

QUALITY ASSURANCE FOR DEFENSE HIGH-LEVEL WASTE FORM PRODUCTION

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ABSTRACT

The Department of Energy (DOE) Office of Defense Waste and Transportation Management (DWTM) is responsible for preparing defense high-level waste for permanent disposal in a Federal Repository. Various types of defense high-level waste are currently in interim storage at three DOE sites: Savannah River, Hanford, and Idaho.

DWTM must meet the requirements specified in OGR/B-14, "Quality Assurance Requirements for High-Level Waste Form Production" in producing canistered waste forms that are acceptable to the repository operator, the DOE Office of Civilian Radioactive Waste Management (OCRWM or RW). The DWTM High-Level Waste Quality Assurance Program is being developed to facilitate the acceptance of the canistered waste forms by RW.

This quality assurance program is designed to meet the requirements of OGR/B-14. As part of its implementation, the program will produce documentation that will be used by RW to support its repository license application to the Nuclear Regulatory Commission. A qualification and overview process is planned to ensure that the quality assurance program meets requirements and, when implemented, continues to operate properly.

INTRODUCTION

The Nuclear Waste Policy Act of 1982 and the Nuclear Waste Policy Act Amendment of 1987 provide the statutory basis for disposal of civilian and defense radioactive waste in a Federal Repository. The Department of Energy (DOE) Office of Defense Waste and Transportation Management (DWTM) is responsible for ensuring that high-level waste resulting from defense programs is processed into canistered waste forms that are acceptable to the repository operator, the DOE Office of Civilian Radioactive Waste Management (OCRWM or RW), for permanent disposal. To meet its responsibilities, DWTM is developing the High Level Waste (HLW) Quality Assurance Program.

The DWTM HLW Quality Assurance Program is a set of management controls that are being developed and implemented to provide an objective basis for adequate confidence that canistered waste forms will be acceptable to RW for permanent disposal in the Federal Repository. A formal, structured set of management control systems is needed because of the impracticality of destructively examining each individual canistered waste form produced. Instead, a set of management controls that covers the waste form production process will be established and executed to provide confidence in the characteristics of the product by providing objective evidence of the integrity of the process that produced it.

DWTM has developed a plan for establishing the HLW Quality Assurance Program so that it will achieve three goals:

1. The quality assurance program will meet RW requirements specified in OGR/B-14, "Quality Assurance Requirements for High-Level Waste Form Production."
2. Documentation describing the HLW Quality

Assurance Program will be prepared so that it can be used to support RW's repository license application to the Nuclear Regulatory Commission (NRC).

3. A qualification and overview process will be incorporated as a method of verifying that the quality assurance program meets requirements and, when implemented, continues to operate properly. This will provide RW and the NRC with confidence in the integrity of each canister of waste produced.

Organization

The DWTM HLW Quality Assurance Program is a composite of the quality assurance programs being developed by three waste form producer organizations, Savannah River, Hanford, and Idaho. As defined in OGR/B-14, each waste form producer organization is made up of elements of DOE Headquarters and the appropriate DOE operations office, the responsible DOE project office (if separate from an operations office) and the responsible operating contractor. Each organizational element, or "major participant organization" must develop a quality assurance program for its activities in defense high-level waste processing. This paper will focus on Savannah River, where defense high-level waste processing facilities are closest to completion. At Savannah River, the major participant organizations are DOE Headquarters, the Defense Waste Processing Facility Project Office within the Savannah River Operations Office (DWPF-PO), and the Operating Contractor (E.I. duPont de Nemours and Company, soon to be Westinghouse Savannah River Company). The quality assurance programs for each major participant will be combined to form the quality assurance program for the entire waste form producer organization, referred to as the

Savannah River Waste Form Producer Quality Assurance Program.

OGR/B-14 and the Waste Acceptance Process

The Savannah River Waste Form Producer Quality Assurance Program must be implemented in accordance with OGR/B-14 in order to support the Waste Acceptance Process. The Waste Acceptance Process is an organized sequence of activities leading to the production of acceptable high-level waste forms. The Waste Acceptance Process is being followed by each waste form producer organization. Each organization will develop and qualify its waste form product and production process, and ultimately produce canistered waste forms. The process includes four key documents.

- The Waste Acceptance Specification (WAS), which outlines the administrative and technical requirements that each canistered waste form must meet.
- The Waste Form Compliance Plan (WCP), which describes the production processes, systems, and techniques to be used to ensure that the requirements of the WAS are met.
- The Waste Form Qualification Report (WQR), which is a compilation of data from the implementation of the WCP which objectively demonstrates that the canistered waste form complies with the WAS.
- Production Records (PRs) for each individual canistered waste form that is produced. These PRs will document the production of each canister of high-level waste, and will accompany each one to the repository for inclusion into a waste package and for permanent disposal.

The Savannah River Waste Form Producer Quality Assurance Program is being developed and implemented to ensure that OGR/B-14 is adequately applied to the Savannah River Waste Form Producer Organizations' Waste Acceptance Process Activities of high-level waste form production. The quality assurance program addresses the basic and supplemental requirements of OGR/B-14.

The basic requirements of OGR/B-14 are invoked by reference. They include the following:

- NSI/ASME NQA-1, "Quality Assurance Program Requirements for Nuclear Facilities"
- DOE Order 5000.3, "Unusual Occurrence Reporting System"
- DOE Order 5700.6B, "Quality Assurance"
- "Guidelines for the Application of Readiness Reviews to DOE Activities"

OGR/B-14 also defines supplementary requirements in the 14 areas shown below:

1. Control of Essential Software
2. Peer Review
3. Control of Experiments/Developmental Activities
4. Qualification of Data
5. Archival of Samples
6. Control of Special Processes
7. Product Certification
8. Readiness Review
9. Selective Application of Program Activities (Quality Levels)
10. Selection, Indoctrination, Training
11. Overview of Quality Assurance Activities
12. Quality Records
13. Modification Control
14. Effectiveness Evaluation

Quality Assurance Program Documentation

Each major participant organization in the Savannah River Waste Form Producer Organization has documented its quality assurance program in a three-part quality assurance program description (QAPD). These QAPDs have been designed to coordinate the interfaces among participants in the overall Savannah River Waste Form Producer Organization. Together, the QAPDs describe an overall quality assurance program for the Savannah River Waste Form Producer Organization that is integrated both vertically and horizontally. Figure 1 illustrates this relationship.

Part 1 of each QAPD provides an overview of the major participant's overall quality assurance program. It identifies the content and application of the quality assurance program and the interface relationships among the organizations involved in the quality assurance program. In Parts 2 and 3, the major participant identifies the activities it will implement in order to meet all requirements of OGR/B-14. Any delegation of activities is also described in Parts 2 and 3. Part 2 details the quality assurance program applicable to the development and qualification of the canistered waste form product and its production process. Part 2 is intended to accompany the WCP and addresses the quality assurance activities applicable to WCP-identified work activities. It also addresses the initial preparation of the WQR. Part 3 describes in detail the quality assurance program applicable to the actual production of canistered waste forms. Any updating of the WQR will be prepared under Part 3. In addition, it addresses quality assurance activities applicable to the preparation of the PRs.

Both Part 2 and Part 3 have been prepared with the appropriate format and content for use in the repository licensing process. The Part 3's developed by DOE Headquarters, the DWPF-PO, and the Savannah River Operating Contractor will be assembled into a composite QAPD

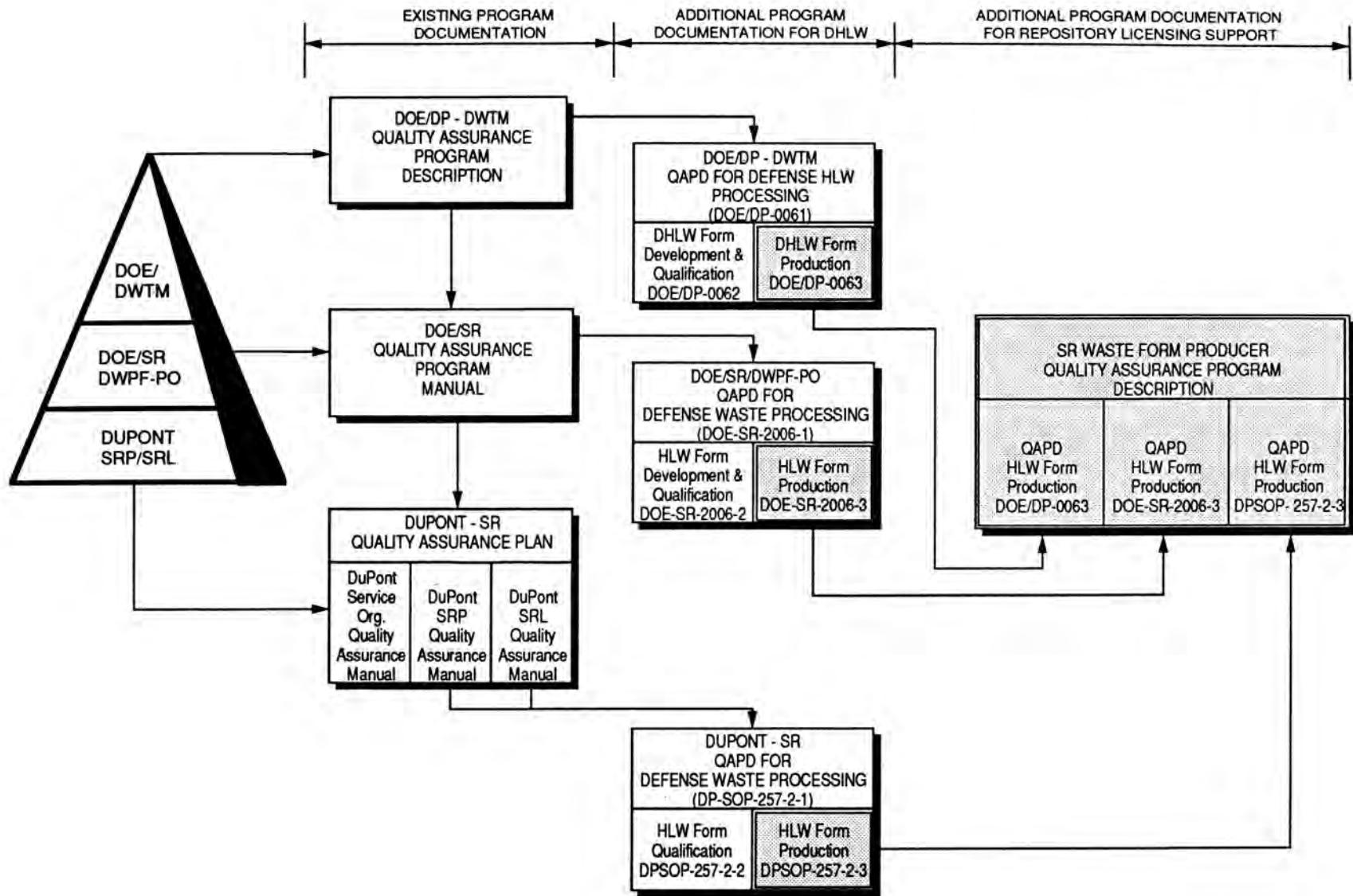


Fig. 1. Savannah River Waste Form Producer Quality Assurance Program Documentation.

for high-level waste form production at Savannah River. This QAPD will be provided to RW to support its repository license application to NRC. NRC will review the Part 2's as part of its evaluation of the development and qualification of the canistered waste form and its production process, which includes the quality assurance program applied to development and qualification activities.

The quality assurance activities described in each QAPD are conducted using implementing procedures. These procedures define responsibilities, identify interfaces, and provide instructions for implementing of quality assurance activities.

Each major participant organization will maintain and control its own implementing procedures. However, each major participant also submits its implementing procedures to the next higher level organization for review and acceptance. For example, the DWPF-PO submits its implementing procedures to DOE Headquarters for review and acceptance. The DWPF-PO then incorporates any relevant comments received from DOE Headquarters.

Qualification and Overview

The Savannah River Waste Form Producer Quality Assurance Program, as defined in the major participants QAPDs and implementing procedures, must be qualified before it is accepted as having fully met requirements. According to proposed plans, RW will ultimately review and accept the quality assurance programs for each of the three waste form producer organizations. This plan will help ensure that the quality assurance programs meet all requirements and will be acceptable to the NRC in its licensing review proceedings. As proposed, each major participant will qualify its own quality assurance program and have overview of the implementation of quality assurance programs for Waste Acceptance Process Activities delegated to lower-tier participants. To qualify its quality assurance program, the major participant must provide an objective basis for confidence in the ability of the quality assurance program to perform its intended function.

Qualification can be achieved through several joint activities. First, standards for the quality assurance program must be established. Standards for the DWTM HLW Quality Assurance Program include OGR/B-14, ANSI/ASME NQA-1, federal laws, DOE orders and internal documents, and NRC regulatory guides. Second, the quality assurance program must be reviewed to ensure that it has adequate potential for success. This involves examining quality assurance program defining and implementing documents such as QAPDs, implementing procedures, and

implementing plans and schedules. Finally, the acceptability of the quality assurance program must be documented. Records must be kept regarding the documents reviewed, the reviewers themselves, the results of reviews, comments and comment resolution, correspondence, and formal acceptance of documents.

The overview process that is being planned and proposed will begin with the development and qualification of the quality assurance program and will then continue routinely after full implementation. Overview involves the conduct of verification activities to ensure that the quality assurance program is performing properly. Verification activities that are used to perform overview include technical reviews, peer reviews, readiness reviews, audits, surveillance and effectiveness assessments. These activities provide information needed to analyze and assess quality achievement and the effectiveness of quality assurance activities so that any need for changes and improvements in the quality assurance program can be identified.

As stated earlier, each major participant organization will have overview responsibilities for any quality assurance activities it delegates to the next lower organization. To facilitate overview activities, all organizations will share overview plans and schedules with the organization directly above them in the overview hierarchy. Although all major participants are involved in overview, RW will be the DOE focal point for overview coordination for repository licensing. RW and NRC will conduct joint overview activities of DOE Headquarters. RW and NRC will also participate in scheduled overviews of the DWPF-PO and the Operating Contractor on an as-desired basis.

SUMMARY

Using OGR/B-14 as its guide, DWTM has developed a HLW Quality Assurance Program which will facilitate acceptance of canistered waste forms by RW as the repository operator. The DWTM HLW Quality Assurance Program incorporates the organizational structure defined by OGR/B-14 and applies it to the Waste Acceptance Process Activities of high-level waste form production. The documentation supporting the DWTM HLW Quality Assurance Program has been formatted to support the RW repository license application to the NRC. A qualification and overview process is being planned and proposed for the DWTM HLW Quality Assurance Program to ensure the acceptability and integrity of the quality assurance program and to verify that it continues to operate properly in achieving intended results.