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SUNSI Review Complete
Template=ADM-013
E-RIDS=ADM-03

ADD: Cynthia Barr, Sarah Achten, Mary Neely
Comment (5)
Publication Date: 5/4/2023
Citation: 88 FR 28618

As of: 6/6/23, 10:20 AM
Received: June 05, 2023
Status: Pending_Post
Tracking No. lii-z26o-5uyd
Comments Due: June 05, 2023
Submission Type: Web

Docket: NRC-2023-0067
Innovative Approaches for Data Collection and Analysis of Surface and Subsurface Residual Radioactivity to Support License Termination

Comment On: NRC-2023-0067-0001
Modern Approaches for Radiological Measurement, Data Collection, and Data Analysis of Surface and Subsurface Residual Radioactivity To Support NRC License Termination

Document: NRC-2023-0067-DRAFT-0005
Comment on FR Doc # 2023-09513

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General Comment

See attached file(s)

Attachments

ES-2023-002 EnergySolutions Comments on NRC-2023-0067

ENERGYSOLUTIONS

June 5, 2023 ES-2023-002

Cynthia Barr
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Comments on Approaches to Radiological Survey to Support Decommissioning and License Termination, Agency/Docket Number NRC-2023-0067

Dear Ms. Barr:

The U.S. Nuclear Regulatory Commission (NRC) requested comments associated with "Modern Approaches for Radiological Measurement, Data Collection, and Data Analysis of Surface and Subsurface Residual Radioactivity To Support NRC License Termination" (Agency/Docket Number NRC-2023-0067) in the *Federal Register* (88 FR 28618) on May 4, 2023. In this notice, the NRC requested responses to a set of general questions.

Energy*Solutions* has reviewed the request and has provided responses to the questions in the attachment to this letter.

Energy*Solutions* appreciates staff efforts to collect this information. We also appreciate the opportunity to comment regarding the techniques that we have implemented on nuclear power plant decommissioning projects. Conducting final status surveys and collecting data to terminate a Part 50 license has proven to be a significant, time-consuming challenge. It is our view that there are survey and data analysis techniques available that could improve the process of demonstrating that a site can be safely released. We encourage the NRC to identify in its guidance those techniques that are available and can be relied upon. It would be of great help to the industry for NRC to issue guidance that would clarify for licensees which techniques they can rely upon with the knowledge that their use will be acceptable to the NRC. Energy*Solutions* looks forward to this increased level of certainty as it continues to decommission nuclear power plants and safely release the sites for unrestricted use.

This letter contains no NRC commitments. If you have any questions, please email me at jtwheat@energysolutions.com.

Respectfully submitted,

Justin T. Wheat
Regulatory Affairs Director

Attachment: Energy*Solutions* Comments on Docket ID NRC-2023-0067

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ATTACHMENT

Energy*Solutions* Comments on Approaches to Radiological Survey to Support Decommissioning and License Termination, Agency/Docket Number NRC-2023-0067

Energy*Solutions* Comments on Approaches to Radiological Survey to Support Decommissioning and License Termination, Agency/Docket Number NRC-2023-0067

No.	Question	Energy*Solutions* Response
1	What types of system(s) or equipment (i.e., instrumentation, including radiation detectors, and software) do you use or plan to use to record radiation detector location and raw instrument response?	There are four systems available that Energy*Solutions* may use in support of final status surveys to record instrument response and position. The systems generally follow the guidance provided in NUREG-1507 and are briefly described below. Position-Sensitive Gas Proportional Counter This system is a single anode-wire detector coupled to a drive vehicle and guided by an operator. This can be used for flat surfaces such as floors and walls and measures gross beta or gross alpha radiation. The software is proprietary to the original equipment manufacturer and processes the data in overlapping 100 cm^2 areas with position correlation based on the drive system digital encoder coordinates. The final output is a two-dimensional display of count rate or activity levels on an overlay map. The system is also capable of operating in a dual-detector coincidence counting mode for low-level alpha scanning. The lower limit of detection for this system is established based on automated empirical testing. Single Gamma-Sensitive Scintillator A single small gamma-sensitive scintillator connected to recording hardware that simultaneously logs Global Positioning System (GPS) location with the detector count rate. This data can be exported to geographic information system (GIS) software and manipulated to display results in a variety of formats including tabular and color-coded maps. Some equipment is also capable of logging the gamma energy spectrum for each interval. The electronics are typically contained in a backpack and operated by a technician for soil surveys.

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No.	**Question**	**Energy*Solutions* Response**
		Towed Gamma Sensitive Scintillator Array An array (up to eight) of small gamma sensitive scintillators towed by a vehicle at a known velocity that simultaneously records each detector response and the corresponding GPS location. Sodium Iodide Scintillation Detectors A pair of large NaI(TI) detectors (4" x 4" x 16") attached to a vehicle and equipped with an onboard logging GPS system. This system is designed and operated to log the gamma spectrum data from each detector at a user-defined interval as the detectors move over the surface at a controlled speed by the vehicle.
2	What methods do you use to calculate scan minimum detectable concentrations to ensure sufficient sensitivity to detect risk-significant levels of residual radioactivity or to better understand measurement uncertainty?	For the systems described above and for a standard assumed cylindrical soil geometry, a sensitivity factor in cps per uR/hr can be measured in a calibration laboratory for each detector. Similar to hand scanning, a calculation to estimate the expected exposure rate factor (uR/hr per pCi/g) can be conservatively calculated to apply against the sensitivity factor to estimate the detector concentration sensitivity factor in cps per pCi/g for standard soils. For discrete particles, the approach is more complicated and supported using a probabilistic analysis and different calibration methods. The minimum detector count (MDC) rate can be determined from a statistical analysis of the collected data sets and this value may differ from across a survey area as background radioactivity/radiation may be heterogeneous.

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No.	Question	**Energy*Solutions* Response**
3	What methods have you used to post-process data to identify areas for follow-up investigation (e.g., use of radiation surveys maps, and statistical tests and measures to identify anomalous radioactivity to be targeted for follow-up investigation)?	For the systems described above, the survey results are represented by large volumes of data. If the data represents a large physical area, then the data has likely been divided into grids, each representing hundreds of measurements (ranging from several hundred to over a thousand). Within each grid, statistics such as mean and standard deviation are calculated and each point in excess of the mean is transformed into a z-score (multiples of the standard deviation) and displayed on a color-coded map. This method identifies graded areas within each grid that are above the mean. The highest of these values are targeted for further investigation. If a system is used that collects gamma spectroscopic data, then review of this data may be part of the investigation.
4	Have you experienced technical issues with data collection and analysis during previous surveys and what methods did you use to troubleshoot those issues? Do you have any lessons learned you could share related to the technical issues?	Depending on the location of the site and the selected GPS system, the accuracy of the GPS coordinate can vary. This may necessitate a more advanced GPS post-processing to correct the location coordinates or the use of other augmented GPS technology. Prior to collecting survey data, this accuracy should be well understood. However, the accuracy for these locations need only be approximately one meter since investigations can be limited to this level. If using a vehicle to move the detectors, select one whose speed can be well controlled at low velocities. Also, ensure the operators of the vehicle practice operations driving in straight paths over long distances and/or use visual aids or precision technology to control survey paths.

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No.	**Question**	**Energy*Solutions* Response**
5	What areas do you see as challenges or gaps to radiological survey design and data analysis that could be addressed in future guidance (e.g., a priori scan minimum detectable concentrations calculation) or tool development (e.g., data integration and post-processing)?	Future guidance should include a-posteriori data processing and MDC calculations that recognize the impact of heterogeneous background distributions. We believe that the use of scan-only surveys using systems that collect large quantities of data with the appropriate analysis should replace the need for performing sampling or fixed measurements if the coverage and MDC values are at or below the derived concentration guideline level (DCGL) values. GIS software has the tools needed to post-process scan data. However, this level of data manipulation requires an in-depth knowledge of digital mapping and the use of these specialized software tools. As such, the availability of tools specific for these tasks would allow for use by less specialized staff with minimal training needs.

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No.	Question	Energy*Solutions* Response
6	What types of instrumentation and approaches do you use to collect subsurface radiological survey data in the field? Specifically, what types of instrumentation and approaches has your organization used to perform surveys of hard to access locations in the subsurface (embedded piping, sumps, soils located at depth or underneath buildings, and bedrock)?	Embedded Piping We use a pipe crawler outfitted with either a beta or gamma detector. The crawler is advanced into the pipe manually at predetermined intervals and a count is initiated for a predesignated count time. Sumps Typically, sumps are modeled and surveyed using in-situ gamma spectroscopy. Deep Soils or Underbuildings and Bedrock Borings are normally collected using a probe rig or a larger drill rig depending on the depth and physical challenges to access the subsurface. The sampling frequency is generally much less than surface soils and is informed based on historical information. For soil collection, samples are aggregated and homogenized over a distance corresponding to the modelling for subsurface soils. Extracted soils or bedrock are field screened with portable instrumentation and a fraction of these are processed for analytical results. In addition to the above for soils, the following methods have been used at various projects: • deep hole radiological data logging has been used for some soils and bedrock environments, • excavation and test pits surveys, • measurements of soil “lifts” in layers, and/or using soil sorter handling and radiation detection equipment.

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No.	Question	**Energy*Solutions* Response**
7	What types of methods and software (e.g., geophysical methods and related software) have been used and subsurface data (e.g., hard and soft data) have been collected, and what novel approaches have been used to combine or condition data to develop site conceptual models or mathematical models, or to show release criteria have been met?	Subsurface data is evaluated using geostatistical methods (including GIS tools) if evidence suggests that concentrations are a large fraction of the subsurface DCGLs, otherwise the data can be tabulated as a demonstration of meeting the release criteria. If the data were to show results are a large fraction of the subsurface DCGLs, a model and analysis approach would be discussed with the stakeholders to reach a technical consensus since there is no regulatory guidance available for this assessment. Note that, our decommissioning projects have not identified substantial subsurface residual radioactivity to necessitate the latter.
8	What statistical approaches have you used to show subsurface residual radioactivity meets release standards including consideration of uncertainty (e.g., number and depth of samples, type of data and statistical approaches used to demonstrate compliance)?	None have been needed to date by Energy*Solutions*. However, we are aware of methods used at other sites using geostatistical nearest-neighbor evaluations.
9	What approaches have you used to optimize subsurface survey designs including initial scoping to final status survey designs (e.g., geometrical or geostatistical techniques)?	Subsurface survey designs to date have been judgmental and informed by historical data and information.
10	What areas do you see as challenges or gaps with respect to subsurface surveys and data analysis that could be addressed in future guidance or tool development?	Currently, subsurface surveys and data analysis methods and techniques can differ among sites, and each set of solutions represents some degree of stakeholder concurrence that is informed by a combination of historical data and practices performed at prior decommissioning sites. Given that nuclear power plants and most material licensees have not shown substantial subsurface residual radioactivity, we believe that there is an excess of regulatory concern for this condition. Regulatory guidance should acknowledge this lesson learned and identify appropriate survey and data analysis methods for subsurface evaluations.