



# 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**

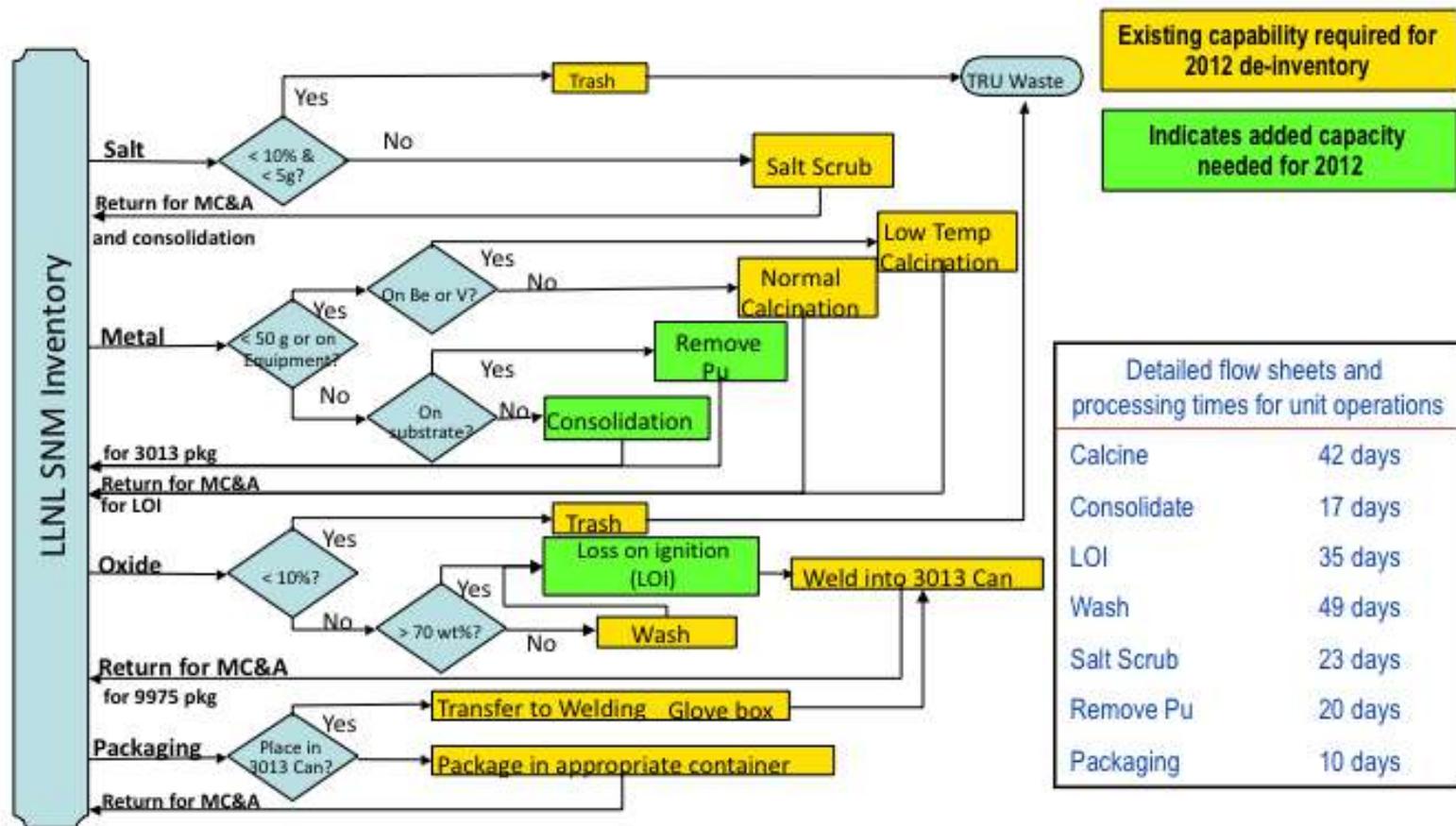
**LLNL continues to have active programmatic activities and will operate at a Security Category III level after 2012 in support of NNSA missions**

# 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

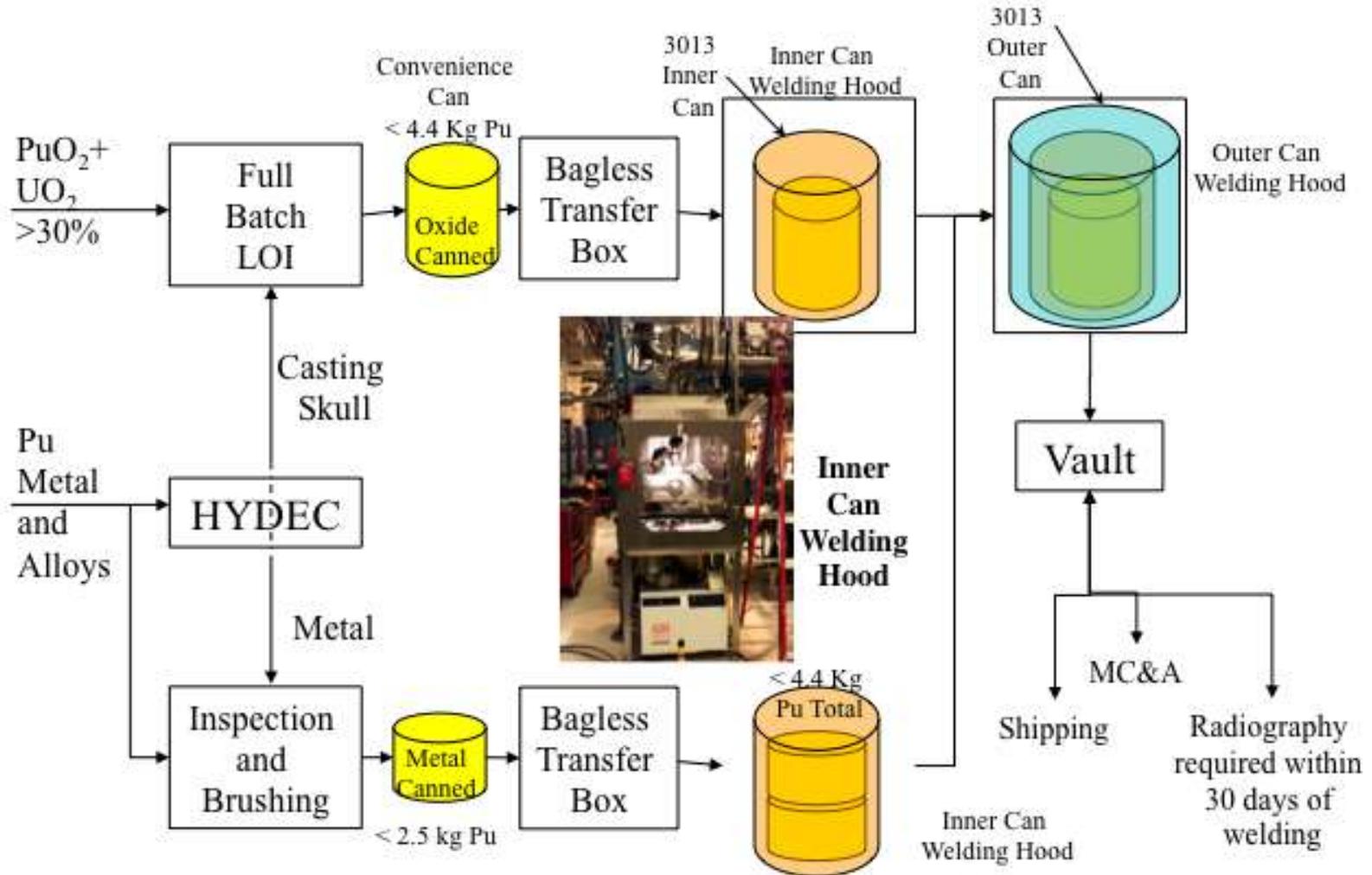


## Other canning in preparation of packaging for shipping

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

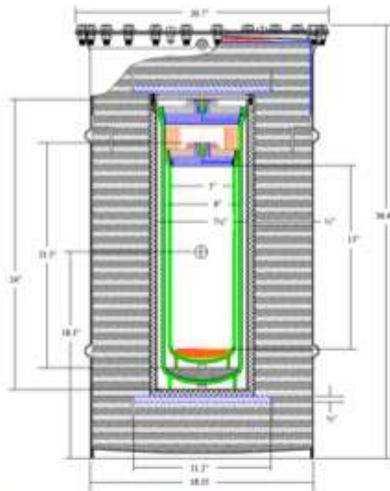


# A laser welder is used in the production of DOE-STD-3013 compliant containers required for shipping



## Various shipping package will be used

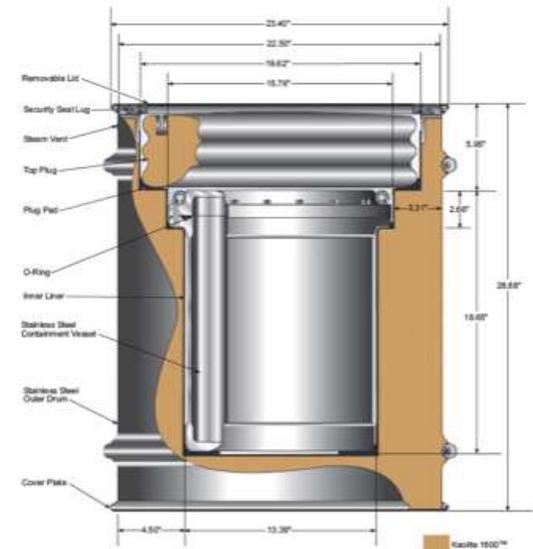
- Most containers will be shipped in the DOE Model 9975
- DOE Models 9977 and 9978 will also be used
- DPP-2 shipping packages will be used for larger and odd-shaped items
  - DPP-2 Safety Analysis Report for Packaging (SARP) Addendum is currently being developed to include some of LLNL's items



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

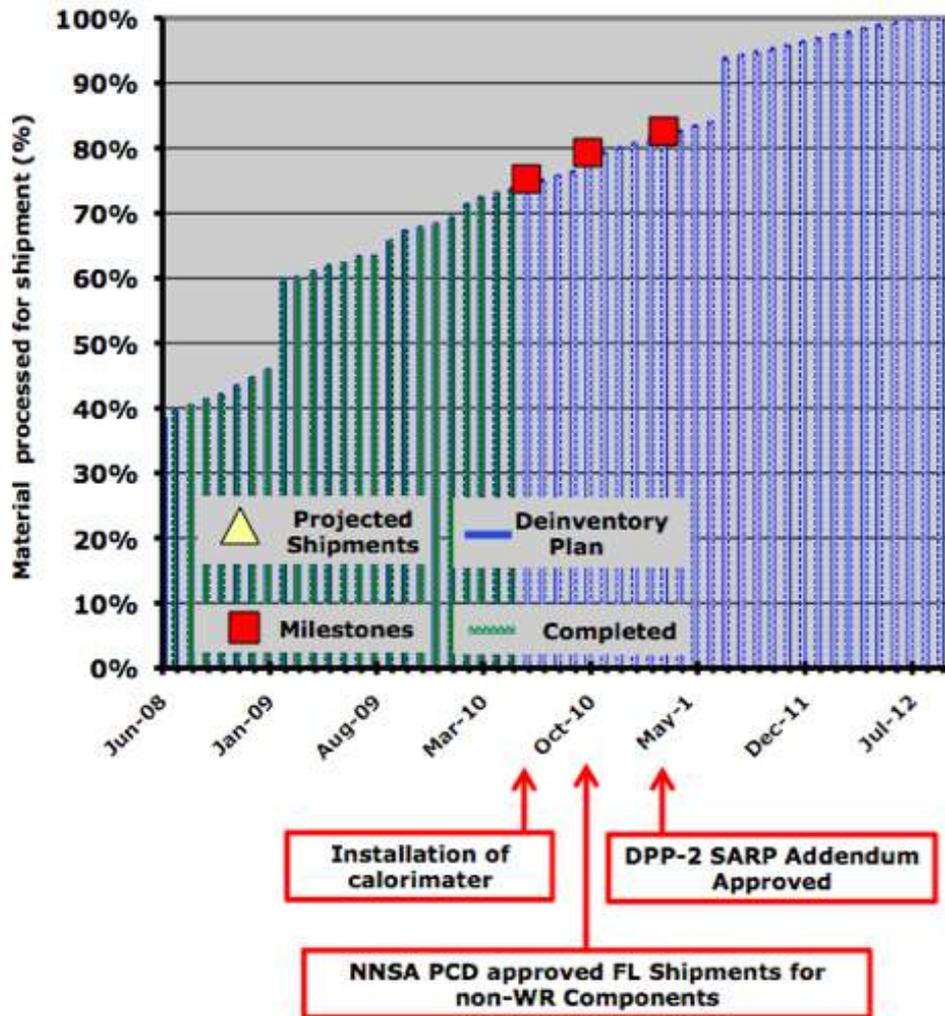
# A schedule has been developed and updated for the 2012 De-Inventory Program

- **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.**

