TECHNICAL WORK PLAN
REDUCED WASTE GENERATION

FY 1986

DUPLICATE

DEPARTMENT OF ENERGY
ROCKWELL INTERNATIONAL
WESTINGHOUSE

JOINT INTEGRATION OFFICE
ALBUQUERQUE, N.M.

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INFORMAL REPORT, NOT FOR FURTHER DISSEMINATION

TECHNICAL WORK PLAN
REDUCED WASTE GENERATION
FY 1986

Joint Integration Office
Rockwell International
North American Space Operations
Albuquerque, NM

MASTER

12
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FY 88 PROPOSED OUT-YEAR WORK PLANS

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INTRODUCTION

The United States Department of Energy is committed to the principles of minimizing the quantity and transuranic content of its TRU waste being generated at its nuclear facilities. The reasons are to reduce costs associated with waste handling and disposal, and also to reduce radiation exposure to workers and risk for radionuclide release to man and the environment.

The purpose of this document is to provide the USDOE with a plan of research and development tasks for waste minimization, and is prepared so as to provide the maximum impact on volumes based on cost/benefit factors. The document is to be updated annually or as needed to reflect current and future tasks.

The Reduced Waste Generation (RWG) tasks encompass a wide range of activities with the principal goals of 1) preventing the generation of waste and 2) converting TRU waste into LLW by sorting or decontamination. Concepts for reducing the volume such as in incineration and compaction are considered within the discipline of Reduced Waste Generation, but are considered as somewhat developed technology with only a need for implementation.

Tasks for waste minimization are generally categorized into four areas as follows:

1. Administrative Control

Concept is to provide an impetus for waste reduction through
1) technology transfer, i.e. publications, seminars, and meetings;
2) awareness training programs; and 3) materials control, i.e. flow sheet reviews.

2. Materials Research and Substitution

Tasks are for analyses of equipment, tools, enclosure surfaces, and other items that can be treated, designed, coated, or substituted with other materials to extend useful life times.

3. Process Development or Optimization

Tasks are to provide for the improvement or development of processes where a reduction in waste can be realized, i.e. replacement of complex, multi-step operations, or where secondary wastes could be reduced.

4. Equipment Research and Development

Tasks are for the utilization of new equipment or demonstration of existing equipment in a new way to effect waste reduction.

The following Technical Work Plan describes proposed activities that can be undertaken to accomplish the subject objective. Included are task guidelines, background, resource requirements, manpower, equipment, work area/gloveboxes, facilities, schedules/milestones, and funding requirements.

FY 1986
TECHNICAL WORK PLAN

1. ADMINISTRATIVE CONTROL

1.1 RWG - National Working Group

AL/RFP

40K

This task will be for the continuation of the National Working Group for Reduction in TRU Waste Arisings. Organizational objectives are to

- 1) exchange ideas on ways in which waste arisings can be minimized,
- 2) provide analytical input for task development and implementation, and
- 3) establish cooperative work efforts for technical development.

Background:

The Working Group was organized in FY 84, and the following meetings have been held:

1. The NWGRTWA held its first meeting in Northglenn, CO, October 14, 1983. Organizational objectives were outlined and future tasks were defined.
2. The second meeting was held at LANL, February 23, 1984, and the principal subjects of discussion were 1) Clarification of Operational Definitions, 2) Investigation of Bagless Posting Systems, 3) Review of Proposed DTWP-RWA FY 1985 Tasks, and 4) Investigation of Glovebox HEPA Filters.
3. The third meeting was held at the Hanford House in Richland, Washington, July 19, 1984. The theme of this meeting was Reduction in Waste Through Equipment Selection and Preventative Maintenance. In addition, presentations were made on proposed waste reduction design features for the new Special Isotope Separation (SIS) facility, status of the bagless posting systems being installed at SRP and LANL, systems study for remote-handled waste, size reduction using high pressure water cutting and the RHP/LANL arc saw, and an update of the FY 85-86 proposed tasks for Reduced Waste Generation.
4. The fourth meeting was a US/UK Workshop on Reduction in Waste Arisings which was held at ORNL, May 13-15, 1985. The objective of this meeting, which was held under the US/UK bilateral agreement for waste management, was to exchange ideas on ways in which waste generation can be minimized through administrative control, materials substitution, equipment utilization, and process optimization.

Work Planned for FY 86:

Host three meetings at different sites and exchange information relevant to waste reduction, and submit a topical report entitled "FY 1986 Summary Report -- National Working Group for Reduction in TRU Waste Arisings".

Resource Requirements:

1. Manpower: 0.5 MY
2. Equipment: None
3. Work Area/Gloveboxes: N/A
4. Facilities: N/A

Schedule/Milestones:

1. The first FY 86 National Working Group for Waste Reduction is scheduled for October 23-24, 1985, at INEL. Discussions on Wednesday, October 23, 1985, will focus on reduction in waste through 1) Optimizing Waste Immobilization, 2) Disposal of Spent Resins, 3) Assay Instrumentation for Waste Sorting at the Source of Generation, 4) Reduction in Pyrochemical Waste Salts Through Recycle, 5) Laser Cutting Technologies, 6) PREPP Volume Reduction, and 7) Super Compactors.

FY 86

	Oct	Jan	Apr	July	
	I-----	I-----	I-----	I-----	I
A.					#1
	I-----	I-----	I-----	I-----	I
B.	#1		#2		#3
	I-----	I-----	I-----	I-----	I

A. Reporting Functions

- #1 Complete report "FY 1986 Summary Report -- National Working Group for Reduction in TRU Waste Arisings"

B. Work Functions

- #1 Host first FY 86 NWGRWA workshop
- #2 Host second FY 86 NWGRWA workshop
- #3 Host third FY 86 NWGRWA workshop

Budget:

Funding is projected to be \$40K FY 86; \$140K FY 87; \$240K FY 88.

2. Materials Research and Substitution

2.1 RWG HEPA LIFE OPTIMIZATION

AL/RFP

150K

This task will 1) examine the administrative control of HEPA filters used in production facilities to ensure optimal usage and disposal, and 2) evaluate the potential for changes in air filtration techniques or materials that would improve the efficiency or longevity. Administrative analysis will include filter handling, installation, change out schedules, volumes, and an understanding of the impetus for change out. In addition, an analysis will be made of the current method for disposal, and if applicable, recommendations for disposal improvement. Recommendations, however, will be reviewed internally through Plant Operations for comment and concurrence to ensure certifiability. Changes in air filtration techniques or materials for improvement will include the investigation of possible pre-filter emplacement as may be applicable to specific problem areas. This may include intermediate air cleaning devices for both disposable and recleanable purposes.

Background:

Fiscal year 85 studies identified 1) the air-filtration systems where most of the TRU filter waste originates, and 2) the types of HEPA filters being employed within these systems. Gloveboxes were also identified where the use of prefilters could be implemented, which would then result in extending the useful lifetime of the filters within the main air-filtration systems.

Work Planned for FY 86:

1) Prepare a work plan of activities, 10/85; 2) Provide for an interfacing working group meeting including representatives from the DTWP, R&D Program Manager, Utilities, Filter Systems, and Plant Waste Operations, 1Q/86; 3) Complete laboratory evaluation of pre-filter choices and specific application, 3/86; 4) Complete design and testing of the pre-filters and provide for emplacement of pre-filters, 7/86; 5) Final report on filter implementation which will include projected waste volumes impacted, anticipated cost/benefit analysis, and overall improvement in filter waste management, 9/86.

Resource Requirements:

1. Manpower: 1.2 MY
2. Equipment: \$30K for equipment and supplies
3. Work Area/Gloveboxes: Work will be performed within the 700 Complex.
4. Facilities: Available at RFP

Schedule/Milestones:

	Oct	Jan	Apr	July
A.	I-----I-----I-----I-----I			
	#1	#2		#3
B.	I-----I-----I-----I-----I			
			#1	#2
	I-----I-----I-----I-----I			

A. Reporting Functions

- #1 Prepare a work plan of activities
- #2 Provide for an interfacing working group
- #3 Final report on filter implementation

B. Work Functions

- #1 Complete laboratory evaluation of pre-filter choices
- #2 Complete design and testing of pre-filters

Budget:

Funding requirements for FY 86 are \$150K

This task will determine if HEPA filters removed from the various plant air filtration systems, and as prepared for shipment through crushing, meet the WIPP Waste Acceptance Criteria for disposal. A recommendation may be made to segregate air filters not meeting the WIPP criteria from those that do. If disposal requirements are not met, then alternative methods for improved immobilization will be identified.

Background:

Simulated, non-radioactive, tests conducted by RFP in FY 84 show approximately 20 wt% of the filter waste contains particles less than 200 microns, which suggests the filters would not meet the WAC. However, because of differences between simulated conditions and actual plant conditions, additional information needs to be obtained on filters from the various process air filtration systems. It is anticipated these tests will be indicative of particle size and characteristics due to process environment, and impingement as a function of distance, density, and flow rates. In addition, information will be obtained on physiochemical characteristics to ensure safety in handling and disposal.

Work Planned for FY 86:

Work elements for FY 86 will be 1) Prepare an overall work plan of activities based on the guidance, 10/85; and 2) Prepare an experimental test plan giving justification, background, schedules, resource requirements, final performance specifications and completion criteria, 11/85. The experimental test plan will then be given to the Waste Certification Committee for review and concurrence. The committee is to respond with comments within 30 working days of receipt. If a positive recommendation is given by the committee to proceed with the task, then the task will proceed as follows:

- a. Complete experimental test as outlined in the plan for filters as removed from the plenum, 8/86.
- b. Complete experimental test as outlined in the plan for filters as crushed for shipment, 8/86.
- c. Complete a final report on task activities, 9/86, that will give guidelines for either certifying the waste filters as is, or for subsequent processing in order to meet the WIPP-WAC requirements.

Resource Requirements:

1. Manpower: 1.0 MY
2. Equipment: Available
3. Work Area/Gloveboxes: Proposed for 771 Bldg.
4. Facilities: Available

Schedule/Milestones:

	Oct	Jan	Apr	July	
A.	I-----I-----I-----I-----I				
	#1				#2
B.	I-----I-----I-----I-----I				
		#1			#2#3
	I-----I-----I-----I-----I				

A. Reporting Functions

- #1 Prepare a work plan of activities
- #2 Final report for certifying waste filters

B. Work Functions

- #1 Complete an experimental test plan for review
- #2 Complete experimental test as outlined in the plan for filters as removed from the plenum, 6/86
- #3 Complete experimental test as outlined in the plan for filters as crushed for shipment, 8/86

Budget:

Funding requirements for FY 86 are \$100K

This task is a continuation of work that began in FY 84 in which equipment was evaluated for longevity in harsh process environments. The results proved that components such as pumps, valves, and miscellaneous other items would have increased lifetimes if replaced with equipment constructed of materials such as stainless steel, Teflon, or coated with impervious materials.

Background:

During FY 85 the metal waste categories were reviewed to determine if specific areas of waste could be identified that are contributing to the overall waste generation. The results of this investigation show three major waste streams that make up the metal category at RFP. The first is the metal from strip out activities; the second from equipment discard; and the third from drum disposal. Continued efforts investigating the third category of waste revealed that by changing the handling practices, a large quantity of the drums currently being crushed with the waste, could be recycled. A test was devised to demonstrate that new equipment could be used to dump waste from 55-gallon drums without contaminating the drum itself. The practice at RFP has been to package waste in stainless steel drums and ship them to the size reduction area for repackaging, and during the repackaging step, the shipping drum became part of the TRU waste stream. If the new equipment is accepted as part of the standard waste handling procedure, a significant reduction in the overall metal waste volumes is expected (approximately 150 m³).

Work Planned for FY 86:

For FY 86, the task will focus on reducing waste through rare earth crucible and mold coating within the plutonium foundry areas. The general method of operation is that plutonium metal is received into the foundry area from several sources, i.e.; off-site, metal from electrolyrefining and direct oxide reduction, and from hydrofluorination/reduction. The metal is then melted in Ta crucibles and poured through a Ta funnel into a mold.

At the Rocky Flats Plant, four of the melting furnaces have been modified to operate using stainless steel (416) molds coated with the rare earth oxide. This technique appears to be a viable option to using graphite molds; however, at this time it is only considered partially proven and is anticipated to be extended to other areas within the foundry.

The results to date show that considerably less plutonium is converted to the oxide when coated molds are used in lieu of graphite molds, and less waste is generated. Production currently generates approximately 23 drums of graphite molds per month which would be eliminated if coated molds could be used throughout the production area. Ta crucibles cost about \$800 each and graphite molds cost \$75. The Ta crucibles now last approximately 500 runs and would be extended through coating. Graphite molds last for only three runs; therefore, the economics show crucible costs for perhaps 750 runs at \$800; whereas, if graphite were used, the cost would be \$56,250. In addition, the volume of waste would be considerable.

Work Planned for FY 86:

Work efforts this fiscal year will 1) Prepare a work plan of activities, 10/85; 2) Prepare test matrix of development activities for coating crucibles and molds, 2/86; 3) Determine processing parameters through experimental testing from the test matrix, 8/86; and 4) A report will be prepared that will identify a process for implementation that will include methodologies for crucible, funnel, and mold coatings. Also included will be an overview of the potential value and benefits that may be derived from the implementation of the technology, 9/86.

Resource Requirements:

1. Manpower: 0.5 MY
2. Equipment: Existing
3. Work Area/Gloveboxes: Existing
4. Facilities: Existing

Schedule/Milestones:

	Oct	Jan	Apr	July
A.	I-----I-----I-----I-----I			
	#1			#2
B.	I-----I-----I-----I-----I			
		#1		#2
	I-----I-----I-----I-----I			

A. Reporting Functions:

- #1 Prepare a work plan of activities, 10/85
- #2 A report will be prepared that will identify a process for implementation that will include methodologies for crucible, funnel, and mold coatings. Also included will be an overview of the potential value and benefits that may be derived from the implementation of the technology, 9/86.

B. Work Functions:

- #1 Prepare test matrix of development activities for coating crucibles and molds, 2/86
- #2 Determine processing parameters through experimental testing from the test matrix, 8/86

Budget:

Funding requirements for FY86 are currently \$50K; however, \$80K is being requested to complete the task.

3. Process Development or Optimization

3.1 RWG - TRUEX

RHO

120K

This task is for the technology transfer and subsequent implementation of the TRUEX process into the Hanford facilities. Developmental work on the process has been ongoing by ANL for the past several years, and thus far, on a laboratory scale has shown to be applicable for removing actinides from process waste streams. Objectives of implementation of the process at RHO will be to demonstrate the TRUEX process for recovering transuranics that would normally be lost to the waste stream and to terminate the transfer of transuranic waste streams to underground holding tanks.

Work Planned for FY 86:

Elements of the FY 86 task will provide technology transfer and identify pilot scale testing to support implementation. Deliverables will be 1) Prepare a Work Plan for the FY 86 task, 10/1/85; 2) Prepare a preliminary experimental test plan including elements of scale, design, statistically valid conclusions, cost and schedule, 12/15/85; 3) Prepare a preliminary production scale implementation plan which will include scale-up factors equipment, specification, costs and schedule, 5/31/86; and 4) A summary document will be prepared finalizing an extensive experimental test plan and production scale implementation plan, 9/15/86. This will include a cost/benefit analysis that will give the value of the process in terms of volumes of waste reduced and cost saving effected.

Background:

Possible application at this time is at the PFP (Z Plant) or the PUREX facility (A Plant), and can address three categories of waste: 1) Stored waste (Complexed Concentrate), 2) Neutralized PUREX sludge, and 3) SY Tanks associated with the PFP.

One of the areas in which the processing might be done in the future is the B Plant (DOE contact is R. Delenoy, FTS 444-2247).

Team Leader for implementation of the work is C. Manry (RHO) and the Program Manager for technical development is R. Wojtasek (FTS 440-1765). RHO is implementing a "Deployment Plan" at the PFP. The current plan is to install the TRUEX process and run it for a year under full scale pilot plant conditions. This will probably not cost more money than it would to put it in under smaller scale.

Resource Requirements:

1. Manpower: 1.0 MY
2. Equipment: Two sets of contactors (8cm) will be needed at \$150K each from ANL. This money is to come from Operations capital.
3. Work Area/Gloveboxes:
4. Facilities:

Schedule/Milestones:

A. Reporting Functions

- #1 Prepare a Work Plan for the FY 86 task

B. Work Functions

- #1 Prepare a preliminary experimental test plan
- #2 Prepare a preliminary Production-Scale Implementation Plan
- #3 Summary document

Budget:

DTWP Funding requirements for FY 86 are \$120K. Additional funds supporting this program are unknown. Outyear funds will be identified during preparation of the test and implementation plan.

The Process Experimental Pilot Plant (PREPP) is a facility to demonstrate methods for processing non-certifiable TRU waste into a form that is acceptable for WIPP disposal. During this processing, wastes will be shredded, incinerated, sized for particle size by passing through a rotating trommel screen, and then the fines will be immobilized with cement. This task is to determine if the waste exiting the sizing step, that are not classified as fines (greater than 1/4 inches in diameter), can be diverted from the TRU category into the LLW category.

Work Planned for FY 86:

Deliverables will be 1) Prepare a work plan of activities, 11/85; 2) Determine if the waste has LLW values that can be segregated prior to grouting, 9/85; 3) Propose instrumentation modifications/additions, 9/86; and 4) Issue an interim year-end summary report which will delineate project costs/benefits, and if favorable, project future actions for implementation, 9/86.

1. Manpower: 0.5 MY
2. Equipment: None
3. Work Area/Gloveboxes: PREPP
4. Facilities: Existing

Oct Jan Apr July

A. I-----I-----I-----I-----I
#1 #2#3

B. I-----I-----I-----I-----I

- #1 Prepare a work plan of activities, 11/85.
- #2 Determine if the waste has LLW values that can be segregated prior to grouting and propose instrumentation modifications/additions, 9/86.
- #3 Issue an interim year-end summary report which will delineate project costs/benefits and if results are favorable project future actions for implementation, 9/86.

Funding is targeted at \$50K for FY 86, and \$50K for FY 87 and FY 88.

4. Equipment Research and Development

Nothing this fiscal year.

FY 87 PROPOSED OUT-YEAR WORK PLANS

1. ADMINISTRATIVE CONTROL

1.1 RWG - National Working Group

AL/RFP

140K

This task will be for the continuation of the National Working Group for Reduction in TRU Waste Arisings. Organizational objectives are to

- 1) Exchange ideas on ways in which waste arisings can be minimized,
- 2) Provide analytical input for task development and implementation, and
- 3) Establish cooperative work efforts for technical development. FY 87 deliverables will be to 1) Host two meetings at different sites and exchange information relevant to waste reduction, 2) Submit a topical report entitled "FY 1987 Summary Report -- National Working Group for Reduction in TRU Waste Arisings".

1.2 RWG - System Implementation Analysis

UND

150K

This task is to provide for an analysis of the major waste generating sites to determine where either technology or administrative controls can be applied to effect an overall reduction or elimination of waste volumes. Goals will be to 1) Identify major sources of waste being generated at specific sites, 2) Suggest technology or methods that can be applied to minimize or eliminate these volumes, and 3) Provide an advocacy role for site implementation. For this endeavor, necessary elements may be to develop strategies for research and development, pilot testing, plant implementation, and provide the analysis for expected costs/benefits that could be derived from implementation.

2. MATERIALS RESEARCH AND SUBSTITUTION

2.1 RWG HEPA Filter Implementation

AL/RFP

100K

This task will be for the technology transfer and implementation of previous year's work on HEPA filter optimization. Technology transfer will be to all the major sites on 1) The administrative control of air filters used in production facilities to ensure optimal usage and disposal, and 2) The potential for changes in air filtration techniques or materials that would improve the efficiency or longevity. Technology on administrative analysis will include filter handling, installation, change out schedules, volumes, and an understanding of the impetus for change out. Included will be the analysis of the current method for disposal, and if applicable, recommendations for disposal improvement. Changes in air filtration techniques or materials for improvement will include the investigation of possible prefilter emplacement as may be applicable to specific problem areas. This may include intermediate air cleaning devices for both disposable and recleanable purposes.

2.2 Equipment/Materials Replacement

AL/RFP

100K

This task is a continuation of past year's work in which equipment was evaluated for longevity in harsh environments. Past year's results have been the implementation of components such as pumps, valves, actuators, and miscellaneous other items that have increased lifetimes. Administrative efforts have produced an estimated reduction of 150 cubic meters of metallic waste from the TRU waste stream. For FY 86, the task focused on reducing waste through rare earth crucible and mold coating within the plutonium foundry areas. This fiscal year the work on crucible and mold coating will be for further implementation at RFP and other USDOE sites.

3. PROCESS DEVELOPMENT OR OPTIMIZATION

3.1 RWG-TRUEX

RHO

800K

This task is for the continuation of the implementation of the TRUEX process into the Hanford processing facilities. Developmental work on the process was completed by ANL and preliminary experimental data on test runs at RHO during FY 86 will demonstrate the feasibility of the process on a laboratory scale to be applicable for removing actinides from process waste streams. This year will provide for the implementation of the process in a pilot plant mode of operation.

3.2 RWG - PREPP Volume Reduction

ID/EG&G

50K

The Process Experimental Pilot Plant (PREPP) is a facility to demonstrate methods for processing TRU waste into a form that is acceptable for WIPP disposal. During this processing, wastes will be shredded, incinerated, sized for particle size by passing through a rotating trommel screen, and then the fines will be immobilized with cement. This task is to continue determining if the wastes exiting the sizing step, that are not classified as fines (greater than 1/4 inches in diameter), can be diverted from the TRU category into the LLW category.

3.3 RWA - Immobilization Improvement

AL/RFP

150K

This task will be for developing, implementing, and/or completing technology for processing wastes into a reduced waste volume. An example would be the improved immobilization of the ferrite waste product into a waste form acceptable for disposal within the WIPP facility. Waste form selection will be based on results of the previous year's study and cost/benefits. Goals will be to provide technical assistance for process implementation.

3.4 RWG - Spent Resin Processing

HEDL

100K

This task is for an analysis of low cost, low temperature combustion systems that can be installed within existing process areas to oxidize and destroy spent ion exchange resins and other difficult to handle combustible waste. An example would be destruction by a new method of acid digestion which uses a peroxide-sulfuric system instead of the standard nitric-sulfuric system which has been a problem in the past because of the NOx off-gas.

4. EQUIPMENT RESEARCH AND DEVELOPMENT

4.1 RWG - Super Compactor

RFP

150K

Task is to evaluate, design and develop (if necessary), and demonstrate a super compaction system for volume reduction. Super compaction is expected to achieve a reduction of 10 to 1 on combustibles and 5 to 1 on light metals and glass. Task objectives would be to determine site application within the USDOE complex, volumes impacted, and the cost/benefit factors that could be derived from implementation. An example of estimated cost/benefits proposed at RFP are as follows:

Current generation rate of combustibles = 1212 M³

Current generation rate of metals and combustibles = 1861 M³

Assuming a super compactor is expected to reduce the volume of the combustibles by 90% and the metals and glass by 50%, this would mean the final volume of compacted combustibles would = 121.2 M³ and metals and combustibles would = 930.5 M³. Or an overall reduction of (3073 - 1051.7) = 2021.3 m³.

Assuming \$5K/M³ saved in disposal costs this would = (5,000 x 2021.3) \$10,106,500 per year.

Cost of the compactor and implementation is expected to be in the range of \$1,000,000.

Deliverables in FY 87 are to 1) Perform an integrated engineering systems analysis to determine inventories and expected volumes of compactible waste at USDOE sites, 2) Survey of compaction technology and equipment available, and 3) Provide a cost/benefit analysis for implementation of compaction at the various sites.

4.2 RWG - Assay/Sort at Source

LANL

100K

Task is to develop a real-time GO/NO-GO counting system for segregating low level waste from TRU waste at the source of generation. Deliverables for FY 87 will include 1) Selection of detector system giving maximum sensitivity for gamma-ray and neutron detection at the less than 100 nCi/gm loading, and 2) Equipment design and construction of a waste handling system.

4.3 RWG - 231Z Bldg. DECON

PNL

400K

The objective of this task is to demonstrate size reduction and in-situ and other decontamination techniques on an actual facility to be refurbished. The purpose would be to gain information on effective methodologies for dismantling, decontaminating, volume reducing, packaging, and certifying waste for shipment to a repository. Elements of work would be to prepare a work plan of strategies for work on the facility, determine the most effective and efficient method, and review these elements with Operations, J10, DTWP Waste Certification Committee, and other organizations that may be concerned with safety and criticality.

FY 88 PROPOSED OUT-YEAR WORK PLANS

1. ADMINISTRATIVE CONTROL

1.1 RWG - National Working Group

AL/RFP

240K

This task will be for the continuation of the National Working Group for Reduction in TRU Waste Arisings. Organizational objectives are to
1) Exchange ideas on ways in which waste arisings can be minimized,
2) Provide analytical input for task development and implementation, and
3) Establish cooperative work efforts for technical development. FY 88 deliverables will be to 1) Host two meetings at different sites and exchange information relevant to waste reduction, 2) Submit a topical report entitled "FY 1988 Summary Report -- National Working Group for Reduction in TRU Waste Arisings".

1.2 RWG - System Implementation Analysis

UND

150K

This task is to provide for continued analysis of the major waste generating sites to determine where either technology or administrative controls can be applied to effect an overall reduction or elimination of waste volumes. Goals will be to 1) Identify major sources of waste being generated at specific sites, 2) Suggest technology or methods that can be applied to minimize or eliminate these volumes, and 3) Provide an advocacy role for site implementation. For this endeavor, necessary elements may be to develop strategies for research and development, pilot testing, plant implementation, and provide the analysis for expected costs/benefits that could be derived from implementation.

2. MATERIALS RESEARCH AND SUBSTITUTION

2.3 Equipment/Materials Replacement

AL/RFP

100K

This task is a continuation of past year's work in which equipment was evaluated for longevity in process environments. Results have been the implementation of components such as pumps, valves, actuators, and miscellaneous other items that have increased lifetimes, and administrative efforts have resulted in estimated reduction of 150 cubic meters of metallic waste from the TRU waste stream. For FY 86 and 87, the task focuses on reducing waste through rare earth crucible and mold coatings within the plutonium foundry areas. This fiscal year the work on crucible and mold coating will be for further implementation at RFP and other USDOE sites.

3. Process Development or Optimization

3.1 RWG-TRUEX

RHO

500K

This task is for the continuation of the implementation of the TRUEX process into the Hanford Plutonium Finishing Plant. Developmental work on the process was completed by ANL and preliminary experimental data on test runs at RHO during FY 86 will demonstrate the feasibility of the process on a laboratory scale to be applicable for removing actinides from process waste streams. This year will provide for the continued implementation of the process in a pilot plant mode of operation.

3.2 RWG - PREPP Volume Reduction

ID/EG&G

50K

The Process Experimental Pilot Plant (PREPP) is a facility to demonstrate methods for processing TRU waste into a form that is acceptable for WIPP disposal. During this processing, wastes will be shredded, incinerated, sized for particle size by passing through a rotating trommel screen, and then the fines will be immobilized with cement. This task is to continue determining if the wastes exiting the sizing step, that are not classified as fines (greater than 1/4 inches in diameter), can be diverted from the TRU category into the LLW category.

3.3 RWA - Immobilization Improvement

AL/RFP

150K

This task will be for the continued development, implementation and/or completing technology for processing wastes into a reduced waste volume. An example would be the improved immobilization of the ferrite waste product into a waste form acceptable for disposal within the WIPP facility. Waste form selection will be based on results of the previous year's study and cost/benefits. Goals will be to provide technical assistance for process implementation.

4. EQUIPMENT RESEARCH AND DEVELOPMENT

4.1 RWG - Super Compactor

RFP

200K

Task is to continue the evaluation, design and development (if necessary), and demonstration of a super compaction system for volume reduction. Super compaction is expected to achieve a reduction of 10-to-1 on combustibles and 5-to-1 on light metals and glass. Task objectives would be to determine site application within the USDOE complex, volumes impacted, and the cost/benefit factors that could be derived from implementation.

4.2 RWG - ASSAY/SORT AT SOURCE

LANL

500K

Task is to continue with the development and demonstration of a real-time GO/NO-GO counting system for segregating low level waste from TRU waste at the source.

4.3 RWG - 231Z Bldg. Decon

PNL

400K

The objective of this task is to continue to demonstrate size reduction and in-situ and other decontamination techniques on an actual facility to be refurbished. The purpose is to gain additional information on effective methodologies for dismantling, decontaminating, volume reducing, packaging, and certifying waste for shipment to a repository.

4.4 RWG - FOOF TECHNOLOGY

LANL

200K

This task is to support the technical development and implementation of the FOOF process which will be used for production improvement and for decontamination efforts. The FOOF process is based on dioxygen difluoride (FOOF) for volatilizing plutonium at room temperature and below. Preliminary experiments at LANL indicate under certain circumstances the process can be a powerful decontaminating agent and may also have improved actinide processing capabilities.

4.5 RWG - CLASSIFIED WASTE DISPOSAL

UND

100K

This task would be to investigate methodologies for processing classified waste to render the product as a non-classified waste which would then be suitable for shipment and disposal in an acceptable repository. Emphasis will be to apply reduced waste generation technology where applicable to minimize volumes, and yet achieve the desired effect. Examples of suggested methodologies may be to shred and/or incinerate and mix the waste in with other current waste streams.

TASK COST BREAKDOWN

		FISCAL YEAR		
	Proposed Site	86	87	88
<u>1. Administrative Control</u>				
1.1	RWG - National Working Group JIO/AL	40	140	240
1.2	RWG - System Implementation Analysis UND		150	150
<u>2. Materials Research and Substitution</u>				
2.1	RWG - HEPA Filter Optimization/Implementation RFP	150	100	
2.2.	RWG - HEPA Filter Characterization RFP	100	100	
2.3	RWG - Equipment and Materials Replacement RFP	50		100
<u>3. Process Development or Optimization</u>				
3.1	RWG - TRUEX RHO	120	800	500
3.2	RWG - PREPP Volume Reduction EG&G	50	50	50
3.3	RWG - Immobilization Improvement RFP		150	150
3.4	RWG - Spent Resin Processing HEDL		100	
<u>4. Equipment Research and Development</u>				
4.1	RWG - Super Compactor RFP		150	200
4.2	RWG - Assay at the Source of Generation LANL		100	500
4.3	RWG - 231Z Bldg. Decon PNL		400	400
4.4	RWG - F00F Technology LANL			200
4.5	RWG - Classified Waste UND			100
TOTALS		510	2240	2590

BACKGROUND INFORMATION AND RESULTS OF PREVIOUS YEAR'S TASKS

FY 81

For information on past activities, the DTWP began funding tasks in FY 81 at a level of \$375K. The tasks and results for that year's funding are as follows:

1. Complete a site survey analysis for identifying major sources of TRU waste.

Reports were prepared entitled, Current Trends in Transuranic Waste Generation at DOE Sites. This report presented a profile of wastes being generated within the context of processes, categories, and waste volumes. In addition, since that time, based on the same work, another document has been prepared entitled, Characteristics of Transuranic Waste at Department of Energy Sites.

2. Complete studies for optimization and evaluation of basic electrolytes for electro-decontamination.

This work was brought to an understanding of validity for implementation, and then discontinued due to a change in funding priorities.

3. Determine the quantitative removal of actinides from process waste streams by using a new ferrite process.

Work confirmed the workability of the ferrite process on a laboratory scale: actinides were removed from process waste solutions, and the solids were crystalline and magnetic which showed promise as a replacement for the existing carrier flocculant precipitation process. It was estimated, at that time, the ferrite process would eliminate 160 M³ of waste per year.

FY 82

In FY 82, building on the previous year's tasks at a funding level of \$400K, the goals were to:

1. Continue the ferrite process development, including characterization of the waste solids and scale-up testing for plant operations.

Results for this task were optimization of the process for implementation into a production operation, discovery of a method to process liquids with interfering ions, and limited testing of the process with plant waste treatment equipment.

2. Design a waste handling/storage system for USDOE sites.

This task resulted in the preparation of a waste charge system, which basically stated the waste generators would pay for packaging, shipping, and storage. Revenues collected would either go to the storage site or DOE who would in turn fund the storage site for operations. After deliberation, the DOE decided that, although the charge system may provide an incentive to reduce waste, it would not justify the added cost of implementation and additional paperwork.

3. Identify and characterize oil and solvent waste streams for possible recycling or diversion from the TRU stream.

Reports were prepared identifying oil and solvent waste streams at RFP as potentially recyclable and diversionable. Studies were also initiated to determine the feasibility of recycling the oils and solvents.

FY 83

For FY 83, the funding level was again \$400K, and the tasks and results were as follows:

1. Complete the design of the demonstration full-scale ferrite waste treatment plant, procure the needed equipment, and continue to support the projected production operation through laboratory work.

During FY 83, demonstration runs were made on a plant scale that continued to show the workability of the ferrite process by lowering the actinide concentrations to levels below 10^{-8} g/l. Laboratory support work showed a diatomaceous earth pre-coat filter could be used for the final filter which replaced the need for a previously required magnetic filter. This change in filters resulted in considerable cost savings in capital equipment. Additional work was performed on difficult-to-process waste streams and process optimization through methods of adding ferrite compound, and testing of a replacement for making ferrite by using magnetite. A seminar was held at RFP to provide the technology transfer of information on ferrite processing to other USDOE sites.

2. Implement a recycle process for a selected oil or solvent waste stream, demonstrate the recycle of additional waste streams, and isolate RFP non-TRU streams that were being treated as TRU waste.

Laboratory results for recycling oil and solvents showed a carry-over of Freon, trichloroethane, and other hydrocarbons which resulted in marginal acceptability of the product. The task for diverting non-TRU streams was implemented which resulted in approximately 100,000 lbs of waste not being classified as TRU.

3. Prepare a handbook on Reduced Transuranic Waste Generation Technology.

Task was initiated with the gathering of information from USDOE sites on methods for waste minimization. Contents will include selection criteria, effectiveness, cost/benefit analysis, and ease of implementation.

FY 84

For FY 84, the funding level was \$600K, and the tasks and results were as follows:

1. Implement a National Working Group for Reduction in Waste Arisings.

This task was for the formation of a National Working Group for the Reduction in Transuranic Waste Arisings (NWGRTWA). Organizational objectives are 1) A means for informational exchange between the different USDOE sites on ways in which the generation of TRU waste can be minimized, 2) A peer review of the progress and an evaluation of the FY RTWA tasks that are being funded under the DTWP, and 3) A catalyst for cooperative work tasks that can be undertaken between sites to achieve common objectives.

Task costs for FY 84: \$20K

The NWGRTWA held its first meeting in Northglenn, CO, October 14, 1983. Organizational objectives were outlined and future task were defined.

The second meeting meeting was held at LANL, February 23, 1984, and the principal subjects of discussion were 1) Clarification of Operational Definitions, 2) Investigation of Bagless Posting Systems, 3) Review of Proposed DTWP-RWA FY 1985 Tasks, and 4) Investigation of Glovebox HEPA Filters.

The third meeting of the National Working Group for Reduction in TRU Waste Arisings (NWGRTWA) was held at the Hanford House in Richland, Washington, July 19, 1984. The theme of this meeting was Reduction in Waste Through Equipment Selection and Preventative Maintenance. In addition, presentations were made on proposed waste reduction design features for the new Special Isotope Separation (SIS) facility, status of the bagless posting systems being installed at SRP and LANL, systems study for remote handled waste, size reduction using high pressure water cutting and the RHP/LANL arc saw, and an update of the FY 85-86 proposed tasks for Reduced Waste Generation.

The fourth meeting of the NWGRTWA is being scheduled to be held at ORNL, February 13-14, 1985. The theme of the meeting will be Assay Instrumentation for Waste Sorting and Reduce Waste Generation Training Programs.

A US/UK Workshop is also being planned for the early summer of 1985 in which all of the current objectives of the Reduced Waste Generation tasks will be addressed.

2. Completion of the Handbook on Waste Minimization Techniques.

This task provided for the completion of a handbook on methods for reducing TRU waste volumes and transuranic content. The handbook identifies practical methods that can be implemented based on selection criteria, effectiveness, cost/benefit analysis, and ease of implementation.

Task costs for FY 84: \$80K.

Total project cost (FY 83 and FY 84): \$116K

A draft copy will be ready for review by the USDOE and its prime contractors by the end of the fiscal year, and following the review the released copy will be published to the community at large.

3. Completion of an analysis of sorting or techniques for removing waste from the TRU category.

This task provided for a cost/benefit study for in-situ decontamination of CH and RH waste including glove boxes and other large TRU contaminated components into LLW. The impetus for this work was the redefinition of TRU waste based on the new DOE order 5820.

Task Costs for FY 84: \$60K.

A summary report is to be prepared by the end of the fiscal year that gives the results of this study. As will be shown in the FY 85 plans, the following year technology transfer will be made through presentations at the individual sites.

4. Completion of Engineering Studies to Reduce Waste.

This task provided for an analysis of engineering designs to effect a reduction in waste through studies of components and equipments in which changes effected the longevity. Within this analysis, studies were made at the working level of components and equipment that would last longer in harsh environments. Results of this study will be made available by the end of the fiscal year.

Task Costs for FY 84: \$40K.

5. Provide for the Implementation of the Ferrite Process.

This task was for the implementation of the ferrite process which is a new method for removing actinides from process wastes streams. During the first week in July, the ferrite process was demonstrated on a plant scale for routine operation. Decontamination factors ranged from 100 to 1000 for a single stage process; therefore, this process shows adequate decontamination for subsequent solution processing for disposal.

A report is to be prepared by the end of the fiscal year describing the process in detail such as chemistry, operational data, cost/benefit, and other information necessary for technology transfer.

Data was also obtained for converting the ferrite waste product into a form acceptable for disposal.

Total funding for this task in FY 84 was \$340K.

6. Design and Testing of Bagless Posting Systems.

This task provided for an analysis of methods in which waste could be removed from glove box lines using equipment such as bagless posting systems. The work included studies of bagout systems, not only within the U.S. but within other countries, and the selection and cost/benefits that can be derived from such systems. Work included design and construction of a prototype system and testing in a demonstration mode. A report is to be prepared for distribution by the end of the fiscal year giving the results of these tests.

Cost for this work for FY 84 totaled \$60K.

FY 85

For FY 85, the funding level was \$550K and the tasks and results were as follows:

1. Continuation of the National Working Group for Reduction in TRU Waste Arisings.

This organization provided a US/UK Workshop on Reduction in Waste Arisings which was held at ORNL, May 13-15, 1985. A FY 1985 Summary Report -- National Working Group for Reduction in TRU Waste Arisings was prepared at the end of the fiscal year.

Task cost for FY 85: \$40K.

2. Provide for technology transfer to USDOE sites on the use of in-situ decontamination and other techniques for converting TRU waste into the LLW category. The basis of this work was the result of the previous year's task in which a cost/benefit study was performed to evaluate the utility of decontamination as a means for waste conversion.

Work included presentations to the major DOE sites on ways in which waste can be recategorized, and a summary report was prepared on the potential value of conversion principles to each site which included benefits, cost savings, and suggestions for improvement and/or implementation.

Task costs were \$60K.

3. Implement HEPA Filter Optimization and Disposal technology.

Work included a systems analysis of HEPA filter handling techniques at the Rocky flats Plant. An administrative change segregating first bank HEPA filters from secondary filters was implemented. This change reduced the amount of TRU filter waste by 50 percent. An analysis of the ways Low Level and TRU filters are processed indicated that a 60 percent reduction in LLW volume could be achieved by crushing the filters. Pre-filter selection was investigated and a recommendation to use a low pressure drop "furnace" filter was made to extend the service life of the first bank of HEPA filters.

Task cost for FY 85: \$150K.

4. This task evaluated several production areas for equipment and materials replacement which would reduce the volume of metal waste being generated. In addition, an overall study was made of the metal waste category so as to provide a better insight as to major sources and contributors to the metal waste inventory.

The results of the year's effort showed that most of the metal waste was from strip out operations, and therefore, little could be gained by equipment replacement. However, waste drums utilized to transfer waste on-site were identified as a significant source of metal waste. A procedural change for handling these drums at the Size Reduction Vault in Building 776 was developed and tested. The tests show that significant waste will be eliminated by incorporating the change into standard operating procedure.

Task costs for FY 85 were \$50K expenses; and \$35K capital.

5. This task was for the implementation and testing of a "Bagless Posting System" which is a way of removing waste from process lines without the use of plastic and also provides for increased safety and a reduction in radiation exposure to workers. Implementation was based on previous year's task which was the design selection and building of a prototype system.

Results for FY 85 were a detailed design description of a bagless posting system developed at the LANL. A report was prepared that includes brief descriptions of several related technologies, an account of the design considerations for a new system that evolved, objective and subjective test evaluations, and detailed drawings of the final prototype system. The report is intended to aid replication of the LANL prototype by others.

Task costs for FY 85: \$150K.

6. This task was for the implementation of reduction in waste generation technologies within two facilities at the Hanford site. One of the facilities is the Plutonium Finishing Plant (PFP) which is being upgraded for recommissioning, and the other is a Special Isotope Separation Facility that is currently in the conceptual design stage.

Activities to achieve the objective were 1) Alternatives for waste volume reduction at SIS and PFP; 2) Handling classified waste; 3) Analysis of gloveboxes; 4) Use of High Gradient Magnetic Filters in PFP; and 5) Examine use of Kynar-lined gloveboxes and windows.

For the task on alternatives for waste volume reduction, options examined such as compaction, melting, etc. proved economically feasible as opposed to no treatment. The option recommended for solid waste streams is incineration for combustibles and the recovery of Pu from the ash. The option recommended for liquid waste was liquid-liquid extraction (TRUEX) followed by ultrafiltration (HGMF).

Analysis of handling classified waste identified four alternatives. The most viable is to blend the classified waste with other waste when processed in the WRAP facility. A cost evaluation of push-through gloveboxes show lower total life-cycle cost for push-through gloveboxes, despite a higher initial purchasing cost.

Task costs for FY 85: \$100K.

SUMMARY OF COST/BENEFIT

YEAR	COST(000's)	BENEFITS
FY81	375	<ul style="list-style-type: none"> - RWG program direction (3 reports) - Development and patent a basic electrolyte for decontamination - Provide basic research for Ferrite Process development
FY82	400	<ul style="list-style-type: none"> - Continued Ferrite Process development - Designed standard waste charge system - Initiate oil and solvent recycle
FY83	400	<ul style="list-style-type: none"> - Design Ferrite Process for Implementation - Implement procedure to eliminate oil and solvent streams from TRU waste - Initiate RWG Handbook <p style="text-align: right;"><u>* 100,000 lbs diverted</u></p>
FY84	600	<ul style="list-style-type: none"> - Implement NWGRWA - Complete RWG Handbook - Analysis for in-situ decontamination and size reduction - Analysis of equipment to extend life times - Implementation of the Ferrite Process - Designed Bagless Posting System <p style="text-align: right;"><u>*(Approx. 80 M3/YR)</u></p>
FY85	550	<ul style="list-style-type: none"> - Continued NWGRWA - Technology transfer of in-situ decontamination including potential benefits - Implemented optimal HEPA filter use and disposal. <u>Estimate reduction in TRU filter by 50%.</u> - Continued analysis of equipment for RWG - Implemented Bagless Posting for testing - Implemented RWG technologies for SIS and PFP <p style="text-align: right;"> <u>* 25% of metal category</u> <u>at RFP, (Approx. 100 M3)/YR</u> </p> <p style="text-align: right;"> HGMS TRUEX Kynar windows and glovebox liners Push through windows </p>

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