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Waste Reduction Plan for the Oak Ridge National Laboratory

R. M. Schultz
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OAK RIDGE NATIONAL LABORATORY
OFFICE OF WASTE MANAGEMENT AND REMEDIAL ACTIONS
WASTE MANAGEMENT OPERATIONS PROGRAM
WASTE MANAGEMENT COORDINATION OFFICE

WASTE REDUCTION PLAN FOR THE OAK RIDGE NATIONAL LABORATORY

Date Published: July 1991

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ACRONYM LIST

AcDm	Activities Description Memorandum
ADM	Action Description Memorandum
ALARA	as low as reasonably achievable
AVID	Accelerated Vendor Inventory Delivery (System)
CH	contact-handled
DOE	Department of Energy
DOT	Department of Transportation
EAM	Environmental ALARA Memorandum
EPA	Environmental Protection Agency
ESD	Environmental Sciences Division
ES&H	Environment Safety and Health
F&M	Finance and Materials Division
FPDL	Fission Product Development Laboratory
GCO	Generator Certification Official
HMIS	Hazardous Materials Inventory System
HQ	Headquarters
HWTS	Hazardous Waste Tracking System
IDB	Integrated Data Base
LGTTG	Liquid Gaseous Treatment Technology Group
LLLW	liquid low-level waste
LLLWC	liquid low-level waste concentrate
LLLWT	Liquid Low-Level Waste Treatment System
LLW	low-level waste
LLWT	low-level waste tumulus
LR	low-range
LSA	low specific activity
NEPA	National Environmental Policy Act
NRWTP	Nonradiological Wastewater Treatment Plant
ORNL	Oak Ridge National Laboratory
ORO	Oak Ridge Operations
PAN	Passive Active Neutron System
PCB	polychlorinated biphenyls
PIP	Performance Improvement Process
PPAP	Pollution Prevention Awareness Program
PWTP	Process Waste Treatment Plant
QG	Qualified Generator
RCRA	Resource Conservation and Recovery Act
R&D	research and development
REDC	Radiochemical Engineering Development Center
RH	remote-handled
RTR	real-time radiography
SGS	Segmented Gamma Scan
SLLW	solid low-level waste
SWSA	Solid Waste Storage Area
SWIMS	Solid Waste Information Management System
TRU	transuranic
TSA	Technical Safety Appraisal
WAC	waste acceptance criteria
WIN	Waste Information Network
WRR	Waste Reduction Representative

1. INTRODUCTION

Oak Ridge National Laboratory is a multipurpose research and development facility owned and operated by the Department of Energy and managed under subcontract by Martin Marietta Energy Systems, Inc. ORNL's primary role is the support of energy technology through applied research and engineering development and scientific research in basic and physical sciences. ORNL also is a valuable resource in the quest to solve problems of national importance, such as nuclear and chemical waste management. In addition, ORNL produces useful radioactive and stable isotopes for medical and energy research that are unavailable from the private sector.

These research and development activities generate numerous small waste streams. In the hazardous waste category alone, over 300 streams of a diverse nature exist. Minimization and reduction of all wastes is an important goal in maintaining efficiency of ORNL R&D activities and protection of workers, the public, and the environment.

Waste minimization is defined as any action that minimizes the volume or toxicity of waste by avoiding its generation or recycling. This is accomplished by material substitution, changes to processes, or recycling wastes for reuse. Waste reduction is defined as waste minimization plus treatment which results in volume or toxicity reduction. The ORNL Waste Reduction Program will include both waste minimization and waste reduction efforts.

Waste reduction has received considerable emphasis and will be an important consideration during the next decade. Federal regulations, DOE policies and guidelines, increased costs and liabilities associated with the management of wastes, limited disposal options and facility capacities, and public consciousness have been motivating factors for implementing comprehensive waste reduction programs.

DOE Order 5820.2A, Sect. 3.c.2.4 requires DOE facilities to establish an auditable waste reduction program for all LLW generators.[1] In addition, it further states that any new facilities, or changes to existing facilities, incorporate waste minimization into design considerations. A more recent DOE Order, 5400.1, Sect. 4.b, requires the preparation of a waste reduction program plan which must be reviewed annually and updated every three years.[2] Implementation of a waste minimization program for hazardous and radioactive mixed wastes is sited in DOE Order 5400.3, Section 7.d.5.[3] This document has been prepared to address these requirements.

2. OBJECTIVES OF THE ORNL WASTE REDUCTION PROGRAM

A formal ORNL waste reduction program for hazardous wastes has been in existence since mid-1985 when it was launched in response to the requirements of the RCRA, Section 3002.[4] The waste reduction plan required by DOE Order 5400.1 expanded ORNL waste minimization and reduction reporting requirements to include all waste types generated. The goals of the ORNL Waste Reduction Program are to prevent pollution and reduce the volume and toxicity of all wastes generated, where economically feasible, maintaining quality, and ensuring the protection of the environment and the health of the public and employees.

Most waste reduction programs address production facilities, which typically have few streams with large volumes. Production facilities are, therefore, able to realize large cost savings through few, focused waste minimization or reduction efforts. ORNL is an R&D facility having up to 300 hazardous wastes streams, most of which are generated in small quantities. In contrast to production facilities, the wide diversity of ORNL waste complicates both management and compliance with regard to reporting requirements. ORNL, as a facility of over 960 small laboratories, will experience difficulty seeing any large cost "savings," even with a comprehensive Waste Reduction Program. However, significant waste reduction can be achieved by the strategy which is outlined in this plan.

The basic strategy for waste reduction at ORNL is to (1) identify major generators of major or problem waste streams and implement projects to reduce those streams and (2) train and motivate all ORNL staff to incorporate waste reduction measures into their activities. The latter aspect targets the small, variable, diverse waste streams and is to be accomplished through workshops, posters, incentive programs, and ORNL policies.

Each ORNL division will conduct waste stream evaluations and assessments of processes and facilities to identify target waste streams and processes for waste reduction efforts. As streams are targeted for waste minimization activity, funding is requested and project-specific waste minimization goals established.

2.1 MANAGEMENT COMMITMENT

Energy Systems and ORNL management are committed to the minimization of waste volumes and toxicity. This position was reflected in a memorandum distributed to all ORNL employees dated September 13, 1985 (See Appendix A) from the ORNL Director to ORNL Division Directors. All ORNL employees received a recent statement from the ORNL Director dated November 22, recognizing the need for pollution prevention (See Appendix A). In addition, ORNL management provided funding from ORNL Overhead in February 1991 to bridge a gap in programmatic support for waste reduction for the remainder of FY 1991.

2.2 ENERGY SYSTEMS' WASTE REDUCTION POLICY STATEMENT

The Energy Systems' policy regarding waste minimization was issued in May 1986 (See Appendix A). That policy reflected the company's commitment to a disciplined, rational approach to waste management. Furthermore, this policy conveyed Energy Systems' intent to implement comprehensive waste minimization programs that reduce the quantity and hazard of generated wastes. DOE and Energy Systems have a policy of total compliance with ES&H laws and regulations, including RCRA waste minimization.

2.3 PROGRAM OBJECTIVES

The objective of a waste reduction program is to establish an organized approach to reduce waste generation at the source or to recycle waste resulting in a reduction of risk to human health and the environment. ORNL's Waste Reduction Program is designed to reduce environmental, health, safety, and financial liabilities while complying with Federal regulations, DOE orders, and company policies. A commitment to waste reduction should also improve ORNL's standing in the scientific and local community. These objectives were communicated to all employees in the policy letters discussed in Sections 2.1 and 2.2.

The following are elements of the Waste Reduction Plan to meet the objectives stated. The elements are discussed in more detail throughout the plan.

- o involve all ORNL employees in the waste reduction effort
- o provide waste reduction training
- o establish achievable, measurable waste reduction goals as part of each Division Director's annual measures of performance
- o establish recycling programs
- o establish waste tracking systems that are designed to evaluate waste reduction accomplishments
- o prioritize the waste streams or facility areas for waste reduction potential by conducting generator evaluations
- o conduct economic feasibility studies of potential waste reduction candidate waste streams

- o obtain funding and establish schedules for the implementation of selected waste stream options
- o establish a program of awards for waste reduction suggestions
- o maintain open channels of communication

The overall success of the program will depend upon the continued commitment of management to the program, achieving realistic waste reduction goals, and the participation of ORNL employees.

2.4 PERFORMANCE GOALS

A priority of a waste reduction program is to establish reasonable waste reduction goals that are quantifiable and measurable. ORNL's divisions will be requested to develop plans for reducing their waste generation by a specified percentage. Divisions will be responsible for evaluating and prioritizing waste streams to achieve these goals. ORNL Waste Management will coordinate waste reduction efforts for selected, large, multi-division waste streams. Later revisions of this plan will document specific goals for each waste category. Established goals for waste reduction will be subject to periodic review. The objective is to reduce the volume and toxicity of all waste streams as much as is practical by establishing goals that are achievable, measurable, meaningful, and acceptable.

ORNL's performance evaluation criteria, established for determining award fees, include waste reduction goals and milestones, providing an additional incentive.

3. WASTE REDUCTION AT ORNL PROGRAM DESCRIPTION

3.1 PROGRAM BUDGET

Table 1 shows the waste reduction budget for the next five fiscal years, including the salary for the Waste Reduction Coordinator, a part-time Co-op student, and the costs for conducting projects sponsored by the Waste Management Coordination Office. ORNL divisions will need to allocate additional funding for waste reduction planning, evaluation, and implementation to benefit their divisions. The funding levels indicated are Requirements, Case 1, and Case 3 levels from the FY 1993 ADS submission.

3.2 ORGANIZATION

ORNL has appointed a Waste Reduction Coordinator to manage the program on waste minimization and reduction. The WRC resides functionally within the Waste Management Organization, as shown in Appendix B.

DOE-ORO Waste Management Division functions as the programmatic oversight for the Waste Reduction Program. DOE-Headquarters Waste Management provides independent oversight of the Waste Reduction Program through routine audits and surveillances. Both the Waste Management Division and Environmental Protection Division provide technical support in the review of Waste Reduction Plans and implementation of procedures.

Table 1. Budget scenarios for ORNL Waste Reduction Program

$000				Case I Projects[a]
FY	Rqt	Case 1	Case 3	
91	1995	300	300	Gaseous waste systems analysis; LLLW flowsheet development.
92	2510	925	925	Upgrade of plan to meet State Law; program audit; waste stream evaluations; project identification; recycling.
93	3300	3300	700	Waste stream evaluations; project identification and implementation; recycling.
94	2600	2600	500	Waste stream evaluations; project identification and implementation; recycling; program audit.
95	2700	2700	800	Waste stream evaluations; project identification and implementation; recycling.
96	2600	2600	800	Waste stream evaluations; project identification and implementation; recycling; program audit.
97	2800	2800	800	Waste stream evaluations; project identification and implementation; recycling.

[a] Case I budgets for FY 1992-97 include funding for 1 1/2 FTE (Waste Reduction Coordinator plus cooperative education student); annual report; review of plan; coordination of comprehensive program; interaction with WRRs; information exchange; tracking of progress toward goals; incentive program; employee training; awareness program; and liquid waste systems analysis.

Since 1985, each ORNL waste generating division has had a WRR. The WRRs are assigned by the respective Division Directors and act as the waste reduction technology transfer point within their divisions. This responsibility includes providing information about the wastes generated within their division for reporting purposes; ensuring that new projects or changes to existing facilities have considered waste reduction in design or construction; and submitting ideas, problems, or nominations of waste reduction efforts originating in their division. It should be noted that the people acting as the division WRR have other responsibilities. This is not a full-time position. The WRRs are often designated as Environmental Protection Officers, Generator Certification Officials, etc., sometimes along with their research or other professional obligations.

The Waste Reduction Coordinator meets with the WRRs biannually to exchange information, provide updates on waste reduction developments, discuss problems, elicit suggestions, and review the program. Informally, contact with the WRRs on waste reduction activities occurs on a more frequent basis. The list of current division Waste Reduction Representatives is maintained by the Waste Management Coordination Office.

3.3 ORGANIZATIONAL INTERFACES

3.3.1 Internal Interfaces

ALARA Program

As for any operation, the ALARA principle must be considered when planning waste minimization. The ALARA and Waste Reduction Programs have common objectives. During the planning of any project or operation consideration is given to minimizing waste, protecting the safety and health of employees, and minimizing impacts to the environment. The ALARA Program is being expanded to include nonradioactive functions, Hazardous Chemicals ALARA. Waste minimization would obviously play an important role in limiting the exposure of personnel to hazardous chemicals. In general, excessive waste results in excessive exposure to either radiation or hazardous chemicals and must be avoided by good planning.

Capital Projects

Any new capital project or change to an existing facility must consider potential waste generation as part of the project plans. Beginning in November 1989, the following waste minimization statement has been in the environmental protection documentation (the ADM, AcDM, or EAM) developed for each new project. Waste reduction will be included in the new NEPA documentation for new projects at ORNL.

> "As called for in DOE Order 5400.1 [Chapter III, Section 4, Part (b)], the Resource Conservation and Recovery Act [Section 1003, Part (a), Item (6)], and ORNL's Waste Reduction Plan, measures will be taken during both the construction and operational phases of the proposed project to implement waste minimization practices. Waste minimization includes actions such as source reduction (minimizing the generation of wastes), material substitution (using less hazardous materials), procurement control (purchasing only quantities required), recycling (reusing materials), and good housekeeping practices (e.g., preventing spills). Guidance regarding waste minimization will be obtained from the ORNL Waste Reduction Coordinator as early as feasible in the planning stages of the proposed project."

Certification Programs

The certification program at ORNL has initiatives that include all categories of waste. Certification program objectives include improved waste stream characterization and segregation, coinciding with waste minimization objectives. Waste generator certification is required, and the required training includes waste reduction.

Development of the ORNL Waste Certification Programs is being closely coordinated with the Waste Reduction Program. Liquid waste, SLLW, and TRU waste GCOs have been appointed to provide waste generation, characterization and processing information. Where appropriate, the information is used in a system analysis data base to determine methods for reducing waste generation and identifying areas where efforts are required for compliance with federal regulations.

Pollution Prevention Awareness Program

DOE Order 5400.1 specifies that a documented PPAP be part of each project's mission statements and project plans. The PPAP has formed an Implementation Planning Committee and Task Teams to develop, plan, and implement components of the PPAP. The PPAP has similar objectives to the Waste Reduction Program to instill awareness, disseminate information; and provide training, rewards and encourage employee participation in environmental issues and pollution prevention. Sharing objectives, the two initiatives will coordinate activities where appropriate, e.g., inclusion of a combined PPAP and waste reduction statement in the project plan.

Performance Improvement Process Program

Waste reduction efforts and suggestions have been supported by the PIP Program. The PIP Program has studied waste reduction activities such as chemical dispensing stations, recycling oil, and paper recycling.

3.3.2 External Interfaces

Other DOE Facilities

Communications with other DOE facilities is accomplished by use of the WIN system which has a waste minimization bulletin board and allow sites to exchange ideas, problems, and technology electronically; attending Waste Reduction workshops, conferences, seminars, etc.; and establishing contacts at other DOE sites to exchange waste reduction information. Information about ORNL's waste reduction training and Waste Reduction Program has been given to other facilities.

Other External Sources

ORNL has utilized and will continue to use the free waste minimization assessment resources from the University of Tennessee's Center for Industrial Services. The EPA has established the Waste Reduction Resource Center of the Southeast which ORNL can use as a waste reduction clearing house.

3.4 WASTE STREAM CATEGORIES

All ORNL waste streams and operations are involved or will be involved in waste reduction efforts.

3.4.1 Waste Stream Identification

For purposes of the Waste Reduction Program, ORNL wastes are classified as:

- hazardous wastes (including containerized gaseous wastes),
- mixed wastes
- gaseous wastes (i.e., air emissions),
- TRU wastes,
- SLLW,
- LLLW,
- process waste, and
- industrial/sanitary waste.

Waste stream characterization plays an important role in both the waste reduction and certification programs. In order to apply waste reduction or certify a waste stream, the waste stream characteristics must be known. Waste stream characterization will also determine if the composition is homogeneous or heterogenous, consistent temporally or inconsistent. For waste reduction efforts, this information will be obtained during waste generator evaluations. The data will be used to apply waste reduction technology, (i.e., process changes, recycling, material substitution, etc.). In the waste certification program, waste stream characterization will determine WAC for generated waste streams. Data will be shared between these programs to avoid duplication of effort.

The CY 1990 waste generation rates for all categories of waste, except gaseous, are given in Table 2. ORNL does not, at present, have quantitative information on gaseous effluents. Hazardous wastes generated during CY 1990 resulted in 75,397 kg from routine operations and 67,692 kg from nonroutine operations such as laboratory cleanout, spills, etc. Presently, the other wastes categories cannot be tracked as routine or nonroutine generation.

Table 2. ORNL waste generation rates for CY 1990[7]

Waste Category	Waste Generation
Hazardous	131,629 kg
Mixed	11,460 kg
Transuranic	3 m^3
Solid low-level	1793 m^3
Liquid low-level	1534 m^3
Process	270,000 m^3
Sanitary/Landfill	11,920 m^3

3.4.2 Tracking Systems

A detailed system for tracking progress toward generators' goals will be developed. Routine feedback will be provided to division management, WRRs, and ORNL management.

To effectively monitor waste reduction progress, ORNL waste tracking systems need further development for each type of waste. A computerized data base has been used for tracking hazardous wastes from the point of generation to ultimate disposal since 1986. Data originate from the "Request for Disposal" form completed by the generator (Appendix C) and are logged into the data system. The data system has file maintenance capabilities, record query, and report generation functions. It is used primarily for record keeping, (prior to FY 1990 as part of the charge-back system) monthly billing of costs to waste generators, shipping manifest generation, disposal records, and report generation.

The primary contribution of the waste tracking system to the waste minimization effort is in establishing generator accountability. For solid waste streams, the data base provides waste generation records categorized by division and individual generator.

In addition to the waste tracking system discussed above, a data system, the HMIS is being developed to track hazardous materials from procurement to the user. The procurement-end data system is not fully operational due to difficulties in accessing the data from the procurement and stores organizations' data bases. The HMIS- Procurement Interface will:

(1) provide for additional review and approval for extremely hazardous materials by a trained professional prior to release of a purchase requisition. Part of the review will consist of justification for large quantities of material, recommending less hazardous substitutes, etc., and

(2) a quarterly management report will be generated that compares receipts of hazardous materials by division over time. This information can then be used for waste minimization purposes.

The Solid Waste Information Management System is a data base for tracking SLLW and TRU waste. The data processed at ORNL in the SWIMS is included in the DOE-wide IDB. Tracking information for the SWIMS is obtained from the UCN-2822 form (shown in Appendix D) which generators must fill out before the waste is accepted.

A plan for new integrated multi-user data bases for tracking waste is being evaluated. User needs identified in the recent "Waste Information Systems Evaluation" will be considered in the assessment of the new tracking system.

Tracking and accounting systems are being developed for other waste categories. However, particularly for liquid and gaseous wastes, lack of flow monitoring capabilities at the generator level will limit accuracy for tracking progress toward division goals.

3.5 WASTE MANAGEMENT COST ACCOUNTING

Prior to FY 1990, ORNL utilized a cost accounting system whereby waste generators were directly charged for the costs of managing their wastes ($ per kg or m^3). However, this system remains in effect for only a few generators. Through the Environmental Restoration and Waste Management Five-Year Plan, waste generating programs contribute funds at the DOE-HQ level. The amount collected from each program is determined according to the quantity of waste it generated during the prior fiscal year. Thus while the cost impact of waste generation is less direct, the new system provides greater accountability and traceability at the HQ level.

In addition budgeting for waste management costs is called out in the ORNL Elements of Cost form prepared for all programmatic work.

3.6 QUALITY ASSURANCE

QA program objectives and methods from DOE Order 5700.6B will be incorporated into the ORNL Waste Reduction Program. Program evaluation will be conducted periodically.

4. WASTE REDUCTION ACTIVITIES

4.1 WASTE REDUCTION INCENTIVES

Besides the legal mandates, DOE orders, regard for health, safety and the environment, the waste generators at ORNL have other incentives to reduce waste.

4.1.1 DOE-ORO Waste Minimization Awards

In order to recognize outstanding achievements and raise contractor employee awareness in the critical area of waste minimization, DOE-ORO has implemented an annual ORO-wide Waste Minimization Award Program. The award is presented to an individual or group who has implemented a waste reduction measure. The award criteria are based on innovation, measurability of results, and projected cost savings in reducing the amount of low-level, TRU, mixed, and hazardous wastes being generated. This is given by DOE-ORO management as a waste minimization incentive.

4.1.2 ORNL Waste Reduction Suggestion Program

As part of the ORNL Waste Reduction Incentive Program, an award program will be established to encourage all employees to generate waste reduction ideas. Bi-monthly, the individual submitting the best waste reduction suggestion, evaluated by a review committee, will receive an award. The managers of the PPAP and ALARA programs have planned similar awards for suggestions in their areas. These award programs may be combined.

4.2 WASTE REDUCTION METHODS

4.2.1 Waste Avoidance/Volume Reduction

Each division, through their WRRs, has been asked to examine existing processes to discover methods to reduce the volume or toxicity of their waste streams. Material substitution, process procedure change, or changing to a new process are all methods to be used to avoid the generation of wastes. Since mixed wastes can only be stored, waste stream segregation techniques are to be applied to avoid the generation of mixed wastes, wherever possible. New projects are to be evaluated with waste avoidance measures in the process design. The division WRRs play a key role in these waste avoidance activities. Examples of projects which have been or are being implemented are given in the following paragraphs.

> Although cooling water from Building 3001 requires no treatment prior to release, it traditionally has been discharged to the process waste system. Maintenance and surveillance personnel suggested and implemented valving changes to divert the cooling water from the process waste system. Elimination of this cooling water from the process waste system helped relieve the hydraulic loading on the PWTP. In addition to 100,000 gal per year of waste avoidance, the cost savings associated with this waste reduction suggestion was approximately $8,000 annually. (This project received the DOE-ORO Waste Minimization Award for 1989.)
>
> A total of 472 55-gal drums of LSA waste material was supercompacted by a commercial vendor to reduce the volume of waste by 70 percent and better utilize the expensive and limited tumulus vault space. The drums of uncompacted waste would have occupied approximately 3,540 ft^3. Supercompacted drums and resulting solidified liquid occupy only 1,070 ft^3 of tumulus storage space. Including the cost of the vendor contract to compact the waste, this project saved approximately $224,500 and 2,470 ft^3 of tumulus storage space. Supercompaction is expected to be a continuing effort, with drums of LSA waste collected and supercompacted about once a year.

4.2.2 Recycling and Reuse

Avoidance of disposal costs and conservation are motivators for recycling through reuse, swapping, off-site sales, and recovery. Throughout ORNL, recycling methods are encouraged and rewarded through the incentive programs. The following cites recycling plans and some successes.

1. In 1990 and early 1991, recycling programs for office paper, aluminum cans, and corrugated cardboard were implemented. Diversion of these streams from the landfill has been a high priority, since the projected fill date for the landfill precedes the availability of its successor. Reuse and recycling of other sanitary waste streams, such as wood, are also being evaluated.

2. One of the most successful waste reductions at ORNL has been the reuse of unexpired surplus chemicals. At one time, unused commercial chemicals constituted 90 percent of the waste chemicals collected at ORNL. Approximately 30 percent of these containers were unopened. Lists of reusable chemicals were circulated by the Hazardous Waste Operations Group to chemical users. Many of these chemicals, which were no longer needed by their owners, have been transferred to new owners for use.[5]

During CY 1989, the F&M Division received numerous chemicals, paint, roofing sealant, used cooking oil, outdated chemicals, and other hazardous materials. Instead of disposing of the hazardous materials at a cost of $300,000, F&M employees developed the idea of on-site sales and donations. Some of the paint was donated to Roane State Community College and some of the chemicals to the University of Tennessee. The remainder of the excess materials was purchased by local businesses at the on-site sale. This practice reduced not only generation of hazardous waste requiring disposal, but also raw materials required by the second-generation owners.

3. Reuse of lead, which if declared waste would be a regulated RCRA metal, is encouraged. By segregating lead from radioactive wastes, the uncontaminated metal can be reused. A fabrication shop at ORNL has been used to remold the recycled lead according to the user needs.

4. Other metals are also recycled through scrap metal sales. In this program, excess metals are sold to outside organizations for reuse. While not all of the material involved would be considered hazardous waste if it were to be discarded instead of recycled, some of the metals would be regulated by RCRA if handled as waste products. This effort resulted in recycling 737 tons of scrap metal in 1987 and 825 tons in 1988. In 1989, largely as a result of cleanup activities in preparation for a TSA audit, this total increased to 1,004 tons.

5. As a PIP project, the Environmental Sciences Division investigated the substitution of 100 percent recycled paper for computer output paper instead of virgin paper. For three months (November 1989 to February 1990), ESD used recycled paper to ensure that it performed to the same level as the virgin paper. By substituting recycled paper for virgin paper, ESD is creating a market for recycled paper, conserving natural resources, and protecting the environment. The recycled computer paper has the added benefit of costing 1/3 the price of virgin paper. (This PIP Project received the Martin Marietta President's Award for Performance Improvement.)

6. As a PIP project, the Plant and Equipment Division is investigating the reuse of used motor oil. The spent oil from routine oil maintenance on ORNL vehicles would be burned for the heating value. During the winter months, the used oil would be the fuel source for space heaters at the ORNL garage.

4.2.3 Material Substitution

Each division has been encouraged to consider substitution, where practical, of less hazardous or less toxic chemicals in processes and experiments. Often substitution affects research quality and cannot be implemented. However, material substitution where possible results in generation of less toxic waste which is less costly to manage consequently. The following are examples of material substitution.

1. The ESD performs toxicity tests with minnow larvae and micro-crustaceans to evaluate stream and wastewater quality. The health of these populations had been periodically evaluated using cadmium chloride as the reference toxicant. After some research of the test protocol, sodium lauryl sulfate, a major constituent of soap, has been substituted for the cadmium chloride. This substitution resulted in a waste that is safe to dispose of in the process waste water system and eliminated the production of a hazardous waste.

2. The substitution of scintillation fluids, which are not RCRA-regulated, for those currently used by ORNL researchers was studied as part of a programmatically funded task during 1988.[6] A number of laboratories at ORNL have substituted the non-RCRA scintillation fluids. If the new fluids will not degrade the quality of research data, the substitution of a medium that is not regulated under RCRA for one that is regulated as a hazardous waste will result in a waste stream which the EPA has approved for discharge into municipal sewer systems.

4.2.4 Procurement Control Practices

Control of procurement of chemicals can prevent excessive inventories, which if the chemicals exceed their shelf life before they are used, could require costly disposal. Therefore, it is a good waste management practice to substitute less hazardous or toxic materials during the procurement process.

One of the most important aspects of a procurement control system is purchasing only the quantities required. Buying bulk quantities of chemicals may be less expensive initially, but the higher cost incurred in disposing of the unneeded volume must also be considered. Therefore, each division is encouraged to review new purchase requisitions and compare them to their present stock. This prevents overstocking of chemicals.

With over 960 laboratories at ORNL, one laboratory may be able to provide a chemical for another. Those approving purchase orders for chemicals for each division have been advised to check for the internal availability of chemicals before ordering new supplies. Lists of surplus materials were distributed as mentioned in Sect. 4.2.2. This waste reduction activity should be a continuing effort.

As part of the Accelerated Vendor Inventory Delivery System, all hazardous chemicals Class III and IV require management approval before they can be purchased and recommendations given for a less hazardous substitute. Justification or an explanation may be required for large quantities of materials. This will help to reduce waste at the source. Personnel involved in the inventory and procurement efforts are trained in safety and waste minimization techniques.

4.2.5 Process Modifications

Waste reduction measures vary from small scale modifications in some programs to broad changes in others. Since ORNL waste generators are primarily numerous small laboratory or research programs, decreasing the volume of waste being generated often involves reductions which, taken by themselves, are apparently small changes in the total volume. However, in terms of quantity of waste produced from that particular program, the savings in waste volumes can be substantial. The following programs are excellent examples:

1. From 1985 to 1987, a waste minimization program reduced the generation rate of LLLW concentrate to approximately 95 m^3/y. Further reduction in 1988 and 1989 brought generation to approximately 49 m^3/y. This was accomplished by a decrease in the generation rate of LLLW at the source and an increase in the evaporation efficiency of the LLLW evaporators from a volume reduction factor of about 9:1 to 30:1. Waste minimization efforts were accomplished by a series of projects and process changes, including the addition of a clarifier to the PWTP. Annual generation rates can be seen graphically in Figure 1.[7]

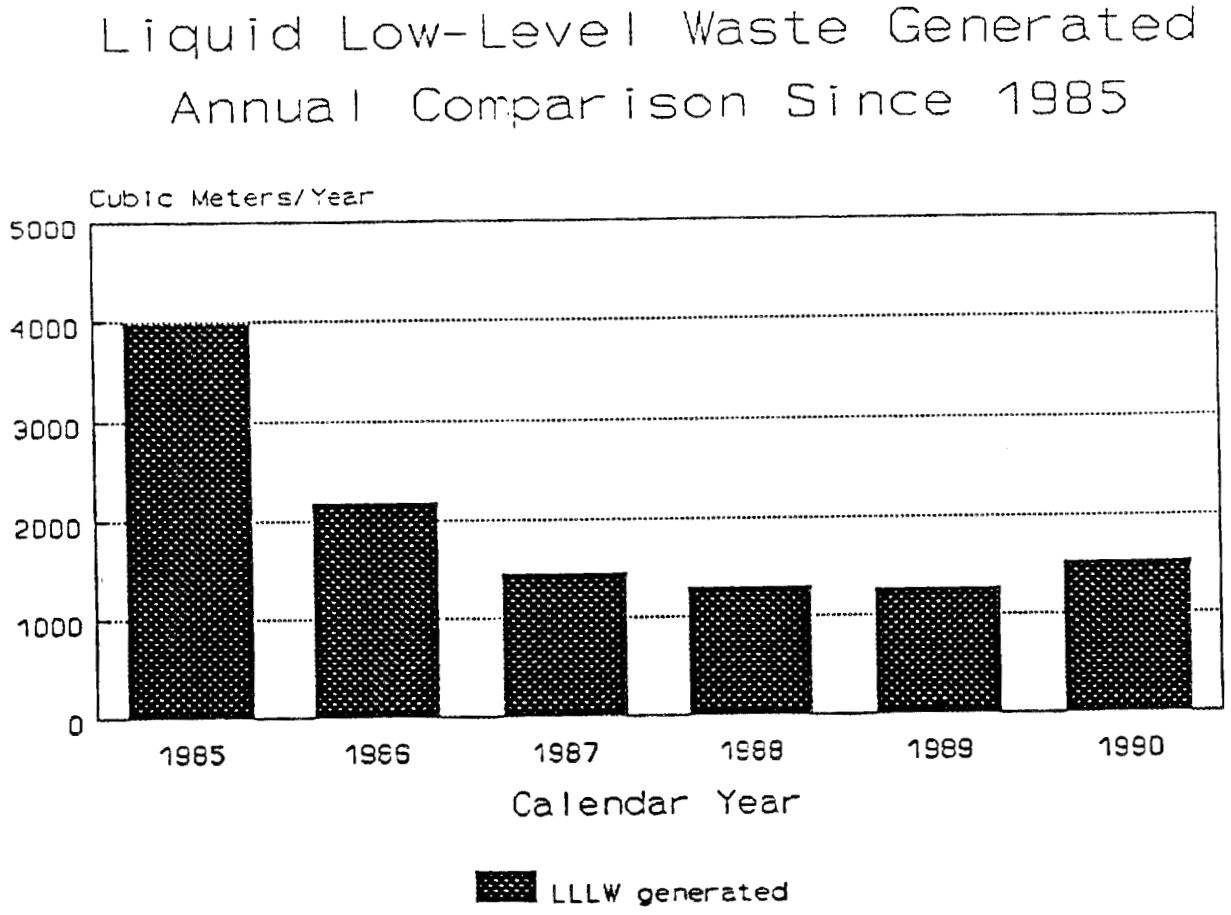

Fig. 1. Annual generation rates of LLLW.

2. The Liquid and Gaseous Treatment Technology Group is taking a unique approach to reduction of radioactive liquid wastes by developing the means to analyze the overall ORNL liquid waste system. By developing a model of the overall liquid waste system, the group has created a method to assess the impacts that each portion of the system has on composition and volume of final waste produced for permanent disposal at ORNL. This is the first attempt at ORNL to determine what effects each generator and treatment operation (whether at the source or in the centralized treatment facilities) has on the final waste form and to implement waste reduction projects accordingly.

   The LGTTG's new approach is effectively reducing the total amount of waste generated by the liquid waste system, with particular emphasis on reduction of LLLWC.

   The group performed the first comprehensive survey of liquid waste generators to determine the amount and type of waste being generated at ORNL and where these streams are presently being routed for treatment. This information was coupled with a technical analysis of the waste treatment facilities to determine where improvements could be made in the waste system which would result in major reduction in the final waste generation rates. Characterization and treatability studies are being performed to support implementation of such projects to reduce final waste generation rates by (1) treatment at the generation site, (2) modification of the processes generating the waste, and/or (3) improved operations at the centralized facilities.

   Results of the systems analysis show that only three current operations at ORNL significantly impact the hazardous nature or the amount of LLLWC. The major contributors to the LLLWC (in descending order) are: (1) the PWTP, (2) the FPDL Facility, and (3) REDC Facility. The LGTTG is focusing waste reduction efforts in these areas since they significantly affect LLLWC generation. Since the PWTP is the single largest contributor to the LLWC, projects have emphasized the upgrade of this facility. Projects are also in progress which will reduce waste generation at the FPDL and REDC in the near future.

   The systems analyses established that installation of an extra holding tank in the PWTP evaporator loop will reduce the LLLWC by 4,000 gal/year. This $30,000 project is in the process of being implemented and will save $200,000/year in waste disposal costs.

   The generator survey identified several once-through cooling water streams which are being fed to the PWTP for radionuclide removal. These streams account for 35 percent of the PWTP feed and a corresponding percentage of the secondary waste generated at the plant. Minor piping modifications are being made to segregate these waste streams which will reduce the SLLW production by 1,400 ft^3/year (33 percent of the present generation rate) and LLLWC by an additional 1,300 gal/year (from 4,000 gal/year to 2,700 gal/year). The cost savings for this project are estimated to be $120,000/year.

   While many previous "waste reduction" projects have reduced the volume of waste entering a given phase of the liquid waste treatment system, they often have little impact on volumes or compositions of the final waste steams which must be treated for permanent disposal. The LGTTG's systems analysis approach is assuring that waste reduction projects are implemented which will be cost effective and significantly reduce the amount of waste being stored for ultimate disposal.

4.2.6 Waste Segregation

Segregation of wastes (e.g. hazardous wastes and radioactive wastes) improves waste management and waste reduction efforts.

1. A program for management of lead has also been instituted at ORNL. The training program described in Sec. 5.1 stresses the segregation of hazardous waste, particularly lead, from radioactive waste.

2. In 1989 as part of a systems analysis, Chemical Technology Division developed a pH segregation system to separate metals-containing wastewater from "clean" wastewater. Using the pH segregation system could reduce the amount of wastewater treated for heavy metals at the NRWTP to about 15,000 gal/week, significantly reducing sludge production and reducing the hydraulic loading of the NRWTP. Using sludge production data from the pilot plant testing for the NRWTP, the pH segregation system will reduce sludge production by a factor of 100.

4.3 LABORATORY CLEANOUTS

Laboratory cleanout, the removal of old or unnecessary chemicals from a laboratory, is encouraged for a number of reasons aside from being a good housekeeping measure. First, clearing the work area of unneeded chemicals reduces health and safety risks. Some chemicals on laboratory shelves may be as old as 40 years. Additional hazards are associated with aging of some chemicals, such as picric acid and ethers, which can become explosive.

Second, eliminating materials associated with expired research projects helps clear the waste generation record for current and future activities in the laboratory. One of the difficulties encountered in measuring progress in waste minimization is accounting for disposal of wastes from projects terminated in prior years. Including waste disposal costs in initial project planning will help alleviate this problem in the future and eliminate the problem of who to charge for legacy wastes. Also, disposal of unneeded chemicals will be more costly in the future than today. Delaying the cleanout and disposal will only increase the costs.

Of the approximately 143,089 kg of waste ORNL managed as hazardous (RCRA wastes are a fraction of this amount) during 1990, approximately 28,614 kg were generated from the cleanout of laboratories.[5] During 1990, a Laboratory-wide inventory of chemicals was initiated to identify chemicals for which the shelf life had expired. These were disposed of using established and approved procedures.

5. WASTE REDUCTION AWARENESS

5.1 EMPLOYEE TRAINING

The waste generator training program includes several courses offered to programs and divisions which produce hazardous or radioactive wastes. In general, these training sessions are designed to instruct the waste generator personnel in the proper techniques for waste segregation, certification, minimization, and packaging, and in the applicable procedures and documentation for waste handling and disposal.

The first training module was designed for SLLW generators to instruct them on the methods and documentation used by Radioactive Solid Waste Operations to collect and dispose of low-level radioactive wastes.

Because of the problems which have been or may be encountered in managing mixed wastes, a major portion of this program is devoted to methods for reducing the quantity of mixed waste being generated, primarily focusing on segregation of radioactive wastes from hazardous wastes. Successful completion of this training is mandatory for radioactive waste generators.

Another program is directed toward hazardous and mixed waste generators, describing the procedures and requirements for managing those wastes at ORNL. This training course addresses such topics as identification of hazardous waste, management of accumulation areas, and minimizing the amount of waste being generated.

A training program specifically for waste minimization techniques was developed in 1988. This course describes some of the problems in waste management, explains the impetus behind implementing the waste minimization program, and includes a classroom exercise in identifying waste streams to which waste reduction techniques could be applied. This training is currently being modified to a workshop format and will be offered to a wide population at ORNL.

In addition, waste reduction principles will be added to General Employee Training, which is required for all ORNL employees and on-site contractors.

5.2 COMMUNICATIONS

Regular meetings with the division WRRs is one of the vehicles used to pass information on waste reduction from the Waste Reduction Coordinator or from WRRs in other divisions to the generators in the representative's division. Transfer of waste reduction ideas or discussion of waste reduction problems is encouraged. Notes from the meetings are sent to the representatives with current waste minimization documents or news.

Waste minimization posters have been distributed to all the WRRs and displayed within their divisions. The goal is to promote employee awareness in the everyday work environment. Seminars and videotape sessions on current waste minimization technology and issues are being planned. Newsletters and bulletin boards will be used to further employee awareness.

6. TECHNOLOGY TRANSFER

An important aspect of ORNL's waste reduction philosophy is the transfer of information about our waste reduction efforts to other facilities, organizations and industry. The following mechanisms are examples of how waste reduction technology can be successfully transferred:

- o participate in the Environmental Restoration and Waste Management waste reduction workshops which includes attendees from other DOE facilities
- o provide input to the WIN waste reduction bulletin board
- o exchange information with the University of Tennessee Center of Industrial Services
- o transfer waste reduction technology successes with the EPA Pollution Prevention Information Clearinghouse and the Waste Reduction Resource Center of the Southeast

In the past, for example, ORNL has provided information on waste minimization training and our charge-back system to other DOE contractors.

7. WASTE REDUCTION PROGRAM EVALUATION

As budgets permit, the ORNL Waste Reduction Program will be routinely evaluated. The evaluation will include all aspects of the program, including whether completed projects have achieved intended goals. Updates, as appropriate, will be made to this plan every three years. Special circumstances (e.g., new legislation or DOE Orders) could require that the plan be updated on a shorter interval. A major revision to the plan is required by January 1, 1992 by the Tennessee Hazardous Waste Reduction Act.

8. REFERENCES

1. DOE Order 5820.2A, "Waste Management Documentation Requirements," September 26, 1988.

2. DOE Order 5400.1, "General Environmental Protection Program", November 9, 1988.

3. DOE Order 5400.3, "Hazardous and Radioactive Mixed Waste Program," February 22, 1989.

4. Resource Conservation and Recovery Act, "Waste Minimization Amendment," November 1984.

5. Smith, M. A., Hazardous Waste Minimization At Oak Ridge National Laboratory During 1988, ORNL/TM-11109, March, 1989.

6. Kimbro, A. R., Scintillation Cocktail Replacement Study, ORNL/CF-89/31, January 1989.

7. Homan, M. D. et al., Waste Reduction Program at Oak Ridge National Laboratory During CY 1990, ORNL/TM-11780, March 1991.

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1. Memorandum, W. F. Furth to R. G. Donnelly et al., Waste Minimization Policy, May 21, 1986.

2. Memorandum, Herman Postma to ORNL Division Directors, Minimization of Hazardous Chemical Waste Volumes and Toxicity, September 13, 1985.

3. Letter, T. B. Hindman, Jr. to DOE Operations Offices, Waste Reduction Guidance, January 18, 1989.

4. Letter, T. E. Wade II to DOE Operations Offices, Waste Minimization Policy for Defense Programs Operations, October 20, 1988.

5. Smith, M. A., Hazardous Waste Minimization At Oak Ridge National Laboratory During 1988, ORNL/TM-11109, March, 1989.

6. Barkenbus B. D. and V. L. Turner, Hazardous Waste Minimization Program - Oak Ridge National Laboratory, ORNL/TM-10313, January 1987.

7. C. M. Kendrick, "Waste Reduction Program Briefing," presented to DOE-ORO, May 16, 1989.

8. Schultz, R. M., Waste Reduction Plan for the Oak Ridge National Laboratory, ORNL/TM-11283, April 1990.

APPENDIX A. Management Commitment for Waste Reduction

ernal Correspondence

MARTIN MARIETTA ENERGY SYSTEMS, INC.

September 13, 1985

Division Directors

Minimization of Hazardous Chemical Waste Volumes and Toxicity

The November 1984 action by Congress to reauthorize the Resource Conservation and Recovery Act of 1976 put forward several significant additions to the original act. One of these revisions, which is outlined in Paragraph 224 (see Attachments 1 and 2), will place additional requirements on the generators of hazardous chemical waste (HCW). Briefly, generators must have in place a waste reduction plan (volumes and toxicity) prior to shipment of waste for disposal after September 1, 1985. Further, this plan must be quantitative and trackable.

Staff from the Operations Division (F. J. Homan, L. C. Lasher, and K. G. Edgemon) and the Environmental and Occupational Safety Division (V. L. Turner) have been assigned to help the waste-generating divisions develop a waste minimization plan. I am asking each Division Director to assign someone to work on this task and provide the name of that person to Mr. Homan (4-7042). The goal is to have a workable plan in place by early September. This plan might include the following elements:

- Avoidance of Waste: Experience has shown that the HCW discarded by some laboratories includes as much as 50 percent by volume of unopened bottles of chemicals. Effective planning and timely procurement of chemicals should reduce this waste stream to essentially zero.

- Substitution: Substitution of nonhazardous or less toxic chemicals where possible.

- Establishment of a Baseline: We will be looking for a baseline figure for the Laboratory to compare minimization progress against.

- Goal Setting: Projection of percentage volume reduction versus time for the next few years. This will admittedly be difficult but will very likely be imposed, especially if no visible progress in minimization occurs.

Thank you for your assistance. I look forward to successful completion of this requirement.

Herman Postma (6-2900)

HP:FJH:rlg

Attachments: (1) Paragraph 224 of 1984 RCRA Ammendments
(2) Summary of HCW Minimization Requirements

cc/att: W. R. Bibb, DOE-ORO
W. F. Furth
F. J. Homan
F. R. Mynatt
T. H. Row
J. H. Swanks
R. S. Wiltshire
File - NoRC

grant or deny such a petition within 24 months after receiving a complete application.

"(B) The temporary granting of such a petition prior to the enactment of the Hazardous and Solid Waste Amendments of 1984 without the opportunity for public comment and the full consideration of such comments shall not continue for more than 24 months after the date of enactment of the Hazardous and Solid Waste Amendments of 1984. If a final decision to grant or deny such a petition has not been promulgated after notice and opportunity for public comment within the time limit prescribed by the preceding sentence, any such temporary granting of such petition shall cease to be in effect.

"(g) EP TOXICITY.—Not later than 28 months after the date of enactment of the Hazardous and Solid Waste Amendments of 1984 the Administrator shall examine the deficiencies of the extraction procedure toxicity characteristic as a predictor of the leaching potential of wastes and make changes in the extraction procedure toxicity characteristic, including changes in the leaching media, as are necessary to insure that it accurately predicts the leaching potential of wastes which pose a threat to human health and the environment when mismanaged.

"(h) ADDITIONAL CHARACTERISTICS.—Not later than 2 years after the date of enactment of the Hazardous and Solid Waste Amendments of 1984, the Administrator shall promulgate regulations under this section identifying additional characteristics of hazardous waste, including measures or indicators of toxicity.".

(b) Section 3001(b)(1) of the Solid Waste Disposal Act is amended by adding the following at the end thereof: "The Administrator, in cooperation with the Agency for Toxic Substances and Disease Registry and the National Toxicology Program, shall also identify or list those hazardous wastes which shall be subject to the provisions of this subtitle solely because of the presence in such wastes of certain constituents (such as identified carcinogens, mutagens, or teratogens) at levels in excess of levels which endanger human health.".

CLARIFICATION OF HOUSEHOLD WASTE EXCLUSION

SEC. 223. (a) Section 3001 of the Solid Waste Disposal Act is amended by adding the following new subsection at the end thereof:

"(g) CLARIFICATION OF HOUSEHOLD WASTE EXCLUSION.—A resource recovery facility recovering energy from the mass burning of municipal solid waste shall not be deemed to be treating, storing, disposing of, or otherwise managing hazardous wastes for the purposes of regulation under this subtitle, if—

"(1) such facility—

"(A) receives and burns only—

"(i) household waste (from single and multiple dwellings, hotels, motels, and other residential sources), and

"(ii) solid waste from commercial or industrial sources that does not contain hazardous waste identified or listed under this section, and

"(B) does not accept hazardous wastes identified or listed

"(2) the owner or operator of such facility has established contractual requirements or other appropriate notification or inspection procedures to assure that hazardous wastes are not received at or burned in such facility.".

WASTE MINIMIZATION

SEC. 224. (a) Section 3002 of the Solid Waste Disposal Act is amended by—

(1) inserting "(a) IN GENERAL.—" after "3002.";

(2) adding the following new subsection at the end thereof:

"(b) WASTE MINIMIZATION.—Effective September 1, 1985, the manifest required by subsection (a)(5) shall contain a certification by the generator that—

"(1) the generator of the hazardous waste has a program in place to reduce the volume or quantity and toxicity of such waste to the degree determined by the generator to be economically practicable; and

"(2) the proposed method of treatment, storage, or disposal is that practicable method currently available to the generator which minimizes the present and future threat to human health and the environment."; and

(3) amending subsection (a)(6) to read as follows:

"(6) submission of reports to the Administrator (or the State agency in any case in which such agency carries out a permit program pursuant to this subtitle) at least once every 2 years, setting out—

"(A) the quantities and nature of hazardous waste identified or listed under this subtitle that he has generated during the year;

"(B) the disposition of all hazardous waste reported under subparagraph (A);

"(C) the efforts undertaken during the year to reduce the volume and toxicity of waste generated; and

"(D) the changes in volume and toxicity of waste actually achieved during the year in question in comparison with previous years, to the extent such information is available for years prior to enactment of the Hazardous and Solid Waste Amendments of 1984.".

(b) Section 3005 of the Solid Waste Disposal Act is amended by adding the following new subsection after subsection (g):

"(h) WASTE MINIMIZATION.—Effective September 1, 1985, it shall be a condition of any permit issued under this section for the treatment, storage, or disposal of hazardous waste on the premises where such waste was generated that the permittee certify, no less often than annually, that—

"(1) the generator of the hazardous waste has a program in place to reduce the volume or quantity and toxicity of such waste to the degree determined by the generator to be economically practicable; and

"(2) the proposed method of treatment, storage, or disposal is that practicable method currently available to the generator which minimizes the present and future threat to human health and the environment."

(c) Section 8002 of the Solid Waste Disposal Act is amended by adding the following new subsection after subsection:

"(r) MINIMIZATION OF HAZARDOUS WASTE.—The Administrator shall compile, and not later than October 1, 1986, submit to the Congress, a report on the feasibility and desirability of establishing standards of performance or of taking other additional actions under this Act to require the generators of hazardous waste to reduce the volume or quantity and toxicity of the hazardous waste they generate, and of establishing with respect to hazardous wastes required management practices or other requirements to assure such wastes are managed in ways that minimize present and future risks to human health and the environment. Such report shall include any recommendations for legislative changes which the Administrator determines are feasible and desirable to implement the national policy established by section 1003.".

BASIS OF AUTHORIZATION

SEC. 225. Section 3006(b) of the Solid Waste Disposal Act is amended by adding the following at the end thereof: "In authorizing a State program, the Administrator may base his findings on the Federal program in effect one year prior to submission of a State's application or in effect on January 26, 1983, whichever is later.".

AVAILABILITY OF INFORMATION

SEC. 226. (a) Section 3006 of the Solid Waste Disposal Act is amended by adding the following new subsection after subsection (e) thereof:

"(f) AVAILABILITY OF INFORMATION.—No State program may be authorized by the Administrator under this section unless—

"(1) such program provides for the public availability of information obtained by the State regarding facilities and sites for the treatment, storage, and disposal of hazardous waste; and

"(2) such information is available to the public in substantially the same manner, and to the same degree, as would be the case if the Administrator was carrying out the provisions of this subtitle in such State.".

(b) The amendment made by subsection (a) shall apply with respect to State programs authorized under section 3006 before, on, or after the date of enactment of the Hazardous and Solid Waste Amendments of 1984.

INTERIM AUTHORIZATION OF STATE PROGRAMS

SEC. 227. Section 3006(c) of the Solid Waste Disposal Act is amended by—

(1) striking out "twenty-four month period beginning on the date six months after the date of promulgation of regulations under sections 3002 through 3005" and inserting in lieu thereof "period ending no later than January 31, 1986";

(2) inserting "(1)" after "INTERIM AUTHORIZATION.—"; and

"(2) The Administrator shall, by rule, establish a date for the expiration of interim authorization under this subsection.

"(3) Pending interim or final authorization of a State program for any State which reflects the amendments made by the Hazardous and Solid Waste Amendments of 1984, the State may enter into an agreement with the Administrator under which the State may assist in the administration of the requirements and prohibitions which take effect pursuant to such Amendments.

"(4) In the case of a State permit program for any State which is authorized under subsection (b) or under this subsection, until such program is amended to reflect the amendments made by the Hazardous and Solid Waste Amendments of 1984 and such program amendments receive interim or final authorization, the Administrator shall have the authority in such State to issue or deny permits or those portions of permits affected by the requirements and prohibitions established by the Hazardous and Solid Waste Amendments of 1984. The Administrator shall coordinate with States the procedures for issuing such permits.".

APPLICATION OF AMENDMENTS TO AUTHORIZED STATES

SEC. 228. Section 3006 of the Solid Waste Disposal Act is amended by adding the following new subsection after subsection (f):

"(g) AMENDMENTS MADE BY 1984 ACT.—(1) Any requirement or prohibition which is applicable to the generation, transportation, treatment, storage, or disposal of hazardous waste and which is imposed under this subtitle pursuant to the amendments made by the Hazardous and Solid Waste Amendments of 1984 shall take effect in each State having an interim or finally authorized State program on the same date as such requirement takes effect in other States. The Administrator shall carry out such requirement directly in each such State unless the State program is finally authorized (or is granted interim authorization as provided in paragraph (2)) with respect to such requirement.

"(2) Any State which, before the date of the enactment of the Hazardous and Solid Waste Amendments of 1984 has an existing hazardous waste program which has been granted interim or final authorization under this section may submit to the Administrator evidence that such existing program contains (or has been amended to include) any requirement which is substantially equivalent to a requirement referred to in paragraph (1) and may request interim authorization to carry out that requirement under this subtitle. The Administrator shall, if the evidence submitted shows the State requirement to be substantially equivalent to the requirement referred to in paragraph (1), grant an interim authorization to the State to carry out such requirement in lieu of direct administration in the State by the Administrator of such requirement.".

FEDERAL FACILITIES

SEC. 229. Section 3007 of the Solid Waste Disposal Act is amended by adding the following new subsection after subsection (b) thereof:

"(c) FEDERAL FACILITY INSPECTIONS.—Beginning 12 months after the date of enactment of the Hazardous and Solid Waste Amend-

HAZARDOUS CHEMICAL WASTE MINIMIZATION REQUIREMENTS

1. Effective September 1, 1985, HCW manifests must contain certification that:

   a. HCW generator has a program in place to reduce volume or quantity and toxicity... and

   b. the proposed method of treatment, storage, or disposal is that which minimizes the present and future threat to public health and the environment.

2. Submission of biannual reports to EPA or states with primacy including:

   a. quantities and nature of HCW identified or listed during the year,

   b. disposition of all HCW,

   c. efforts undertaken during the year to reduce volumes and toxicity of waste generated, and

   d. the changes in volume and toxicity of waste actually achieved during the year in question in comparison with previous years.

3. Effective September 1, 1985, it will be a condition of any permit issued for TSD facilities that the permittee certify at least annually that:

   a. the generator of HCW has a program in place to reduce volume or quantity and toxicity to the degree economically practicable and

   b. the proposed method of TSD is the best available to minimize the present and future threat to human health and the environment.

4. EPA must report to Congress by October 1, 1986, on the feasibility and desirability of establishing standards of performance or of taking other additional actions to require the generators of HCW to reduce the volume or quantity and toxicity of the waste they generate... Such a report shall include any recommendations for legislative changes...

Internal Correspondence

MARTIN MARIETTA ENERGY SYSTEMS, INC.

November 22, 1989

ORNL Staff

Pollution Prevention Awareness Program

Pollution has become a major international, national, and local problem that effects all of us. The ozone hole in Antarctica, carbon dioxide in the atmosphere, and acid rain are examples. While as individuals we may not be able to do much about these problems directly, we can do more to ensure that we are not contributing to pollution unnecessarily by carelessness or ignorance. In the final analysis, most pollution is a local problem and must be dealt with locally. The Laboratory is engaged in activities that must deal with waste that was generated in the past and with waste that is being produced now. It is important that this be done properly and that we do everything we can to minimize or eliminate pollution resulting from these efforts. To help achieve this goal, a program that will seek to educate all of us about problems associated with pollution and its prevention will be initiated. This will be called the "Pollution Prevention Awareness Program." Our ability to continue functioning as a world-class laboratory depends in many respects on how well we do in handling the problems associated with past and present waste. I expect every employee of the Lab to do their share to improve the quality of the environment in which we work and live.

Alvin W. Trivelpiece, 4500N, MS-6255 (6-2900)

AWT:bg

ernal Correspondence

MARTIN MARIETTA ENERGY SYSTEMS, INC.

May 21, 1986

R. G. Donnelly
G. G. Fee
W. R. Golliher
H. Postma

Waste Minimization Policy

In concert with Ken Jarmolow's personal commitment to a strong environmental program, as laid out in his environmental protection policy statement, the attached waste minimization policy is being issued. This policy represents the Martin Marietta Energy Systems commitment to a concept that can result in a more disciplined, rational approach to waste management. It has been formulated with the assistance of all of our installations. Besides being required by law, I am convinced that waste minimization can be a cost savings concept in the long run, much as energy conservation has been nationally. We all intend for the Energy Systems sites to implement comprehensive waste miniminization programs that reduce the quantity and hazard of waste. Many major steps toward this end have already been taken, additional reductions are being requested by DOE, and more opportunities are known to exist. I believe that Energy Systems has the talent and ability to demonstrate innovative means to achieve minimization, and will be a leader in this endeavor.

W. F. Furth, 1000, MS 214A, ORNL (6-8006) - NoRC

WFF:TPAP:lhs

Attachment

cc/att: R. C. Baker
R. L. Egli, DOE-ORO
C. C. Hopkins
K. Jarmolow
C. G. Jones
M. L. Jones
R. G. Jordan
J. A. Lenhard, DOE-ORO
L. W. Long
W. F. Manning, DOE-ORO
L. J. Mezga
M. E. Mitchell
D. C. Parzyck
T. H. Row
J. E. Shoemaker
K. W. Sommerfeld
R. J. Spence, DOE-ORO
R. S. Wiltshire
L. F. Willis

cc: T. P. A. Perry-RC
File-WFF

WASTE MINIMIZATION POLICY

It is the intent of Martin Marietta Energy Systems, Incorporated to manage all waste in such a way that human health and the environment are are protected, and in a manner consistent with the Oak Ridge Operations policy for radioactive, nonradioactive mixed, and hazardous waste. To this end, the following policy is to be implemented at all Energy Systems installations.

Waste Minimization Policy

It is the policy within Energy Systems to minimize the generation of hazardous waste, mixed hazardous waste, and low level radioactive waste resulting from all activities.

The preferred avenues for achieving waste elimination or reduction are through process elimination, optimization, or change, material substitution, recycle, reuse, sale, or energy recovery. For residual wastes that may not be amenable to the preceding methods, the goal for dispoal is use of the most cost-effective method, such as biological, chemical or protects human health and the environment. The evaluation of cost effectiveness and environmental worthiness must be made with regard to long term potential liabilities, as well as immediate cost considerations.

Practice

The following forms of waste management are to be considered for each waste generated at Energy Systems installations.

Process optimization

Process changes

Substitution of less hazardous materials

Reclamation, reuse, or recycling of waste

Better segregation of waste streams

Incentive programs

Discontinuance or consolidation of certain operations

Waste concentration and/or segregation

If the preceding efforts are not suitable or are inappropriate, the following waste management methods, to reduce waste toxicity or volume, are to be considered.

Waste incineration and other treatment technologies

Waste treatment

If the preceding methods of reducing waste toxicity and volume are not suitable or are inappropriate, then the following waste management methods are to be considered.

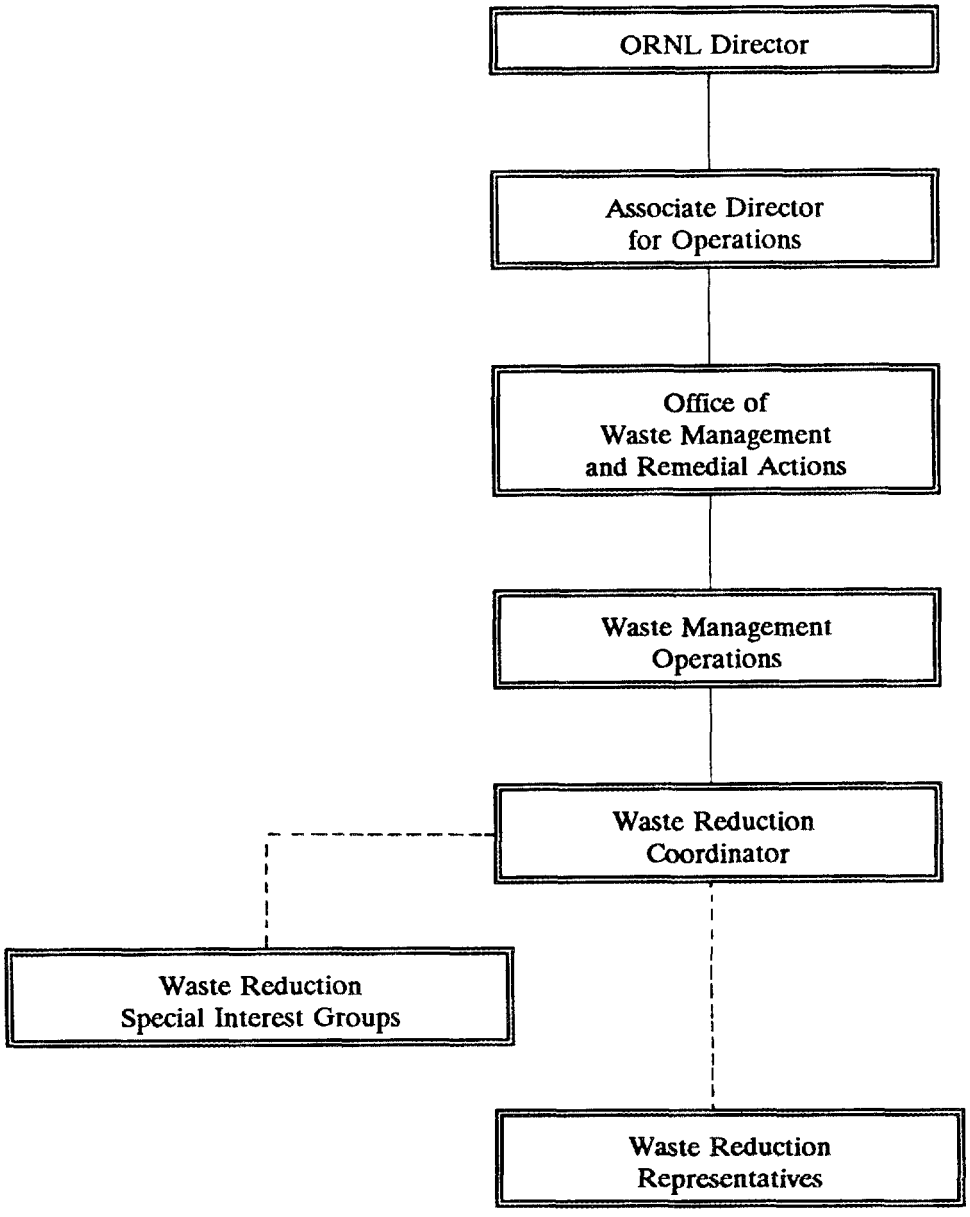
Waste storage (until a suitable disposal or treatment method is determined)

Waste disposal in or on the land (for certain wastes)

For some radioactive waste, the use of land disposal may be the only practicable alternative. Land disposal will continue to be evaluated as a disposal option, but only on a limited basis in concert with our intent to refrain from developing new burial grounds until an Oak Ridge disposal philosophy is fully developed.

This policy will be implemented through a program of goals, training, and communication that conveys not only the philosophy of waste minimization, but the methods and measures of accomplishments. The program will be audited on a regular basis by the Central Environmental Staff to ensure that it effectively achieves minimization as outlined. Annual reviews and revisions of the program by the appropriate site staffs and the Energy Systems Central Environmental Staff will ensure that minimization programs remain dynamic and ever improving. This program demonstrates the Energy Systems commitment to responsible waste management and to the goals enunciated by Secretary Harrington on January 4, 1986.

APPENDIX B: Simplified Organizational Structure for Waste Reduction at ORNL



--- programmatic relationship

APPENDIX C: Hazardous Waste Request for Disposal Form

No. 12602.

REQUEST FOR DISPOSAL OF HAZARDOUS WASTE MATERIAL

te

Page 1 of

ste Generator | Bldg. | Room No.

nt | Employee No. | Phone No. | Charge/Work Order No.

cation of Material | Room or Area

TEM NO.	DESCRIPTION OF MATERIAL *	QUANTITY	RADIOACTIVE/ NONRADIOACTIVE***	HAZARD INFORMATION	EPA WASTE NO./ CONTAINER NO. **

* IF THE WASTE IS A CHEMICAL MIXTURE OR AN ITEM SUCH AS CONTAMINATED CLOTHING, LIST EACH CHEMICAL AND APPROXIMATE AMOUNTS OF EACH. ALL FORMS NOT PROPERLY FILLED OUT WILL BE RETURNED!

TO BE COMPLETED BY THE HAZARDOUS WASTE OPERATIONS GROUP

STORAGE LOCATION | TOTAL WEIGHT/VOLUME

DATE TO STORAGE | RECYCLE/DISPOSAL DATE | RECYCLE/DISPOSAL SITE

WHITE - HWOG
CANARY - CONTAINER
BLUE - WASTE GENERATOR

**INFORMATION TO BE COMPLETED BY HWOG
***HP TAG REQUIRED PRIOR TO PICKUP

APPENDIX D: SLLW Request for Disposal Form (UCN-2822)

REQUEST FOR STORAGE OR DISPOSAL OF RADIOACTIVE SOLID WASTE OR SPECIAL MATERIALS

No. 73515

REQUESTER: EXECUTES THIS SECTION BEFORE ARRANGING MATERIAL TRANSFER

DATE	ORIGIN OF WASTE (BULDG NO.)	REQUESTER'S SIGNATURE	BADGE NO	PHONE NO	BUILDING/MAIL STOP

(CHECK IF APPLICABLE)	TOTAL VOLUME (CU FT ONLY)	COMBUSTIBLE VOL (CU FT ONLY)	WEIGHT (LBS ONLY)	ACCOUNTABILITY NO (MM NO)
☐ OFFSITE				
☐ CONSTRUCTION	CHARGE WORK ORDER NUMBER		(FOR WASTE OPERATIONS USE ONLY) COST SYMBOL:	COST ADJUSTMENT:

WASTE CLASSIFICATION (CHECK ONLY ONE)

1. ☐ TRU OR U-233 (RETRIEVABLE) (> 100 μ Ci/Kg)
2. ☐ URANIUM/THORIUM
3. ☐ FISSION PRODUCT
4. ☐ INDUCED ACTIVITY
5. ☐ TRITIUM
6. ☐ BETA-GAMMA TRU OR U-233 (> 100 μ Ci/Kg) (RETRIEVABLE)
7. ☐ ALPHA TRU OR U-233 (<100 μCi/Kg) BETA-GAMMA TRU OR U-233 (< 100 μ Ci/Kg)
8. ☐ OTHER _____
9. ☐ LANDFILL/SUSPECT

A. ☐ CONTAMINATED ASBESTOS

TYPE OF WASTE (CHECK ONLY ONE)

	BRIEF DESCRIPTION
☐ (BW) BIOLOGICAL WASTE	
☐ (CE) CONTAMINATED EQUIPMENT	
☐ (DD) DECONTAMINATION DEBRIS	
☐ (DS) DRY SOLIDS	
☐ (SS) SOLIDIFIED SLUDGE	
☐ (NC) NOT CLASSIFIED	

CONTAINER TYPE (CHECK ONLY ONE)

1. ☐ 55 GAL SS DRUM
2. ☐ 30 GAL SS DRUM
3. ☐ 4-½ " WALL CONCRETE CASK
4. ☐ 6" WALL CONCRETE CASK
5. ☐ 12" WALL CONCRETE CASK
6. ☐ 55 GAL BI DRUM
7. ☐ 30 GAL BI DRUM
8. ☐ WOODEN BOX _____
9. ☐ OTHER _____
10. ☐ GI CAN
11. ☐ PLASTIC
12. ☐ DUMPSTER
13. ☐ NONE
14. ☐ CASK NO _____ WALL THICKNESS _____ IN. SHIELDING MTL _____
15. ☐ METAL BOX _____

PRINCIPAL ISOTOPE(S): (BEST ESTIMATE)

1. IDENTITY _____ QUANTITY _____ ☐ GRAMS ☐ CURIES
2. IDENTITY _____ QUANTITY _____ ☐ GRAMS ☐ CURIES
3. IDENTITY _____ QUANTITY _____ ☐ GRAMS ☐ CURIES
4. IDENTITY _____ QUANTITY _____ ☐ GRAMS ☐ CURIES

REQUESTER'S COMMENTS FOR THOSE HANDLING WASTE IN THE FIELD:

TOTAL CURIES (BEST ESTIMATE)

WMO FIELD REPRESENTATIVE (APPROVAL SIGNATURE) | **DATE**

HEALTH PHYSICIST: EXECUTES THIS SECTION BEFORE MATERIAL TRANSFER

RADIATION DATA:

BETA-GAMMA: FOR PACKAGE _____ mrem/hr @ _____ in.

SURFACE CONT. _____ dpm (alpha); _____ dpm (beta/gamma); NEUTRON READING _____ mrem/hr

HP SURVEYOR'S COMMENTS FOR THOSE HANDLING WASTE IN THE FIELD:

HP'S SIGNATURE | **DATE**

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