



LAWRENCE
LIVERMORE
NATIONAL
LABORATORY

The Status of De-Inventory of Security Category I/II Nuclear Materials at Lawrence Livermore National Laboratory (LLNL)

D. C. Riley, K. Dodson

May 14, 2010

34th Annual Actinide Separations Conference
Argonne, IL, United States
May 17, 2010 through May 20, 2010

Disclaimer

This document was prepared as an account of work sponsored by an agency of the United States government. Neither the United States government nor Lawrence Livermore National Security, LLC, nor any of their employees makes any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States government or Lawrence Livermore National Security, LLC. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States government or Lawrence Livermore National Security, LLC, and shall not be used for advertising or product endorsement purposes.

The Status of De-InVENTORY of Security Category I/II Nuclear Materials at Lawrence Livermore National Laboratory (LLNL)

D.C. Riley and K.E. Dodson LLNL De-InVENTORY Program Nuclear Materials Technology Program
34th Annual Actinides Separations Conference May 17-20, 2010, Argonne, Illinois

De-inventory of Security Category I/II Special Nuclear Materials (SNM) from LLNL is required for NNSA's Complex Transformation Plan

- NNSA Administrator Thomas D'Agostino has defined "Complex Transformation" as NNSA's vision for a smaller, safer, more secure, and less expensive nuclear weapons complex that leverages the scientific and technical capabilities of the workforce and meets national security requirements
- Part of Complex Transformation entails reducing or eliminating SNM storage at certain sites and consolidating all materials and Security Category I/II operations at the minimal number of sites
- A LLNL plan has been developed to de-inventory to Security Category III level by October 1, 2012

Most of LLNL's nuclear material inventory will be declared excess to program mission by 2012

- Approximately 87% of LLNL's starting inventory will be declared excess to NNSA missions at the completion of the Security Category I/II nuclear material de-inventory
- Excess inventory will be transferred to sites for consolidation and future disposition
 - About 67% to SRS
 - About 5% to LANL
 - About 11% to Y-12
 - About 2% to Pantex
 - About 2% to Others
- Missions and associated materials (about 13% of the starting inventory) are planned for transfer to LANL and other sites

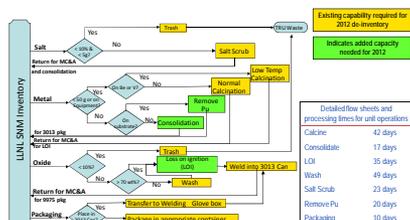
LLNL continues to have active programmatic activities and will operate at a Security Category III level after 2012 in support of NNSA missions

LLNL's inventory predominantly consists of weapons grade nuclear materials

Material Type	Element Wt% (April 16, 2010)
Depleted Uranium (<0.71% U-235)	11.8
Natural Uranium (0.7% U-235)	0.8
Enriched Uranium (0.90 to <20% U-235)	3.3
Highly Enriched Uranium (>20% U-235)	30.8
Plutonium-239	48.3
Neptunium-237	0.1
Thorium	0.7
Other	4.2

The inventory is 77% Metal, 16% Non-Metal and 7% Waste

Processing plans have been developed for each group of items in the inventory



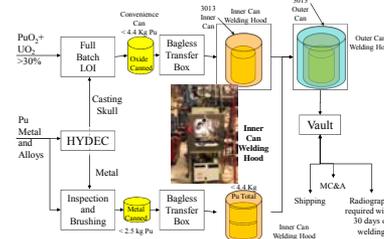
About 1700 items must be stabilized for transportation and long term storage

Most items are canned in preparation of packaging for shipping

- Crimp sealed food pack cans
- DOE Standard 3013 containers
 - Designed for 50 year storage
 - Requirements
 - < 4.4 kg Pu + U
 - Double welded container
 - No organics
 - Metals
 - No loose oxides
 - Pieces larger than 50 grams
 - Oxide
 - Calcined > 950°C
 - Moisture content less than 0.5 wt%
 - Loss on ignition tested > 1000°C
- Special containers
 - Conflat
 - Special forms capsule

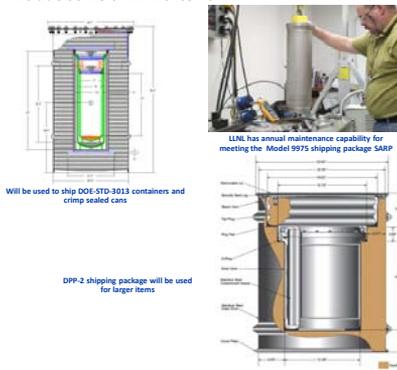


A laser welder is used in the production of DOE-STD-3013 compliant containers required for shipment

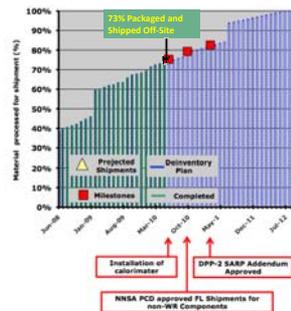


Various shipping packages will be used

- Most containers will be shipped in the DOE Model 9975
- DOE Models 9977 and 9978 will also be used
- DPP-2 shipping packages will be used for larger and odd-shaped items
 - DPP-2 SARP Addendum is currently being developed to include some of LLNL's items



Approximately 73% of LLNL's starting inventory has been packaged and shipped off-site



A schedule has been developed and updated for the 2012 De-InVENTORY Program

- Developed the processing steps for each of the processing chains and associated time line
- Linked the processing chains together to generate the schedule
- Several important assumptions were used
 - Time to perform each operation was based on historical data, actual observations and communications with the operators
 - The operating calendar takes into account:
 - Working 4 days/week
 - Holidays
 - Known facility "shut-downs" including inventory and maintenance requirements
- Modifications have been made to include actual processing data

Lessons Learned - Watch the fine print

- Some content specifications for a shipping package were developed for a specific set of materials
- Even though you may have similar material you need to read all of the information in the shipping package SARP to verify that you can send it
- Example: DOE Model 9975 content envelope C.8 is for neptunium but there are additional requirements on:
 - the procedure to prepare the oxide
 - additional restrictions on the container that can be used
 - inerting the container

Lessons Learned - Do not get too close to the limits specified in the requirements documents

- Some 3013 cans were potentially filled too close to the 5 kg limit
 - The receiver site required the potential measurement uncertainty associated with the balances to be included
 - Including the uncertainty resulted in the containers' potential weight being at 5.0006 kg
 - Significant additional Authorization Basis requirements were completed before the cans were approved for shipment

Lessons Learned - There can be multiple requirement documents for shipping a single item

- The DOE 3013 Standard controls what is packaged in a DOE-STD-3013 container
- But the model 9975 SARP also controls what can be shipped in a DOE-STD-3013 container
- Requirements for the model 9975 SARP are more restrictive than the DOE-STD-3013 requiring changes to the model 9975 SARP to allow some containers that met the DOE-STD-3013 to be shipped

Lessons Learned - Watch for the unmentioned

- When working with receiver sites, be aware that they may have a number of restrictions that are not stated
- There may be Authorization Basis requirements at the receiver site that the shipper is not aware of
- Request that any new or additional requirements are provided in writing so that the requirements are clear between both parties

Lessons Learned - Be sure you can live by your own rules

- In formalizing packaging requirements we set a limit of three days between calcining oxides and welding into DOE-STD-3013 can sets to account for weekends (Friday off, Saturday, and Sunday)
- There are a number of Monday holidays, so we had to redevelop procedures to allow for as many as four days between calcining and canning

