and risk-informed decision making. Evaluation factors should include (1) the location and accessibility, (2) the concentrations of radionuclides and extent of the residual radioactivity, (3) the efficacy of monitored natural attenuation, (4) the volume of the release, (5) the mobility of the radionuclides, (6) the depth of the water table, and (7) whether “significant residual radioactivity” (see glossary) is expected at the time of decommissioning.”</p> <p><u>Comment</u> - Suggest adding reference to EPRI Report No. 1021104 "Groundwater and Soil Remediation Guidelines for Nuclear Power Plants," Electric Power Research Institute, Palo Alto, CA, December 2010.</p>	<p><u>Comment #20 accepted.</u></p> <p><u>Response:</u></p> <p>EPRI Reports No. 1021104 "Groundwater and Soil Remediation Guidelines for Nuclear Power Plants," (a proprietary document) and Report 1023464, “Groundwater and Soil Remediation Guidelinse for Nuclear Power Plants” (a public document) have been added as references.</p>
Janet Schlueter	Section C.1.6	<p><u>Comment #21.</u></p> <p>Page 18, “NUREG-1301 and NUREG-1302 provide guidance on implementing the environmental monitoring</p>	<p><u>Comment #21 accepted.</u></p> <p>The text in C.1.6 has been revised as follows:</p>

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		<p>program for I-131 analysis on each composite of drinking water. The sampling and analysis of a drinking water composite sample should be performed when the projected annual thyroid dose from I-131 in drinking water is greater than 1 mrem.”</p> <p>Comment - Is the projection of annual thyroid dose based on the liquid effluent concentration? Is information on how to do this projection provided in another regulatory guide?</p>	<p><i>NUREG-1301 and NUREG-1302 provide guidance on the Radiological Environmental Monitoring Program. Table 3.12-1 therein provides guidance on implementing the environmental monitoring program, including an I-131 sampling and analysis on each composite of drinking water.</i></p> <p><i>If a drinking water exposure pathway exists, a prospective dose evaluation should be performed based on I-131 in effluent discharges to determine the maximum likely annual I-131 thyroid dose to a person in any age group. The purpose of the prospective dose evaluation is to determine the environmental sampling and analysis requirements. Note: Freshwater fish ingestion is not included in the prospective dose evaluation of I-131 from the drinking water route of exposure.</i></p> <p><i>If the likely dose from I-131 is greater than 1 mrem per year, a composite drinking water sample should be collected over a 2-week period and an I-131 analysis performed with an LLD of 1 pCi/liter. If the likely dose from I-131 is less than or equal to 1 mrem per year, a monthly composite sample should be obtained, and an I-131 analysis performed with an LLD of 15 pCi/liter.</i></p>
Janet Schlueter	Section C.1.8	<p><u>Comment #22.</u></p> <p>Page 19, “This RG introduces the term “principal radionuclide” in a risk-informed context. A licensee may evaluate the list of principal radionuclides for use at a particular site. The principal radionuclides may be</p>	<p><u>Comment #22 not accepted.</u></p> <p>The guidance as stated in the draft RG was correct in use of the word “may” because there “may” be other acceptable methods of determining principal</p>

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		<p>determined based on their relative contribution to (1) the public dose compared to the 10 CFR Part 50, Appendix I, design objective doses ..”</p> <p>Comment - Saying "may be determined... or" makes it sound like there is a choice. Where in fact, a principal radionuclide is determined if it is either of these things. May want to use "and" instead of "or" here? It is clearer when the 1% rule is provided in the paragraph below. There the use of the term "or" is appropriate.</p>	<p>radionuclides developed by licensees (if technically justifiable).</p>
Janet Schlueter	Section C.1.9	<p><u>Comment #23.</u></p> <p>Page 21, “Estimation of Carbon-14 in Nuclear Power Plant Gaseous Effluents,” Technical Report 1011106 (Ref. 60).”</p> <p>Comment - Needs to be changed to 1021106</p>	<p><u>Comment #23 accepted.</u></p> <p>The report number has been corrected “1021106.”</p>
Janet Schlueter	Section C.2.2	<p><u>Comment #24.</u></p> <p>Page 23, “(ASTM) D 3370-07” and “ASTM D 3370-095A, “Standard Practices for Sampling Water from Closed Conduits” (Ref. 62)”</p> <p><u>Comment</u> – These standards appears to be superseded by D3370-18.</p>	<p><u>Comment #24 accepted.</u></p> <p>The reference number has been updated to D3370-18.</p>
Janet Schlueter	Section C.3.6	<p><u>Comment #25.</u></p> <p>Page 28, (Number) 6. The groundwater monitoring results should be used in the development and testing of a conceptual site model to predict radionuclide transport in groundwater. The conceptual site model is generally considered adequate when it predicts the results of monitoring (sometimes called a calibrated model).”</p>	<p><u>Comment #25 accepted.</u></p> <p>This formatting error involving paragraph number (6) has been corrected by deleting paragraph number (6) with the text reformatted as the next sequential paragraph.</p>

Commenter	Section of DG-1377	Specific Comments	NRC Resolution
		<p><u>Comment</u> - When comparing with the previous version, it appears that this is not meant to be #6 but a new paragraph that provides additional information.</p>	
Janet Schlueter	Section C.3.6	<p><u>Comment #26.</u></p> <p>Page 28, “contaminated material” Comment - Suggest using term "radioactive material".</p>	<p><u>Comment #26 accepted.</u></p> <p>The word “contaminated” has been replaced with “licensed (radioactive) material.”</p>
Janet Schlueter	Section C.5.9	<p><u>Comment #27.1.</u></p> <p>Page 38, “contributions from I-131, I-133, tritium, and radionuclides in particulate form.” Do the plants not have to calculate doses due to C-14? If so, how should that be reported?</p> <p><u>Comment #27.2.</u></p> <p>EPRI also has a couple of reports on conducting C-14 dose calculations that may be a useful reference. EPRI Report No. 1024827 "Carbon-14 Dose Calculation Methods at Nuclear Power Plants" published April 2012. https://www.epri.com/research/products/00000000001024827</p>	<p><u>Comment #27.1 accepted.</u></p> <p>C-14 is a radioactive gas (mostly in the form of CO₂ and CO). Doses from C-14 are not included Appendix I which specifies limits for I-131, I-133, tritium, and radionuclides in particulate form.</p> <p>However, doses from C-14 must be included in demonstrating compliance with EPA 40 CFR 190.10 requirements because the EPR regulation specifies dose limits “<i>as a result of exposures to planned discharges of radioactive materials, radon and its daughters excepted, ...</i>”.</p> <p><u>Comment #27.2 accepted.</u></p> <p>EPRI Report No. 1024827 has been added as a reference in Section C.1.9, “Carbon-14.”</p>

Commenter	Section of DG-1377	Specific Comments	NRC Resolution
Janet Schlueter	Section C.9.1	<p><u>Comment #28.</u></p> <p>(Section 9.1, Gaseous Effluents) Page 42, “fission and activation gases, iodines/halogens, particulates, tritium, and gross alpha.”</p> <p><u>Comment</u> - Should carbon-14 not be included here (and subsequent tables) also? If not, where should Carbon-14 be reported?</p>	<p><u>Comment #28 accepted.</u></p> <p>The reporting of C-14 has been added to Section C.9.1 and added to the gaseous effluent Tables A-1, and Tables A-1A through A-1F.</p>
Janet Schlueter	Reference	<p><u>Comment #29.</u></p> <p>Page 63, “60. Electric Power Research Institute, “Estimation of Carbon-14 in Nuclear Power Plant Gaseous 196 Effluents,” Technical Report 1011106, Palo Alto, CA, December 2010.”</p> <p><u>Comment</u> – Needs to be corrected to 1021106.</p>	<p><u>Comment #29 accepted.</u></p> <p>The reference number has been corrected to 1021106 (see revised document page number 65, Reference No. 65).</p>
Janet Schlueter	Reference	<p><u>Comment #30.</u></p> <p>Page 63, “69. EPRI Report No. 1015118, “Groundwater Protection Guidelines for Nuclear Power Plants,” Electric Power Research Institute, Palo Alto, CA, November 2007.”</p> <p><u>Comment</u> – EPRI Report 1015118 has been superseded by EPRI report 3002000546 “Groundwater Protection Guidelines for Nuclear Power Plants: Revision 1” Electric Power Research Institute, Palo Alto, CA., October 2013.</p> <p>Also suggest adding EPRI Report No. 1021104 "Groundwater and Soil Remediation Guidelines for Nuclear</p>	<p><u>Comment #30 accepted.</u></p> <p>The reference to superseded EPRI Report 1015118 has been replaced by the revised EPRI Report No. 3002000546.</p> <p>EPRI Report No. 1021104 has been added to Section C.1.5 and included as new Reference No. 58.</p>

Commenter	Section of DG-1377	Specific Comments	NRC Resolution
		Power Plants," Electric Power Research Institute, Palo Alto, CA, December 2010.	
Janet Schlueter	Reference	<p><u>Comment #31.</u></p> <p>Page 63, Footnote 9 “reports may be purchased from...”</p> <p><u>Comment</u> - Change to "may be obtained from" from EPRI. Saying it may need to be purchased may cause confusion for members who have access to the reports as part of their membership. Add EPRI website: https://www.epri.com which is the most convenient way for obtaining reports. Also suggested deleted the fax number for simplicity.</p>	<p><u>Comment #31 accepted.</u></p> <p>Corresponding Footnote No. 11 (on revised page number 66) has been changed as follows:</p> <p><i>Copies of Electric Power Research Institute (EPRI) standards and reports may be obtained from EPRI, 3420 Hillview Ave., Palo Alto, CA 94304; telephone (800) 313-3774; https://www.epri.com</i></p>