Tank Waste Processing and Disposal Technology Development Data Summary

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**TANK WASTE PROCESSING AND DISPOSAL TECHNOLOGY
DEVELOPMENT DATA SUMMARY**

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ABSTRACT

The U.S. Department of Energy's Waste Management and Technology Development Programs are engaged in a number of projects to develop, demonstrate, test, and evaluate new technologies to support the clean-up and site remediation of more than 300 underground storage tanks containing over 381,000 cubic meters (100 million gallons) of radioactive mixed waste. Significant development is needed within primary processing functions and in determining an overall bounding strategy. This document is a first attempt to summarize the overall strategy and show technology development activities within the strategy. It is intended to serve as an information resource to support understanding, decision making and integration of multiple program technology development activities. Recipients are encouraged to provide comments and input to the authors for incorporation in future revisions.

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1.0 INTRODUCTION 1

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A TECHNOLOGY DEVELOPMENT ACTIVITIES CHART A-1

LIST OF TERMS

DOE	U.S. Department of Energy
EM-30	Waste Management Program
EM-50	Technology Development Program
UST-ID	Underground Storage Tank - Integrated Demonstration
WPDP	Waste Processing and Disposal Program

**TANK WASTE PROCESSING AND DISPOSAL TECHNOLOGY
DEVELOPMENT DATA SUMMARY**

1.0 INTRODUCTION

This document presents the results of ongoing efforts within the Department of Energy's Underground Storage Tank - Integrated Demonstration (UST-ID) to facilitate an integrated approach in developing emerging technologies needed for tank waste remediation. The Waste Processing and Disposal Program (WPDP) of the UST-ID is conducting a number of technology development projects aimed at tank waste processing and disposal at four UST-ID participating sites: Hanford, Savannah River, Idaho National Engineering Laboratory, and Oak Ridge.

Production of nuclear materials has been a major mission of the U.S. Department of Energy (DOE) and predecessor agencies for the last 50 years. These activities have contributed to a substantial accumulation of hazardous, radioactive, and mixed wastes at a number of sites. One of DOE's most significant challenges will be remediating the more than 300 underground storage tanks and associated near-field environments at the participant sites. The DOE has made a commitment to remediate the tank sites that are not in compliance with state and federal regulations and to treat and dispose of the wastes in accordance with accepted practice. This remediation program will constitute one of the most complex and resource-intensive clean-up actions ever attempted by a government agency.

The cost of cleanup of the tank sites will be prohibitive using some of the current baseline technologies. Furthermore, major gaps exist in key technology areas for processing and disposal of the waste. New and improved technologies are needed that will support the baseline strategies, reduce costs, accelerate clean-up, and enhance safety. Accordingly, the DOE's Waste Management (EM-30) and Technology Development (EM-50) Programs are engaged in a number of projects to develop, demonstrate, test, and evaluate new technologies to support the tank waste clean-up mission.

The EM-30 Program at each site has the responsibility to safely store and proceed to treat and dispose of existing and new wastes in a manner that is environmentally sound, technically correct, safe to workers and the public, cost-effective, and in full compliance with applicable laws, regulations and DOE orders. To support these remediation objectives, EM-30 must develop the baseline strategy for retrieval, treatment, and disposal, and ensure that the needed technologies are developed.

The EM-50 Program is pursuing technology development activities at multiple national laboratories and management/operating contractors to support the site remediation efforts. Tank waste processing and disposal technology development activities are focused in two programs: the Efficient Separations and Processing - Integrated Program and the UST-ID/WPDP. Part of the WPDP mission is to facilitate overall integration of technology development across the sites and programs. To support this effort, the WPDP has compiled the technology development project data and organized it into an overall functional strategy.

Appendix A to this document presents the WPDP Technology Development Activities Chart, which shows the EM-30 and EM-50 technology development activities arranged by major processing functions in the current baseline strategy. The WPDP chart is intended as a visual tool to aid in determining applicability of technologies and the relative emphasis placed in the various functional needs. Recipients are encouraged to review it and provide any input and comments to the authors. Periodic revisions are planned for the purpose of incorporating comments, input, and changes in program direction.

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APPENDIX A
TECHNOLOGY DEVELOPMENT ACTIVITIES CHART

Solids

CONCENTRATED Cs/Sr/TRU/To PRODUCT STREAMS (TO DST INTERIM STORAGE)

Organic (Complexant) Destruction

Electrochemical Destruction
EM-30, TWRS
PNL Schmidt

Organic Destruction
EM-50, UST-ID
ORNL Hunt

Heat & Digest Basic
EM-30, TWRS
WHC Delegard
PNL Schmidt

Calcination/Dissolution
EM-50, UST-ID
WHC Crawford

Simulant Development
EM-30, TWRS
WHC Hohl
PNL Bryan

Electrochemical Destruction
EM-50/ESPIP
WSRC Hobbs

Other Processes/Feeability
Survey/Selection Criteria
EM-30, TWRS
PNL Schmidt
PNL Eakin

Hydrothermal Processing
EM-30, TWRS
LANL Buelow

Elimination/Recycle/Reduction
of Organics in REDC Wastes
EM-30, ORNL
MMES/OR Bond

Hydrothermal Processing
EM-30, TWRS
PNL Schmidt

Cs Removal

IPW/Cs-IX CDU
EM-30, TWRS
PNL, WHC Hansrote

CPU Development
EM-50, UST-ID
PNL Richmond

Cs IX Development/Test
EM-30, TWRS
PNL Carlson
PNL Kurath
PNL Latemina
PNL Bray

Cs Extraction Testing
EM-50, UST-ID
WSRC Bibler

SKID Test Unit
EM-50, UST-ID
WSRC Bibler

Electrochemical Cs IX
EM-30, TWRS
PNL Surma

Cs Extraction Testing
EM-30, SRS
WSRC Bibler

IE-96/Zeolite
EM-30, TWRS
WHC, PNL Bray

Sludge/Supernate Process
Testing
EM-50, UST-ID
MMES/OR Egan

Crystalline Silicotitanates
EM-30, TWRS
SNL Brown

In-Situ Mag. Assisted
EM-50, ESPIP
ANL Nunez

Crystalline Silicotitanate IX
EM-50, ESPIP
SNL Brown

Develop and Test Sorbents
EM-50, ESPIP
PNL Wester

Inorganic IX - FeCN from
Highly Alkaline Waste/
Resorcinol for Cs/REDC Waste
EM-30, ORNL
MMES/OR Kent
MMES/OR Egan

Carbolide/CDC Process
EM-30, SRS
WSRC McCabe

To Offgas
Treatment

EVAP RECYCLE

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Figure A-1. Tank Waste Processing and Disposal
Technology Development Activities Chart

EM-30, SRS
WSRC

Hay

Single-Shell Tanks

<u>Site</u>	<u>No. Tanks</u>	<u>Total Waste (Mgal)</u>
Hanford	149	36.6
Fernald	4	2.8
INEL	11	2.3
SRS	8	2.1
OR	91	0.8

Thermal Reconstitution

Calcination Engineering,
Equipment Development,
Dissolution Chemistry
EM-30, TWRS
WHC Crawford

Corrosion Studies
EM-30, TWRS
PNL

Calcination/Dissolutio
EM-50, UST-ID
WHC

Thermal Reconstitution
Investigate Other Processes
EM-30, TWRS
PNL Kurath

Residue Leaching
SPIP
Culley

Thermal Treatment of
Waste / Calcine
SPIP
Todd

Final
SPIP
R
Egan

Advanced Sludge Processing

Separations/Tech. Review
Bench/Solvent Extraction
EM-30, TWRS
PNL
PNL
PNL
Sevigny
Lumetta
Kurath

CC Solids Behavior Tests
EM-30, TWRS
WHC
Hohl

Corrosion Tests/Reqs.
EM-30, TWRS
WHC
Hohl

TRU Removal by IX
EM-30/TWRS
LANL
Yarbro

Cation IX Absorbers
EM-30/TWRS
LANL

High Gradient Magnetic Sep.
EM-30/TWRS
LANL
Avers

GTM Enhancements,
TRUEX/SREX Devel., Test
EM-30, TWRS
ANL
ANL
Vandegriff
Horwitz

TUC Development
EM-30, TWRS
ANL
Horwitz

Crystalline Silicotitanates
EM-30, TWRS
SNL
Brown

TRUEX; SREX; Crown Ethers
CMP; CMPO
EM-30, INEL
WINCO
Brewer

Sludge Washing & Dissolution
EM-50, UST-ID
MMES/OR
Egan

TRUEX Model Validation
EM-50, UST-ID
MMES/OR
Felker

TRUEX Model Development
EM-50, UST-ID
ANL
Vandegriff

Technical Exchange
EM-50, UST-ID
MMES/OR
Jubin

Sequestering Agents for TRU
EM-50, ESPIP
LANL
Jarvinen

Alk. Tank Sludge Treatment
EM-50, ESPIP
PNL
Quinn

Adv. Processing/Clean Option
EM-50, ESPIP
ANL
Horwitz

Continuous Chromatography
EM-50, ESPIP
MMES/OR
Williams

Talspeak
EM-50, ESPIP
MMES/OR
Toth

Cs, Sr, Ru Removal by IX/
Precipitation
EM-30, ORNL
MMES/OR
Egan

Cs Removal - AMP; CST
EM-30, INEL
WINCO
Miller

To LLW
Vitrification

HLW Evaporation

HLW Evaporation
EM-30, TWRS
WHC

Mobile Evap./
EM-50, UST-ID
ANL

HLW Evaporation
EM-30, INEL
WINCO
Wood

Mobile Evap./Concentrator
M-60, UST-ID
NL Chamberlain

HLW TREATMENT

HWVP Program (Baseline)
EM-30, TWRS
WHC Powell

HLW
EM-3
WINC

Stirre
EM-3
WSP

Systems Analysis/Crosscut

Systems Engineering
EM-30, TWRS
WHC Holmes
WHC Barton
WHC Boomer
WHC Woods
WHC et al

Clean Option Study
EM-60, UST-ID
MMES/OR Malkemus

ESPIP Coordination
EM-60, ESPIP
PNL Kuhn

Alternative Process Evaluation
EM-30, TWRS
WHC Barton
WHC Sutherland
PNL Brothers
SAIC Beary
SAIC Nicholson

ESPIP Support
EM-60, ESPIP
MMES/OR Watson

Global Process Evaluation
EM-60, ESPIP
WHC Seeman

Filter Corrosion Testing
EM-30, TWRS
WHC Schwenk
WHC Briton

WPAG
EM-30, SRS
WSRC Thompson

Systems Analysis
EM-30/TWRS
LANL Farish

Dynamic Computer Simulation
EM-30, SRS
WSRC Wach

Sorbents Scooping
EM-30/TWRS
LANL Marsh

Experimental Infrastructure
EM-30/TWRS
LANL Buslow

Integrated Flowsheet Devel.
EM-30, INEL
WINCO

Key	
Title [DOE/Field Program Element Contractor/Lab PI]	EM-50/UST-ID Funded Activities
EM-30, TWRS Funded Activities	EM-50, ESPIP Funded Activities
EM-30/TWRS/LANL Funded Activities	EM-30, ORNL Funded Activities
EM-30/TWRS/SNL Funded Activities	EM-30, INEL Funded Activities
EM-30/TWRS/ANL Funded Activities	EM-30, SRS Funded Activities

TANK WASTE PROCESSING AND DISPOSAL TECHNOLOGY DEVELOPMENT ACTIVITIES

Compilation of UST-ID, ESPIP and EM-30 Funded
Projects at UST-ID Participating Sites

December 30, 1993

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