Used Fuel Disposition Campaign Preliminary Quality Assurance Implementation Plan

Fuel Cycle Research & Development

Prepared for
U.S. Department of Energy
Used Fuel Disposition Campaign
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FCT Quality Assurance Program Document

Appendix E
FCT Document Cover Sheet

Name/Title of Deliverable/Milestone	Preliminary UFD Campaign QA Implementation Plan
Work Package Title and Number	FTSN11UF0102, "Campaign Management & Integration – SNL"
Work Package WBS Number	1.02.08.01
Responsible Work Package Manager	Kevin McMahon (Name/Signature)
Date Submitted	

Quality Rigor Level for Deliverable/Milestone	☐ QRL-3	☒ QRL-2	☐ QRL-1 ☐ Nuclear Data	☐ N/A*

This deliverable was prepared in accordance with Sandia National Laboratories
(Participant/National Laboratory Name)

QA program which meets the requirements of
☒ DOE Order 414.1 ☐ NQA-1-2000

This Deliverable was subjected to:

☒ Technical Review
Technical Review (TR)
Review Documentation Provided
☐ Signed TR Report or,
☐ Signed TR Concurrence Sheet or,
☒ Signature of TR Reviewer(s) below
Name and Signature of Reviewers
Neil R. Brown, LANL
Neil R Brown 1/4/11

☒ Peer Review
Peer Review (PR)
Review Documentation Provided
☐ Signed PR Report or,
☐ Signed PR Concurrence Sheet or,
☒ Signature of PR Reviewer(s) below
Kevin B. Sorenson, SNL
KB Sorenson 1/11/11

*Note: In some cases there may be a milestone where an item is being fabricated, maintenance is being performed on a facility, or a document is being issued through a formal document control process where it specifically calls out a formal review of the document. In these cases, documentation (e.g., inspection report, maintenance request, work planning package documentation or the documented review of the issued document through the document control process) of the completion of the activity along with the Document Cover Sheet is sufficient to demonstrate achieving the milestone. QRL for such milestones may be also be marked N/A in the work package provided the work package clearly specifies the requirement to use the Document Cover Sheet and provide supporting documentation.

1. EXECUTIVE SUMMARY

The primary objective of this report is to determine whether the existing Fuel Cycle Technologies (FCT) Quality Assurance Program Document (QAPD) is sufficient for work to be performed in the Used Fuel Disposition Campaign (UFDC), and where the existing QAPD is not sufficient, supply recommendations for changes to the QAPD to accommodate the UFDC. During November 2010, a meeting was held in Las Vegas, Nevada that included all of the FCT QA Points of Contact from each National Laboratory site, as well as the DOE Office of Nuclear Energy headquarters QA Program Manager. During this meeting, use of the FCT QAPD for UFDC activities was discussed. A consensus was reached by all participants that there need be no specific changes to the FCT QAPD for QA implementation when conducting UFDC R&D activities. The FCT QAPD provides a sound and useable foundation for the implementation of QA for UFDC R&D activities, including the application of QA in a graded approach.

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2. INTRODUCTION

The management of used nuclear fuel and nuclear waste is required for any country using nuclear energy. This includes the storage, transportation, and disposal of low level waste (LLW), used nuclear fuel (UNF), and high level waste (HLW). The Office of Fuel Cycle Technologies (FCT) within the U.S. Department of Energy (DOE), Office of Nuclear Energy (NE), has established the Used Fuel Disposition Campaign (UFDC) to conduct the R&D activities related to storage, transportation and disposal.

The Mission of the UFDC is:

> *To identify alternatives and conduct scientific research and technology development to enable storage, transportation and disposal of used nuclear fuel and wastes generated by existing and future nuclear fuel cycles*.

The Grand Challenge for the UFDC is:

> *To provide a sound technical basis for absolute confidence in the safety and security of long-term storage, transportation, and disposal of used nuclear fuel and wastes from the nuclear energy enterprise.*

The safe storage, transportation and disposition of used nuclear fuel and/or high level nuclear waste is a fundamental aspect of the nuclear fuel cycle. The United States currently utilizes a once-through fuel cycle where used nuclear fuel is stored on-site in either wet pools or in dry storage systems with ultimate disposal in a deep mined geologic repository envisioned. However, a decision not to use the proposed Yucca Mountain Repository will result in longer interim storage at reactor sites than previously planned. In addition, alternatives to the once-through fuel cycle are being considered as discussed above. These two factors lead to the need to develop a credible strategy for managing radioactive wastes from any future nuclear fuel-cycle in order to provide acceptable disposition paths for all wastes regardless of transmutation system technology, fuel reprocessing scheme(s), and/or the selected fuel cycle. These disposition paths will involve the storing and transportation of radioactive material for some period of time and the ultimate disposal of radioactive waste.

Results from storage, transportation and disposal R&D activities conducted by the UFDC have the potential (in varying degrees) of being used to make licensing decisions in the future. If there is a reasonable likelihood that results may be used in future licensing, and it would be difficult to replicate the R&D at a later time, it may be appropriate to apply additional quality assurance (QA) rigor to minimize rework in the future. Examples of such R&D activities may include:

- Experimental work of long duration;
- Experimental work that may be difficult to repeat;
- Experimental work that is expensive to conduct; or
- Software (code) development intended to be used for licensing decisions in the future.

These examples represent activities that would be difficult, and perhaps impossible, to repeated without considerable expenditure of cost and/or effort. This is not an exhaustive list, only a representative one.

Section 3 of this Preliminary Quality Assurance Implementation Plan describes the application of QA for all FCT R&D activities. Section 4 of this Preliminary Quality Assurance Implementation Plan describes the approach to the implementation of QA for UFDC storage, transportation and disposal R&D activities.

3. FUEL CYCLE TECHNOLOGIES QUALITY ASSURANCE PROGRAM

The current version of the Fuel Cycle Technologies Quality Assurance Program Document (QAPD) was issued October 13, 2010. This implementation plan may require revisions to conform to future versions of the QAPD. The purpose of the QAPD is to define QA requirements for the FCT Program. QA activities for the FCT Program, including UFDC R&D activities, are conducted in accordance with the QAPD, Section 6 General Implementation Requirements. Each laboratory designates an FCT QA point of contact (POC) for FCT work. QA audits, surveillances and assessments related to the work are coordinated with the laboratory FCT QA POC.

The QAPD specifies QA requirements in the context of Quality Rigor Levels (QRLs 1, 2, 3, and N/A), as summarized below in Table 1. Identification, assignment, and approval of QRL for milestones/deliverables are accomplished during the work package planning process using guidance in the QAPD.

With specific augmentation identified in the QAPD (and summarized in Table 1), procedures and processes established to implement the DOE approved QA Program for individual National Laboratories are sufficient to meet QRL 2 and 3 requirements. Additionally, participant's procedures and processes that are in place to implement an established NQA-1 compliant program are intended to meet QRL 1 requirements.

Table 1 – Summary of FCT Quality Assurance Requirements

Activity Type	QRL	QA Program	Review Requirements
I And Nuclear Data	1	NQA-1 compliant *For Nuclear Data, follow the established, NRC accepted, process used by the Cross Section Evaluation Group and coordinated by the National Nuclear Data Center at BNL.	Consistent with applied NQA-1 elements
II	2	Existing Lab QA program	Peer-Review Consistent with FCT QAPD Appendix C
III	3	Existing Lab QA program	Tech Review Consistent with FCT QAPD Appendix B
Other (incl. admin)	N/A (QAPD Section 6.2)	Existing Lab QA program	Consistent with Existing Lab QA program

4. QUALITY ASSURANCE IMPLEMENTATION FOR UFDC R&D

During November 2010, a meeting was held in Las Vegas, Nevada that included all of the QA POCs from each National Laboratory site, as well as the DOE NE HQ QA Program Manager. During this meeting, use of the FCT QAPD for UFDC activities was discussed. A consensus was reached by all participants that there need be no specific changes to the FCT QAPD for QA implementation when conducting UFDC R&D activities. The FCT QAPD provides a sound and useable foundation for the implementation of QA for UFDC R&D activities, including the application of QA in a graded approach.

NQA-1 quality assurance elements for specific work activities may be deemed applicable to work packages where the QRL designation is QRL-1, QRL-2 or QRL-3. A subset of the 18 NQA-1 quality assurance elements may be considered applicable to a specific work package, regardless of the QRL designation for that work package. For reference, the listing of the 18 NQA-1 elements in Table 2 below is intended to identify those specific QA elements (requirements) that may apply to a specific work package. Whenever a work activity is evaluated to require the inclusion of NQA-1 quality elements, regardless of the QRL designation, a test/activity plan will be included as a milestone in each applicable work package. The test/activity plan will identify and describe the test(s)/activity being performed and will also include the identification of additional NQA-1 QA elements as requirements for the work package and the specific associated NQA-1 procedures necessary to implement these additional requirements. Use of guidance provided in NQA-1 (2008) Part IV, Subpart 4.2 (*Guidance on Graded Application of Quality Assurance (QA) for Nuclear-Related Research and Development*) is encouraged when applying NQA-1 in a graded approach. Graded application of NQA-1 requirements and procedures identified in a work package test/activity plan are in addition to any existing Lab QA procedures in place at the performing national laboratories for the base Lab QA program. A completed work package specific test/activity plan, itself a QA record, would be applicable to the entire period of performance for the test/activity and could apply to multiple fiscal years.

Transitory working information and non-record materials will be managed in laboratory-specific file/document management systems. FCT deliverables and associated records will be managed in accordance with the FCT Records Management Plan upon finalization of the deliverable. Submittal of records to the Fuel Cycle Research and Development Document Management System will maintain the associations between deliverables and supporting documentation.

Table 2 – Summary of NQA-1 Quality Assurance Elements

	NQA-1 (2008) Requirement Excerpt[a]
1.	**Organization** - Responsibilities for the establishment and implementation of the quality assurance program shall be defined. The organizational structure, functional responsibilities, levels of authority, and lines of communications for activities affecting quality hall be documented.
2.	**Quality Assurance Program** - The program shall identify the activities and items to which it applies. The program shall provide control over activities affecting quality to an extent consistent with their importance.

[a] Refer to ASME NQA-1-2008 (Revision of ASME NQA-1-2004) Quality Assurance Requirements for Nuclear Facility Applications for complete description of requirement.

3.	**Design Control** – The design shall be defined, controlled, and verified. Design inputs shall be specified on a timely basis and translated into design documents. Design interfaces shall be identified and controlled. Amplified requirements in NQA-1 Part II, Subpart 2.7 Quality Assurance Requirements for Computer Software for Nuclear Facility Applications applies to software design control may apply.
4.	**Procurement Document Control** - Applicable design bases and other requirements necessary to assure adequate quality shall be included or referenced in documents for procurement of items and services. To the extent necessary, procurement documents shall require Suppliers to have a quality assurance program consistent with the applicable requirements of NQA-1.
5.	**Instructions, Procedures and Drawings** - Activities affecting quality and services shall be prescribed by and performed in accordance with documented instructions, procedures, or drawings that include or reference appropriate quantitative or qualitative acceptance criteria for determining that prescribed activities have been satisfactorily accomplished.
6.	**Document Control** - The preparation, issue, and change of documents that specify quality requirements or prescribe activities affecting quality such as instructions, procedures, and drawings shall be controlled to ensure that correct documents are being employed.
7.	**Control of Purchased Items and Services** - The procurement of items and services shall be controlled to ensure conformance with specified requirements. Amplified requirements in NQA-1 Part II, Subpart 2.14 Quality Assurance Requirements for Commercial Grade Items and Services may apply.
8.	**Identification and Control of Items** - Controls shall be established to assure that only correct and accepted items are used or installed.
9.	**Control of Special Processes** - Special processes that control or verify quality, such as those used in welding, heat treating, and nondestructive examination, shall be performed by qualified personnel using qualified procedures in accordance with specified requirements.
10.	**Inspection** - Inspections required to verify conformance of an item or activity to specified requirements or continued acceptability of items in service shall be planned and executed.
11.	**Test Control** - Tests required to collect data such as for siting or design input, to verify conformance of an item or computer program to specified requirements, or to demonstrate satisfactory performance for service shall be planned and executed. Amplified requirements in NQA-1 Part II, Subpart 2.20 Quality Assurance Requirements for Subsurface Investigations for Nuclear Power Plants may apply.
12.	**Control of Measuring and Test Equipment** - Tools, gages, instruments, and other measuring and test equipment used for activities affecting quality shall be controlled, calibrated at specific periods, adjusted, and maintained to required accuracy limits.
13.	**Handling, Storage and Shipping** - Handling, storage, cleaning, packaging, shipping, and preservation of items shall be controlled to prevent damage or loss and to minimize deterioration.

14. Inspection, Test, and Operating Status - The status of inspection and test activities shall be identified either on the items or in documents traceable to the items where it is necessary to ensure that required inspections and tests are performed and to ensure that items that have not passed the required inspections and tests are not inadvertently installed, used, or operated.
15. Control of Nonconforming Items – Items that do not conform to specified requirements shall be controlled to prevent inadvertent installation or use.
16. Corrective Action - Conditions adverse to quality shall be identified promptly and corrected as soon as practicable. In the case of a significant condition adverse to quality, the cause of the condition shall be determined and corrective action taken to preclude recurrence.
17. Quality Assurance Records - The control of quality assurance records shall be established consistently with the schedule for accomplishing work activities. Quality assurance records shall furnish documentary evidence that items or activities meet specified quality requirements. Quality assurance records shall be identified, generated, authenticated, and maintained, and their final disposition specified.
18. Audits - Audits shall be performed to verify compliance to quality assurance program requirements, to verify that performance criteria are met, and to determine the effectiveness of the program. Audit results shall be documented and reported to and reviewed by responsible management. Follow-up action shall be taken where indicated.