



Assessment of Radioactive Waste Management at the Lawrence Livermore National Laboratory

Interim Report

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Office of Enterprise Assessments
U.S. Department of Energy

Assessment of Radioactive Waste Management at the Lawrence Livermore National Laboratory August 26-30, 2019 Interim Report

Overview

This assessment is in response to the Deputy Secretary of Energy's July 9, 2019, memorandum directing the Office of Enterprise Assessments (EA) to undertake a U.S. Department of Energy (DOE)-wide assessment of the procedures and practices for packaging and shipping radioactive waste. The assessment activities focused on the performance of processes to characterize, package, and ship transuranic (TRU) waste as implemented at the Lawrence Livermore National Laboratory (LLNL) by the management and operating contractor, Lawrence Livermore National Security, LLC (LLNS), and Nuclear Waste Partnership, LLC (NWP). For TRU waste management, LLNL and many other generators across the enterprise implement a centralized process for waste characterization and certification through the Central Characterization Program (CCP), which is coordinated by the Waste Isolation Pilot Plant (WIPP) contractor, NWP, under the oversight of the Carlsbad Field Office (CBFO). The enhancement of this centralized structure for TRU waste management and the oversight thereof, which was initiated after the 2014 accident events at the WIPP facility, have resulted in program implementation that is generally consistent and uniform.

This assessment was performed concurrent with a waste certification audit conducted by the CBFO Office of Quality Assurance, which was commissioned to evaluate LLNL's readiness to begin shipping TRU waste to WIPP. The assessment team, identified in Appendix A, examined a sample of waste generator operations representing the waste streams shipped to WIPP for disposal. The diverse control strategy (defense-in-depth) used for LLNL's TRU waste management processes, from the generator to final packaging, is illustrated in Appendix B.

This report provides the interim results of the assessment of TRU waste management at LLNL. At the conclusion of the enterprise-wide assessment, a final compilation report will include the results of this summary. The perspective gained by conducting this assessment could change as additional information becomes available from subsequent site assessments. The final compilation report will identify best practices, lessons learned, and cross-cutting recommendations.

DOE Order 227.1A, *Independent Oversight Program*, describes and governs the DOE independent oversight program, which EA implements through a comprehensive set of internal protocols, operating practices, assessment guides, and process guides. DOE Order 227.1A defines the terms best practices, findings, deficiencies, opportunities for improvement, and recommendations. In accordance with DOE Orders 227.1A and 226.1B, *Implementation of Department of Energy Oversight Policy*, it is expected that the site will analyze the causes of findings and deficiencies identified in this summary, develop corrective action plans for findings, and implement compensatory corrective actions for program and performance deficiencies.

Summary

Overall, LLNL's waste management program ensures proper characterization, packaging, and shipping of radioactive waste for disposal, and the Livermore Field Office maintains adequate operational awareness of radioactive waste management activities. The assessment found no findings and no deficiencies, but did identify one interim recommendation and one opportunity for improvement for consideration by DOE

Federal and contractor management. In addition, this assessment found that the self-assessments performed by LLNS, as required by the National Nuclear Security Administration (NNSA) Chief of Staff's July 16, 2019, memorandum, were adequate. Although peer reviews are underway, the peer review at this site had not been completed at the time of this assessment. The results of the peer reviews will be addressed in the final compilation report..

Positive Attributes

Waste Characterization

- The CCP Acceptable Knowledge (AK) experts are knowledgeable and have diverse experience. The AK Summary Report, which was developed in accordance with CCP-TP-005, *CCP Acceptable Knowledge Documentation*, is thorough and cites all appropriate references to LLNL waste documentation. AK experts make appropriate use of this documentation in identifying waste stream constituents and characteristics.
- CCP's real-time radiography (RTR) process is well-developed and incorporates independent reviews. An initial scan and a second independent replicate scan are performed on waste containers by qualified, independent RTR operators, and the replicate scans are jointly reviewed and reconciled by all responsible RTR operators. In addition to the independent replicate scans, independent observations of video output of the RTR process are performed under uniform conditions and procedures.
- CCP RTR operators are knowledgeable and experienced. The assessment team interviewed two qualified RTR operators and observed them performing operations, during which they used the RTR equipment competently and in accordance with the applicable procedure. During observed RTR operations, the operator had a copy of the AK Summary Report available for reference, as required.

Waste Stream Control

- Waste generator processes are robust in helping ensure certainty about waste origins, treatment, characteristics, and constituents. For newly-generated waste, LLNL waste generators follow a rigorous and well-defined process for planning experiments and operations that generate radioactive waste, identifying and documenting waste stream constituents (using the Information Gathering Document), placing waste in containers, and transferring waste to organizations responsible for characterization, storage, and disposal. The current process includes videography of all contents in every container; however, once the CCP has been certified at LLNL, videography will be replaced by visual examination (VE) of 100% of the waste, allowing completion approximately four times as fast as the current process.
- For previously generated waste (also referred to as legacy waste at some DOE sites), LLNL is in the process of 100% repackaging and is using the same videography process described above for newly-generated waste. Videography will also be replaced by VE of 100% of the waste.
- The VE process coordinates both LLNL and CCP qualified personnel to effectively examine 100% of items going into TRU waste containers, and all TRU waste containers that have undergone the VE process are immediately tamper-sealed. LLNL fissile material handlers who were observed identifying and segregating items from homogeneous solid waste (solidified liquid TRU waste) demonstrated alertness in identifying prohibited items. In one instance, a fissile material handler identified a difficult-to-see undesired item among a large quantity of solidified TRU waste being packaged. The process of immediately closing and sealing waste containers that have been through

the VE process was observed; this process further helps prevent the introduction of prohibited items into the waste stream.

Packaging and Shipping

- Observations indicated that packaging and shipping processes are generally adequate. Although LLNL currently has not implemented a TRU waste shipping process, programmatic documents and interviews with responsible individuals showed that LLNL has developed a draft work activity and control document that adequately describes how LLNL supports loading operations conducted by multiple CBFO shipping and transportation contractors.

Federal Oversight

- The self-assessment directed by the NNSA Chief of Staff, following the discovery of the Y-12 National Security Complex issue, was rigorous and effective. It reviewed program documentation and recent assessments, included field observations conducted over three weeks of evaluation, and identified seven deficiencies, nine observations, seven recommendations for continuous improvement, and three strengths. The LLNL self-assessment also reviewed previous annual assessments of “generator areas” as performed by the Certified Unified Program Agency (CUPA) of the State of California and noted that those assessments found no systemic or institutional issues. The next annual CUPA was scheduled to begin in autumn 2019, shortly after the self-assessment was completed.

Findings

The assessment identified no findings.

Deficiencies

The assessment identified no deficiencies.

Other Areas of Weakness

Other areas of weakness represent potential vulnerabilities that warrant site management’s consideration but do not rise to the level of a finding or deficiency as defined in DOE Order 227.1A. For any other identified areas of weakness, the site should review the potential vulnerabilities and take appropriate actions. These weaknesses will be further reviewed against subsequent enterprise-wide site assessments to determine whether the vulnerability is cross-cutting and warrants an enterprise-wide response.

Waste Characterization

- At LLNL, CCP AK experts do not document the performance of formal and direct field-level verification of waste generator procedure implementation. Without this formal process, the AK experts do not consistently take advantage of an opportunity to better understand and provide additional oversight of waste generation processes for newly-generated waste; furthermore, added responsibility is placed on waste generator documentation and procedure change processes, such as Information Gathering Document and Interface Waste Management Documents List (IWMDL) preparation, review, and approval, as well as quality assurance and oversight processes, to verify the adequacy of implementation. (Note: Interviews revealed that the AK experts for this project have made multiple visits to the field to watch operations, but none of these visits have been formally documented or formally planned.) See OFI-CCP-LLNS-1.

Interim Recommendations

Interim recommendations are intended to capture the evolving need for possible DOE management attention based on identified conditions from a single or multiple-site assessment. Interim recommendations should be considered suggestions for improving program or management effectiveness.

- It is recommended that CCP work together with responsible site contractors to establish a formal process for AK experts to periodically observe and conduct field assessments of the processes used to generate newly-generated waste. These observations should include the range of processes used, from initial waste generation through waste packaging.

Opportunities for Improvement

Opportunities for improvement are suggestions that are offered to assist cognizant managers in improving programs and operations.

- **OFI-CCP-LLNS-1:** CCP and LLNS should consider developing work processes to formalize AK experts' verification of waste generation procedure implementation in the field and at the point of origin, as well as the documentation of this formal verification.

Appendix A
Supplemental Information

Dates of Office of Enterprise Assessments Onsite Assessment

August 26-30, 2019

Assessment Team

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Appendix B

Description of TRU Waste Control Defense-in-Depth as Applied at LLNL

This figure shows the various engineering and administrative controls implemented throughout the radioactive waste management process to ensure that waste shipped to a disposal site meets all waste acceptance criteria and that no prohibited items are accidentally introduced into waste streams. Defense-in-depth is intended to reduce the likelihood of a non-compliant waste package by implementing a diverse defensive control strategy, so that if one layer of defense turns out to be inadequate, another layer of defense will prevent a non-compliance. In this figure, the generator is the point of origin of any waste stream. As waste progresses through the process, it can be accumulated and stored at various locations. Along the way, the waste is characterized and verified to be appropriate for the approved waste stream. Once finally packaged, the waste is certified to have met all requirements and is shipped to its final disposal site.

