

Lawrence Livermore National Laboratory

Criticality Safety Controls and Disposal of TRU Drums Generated by the LLNL Pu Facility

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Philip Chou, John Wolf and John Pearson
Nuclear Operations Directorate

Lawrence Livermore National Laboratory, P. O. Box 808, Livermore, CA 94551

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Scope

- *Pu Facility TRU Waste (TRUW) drum criticality controls*
- *TRUW drum generation and certification*
- *TRUW drum disposal*



Pu Facility TRUW Drum Criticality Controls

Three different types of criticality safety controls in the form of Standard Criticality Control Conditions (SCCCs) are applied to TRU Waste (TRUW) drums in the Pu Facility:

- SCCC W
- SCCC A
- SCCC W_x



Pu Facility TRUW Drum Criticality Controls

SCCC W

- *120 grams Pu*
- *First developed in late 80's*
- *Criticality controls on Moderators/Reflectors: water and poly (PE) moderation allowed; 300 grams Be or 8 kilograms graphite or 100 kilograms Nat-/Dep-U*
- *SCCC W is the same as Radioactive and Hazardous Management (RHWM) waste acceptance criteria limits.*



Pu Facility TRUW Drum Criticality Controls

SCCC A

- *65 grams Pu*
- *Developed in late 90's*
- *No controls on Moderators/Reflectors: water, PE, HDPE, Be, graphite and Nat-/Dep-U are allowed with unlimited amounts.*
- *In additions to waste drum applications, SCCC A are also used for glovebox operations as well.*



Pu Facility TRUW Drum Criticality Controls

SCCC Wx

- *200 grams Pu*
- *developed in early 2000's*
- *Criticality controls on Moderators/Reflectors: water and limited PE moderation and reflection allowed; other than trace quantities, no Be, graphite, Nat-/Dep-U are allowed.*



Pu Facility TRUW Drum Criticality Controls

SCCCs A, W, and Wx are developed with conservative assumptions:

- Pu in each drum is first optimally moderated by PE or HDPE in a spherical core. The core is then reflected by allowed reflectors in shells and finally by the bulk PE inside the drum.
- Fissile-reflector cores are then placed in a closest configuration in a 2-wide by 2-high 4-drum pack in infinite X-Y array.



Pu Facility TRUW Drum Criticality Controls

Drums packed under SCCC W are preferred for the following reasons:

- LLNL fissionable material inventory controls do not factor in the uncertainty, unlike WIPP, which requires the inclusion of two standard deviations. 120-gram limit allows the inclusion of uncertainty while meeting 200-gram WIPP limit.
- SCCC W controls the amount of Be. With waste content weighs more than 30 kilograms, Be is less than 1 weight %. There will be no impact on TRUPACT-II loading.



Pu Facility TRUW Drum Criticality Controls

Drums cannot be packed under SCCC W are then packed under SCCC A or SCCC Wx

- SCCC Wx are typically assigned to drums assayed with more than 120 grams (but less than 200 grams) Pu
- SCCC A are assigned for drums not meeting the moderator/reflector limits for SCCC W.



TRUW Drum Generation and Acceptance

- *TRUW drum generated in Pu Facility will first be transferred to Radioactive and Hazardous Waste Management (RHWM) waste storage facilities. These TRUW drums will then be disposed offsite by RHWM.*
- *Acceptance into RHWM storage facilities require detailed review.*
- *SCCCs W and Wx meet RHWM Waste Acceptance Criteria while SCCC A may not because of moderators and reflectors*



TRUW Drum Generation and Acceptance

- *TRUW drums generated in Pu Facility are assigned one of the three SCCCs based on their contents*
- *Contents information is collected on waste parcel cards and waste disposal requisition form*
- *Information on nuclide activity, moderators/reflectors and their amounts, dose rates and others are collected.*
- *All information will be certified by the generator and reviewed by the waste technician, the radiological characterization analyst (RCA) and the characterization chemist.*
- *Upon review and approval of the records control officer (RCO), the TRUW drum can then be transferred to RHWM waste storage facility.*



TRUW Drum Disposal

- *Prior to 2007, the start of the De-Inventory Program (DIP), 80 TRUW drums were generated annually.*
- *Now, in DIP, TRUW drum generation rates have been accelerated to more than 100 drums annually. It is anticipated that this drum generation rate remain accelerated at this level until the end of DIP in 2012.*



TRUW Drum Disposal

- *LLNL does not have own certified WIPP waste certification program owing to being considered a 'small' site*
- *Relying on outside organizations, such as Mobile Vendors and Idaho National Laboratory, for certifying TRUW waste for WIPP disposal.*
- *LLNL has capability in prescreening waste for WIPP certification by outside organizations.*



TRUW Drum Disposal

- *SCCC W can meet the WIPP 200-gram fissile loading requirement.*
- *SCCC Wx can also meet the WIPP 200-gram fissile loading requirement with small uncertainty.*
- *SCCC A may not meet the WIPP requirements because of moderators/reflectors.*



TRUW Drum Disposal

LLNL TRUW Drum Offsite (WIPP) Disposal History

- *In 2004, Mobile Vendors helped with the disposal of 683 drums at WIPP*
- *In 2010, 214 drums were shipped to the Idaho National Laboratory for the certification for final disposal at WIPP.*
- *Approximately 600 drums remain in LLNL. Some were rejected for WIPP disposal for reasons other than criticality safety, such as prohibited item (un-punctured cans, large sealed container) or high contact handle doses. Repackaging for these drums is required.*



Summary

- *SCCCs W, Wx and A are applied to the criticality safety controls on the Pu Facility generated TRUW drums.*
- *TRUW drums are subjected to detailed review before they may be transferred from Pu facility to RHWM storage facilities.*
- *SCCC W drums are most consistent with WIPP criticality safety requirements.*
- *Drums rejected by the WIPP waste certification process need to be repackaged.*

