



Lawrence Livermore National Laboratory

Lawrence Livermore National Laboratory Security Category I/II Special Nuclear Material De-Inventory Status

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

- **National Nuclear Security Administration (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 Lawrence Livermore National Laboratory (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 mission at the completion of the Security Category I/II nuclear materials de-inventory**
- **Excess inventory will be transferred to site for consolidation and future disposition**
 - **About 67% to Savannah River Site (SRS)**
 - **About 5% to Los Alamos National Laboratory (LANL)**
 - **About 11% to Y-12**
 - **About 2% to Pantex**
 - **About 2% to Others**
- **Mission and associated materials (about 13% of the starting inventory) are planned for transfer to LANL and other sites**

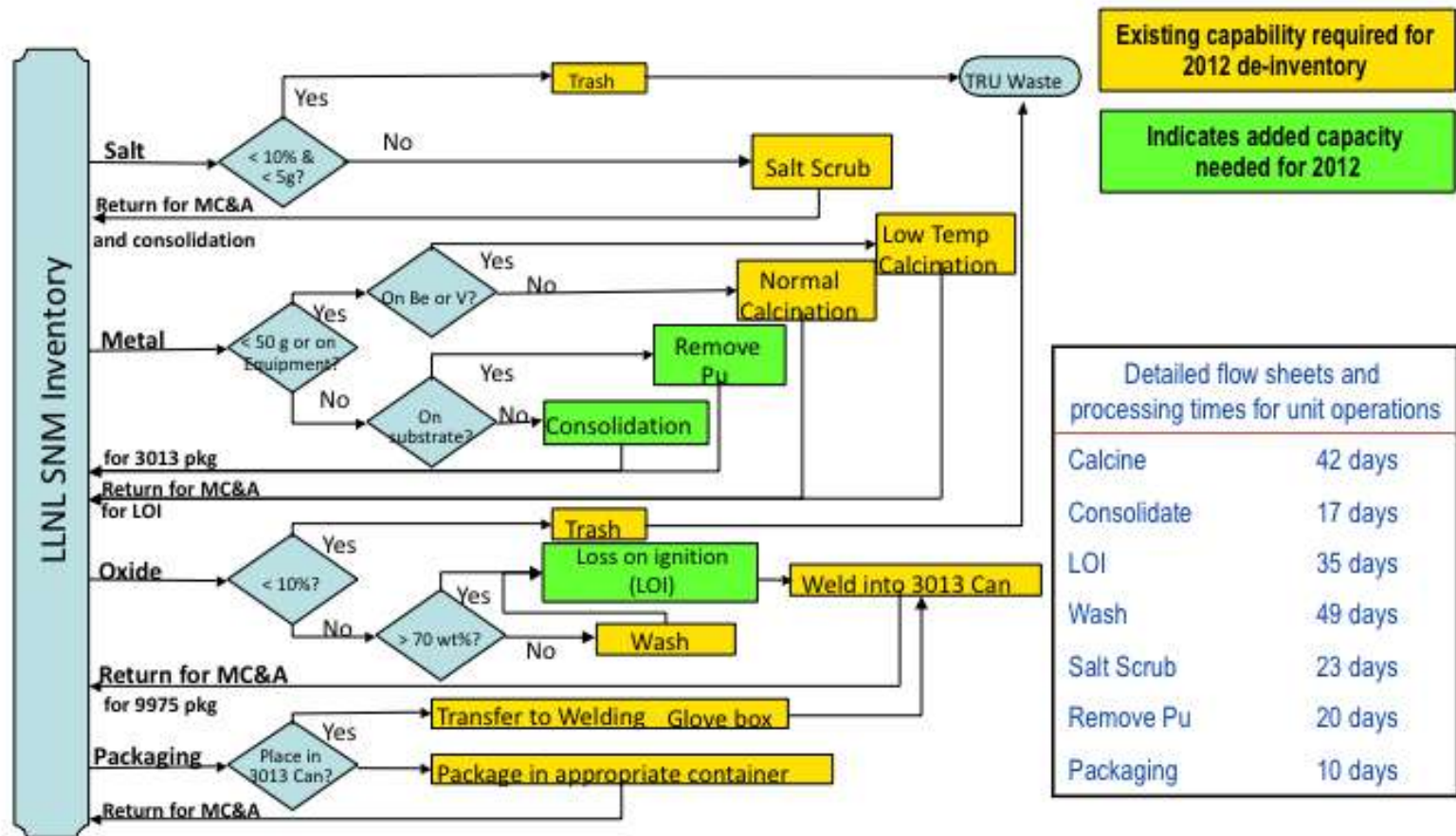
LLNL continues to have active programmatic activities and will operate at a Security Category III level after 2012 in support of NNSA missions

LLNL's inventory predominantly consists of weapons grade nuclear materials

Isotope	Percentage of Remaining Inventory (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 plan have been developed for each group of item 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

- Department Of Energy (DOE) Standard 3013 containers

- Designed for 50 year storage
- Requirements
 - < 4.4 kg Plutonium + Uranium
 - Double welded container
 - No organics
 - Metals

- No loose oxides
- Piece larger than 50 grams

- Oxide

- Calcined > 950° C
- Moisture content <0.5 wt%
- Loss on ignition tested > 1000° C

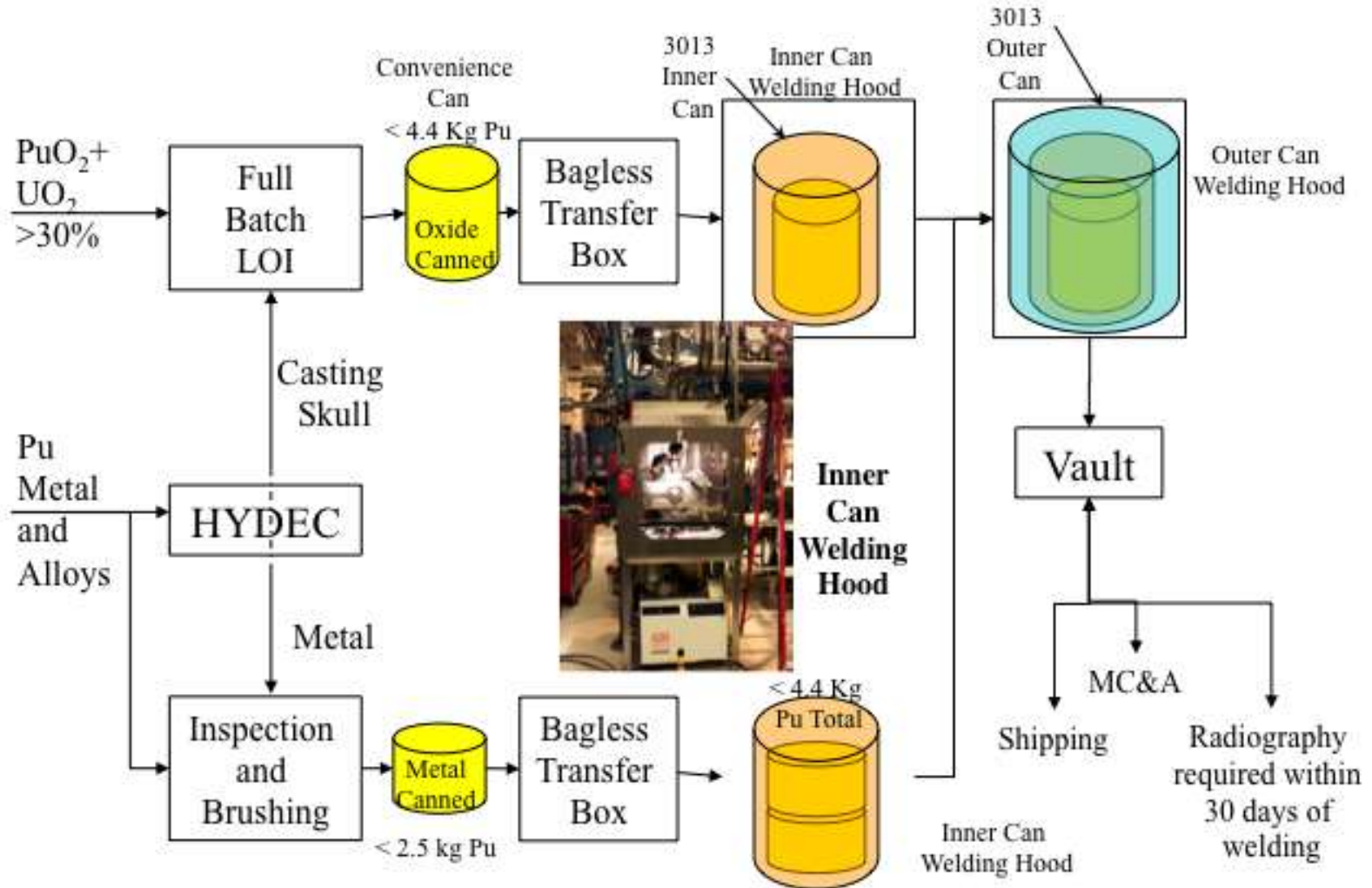


Other canning in preparation of packaging for shipping

- **Crimp sealed cans**
- **Special containers**
 - **Conflat**
 - **Special forms capsule**

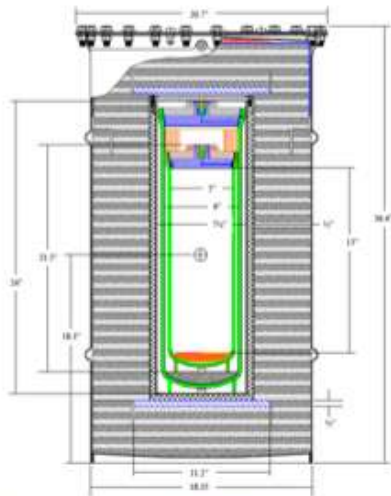


A laser welder is used in the production of DOE-STD-3013 compliant containers required for shipping



Various shipping package will be used

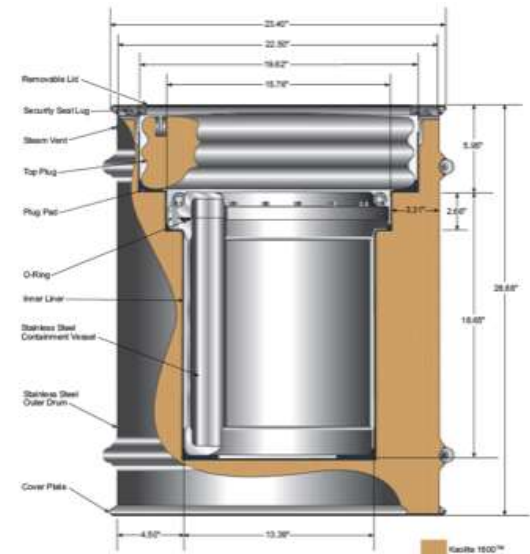
- Most containers will be shipped in the DOE Model 9975
- DOE Models 9977 and 9978 will also be used
- DPP-2 shipping packages will be used for larger and odd-shaped items
 - DPP-2 Safety Analysis Report for Packaging (SARP) Addendum is currently being developed to include some of LLNL's items



Will be used to ship DOE-STD-3013 containers and crimp sealed cans



LLNL has annual maintenance capability for meeting the Model 9975 shipping package SARP



DPP-2 shipping package will be used for larger items

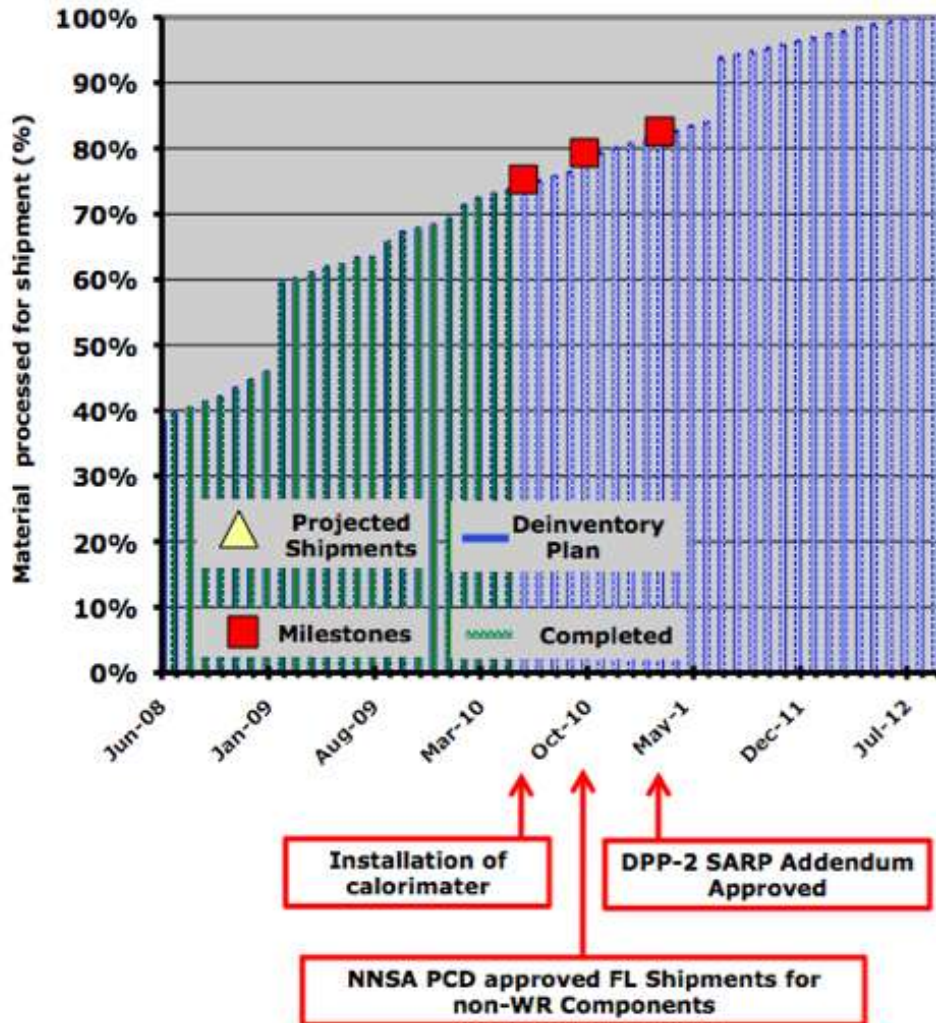
A schedule has been developed and updated for the 2012 De-Inventory Program

- **Developed the processing steps for each of the processing chains and associated time line**
- **Linked the processing chain together to generate the schedule**
- **Several important assumption were used**
 - **Time to perform each operation was based in historical data, actual observation and communication with the operator**
 - **The operating calendar takes into account:**
 - **Working 4 days/week**
 - **Holidays**
 - **Known facility “shut-downs” including inventory an maintenance requirements**
 - **Modification have been made to include actual processing data**

DPP-2 shipping package will be used
for larger items



By June, approximately 73% of starting inventory has been packaged and shipped off-site



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 analysis were completed before the cans were approved for shipments**

Lessons Learned –There can be multiple requirement documents for shipping a single item that do not agree

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



Lessons Learned –Watch for the unmentioned

- **When working with receiver site, be aware that they may have a number of restrictions that are not stated**
 - **There may be Authorization Basis requirement at the receiver sites 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 requirement LLNL set a limit of three days between calcining oxides and welding into a DOE-STD-3013 can set to account for weekends (Friday off, Saturday, and Sunday)
- There are a number of Monday holidays, so LLNL had to redevelop procedures to allow as many a four days between calcining and canning.



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 materials you need to read all of the information in the shipping package SARP to verify that you can send the materials**
- **Example: DOE Model 9975 content envelope C.8 is for neptunium oxide but there are additional requirements about:**
 - **The procedure to produce the oxide**
 - **The container that can be used**
 - **Inert of the container**
- **These restrictions have required LLNL to request a Letter of Amendment in which planned processing of the material is shown to be equivalent to that required in the SARP.**