

Contract No:

This document was prepared in conjunction with work accomplished under Contract No. DE-AC09-08SR22470 with the U.S. Department of Energy.

Disclaimer:

This work was prepared under an agreement with and funded by the U.S. Government. Neither the U. S. Government or its employees, nor any of its contractors, subcontractors or their employees, makes any express or implied: 1. warranty or assumes any legal liability for the accuracy, completeness, or for the use or results of such use of any information, product, or process disclosed; or 2. representation that such use or results of such use would not infringe privately owned rights; or 3. endorsement or recommendation of any specifically identified commercial product, process, or service. Any views and opinions of authors expressed in this work do not necessarily state or reflect those of the United States Government, or its contractors, or subcontractors.

SRS K-Area Material Storage – Expanding Capabilities

Richard Koenig
Savannah River Nuclear Solutions

Abstract

In support of the Department of Energy's continued plans to de-inventory and reduce the footprint of Cold War era weapons' material production sites, the K-Area Material Storage (KAMS) facility, located in the K-Area Complex (KAC) at the Savannah River Site reservation, has expanded since its startup authorization in 2000 to accommodate DOE's material consolidation mission. During the facility's growth and expansion, KAMS will have expanded its authorization capability of material types and storage containers to allow up to 8200 total shipping containers once the current expansion effort completes in 2014. Recognizing the need to safely and cost effectively manage other surplus material across the DOE Complex, KAC is constantly evaluating the storage of different material types within K area. When modifying storage areas in KAC, the Documented Safety Analysis (DSA) must undergo extensive calculations and reviews; however, without an extensive and proven security posture the possibility for expansion would not be possible.

The KAC maintains the strictest adherence to safety and security requirements for all the SNM it handles. Disciplined Conduct of Operations and Conduct of Projects are demonstrated throughout this historical overview highlighting various improvements in capability, capacity, demonstrated cost effectiveness and utilization of the KAC as the DOE Center of Excellence for safe and secure storage of surplus SNM.

Introduction

The K-Area Material Storage (KAMS) Project at the Savannah River Site converted a former production Reactor Building into a secure Category 1 storage facility in 2000. The original baseline scope was to allow storage of 2,000 9975 shipping packages. With changes in EM mission and reorganization of the DOE Enterprise security requirements, the KAMS storage area underwent expansion and flexibility increase several times in the following 12 years, ultimately providing 8200 storage positions for a multitude of material types in various storage containers. These expansions were mostly handled by not only construction activities, but by changes to the Documented Safety Analysis and Security posture of the facility.

This paper provides a concise history of the evolution of the K Area Complex facility which currently operates today. A description of the timeline outlining the expansion capability, detailing the authorization of the various material types and containers which are now authorized for storage, as well as an insight to the near-term future of the facility.

Early Years, 1999- 2004, Facility Development

The original scope (Phase 1) of the effort was to support accelerated de-inventory of material from Rocky Flats Environmental Technology Site (RFETS), requiring safe, secure storage of 2000 shipping packages. This effort required the initial construction phase to convert the 105-K Reactor Facility into a secure, Category I storage vault-type room. The facility would be designed for receipt of non-pit surplus plutonium in metal or stabilized oxide form packaged in DOE-STD-3013 containers. Each 3013 would be shipped and stored in a Type B 9975 package. The robust 3013 and 9975 package combination are analyzed to survive all of the facility design basis events without a release.



Within a year of initial project authorization, Phase 2 activities began which installed a NDA asset suite to accommodate Material Control and Accountability aspects of the mission. Phase 2 was purposely separated from the original project start so as to not delay the original receipt capability of the facility to support the original ship date of RFETS.

As changes in security requirements emerged based on world events, nuclear materials stored at other Savannah River Site facilities were also consolidated into the K-Area Materials storage area. This expansion enabled the construction activities of Phase 3, increasing the facility storage capability to 3000 containers. Additional capability authorized in Phase 3 defined the US-IAEA Pu Voluntary Agreement Material Balance Area.



Phase 4 and 5 were authorized following the DOE decision to consolidate the Hanford Plutonium at SRS. K-area provided support for further expanding the capacity of the material storage area to 5300 shipping containers.

Program Capability Expansion, 2004 - 2007

With the ever changing landscape of the DOE Enterprise, KAMS has evolved beyond the exclusive storage capability of stabilized Plutonium in 3013 containers. Once KAMS became the only Cat.1 storage facility at SRS, KAMS mission expanded to support HEU activities. Uranium metal designated for H canyon dissolution and blenddown was received in K area utilizing Type B shipping packages. Uranium metal was received from Y-12, Lawrence Livermore, Los Alamos and other sites. The K Area Documented Safety Analysis was expanded to receive additional material types and corresponding different shipping and storage packages. The ES-3100, Pipe overpack container and the 6M were analyzed and authorized for facility use.

Capitalizing on the ability for the K area facility to receive and store Special Nuclear Material (SNM), DOE began utilizing the flexibility of SRS to authorize and provide

capability in a short time frame for additional missions. During this period, K Facility became the K-Area Complex (KAC) to more accurately acknowledge the ability to store a multitude of containers, including casks, to support DOE Missions involving disposition surplus materials from other sites with an identified disposition path. During this period, K facility successfully supported with the appropriate DSA changes and facility upgrades to support receipt of:

- Defense Programs effort to temporarily house Tritium Production Bars prior to transporting to their final processing location.
- The Neptunium Recovery Mission by storing the target plates prior to processing in H Area. Additionally, provided interim storage of the processed oxide when required.
- Various NNSA missions by providing a temporary Category II/III storage facility to support HEU and LEU disposition missions.
- Fast Flux Test Facility fuel assemblies in support of the Hanford De-inventory effort.



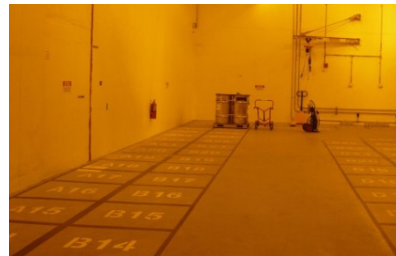
It was recognized that with the potential long term storage possibility of the 3013 container that a surveillance program would be developed to ensure that they meet their 50 year storage life. In order for KAC to perform this function, the K-Interim Surveillance Glovebox and nondestructive measurement equipment was installed. This project included the construction of a interim storage area of 300 spaces within a Category II

Vault. This vault is separate from the Material storage area and allows storage of diverse, non-3013 oxide within a 9975 package.

K-Area Complex, 2007 - Present

The primary objective for SRS's K-Area Complex is to accommodate DOE's goal for consolidation of surplus nuclear materials program.

The largest quantity of special nuclear material involved in these programs will be transferred to Mixed-oxide Fuel Fabrication Facility (MFFF). However, in the interim period prior to these facilities being operational; KAC will be the storage site for the feed materials.



During this period of KAC expansion capability, the effort has been directed to accommodating both EM and NNSA future planning projections to provide adequate storage space for their missions. Awaiting a pending decision on the Surplus Pit Disposition Program, KAC recently completed an additional vault expansion allowing an additional 900 storage positions to accommodate near-term MFFF feed. Without this

addition, it was projected that available storage capacity in KAC would have been filled before the end of FY2014.



In 2009, KAC completed an additional construction project which increased MC&A NDA measurement capability in the material storage area. The installation of a drum size Shuffler (active well neutron multiplicity counter) and corresponding equipment was added to increase efficiency and accuracy of our measurement capability for the residing inventory.

In 2011, KAC was requested to support an aggressive Global Non-proliferation effort through the office of Global Threat Reduction Initiative (GTRI). GTRI's goal is to eliminate stockpiles of excess weapon-usable nuclear material from foreign sites, returning it to US soil and securing it from possible diversion for malevolent purposes. The GTRI program plays a critical role in President Obama's commitment to secure vulnerable materials as explained in his 2009 Prague speech. Based on this long-term US commitment, NNSA has worked with Environment Management to dedicate additional storage positions be made available in support of this effort.



Documented Safety Analysis, 2002 – Present

As the KAC was expanded and upgraded throughout its history to accommodate additional storage positions, content of materials and types of shipping packages, these were authorized through changes to the K Area Documented Safety Analysis and Facility Reviews.

The KAC DSA rev. 0 was issued 6/2003. Since then, the DSA has been revised to accommodate the expansion of the facility or as required to execute new mission scope. The changes have been mission-driven with minimal funding. Compressed schedules to complete and/or comply with specific Department requests were typically expected due to Mission Critical completion requirements. With this importance of schedule completion generally meant that allowance for “additional, non-mission” scope would be withheld from the particular revision in process.

With the continuous “cycle of change” typically resulted with no time for improvement to avoid potential future revisions. KAC Regulatory programs has recently rolled out a 3 year DSA Strategy Development plan which will allow KAC material programs the ability to gain efficiency while implementing effective increased capability without expanding resources.

Included in the 3 year strategy is the implementation of a Container Certification program. The intent of this program is to provide the Facility a “streamlined authorization process” to authorize and accept receipt of various DOT Type B Certified

Containers with authorized content package matrices. The implementation of this program will conceptually allow KAC resources to work more efficiently while considerably reducing the overall authorization process timeline of such material.

Strong Security Presence, Category I Storage Facility

In addition to the Facility Authorization basis, MC&A regulations and Packaging Certification requirements, Security plays a large role in KAC Operation. Because of the security posture and implementation at the K-Area Facility, mission expansion and evolution of the Category 1 storage program continues. Beginning in 2003, DOE issued the 2003 DBT Policy. This was revised in 2004 by DOE Order (O) 470.3, and subsequently again in 2005 through (O) 470.3A (thus DBT 2005), requiring implementation of Design Basis Threat (DBT) Policy. The DBT Upgrade project enhanced the physical security infrastructure to meet DBT postulated threats. In 2008, SRS completed the security measures necessary to achieve full implementation of the 2005 DBT. SRS was the first Complex Site to achieve such validation.

Conclusion

Nuclear Materials Consolidation and Storage has enabled multiple DOE sites to eliminate their inventory of surplus materials that remained after the end of the Cold War, bringing surplus Plutonium and HEU to SRS, where it can be stored for disposition.

Consolidated storage is performed as in interim measure, to provide feed to disposition programs. Future receipts from other government facilities will allow leveled shipping schedules and provide flexibility in processing operation facilities.

Thousands of square feet of potential storage footprint remains in the cavernous 105-K building for future mission. SRS continues to explore potential expansion opportunities and mission capabilities in support of the Departments' domestic and international Nuclear Material Consolidation and Disposition goals.

The Design of the security infrastructure in KAC allows from increased mission support beyond current identified mission without requiring extensive security upgrades. This infrastructure allows security management to quickly adjust to changing threat conditions.

K-Area Complex has demonstrated the flexibility to continue to be part of the solution in the Nuclear Material Disposition planning to provide a safe, secure and economic storage in completing specific nuclear material mission planning for a wide array of material types.