STANDARDIZATION OF DOE DISPOSAL FACILITIES WASTE ACCEPTANCE PROCESSES

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ABSTRACT

On February 25, 2000, the U.S. Department of Energy (DOE) issued the Record of Decision (ROD) for the Waste Management Programmatic Environmental Impact Statement (WM PEIS) for low-level and mixed low-level wastes (LLW/ MLLW) treatment and disposal. The ROD designated the disposal sites at Hanford and the Nevada Test Site (NTS) to dispose of LLW/MLLW from sites without their own disposal facilities. DOE's Richland Operations Office (RL) and the National Nuclear Security Administration's Nevada Operations Office (NV) have been charged with effectively implementing the ROD. To accomplish this task NV and RL, assisted by their operating contractors Bechtel Nevada (BN), Fluor Hanford (FH), and Bechtel Hanford (BH) assembled a task team to systematically map out and evaluate the current waste acceptance processes and develop an integrated, standardized process for the acceptance of LLW/MLLW. A structured, systematic, analytical process using the Six Sigma system identified disposal process improvements and quantified the associated efficiency gains to guide changes to be implemented. The review concluded that a unified and integrated Hanford/NTS Waste Acceptance Process would be a benefit to the DOE Complex, particularly the waste generators. The Six Sigma review developed quantitative metrics to address waste acceptance process efficiency improvements, and provides an initial look at development of comparable waste disposal cost models between the two disposal sites to allow quantification of the proposed improvements.

INTRODUCTION

To document plans and objectives in dealing with the radioactive low-level and mixed low-level wastes (LLW/MLLW) generated and processed in cleaning up its sites and facilities, the U.S. Department of Energy (DOE) published the Waste Management Programmatic Environmental Impact Statement (WM PEIS) for the complex (1). As indicated in the WM PEIS Record of Decision (ROD) for LLW and MLLW (2), waste disposal facilities at the Hanford Site in southeast Washington state and at the Nevada Test Site (NTS) in Nevada were designated to receive wastes from other DOE sites across the complex as well as continuing to dispose of wastes generated on-site. This means that the approximately 30 waste generating sites that do not have on-site disposal capacity will have to meet the waste acceptance criteria at either Hanford or the NTS, or both, as they clean up and close their respective facilities.

The Waste Management Division Directors from DOE's Richland Operations Office (RL) and the National Nuclear Security Administration's Nevada Operations Office (NV) have recognized

the need to examine their existing waste acceptance processes at Hanford and the NTS, respectively. They assembled a joint task team with representatives from NV and RL, assisted by their operating contractors Bechtel Nevada (BN), Fluor Hanford (FH), and Bechtel Hanford (BH), to identify improvements that could be made to increase complex-wide waste disposal efficiency and effectively implement the decisions made in the amended WM PEIS ROD.

The current separate waste acceptance practices, which require waste generators to conform to both the NTS and Hanford review and approval processes to be authorized to ship waste to both disposal sites, are viewed as being less than optimal. It is felt that a single standardized process could be developed to eliminate inefficiencies and duplicative requirements, and to take full advantage of the WM PEIS ROD's direction regarding ultimate disposition of LLW/MLLW.

The specific focus of this joint task team was to develop an improved, standardized, and integrated waste acceptance process between waste generators and the two waste disposal sites. The objective is to present affected waste generators with one set of programmatic acceptance requirements in order to qualify waste for shipment to either site. The degree to which site-specific waste acceptance criteria can be combined into a single set of performance requirements will be determined during the implementation phase as specific waste streams are evaluated. Some site-specific waste acceptance criteria, which are based on disposal site-specific performance assessments, may still need to be met by generators, but the process for waste stream approval will be standardized.

The results of this effort will include a description of the improved standardized process, as well as the logical underpinnings to support and justify the recommended changes. While this project addresses only a portion of the overall waste disposal issues across the DOE complex, the conclusions drawn from this effort can be used to make substantive process improvements that will result in more efficient use of DOE waste disposal resources.

This effort will also help address several criticisms have been made of DOE's LLW/MLLW practices. These criticisms include concerns raised by the U.S. General Accounting Office (GAO) disposal cost report (3), the DOE Inspector General's (IG's) audit report (4), the GAO's nuclear cleanup report (5), and outcomes of related Congressional appropriations hearings. The predominant concerns revolve around issues of the cost-effectiveness of waste disposal decisions.

In response to the DOE IG audit report (4) regarding the use of DOE's LLW disposal facilities, DOE has committed to the following actions:

1. Establish an integrated, complex-wide disposal program to ensure the optimal use of LLW and MLLW disposal facilities.

2. Develop a standard waste acceptance process to allow generators to qualify waste for disposal at either NTS or Hanford.

3. Establish performance measures for the efficient use of NTS and Hanford disposal operations.

The task team charter addresses the second commitment, the responsibility for which was jointly delegated to NV and RL as DOE's designated LLW/MLLW disposal site operators.

A Waste Generators' Summit, held in Denver, Colorado in June 2001, addressed these wide-ranging issues. The objectives of the Summit were to assist DOE in developing responses to criticisms, and to achieve a cost-effective path forward to demonstrate fiscal responsibility on a complex-wide basis for waste disposal decisions. A preliminary draft of the standardized waste acceptance process was presented at the Summit to solicit comments and input. Subsequent to this Summit, an improved standardized process was developed to address comments and further refinements.

DEVELOPMENT

The set of analytical tools adopted to provide a structured framework for this process improvement project is the Six Sigma methodology, as applied by BN and BH. Six Sigma is a rigorous statistical-based system for achieving, sustaining, and maximizing business performance. The methodology provides a clear means of work-process quality measurement, resulting in the identification of significant process enhancements. It consists of four sequential phases: Measure, Analyze, Improve, and Control.

The joint NV and RL team applied the Six Sigma "Measure" phase tools, supplemented by "Analyze," "Improve," and "Control" activities, to develop a conceptual framework for enhancing the waste acceptance process. The team used the process mapping tool to break each site's process into a series of steps and identified the associated measurable components that contribute to the process (input variables) and corresponding measurable results of the process (output variables). The value added by each input and output step were evaluated to aid in determination of overall process efficiency. Additionally, failure modes and effects analysis (FMEA) was used to identify and prioritize potential process improvements.

Five significant differences exist between the waste management activities at the two disposal sites: (1) site-specific environmental conditions result in limitations on the types of waste that can be accepted for disposal at each site, (2) the authority delegated to the contractor, (3) the volume of waste disposed on an annual basis, (4) the sources of waste, and (5) waste shipment and disposal volume forecasting processes. These differences are further described as follows:

- Both sites have a Disposal Authorization Statement issued by DOE pursuant to DOE Order 435.1 (6), identifying site-specific technical restrictions on the waste that can be accepted for disposal, based on site-specific performance assessments and environmental analyses. The idealized waste acceptance process will not eliminate any of these technical requirements.

- At NTS, NV has retained the decision-making authority for waste acceptance at the Federal level. At Hanford, RL has delegated waste acceptance authority to the contractor.

- At NTS, the volume of LLW sent for disposal by offsite generators is presently more than 1 million ft^3 per annum. At Hanford, the volume of LLW/MLLW sent for DOE disposal by offsite generators is presently about 100,000 ft^3 per annum. Both sites have the physical capability to increase the volume of waste disposed. NTS expects to handle annual volumes in the range of 2 to 3 million ft^3 over the next 5 years; Hanford expects to handle volumes in the range of 200,000 to 300,000 ft^3 per year, unless rail transport capability is restored and larger volumes are shipped to Hanford by rail.

- Up to 90% of the wastes disposed at NTS are generated offsite, but at Hanford only about half of the waste disposed comes from offsite generators.

- Both sites require specific forecasts of future waste volumes by generators; however, the methods and data stipulated for each of these sites are different.

The NTS waste acceptance process involves a strong front-end emphasis on the application of generator waste certification programs based on nationally recognized quality assurance standards. Onsite facility evaluations of the generators' waste streams and waste certification programs are performed to ensure that they meet the NTS waste acceptance criteria. Facility evaluations include a review of waste traceability, quality assurance, RCRA compliance, and radiological characterization. New waste streams are evaluated through the NV's Waste Acceptance Review Panel (WARP), comprised of various technical disciplines, including representatives from the State of Nevada. The NTS approach is to establish quality up-front and to verify waste generator compliance through onsite facility evaluations and the WARP process.

Hanford's waste acceptance process incorporates limited quality assurance reviews of generator programs to ensure that they meet the Hanford Site criteria. Hanford relies more heavily on performing physical verification of waste streams on the receiving end at Hanford through nondestructive assay, visual examination, and/or chemical sampling. This approach focuses on demonstrating proof-of-compliance to the regulators upon waste receipt. Physical verification serves as the primary quality control point that demonstrates a generator is complying with the waste acceptance criteria, and indicates (through passing the verification function) that the generator's quality assurance program is effective.

The results of the process mapping and FMEA for each site were analyzed to develop an idealized process that incorporated the essential features of each while optimizing the throughput by eliminating steps that add no value to the outcome of the process or that intentionally build in "review, comment and rework" loops. Instead of traditional documentation review, comment and resolution cycles, the idealized process utilized cooperative, facilitative processes in which the integrated disposal sites and generator site personnel work together to develop acceptable approved waste stream profiles and shipment authorizations. The idealized process was developed in conjunction with a review of applicable regulatory requirements to ensure that all were properly considered and provisions incorporated to ensure compliance. It is designed so the teamwork and cooperation during the development of waste management programs and documents, facility evaluations, waste profiles, and waste shipment receipt will enhance process efficiency, reduce cycle time, eliminate rework cycles, and improve communication.

The facilitative steps in the idealized process replace several serial steps that were identified as causes of overall delays in approvals in the current processes at the two disposal sites. Replacement of the serial steps with a new cooperative and facilitative team approach will help to ensure that DOE complex-wide goals and efficiencies are achieved by focusing waste generator and disposal sites on maximizing the throughput of waste for disposal, while providing the required assurances for compliance.

The idealized process optimizes the "up-front" generator facility evaluations versus the "after-the-fact" receipt verification. In the idealized process, the physical waste verification step takes on the proper role of ensuring that the overall program continues to produce quality products instead of serving to "catch" errors. This represents a relatively small change in the actual work performed, but requires a large change in the philosophical approach to compliance with waste acceptance requirements. It emphasizes the responsibility of the up-front waste generation processes to eliminate failure and noncompliance instead of relying on verification at the end of the process to detect errors, which require inefficient rework to resolve.

The standardized waste acceptance process was subjected to the Six Sigma analytical tools to optimize the throughputs and cycle times, identify areas of process improvement, and ensure that the potential problems identified in the individual site analyses were adequately addressed in the new process. This exercise was performed "on paper" as opposed to analysis of an actual on-going process, and has been referred to as a "virtual" waste acceptance process. The virtual process now requires implementation through a trial run to demonstrate its effectiveness and utility. It is expected that the trials will begin in the current fiscal year. Similar data to that collected for the individual site processes will be collected during process implementation so that the improvements can be quantified.

RESULTS

The results of the initial Six Sigma review team efforts were documented in a formal report published in September 2001 (7). This paper has drawn heavily on the results documented in that report. The effort has resulted in identification of an idealized waste acceptance process that should reduce duplication of effort by generators preparing waste streams for disposal at Hanford or NTS, provide consistency between site characterization requirements, and optimize waste stream approval activities. The resulting savings will then be available for additional cleanup efforts across the complex.

CONCLUSIONS AND REMAINING ACTIONS

In developing the standardized waste acceptance process, it has become clear that the NTS and Hanford disposal sites have similar objectives, goals, and customers. The two sites share common problems and a common understanding of those problems. Existing site-specific environmental, regulatory, and contractual differences must be respected and may continue to dictate different approaches to resolving many issues.

This process improvement project has identified issues that can be resolved in a common manner through use of the recommended standardized waste acceptance process. With the standardized

waste acceptance process, waste generators undergo a single waste acceptance quality assurance process prior to actual waste shipment, use standardized forms, and are reviewed by common auditors. The standardized waste acceptance process focuses on the elimination of process failures by ensuring that up-front quality assurance practices and appropriate controls are in place.

The standardized waste acceptance process includes appropriate verification processes, and the verification results will be shared between the two disposal sites. Both sites will use this verification step to help ensure the effectiveness of up-front (pre-shipment) quality assurance efforts. NTS and Hanford will work closely and cooperatively with the waste generator community to ensure that quality assurance, waste characterization, and profiling efforts are as efficient as possible.

The information used to develop the standardized waste acceptance process was extrapolated from data derived from the existing waste acceptance processes at NTS and Hanford. Actual performance history is necessary in order to complete data gathering and analysis for the standardized waste acceptance process. The team can then analyze the performance data and refine the proposed standardized waste acceptance process improvements.

RECOMMENDATIONS

- Continue the standardized waste acceptance process development:
  - Assign a joint team to lead the effort.
  - Develop a scope of work for the joint team and determine the complexity of the joint acceptance process.
  - Develop the process, procedures, and guidance for the common, standard waste acceptance process.
  - Develop balanced criteria for auditing and verification.
  - Develop standardized forms and procedures for NTS and Hanford to the extent practicable.
  - Form a pilot team for each of the disposal sites (include disposal site operator and at least one representative waste generator) under the direction of NV and RL.
  - Perform a test run of the virtual case concept and collect performance data (using the Measure, Analyze, Improve, and Control phases).
  - Monitor and report on the performance.
  - Finalize and recommend full implementation of the improved process.

Other actions that will help improve the overall efficiency of the DOE waste disposal practices include the following items:

- Develop a DOE complex-wide integrated baseline schedule.
- Develop DOE complex-wide waste disposal priorities.
- Improve the quality and timeliness of information and input to the Integrated Planning, Accounting, and Budgeting System (IPABS) database for waste forecasting, and consistently use the IPABS as the basis for short- and long-term planning.
- Streamline funding methods for waste disposal across the DOE complex.
- Realign and incentivize contracts to promote efficient waste disposal.

OBSERVATIONS

To successfully accomplish the objective of increasing DOE waste disposal efficiency through the implementation of the changes recommended in this report, the following points are critically important:

- A sense of urgency must be developed.
- The shared process improvement vision must be developed and communicated.
- Responsible parties must be empowered.
- The new approaches must be anchored into a common, complex-wide culture.

A structured, analytical methodology such as that used thus far by the process improvement team can be a powerful tool for accomplishing the foregoing objectives, and can be productively applied across the broader spectrum of waste management opportunities. One conclusion from the FMEAs performed at the disposal sites is that the waste generators can significantly improve the DOE complex's overall efficiency through elimination of rework and waste acceptance failures by applying this type of analytical approach to their waste management processes that prepare waste for disposal.

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