

UNITED STATES
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OFFICE OF NEW REACTORS
OFFICE OF FEDERAL AND STATE MATERIALS
AND ENVIRONMENTAL MANAGEMENT PROGRAMS
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
WASHINGTON, D.C. 20555

(date)

**NRC REGULATORY ISSUE SUMMARY (2014-XX)
REPORTING OF H-3, C-14, Tc-99, and I-129 ON THE
UNIFORM WASTE MANIFEST**

ADDRESSEES

All licensees, certificate holders, and applicants for a fuel cycle facility licensed under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 40, "Domestic Licensing of Source Material," 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material," or 10 CFR Part 76, "Certification of Gaseous Diffusion Plants."

All operating reactor facilities; all decommissioning reactor facilities; all holders of and applicants for a power reactor combined license under 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Reactors;" all holders of an operating license for a non-power reactor (research reactor, test reactor, or critical assembly) under 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," except those who have permanently ceased operations; all independent spent fuel storage installation specific licensees; and all Radiation Control Program Directors and State Liaison Officers.

INTENT

The U.S. Nuclear Regulatory Commission (NRC) is issuing this regulatory issue summary to inform addressees of the option to use indirect methods to determine the activity of H-3, C-14, Tc-99, and I-129 reported on the uniform waste manifest when the radionuclide is present at a concentration less than the lower limit of detection (LLD). The reason for noting this option is because accurately reporting the activities of these radionuclides is important for better decision making regarding the disposal of low-level radioactive waste (LLRW). Overestimation of disposal site inventory could lead to premature loss of disposal system capacity, whereas underestimation of inventory could lead to public health and safety concerns.

Neither a specific action nor any written response is required. The NRC is providing this RIS to the Agreement States for their information and for distribution to their licensees as appropriate.

BACKGROUND

Appendix G of 10 CFR Part 20 requires that an NRC uniform manifest (i.e., NRC Forms 540, 541, and 542) be prepared for waste intended for ultimate disposal at a licensed LLRW land disposal facility, and states that the activity of each of the radionuclides H-3, C-14, Tc-99, and I-129 contained in the shipment must be reported on the uniform manifest. These radionuclides were identified as being of particular concern for the groundwater pathway dose in the analysis performed for NUREG-0782, "Draft Environmental Impact Statement on 10 CFR Part 61 Licensing Requirements for Land Disposal of Radioactive Waste," published in September 1981. The concentration values provided in the 10 CFR Part 61 waste classification tables are based on intruder protection, and the potential groundwater pathway dose was not considered in the development of these tables. Instead, the NRC staff decided that the groundwater pathway for each disposal facility should be analyzed on a case-by-case basis because the groundwater pathway impacts are site-specific and are a function of the total inventory of radionuclides at a disposal site. The quantities of the four radionuclides believed to be especially important to the groundwater pathway (i.e., H-3, C-14, Tc-99, and I-129) were required to be reported on the uniform manifest. According to NUREG/BR-0204, Revision 2, "Instructions for Completing NRC's Uniform Low-Level Radioactive Waste Manifest," if these four radionuclides are present in the waste in quantities less than the LLD, they must be reported as being present at the LLD value on the uniform manifest. Because these radionuclides are difficult to measure, the LLD values are potentially much higher than the actual concentrations in the waste. Research indicates that the use of the LLD values may be resulting in a significant over-estimation of the inventory of these four radionuclides in disposal facilities (See NUREG/CR-6567, "Low-Level Radioactive Waste Classification, Characterization, and Assessment: Waste Streams and Neutron-Activated Metals").

The uniform manifests are often the best source of inventory information for performance assessments, though the disposal sites are not required to use the uniform manifest information. Because the inventory of radionuclides is a key parameter in the determination of the projected dose from the groundwater pathway in a performance assessment, the reporting of more accurate information for risk-significant radionuclides on the uniform manifests could improve the usefulness of the performance assessment results and lead to better decision making regarding the disposal of LLRW. Overestimation of inventory could lead to premature loss of disposal system capacity (e.g., closure of disposal sites), whereas underestimation of inventory could lead to public health and safety concerns.

SUMMARY OF ISSUE

Licensees may be able to generate and report more accurate uniform manifest numbers for wastes that have radionuclide concentrations less than the LLD by using indirect methods. It is expected that the use of indirect methods will be most appropriate for licensees with well-characterized and consistent waste streams (e.g., nuclear power plants). 10 CFR 61.55(a)(8) allows for the use of indirect methods to determine the concentrations of radionuclides in waste for the purpose of waste classification *if there is reasonable assurance that the indirect methods can be correlated with actual measurements*. However, the instructions for completing the uniform manifest (NUREG/BR-0204) do not include this option for reporting the inventory of H-3, C-14, Tc-99, and I-129.

The basis for any indirect methods used should be justified by the licensee. As part of this basis, the licensee should determine the range of conditions under which the indirect method is appropriate and the situations that could lead to a change in the correlation or cause the indirect method to no longer be appropriate. This is particularly important when the indirect method is based on an empirical relationship that does not have a physical basis. For example, indirect methods involving the correlation of radionuclides with different production mechanisms (e.g., activation products versus fission products) or different transport properties (e.g., H-3 and C-14 versus Co-60 or Cs-137) would not be expected to correlate well over a range of conditions.

One type of indirect method is the use of scaling factors. Scaling factors are used to calculate the activity of a difficult-to-measure radionuclide from that of an easy-to-measure radionuclide that have been shown to be correlated. The NRC previously published guidance on the use of scaling factors to determine radionuclide concentrations in waste for the purpose of waste classification in the 1983 Branch Technical Position (BTP) on Waste Classification, as well as in Information Notice 86-20, "Low Level Radioactive Waste Scaling Factors, 10 CFR Part 61." This guidance is summarized in Enclosure 1 and is also applicable to the use of scaling factors for the purpose of reporting of hard-to-measure radionuclides on the uniform manifest. As stated in the guidance and described in more detail in Enclosure 1, scaling factors should be periodically confirmed through direct measurements of samples that are representative of the waste stream, and a reasonable target for determining inferred radionuclide concentrations is that the concentrations are accurate to within a factor of 10.

Other indirect methods, such as the use of material accountability or computer codes that predict the activity of radionuclides, can also be used to determine the reported activity of H-3, C-14, Tc-99, and I-129 on the uniform manifest if there is reasonable assurance that the results obtained using these methods are correlated with actual measurements. As with the use of scaling factors, periodic sampling should be performed to confirm that the method remains appropriate and that it is accurately determining the concentrations to within a factor of 10.

Although licensees may report conservative values for radionuclides on the uniform manifest, there may be benefits for disposal facilities if more accurate and less conservative numbers are used. The 1983 BTP on waste classification states that the lower limit of detection of a measurement technique for direct measurement of a particular radionuclide should be no more than 0.01 times the concentration for that radionuclide listed in Table 1 of §61.55, and 0.01 times the smallest concentration for that radionuclide listed in Table 2 of §61.55. Although not required, licensees can take additional steps, such as using improved analytical techniques (e.g., mass spectrometry, increased count times), to achieve a lower detection limit.

This RIS does not require licensees to make any changes to how they report the activity of H-3, C-14, Tc-99, and I-129 on the uniform manifest, and licensees continue to have the option to report LLD-based activity values. As described in NUREG/BR-0204, LLD-based values reported on the uniform manifest should continue to be put in parentheses.

BACKFIT DISCUSSION

This RIS discusses additional ways by which licensees may satisfy the existing regulatory requirements in 10 CFR Part 20, Appendix G. This RIS requires no action or written response beyond that already required by the regulations. As this RIS does not require any action, the

RIS does not represent backfitting as defined in 10 CFR 50.109(a)(1), and is not otherwise inconsistent with any issue finality provision in 10 CFR Part 51. Therefore, the NRC did not prepare a backfit analysis for this RIS or further address the issue finality criteria in Part 52.

FEDERAL REGISTER NOTIFICATION

[Discussion to be provided in final RIS]

CONGRESSIONAL REVIEW ACT

[Discussion to be provided in final RIS]

RELATED GENERIC COMMUNICATIONS

Information Notice 86-20, "Low-Level Radioactive Waste Scaling Factors, 10 CFR Part 61"

PAPERWORK REDUCTION ACT STATEMENT

This RIS does not contain information collection requirements and, therefore, is not subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.).

CONTACT

This RIS requires no specific action or written response. If you have any questions about this summary, please contact one of the technical contacts listed below.

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Enclosures

1. Additional Information on the Use of Scaling Factors
2. References
3. Recently Issued FSME Generic Communications

ADDITIONAL INFORMATION ON THE USE OF SCALING FACTORS

The NRC previously published guidance on the use of scaling factors in the 1983 Branch Technical Position (BTP) on Waste Classification and Information Notice (IN) 86-20. This previous guidance is also applicable to the use of scaling factors for the purpose of reporting of hard-to-measure radionuclides on the uniform manifest. In this previous guidance, the NRC staff stated that a reasonable target for determining inferred radionuclide concentrations is that the concentrations are accurate to within a factor of 10 when compared to direct measurements.

As described in the BTP and IN 86-20, scaling factors should be developed on a facility and waste stream specific basis. If a site has multiple units, separate scaling factors may need to be developed for the waste streams from each unit. If generic information from other sites is used in the development of the scaling factors, it is important to consider whether the information is applicable to the specific facility and waste streams. For example, if a power reactor has a higher amount of fuel failure than usual, generic information may not be applicable.

Scaling factors should be periodically confirmed through direct measurements of samples that are representative of the waste stream. More rigorous analytical techniques, such as using an increased counting time or mass spectrometry, may be needed for these measurements to verify values that are lower than the lower limit of detection (LLD) typically achieved. The guidance in the BTP suggests that the confirmatory analysis should be performed on at least a biannual basis for Class A waste and annually for Class B and C waste; however, the BTP goes on to state that "these frequencies may be raised or lowered based upon consideration of particular facility, waste stream, or radionuclide characteristics." Therefore, licensees can change the sampling frequencies (e.g., per fuel cycle) based on information such as trend analysis or historical data. A confirmatory analysis should also be performed whenever there is reason to believe that facility or process changes may have significantly altered the previously determined correlations (e.g., increased fuel failure, crud burst, change in reactor coolant chemistry, etc.).

IN 86-20 discusses problems observed in the determination of low-level waste scaling factors during the 1980s and provides guidance on how to avoid these problems and the inappropriate use of scaling factors. Inspections at the time found that licensees were using scaling factors derived from a mix of generic and facility-specific data that differed significantly from actual measured values, with differences as high as a factor of 10,000 being observed. The inspections also found that the same scaling factors were often used for all of the waste streams despite significant differences in radionuclides in the different waste streams. When discrepancies (i.e., differences greater than a factor of 10) are observed between the calculated and measured concentration values, either the scaling factors need to be adjusted, or the waste stream needs to be resampled if there is some question as to the validity of the sample analysis causing the discrepancy. It may also be useful to perform a trend analysis comparing the predicted and actual concentration values to ensure that the scaling factors are not consistently under or over-predicting the inventories in the waste stream.

References

1. 10 CFR Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste" (<http://www.nrc.gov/reading-rm/doc-collections/cfr/part061/>)
2. 10 CFR Part 20, Appendix G, "Requirements for Transfers of Low-Level Radioactive Waste (LLRW) Intended for Disposal at Licensed Land Disposal Facilities and Manifests," (<http://www.nrc.gov/reading-rm/doc-collections/cfr/part020/>)
3. IN 86-20, "Low Level Radioactive Waste Scaling Factors, 10 CFR Part 61," (ADAMS Accession No. ML103420436)
4. NUREG/CR-6567, "Low-Level Radioactive Waste Classification, Characterization, and Assessment: Waste Streams and Neutron-Activated Metals" (ADAMS Accession No. ML003752437)
5. 1983 Branch Technical Position on Radioactive Waste Classification (ADAMS Accession No. ML033630755)
6. NUREG/BR-0204, Rev 2, "Instructions for Completing NRC's Uniform Low-Level Radioactive Waste Manifest," (ADAMS Accession No. ML071870172)
7. NUREG/CR-6567, "Low-Level Radioactive Waste Classification, Characterization, and Assessment: Waste Streams and Neutron-Activated Metals," (ADAMS Accession No. ML003752437)

List of Recently Issued Office of Federal and State Materials and Environmental Management Programs Generic Communications			
Date	GC No.	Subject	Addressees
03/13/2014	RIS-2014-03	Notice of 10 CFR Part 37 Implementation Deadline for NRC Licensees	All holders of and applicants for U.S. Nuclear Regulatory Commission (NRC) licenses that possess Category 1 and Category 2 quantities of radioactive material, NRC Master Material Licensees, Agreement State Radiation Control Program Directors, and State Liaison Officers
03/04/2014	IN-99-03, Rev. 1	Exothermic Reactions Involving Dried Uranium Oxide Powder (Yellowcake)	All operating uranium recovery facilities that produce uranium oxide powder (yellowcake). All Agreement States with the authority to regulate uranium mills (i.e., Utah, Colorado, Texas, Ohio, Illinois, and Washington).
01/10/2014	RIS-2014-01	Regulatory Requirements for Withholding of Proprietary Information from Public Disclosure	All distributors of general license devices submitting a request that information be withheld from public disclosure under the provisions of Title 10 of the <i>Code of Federal Regulations</i> Section 2.390, "Public Inspections, Exemptions, Requests for Withholding." All Agreement and Non-Agreement States, and State Liaison Officers.
11/15/2013	IN-2013-22	Recent Licensing Submittals Containing Personally Identifiable Information	All materials licensees, certificate holders, applicants, and other entities subject to regulation by the U.S. Nuclear Regulatory Commission for the use of source, byproduct, and special nuclear material. All Radiation Control Program Directors and State Liaison Officers.

List of Recently Issued Office of Federal and State Materials and Environmental Management Programs Generic Communications			
Date	GC No.	Subject	Addressees
10/17/2013	RIS-2013-17	Resuming Normal Interactions Between the NRC and NRC Stakeholders Following an Agency Shutdown	All U.S. Nuclear Regulatory Commission (NRC) licensees, certificate holders, permit holders, and applicants; all Agreement and Non-Agreement States, and State Liaison Officers; and other interested stakeholders.
10/09/2013	RIS-2013-16, Supp. 1	Interactions Between the NRC and NRC Stakeholders During a Lapse of Agency Appropriations	All U.S. Nuclear Regulatory Commission (NRC) licensees, certificate holders, permit holders, and applicants; all Agreement and Non-Agreement States, and State Liaison Officers; and other interested stakeholders.
Note: This list contains the six most recently issued generic communications, issued by the Office of Federal and State Materials and Environmental Management Programs. A full listing of all generic communications may be viewed at the NRC public Web site at the following address: http://www.nrc.gov/reading-rm/doc-collections/gen-comm/index.html			