Department of Energy
Carlsbad Area Office
P. O. Box 3090
Carlsbad, New Mexico 88221

DEC 0 5 1995

To Patty H
Steve Z

Dear Colleague:

Please find enclosed the Abstract and Executive Summary for the document entitled "Radioactive Waste Processing and Volume Reduction Technology Study" provided for your information. This study has been prepared by the Department of Energy (DOE) Carlsbad Area Office and submitted to Congress on October 26, 1995, to fulfill the requirements of Section 19 of the Waste Isolation Pilot Plant Land Withdrawal Act (LWA), Public Law 102-579.

This study reviews the technologies that are currently available and/or under development for the processing or volume reduction of transuranic radioactive wastes. As required by the LWA, the study identifies technologies involving the use of chemical, physical, and thermal (including plasma) processing techniques.

This study summarizes thirty-five technologies that may be applicable to the thermal and non-thermal treatment of transuranic waste. The study reviews 219 potential candidate processes that are at various stages of development. The following information is provided for each process: a process description, process objective, process type, applicable waste type, process maturity, and final waste form.

Individual DOE facilities may use this study in conjunction with site treatment plans developed under the Federal Facilities Compliance Act and state agreements to identify technologies and potential processes that, if needed, might be appropriate for future implementation.

Please call (800)336-9477 to request a copy of the document, or Don Watkins of my staff, at (505)234-7478, for additional information.

Sincerely,

Michael R. McFadden
For George E. Dials
Manager

Enclosure

cc w/o enclosure:
Don Watkins, CAO

DOE/CAO-95-3102

Radioactive Waste Processing and Volume Reduction Technology Study

October 1995

U. S. Department of Energy
Carlsbad Area Office
Carlsbad, New Mexico

Abstract

This study was written in response to Section 19 of the Waste Isolation Pilot Plant Land Withdrawal Act (Public Law 102-579). It summarizes 35 categories of technologies that may be applicable to the thermal and non-thermal treatment of transuranic (TRU) or mixed TRU wastes. It reviews 219 potential candidate processes which are at various stages of development and provides for each process a description, process objective, process type, applicable waste type, process maturity, and final waste form.

Executive Summary

Congress authorized the Waste Isolation Pilot Plant (WIPP) in the U. S. Department of Energy National Security and Military Applications of Nuclear Energy Authorization Act of 1980, Public Law 96-164. The WIPP is a research and development facility designed to demonstrate the safe disposal of transuranic (TRU) radioactive waste resulting from U.S. defense activities. It is located 42 kilometers (26 miles) east of Carlsbad, New Mexico.

The Radioactive Waste Processing and Volume Reduction Technology Study was prepared in response to Section 19 of the WIPP Land Withdrawal Act (Public Law 102-579), of October 30, 1992: Section 19 states:

> *Within three years after the date of this Act, the Secretary shall submit to Congress a study reviewing the technologies that are available and that are being developed for the processing or reduction of volumes of radioactive wastes. The study shall include an identification of technologies involving the use of chemical, physical, and thermal (including plasma) processing techniques.*

This study focuses on technologies for processing or reducing the volume of TRU and mixed TRU waste. Thirty-five technology categories and 219 potential candidate processes are described. These processes may be applicable to the thermal and non-thermal treatment of TRU and mixed TRU waste.

The development and application of these processes produce several desired results: (1) creating a more stable waste form; (2) reducing the amount of space needed to store or dispose of waste; (3) reducing risks to the environment, public and workers from hazardous components in the waste, which are regulated under the Resource Conservation and Recovery Act (RCRA); and (4) reducing risks to the environment, public and workers from radioactive components in the waste. The Department of Energy (DOE) will use this study in future analyses of treatment options for TRU and mixed TRU waste.

Each of the 219 processes may be applicable to TRU, mixed TRU, radioactive (rad), mixed radioactive (mixed rad), or hazardous waste. The processes range in maturity from conceptual, to pilot, and commercial. A single process may meet more than one objective, treat more than one waste type, and have a different level of maturity for different waste types. The distribution of the 219 processes with respect to the parameters described above is summarized in Table 1.

TABLE 1. DISTRIBUTION OF PROCESSES ACCORDING TO WASTE TYPE, PROCESS OBJECTIVE AND MATURITY.

Volume Reduction	**TRU**	**Mixed TRU**	**Rad**	**Mixed Rad**	**Hazardous**
Conceptual	63	85	53	68	25
Pilot	31	28	34	37	30
Commercial	11	10	20	18	59
Total	105	123	107	123	114
Physical stabilization	**TRU**	**Mixed TRU**	**Rad**	**Mixed Rad**	**Hazardous**
Conceptual	18	26	13	17	9
Pilot	18	15	20	21	17
Commercial	4	4	8	7	17
Total	40	45	41	45	43
Hazardous mitigation	**TRU**	**Mixed TRU**	**Rad**	**Mixed Rad**	**Hazardous**
Conceptual	N/A	145	N/A	122	48
Pilot		33		47	55
Commercial		8		18	82
Total		186		187	185
Radioactive mitigation	**TRU**	**Mixed TRU**	**Rad**	**Mixed Rad**	**Hazardous**
Conceptual	53	61	46	52	N/A
Pilot	31	28	34	33	
Commercial	7	6	10	9	
Total	91	95	90	94	

As indicated in the table, the greatest number of processes address the mitigation of hazardous characteristics in the waste. Processes that achieve physical stabilization are the least abundant for all waste types. Over 100 processes related to volume reduction apply to TRU and mixed TRU waste. The majority of processes that are applicable to TRU and mixed TRU waste are presently in the conceptual stages of development; however, commercial processes exist for volume reduction, physical stabilization, mitigation of hazardous properties, and mitigation of radioactive properties of TRU and mixed TRU waste.