Assessment of the Radioactive Waste Certification Program at Nuclear Fuel Services, Inc. for Shipments to U.S. Department of Energy Sites

Interim Report

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Office of Enterprise Assessments
U.S. Department of Energy

Assessment of the Radioactive Waste Certification Program at Nuclear Fuel Services, Inc. for Shipments to U.S. Department of Energy Sites February 24-27, 2020 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.

Radioactive waste management at Nuclear Fuel Services, Incorporated (NFS) is regulated by the Nuclear Regulatory Commission (NRC), the state of Tennessee, and the Environmental Protection Agency (EPA); however, some of its radioactive waste is shipped to DOE sites for treatment and/or disposal. This assessment focused on the waste certification program at NFS for shipments to DOE sites, specifically: (1) the shipment of potential transuranic (TRU) waste by NFS to the DOE Transuranic Waste Processing Center (TWPC) in Oak Ridge, Tennessee for characterization, packaging, and shipment by TWPC for disposal at the Waste Isolation Pilot Plant (WIPP) as TRU waste or at the Nevada National Security Site (NNSS) for waste that TWPC characterizes as low-level waste (LLW); and (2) the characterization, packaging, and shipment of LLW by NFS to NNSS for disposal. The EA assessment team also assessed the effectiveness of corrective actions taken by NFS and the NNSS radioactive waste acceptance program (RWAP) to address the NFS non-compliant shipments to NNSS of 55 2-liter bottles of corrosive, hazardous liquid ("blowback" solution) and 93 waste packages containing chromium mischaracterized as LLW. NFS self-identified these non-compliant shipments in 2016.

During February 25-26, 2020, a team from the NNSS RWAP concurrently performed a surveillance of LLW management at NFS. A representative from the National Nuclear Security Administration Nevada Field Office (NFO), the DOE Office of Environmental Management (EM) RWAP Program Office, and the state of Nevada oversaw this RWAP surveillance.

The EA assessment team, identified in Appendix A, examined NFS and the NNSS RWAP corrective actions from the non-compliant shipments in 2016, a sample of NFS waste operations, and the performance of the concurrent NNSS RWAP surveillance to assess the effectiveness of the corrective actions. NFS operations examined involve packaging and certifying LLW and packaging and shipping potential TRU waste for treatment and disposal at DOE sites. Separately, EA performed two other assessments related to the NNSS RWAP and the processing of NFS radioactive waste. The first at NNSS, including an assessment of its RWAP, was performed in February 2020. The second in March 2020 was of LLW and TRU waste management at Oak Ridge for EM, including the TWPC's characterization, packaging, and shipment of NFS-generated LLW and TRU waste. The results of these two related assessments are addressed in separate interim reports.

This report provides the interim results of the assessment of the NFS and the NNSS RWAP corrective actions from the non-compliant shipments in 2016 and the radioactive waste certification program at NFS. 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 (OFIs), and recommendations and how these are required to be addressed within the DOE complex.

Summary

Overall, the NFS and the NNSS RWAP causal analyses and corrective actions requested and overseen by NFO instituted significant changes in NFS's management of radioactive waste and the NNSS RWAP. Subsequent audits and inspections of NFS waste processing by the NNSS RWAP, the NRC, the state of Tennessee, and the EPA did not identify recurrence of these non-compliances. The NNSS RWAP surveillance team that was on site concurrent with this EA assessment effectively implemented the lessons learned and corrective actions developed by the NNSS RWAP from its causal analysis of NFS-identified non-compliances. These actions improved NNSS RWAP's oversight of NFS's waste certification program to prevent recurrence of similar non-compliances.

NFS procedures and their implementation provide objective evidence (e.g., video of waste packaging operations, with audio narration) of waste package contents, composition, and the absence of prohibited items for all potential TRU waste being shipped by NFS for characterization, packaging, and shipment by TWPC for disposal at WIPP (for TRU waste) and NNSS (for waste that TWPC characterizes as LLW).

This assessment identified no findings, deficiencies, other areas of weakness, or interim recommendations for the waste certification program at NFS. This assessment identified two OFIs to help ensure that NNSS RWAP assessors develop the skills to assess the performance of waste certification programs via the use of mentors and/or additional guidance to supplement the new profile review checklist and that NFS requires workers to print their name (and/or badge number) on documents next to their signatures or initials.

Positive Attributes

Waste Certification Program Supporting Disposal at NNSS

Corrective Actions for Non-compliances Reported by NFS in 2016

- In addition to a causal analysis, NFS performed a failure mode, effects, and criticality analysis (FMECA) to identify programmatic weaknesses and prioritize actions to resolve them, leading to the significant improvements to the NFS waste certification program listed below.
- Comment resolution on the NFS corrective action plans was formally documented and indicative of rigorous and open communication between NFS and NNSS RWAP.
- NFS significantly improved its waste certification program by:
    - Significantly improving the integration of process knowledge (e.g., from engineers cognizant of fuel manufacturing processes) into waste characterization by assigning this responsibility to "waste engineers." These waste engineers also develop specific waste instructions for workers' use to ensure that waste is appropriately dispositioned.
    - Including waste organization management and waste engineers in the NFS configuration control process (i.e., the Safety and Regulatory Review Routing Form) to ensure that changes impacting waste certification are appropriately addressed.

- Establishing periodic reviews of waste streams and their associated bases for waste determination to ensure that waste characterization accurately reflects current processing methodologies.
- Improving the coordination of material accountability inventories and production schedules to reduce the number of bottles of blowback solution generated. By procedure, bottles of blowback solution are now also required to be treated and segregated from other bottles of solid waste to prevent inadvertently shipping additional non-compliant bottles of blowback solution to NNSS.

- NFS proactively worked with the states of Tennessee and Nevada to exclude radioactive waste containing chromium from hazardous waste controls, allowing it to be stored at NFS and shipped to NNSS for disposal as LLW.
- NNSS improved its RWAP by:
  - Using the lessons learned from these non-compliances to provide training to NNSS RWAP and NFS personnel, and adding training on waste profile review and acceptance to the qualification process for NNSS RWAP auditors.
  - Revising NNSS RWAP procedures to include additional examination of waste streams that rely primarily on process knowledge.
  - Reiterating the waste generator's responsibility to give profile reviewers and/or NNSS RWAP assessors access to the information or facility needed to validate waste determinations.
- In May 2017, the NFS parent organization, BWX Technologies, Incorporated, issued an independent assessment of NFS's corrective action implementation verifying readiness to restart waste shipments to NNSS.
- In May 2017, an NNSS RWAP audit determined that the NFS waste certification program was effective and that the NFS corrective actions were "major changes to the NFS waste characterization and certification processes, and through continued implementation will ensure waste shipped to the NNSS is compliant with the current NNSS WAC [waste acceptance criteria] and will prevent recurrence of similar issues." Subsequent NNSS RWAP audits did not identify any recurrence of these non-compliances.
- Subsequent audits and inspections at NFS by the NRC, the state of Tennessee, and the EPA that reviewed NFS's radioactive waste management did not identify any findings/violations "of more than minor significance."
- In June 2019, NFS issued a second FMECA to assess the effectiveness of actions taken after the first FMECA and to identify actions to further improve radioactive waste management by NFS. NFS has kept NNSS RWAP personnel informed of these actions.

NNSS RWAP Surveillance

- Both NNSS RWAP surveillance team members were experienced and knowledgeable of NFS facilities and programs. They had participated in previous NNSS RWAP audits and surveillances at NFS and conducted the surveillance efficiently.
- The NNSS RWAP surveillance included adequate field observations of the generation, handling, staging, and storage of the two waste streams being shipped to NNSS for disposal.
- The NNSS RWAP surveillance demonstrated that the applicable corrective actions taken for its RWAP have been effective:
  - NNSS RWAP surveillance team members had the necessary security clearances and access to the NFS areas and information to effectively evaluate the NFS waste management program, processes, and waste characterizations.

- The checklists used by the NNSS RWAP surveillance team adequately ensured that a new NFS profile for storing, shipping, and disposing radioactive waste with chromium as LLW at NNSS, per the exclusions approved by the states of Tennessee and Nevada, complied with the NNSS waste acceptance criteria. The NNSS RWAP surveillance team members also supplemented this checklist with additional lines of inquiry based on their experience and knowledge. (See **OFI-RWAP-1**.)

Interface with TWPC

Waste Stream Control and Development of Process Knowledge

- NFS records video, with audio narration, of all potential TRU waste to provide evidence of waste package contents and composition, as well as the absence of prohibited items. The associated standard operating procedure (SOP 335-L, *Waste Packaging for WIPP Disposal*) provides extensive instructions for recording both written and video/audio information on waste package contents.
- An in-depth review of shipping records for 101 TRU waste drums, 55 LLW drums, and 2 LLW boxes confirmed compliance with U.S. Department of Transportation regulations and TWPC or NNSS waste acceptance criteria, as appropriate. However, a number of these characterization and shipping documents did not clearly indicate who performed or initialed some steps or corrections. (See **OFI-NFS-1**.)

Findings, Deficiencies, Other Areas of Weakness, and Interim Recommendations

This assessment identified no findings, deficiencies, areas of weakness, or interim recommendations applicable to the NFS radioactive waste certification program for shipments to DOE sites.

Opportunities for Improvement

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

- **OFI-RWAP-1:** NNSS RWAP should consider providing guidance and/or assigning more experienced auditors as mentors to supplement the new profile review checklist and ensure that its RWAP teams assess the performance of waste certification programs in addition to compliance with NNSS waste acceptance criteria.

- **OFI-NFS-1:** NFS should consider implementing the typical industry practice of requiring a printed name (and/or badge number) to be recorded on documents when the performer records a signature or initials.

Appendix A
Supplemental Information

Dates of Office of Enterprise Assessments (EA) Onsite Assessment

February 24-27, 2020

Assessment Team

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