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IAEA SAFEGUARDS DURING PLUTONIUM STABILIZATION AT HANFORD'S PLUTONIUM FINISHING PLANT

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

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Richland Operations Office under Contract DE-AC06-96RL13200

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IAEA SAFEGUARDS DURING PLUTONIUM STABILIZATION AT HANFORD'S PLUTONIUM FINISHING PLANT

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February 2004

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IAEA Safeguards During Plutonium Stabilization at Hanford's Plutonium Finishing Plant

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ABSTRACT

The Vault at the Plutonium Finishing Plan (PFP) became subject to the International Atomic Energy Agency (IAEA) safeguards beginning in 1994 as part of the U.S. excess fissile material program. The inventory needed to be stabilized and repackaged for long-term storage to comply with Defense Nuclear Facilities Safety Board Recommendation 94-1. In 1998, the United States began negotiations with IAEA to develop methods to maintain safeguards as this material was stabilized and repackaged. The Design Information Questionnaire was revised and submitted to the IAEA in 2002 describing how PFP would be modified to accommodate the stabilization process line. The operation plan for 2003 was submitted describing the proposed schedules for removing materials for stabilization. Stabilization and repackaging activities for the safeguarded plutonium began in January 2003 and were completed in December 2003. The safeguards approach implemented at the Hanford Site was a combination of the original baseline approach augmented by a series of five vault additions of stabilized materials followed by five removals of unstabilized materials. IAEA containment and surveillance measures were maintained until the unstabilized material was removed. Following placement of repackaged material (most from the original safeguarded stock) into the storage vault, the IAEA conducted inventory change verification measurements and then established containment and surveillance. As part of the stabilization campaign, the IAEA developed new measurement methods and calibration standards representative of the materials and packaging. The annual physical inventory verification was conducted on the normal IAEA schedule following the fourth additional/removal phase. Plant activities and the impacts on operations are described.

INTRODUCTION

In September 1993, before the United Nations, President Clinton offered to place nuclear material excess to national defense needs under international safeguards. Starting in November 1993, the U.S. Department of Energy (DOE) began identifying excess fissile materials that could be made available for IAEA safeguards. In 1994 and 1995, plutonium materials at the Hanford

Site and the Rocky Flats Environmental Technology Site (RFETS) were voluntarily offered and subsequently selected by the International Atomic Energy Agency (IAEA) for placement under international safeguards.

DNFSB RECOMMENDATION 94-1

In 1994, the Defense Nuclear Facilities Safety Board (DNFSB), an independent, external safety oversight panel for Department of Energy (DOE) nuclear facilities, reviewed handling and storing nuclear material at DOE facilities. The DNFSB subsequently issued Recommendation 94-1, which calls for plutonium metals and oxides to be stabilized and packaged to meet the DOE storage standard by the year 2002. To support implementation of the plan to resolve DNSFB Recommendation 94-1, the DOE conducted a plutonium vulnerability assessment, and the final report was issued September 1995.

To provide specifications for long-term storage, the DOE storage standard, DOE-STD-3013, was issued in 1995. DOE-STD-3013 calls for a "can-in-can" package (the 3013 container). This consists of an internal convenience can inside two cans, each with an inert internal atmosphere and welded shut. The stabilization process called for by DOE-STD-3013 involves subjecting the plutonium oxide to a two-hour soak at 950 °C in an oxygen-rich atmosphere to eliminate pyrophoricity and volatile compounds prior to packaging.

Hanford began pilot-scale stabilization using two small muffle furnaces in 1994. At the Hanford Site, a manual stabilization capability was implemented and a "Bagless Transfer System" developed. The processing area was located near the existing storage vault housing the safeguarded material. The plan was that stabilized material would be returned to the storage vault, where the safeguards approach would remain as previously implemented. Hanford began full scale stabilization in 2000 and completed the first welded 3013 container in April 2001. Stabilization of the safeguarded materials at Hanford began in January 2003 and was completed in December 2003.

BASELINE SAFEGUARDS APPROACH

The IAEA's implementation of international safeguards at Hanford and RFETS before stabilization consisted of design information verification, monthly interim inventory verifications that focused on containment and surveillance of the static inventory, and item verification measurements during the initial and annual physical inventory verification (PIV). The Hanford facility has two main features: the declared area where nuclear materials are stored, and the support areas available to assist IAEA inspectors during their verification activities. The support areas include a glovebox room for taking samples, the non-destructive analysis (NDA) laboratory, a laboratory for IAEA measurements systems, a staging area for shipping materials and samples, and storage rooms for IAEA equipment, including recording systems for the IAEA surveillance systems.

The vault is laid out in four aisles, with 8 or 10 cubicles on each side. Each cubical contains up to 28 items held vertically on pedestals. To achieve acceptable containment capability at Hanford, the storage vault racks were modified by installing a container restraining bar on each storage pedestal allowing application of IAEA seals. The IAEA has maintained containment by the use of IAEA seals on the restraining bars and doors of each cubicle. Two IAEA cameras were installed on each storage aisle to provide surveillance of the storage cubicles. The cameras were connected to a MUX system in the IAEA work space to allow review of surveillance records from outside the storage vault.

ADVANCED PLANNING FOR SAFEGUARDS DURING STABILIZATION

The stabilization and packaging of plutonium under IAEA safeguards at Hanford and RFETS was first discussed at a U.S./IAEA technical meeting at Hanford in August 1996. The initial plan was that Rocky Flats would be processing the safeguarded materials at the beginning of the campaign and that Hanford would process the safeguarded material at the end of the campaign.

The challenge to both the IAEA and the United States was to enable the IAEA to verify accountancy and maintain continuity of knowledge of the material inventory subject to safeguards while the inventory moved from static storage through stabilization and packaging processing and back to storage, without undue resource requirements for the IAEA or operational constraints for the Operator. An additional challenge was that the planned processing would destroy the items in the existing inventory, along with their pedigree, and replace them with an entirely new inventory of 3013 Containers. Further, the containment and surveillance techniques could not impact the integrity of the 3013 Standard Container, but must provide for future transfer of the safeguarded material to another DOE site subject to IAEA safeguards.

The general approach was that the IAEA safeguards for the vault area would remain as currently implemented, but would likely involve increased inspection effort for measurements to verify inventory changes for transfers between the current safeguarded facility and the new eligible facility for stabilization. The development of a general approach for stabilization focused on facility definition, tradeoffs in various operation modes, and locations for IAEA monitoring systems. This included such issues as whether to treat the stabilization facility as a separate facility or to treat stabilization and storage as a single facility and the reporting implications; continuous operations versus campaigns with cleanouts; IAEA inventory verification as compared to the Operator minimizing inventory by cleanouts; coordinating and scheduling process activities with IAEA verifications; and IAEA concerns regarding potential process upsets and IAEA access to resolve process holdup.

The Design Information Questionnaires (DIQs) for the existing facilities would be revised as appropriate to describe changes in material characteristics, and storage configuration for the new containers.

During the March 1998 bilateral coordination meeting in Vienna on the implementation of IAEA safeguards in the U.S., the IAEA committed to developing an options paper. This paper was delivered to the U.S. on April 29, 1998. By October 1998, the U.S. had developed an alternative proposal for both the RFETS and Hanford facilities, which was similar to one of the IAEA's options. The U.S. presented this proposal to the IAEA at the November 1998 bilateral meeting. The U.S. proposal contained a set of common elements, or baseline, that are unaffected by the option selected for safeguards implementation in the stabilization process area.

These plans addressed both the Rocky Flats Environmental Technology Site and the Hanford Site. The approach at Rocky Flats was that the safeguards materials would be stabilized at the beginning of the campaign, and that the stabilized materials would be shipped to the Savannah River Site by October 2002. The approach at the Hanford Site was that the safeguarded materials could be processed in phases at the end of the stabilization campaign, between January 2004 and October 2004. Long range DOE planning called for shipping this material from Hanford to begin in 2006. The processing at the Hanford Site was proceeding ahead of schedule during 2002, the schedule was revised to show the safeguards materials being stabilized beginning in January 2003.

HANFORD STABILIZATION PROCESS

Materials Stabilized

The inventory is comprised of two general strata: 1) relatively high quality plutonium oxide (<84% Pu), and 2) plutonium-rich (>56% Pu) scrap originating from various DOE complex-wide processing sources. As agreed to with the IAEA the stabilized materials placed under IAEA safeguards remained substantially equivalent in total mass, plutonium weight percent, and plutonium isotopic composition to the pre-stabilized inventory.

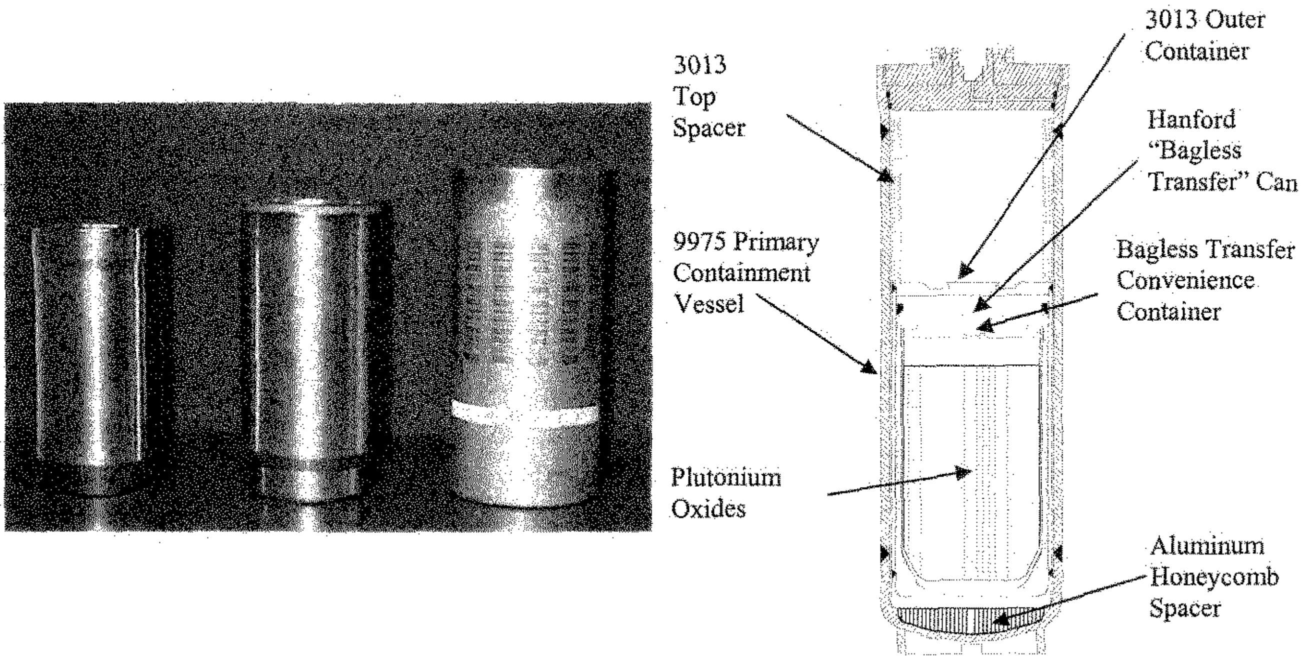
The pre-stabilization inventory contained reasonably good quality plutonium oxide as well as scrap materials. The scrap fraction non-plutonium cation and anion contamination was never fully characterized, but some items were known to contained chloride salts or beryllium. Some of these items, including the chloride and beryllium scrap fraction, were suspected to cause problems for IAEA verifications using neutron coincidence measurements.

Stabilization Process

The stabilization process consisted of a glovebox line containing a preparation area, muffle furnaces, packaging into a bagless transfer convenience can (BTCC), and then packaging in to a welded bagless transfer can for removal from the glovebox line. To achieve a stabilized product, the process line heated the feed materials to greater than 950 degrees Celsius for greater than two hours. After the material was cool, a loss on ignition test (LOI) was performed. Material successfully passing the LOI were placed in the BTCC. Materials failing the LOI were recycled.

The glovebox line uses a manual trolley with thermal shielding installed on any surface reachable by the gloves. The contents of the cans are manually transferred to the furnace boats and then transferred manually to the sieve and bagless transfer convenience can at the completion of stabilization. While the process is designed to minimize spillage and the process is batch based, there is not a one-to-one correspondence between the input containers and the output containers as the product containers hold a greater amount of material than the input containers. In addition, containers with significant amounts of organics were split to maintain safety parameters. The BTCC was placed into a bagless transfer can (BTC) and welded.

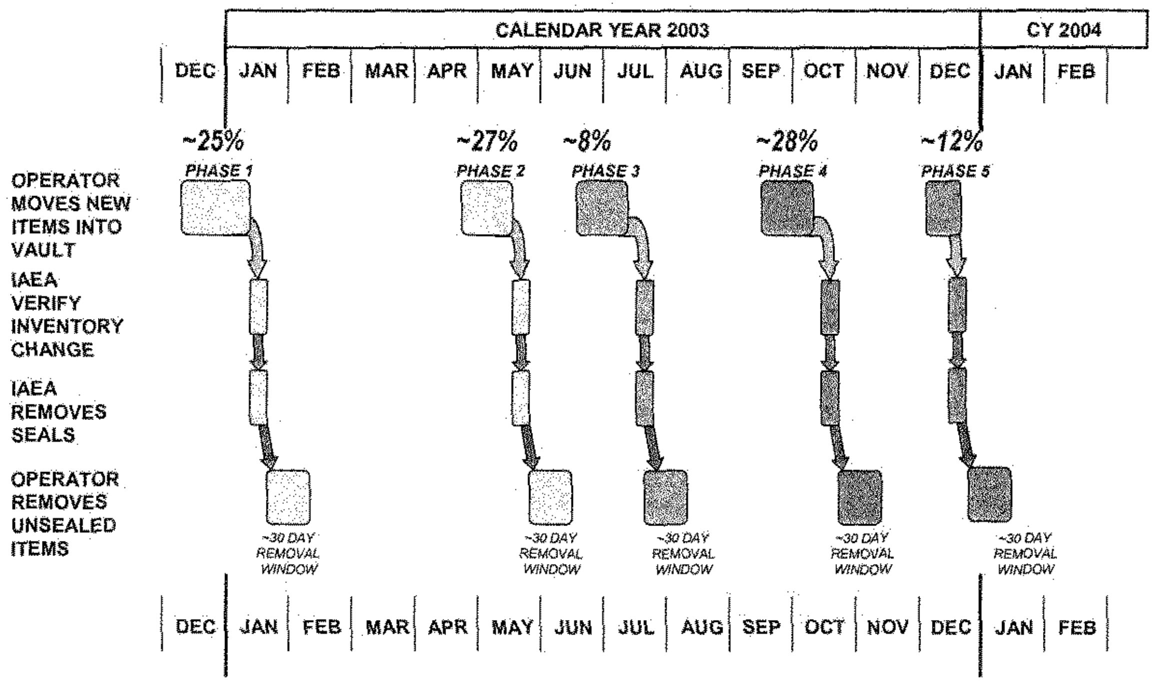
The BTC was placed into a 3013 container and welded. Safety checks were performed including leak detection for weld integrity and x-ray deflection measurements to establish a baseline for internal pressure buildup. Completed 3013 containers were then sent for accountability measurements for domestic safeguards. Measurements for domestic safeguards were either from the Plutonium Scrap Multiplicity Counter (PSMC) or calorimeter to determine plutonium mass, supported by high resolution gamma ray spectroscopy to determine plutonium isotopics.



3013 container system

SAFEGUARDS OF STABILIZED MATERIALS

The general approach that was implemented at the Hanford Site was a combination of the baseline approach implemented by a series of five vault additions of stabilized materials followed by five removals of unstabilized materials as shown in the following figure. Each addition was verified by the IAEA coinciding with a regular monthly IIV or the annual PIV and then IAEA seals were installed on the cubicles containing the verified materials. The facility and stabilization process was described in the revised DIQ that was submitted in 2002. The operational plan was submitted when the schedule for stabilizing the safeguarded material was finalized.



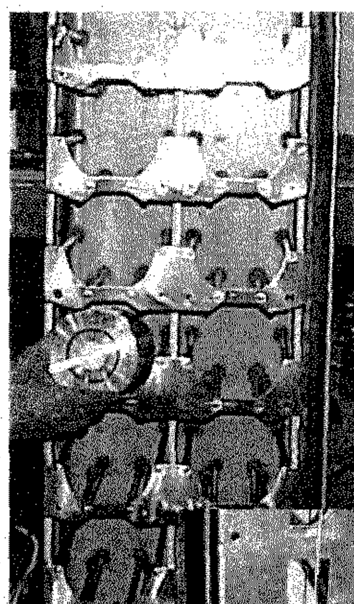
The newly stabilized items in 3013 containers from the processing line would be measured for domestic accounting and placed in storage awaiting IAEA verification measurements before being placed under IAEA seals. Monthly inspections for timely detection would include:

- Review of accounting records
- Review of surveillance tapes on the storage vault (if applicable)
- Verification checks of IAEA seals
- Review operating records
- Verification of received stabilized material inventory changes
  - NDA to detect gross and partial defects
- Attach IAEA seals to storage locations containing stabilized material
- Remove IAEA seals to permit transfer of material for stabilization

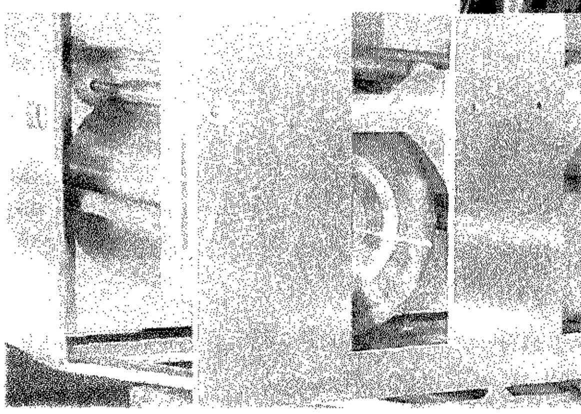
During the Inventory Change Verification (ICV) activities, the IAEA inspectors selected a statistical sample of the newly created stabilized items to be verified for gross and partial defects. NDA measurements were performed using IAEA owned inspector/operator joint-use plutonium scrap multiplicity counter and high resolution gamma energy analysis systems. An operator-owned IAEA-authenticated calorimeter was used to resolve matrix affected measurement results. Existing IAEA working standards were used for equipment calibration until removed for stabilization. Newly stabilized material standards were selected, characterized using the IAEA-authenticated calorimeter and replaced the older working standards

Containment and Surveillance

The materials subject to IAEA safeguards are stored in a vault in the 2736 building at the Plutonium Finishing Plant on the Hanford Site. The vault consists of 4 aisles with 8 or 10 cubicles on each side. Each cubicle stores up to 28 items. The material initially subject to safeguards was stored in 7-inch cans that were stored vertically in racks that were part of the Vault Safety and Inventory System (VSIS). VSIS provided near-real-time monitoring of several attributes for safety and security. The DOE standard 3013 containers used for stabilized materials are larger and could not be returned to that storage arrangement. Thus the facility operator developed new storage racks for storage of the 3013 containers. Prior to installing the new storage racks, the old racks required removal. Since the safeguarded 7-inch can materials were primarily stored in the first two aisles of the vault, the remaining empty cubicles were modified with no impact on IAEA's containment and surveillance.



In addition, the 3013 container is a welded container and was not designed to allow application of domestic or IAEA seals. The weld provides an intrinsic seal for domestic use, but this was not adequate for the IAEA use. The 3013 container is an example where methods that may be acceptable for domestic safeguards and security may not be sufficient for IAEA safeguards. Several options were considered that addressed both joint use of advanced sealing technologies by the IAEA and facility operator, and independent development of IAEA containment and sealing approach. The approach taken was to use IAEA VACOSS seals and the facility operator would modify the storage racks to allow attachment of a containment plate for application of IAEA seals. As the new storage racks became available, the IAEA participated in their installation to apply seals on the racks and observe design features that would be obscured after installation. Surveillance cameras remained as implemented on materials before stabilization. IAEA containment and surveillance measures were maintained until the material was removed by phase for stabilization and repackaging. Following placement of the repackaged material into the storage vault, the IAEA conducted inventory change verification measurements on the stabilized and repackaged material and then established final containment and surveillance.



In addition to containment and surveillance on stored materials, containment and surveillance methods were developed and implemented in the support areas where the IAEA measurement systems were located. The IAEA could then monitor their measurement equipment as well as provide containment and surveillance of materials during measurements.

Measurements and Calibration Materials

Three types of measurement systems are used for measurements by the facility operator and by the IAEA for verification of the facility operator's data. The facility operator primarily determines the accounting values using calorimetry or neutron multiplicity counting, supported by high resolution gamma-ray spectroscopy to determine the plutonium isotopics. The facility operator uses neutron multiplicity counting when cycle times are less than calorimeter measurement time to achieve the required precision.

IAEA Verifications

IAEA inspectors continued to perform routine interim inventory verifications (IIV) during the stabilization campaign of material stored in the vault under containment and surveillance. In addition, five inspections were extended for verification of the stabilized materials and one visit was made for the creation of calibration standards. The annual physical inventory verification was conducted on the normal IAEA schedule following the fourth additional/removal phase.

PLANT IMPACTS

Impacts of IAEA safeguards are identified in four general areas: 1) long lead time activities, 2) facility modifications to implement IAEA safeguards, 3) procedural changes to implement IAEA safeguards, and 4) plant schedules and funding. Operations personnel were involved in the advanced planning and factored IAEA impacts into the scheduling of the stabilization campaigns.

Long Lead Time Activities

Long lead time activities include US/IAEA joint meetings to reach agreement on changes in the safeguards approach, implementation of new monitoring and NDA equipment, and facility modification to accommodate IAEA safeguards. Modifications to the plant and operating procedures require requirements definition, engineering design, security and safety basis evaluations as well as other regulatory reviews, creating or re-writing procedures, documentation, and testing under regular operational conditions. Such modifications primarily involve DOE oversight and the facility operator. With the addition of IAEA safeguards, the IAEA become a third party in the planning, design, and implementation of those components that relate to safeguards.

Facility Modifications

To support ongoing IAEA safeguards during stabilization, facility modifications included procurement, development, and installation of new IAEA measurement capability, containment and surveillance for IAEA measurement systems, and relocating IAEA workspace to accommodate plant expansion of the stabilization process area. The new 3013 containers were larger than the 7" can, so a new calorimeter was needed. This presented several problems that had to be resolved for the IAEA to authenticate the calorimeter and develop calibration standards. While the IAEA has procedures for these activities, the implementation needed coordination with plant modification and the availability of material suitable to create calibration materials. The calorimeter that was used in the baseline approach used operating software that had been developed by PFP staff, so a copy of the design documents and source code could be provided to the IAEA for use in their authentication activities. The new calorimeter used third party software, which increased complexity of the authentication process as it was not possible for the plant operator to provide a copy of the source code.

Procedural Changes

PFP, because it contains both safeguarded materials and materials not subject to IAEA safeguards, used managed access during IAEA inspections. The procedures developed were a part of general preparations for IAEA safeguards and are reviewed for the specific activities of each inspection. Managed access procedures address protection of classified and sensitive information as well as inspector safety. Managed access measures include host and escort training, shrouding of sensitive items, removal of non-safeguarded materials from inspector paths, and route control. While many of the managed access measures are transparent to the inspector, some measures require cooperation between the plant operation and IAEA inspectors. The stabilization resulted in an increase in the movements of materials, not only for processing for follow up safety surveillances and quality assurance tests.

Plant Schedule and Funding

The impacts on plant schedules and funding can be divided into two categories: 1) direct impacts, and 2) indirect impacts from the presence of another party for review and coordination. IAEA safeguards had direct impacts in the scheduling and funding for modification of storage racks to accommodate IAEA seals, modification of the facility to provide workspace, equipment purchases for measurement systems, and materials handlers during creation of calibrations standards and material movements during ICV activities.

The United States provided schedules for plant modifications, process start up, and material exchanges between the vault and the process. The IAEA reviewed these schedules and coordinated their activities with the plant schedules. IAEA activities were then incorporated into plant schedules including modification of storage racks, development of calibration standards, verification measurements, and implementation of IAEA seals. The anticipation of IAEA activities in turn reduced some of the operator's flexibility to quickly respond to plant situations and changes.

SUMMARY

The plutonium originally subject to IAEA safeguards at Hanford's Plutonium Finishing Plant has been removed, stabilized and repackaged for long-term storage. In order to maintain an equivalent quantity and quality of plutonium subject to IAEA safeguards, stabilized and repackaged plutonium (most from the original safeguarded stock) was exchanged in five phases over a one year period. The "new" inventory was verified by the IAEA and placed under IAEA containment and storage. The stabilization of these materials was completed ahead of schedule and IAEA safeguards implemented in an efficient and effective manner. The approach to IAEA safeguards was developed in a cooperative manner that included technical development and new methods. The approach, while relatively standard for the IAEA, represented a significant change for the operator from the approach previously implemented for static storage. The IAEA safeguards involved developing new measurement methods, new containment and sealing methods, and certifying new materials for calibration standards. The materials under safeguards are now expected to remain under static storage until they are shipped offsite as part of the plutonium material disposition program.

REFERENCES

B.W. Smith, L. P. McRae, and A.C. Walker. 1995. "Project Planning at the Hanford Site for International Atomic Energy Agency (IAEA) Safeguards of Excess Fissile Material." Nuclear Materials Management XIV (Proceedings Issue): 527-532.

T. L. Welsh, R.A. Hamilton, E. S. Baker, S. T. Hurlburt, D. M. Fazzari, C. H. Delegard, L. P. McRae, A. M. Liebetrau, R. J. Lemaire, P. -M. DeRidder. 1996. "Comparison of Calorimetry and Destructive Analytical Measurement Techniques for Excess Plutonium Powders" American Chemical Society, 211th National Meeting,

L. P. McRae, C. H. Delegard, R. A. Hamilton, W. A. Westsik. 1996. "International Atomic Energy Use of Facility Calorimeters for Safeguards Purposes" INMM, 37th Annual Meeting (Proceedings Issue)

L. K. Kwei, R. K. Larsen, P. W. Oppedal, and B. L. Fearey, " 1998. Application of International Safeguards to Plutonium Residue Thermal Stabilization and Packaging Processes at the Rocky Flats Environmental Technology Site," Proceedings of the 39th Annual Meeting, Institute of Nuclear Materials Management, Naples, Florida, July 26-30, 1998, on CD-ROM.

Angel B. Joy, Alan C. Walker, Lawrence Kwei, Matthew McCormick, Nancy Jo Nicholas, Brian W. Smith and Robert K. Larsen. 1999. "Application of IAEA Safeguards to Plutonium Thermal Stabilization and Packaging Processes for US Excess Fissile Material." Nuclear Materials Management XXIX (Proceedings Issue).

Lawrence Kwei, Brian Smith, Robert Whitesel, Rene Lamaire, Pantelis Ikonomou and Diana Langner. 2000. "Joint United States/IAEA Proposed Approach for Safeguards During Plutonium Stabilization, Packaging, and Shipment." Nuclear Materials Management 41st Annual Meeting (Proceedings Issue).

M.J. Winkelman, L.P. McRae. 2002. "Transitioning LANMAS To Meet International Reporting Requirements" INMM 43rd Annual Meeting.