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Analysis of Potential Cost Savings and the Potential for Reduced Environmental Benefits of the Proposed Universal Waste Rule

TABLE OF CONTENTS

PART I - INTRODUCTION

PART II - COST ANALYSIS

PART I - INTRODUCTION AND BACKGROUND

CHAPTER 1 - INTRODUCTION

1.1 Purpose of Document

This document has been developed by the U.S. Environmental Protection Agency (EPA) in support of a proposal to modify the Resource Conservation and Recovery Act (RCRA) Subtitle C regulations governing management of hazardous waste. The proposal, known as the Universal Wastes proposal, was published in the Federal Register on February 11, 1993 (58 FR 8102) under the title Hazardous Waste Management System: Modification of the Hazardous Waste Recycling Regulatory Program. The proposed changes and the rationale for making these changes are described in detail in the Federal Register notice. The proposed changes are also summarized in Chapter 2 of this document.

In the preamble to the proposed Universal Wastes rule (58 FR 8126) the Agency committed to:

- "analyze the costs of the current regulatory requirements for generators and collection facilities and of the requirements [proposed]";
- "analyze whether there are significant reduced environmental benefits from the modifications being proposed"; and
- notice the analysis for comment prior to promulgating a final rule.

This document, which has been noticed for comment in the Federal Register (59 FR 31568), presents these analyses. Part II discusses and compares the costs of the existing Subtitle C regulations and of the proposed changes to these regulations. Part III discusses whether the proposed changes will significantly reduce the environmental benefits provided by the current Subtitle C regulations.

Three types of universal hazardous waste are included in the analyses in this document:

- Hazardous waste batteries, for which specific regulatory language was proposed (including nickel-cadmium and mercuric oxide batteries);
- Suspended and/or canceled pesticides that are recalled, for which specific regulatory language was proposed; and
- Hazardous waste mercury-containing thermostats, for which appropriate regulatory requirements were discussed in some detail in the preamble to the proposal.

1.2 Introduction

There are several hazardous wastes that are generated in relatively small quantities by a large and diverse set of businesses that EPA believes will be better controlled by more tailored standards than is provided in the current hazardous waste rules. Examples of these wastes include nickel-cadmium and mercuric oxide batteries and mercury-containing thermostats that businesses want to discard. The vast number of generators of these "universal wastes" makes implementation of the hazardous waste program difficult for EPA and the states. It is also clear that generators of these universal wastes are having difficulties in properly handling these types of wastes under the full RCRA Subtitle C requirements.

To improve management of these universal wastes, the Agency proposed the Universal Waste Rule. The proposed regulatory changes would establish new requirements for several types of batteries and recalled pesticides.[1] In the preamble of the proposed rule, EPA discusses how thermostats could also be regulated in the future in the same way batteries are in the proposal. The proposed rule also provides a process for persons to petition EPA to place additional wastes under similar regulatory controls to those covered in the proposal. Although EPA must decide in the final rule which wastes will be subject to Part 273, for purposes of analysis, we assumed batteries, suspended and/or cancelled pesticides that are recalled, and thermostats would be subject to the proposed reduced requirements under Part 273.

The proposed Universal Waste Rule (40 CFR Part 273) would tailor the regulatory controls placed on the hazardous wastes that the rule covers. Part 273 would allow generators of the covered universal wastes to ship them without a RCRA Subtitle C manifest and without using RCRA-regulated hazardous waste transporters. Additionally, generators would also not have to prepare biennial reports, contingency plans, and Land Disposal Restriction notifications and would have simpler training requirements for employees. The proposed Part 273 rule would also increase the time period that generators could accumulate these wastes without obtaining an EPA storage permit, which could make shipping them off site more economical. Generators of universal wastes covered by the rule will have several shipment and handling options that they could use to comply with the Part 273 rule that cost less than meeting the full RCRA Subtitle C requirements. The alternative collection and shipment practices that the proposed Part 273 rule makes available to generators of these universal wastes include:

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[1] The batteries that EPA has considered for control under the Part 273 rule proposed include nickel-cadmium, and mercuric-oxide batteries that are hazardous wastes, because they fail the toxicity characteristic of RCRA Part 261. In some cases, lithium, and alkaline batteries may also fail the Part 261 toxicity characteristic and reactivity characteristic, respectively. Lead-acid batteries that are reclaimed are currently regulated under RCRA Part 266, which has tailored standards for their control. EPA asked for public comment on regulating lead-acid batteries under Part 273, but proposed to retain the existing Part 266 regulations.

- Shipment by common carriers (trucks) to central consolidation points that will have fewer regulatory requirements than RCRA Subtitle C storage facilities (and the consolidation points will ship these universal wastes to hazardous waste treatment facilities),

- Direct shipment by common carriers to a hazardous waste treatment facility without a manifest, and

- Shipment via parcel carriers, such as the United Parcel Service (UPS).

CHAPTER 2. BACKGROUND

In Part II of this analysis, the Agency estimates the cost differences between compliance with the existing full RCRA Subtitle C requirements and compliance with the proposed Part 273 Universal Wastes regulations for generators of universal wastes. This economic impact analysis examines the savings that should result from generators handling hazardous wastes batteries and thermostats under several possible options for complying with the proposed Part 273 requirements, and identifies the least-cost compliance options. This economic impact analysis also estimates the incremental savings that should result for generators of pesticides (e.g. farmers, retail outlets) that are hazardous wastes after their recall. EPA expects that generators of recalled pesticides that are hazardous wastes will send these materials to consolidation points regulated under the proposed Part 273 Rule rather than RCRA-permitted Subtitle C storage facilities to await management by the manufacturers of the recalled pesticides.

Part III of this analysis presents a qualitative analysis of whether the proposed changes to the hazardous waste regulations for universal wastes would significantly reduce the environmental benefits provided by the current hazardous waste regulations.

In the Universal Wastes rule, EPA proposed to streamline the RCRA Subtitle C regulatory requirements for certain widespread hazardous wastes that it has designated as universal wastes. This chapter summarizes the characteristics of universal wastes and describes the universal wastes addressed in this analysis. This is followed by a description of the current full RCRA Subtitle C requirements for these universal wastes and associated program implementation problems. Then the proposed Part 273 regulations are described. Finally, universal wastes that are not covered in this analysis are discussed.

2.1 Characteristics of Universal Waste and Coverage of Analysis

Universal wastes, as defined by EPA in the proposed Universal Waste Rule, are hazardous wastes that have three main characteristics:

- They are frequently generated in a wide variety of settings other than the industrial settings usually associated with hazardous wastes;
- They are frequently generated by a vast community, the size of which poses implementation difficulties for both those who are regulated and the regulatory agencies charged with implementing the hazardous waste program; and
- They may be present in significant volumes in the municipal solid waste stream.

EPA's Universal Waste Rule proposed streamlined Part 273 requirements for:

- Hazardous waste batteries, including nickel-cadmium, mercuric-oxide, and lithium batteries;
- Suspended and/or cancelled hazardous waste pesticides that are recalled.

The Agency estimates that these wastes will be considered hazardous because they will fail the RCRA Part 261 toxicity characteristic, or exhibit the RCRA Part 261 hazardous waste characteristics of corrosivity or reactivity. In the case of pesticides, they may also appear on the RCRA Part 261 list of commercial products that are hazardous if discarded. The preamble of the Part 273 proposal also discussed applying the Part 273 requirements for batteries to thermostats containing mercury.

In the economic impact analysis, the Agency estimated the savings from reduced RCRA controls under the proposed Part 273 Rule for nickel-cadmium batteries, mercuric-oxide batteries, thermostats containing mercury, and recalled pesticides that are hazardous wastes. EPA did not analyze the savings for lithium batteries because they are produced in very small quantities.

2.2 Full RCRA Subtitle C Requirements and Universal Waste Issues

Like other hazardous wastes, universal wastes are currently controlled under the full RCRA Subtitle C requirements from the point of generation to their final disposal under an extensive set of hazardous waste regulations. Several types of program implementation issues have arisen from the use of the full RCRA Subtitle C regulation for these types of wastes.

2.2.1 Full RCRA Subtitle C Requirements

Under the full RCRA Subtitle C requirements, generators of universal wastes are subject to a number of operational controls, recordkeeping, and other administrative requirements. These requirements can cumulatively result in substantial costs to the generator. A listing of the full RCRA Subtitle C Part 262 requirements for generators producing different monthly volumes can be found in Exhibit 2-1. In this report, generators of less than 100 kilograms (220 pounds) per month are referred to as conditionally exempt small quantity generators (CESQGs); generators of between 100 and 1,000 kilograms of hazardous wastes per month are referred to as small quantity generators (SQGs); and generators producing over 1,000 kilograms of hazardous wastes per month are referred to as large quantity generators (LQGs).

Generators of hazardous waste generally must use transporters complying with RCRA Subtitle C requirements. Under the RCRA Subtitle C Part 263 rules, transporters of hazardous wastes must obtain an EPA ID number, comply with DOT packaging and placarding regulations, and meet other requirements. Transporters may not accept hazardous waste unless accompanied by a manifest. In general, use of a manifest restricts the options available for transport of wastes to a limited number of hazardous waste transporters that will transport manifested hazardous waste. A listing of the current RCRA requirements for hazardous waste transporters can be found in Exhibit 2-2.

Existing RCRA Subtitle C requirements for hazardous waste recycling, treatment, or disposal facilities are not altered by the proposed Part 273 Rule. The current RCRA Subtitle C requirements for facilities that consolidate and store hazardous wastes for greater than 10 days require that these facilities have an operating permit and meet a set of comprehensive standards for the proper design, operation, and closure of these facilities under RCRA Subtitle C Part 264.

Exhibit 2-1
Full RCRA Subtitle C Part 262 Requirements for Hazardous Waste Generators that Have Differing Monthly Generation Rates

< 100 kilograms/month	100 - 1000 kilograms/month	> 1000 kilograms/month
A. General	A. General	A. General
- Generators of solid waste must determine if the waste is hazardous by 1) determining if the waste is listed in Subpart D of Part 261 or, 2) determining if the waste is identified in Subpart C of Part 261 by either testing the waste or through applying knowledge of the hazardous characteristics of the waste	- Generators of solid waste must determine if the waste is hazardous by 1) determining if the waste is listed in Subpart D of Part 261 or, 2) determining if the waste is identified in Subpart C of Part 261 by either testing the waste or through applying knowledge of the hazardous characteristics of the waste	- Generators of solid waste must determine if the waste is hazardous by 1) determining if the waste is listed in Subpart D of Part 261 or, 2) determining if the waste is identified in Subpart C of Part 261 by either testing the waste or through applying knowledge of the hazardous characteristics of the waste
- May not store >1000 kg at any time. Otherwise, requirements for SQGs apply.	- Must obtain EPA ID number	- Must obtain EPA ID number
- If generating >1 kg of acutely hazardous waste per month, requirements for LQGs apply.	- May only send waste to a permitted Subtitle C treatment, storage, disposal facility or Subtitle C recycler	- May only send waste to a permitted Subtitle C treatment, storage, disposal facility or Subtitle C recycler
- Must send waste to a hazardous waste facility, a recycler, or a facility licensed by the state to manage municipal or industrial waste.	B. The Manifest	B. The Manifest
	- If the waste is transported off site, the owner/operator must prepare a manifest	- If the waste is transported off site, the owner/operator must prepare a manifest
	C. Pre-Transport	C. Pre-Transport
	- Must package, label, and mark all wastes in accordance with applicable DOT requirements	- Must package, label, and mark all wastes in accordance with applicable DOT requirements
	- May accumulate waste for up to 180 days without a permit providing the waste is managed in tanks or containers in accordance with §262.34	- May accumulate waste for up to 90 days without a permit providing the waste is managed in tanks or containers in accordance with §262.34
	- The date the period of accumulation begins must be marked on each container and the tank or container must be labeled "hazardous waste"	- The date the period of accumulation begins must be marked on each container and the container or tank must be labeled "hazardous waste"

Exhibit 2-1 (continued)
Full RCRA Subtitle C Part 262 Requirements for Hazardous Waste Generators that Have Differing Monthly Generation Rates

< 100 kilograms/month	100 - 1000 kilograms/month	> 1000 kilograms/month
	- If accumulation of waste exceeds 180 days (or 270 days for long distance transport), or if the total quantity accumulated >6000 kg, must obtain a permit - Must ensure employees are familiar with proper waste handling and emergency procedures - Must comply with Subpart C of 265, Preparedness and Prevention - Must comply with basic contingency planning and emergency procedures of §262.34(d)(5) - Must comply with land ban notification requirements of §268.7 D. Record keeping - Must keep a copy of each signed manifest for at least 3 years - Must keep records of any tests or waste analysis used to determine if a waste is hazardous for at least 3 years - Must report to the Regional Administrator if the generator has not received a copy of the manifest signed by the destination facility within 60 days of the date the waste was accepted by the initial transporter	- If accumulation of waste exceeds 90 days, must obtain a permit - Must comply with personnel training requirements of §265.16 - Must comply with Subpart C of 265, Preparedness and Prevention - Must comply with Subpart D of 265, Contingency Plan and Emergency Procedures - Must comply with land ban notification requirements of § 268.7 D. Record keeping - Must keep a copy of each signed manifest for at least 3 years - Must keep records of any tests or waste analysis used to determine if a waste is hazardous for at least 3 years - Must submit an exception report to the Regional Administrator if the generator has not received a copy of the manifest signed by the destination facility within 45 days of the date the waste was accepted by the initial transporter - Must submit a biennial report and keep a copy for at least 3 years

Exhibit 2-1 (continued)
Full RCRA Subtitle C Part 262 Requirements for Hazardous Waste Generators that Have Differing Monthly Generation Rates

< 100 kilograms/month	100 - 1000 kilograms/month	> 1000 kilograms/month
	E. Exports of hazardous waste - If the generator intends to export hazardous waste, must comply with the export notification requirements of 262 Subpart E	E. Exports of hazardous waste - If the generator intends to export hazardous waste, must comply with the export notification requirements of 262 Subpart E

Exhibit 2-2
Full RCRA Subtitle C Part 263 Requirements for Transporters

A. General

- Must receive an EPA ID number
- Can store the hazardous waste in containers at a transfer facility for up to 10 days without a permit

B. Compliance with the Manifest System and Recordkeeping

- Must not accept hazardous waste unless accompanied by a manifest
- Must sign and date the manifest to acknowledge acceptance of the waste
- Must return a signed copy of the manifest to the generator before leaving the property
- Must ensure that the manifest accompanies the waste
- When delivering waste to another transporter or destination facility, must obtain the signature of the owner/ operator of the facility and keep one copy of the manifest
- Must deliver the entire quantity to the destination facility listed on the manifest, the alternate facility, or the next designated transporter
- Must keep a copy of the signed manifest for at least 3 years

C. Hazardous Waste Discharges

- In the event of a discharge of hazardous waste during transportation, the transporter must take appropriate immediate actions to protect human health and the environment
- If required by 49 CFR 171.15, must give notice to the National Response Center and report in writing to the Director of the Office of Hazardous Materials Regulations, Materials Transportation Bureau, Department of Transportation
- Must clean up any hazardous waste discharge or take action as required or approved by federal, state, or local officials

However, the proposed Part 273 allows universal wastes to go to a new storage facility referred to as a "consolidation point," which has its own unique regulatory requirements that will be discussed below.

2.2.2 Implementation Issues

The full RCRA Subtitle C requirements are extensive. Generators of universal wastes have expressed concerns about how these requirements apply to the types of wastes that they produce (e.g., batteries), and the expense involved in managing the relatively small volumes they generate within these requirements. Businesses that only generate these hazardous wastes have expressed concerns over the complexity of the regulations.

Universal wastes are also difficult to control from the perspective of disposal facilities. Due to the nature of these wastes (e.g., indistinguishable from household wastes), operators of municipal solid waste management facilities cannot distinguish them from those originating from RCRA-exempt sources such as conditionally exempt small quantity generators or households. Some municipalities have attempted to keep universal wastes out of municipal solid waste streams by organizing special collection programs that target hazardous wastes typically generated by households and small businesses. Additionally, some states have enacted laws that encourage or require manufacturers and retailers to become involved in the collection and proper disposal of their products after they become wastes. Existing RCRA requirements, however, may act as an impediment to the implementation of these programs.

Universal wastes, such as hazardous waste batteries, thermostats, and certain recalled pesticides, are not easy for EPA and States to control through the full RCRA Subtitle C requirements because a very large number of businesses produce them.

These concerns have led the Agency to believe that it will be more effective to channel many universal wastes into proper recycling and management programs with controls that are tailored to both the type of waste produced and the generators that produce them.

2.3 Proposed Part 273 Requirements

The proposed Part 273 rule provides generators, transporters, and storers (consolidation points) of universal wastes tailored regulatory requirements that have considerable flexibility in compliance options. EPA estimates that this approach will save money and encourage better management of these wastes, because the generators will find it easier to comply with the new requirements of Part 273. Exhibit 2-3 lists the proposed Part 273 requirements for generators of universal wastes. Exhibits 2-4 and 2-5 list the proposed Part 273 requirements for transporters and consolidation points, respectively. It should be noted that generators of wastes may continue to comply with the full RCRA Subtitle C rules, if they elect to do so.

Exhibit 2-3
Proposed Part 273 Universal Waste Requirements for Generators of Universal Hazardous Wastes

< 100 kg/month	> 100 kg/month
Hazardous Waste Batteries and Thermostats	
- Same as CESQG requirements under full RCRA Subtitle C (Part 273 is optional)	- Must send waste to a consolidation point or a Subtitle C destination facility (treatment, disposal, or recycling facility) - No manifest or hazardous waste transporter necessary for transport to a consolidation point or destination facility - May store wastes for up to 1 year from the date the item becomes a waste - Must label wastes with the date they became waste to demonstrate storage <1 year (or use alternate documentation methods) - May not dilute, dispose of, or treat wastes except by removing electrolyte from batteries or responding to releases - Must immediately contain releases and residues. If the material resulting from the release is hazardous waste, the generator must manage it in accordance with all requirements of Parts 260-272 - If storing > certain quantities of batteries/thermostats at any time, must send written notification to the Regional Administrator - Must ensure employees are familiar with proper waste handling and emergency procedures

Exhibit 2-3 (continued)
Proposed Part 273 Universal Waste Requirements for Generators of Universal Hazardous Wastes

< 100 kg/month	> 100 kg/month
Recalled Pesticides	
- Same as CESQG requirements under full RCRA Subtitle C (Part 273 is optional)	- Must send waste to a consolidation point, or a Subtitle C destination facility (treatment, disposal, or recycling facility) - No manifest or hazardous waste transporter necessary for transport from generator to a consolidation point or destination facility - May store wastes for up to 1 year from the date the pesticide becomes a waste - Pesticides must be contained in either closed, non-leaking original packaging materials, original packaging that has been overpacked, tanks meeting Subtitle C requirements, or non-leaking transport vehicles - May not dilute, dispose of, or treat wastes except in responding to releases - Must label container with the date the pesticide became waste to demonstrate storage <1 year (or use alternate documentation methods) - Must immediately contain releases and residues. If material resulting from the release is hazardous waste, the generator must manage it in accordance with Parts 260-272 - Must ensure employees are familiar with proper waste handling and emergency procedures

Exhibit 2-4
Proposed Part 273 Universal Waste Requirements for Transporters of Universal Wastes

Hazardous Waste Batteries and Thermostats
- May store at a transfer facility for <10 days - May not dilute, dispose of, or treat batteries/thermostats except in responding to releases - May not remove the electrolyte from batteries - May not transport wastes to a place other than a consolidation point, destination facility, or foreign destination - Must manage wastes in a way that minimizes releases - Shipments from a consolidation point to a destination facility must comply with the requirements of part 263
Recalled Pesticides
- Must contain pesticides in either the original packaging materials kept closed and non-leaking, original materials that have been overpacked in larger, non-leaking container, tanks, or non-leaking transport vehicles - May store at a transfer facility for <10 days - May not dilute, dispose of, or treat pesticides except in responding to releases - May not transport wastes to a place other than a foreign destination, consolidation point, or destination facility designated by the person conducting the recall

Exhibit 2-5
Proposed Part 273 Universal Waste Requirements for Consolidation Points

Hazardous Waste Batteries and Thermostats
- May store batteries/thermostats for no longer than 1 year from the date of receipt - Must be able to demonstrate that the wastes were not stored for more than 1 year from the date received by labeling individual items or containers with the date received (or use alternative documentation methods) - May not dilute, dispose of, or treat wastes except in removing electrolyte or responding to releases - Must manage batteries/thermostats in a way that minimizes releases - Must immediately contain all releases and residues. If material resulting from the release is hazardous waste, the owner or operator must manage it in accordance with Parts 260-272 - Must ensure employees are familiar with waste handling and emergency procedures - If store > certain quantities of batteries/thermostats, must send written notification to Regional Administrator and get EPA ID number - If ship wastes to a destination facility, must send written notification to Regional Administrator and get EPA ID number - If ship to a destination facility, must comply with the manifesting, packaging, labeling, recordkeeping, and reporting requirements of Part 262
Recalled Pesticides
- Must contain pesticides in either the original packaging materials kept closed and non-leaking, original materials that have been overpacked in larger, non-leaking container, tanks, or non-leaking transport vehicles - May store hazardous waste pesticides for up to 1 year from the date of receipt - Must label containers or tanks with the date of receipt in order to demonstrate storage <1 year (or use alternative documentation methods) - May not dilute, dispose of, or treating pesticides except in responding to releases - May not send waste to a place other than a foreign destination, consolidation point, or the destination facility designated by the person conducting the recall - Must immediately contain releases and residues. If material resulting from the release is hazardous waste, the owner or operator must manage it in accordance with Parts 260-272 - Must ensure employees are familiar with proper waste handling and emergency procedures

There are eight major changes to the full RCRA Subtitle C requirements that the proposed Part 273 Rule would provide for universal wastes. Under the proposed rule, generators do not need to manifest their batteries, thermostats, and recalled pesticides when they ship them to a consolidation point or directly to a hazardous waste treatment facility.[2] They do not need to use a hazardous waste transporter in shipping them off site. Additionally, generators are not required to prepare a contingency plan, biennial reports, and LDR notifications and are allowed less stringent training for employees who handle waste. The proposed Universal Waste Rule would also increase storage time for universal wastes to one year in order to allow greater accumulation of wastes to facilitate economies of scale for proper management. Under the proposed rule, consolidation points would have fewer requirements than storage facilities receiving other types of hazardous wastes stored more than 10 days before shipment.

2.4 Wastes/Generators not Subject to the Proposed Part 273 Requirements

EPA proposed to retain the existing Part 266, Subpart G, regulations governing management of lead-acid batteries that are reclaimed (the vast majority of lead-acid batteries are reclaimed). Under Subpart G, lead-acid batteries that are to be reclaimed are generally not subject to regulation until they reach a reclamation facility. The Agency proposed to allow management of lead-acid batteries under either the existing Part 266 requirements or the proposed Part 273 requirements. The Agency expects that most lead-acid batteries (auto batteries) would continue to be managed under Part 266, but that some small, sealed lead-acid batteries that may be difficult to distinguish from other sealed batteries may be voluntarily managed with these other batteries under Part 273. Because the volume of small, sealed lead-acid batteries is small, and because management under Part 273 would be voluntary, these batteries have not been included in the cost estimate.

Under the Universal Wastes proposal, CESQGs and households that generate universal wastes would not be required to manage these wastes under the proposed Part 273 requirements, but could do so if they choose. The option of continuing to manage these wastes under the existing household waste exemption (40 CFR 261.4(b)(1)) and the CESQG exemption (40 CFR 261.5) would still remain. Although EPA anticipates that many collection programs managing some regulated universal wastes will manage these exempt wastes together with regulated waste, the costs of managing these exempt wastes under the Part 273 requirements are not included in the cost estimate because such management would be voluntary.

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[2] Most batteries and mercury thermostats are required by the Land Disposal Restrictions program to meet reclamation technology standards (e.g., thermal recovery). The pesticides are likely to be toxic organics and their generators are likely to have to meet concentration standards based on incineration.

PART II - COST ANALYSIS

CHAPTER 3. REGULATED COMMUNITY

To prepare its estimates of total cost savings from proposed Universal Wastes rule, EPA estimated the size of the regulated community covered by the proposal and the volume of wastes these generators produce annually. The Agency developed estimates of the number of generators and volumes of waste produced for sealed nickel-cadmium (ni-cd) batteries, vented nickel-cadmium (ni-cd) batteries, mercuric-oxide batteries, mercury-containing thermostats, and recalled pesticides that are hazardous wastes. Estimating the regulatory savings that could result from the proposed Part 273 Rule necessitated estimating the generators and waste volumes in each of the RCRA Subtitle C generator categories (i.e., conditionally exempt small quantity generators, small quantity generators, and large quantity generators).

To gather information on the number of generators and waste generation rates of batteries and thermostats, EPA contacted experts in industry as well as in state governments, many of whom have been developing programs similar to the Universal Wastes proposal. EPA generally found that knowledge of generators and volumes of universal wastes tended to be concentrated in a few individuals whose jobs specifically required that they understand the overall market in which batteries or thermostats were produced, discarded, and managed as wastes. EPA relied heavily on the information from these individuals. The Agency primarily used input from individuals with less comprehensive knowledge for confirmatory purposes.

In documenting this analysis, EPA has generally cited the individuals from whom it obtained the bulk of its information, even though any single source was typically supported by three other sources. For sealed ni-cd batteries, EPA's primary sources were the Portable Rechargeable Battery Association (PRBA) and INMETCO, a recycler of nonferrous metals.[3,4] For vented ni-cd batteries, EPA's primary sources were INMETCO and the Cadmium Council.[5] EPA could not identify any source on the use of mercuric-oxide batteries across battery types and applications. For this analysis, the Agency gathered most of the information on mercury batteries from two reclamation facilities: Bethlehem Apparatus and Mercury Refining. The production of mercury-containing thermostats in the United States is concentrated among a small

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[3] PRBA has been developing a manufacturers' take-back system, and therefore had previously started to gather the type of data EPA required for the current analysis.

[4] INMETCO uses waste batteries for its secondary smelting process, and therefore tracks the sources of primary and secondary cadmium.

[5] The Cadmium Council is a trade association that promotes the use of cadmium in rechargeable batteries. Its members include manufacturers of vented ni-cd batteries, as well as industrial users.

number of manufacturers. For this analysis, EPA relied heavily on information supplied by Honeywell Corporation.[6]

EPA was able to draw on work prepared by the Office of Pesticide Programs (OPP) to estimate the size of the regulated community covered in a pesticide recall (e.g., retailers and distributors of pesticides) and waste volumes that would be covered by the proposed Part 273 Rule. OPP had conducted an analysis on the size of this regulated community during its development of Agency procedures for the recall of pesticide products.

EPA's methodology for determining the size of the regulated community and the annual volume of universal waste generated is explained below for each type of universal waste. The results of EPA's analysis follow each methodology description. Given that the Agency had to rely extensively on the judgment of many industry experts and materials often prepared for other purposes to develop its generator and waste generation estimates, the results are presented as order-of-magnitude estimates. (In Chapter 5, the Agency examines the cost implications of the accuracy of these estimates in a sensitivity analysis of the number of generators covered by the Universal Waste Proposal.)

3.1 Sealed Nickel-Cadmium Batteries

EPA developed estimates of the number of generators of waste sealed nickel-cadmium batteries in various size categories, the number of waste batteries these generators produce annually, and the amount of battery waste (in pounds) these generators produce annually. The categories of waste generators covered in the Agency's estimates include CESQGs, SQGs, and LQGs, although the Agency proposed changes to the regulations applicable to only the last two groups of generators.

3.1.1 Number of Generators

To determine the number of generators of sealed nickel-cadmium (ni-cd) batteries, EPA first considered how many of the total number of all hazardous waste generators fall into the three generator categories: conditionally exempt small quantity generators, small quantity generators, and large quantity generators. EPA's RCRA Data Summary provides estimates for the total number of all CESQGs (480,000), SQGs (180,000), and LQGs (20,000) (for a total of 680,000 hazardous waste generators).[7] Based on discussions with industry, EPA estimated percentages of all these hazardous waste generators that generate used ni-cd batteries: 50 percent for conditionally exempt generators, 67 percent for small quantity generators, and 75

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[6] Honeywell is currently developing its own reverse distribution system for mercury-containing thermostats.

[7] In the RCRA Data Summary estimates of the number of CESQGs and SQGs are based on EPA's analysis for the Small Quantity Generator Regulatory Impact Analysis, which was completed in 1986. Estimates of the number of LQGs are based on the results of EPA's 1989 Biennial Report survey.

percent for large generators.[8] Applying these percentages to the total number of all generators in each of these generation categories yields the following estimates of generators of sealed ni-cd batteries: 240,000 conditionally-exempt small quantity generators, 120,000 small quantity generators, and 15,000 large quantity generators.[9] It appears that generators would be likely to change batteries biennially.[10] Therefore, the Agency assumed that one-half of all generators have ni-cd batteries to dispose of in any given year. The resulting estimates of the generators of sealed nickel-cadmium batteries appear in Exhibit 3-1.

3.1.2 Number of Batteries Disposed

EPA estimated the total number of sealed ni-cd batteries generated by non-households for disposal by apportioning the total number of ni-cd batteries annually entering the waste stream (165 million, rounded to 170 million for this analysis)[11] among an estimated number of household generators (60 percent, or 100 million, rounded from 102 million) and non-household generators (40 percent, or 70 million, rounded from 68 million).[12]

3.1.3 Total Quantity Disposed

Based on data provided by the battery industry, EPA estimated the total quantity of sealed ni-cd batteries generated for disposal annually to be 14 million pounds.[13] Applying the same percentage allocation used to estimate the number of non-household batteries generated (i.e., total generation that was split between 60 percent household and 40 percent non-household use), the Agency estimated 5.6 million pounds of sealed ni-cd batteries were generated by non-households. Of this 5.6 million pounds, large quantity generators account for 20 percent by

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[8] The proportions of generators for each type of RCRA generator are based on personal communication with Mark Schweers of INMETCO, September 1993. INMETCO is a major recycler of ni-cd batteries, and estimates are based on knowledge of their client base.

[9] EPA found no indication that generation of sealed ni-cd batteries, or any other universal waste, would cause facilities to change RCRA-generator categories (e.g., from CESQG to SQG, or SQG to LQG).

[10] Personal communication with Mark Schweers of INMETCO, September 1993.

[11] Draft "Market Analysis and Projected Used Battery Discards," prepared by the Portable Rechargeable Battery Association, August 1993, Exhibit 1.

[12] The Agency estimated the percentage of batteries generated from households versus non-households based on an EPA communication to Paul Borst, U.S. EPA, from Panasonic Industrial Company, May 14, 1992. For the current analysis, EPA confirmed the accuracy of this estimate with representatives of the Portable Rechargeable Battery Association.

[13] Draft "Market Analysis," Portable Rechargeable Battery Association, August 1993.

weight.[14] This means that they generate approximately 1.1 million pounds of sealed ni-cd batteries. Non-LQGs account for the remaining 80 percent. EPA allocated this remaining quantity of batteries (4.1 million pounds) by the percentage of sealed ni-cd battery generating non-LQGs that were CESQGs (67 percent) and SQGs (33 percent) (allocation from section 3.1.1.). All estimates were rounded for presentation in Exhibit 3-1.

Exhibit 3-1
Generators and Annual Quantity of Sealed Nickel-Cadmium Battery Waste

Type of Generator	Number of Generators	Annual Number of Waste Batteries	Annual Quantity of Waste (1,000 pounds/year)
Conditionally Exempt Small Quantity Generator	120,000	28,000,000	2,800
Small Quantity Generator	60,000	17,000,000	1,700
Large Quantity Generator	8,000	11,000,000	1,100

3.2 Vented Nickel-Cadmium Batteries

EPA developed estimates of the number of waste generators of vented nickel-cadmium batteries in various size categories, the number of waste batteries generators produce per year, and the amount of battery waste (in pounds) these generators annually produce. The categories of waste generators covered in the Agency's estimates include CESQGs, SQGs, and LQGs, although the Agency proposed changes to the regulations applicable to only the last two groups of generators.

3.2.1 Number of Generators

In analyzing the number of generators of vented ni-cd batteries, EPA determined that virtually all generators of vented ni-cd batteries are large quantity generators.[15] EPA found the universe of LQGs to be 670, based on estimates of the number of generators in various sectors of industry, including airlines, railroads, and transit authorities, among others.[16] Exhibit 3-2

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[14] Personal communication with Jeff Bagby of Weinberg, Bergeson, and Neuman, attorneys representing the Portable Rechargeable Battery Association, August 1993. This estimate is based on analysis of the sources of sealed ni-cd battery generation.

[15] Personal communication with Hugh Morrow of the Cadmium Council, September, 1993.

[16] This estimate is based on data provided by Hugh Morrow of the Cadmium Council, who solicited this information from major producers of vented ni-cd batteries, September, 1993.

presents the number of LQGs of vented ni-cd batteries and the total volume generated annually. Small quantity generators of vented ni-cd batteries were excluded from this analysis because of the small number of generators in the universe (less than five) and the low volume of waste generated.[17]

Exhibit 3-2
Generators and Annual Quantity of Vented Nickel-Cadmium Battery Wastes

Type of Generator	Number of Generators	Annual Number of Waste Batteries	Annual Quantity of Waste (1,000 pounds/year)
Conditionally Exempt Small Quantity Generator	less than 5	< 50	< 1
Small Quantity Generator	less than 5	< 50	< 1
Large Quantity Generator	670	18,000	350

3.2.2 Number of Batteries Disposed

EPA determined the number of batteries and total quantity of waste batteries to be insignificant for both CESQGs and SQGs, based on consultation with INMETCO.[18] Therefore, the waste generation quantity of batteries for LQGs equaled the total quantity of vented ni-cd batteries generated annually.

3.2.3 Total Quantity Disposed

EPA developed an estimate of the annual quantity of vented ni-cds disposed based upon data provided by industry on the usage of vented ni-cd batteries. EPA obtained estimates of the total power of batteries used by four groups (airlines, transit authorities, railroads, and other industry) in terms of million ampere hours per year and the average battery lifespan in these industries.[19,20] Assuming an equal weight of batteries is taken out of service yearly in each of these four industries over the course of the typical lifespan of the batteries, EPA estimated that 350,000 pounds of vented ni-cd batteries would be generated annually. Because the production of vented ni-cd batteries is not concentrated among a small set of firms, EPA was

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[17] Personal communication with Mark Schweers of INMETCO. Mr. Schweers provided this information based on knowledge of the client base of his company, September, 1993.

[18] Ibid.

[19] Personal communication with Hugh Morrow of the Cadmium Council, August 1993.

[20] EPA estimate is based on a power-to-weight conversion factor of 28 ampere hours per kilogram, (see Encyclopedia of Chemical Technology, volume 3, p. 987, 4th ed.).

not able to determine annual production levels. For this analysis, EPA assumed that the market for vented ni-cd batteries is mature. Under this assumption, waste generation would equal annual production and both production and waste generation would be stable.

3.3 Mercuric-Oxide Batteries

The methodology used to estimate the number of generators and total volumes of mercuric-oxide batteries varied for each generator size category. The approach used for each generator group is presented below. The total volume of mercury batteries is presented, by generator size category, in Exhibit 3-3.

Exhibit 3-3
Generators and Annual Quantity of Mercuric-Oxide Battery Waste

Type of Generator	Number of Generators	Annual Number of Waste Batteries	Annual Quantity of Waste (1,000 pounds/year)
Conditionally Exempt Small Quantity Generator	3,600	3,600	< 1
Small Quantity Generator	800	2,600,000	310
Large Quantity Generator	225	190,000	190

3.3.1 Conditionally Exempt Small Quantity Generators

Professional photographers are the only significant non-household users of mercury button cells, and EPA concluded that no other type of mercuric-oxide cell would be generated by CESQGs.[21] EPA determined the number of CESQGs by consulting with the Professional Photographers Association, which stated that of the 18,000 professional photographers, one in five, or 3,600, still use mercuric-oxide batteries.[22] EPA assumed an average life of one year per mercuric-oxide battery,[23] with an average weight of 3.6 grams per battery.[24] Therefore, the estimated total weight of the mercury battery wastes generated by CESQGs is less than 1,000 pounds per year.

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[21] Personal communication with Ray Balfour of Rayovac Corporation, August 1993.

[22] Personal communication with Alan Simpson of the Professional Photographers Association, August 1993.

[23] Ibid.

[24] Used Dry Cell Batteries, prepared by U.S. EPA, Office of Solid Waste, December 1992, p. 52.

3.3.2 Small Quantity Generators

The number of SQGs generating mercuric-oxide batteries was based on estimates from the American Hospital Association (AHA).[25] The AHA indicated that roughly one tenth of all hospitals (8,000) still use mercuric-oxide batteries.[26] All but approximately three percent of the hospitals were estimated to be SQGs.[27]

EPA derived the total number of mercuric-oxide batteries by taking the average number of mercuric-oxide batteries per hospital (3,200)[28] and multiplying this by the total number of hospitals that are SQGs (800).[29] This resulted in a waste generation rate of 2.6 million batteries per year. The number of batteries generated annually was then multiplied by the average weight of an 8.4 volt mercuric-oxide battery (1.9 ounces)[30] to derive a total waste volume of 310,000 pounds for SQGs.

3.3.3 Large Quantity Generators

EPA estimated that there are 225 LQGs that generate mercuric-oxide batteries. This estimate was based on communications with three sources. A representative of Bethlehem Apparatus indicated that used mercuric-oxide batteries generated at federal facilities are generated by 100 contractors who are all LQGs.[31] In addition to this, EPA estimates that there are 200 major railway companies, half of which generate used mercury batteries.[32] The total number of LQGs also includes the 25 LQG hospitals that the American Hospital Association estimated to exist.[33]

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[25] Personal communication with Bob Turk of the American Hospital Association, August 1993.

[26] Ibid.

[27] Ibid.

[28] Estimate based on data in Price, "Managing Mercury Battery Wastes through Source Substitution," MSW Management, January/February 1992, p. 16.

[29] Personal communication with Bob Turk of the American Hospital Association, August 1993.

[30] Personal communication with Bruce Lawrence of Bethlehem Apparatus, a major recycler of mercury-containing batteries, August 1993.

[31] Ibid.

[32] Personal communication with Hugh Morrow of the Cadmium Council, August 1993.

[33] Personal communication with Bob Turk of the American Hospital Association.

Estimates of waste generation quantities for LQGs were obtained by subtracting the quantities for CESQGs and SQGs from the total generation rates. The total generation rates were determined through consultation with a mercury battery recycling company.[34] Based on this knowledge, EPA estimated total waste generation quantities of mercuric-oxide batteries to be 500,000 pounds per year. Accordingly, EPA subtracted the quantities estimated for CESQGs and SQGs to estimate the total quantity generated by LQGs.

3.4 Used Mercury-containing Thermostats

EPA developed estimates of the number of waste generators of mercury-containing thermostats in various size categories, the number of mercury-containing thermostats produced per year, and the amount of battery waste (in pounds) these generators produce annually. The categories of waste generators covered in the Agency's estimates include CESQGs, SQGs, and LQGs, although the Agency proposed changes to the regulations applicable to only the last two groups of generators.

3.4.1 Number of Generators

Exhibit 3-4 presents the number of generators of mercury-containing thermostats and the annual quantity of thermostat wastes they generate. The primary groups generating mercury-containing thermostats are:

- Heating, ventilation and air-conditioning (HVAC) contractors;
- Wrecking and demolition firms; and
- Firms using in-house maintenance workers.

Each of these categories is discussed below.

Exhibit 3-4
Generators and Annual Quantity of Mercury-Containing Thermostat Waste

Type of Generators	Number of Generators	Annual Number of Waste Thermostats	Annual Quantity of Waste (1,000 pounds/year)
Conditionally Exempt Small Quantity Generator	83,000	1,200,000	180
Small Quantity Generator	13,000	210,000	32
Large Quantity Generator	1,400	7,000	1
TOTAL	97,000	1,400,000	210

[34] Personal communication with Bruce Lawrence of Bethlehem Apparatus.

EPA estimated that there are approximately 50,000 heating, ventilation, and air conditioning (HVAC) contractors.[35] EPA has assumed that nearly all of these are CESQGs, except for roughly 30 extremely large firms.[36]

There are 1,200 firms specializing in wrecking and demolition work.[37] Based on a discussion with representatives from the Demolition Contractors of America, EPA estimated that half of these firms are CESQGs and half are SQGs.[38]

EPA estimated that five percent (225,000) of the approximately 4.5 million mercury-containing thermostats generated each year are generated by firms using in-house maintenance workers and that these workers remove 1 to 500 thermostats per year, with a typical generator removing 5 per year. Based on these assumptions, EPA estimated that 45,000 generators fall into this category in any given year. EPA apportioned the 45,000 facilities by the percentage of all hazardous waste generators within each class (CESQGs, SQGs, and LQGs). There are a total of 680,000 generators of hazardous waste with a break down of 480,000 CESQGs, 180,000 SQGs, and 20,000 LQGs. This ratio indicates that 71 percent of the 45,000 firms using in-house maintenance are CESQGs. This, along with the other two sources of CESQGs, provided the basis for EPA's estimate of 83,000 CESQGs.

EPA also determined that 26 percent of generators conducting in-house maintenance are SQGs based on the ratio of SQGs of hazardous waste (180,000), and the total number of hazardous waste generators (680,000). EPA apportioned 26 percent of the 45,000 facilities performing in-house thermostat removal to arrive at an estimated 11,700 SQGs conducting in-house maintenance. For its analysis, EPA rounded this number to 12,000. There were 600 wrecking and demolition firms which EPA assumed to be SQGs, as well as approximately 30 HVAC contractors which EPA also assumed to be SQGs. This resulted in a total estimate of 12,630 SQGs of mercury-containing thermostats, a number which EPA rounded to 13,000 for its analysis.

EPA estimated the number of LQGs using the same methodology used to estimate the number of CESQGs and SQGs. The number of LQGs (20,000) compared to the total number of hazardous waste generators (670,000) resulted in a 3 percent portion of the 45,000 facilities performing in-house maintenance, for an estimate of 1,400 LQGs of mercury-containing thermostats.

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[35] "Estimates for Generation of Out-of-Service Thermostats," prepared by Nancy Onkka of Honeywell, September 16, 1993.

[36] Ibid.

[37] Based on information contained in the 1987 Census of Construction Industries, Bureau of the Census.

[38] Personal communication with Mike Taylor of the Demolition Contractors of America, September 1993.

3.4.2 Number of Thermostats Disposed

In estimating the total number of used mercury-containing thermostats, EPA consulted with representatives from Honeywell to develop an estimate of 4 million to 5 million thermostats removed from service annually.[39] This estimate includes thermostats removed from either residences or businesses. EPA used the midpoint of this estimate, 4.5 million, for its analysis. Out of the 4.5 million thermostats removed from service annually, EPA estimated that 75 percent, or roughly 3.4 million, are residential thermostats removed by HVAC contractors.[40] EPA estimated that only 35 percent, or roughly 1.2 million, of these 3.4 million thermostats are retained by the HVAC contractors removing them, with the remainder being left with the homeowner. Thus, HVAC contractors generate roughly 1.2 million thermostats annually. EPA determined that firms using in-house maintenance staff are generated mercury-containing thermostats; the Agency estimated that approximately 5 percent, or 225,000, of the 4.5 million thermostats removed from service annually are generated by such firms.

To determine how many thermostats are generated by CESQGs, EPA considered two sources: (1) HVAC contractors that are CESQGs, and (2) in-house maintenance staff at facilities that are CESQGs. The Agency estimated that the number of thermostats removed from service in homes and retained by CESQG-HVAC contractors is roughly 1.0 million, which assumes that nearly all HVAC contractors are SQGs. Of the 225,000 thermostats removed by in-house maintenance staff, the Agency estimated that 71 percent, or 159,750 (rounded to 160,000 for EPA's analysis), are generated at facilities that are CESQGs. The resulting total number of thermostats that EPA estimated are generated by CESQGs is approximately 1.2 million.

EPA estimated that 26 percent, or 58,500 (rounded to 60,000 for EPA's analysis) of the 225,000 thermostats generated by firms using in-house maintenance staff are removed from service at facilities that are SQGs. EPA determined that 30 HVAC contractors are SQGs also. Based on knowledge of the industry, EPA assumed that each of the 30 SQG-HVAC contractors generates 5,000 thermostats annually,[41] for a total of 150,000 thermostats generated by SQG-HVAC contractors per year. The Agency developed its estimate of 210,000 thermostats generated annually by SQGs by combining the 150,000 thermostats generated by SQG-HVAC contractors with the roughly 60,000 thermostats generated by in-hose maintenance staff at facilities that are SQGs.

The only LQGs of thermostats are firms using in-house maintenance staff at facilities that are LQGs. EPA apportioned three percent of the 225,000 thermostats removed by in-house staff to facilities that are LQGs, for a total of 6,750 thermostats (rounded to 7,000 for EPA's analysis).

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[39] "Estimates," prepared by Nancy Onkka of Honeywell.

[40] Ibid.

[41] Ibid.

3.4.3 Total Quantity Disposed

EPA estimated the total quantity for each class of generator by using an average weight of 0.15 pounds per thermostat.[42] This estimate was applied to the total number of thermostats generated to estimate the total quantity generated, in pounds per year, for each class of generator.

3.5 Recalled Pesticides

The Universal Waste Rule would allow generators (i.e., distributors and retail outlets) of pesticide waste to follow reduced RCRA hazardous waste management requirements in the event that the pesticide was a listed or characteristic hazardous waste. It is difficult to predict the nature and amount of material that will be subject to future recalls as well as whether or not the recalled material would be hazardous waste under RCRA.

Given the history of pesticide recalls and the plans of the Office of Pesticide Programs, EPA developed a plausible scenario of when the Agency would recall pesticides that would be considered hazardous wastes. EPA assumed that a national pesticide recall that covers 50,000,000 pounds of product that would be hazardous waste would occur once every five years. The material would be in the possession of 20,000 businesses (generators). Because, on average, these businesses would generate more than 1,000 kilograms of pesticide waste in one month, they are assumed to be large quantity generators. The number of generators existing each time a national recall occurred was taken from the Cost Analysis of Hypothetical Pesticide Recall Actions, U.S. EPA, Office of Pesticide Programs, July 19, 1991. This analysis had considered the cost implications of national recalls of pesticide products when OPP developed proposed pesticide recall procedures. These generator and generation estimates are provided in Exhibit 3-5.

Exhibit 3-5
Generators and Quantity of Waste
in a Typical Pesticide Recall Where
the Material Would Be a Hazardous Waste

	Number of Large Quantity Generators	Total Waste Amount (1,000 pounds/year)
Large National Recall	20,000	50,000

[42] "EPA's Proposed Collection System Regulations for Recycling Hazardous Waste," Letter from Margaret Graves, Latham & Watkins (attorneys for Honeywell) to Mike Petruska, U.S. EPA, Office of Solid Waste, p. 16.

3.6 Total Generators Covered by the Universal Waste Proposal

EPA estimates that there is considerable overlap between the generators of several of the universal wastes covered in the economic impact analysis. Applications using sealed ni-cd batteries, especially portable computers, two-way communication devices, and portable tools, are increasingly common. Representatives at several trade associations and recyclers that EPA contacted indicated that nearly all generators of vented ni-cd batteries, mercuric-oxide batteries, and mercury-containing thermostats would also generate sealed ni-cd batteries.[43] Accordingly, EPA is assuming that the generator universes for vented ni-cd batteries, mercuric-oxide batteries, and mercury-containing thermostats totally overlap the universe for sealed ni-cd batteries. Taking this overlap into account, EPA estimates there are about 83,000 large and small quantity generators of batteries and thermostats covered by the Part 273 Rule proposal that annually produce 3,683,000 pounds (1,842 tons) of universal waste. Additionally, EPA estimates that there will be another 20,000 generators of recalled pesticide wastes that will have to meet EPA's Part 273 rules when recalls periodically occur.

[43] Hugh Morrow of the Cadmium Council, Norm England of the Portable Rechargeable Battery Association, Bruce Lawrence of Bethlehem Apparatus, and Mark Schweers of INMETCO, October, 1993.

CHAPTER 4. COST ANALYSIS METHODOLOGY

This chapter presents EPA's methodology for estimating the savings that would result from generators of universal wastes complying with the proposed Part 273 requirements rather than the full RCRA Subtitle C requirements. Section 4.1 provides an overview of the approach used in the cost analysis. Section 4.2 presents the generator activities analyzed for the full RCRA Subtitle C requirements and their unit costs. Section 4.3 presents the generator activities for each compliance option under the proposed Part 273 Rule and their unit costs.

4.1 Overview of the Cost Analysis Approach

For this Economic Impact Analysis, EPA estimated the incremental cost differences between compliance with the full RCRA Subtitle C requirements and the proposed Part 273 Rule for generators of universal wastes. The universal wastes examined for this analysis include:

- Vented nickel-cadmium batteries,
- Sealed nickel-cadmium batteries,
- Mercuric-oxide batteries,
- Used mercury-containing thermostats, and
- Recalled pesticides that are hazardous wastes.

For each of these types of hazardous waste, the Agency identified and estimated the costs of all the requirements that should result in an incremental cost difference between the existing full RCRA Subtitle C regulations and the proposed Part 273 Rule. EPA reviewed how wastes would move through the RCRA system from the generator to the final treatment facility (referred to as the "destination" facility in the proposed Part 273 Rule) in order to identify the areas where compliance costs would differ from the full RCRA Subtitle C requirement costs.

The Agency considered the annual compliance costs that would result from four different compliance options under the proposed Part 273 Rule for generators of each type of hazardous waste battery and thermostats covered in this analysis. For each type of waste generator, the Agency identified the least-cost method of compliance with Part 273 in order to determine the savings that would result from generators no longer complying with the full RCRA requirements.[44] Because the nature, size, and frequency of pesticide recalls will vary, the Agency consulted with the Office of Pesticide Programs (OPP) to develop a likely recall scenario for estimating the costs of the proposed Part 273 Rule. EPA decided to consider the annualized incremental cost savings that could result from a national recall of a pesticide that was a hazardous waste once every five years over a 20-year time period.

In estimating the baseline costs associated with full RCRA Subtitle C compliance, EPA assumed that all generators of universal wastes are currently in compliance. Therefore, sunk

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[44] Due to the difference in volumes handled by the different generator types, the least-cost method was not the same for every type of hazardous waste battery and thermostat generator.

costs, such as obtaining an EPA ID number, were not considered in this analysis. Only the costs of compliance activities which were expected to vary between the full RCRA Subtitle C requirements and the proposed Part 273 requirements were included in this analysis. Therefore, the compliance costs presented in this analysis for the full RCRA Subtitle C requirements and the proposed Part 273 Rule are partial compliance costs that enable estimation of the incremental cost savings from the Part 273 proposal, rather than total compliance costs of each set of rules. For the analysis of pesticide recalls, the Agency annualized the costs over a 20-year period using a 7 percent discount rate. All costs presented in this analysis are reported as 1992 dollars.[45]

EPA recognized that some generators generate several types of wastes covered by the Universal Waste proposal. This most frequently occurred for generators of different types of ni-cd batteries. It was also apparent that the costs covered in the analysis were largely variable costs associated with the individual wastes. Given these facts, EPA constructed the analysis to focus on variable cost differences between generators handling different universal wastes under the proposed Part 273 Rule and the full RCRA Subtitle C requirements. This led to a separate analysis of each type of universal waste covered in the economic impact analysis and the generators that produce it.

The focus of EPA's analysis was the savings that the proposed Universal Waste Rule would provide the regulated community when compared to the full federal RCRA Subtitle C requirements. Current state requirements, plans, and expected response to the proposed Part 273 Rule were not factored into the economic impact analysis.

4.2 Type of Unit Costs and Their Sources

The unit costs used in the analysis of battery and thermostat wastes are annual recurring costs. The unit costs for pesticide recalls are the cost of generators shipping wastes to consolidation facilities and the development and/or use of a facility over a one-year period each time a recall occurs.

EPA obtained unit costs for both sets of requirements from personal communications with industry experts, existing EPA documents, and specially developed estimates for this analysis. The specific unit costs used in the analysis of each compliance option are presented in the section that discusses that particular compliance option. The sources of the unit costs are presented in Appendix A.

4.3 Cost Elements for Full RCRA Subtitle C Compliance

The costs of the full RCRA Subtitle C requirements that EPA used for this analysis are based on the future costs to generators complying with existing RCRA hazardous waste requirements. Within that set of expected future costs, EPA examined only the cost of those

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[45] This was done by inflating the costs in earlier years through the use of Gross Domestic Product deflators and reporting the current cost (or service price) estimates as 1992 dollars that were obtained from commercial treatment facilities, transporters, and other sources.

activities that are likely to differ between the full RCRA Subtitle C and Part 273 requirements, due to either differing requirements, or the existence of different economies of scale. Sunk costs that result from generators' past actions to comply with RCRA Subtitle C were not considered in this analysis. Furthermore, EPA assumed that generators of batteries, thermostats, and recalled pesticides that will be hazardous wastes already comply with all of the full RCRA Subtitle C requirements.

4.3.1 Batteries and Used Thermostats

Because the shipping, storage, and packaging requirements discussed for used thermostats are the same as those proposed for batteries, the Agency examined the economic impacts of the special collection rule on these two waste types in one analysis. All costs were divided into one of three categories: on-site costs, shipping costs, or reclamation costs. Reclamation costs (rather than disposal costs) are incurred by generators of batteries and thermostats because under RCRA's Land Disposal Restrictions (LDRs), generators are required to treat their waste to Best Demonstrated Available Technology (BDAT) levels. The BDAT is mercury retorting for mercury-containing batteries and thermostats (i.e., high mercury D009 wastes) and thermal recovery for nickel-cadmium batteries (i.e., D006 wastes).

The cost elements comprising the on-site cost portion of the analysis under full RCRA Subtitle C requirements included:

- Employee training;
- Maintenance costs for a contingency plan;
- Packaging of wastes in accordance with Department of Transportation (DOT) specifications for hazardous waste;
- Filing biennial reports;
- Manifest completion and recordkeeping per shipment; and
- LDR Notification.

Training costs included an annual refresher course for employees that was assumed to be taught to an average of four employees by a professional trainer for $300 per course. The initial establishment of a training program and training of employees was assumed to already have occurred and is a sunk cost. Training of the four employees was assumed to take two hours each at a loaded labor rate of $27 per employee hour. Additionally, one hour of a plant manager's time at $60 per hour (loaded) was required per generator, as well as one half hour of clerical time for recordkeeping required under Part 262. The loaded rate for a clerical person's time was estimated at $20 per hour. Exhibit 4-1 provides the total annual training cost per generator and the other full RCRA Subtitle C unit costs of compliance described below.

Exhibit 4-1
On-Site Unit Costs of Full RCRA Subtitle C Requirements by Generator Type (in 1992 dollars)

On-Site RCRA Requirement	Annual Costs Per:	
	Small Quantity Generator	Large Quantity Generator
Training Update	$308	$586
Contingency Plan Update	$200	$200
Packaging & Labeling Shipments	$13.50 per shipment 2 shipments per year	$13.50 per shipment 4 shipments per year
Biennial Report (annualized)	N/A	$428
Manifest Completion and Recordkeeping	$36 per shipment 2 shipments per year	$36 per shipment 4 shipments per year
Land Ban Notification	$7.88 per shipment 2 shipments per year	$7.88 per shipment 4 shipments per year

Maintenance costs for a contingency plan included the costs of updating and maintaining the plan and were attributed to both small quantity generators and large quantity generators. The costs of developing the initial plan were considered sunk costs for a facility in compliance and were therefore not included in the analysis.

The costs attributed to packaging wastes in accordance with DOT specifications included the labor and materials costs per shipment. Costs of reading and understanding DOT regulations were considered sunk costs. LQGs, who can accumulate wastes for no longer than 90 days without a RCRA permit, were assumed to make four shipments of waste per year. SQGs were assumed to ship wastes twice a year due to the increased accumulation time allowed for generators in this category.

Biennial reporting costs were attributed to LQGs only. Small quantity generators are not required to submit the biennial report. The costs of the report were spread over two years to provide annualized unit costs consistent with the cost factors in this analysis. The Biennial report was assumed to take 9.5 hours per year to complete by a plant engineer, or equivalent (an engineer's hourly loaded labor rate is $45).

Per shipment manifesting and manifest recordkeeping costs were attributed to SQGs and LQGs on a per shipment basis. Costs associated with LDR notification were incurred by both small quantity generators and large quantity generators. LDR notification costs were attributed on a per shipment basis with SQGs shipping wastes twice a year and LQGs shipping four times a year.

Export notification was not included as part of the shipping costs under the full RCRA Subtitle C requirements. EPA contacted industry representatives in order to estimate the frequency and likelihood of exportation. According to industry experts, it is no longer

economically attractive to export these wastes for either disposal or reclamation.[46] Exporters currently are charging a fee to receive batteries and thermostats for export rather than paying generators for them as they have in the past. Therefore, EPA assumed all generators were shipping their waste to treatment facilities within the United States.

The sole shipping cost element under the full RCRA Subtitle C requirements was the cost of transporting the waste from the generator to the reclamation facility. To estimate transportation costs, the Agency assumed the generator shipping distance to the destination facility to be 1,500 miles using a hazardous waste carrier. This assumption was based on a large number of generators throughout the country shipping wastes to a limited number of facilities. An existing thermal recovery facility that can be used for reclamation of ni-cd batteries is located in Pennsylvania; an existing pretreatment facility for batteries is located in California; and existing mercury-retorting facilities reclaiming mercuric-oxide batteries and mercury-containing thermostats are located in Pennsylvania and New York.[47] EPA assumed large quantity generators would have lower per pound transportation costs than small quantity generators due to the existence of economies of scale for transportation of full truck loads and shipments that occur without as many stops. Because per pound hazardous waste transport costs were unavailable, EPA estimated variations in hazardous waste transport costs by comparing the relationship between the long distance hazardous waste transportation costs provided in EPA's 1990 Survey of Selected Hazardous Waste Management Industry to common carrier costs for long distance shipments when each is carrying a full loaded truck. Comparing the relationship between costs showed that hazardous waste transporter charges were approximately 1.3 times those of a common carrier. Because partial load costs were not available for hazardous waste transport and EPA had obtained partial load common carrier costs, common carrier costs were multiplied by a factor of 1.3 in order to estimate hazardous waste transport costs. For shipments of 138 pounds or less, the generator was assigned a transporter fixed minimum charge of approximately $78. The actual shipping costs for each generator size under the full RCRA Subtitle C requirements are presented in Exhibit 4-2.

Notably, the EPA survey of hazardous waste transporter prices included the costs of the use of transfer facilities to move waste to commercial treatment facilities. Therefore, the costs of the current reliance on transfer stations is captured in the unit costs in Exhibit 4-2.

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[46] Based on conversations with Ann Mossbarger of Sanyo Energy Corporation, Marlene Booth of INMETCO, and Saskia Mooney of Weinberg, Bergeson, and Neuman (representing the Portable Rechargeable Battery Association).

[47] Existing treatment facilities for mercury retorting are: Bethlehem Apparatus, Hellertown, Pennsylvania, and Mercury Refining, Schenectady, New York. Existing Ni-cd thermal recovery facility is: INMETCO, Pittsburgh, Pennsylvania. Existing pretreatment facility for batteries is: Kinsbursky Brothers, Anaheim, California.

Exhibit 4-2
Shipping Costs for Full RCRA Subtitle C Requirements
(in 1992 dollars)

Shipment Size[1] (in pounds)	Per Generator Unit Cost
Shipments <200 pounds	$78.12 (fixed minimum)
Shipments of 388 pounds	$130.20
Shipments of 522 pounds	$149.97
Shipments of 844 pounds	$242.48

[1] These shipment sizes match up to the average annual wastes produced by different size generators of batteries and thermostats.

The Agency obtained prices for reclamation through personal communications with facilities currently treating these wastes.[48] Reclamation prices varied depending on the size of the waste shipment received by the treating facility. The prices (unit costs) for mercury and ni-cd reclamation are listed by waste shipment ranges in Exhibit 4-3. In general, the Agency selected the lowest prices quoted by commercial facilities for the analysis, assuming generators would be price sensitive in meeting EPA's regulatory requirements.

Exhibit 4-3
Full RCRA Subtitle C Requirements
Reclamation Costs for Mercury and Ni-cd Batteries and Thermostats
(in 1992 dollars)

Material/Shipment Size	Cost per Pound
Mercury waste shipment < 500 pounds	$2.85
Mercury waste shipment 500 - 5,000 pounds	$2.60
Vented ni-cd shipment (any size)	$0.26
Sealed ni-cd shipment (any size)	$0.24

[48] Personal communication with: Bruce Lawrence of Bethlehem Apparatus; Alan Wilds of Mercury Refining; Todd Coy of Kinsbursky Brothers; and Mark Schweers of INMETCO, September, 1993.

The cost associated with each cost element were summed to obtain the total costs per generator for both SQGS and LQGs. Per generator incremental costs for each generator group under full RCRA Subtitle C compliance are presented in Exhibit 4-4. Per generator costs for each generator group were then multiplied by the number of generators in each waste and size category to estimate the total cost of full RCRA Subtitle C compliance per generator group that are presented in Chapter 5, Results of Cost Analysis.

Exhibit 4-4
Per Generator Annual Costs for Complying with Full RCRA Subtitle C Requirements
Hazardous Waste Batteries and Thermostats
(in 1992 dollars)[1]

Universal Waste Coverage	Average Annual Waste Per Generator (pounds)	Per Generator Annual Costs:			Total Annual Costs Per Generator
		On Site	Shipping	Reclamation	
Thermostats					
SQGs	2	$623	$78.12	$5.70	**$707**
LQGs	1	$1,444	$78.12	$2.85	**$1,525**
Vented Ni-Cd Batteries					
LQGs	522	$1,444	$149.97	$135.72	**$1,730**
Sealed Ni-Cd Batteries					
SQGs	28	$623	$78.12	$6.72	**$708**
LQGs	138	$1,444	$78.12	$33.12	**$1,555**
Mercuric-Oxide Batteries					
SQGs	388	$623	$130.20	$1,105.80	**$1,859**
LQGs	844	$1,444	$242.48	$2,194.40	**$3,881**

[1] Costs are for the annual future costs of compliance that are different than the costs generators will have under the proposed Part 273 Rule.

[2] There were less than five SQGs with vented ni-cd batteries. They were excluded from the analysis due to their insignificance in estimating cost savings from the proposed Part 273 Rule.

4.3.2 Recalled Pesticides

In order for a recalled pesticide to become a hazardous waste, it must first become a solid waste. In the event of an EPA recall, the recall statement could designate the pesticide registrant's intention to do one of five things with the recalled product:

- Dispose of the pesticide,
- Burn it for energy use,
- Incinerate it,
- Reformulate it, or
- Reuse or recycle it.

In order for the pesticide to become a solid waste, the registrant or recall notice must specifically state the intention to burn the pesticide for energy use, dispose of it, or incinerate the recalled product. If the intent to dispose or burn the pesticide is not specifically stated in the recall notice, the pesticide would remain a product being reshipped rather than a solid waste. EPA predicts that many of the recalled pesticides that become solid wastes will either fail one of the RCRA hazardous waste characteristic tests and therefore be a hazardous waste, or will already be listed under the RCRA Subtitle C regulations as hazardous waste.[49]

In order to develop annual estimates of current compliance costs for the full RCRA Subtitle C requirements, the Agency estimated the costs of a major pesticide recall with 50,000,000 pounds of a pesticide product once every five years over a 20 year period. EPA assumed that the registrants of the pesticide would consolidate it in eight different storage locations prior to its disposal. The pesticide waste would be stored for one year prior to its ultimate disposal. The storage facilities would have obtained RCRA permits for storage of the pesticides and would not use these storage areas for other purposes afterwards. The Agency also assumed that different pesticide registrants (i.e., manufacturers) were subjected to each EPA recall leading to the permitting of additional waste storage over time with each recall. Costs were then discounted and annualized to estimate the yearly costs. EPA assumed that the pesticide product would become a hazardous waste at the time of the recall notice. The Agency assumed recalls would occur in years 3, 8, 13, and 18 of the 20-year period.

Costs for the pesticide analysis were disaggregated into on-site and storage costs. Because the nature of a recall would prevent generators from accumulating waste over time and taking advantage of economies of scale, disposal costs were assumed to be the same under full RCRA Subtitle C requirements and the proposed Universal Waste Rule and were therefore

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[49] Unused pesticides would be discarded commercial chemical products and thus would be listed under 40 CFR 261.33.

excluded from the analysis[50]. On-site generator cost elements for the pesticide analysis included:

- Training,
- Completion of a contingency plan,
- Manifest completion and recordkeeping,
- Biennial Reporting (annualized), and
- LDR notification.

On-site unit costs are presented in Exhibit 4-5.

Exhibit 4-5
On-Site Full RCRA Subtitle C Requirements
Pesticide Analysis Unit Costs
(in 1992 dollars)

On-Site Cost Element	Per Generator Unit Cost
Training	$586
Completion of a contingency plan	$2,000
Manifest completion and recordkeeping	$36.24
Biennial Report (annualized)	$428
LDR Notification	$7.88

The RCRA-permitted storage facilities were assumed to be single story structures with RCRA permits, insurance, concrete floors, temperature control, sprinkler systems, security, and secondary containment. Costs for the eight storage facilities were obtained from EPA's Cost Analysis of Hypothetical Pesticide Recall Actions. Costs for storage were presented in the aggregate and therefore could not be broken down to the unit cost level. After inflating the costs to 1992 dollars, the total storage costs are estimated to be $210,334,064 or $26,291,758 per storage facility.

[50]Shipping costs were also assumed to be the same for the Subtitle C baseline requirements and for the proposed Universal Waste Rule, based on the Cost Analysis of Hypothetical Pesticide Recall Actions, U.S. EPA, Office of Pesticide Programs, July 19, 1991. Although there is some evidence that costs for the shipment of hazardous wastes may be significantly greater than the cost for the shipment of other hazardous materials, the difference in costs for waste pesticides could not be established without a carefully designed survey, which was beyond the scope of this analysis.

4.4 Cost Elements for Thermostats and Batteries under the Proposed Part 273 Rule

EPA analyzed four separate compliance options for thermostats and batteries under the proposed Part 273 Rule. The primary differences between each of these options were the different modes of transport generators would use to ship their batteries and thermostats to a consolidation point or reclamation facility. The four options considered are:

- Shipment of wastes by common carriers (trucks) to consolidation points (which then use hazardous waste transporters to ship wastes to a destination facility);
- Shipping wastes directly to a reclamation facility via common carriers (trucks);
- Shipment of wastes via a parcel carrier (i.e., UPS); and
- For thermostats only, a reverse distribution system where generators ship their used thermostats to Honeywell Corporation, that then has the mercury-containing component (ampule) of the thermostat reclaimed by a commercial facility.

The assumptions and methodology for each option are presented separately in the following sections. Although some activities of the proposed rule are identical to activities that occur under full RCRA Subtitle C, the existence of differences in economies of scale led to developing different unit costs for compliance with the proposed Part 273. Throughout the analysis of each option, the Agency consistently assumed that all generators of hazardous waste batteries and thermostats are shipping their waste to reclamation facilities within the United States. This assumption was developed after numerous conversations between the Agency and industry representatives regarding current export practices. Exporters currently are charging a fee to export batteries and thermostats.[51] According to industry experts, it is no longer economically attractive to export these wastes for either disposal or reclamation.[52]

4.4.1 Generators Ship Waste to Consolidation Points

For this compliance option, generator costs were considered in four categories: on-site costs, shipping costs, consolidation costs, and reclamation costs. On-site costs incurred by either small or large quantity generators under the proposed rule are employee training and the bill of lading. Employee training for both generator categories (small and large quantity) was assumed to be comprised of a $200 training course or equivalent in-house work for each generator. Additionally, generators were assumed to train 4 employees each for 1 hour at a laborer's wage rate of $27. This resulted in a total per generator training cost of $308. The cost for the bill of lading is $7.50 per shipment, which breaks down into a conservative estimate of six minutes

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[51] Based on conversation with Marlene Booth of INMETCO, October, 1993.

[52] Based on conversations with Ann Mossbarger of Sanyo Energy Corporation, Marlene Booth of INMETCO, and Saskia Mooney of Weinberg, Bergeson, and Neuman, October, 1993.

of an engineer's time at a rate of $45 per hour to write up the bill of lading and three minutes of a manager's time at a rate of $60 per hour to supervise the write-up.

Shipping costs included the cost of shipping the waste to a consolidation point as well as pro rata costs of transporting the waste from the consolidation point to the reclamation facility. Transportation from the generator to the consolidation point was based on an assumed distance of 20 miles using common carrier (truck) transportation rates. Transportation costs were based on rate schedules received from several common carriers. For all the shipment sizes in this analysis (e.g., the average waste size per generator) for a distance of 20 miles, the generator incurred the fixed minimum cost of the transporter.

Costs of shipping the total waste volume from the consolidation point to a reclamation facility were assigned to generators on a pro rata basis. Transportation from the consolidation point to a reclamation facility were based on an assumed distance of 1,500 miles. Generators' pro rata share of shipment from a consolidation point are approximately $0.11 per pound. Transport costs from a consolidation point to a reclamation facility also included the cost of manifesting the shipment and the prices charged by hazardous waste transporters. Manifest costs incurred by consolidation points were assigned to generators on a per pound of waste generated basis to spread the costs between the users of the consolidation point. Per generator costs of the manifested shipment from the consolidation point were $0.0009 per pound. The unit cost elements used to calculate shipping costs are presented below in Exhibit 4-6.

Exhibit 4-6
Proposed Part 273 Requirements
Unit Costs for Shipping under the Consolidation Point Compliance Option
(in 1992 dollars)

Shipping Cost Element	Unit Costs
Shipment from generator to a consolidation point (20 miles)	$44.14 (fixed minimum) per generator
Shipment from a consolidation point to a reclamation facility ($2,817.40 per shipment)[1]	approximately $0.11 per pound of waste
Manifest costs	$0.0009 per pound of waste

[1] Based on apportioning all the waste generated by CESQGs, SQGs, LQGs between the 268 consolidation points assumed to exist.

EPA based the cost of operating a consolidation point on the assumption that one consolidation point would exist per metropolitan statistical area (MSA). Each consolidation point was assumed to receive an equal amount of the total waste volume. Given EPA's interest in collecting batteries and thermostats from all types of generators (including conditionally exempt

small quantity generators), the Agency developed model consolidation facilities capable of accepting waste from all generators and assigned pro rata costs to the generator groups based on their share of the total waste handled. Pro rata costs of operating a consolidation point are approximately $0.50 per pound of waste.

The Agency calculated the size of each consolidation point for receiving thermostats and batteries based on the amount of batteries and thermostats that could be packed in a 55-gallon drum and storage arrangements for these drums that would allow easy inspection. Each consolidation point was assumed to manage an equal volume of the total battery and thermostat waste. Assuming 16.36 pounds of batteries/thermostats per gallon, stored in full 55-gallon drums, packed two deep, with four feet of aisle space between rows, EPA calculated that 112 pounds of waste could be stored per square foot of warehouse space.[53] This resulted in a warehouse size of 222 square feet. In calculating warehouse cost per square foot, the Agency used an average cost for retail business space. EPA also assumed that each consolidation point would have two employees, available one half day each week to accept waste at the consolidation point.

Exhibit 4-7 presents the costs per consolidation point as well as the total national costs for consolidation points. The annual costs per consolidation point were approximately $12,000, which resulted in total annual costs for consolidation points of $3.2 million.

Exhibit 4-7
Annual Consolidation Point Costs for
Hazardous Waste Thermostats and Batteries
(in 1992 dollars)

Waste Handled per Consolidation Point (lbs)	24,862
Average Size of Warehouse (square feet)	222
Cost per Square Foot (annualized)	$4.55
Employee Training (annual)	$308
Labor (annual)	$10,800
Annual Cost per Consolidation Point	**$12,118**
Number of Consolidation Points	268
Annual Total Cost	**$3,247,651**

[53] Based on personal communication with Bruce Lawrence of Bethlehem Apparatus who stated that a 55-gallon drum of batteries weighed approximately 900 pounds.

The Agency obtained unit costs for reclamation through personal communications with facilities currently treating these wastes.[54] Reclamation costs varied depending on the size of the waste shipment received by the treating facility. Reclamation costs represent the per pound cost the generator would pay the reclamation facility to accept their waste. The unit costs for mercury and ni-cd reclamation were based on price structures the Agency obtained from reclaimers and are listed in Exhibit 4-8.

Exhibit 4-8
Proposed Part 273 Requirements: Consolidation Points
Reclamation Costs for Mercury and Ni-cd Batteries and Thermostats
(in 1992 dollars)

Material/Shipment Size	Cost per Pound
Mercury waste shipment 500 - 5,000 pounds	$2.60
Vented ni-cd waste shipment (any size)	$0.26
Sealed ni-cd waste shipment (any size)	$0.24

The total annual per generator costs for complying with the Proposed Part 273 Rule by shipping waste by common carrier (truck) to a consolidation point that later ships the waste by hazardous waste transporter are presented in Exhibit 4-9. Total per generator costs are presented by generator type and size category.

[54] Personal communications with Bruce Lawrence of Bethlehem Apparatus; Alan Wilds of Mercury Refining; Todd Coy of Kinsbursky Brothers; and Mark Schweers of INMETCO, September, 1993.

Exhibit 4-9
Annual Per Generator Costs for Complying with the Proposed Part 273 Requirements by Shipping Hazardous Waste Batteries and Thermostats to Consolidation Points[1] (in 1992 dollars)

Universal Waste Coverage	Average Annual Waste (pounds)	Annual Per Generator Costs:				Total Annual Per Generator Costs
		On Site	Shipping	Consolidation (Pro Rata Share)	Reclamation	
Thermostats						
SQGs	2	$315.50	$44.37	$0.98	$5.20	**$366**
LQGs	1	$315.50	$44.25	$0.49	$2.60	**$363**
Vented Ni-Cd Batteries						
LQGs	522	$315.50	$103.77	$254.43	$135.72	**$809**
Sealed Ni-Cd Batteries						
SQGs	28	$315.50	$47.34	$13.65	$6.72	**$383**
LQGs	138	$315.50	$59.90	$67.26	$33.12	**$476**
Mercuric-Oxide Batteries						
SQGs	388	$315.50	$88.46	$189.16	$1,008.80	**$1,602**
LQGs	844	$315.50	$140.55	$411.37	$2,194.40	**$3,062**

[1] Note that these costs are for activities generators complete under the proposed Part 273 Rule that have different costs than exist under the full RCRA Subtitle C rules.

4.4.2 Generators Ship Directly to a Reclamation Facility Via Common Carrier (Truck)

For this compliance option, generator costs were considered in three categories: on-site costs; shipping costs; and reclamation costs. As with the consolidation point option, the on-site costs incurred by small or large quantity generators under the proposed rule are employee training and the bill of lading. Employee training for both generator size categories (small and large quantity) was comprised of a $200 training course or equivalent preparatory work for each generator. Additionally, generators were assumed to train 4 employees each for 1 hour at a laborer's wage rate of $27. This resulted in a total annual per generator training cost of $308. The bill of lading cost is .05 of a manager's time at $60 per hour and .10 of an engineer's time at $45 per hour for a total of $7.50 per shipment.

To analyze the cost of shipments directly from the generator to a reclamation facility, EPA assumed a distance of 1,500 miles from the generator to the reclamation facility. Because the shipments were being transported directly to a destination facility, a manifest was not required. EPA estimated the costs for transporting the waste based on communications with representatives from several common carriers. The unit costs for shipping the waste amounts used in this analysis are presented in Exhibit 4-10. To develop these costs, the Agency used an average of two rate schedules provided. The Agency noted that some carriers establish rates without sensitivity to the volume of waste carried. However, EPA assumed that generators would locate carriers with variable weight rates in order to economize on the relatively small shipments that they transport.

Exhibit 4-10
Proposed Part 273 Requirements: Option to Ship Direct Via Common Carrier (Truck) Option Shipping Unit Cost (in 1992 dollars)

Shipment Size[1] (pounds)	Per Generator Unit Cost
Shipments < 200 pounds	$60.09 (fixed minimum)
Shipments of 388 pounds	$100.15
Shipments of 522 pounds	$115.36
Shipments of 844 pounds	$186.52

[1] These shipment sizes match up to the average annual wastes produced by different generators of battery and thermostat waste.

The Agency obtained reclamation costs through personal communications with facilities currently treating these wastes and are listed by the size of the waste shipment in Exhibit 4-11. Reclamation costs varied depending on the size of the waste shipment received by the treating facility. Reclamation costs represent the per pound cost the generator would pay the reclamation facility to accept their waste. The unit costs for mercury and ni-cd reclamation were based on prices the Agency obtained from commercial facilities reclaiming these wastes.[55]

[55] Personal communications with Bruce Lawrence of Bethlehem Apparatus, Alan Wilds of Mercury Refining, Todd Coy of Kinsbursky Brothers, and Mark Schweers of INMETCO, September, 1993.

Exhibit 4-11
Proposed Part 273 Requirements: Option to Ship Direct Via Common Carriers (Truck) Reclamation Costs for Batteries and Thermostats (in 1992 dollars)

Material/Shipment Size	Cost per Pound
Mercury shipment < 500 pounds	$2.85
Mercury shipment 500 - 5,000 pounds	$2.60
Vented ni-cd shipment (any size)	$0.26
Sealed ni-cd shipment (any size)	$0.24

The total annual per generator costs for complying with the proposed Part 273 Rule by shipping waste directly to a reclamation facility are presented in Exhibit 4-12. Total per generator costs are presented by generator type and size category.

Exhibit 4-12
Annual Per Generator Costs for Complying with Part 273 Requirements Option where Generators Ship Directly to a Destination Facility (in 1992 dollars)

Universal Waste Coverage	Average Annual Waste (pounds)	Annual Per Generator Costs:			Total Annual Per Generator Costs
		On Site	Shipping	Reclamation	
Thermostats					
SQGs	2	$315.50	$60.09	$5.70	**$381**
LQGs	1	$315.50	$60.09	$2.85	**$378**
Vented Ni-Cd Batteries					
LQGs	522	$315.50	$115.36	$135.72	**$567**
Sealed Ni-Cd Batteries					
SQGs	28	$315.50	$60.09	$6.72	**$382**
LQGs	138	$315.50	$60.09	$33.12	**$409**
Mercuric-Oxide Batteries					
SQGs	388	$315.50	$100.15	1,105.80	**$1,521**
LQGs	844	$315.50	$186.52	$2,194.40	**$2,696**

4.4.3 Generators Ship Waste Via Parcel Carrier

For this compliance option, on-site costs included employee training. Employee training for both generator size categories (small and large quantity) was comprised of a $200 training course or equivalent preparatory work for each generator. Additionally, generators were assumed to train 4 employees each for 1 hour at a laborer's wage rate of $27. This resulted in a total annual per generator training cost of $308. EPA estimates indicate that handling and packing a parcel for shipment would require five minutes of processing time annually. Processing costs per wholesaler were estimated using the labor rate for a distribution center employee of $20 per hour.

The Agency obtained shipping costs for this option from a United Parcel Service (UPS) rate schedule for commercial customers.[56] Shipping costs include the cost of purchasing the box as well as the cost of transporting it via UPS. Shipments for thermostats were based on the cost for shipping a 10-pound box. Due to the low volume of waste for used thermostats, the Agency assumed a box price of $0.80 per box with only one shipment per year. For batteries, the cost of shipping was based on the volume of waste shipped by each generator. If a generator's average annual waste exceeded UPS's maximum parcel weight of 70 pounds, the Agency assumed the cost of the 70 pound box with multiple shipments occurring during the year. Due to the low volume of waste per generator for SQGs of sealed ni-cd batteries, the Agency estimated the cost of shipment for this generator group using UPS's cost for a 30 pound parcel. Boxes for used batteries were estimated to cost $1.90 per box due to the density of the batteries and the size of shipments.[57] The unit cost for shipping used in the analysis of this option are presented in Exhibit 4-13. EPA assumed that the average shipping distance was 1,500 miles to the commercial reclamation facilities.

Exhibit 4-13
Proposed Part 273 Requirements: Shipment Via Parcel Carrier
Shipping Costs for Batteries and Thermostats
(in 1992 dollars)

Shipping Cost Element	Per Generator Unit Cost
Small box for thermostats	$0.80
Larger box for batteries	$1.90
UPS cost for shipping a 10-pound box	$3.14
UPS cost for shipping a 30-pound box	$15.00
UPS cost for shipping a 70-pound box	$26.56

[56] Rate schedules obtained from John Davis of UPS, October, 1993.

[57] Box prices obtained from United Parcel Service, October, 1993.

The Agency obtained reclamation costs through personal communications with facilities currently treating these wastes.[58] Reclamation costs varied depending on the size of the waste shipment received by the treating facility. Reclamation costs for batteries represent the per pound cost the generator would pay the reclamation facility to accept their waste. Cost of mercury thermostat reclamation were different than the cost used for mercuric-oxide batteries. For thermostats, reclamation costs were based on the cost of reclaiming a half-gallon box which contains approximately five thermostats. Small quantity generators of thermostats would ship three boxes annually and LQGs would ship one box annually. These costs are listed below in Exhibit 4-14. The unit costs for batteries were based on price structures the Agency obtained and are listed by the size of the waste shipment in Exhibit 4-8. Costs differed due to the exceptionally low volume of waste per generator of used mercury-containing thermostats.[59]

Exhibit 4-14
Proposed Part 273 Requirements: Shipment Via Parcel Carrier
Reclamation Costs for Batteries and Thermostats
(in 1992 dollars)

Material/Shipment Size	Unit Cost
Mercury Thermostats	$115 per box
Mercury shipment < 500 pounds	$2.85 per pound
Mercury shipment 500 - 5,000 pounds	$2.60 per pound
Vented ni-cd shipment (any size)	$0.26 per pound
Sealed ni-cd shipment (any size)	$0.24 per pound

The total annualized per generator costs for complying with the Proposed Part 273 requirements by shipping wastes via parcel carrier are presented in Exhibit 4-15 by generator type and size.

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[58] Personal communications with Bruce Lawrence of Bethlehem Apparatus, Alan Wilds of Mercury Refining, Todd Coy of Kinsbursky Brothers, and Mark Schweers of INMETCO, September, 1993.

[59] In this case, to allow direct comparison with the Honeywell system, the Agency used the prices quoted by the same commercial facility Honeywell planned to use for thermostats.

Exhibit 4-15
Annual Per Generator Costs for Complying with Part 273 Requirements Option where Generators Ship Wastes Via Parcel Carrier (in 1992 dollars)

Universal Waste Coverage	Average Annual Waste (pounds)	Annual Per Generator Costs:			Total Annual Per Generator Costs
		On Site	Shipping	Reclamation	
Thermostats					
SQGs	2	$308	$3.94	$345	**$657**
LQGs	1	$308	$3.94	$115	**$427**
Vented Ni-Cd Batteries					
LQGs	522	$308	$227.68	$135.72	**$671**
Sealed Ni-Cd Batteries					
SQGs	28	$308	$16.90	$6.72	**$332**
LQGs	138	$308	$56.92	$33.12	**$398**
Mercuric-Oxide Batteries					
SQGs	388	$308	$170.76	$1,105.80	**$1,585**
LQGs	844	$308	$369.98	$2,194.40	**$2,872**

4.4.4 Generators of Thermostats Ship Via Parcel Carrier to Honeywell Corporation

EPA was approached by Honeywell Corporation, a major manufacturer of mercury-containing thermostats requesting that the Agency allow for a unique reverse distribution system for the collection and treatment of used thermostats.[60] This approach relies on a mail delivery system to transport used thermostats from wholesalers back to the manufacturer where the mercury ampule is then removed. The used ampules are then stored at a permitted RCRA Subtitle C storage facility until they are shipped to a mercury reclamation facility.[61]

Although the Agency only focused on the implications of generators that must currently meet the full RCRA Subtitle C requirements using the Honeywell option, the company intends to allow CESQGs and the public to return thermostats to them to enable mercury reclamation.

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[60] Honeywell Corporation has requested that EPA allow the mailing of used thermostats by their wholesalers to a central location for processing and disposal.

[61] Details of the approach were presented to the Agency by Honeywell in "Technical Proposal For Honeywell's Mercury Reclamation and Recycling Program".

EPA analyzed the costs associated with this approach. EPA assumed that the manufacturer proposing the reverse distribution system would receive all thermostats generated annually, including those manufactured by other firms. EPA assumed all thermostats generated by SQGs and LQGs would be sent to the one manufacturer proposing the mailing approach. Therefore, the manufacturer would receive 217,000 thermostats or about 33,000 pounds of waste annually. The Agency examined the annual costs associated with this approach by estimating the costs of on-site generator and wholesaler activities, shipping, storage, and reclamation, using the following approach.[62]

On-site costs for this approach included the cost of employee training for both generators and wholesalers of used thermostats and the cost of handling and packaging the thermostats for shipment. EPA based the number of wholesalers on the manufacturer's statement of the existing number of wholesaler locations (5,000) distributing their thermostats.[63] Each wholesaler was assumed to train two employees for one hour each on the proper handling and packaging requirements for the used thermostats. The Agency assumed that each generator would train four people for one-half hour each based on the manufacturer's statement about the time necessary to read a company-published safety brochure on the proper handling of thermostats. The labor cost for wholesalers was based on the hourly wage for an employee at a distribution center of $20, and the labor cost for generators was based on the hourly wage for a laborer of $27. Per generator training costs were $54 for both SQGs and LQGs. Per wholesaler training costs were $40.

The Agency assumed that no packaging costs would be incurred by generators when they return them to the wholesaler. Each wholesaler was assumed to invest five minutes of processing time annually (at a wage of $20 hour) for receiving and packaging the thermostats. Per wholesaler packaging costs were, therefore, $1.06 annually.

Shipping costs included the cost of purchasing the box, shipping via a parcel carrier to Honeywell, and hazardous waste transport of the ampule to a storage facility and then to the reclamation facility. Generators were assumed to have negligible transportation costs to the wholesaler because EPA assumed generators would return used thermostats at the time that they purchased a new supply. The Agency used prices already negotiated between the manufacturer and the parcel carrier as the actual cost for both the box and the price of shipment.[64] The boxes are recyclable and wholesalers are expected to use each box for 10 shipments. Each wholesaler was assumed to ship one box of used thermostats to the manufacturer once a year

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[62] EPA worked with Nancy Onkka of Honeywell to develop the unit costs and coverage of the Honeywell option during the preparation of the economic impact analysis.

[63] Based on conversation with Nancy Onkka of Honeywell who stated that Honeywell has 2,000 wholesalers. Most of these wholesalers have multiple locations, which resulted in a total number of wholesalers of approximately 5,000.

[64] Based on personal communication with Nancy Onkka at Honeywell, August 1993.

based on the number of wholesalers and the average number of thermostats per wholesaler. Boxes cost $1.20 per use and each box shipment costs $5.10.[65]

The mercury ampules, which would be removed by the manufacturer, would then be shipped for temporary storage to an existing RCRA-permitted storage facility owned by the manufacturer and then on to the final reclamation facility. The total distance of travel for the ampules is 984 miles.[66] The Agency assumed ampules would be shipped in 55-gallon drums and transported by a hazardous waste hauler. Hazardous waste transportation costs were based on the per pound cost of transporting a partial load ($0.0015 per pound/mile).[67] Total per wholesaler shipping costs are $6.35. Costs incurred by wholesalers were then assigned on a pro rata basis to both small and large quantity generators.

The Agency developed storage costs assuming the ampules would be stored in four 55-gallon drums requiring four square feet per drum. The annual cost per square foot of storage needed was obtained from EPA's RCRA Reauthorization Cost Analysis (1992) and inflated to 1992 dollars ($4.55 per square foot). Total storage costs were $73 annually.

Disposal costs included the cost of training an employee for ampule removal, removal of the ampule, reclamation of the mercury ampules, and disposal of the solid waste portion of the thermostat. The Agency assumed that the manufacturer would pay $200 for a training course and would train four people for an hour each on safe ampule removal procedures. Total training costs for the manufacturer were $308.

Ampule removal was assumed to take 1 minute per thermostat and would be conducted at a cost of $27 per hour (assumed laborer completing the task). EPA assumed 217,000 thermostats require ampule removal per year for a total cost of $97,650.

The cost of recovering the mercury ampules was based on price quotes obtained from the reclamation facility that has agreed to participate in the manufacturer's reverse distribution system ($2,140 per 55-gallon drum).[68] Total ampule recovery costs were $8,560. The non-hazardous portion of the used thermostat (95 percent of the weight of the thermostats) would be disposed of at a municipal solid waste facility. Municipal solid waste collection and disposal costs were obtained from the EPA's RCRA Reauthorization Cost Analysis (1992) and inflated to 1992 dollars. The inflated cost for solid waste disposal was $70 per ton, which resulted in a total cost for solid waste disposal of $1,097.

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[65] The boxes cost $12 each and have a cost of $1.20 per use if used 10 times.

[66] Distance determined by measuring highway miles from Honeywell Corporation to their storage facility and from the storage facility to the reclamation facility that has agreed to accept the ampules.

[67] Mercury ampules weigh five percent of the weight of the thermostat, which results in approximately 1,650 pounds of mercury ampules annually.

[68] Based on personal communication with Bethlehem Apparatus, October 1993.

In order to estimate costs for small and large quantity generators under this option, wholesaler costs and costs incurred after consolidation of the thermostats were assigned to the generator groups proportionately, based on the number of generators in each group.

4.5 Cost Elements for a Pesticide Recall under the Proposed Part 273 Rule

On-site costs incurred under the proposed Part 273 Rule for pesticides include employee training. Generators of recalled pesticides were assumed to spend $308 on employee training. Employee training costs include $200 per generator for a safety training course and the cost of training four employees for one-half hour each using a laborer's wage of $27 per hour.

Storage costs were based on the cost of storing the pesticide at eight bonded warehouses for one year. Bonded warehouses were assumed to be single story structures with concrete floors, temperature control, sprinkler systems, security, and secondary containment. Costs for the eight storage facilities were obtained from EPA's Cost Analysis of Hypothetical Pesticide Recall Actions and inflated to 1992 dollars. Costs for storage were presented in the aggregate and therefore could not be broken down to the unit cost level. Total storage costs for each facility are estimated to be $1,629,071.

CHAPTER 5. RESULTS OF COST ANALYSIS

This chapter presents the results of EPA's cost analysis of the savings the Agency estimates would occur under the proposed Universal Waste Rule. The results from the battery and thermostat analysis and the pesticide analysis are presented independently below. For batteries and thermostats, the total cost for each compliance option are presented as well as the least-cost compliance method for each generator type and size. This is followed by a sensitivity analysis of key parameters for the least cost option and a discussion of the major limitations of the analysis.

5.1 Thermostats and Batteries Savings

Exhibit 5-1 presents the total annual on-site, shipping and reclamation costs to generators under full RCRA Subtitle C requirements. Costs in Exhibit 5-1 are disaggregated by generator type, size, and whether the costs were attributable to on site handling, shipping or reclamation. Total annual costs associated with full RCRA Subtitle C compliance for cost elements that will differ under the proposed rule are approximately $70 million.

Exhibit 5-2 presents the total annual costs associated with compliance with the proposed Part 273 requirements by generators shipping wastes to consolidation points. Exhibits 5-3, 5-4, and 5-5 present the total annual costs for compliance with the proposed Part 273 Rule by generators shipping wastes directly to a destination facility via truck, shipping wastes via parcel carrier, and the Honeywell reverse distribution system, respectively. In Exhibit 5-5, the costs incurred by wholesalers in the reverse distribution system were attributed to small and large quantity generators on a pro rata basis.

The least-cost method of compliance for the generators of the different universal wastes are presented in Exhibit 5-6. The least-cost method combines the lowest cost of compliance for each individual generator type and size category to estimate the aggregate least-cost method of compliance for all generator types. Under the least-cost method, total annual costs for the parts of the proposed rule that are different than the full RCRA Subtitle C compliance costs are approximately $26 million. The selection by universal waste generators of the least expensive method of compliance with the proposed rule should result in a total annual net savings to generators of thermostats and batteries of approximately $43 million.

5.2 Pesticide Recall Savings

The total cost per pesticide recall of compliance with both the full RCRA Subtitle C and the proposed Part 273 Rule are presented in Exhibit 5-7. The total cost of compliance with the full RCRA Subtitle C requirements for pesticides for provisions that are different under full RCRA Subtitle C requirements and the proposed Part 273 requirements are estimated to be $271 million per recall. Total costs for generators of pesticides that are cancelled and recalled under the proposed Part 273 Rule for provisions that are different under full Subtitle C and the proposed Part 273 are estimated to be $19 million per recall. This results in an estimated $252 million in savings per recall. As shown in Exhibit 5-8, the total annualized savings over a 20-year period are $50 million.

Exhibit 5-1
Total Annual Costs for Generators Complying with Full RCRA Subtitle C Requirements
Hazardous Waste Batteries and Thermostats[1]
(in thousands of 1992 dollars)

Universal Waste Coverage	Number of Generators	Average Annual Waste (pounds)	Annual On-Site Costs	Annual Shipping Costs	Annual Reclamation Costs	Total Annual Costs[2]
Thermostats						
SQGs	13,000	2	$8,099	$1,016	$74	**$9,189**
LQGs	1,400	1	$2,022	$109	$4	**$2,135**
Vented Ni-Cd Batteries						
LQGs	670	522	$967	$100	$91	**$1,158**
Sealed Ni-Cd Batteries						
SQGs	60,000	28	$37,380	$4,687	$403	**$42,470**
LQGs	8,000	138	$11,552	$625	$265	**$12,442**
Mercuric-Oxide Batteries						
SQGs	800	388	$498	$104	$885	**$1,487**
LQGs	225	844	$325	$55	$494	**$874**
TOTALS			**$60,843**	**$6,696**	**$2,216**	**$69,755**

[1] Costs include only those cost elements expected to vary between the full RCRA Subtitle C requirements and the proposed Part 273 requirements. Total costs do not estimate full costs for compliance with all of the RCRA Subtitle C requirements.

[2] Costs may not total in some cases due to rounding.

Exhibit 5-2
Annual Total Costs for Generators Complying with the Proposed Part 273 Rule by Shipping Hazardous Waste Batteries and Thermostats to Consolidation Points[1] (in thousands of 1992 dollars)

Universal Waste Coverage	Number of Generators	Average Annual Waste (pounds)	Annual On-Site Costs	Annual Shipping Costs	Annual Consolidation Costs	Annual Reclamation Costs	Total Annual Costs[2]
Thermostats							
SQGs	13,000	2	$4,102	$577	$13	$68	**$4,759**
LQGs	1,400	1	$442	$62	$686	$4	**$508**
Vented Ni-Cd Batteries							
LQGs	670	522	$211	$70	$170	$91	**$542**
Sealed Ni-Cd Batteries							
SQGs	60,000	28	$18,930	$2,840	$819	$403	**$22,993**
LQGs	8,000	138	$2,524	$479	$538	$265	**$3,806**
Mercuric-Oxide Batteries							
SQGs	800	388	$252	$71	$151	$807	**$1,282**
LQGs	225	844	$71	$32	$93	$494	**$689**
TOTALS			**$26,532**	**$4,130**	**$1,785**	**$2,131**	**$34,578**

[1] Costs include only those cost elements expected to vary between the full RCRA Subtitle C requirements and the proposed Part 273 requirements. Total costs do not estimate full costs for compliance with Part 273.

[2] Costs may not total in some cases due to rounding errors.

Exhibit 5-3
Annual Total Costs for Complying with the Proposed Part 273 Rule
Generators Ship Directly to a Destination Facility Via Truck[1]
(in thousands of 1992 dollars)

Universal Waste Coverage	Number of Generators	Average Annual Waste (pounds)	Annual On-Site Costs	Annual Shipping Costs	Annual Reclamation Costs	Total Annual Costs[2]
Thermostats						
SQGs	13,000	2	$4,102	$781	$74	**$4,957**
LQGs	1,400	1	$442	$84	$4	**$530**
Vented Ni-Cd Batteries						
LQGs	670	522	$211	$77	$91	**$380**
Sealed Ni-Cd Batteries						
SQGs	60,000	28	$18,930	$3,605	$403	**$22,939**
LQGs	8,000	138	$2,524	$481	$265	**$3,270**
Mercuric-Oxide Batteries						
SQGs	800	388	$252	$80	$885	**$1,217**
LQGs	225	844	$71	$42	$494	**$607**
TOTALS			**$26,532**	**$5,151**	**$2,216**	**$33,898**

[1] Costs include only those cost elements expected to vary between the full RCRA Subtitle C requirements and the proposed Part 273 requirements. Total costs do not estimate full costs for compliance with Part 273.

[2] Costs may not total in some cases due to rounding.

Exhibit 5-4
Annual Total Costs for Complying with the Proposed Part 273 Rule Option where Generators Ship Wastes Via Parcel Carrier[1] (in thousands of 1992 dollars)

Universal Waste Coverage	Number of Generators	Average Annual Waste (pounds)	Annual On-Site Costs	Annual Shipping Costs	Annual Reclamation Costs	Total Annual Costs[2]
Thermostats						
SQGs	13,000	2	$4,004	$51	$4,485	**$8,540**
LQGs	1,400	1	$431	$6	$161	**$598**
Vented Ni-Cd Batteries						
LQGs	670	522	$206	$153	$91	**$450**
Sealed Ni-Cd Batteries						
SQGs	60,000	28	$18,480	$1,014	$403	**$19,897**
LQGs	8,000	138	$2,464	$455	$265	**$3,184**
Mercuric-Oxide Batteries						
SQGs	800	388	$246	$137	$885	**$1,268**
LQGs	225	844	$69	$83	$494	**$646**
TOTALS			**$25,900**	**$1,899**	**$6,784**	**$34,583**

[1] Costs include only those cost elements expected to vary between the full RCRA Subtitle C requirements and the proposed Part 273 requirements. Total costs do not estimate full costs for compliance with Part 273.

[2] Costs may not total in some cases due to rounding error.

Exhibit 5-5
Annual Total Costs for Generators Complying with the Proposed Part 273 Rule Using the Honeywell Corporation Reverse Distribution System (in thousands of 1992 dollars)

Universal Waste Coverage	Number of Generators	Average Annual Waste (pounds)	Annual On-Site Costs	Annual Shipping Costs	Annual Storage Costs	Annual Disposal Costs	Total Annual Costs
Thermostats							
SQGs	13,000	2	$890	29	$.065	$97	**$1,016**
LQGs	1,400	1	$96	3	$.007	$10	**$109**
TOTALS			**$986**	**$32**	**$.072**	**108**	**$1,125**

Exhibit 5-6
Least-Cost Method of Compliance for the Proposed Part 273 Rule by Generator Type[1] (in thousands of 1992 dollars)

Generator Type	Least-Cost Option	Total Annual Cost
Thermostats		
SQG	Honeywell	$1,016
LQG	Honeywell	$109
Vented Ni-cd Batteries		
LQG	Ship Direct via Truck	$380
Sealed Ni-cd Batteries		
SQG	Ship via Parcel Carrier	$19,897
LQG	Ship Direct via Parcel Carrier	$3,184
Mercuric-Oxide Batteries		
SQG	Ship Direct via Truck	$1,217
LQG	Ship Direct via Truck	$607
Total Annual Cost Using Least-Cost Method		**$26,410**
Total Annual Full RCRA Subtitle C Compliance Cost		**$69,755**
Total Annual Savings from the Proposed Part 273 Rule		**$43,345**

[1] Costs include only those cost elements expected to vary between the full RCRA Subtitle C requirements and the proposed Part 273 requirements. Total costs do not estimate full costs for compliance with Part 273.

Exhibit 5-7
Total Costs for Complying with the Proposed Part 273 and Full RCRA Subtitle C Requirements for Pesticides Per Recall (in thousands of 1992 dollars)

Requirements	Number of Generators	Total On-Site Costs	Total Storage Costs	Total Costs per Recall
Full RCRA Subtitle C	20,000	$61,163	$210,334	271,497
Proposed Part 273	20,000	$6,400	$13,033	$19,433
Net Savings Per Recall				$252,064

Exhibit 5-8
Total and Annualized Savings under the Proposed Part 273 Rule for Large Pesticide Recalls Every Five Years (in thousands of 1992 dollars)

Years of Recall	Discount Factor	Discounted Value of Savings[1]
3	.8163	$205,760
8	.5820	$146,701
13	.4150	$104,607
18	.2959	$74,586
Total Present Value Savings		**$531,653**
Annualized Savings		**$50,184**

[1] The savings are discounted unsing a 7 percent discount rate and are annualized over a 20-year period.

5.3 Total Savings

EPA estimates the total annual savings incurred to generators of hazardous waste batteries, thermostats, and recalled pesticides as a result of the proposed Universal Waste Rule are approximately $93 million.

5.4 Sensitivity Analysis

This section presents the results of EPA's analysis of the effects of varying selected major parameters in the cost analysis (where the Agency used considerable judgment in arriving at the parameter's value) on the estimated savings incurred under the proposed Universal Waste Rule.[69] Each parameter that EPA used was analyzed with regard to the relevant range of values it potentially could have. In EPA's analysis of the sensitivity of each cost factor, all other parameters remained as they were in the initial "base" case analysis that was presented above (i.e. were held constant), except in the best-case and worst-case analysis where all the elements under examination were increased and decreased by 25 percent, respectively.

5.4.1 Batteries and Thermostats

Exhibit 5-9 shows the results of the sensitivity analysis for batteries and thermostats. For purposes of comparison, the results from generators selecting the least-cost option for compliance that were presented earlier in this chapter appear at the top of the exhibit as the base case estimate. Note that from the original analysis, none of the least-cost options change due to the varying of unit cost parameters that EPA examined, except for LQGs with sealed Ni-cd batteries when their direct transportation costs are reduced by 25 percent. The following assumptions were analyzed in the sensitivity analysis for EPA's analysis of batteries and thermostats:

- Number of Generators - EPA set its lower bound estimates of the number of generators equal to 25 percent less than the values used in its initial cost-effectiveness analysis. It set its upper bound estimates equal to 25 percent greater than the values used in its initial cost analysis.

- Cost to Transport Waste - The Agency varied the estimates of the cost of transportation via truck by plus or minus 25 percent of the original estimate. The costs of transportation via parcel carrier were not varied because these costs were obtained directly from the parcel carrier.

- Cost of Employee Training - EPA increased and decreased the cost of employee training required by 25 percent.[70]

- Cost of Contingency Plan - The Agency increased and decreased by 25 percent the cost of maintaining the contingency plan required under full RCRA Subtitle C compliance.

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[69] EPA did not examine the discount rate in this analysis because all the costs examined were annual costs.

[70] Under the Honeywell reverse distribution system, the only training costs that were varied were those that were thought to be highly uncertain. Since Honeywell had provided specific values for the cost of their training program associated with their approach, these costs were not varied.

Also included in Exhibit 5-9 are estimates of the possible range of costs under both regulatory scenarios. The costs associated with the best-case scenario were estimated using the high end estimates (i.e., increased by 25 percent) for each cost element included in the sensitivity analysis. The costs associated with the worst-case scenario combined the lower bound estimates for each cost element. The results from these two analyses suggest that the range of total annual savings from the proposed Universal Waste Rule's RCRA requirements for generators of batteries and thermostats could be $27 million to $63 million.

Exhibit 5-9
Results of Sensitivity Analysis on the Annual Cost of Compliance with the Proposed Part 273 Rule to Generators of Batteries and Thermostats under the Least-Cost Method of Compliance[1]
(in thousands of 1992 dollars)

Cost Case Examined	Annual Costs of:		Annual Incremental Savings
	Full RCRA Subtitle C Compliance	Part 273 Compliance by Least Cost Method	
Base Case Estimate	**$69,755**	**$26,410**	**$43,345**
Increase number of generators by 25 %	$87,194	$33,013	$54,181
Decrease number of generators by 25 %	$52,316	$19,808	$32,509
Increase cost of training by 25 %	$76,946	$31,971	$44,975
Decrease cost of training by 25 %	$62,564	$20,849	$41,715
Increase cost of a contingency plan by 25 %	$73,960	$26,410	$47,550
Decrease cost of a contingency plan by 25 %	$65,550	$26,410	$39,140
Increase cost of truck transport by 25 %	$71,429	$26,580	$44,849
Decrease cost of truck transport by 25%	$68,081	$26,240	$41,841
Best-case estimate (all elements above increased by 25 %)	$103,531	$40,176	$63,355
Worst-case estimate (all elements above decreased by 25 %)	$42,514	$15,510	$27,004

[1] The costs provided are only for areas where the unit costs for activities under the Full RCRA Subtitle C requirements and the proposed Part 273 Rule are different. They do not represent total compliance costs for all requirements.

5.4.2 Pesticides

The results of EPA's sensitivity analysis of the cost of compliance with the Universal Waste Rule for generators of suspended or cancelled and recalled pesticides are presented in Exhibit 5-10. The following major assumptions were analyzed in the sensitivity analysis for EPA's analysis of pesticides:

- Number of Generators - EPA set its lower bound estimates of the number of generators equal to 25 percent less than the values used in its initial cost-effectiveness analysis. It set its upper bound estimates equal to 25 percent greater than the values used in its initial cost analysis.

- Cost of Employee Training - EPA increased and decreased the cost of employee training required by 25 percent.

- Cost of Contingency Plan - The Agency increased and decreased by 25 percent the cost of maintaining a contingency plan that is required under full RCRA Subtitle C compliance.

- Storage Costs - EPA increased and decreased the per facility cost of storage by 25 percent for compliance under both the proposed Universal Waste Rule and full RCRA Subtitle C compliance.

- Discount Rate - EPA estimated the net present value of savings using discount rates of 3 percent and 10 percent.

Also included in Exhibit 5-10 are estimates of the costs associated with the best-case scenario (where all the above cost elements are increased 25 percent and the 3 percent discount rate is used) and the worst-case scenario (where all the above cost elements are decreased 25 percent and the 10 percent discount rate is used). The results from these two analyses suggest that the range of total annual savings from the proposed Universal Waste Rule for generators of recalled pesticides could be $28 million to $78 million.

Exhibit 5-10
Results of Sensitivity Analysis on the Cost of Compliance with the Proposed Part 273 Rule to Generators of Suspended or Cancelled and Recalled Pesticide (in thousands of 1992 dollars)

Cost Case Examined	Full RCRA Subtitle C Compliance	Proposed Part 273 Compliance	Incremental Savings Per Recall	Total Net Present Value of Savings[1]	Annualized Savings Over 20 Years[2]
Base Case Estimate	**$271,497**	**$19,433**	**$252,064**	**$531,653**	**$50,184**
Increase number of generators by 25 %	$339,371	$24,291	$315,080	$664,567	$62,731
Decrease number of generators by 25 %	$203,623	$14,575	$189,048	$398,740	$37,638
Increase cost of training by 25 %	$274,427	$20,973	$253,454	$534,585	$50,461
Decrease cost of training by 25 %	$268,567	$17,893	$250,674	$528,722	$49,908
Increase cost of a contingency plan by 25 %	$281,497	$19,433	$262,064	$552,745	$52,175
Decrease cost of a contingency plan by 25 %	$261,497	$19,433	$242,064	$510,561	$48,193
Increase cost of storage by 25 %	$324,081	$22,691	$301,390	$635,692	$60,005
Decrease cost of storage by 25%	$218,913	$16,175	$202,738	$427,615	$40,364
Discount rate set at 3 percent	$271,497	$19,433	$252,064	$749,361	$50,369
Discount rate set at 10 percent	$271,497	$19,433	$252,064	$425,333	$49,959
Best-case (all elements increased by 25%, discount rate 3 percent)	$421,264	$30,289	$390,975	$1,162,330	$78,127
Worst-case (all elements decreased by 25%, discount rate 10 percent)	$154,487	$10,976	$143,511	$242,161	$28,444

[1] The costs are discounted using a 7 percent discount rate (unless otherwise specified) and are annualized over a 20 year period.
[2] The costs provided are only for areas where the unit costs for activities under the Full RCRA Subtitle C requirements and the proposed Part 273 Rule are different. They do not represent total compliance costs for all requirements.

5.5 Major Limitations

In reviewing the above results of the economic impact analysis for the proposed Universal Waste Rule, the following limitations should be recognized:

- Published data on the quantities of wastes generated and the number and type of generators were sparse. EPA developed estimates of the affected universe of batteries and thermostats based on communications with experts in the industries of concern. The estimates of the generators and waste volumes for pesticide recalls are for a plausible future scenario based on work that EPA has done to support its development of pesticide recall procedures. EPA was required to exercise a considerable degree of judgment in developing the estimates of generators and volumes of universal wastes.

- The baseline for EPA's analysis assumes compliance with the full RCRA Subtitle C requirements. Non-compliance in the baseline situation (full RCRA Subtitle C rules) would lower the savings estimated for the proposed Part 273 Rule.

- The analysis is based on the handling of average volumes of waste streams in each generator class, rather than some type of distribution of volumes of waste in each generator category.

- EPA's analysis considers regulations at the federal level only. Some states are in the process of establishing rules for their own special collection systems. State programs are not reflected in EPA's analysis. Also, the analysis assumes states will adopt the Part 273 requirements, rather than maintain the stricter status quo situation. They have authority under RCRA to have more stringent hazardous waste programs. Therefore, the estimated savings shown in this chapter depend on state adaptation of the Proposed Part 273 rule.

- EPA simplified the analysis by handling all costs of compliance with the full RCRA Subtitle C requirements and the proposed Part 273 Rule using a framework for analysis that examined the costs on a per waste type basis for the generators of each waste. Implicit in this approach is the assumption that there are no significant economies of scale available to generators who generate more than one of these wastes. Overall, this assumption appears valid given the limited generator overlap that EPA estimates exists between waste categories, and the variations in what generators would need to do to properly manage different wastes.

- Unit costs are based on assumed averages. Individual entities in the universe may bear higher or lower unit costs.

- The number of consolidation points available for battery and thermostat wastes for the compliance option that relies on truck transport to consolidation points was estimated based on the number of MSAs, rather than on the number of storage facilities in existence. This estimate may over or understate the actual number of consolidation points that would exist under the proposed Part 273 Rule, and therefore not accurately reflect the costs savings that could result from the rule.

PART III. POTENTIAL FOR REDUCTION IN ENVIRONMENTAL BENEFITS

CHAPTER 6 - ANALYSIS OF POTENTIAL FOR REDUCTION IN ENVIRONMENTAL BENEFITS

To determine whether the proposed changes to the regulations are likely to cause significant reduced environmental benefits when compared to the existing Subtitle C regulations, the Agency assessed whether the risks posed by management of the universal wastes in question under the proposed regulations (40 CFR Part 273) are likely to be significantly higher than the risks posed by management of the same wastes under the existing hazardous waste regulations.

In summary, based on the requirements included in the proposed rule, the nature of the wastes, and the generation and management patterns of the wastes, the Agency concludes that it is not likely that management of these universal wastes under the proposed rule would pose significantly increased risks compared to management of the same wastes under the existing Subtitle C regulations. The factors the Agency assessed in coming to this conclusion include:

- These universal wastes are contained and pose low potential for release;
- The proposed requirements provide a higher level of protection for larger quantities of waste;
- The proposed regulations limit the length of time that these wastes may be stored;
- The proposed waste management requirements provide sufficient protection to minimize the risks posed by these wastes;
- Other authorities and controls provide additional protection; and
- The proposed regulations will facilitate improved management of unregulated wastes.

Each of these factors is discussed in detail below.

6.1 Wastes Are Contained and Pose Low Potential for Releases

The three wastes considered for regulation under Part 273 each represent a very limited universe of wastes with characteristics that make the risk of releases of hazardous constituents from the wastes during collection lower than those posed by the typical industrial hazardous waste (e.g., sludges or production by-products). The three waste types include only materials that, as wastes, exist in the same state they did as products, and the products themselves or the product packaging have been specifically designed to protect against releases or exposures of the contained hazardous constituents during reasonable worst case product management scenarios. The management standards proposed for these universal wastes are designed to ensure that management during collection of the wastes is similar to the normal product handling scenarios the products have specifically been designed to withstand.

Due to the protective product or packaging design, the Agency believes that the risk of release or other exposure during collection is relatively low as long as there are management standards in place to ensure that management during collection is similar to product handling procedures and that the integrity of the protective design is maintained. Thus, the Agency believes that streamlining the requirements for collection of these wastes will not result in

increased net risks. The characteristics that make the risk of release during collection low for each of the wastes proposed for regulation under Part 273 (or discussed in detail in the proposal) are described below.

The universe of hazardous waste batteries includes manufactured items that have been produced with casings that are specifically designed to protect the internal components of the battery from damages such as physical impacts, deterioration, corrosion, and chemicals or other factors external to the battery, and to protect the user from contact with the internal battery components. These casings are generally made of steel or rigid plastic and, it is reasonable to assume, are designed to withstand reasonable worst case situations that batteries are likely to be exposed to during product storage and use. Because the conditions batteries will be exposed to during collection (e.g., transport, storage for relatively short periods of time (less than one year)) are similar to those encountered during use, the Agency believes that the casings will continue to minimize the risk of damage to batteries and releases of hazardous constituents from batteries during collection. In addition, the Agency believes that a large percentage of the batteries managed under this rule will be the small consumer-type batteries generally found in retail stores. This is because the large majority of hazardous waste batteries (other than lead acid batteries) are of this type. For example, 70% of nickel-cadmium batteries are small consumer-type batteries.[71] These batteries, known as starved electrolyte batteries, generally do not contain free liquids. The electrolytes for these batteries are a gel or are absorbed into a porous separator material. Thus, releases from these batteries are even more unlikely than from those with liquid electrolytes. Due to this low risk of release or other exposure during collection of hazardous waste batteries, the Agency believes that there will not be significant reduced environmental benefits from managing these wastes under the proposed rule as compared to management under the existing full Subtitle C regulations.

The universe of hazardous waste pesticides included in the proposal is quite narrow and includes only cancelled and/or suspended pesticides that are recalled under regulations now being developed under the Federal Insecticide, Fungicide, and Rodenticide Act (regulations governing these recalls were proposed under FIFRA on May 5, 1993 (58 FR 26856)). These regulations will require that a registrant conducting a recall have the recall procedures pre-approved by EPA and that the recall meet certain requirements. The proposed 273 regulations would include only pesticides packaged in non-leaking original product packaging (or overpacked if leaking), in a tank meeting the hazardous waste tank requirements (including secondary containment), or in a non-leaking transport vehicle or vessel.

It is expected that many of the pesticides managed under Part 273 will be in the original product packaging because it will be returned from distributors or users who have the pesticides in storage but have not yet sold or used them. This packaging, it can be assumed, has been designed by the manufacturer to contain and protect the pesticide under reasonable worst case product storage and transport conditions. Under the recall, the pesticides will be managed under similar conditions. They will generally be stored and transported by the same entities that managed the products through the product distribution chain. Pesticides that will be returned

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[71]Cadmium Council, 1993.

in larger quantities will also be returned through the distribution chain and will likely be managed in tanks and transport vehicles that are similar to those in which bulk product pesticides were managed through the product distribution chain. Because of the packaging described above, the Agency believes that the risk of releases of the universe of pesticides included in the proposal is relatively low. Due to this low risk of release or other exposure during collection of suspended, cancelled, and/or recalled pesticides, the Agency believes that there will not be significant reduced environmental benefits from managing these wastes under the proposed rule as compared to management under the existing full Subtitle C regulations.

Similarly, the mercury in mercury-containing thermostats is enclosed in a shock-resistant glass ampule protected by a surrounding metal structure which is constructed to ensure that the mercury does not escape from the thermostat during product storage, installation, use, and removal. Due to the materials of construction (metal and shock-resistant glass), this protective apparatus remains intact and continues to protect the mercury from release when the thermostat is removed from its installation. Management of the waste thermostat under the proposed rules will be similar to management of the product thermostat prior to use (e.g., removal by the same person installing the replacement thermostat, and transportation and storage through the same system used to distribute new thermostats). Due to the protective apparatus in which the mercury in a thermostat is housed, the crush-resistant glass vial in which the mercury is contained, and the similarity of thermostat management methods under the proposal to the management scenarios this product was designed by the manufacturer to withstand, the Agency believes that the risk of releases of mercury is relatively low. Thus, the Agency believes that there will not be significant reduced environmental benefits from managing these wastes under the proposed rule as compared to management under the existing full Subtitle C regulations.

6.2 Requirements Provide A Higher Level of Protection For Larger Quantities of Waste

The proposed Part 273 regulations were designed to minimize the regulatory requirements for management of relatively small quantities of universal wastes, and to provide increased protection for management of larger quantities of these wastes. As discussed above, the Agency believes that the risks posed by management of these wastes under the proposed rule is relatively low due to the packaging or protective construction of the products that become universal wastes. To ensure that the risks of collecting these wastes are minimized, however, the Agency has identified the two typical collection scenarios that it believes could present relatively high risks (compared to other collection scenarios), and has specifically designed management standards to minimize these risks. The first scenario of concern is situations where larger quantities of these wastes are consolidated at one location or transported in one shipment. For example, if a fire or other emergency occurred at such a location, relatively large quantities of hazardous constituents could be released to the environment. Similarly, if the management practices are poor at a facility where large quantities of these wastes are managed, the risk of larger quantities of hazardous constituents being released through poor management practices is increased.

To counter the relatively increased risks posed by management of larger quantities of these wastes the proposed management requirements were tailored to provide increased protection when larger quantities are managed. For example, handlers who store more than

specific quantities of batteries identified in the rule are required to notify the Agency (or state agency) that they are managing these quantities of these wastes, thus providing the regulating authority the opportunity to conduct inspections to ensure that the wastes are being managed properly. (Comment was requested on an appropriate quantity cut-off for thermostats.) Pesticide handlers will be identified through the recall plan approval procedures). Use of the manifest for shipments of batteries from the last consolidation point to the final destination facility was proposed to ensure that these larger, consolidated shipments are handled only by registered hazardous waste transporters and that point-to-point tracking is provided by the manifest. No regulatory changes were proposed for destination facilities (treatment, recycling, and disposal facilities); they will retain the current full Subtitle C protection for their treatment, disposal, and recycling activities.

EPA believes that there will not be significant reduced environmental benefits under the proposal because, when aggregated into larger quantities, universal wastes become subject to more stringent regulation (similar to Subtitle C) designed to protect against the relatively increased risks of large quantities. The requirements are designed to be less stringent only for the initial phases of collection (from generators that each generate relatively small quantities of these wastes), when typically the wastes will be managed in smaller quantities and the risks will be lessened.

6.3 Regulations Limit the Length of Time That Universal Waste Be Stored

The second typical collection scenario that the Agency has identified as one that could present relatively higher risks (compared to other collection scenarios) is situations where universal wastes are stored for relatively long periods of time. The Agency believes that the risks may be increased when universal wastes are stored for long periods of time for several reasons. First, long storage times may indicate that the manager of the facility does not have procedures in place to ship the wastes on for recycling, or treatment and disposal (e.g., contracts with transporters and receiving facilities), or that the manager is having difficulty making such arrangements. Since use of storage space is generally a cost to a facility, long storage times may signal inattention to proper management of these wastes. Long storage times may also increase the risk of managing these wastes in that the products or the packaging may begin to deteriorate over time (e.g., corrosion of battery casings, thermostat housings, or pesticide packaging in the presence of high humidity or dampness), which could eventually lead to releases of the contained hazardous constituents.

To minimize the potential for increased risks posed by long storage times the proposed management standards limit storage of universal wastes at any location to one year or less. Storage in the course of transport is limited to ten days. The one year storage time limit is documented and made easily enforceable by requiring the handler to demonstrate, by one of several methods, that universal wastes have not been on-site for more than a year. This one year time limit and associated documentation are designed to ensure that handlers of universal wastes keep the wastes moving through the collection system toward recycling or treatment and disposal facilities and that they maintain active attention to management of the wastes to ensure that they do not exceed the time limit.

EPA believes that there will not be significant reduced environmental benefits under the proposal due to storage for excessive periods of time (as compared to the current hazardous waste regulations) because the one year time limit and the associated documentation will limit such excessive storage. The Agency believes this mechanism will successfully limit long storage times because it will be simple for handlers to understand and to comply with, and for regulatory agencies to enforce. Limiting the storage times for these wastes will ensure that handlers of these universal wastes continue active management of the wastes and do not overlook them through negligence or neglect. Limited storage times will also minimize the likelihood that the protective product or packaging design will be compromised through deterioration or by repeated movement of the wastes over time among different storage locations at the facility.

6.4 The Proposed Part 273 Requirements Provide Protection

The existing Subtitle C requirements for hazardous waste are designed to minimize the risk of releases of hazardous waste to human health and the environment and to ensure that any releases that do occur are handled in such a way as to minimize damages to human health and the environment. This is accomplished through regulations applicable to each entity managing the waste including generators, transporters, storage facilities, and treatment and disposal facilities. These regulations impose requirements to prevent leaks and spills during storage and transport, to ensure that wastes are managed by the appropriate regulated persons, to track movement of wastes, to alert regulating agencies to activities that may require some oversight, to ensure that wastes are treated to the extent possible prior to land disposal, and to ensure that treatment and disposal units are designed to prevent releases to the environment.

The proposed Part 273 requirements include basic standards to minimize the risk of release to the environment and manage releases should they occur. In addition, these requirements are enforceable. They include sufficient requirements to provide regulatory oversight and ensure compliance with these requirements.

Proposed Part 273 includes regulatory provisions that require universal wastes to be managed in a manner that minimizes risk to human health and the environment. Part 273 waste handlers are subject to general performance standards to minimize the risk of releases to the environment and contain releases in the event they occur.

To help reduce the likelihood that releases of hazardous constituents from universal wastes occur, Part 273 regulatory provisions include a basic training requirement for generators and owner/operators of consolidation points. These handlers are required to make employees familiar with proper waste handling and emergency procedures appropriate to the wastes they are handling. Thus, handlers must ensure that employees managing universal wastes are familiar with the possible safety and environmental risks associated with these wastes, the standard operating procedures appropriate for minimizing these risks, the warning signs indicating that risks may be increased (e.g., a leaking battery), and procedures to control the risks should an emergency occur. Providing this training to employees managing universal wastes will improve their ability to protect against risks to human health and the environment, and will decrease the probability of a release of hazardous constituents from universal wastes to the environment.

To compliment its release prevention provisions, proposed Part 273 includes a release response requirement for all universal waste handlers. Handlers are required to immediately contain and appropriately manage any releases from universal wastes. Handlers are also required to determine if materials resulting from a release are hazardous waste, and if so, manage them under the full Subtitle C hazardous waste regulations. This would including any material released from the universal waste article or packaging, contaminated cleanup materials, and contaminated media. Thus, any materials that do not retain the protective product or packaging design discussed in Section A will be provided the full protection of the hazardous waste regulations, since the reduced requirements of proposed Part 273 would no longer be appropriate.

In addition to these requirements, handlers managing universal wastes are subject to prohibitions to ensure that the wastes retain the characteristics that make the minimized Part 273 requirements appropriate. All universal waste handlers (except final destination facilities) are prohibited from diluting, treating (except for removing battery electrolyte or responding to a release), or disposing of universal wastes on-site. These prohibitions assure that universal wastes that are packaged or self-contained in a manner that minimizes the risk of release remain intact until they reach a fully regulated destination facility for treatment, recycling or disposal. These prohibitions also reduce the risks of managing these wastes by ensuring that universal waste handlers are not conducting any complex waste management operations such as mixing or separating wastes or constituents, managing volatile or liquid wastes in open containers, or transferring liquid wastes from one container to another.

The risks of managing universal wastes are further reduced by the limited universe of wastes covered, the easily identifiable nature of the wastes, and the uniformity of the wastes in terms of hazardous constituents and characteristics. Universal waste handlers will be sure of the nature and character of the wastes they are handling without conducting any waste sampling, testing, or analysis because they can rely on the uniformity of the manufactured products that have become wastes.

Under the proposal, universal waste generators and consolidation point operators are also prohibited from sending the wastes to any place other than a consolidation point or destination facility. This ensures that the wastes will eventually reach a destination facility for appropriate recycling or treatment and disposal. Destination facilities receiving universal wastes remain subject to applicable Parts 260 to 272 Subtitle C requirements. Therefore, under proposed Part 273, the protective product design or packaging must remain intact until they become aggregated at a destination facility, where they are subject to management under the more stringent regulation of full Subtitle C. For this reason, EPA believes that management of universal wastes under proposed Part 273 would not result in significant reduced environmental benefits.

To ensure that waste handlers comply with the terms of the new system, Part 273 includes provisions, albeit streamlined, to ensure that the system is enforceable. First, the sanction for noncompliance with Part 273 requirements is to subject universal waste handlers to the full Subtitle C hazardous waste regulations of 40 CFR Parts 260-272. In addition, the burden of proof for demonstrating that the universal waste handler qualifies for the Part 273 requirements remains with the handler (see 40 CFR §261.2(f)). This requires the waste handler

managing waste under the reduced requirements of Part 273 to show through appropriate documentation that his or her activities are limited to those allowed under the Part 273 regulations.

In addition to these requirements, proposed Part 273 includes specific recordkeeping and reporting requirements to better ensure compliance. For example, for hazardous waste battery management, Part 273 includes a notification requirement for waste handlers who accumulate more than 20,000 kg of hazardous waste batteries. This requirement will facilitate Agency oversight of facilities aggregating universal wastes in larger quantities, where the risks posed by the wastes may be increased. Comment was requested on an appropriate quantity limit for notification of handlers managing mercury-containing thermostats. (Suspended and/or cancelled pesticides that are recalled and managed under Part 273 are subject to recordkeeping and reporting requirements under Section 19 of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)). In addition, all Part 273 waste shipments from the final consolidation point to the destination facility must be accompanied by a hazardous waste manifest and transported using a hazardous waste transporter, providing control equivalent to full Subtitle C for these larger shipments. Finally, any shipments of universal wastes to foreign destinations are subject to the same procedures for notice and consent from the receiving country as any other hazardous waste.

6.5 Other Authorities and Controls Provide Additional Protection

In addition to the controls included within the proposed Part 273 regulations discussed above, the Agency further believes that there are not significant reduced environmental benefits for hazardous wastes managed under Part 273 because other federal statutory authorities for environmental protection provide safeguards against forms of environmental injury. Universal waste pesticides remain subject to storage and transport requirements under Section 19 of FIFRA. Releases of universal wastes above reportable quantity (RQ) thresholds are subject to reporting requirements under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as Superfund. In a worst case scenario involving releases of hazardous constituents from universal wastes, cleanup could be accomplished under RCRA (materials released from universal wastes are subject to applicable RCRA Subtitle C requirements) or under Superfund (because universal wastes are hazardous wastes, they are also hazardous substances under Superfund, for which liability for remediation is assigned). Further, as mentioned above, EPA has authority under Section 7003 of RCRA to take immediate action in the event of a release from hazardous waste that presents an imminent and substantial endangerment to health or the environment.

With respect to transportation, the Department of Transportation's (DOT) regulations governing hazardous materials will apply to universal wastes in the same way that they apply to the products that become universal wastes (e.g., product batteries, thermostats, and pesticides). Thus, if a universal waste is identified as a hazardous material when shipped as a product, it will continue to be a hazardous material when shipped as waste and all of the same hazardous materials controls designed to protect against transportation risks will apply. Conversely, if a universal waste is not identified as a hazardous material when shipped as a product because the DOT has determined that hazardous materials controls are not necessary,

the universal waste will not be a hazardous material when shipped as a waste and the hazardous materials controls will also not be applicable. Because the DOT regulations are designed to minimize risks during transport of these materials when products, and the materials are basically the same when shipped as wastes as they are when products, the DOT regulations will provide adequate protection for transport of universal wastes.

Finally, in addition to these statutory and regulatory controls, the Agency generally expects to include in the universal wastes system wastes for which there is some indication that public or private entities are likely to sponsor "take back" or collection programs. Specifically, the rechargeable battery industry and thermostat manufacturers are both proposing national "take back" programs under which procedures and charges for shipping universal wastes from collectors (e.g., retailers and contractors) back to the manufacturer or to a reclamation facility (and any costs for reclamation) will be prearranged and prepaid by the manufacturers. Similarly, pesticide recall procedures provide an infrastructure and funding for returning recalled pesticides to the registrant for treatment and disposal. Such programs increase the likelihood of collecting these wastes from generators by removing economic barriers to collection, i.e., the cost of shipping. Such programs also reduce the risk of releases and mismanagement by specifying appropriate shipping and packaging procedures, by minimizing the likelihood of intermediate collection points collecting wastes and then finding they do not have the resources to ship and reclaim or dispose of the wastes, and by ensuring that the waste reaches the appropriate destination facility.

6.6 The Proposed Rule Will Facilitate Improved Management of Unregulated Wastes

Finally, the Agency believes that streamlining the regulatory requirements for collection of the portion of these universal wastes that are regulated will facilitate improved management and recycling of the portion that is not regulated (or minimally regulated). Specifically, the same universal wastes that are regulated when generated by small or large quantity generators are completely exempt from the hazardous waste regulations when generated by households, and are basically exempt when generated by Conditionally Exempt Small Quantity Generators (generate less than 100 kilograms of hazardous waste per month). Universal wastes in each of these regulatory categories are totally indistinguishable, however, once they are removed from the generator's facility.

Fear of enforcement action for noncompliance with the hazardous waste regulations has reportedly greatly inhibited the voluntary collection and management of these unregulated portions of the waste stream. Sponsors of collection programs for these wastes (generally municipalities' household hazardous waste collection programs or manufacturers' product take-back programs) point out that it is not administratively feasible to document that the wastes they collect are not regulated hazardous wastes (assuming that such a determination was correctly made by the generator in the first place). This inability to identify the various regulatory categories of universal wastes has been a major barrier to participation in collection programs because potential participants (e.g., retailers, communities) are not willing to take on the liability of non-compliance with the hazardous waste regulations, and compliance would be prohibitively expensive.

The Agency anticipates that the proposed streamlined regulatory requirements for the regulated portion of the universal waste stream will make it such that persons wishing to collect these wastes will be able to implement programs with greatly reduced costs and administrative effort. Because these programs will be in compliance with requirements for the most regulated portion of the waste stream, these programs will not only be able to collect all three categories of universal wastes without any additional expense or effort, but also will not be required to keep track of which wastes fall into which category. The Agency anticipates that this will greatly increase the number and scope of collection programs run by manufacturers, communities, and other entities. As required under the proposed Part 273 requirements, wastes managed under such programs will be recycled or treated and disposed at facilities in compliance with the full Subtitle C hazardous waste regulations. Thus, the proposal would decrease the quantity of unregulated waste disposed of in municipal landfills or combustors, and increase the quantity managed at controlled hazardous waste recycling or disposal facilities designed to minimize the risks posed by recycling and disposal of similar waste types. Further, because recycling is mandatory for many of the proposed universal wastes under the land disposal restrictions rules (40 CFR 268), and because many of the sponsors of collection programs will choose the recycling option, the Agency believes the proposal will increase recycling of these wastes.

APPENDIX A. SOURCES FOR UNIT COSTS ESTIMATES

This appendix presents the sources, assumptions, and methodology for developing the individual unit cost estimates used in this analysis. Cost elements are categorized as either on site, shipping, consolidation, or reclamation. Cost elements are presented separately for batteries and thermostats, and pesticides in Exhibit A-1.

Exhibit A-1
Sources for Unit Cost Estimates

Cost Element	Source	Assumptions/ Methodology
Thermostats and Batteries		
On-Site Costs		
Packaging and labeling to DOT specifications	Obtained from DPRA, September 1993.	Assumed cost of reading DOT regulations was a sunk cost and not included. Assumed one half-hour of labor per shipment using the hourly wage of a laborer of $27. Labor costs were obtained from Employment and Earnings, March 1993, Bureau of Labor Statistics, USDL. $13.50 per shipment.
Maintenance cost of a contingency plan	Obtained from "Estimating Costs for the Economic Benefits of RCRA Noncompliance" Draft Report, May 1993.	$200 per generator.

Cost Element	Source	Assumptions/ Methodology
Employee training	EPA professional judgment.	For compliance under the Proposed Part 273, assumed $200 per training course per small quantity generator and training for 4 employees per generator and requiring 1 hour per employee to attend the course, which resulted in a total of $308 per generator. Large-quantity generators receive more in-depth training. For compliance under full RCRA Subtitle C requirements, assumed $300 per training course per generator and training 4 employees for 2 hours each. Additionally, 1 hour of labor was assumed for the plant manager and one half hour for a clerical person to maintain records. Total training costs under full RCRA Subtitle C requirements were $586 per generator. Under the Honeywell reverse distribution system, training costs were $308 for ampule removers, $40 for generators, and $54 for wholesalers.
Bill of Lading	Personal communication with Lorie Prince of Ametech, Inc. Environmental Transportation Services, Chanute, Kansas, and EPA professional judgement.	Assumed .05 hours of a manager's time and .10 of an engineer's time to fill out the bill of lading. Labor rates used are $60 per hour for managers and $45 per hour for engineers. $7.50 per shipment.
Manifest completion & recordkeeping	Hours per labor group from Information Collection Request Number 801 "Requirements for Generators, Transporters, and Waste Management Facilities Under the RCRA Hazardous Waste Manifest System", June 15, 1992. Hourly rate per labor group from Employment and Earnings, March 1993.	Assumed a total of .78 hours for completion and recordkeeping. Time for completion was divided disproportionately between a plant manager, engineer, and clerical personnel. $36.24 per shipment.
Land ban notification	Information Collection Request Number 1442.04 "Land Disposal Restrictions for Newly Listed Wastes and Hazardous Debris", November 24, 1992.	For large- and small-quantity generators, assumed a .10 hours of an engineer's time and .125 hours of clerical time, with labor rates of $45 and $27 per hour, respectively. $7.88 per shipment

Exhibit A-1 (continued)
Sources for Unit Cost Estimates

Cost Element	Source	Assumptions/ Methodology
Shipping Costs		
Hazardous waste transport	EPA professional judgement based on EPA's 1990 Survey of Selected Hazardous Waste Management Industry.	Per pound costs were not available for less than truckload quantities, however, full load averages were approximately 1.3 times higher than common carrier costs. Therefore, common carrier costs based on the size of the load were multiplied by a factor of 1.3 to estimate hazardous material transport costs.
Common carrier and parcel carrier transport	Telephone interviews with common carriers.	Contacted Poole Truckline, Independent Freightwide, TNT Red Star Express, J.B. Hunt Special Commodities, Miles, Inc., and UPS
Distance from generator to consolidation point	EPA professional judgment.	Assumed one consolidation point existed per metropolitan statistical area (MSA). Average shipment distance to it was 20 miles.
Distance from generator to destination facility	EPA professional judgment.	The distances to disposal facilities was assumed to be 1,500 miles. A thermal recovery facility handling Ni-cd batteries was located in Pennsylvania. Mercury retorting facilities handling mercury-containing batteries and thermostats were in Pennsylvania and New York.
Distance from consolidation point to destination facility	EPA professional judgment.	The distances to disposal facilities was assumed to be 1,500 miles. Thermal recovery facilities handling Ni-cd batteries were located in California and Pennsylvania. Mercury retorting facilities handling mercury-containing batteries and thermostats were in Pennsylvania and New York.

Exhibit A-1 (continued)
Sources for Unit Cost Estimates

Cost Element	Source	Assumptions/ Methodology
Consolidation Costs		
Number of consolidation points	Metropolitan statistical areas obtained from "Statistical Abstract of the United States, 1991", Department of Commerce, Census Bureau.	Assumed one consolidation point per metropolitan statistical area. This leads to 268 consolidation points.
Cost per square foot of consolidation facility	"Analysis for RCRA Reauthorization." 1992, EPA.	Inflated the 1990 average cost of retail business space of $4.26 per square foot to 1992 dollars. $4.55 per square foot.
Warehouse size	EPA professional judgement.	EPA developed size based on the pounds of waste per drum and drum storage arrangements assumed to be appropriate. Assumed 55 gallon drum to be 2 ft by 3 ft. packed 2 deep with 4 feet of aisle space between rows. Assumed 16.36 lbs/ gallon. This resulted in 112 pounds of waste stored per square foot.
Reclamation Costs		
Reclamation costs	Telephone interviews with reclamation facilities.	Obtained price quotes from INMETCO, Mercury Refining, and Bethlehem Apparatus.

Exhibit A-1 (continued)
Sources for Unit Cost Estimates

Cost Element	Source	Assumptions/ Methodology
Recalled Pesticides		
On-Site Costs		
Contingency plan (Development)	Obtained from "Estimating costs for the Economic Benefits of RCRA Noncompliance," Draft Report, May 1993.	$2,000 per generator.
Bill of Lading	Personal communication with Lorie Prince of Ametech, Inc. Environmental Transportation Services, Chanute, Kansas, and EPA professional judgement.	Assumed .05 hours of a manager's time and .10 of an engineer's time to fill out the bill of lading. Assumed an additional .10 of an engineer's time to fill out DOT requirements on a shipping paper for hazardous materials transported by a common carrier. Labor rates used are $60 per hour for managers and $45 per hour for engineers. $12.00 per shipment.
Land ban notification	Information Collection Request Number 1442.04 "Land Disposal Restrictions for Newly Listed Wastes and Hazardous Debris", November 24, 1992.	Assumed a .10 hours on an engineer's time and .125 hours of clerical time, with labor rates of $45 and $27 per hour, respectively. $7.88 per shipment
Employee training	EPA professional judgment.	For compliance under the Proposed Part 273, assumed $200 per training course per generator and training for 4 employees per generator and requiring 1 hour per employee to attend the course, which resulted in a total of $309 per generator. For compliance under full RCRA Subtitle C requirements, assumed $300 per training course per generator and training 4 employees for 2 hours each. Additionally, 1 hour of labor was assumed for the plant manager and one half hour for a clerical person to maintain records. Total training costs under full RCRA Subtitle C requirements were $586 per generator.

Exhibit A-1 (continued)
Sources for Unit Cost Estimates

Cost Element	Source	Assumptions/ Methodology
Manifest	Hours per labor group from Information Collection Request Number 801 "Requirements for Generators, Transporters, and Waste Management Facilities Under the RCRA Hazardous Waste Manifest System", June 15, 1992. Hourly rate per labor group from Employment and Earnings, March 1993.	Assumed a total of .78 hours for completion and recordkeeping. Time for completion was divided disproportionately between a plant manager, engineer, and clerical personnel. $36.24 per shipment.
Shipping Costs		
Hazardous waste transport	EPA professional judgement based on EPA's 1990 Survey of Selected Hazardous Waste Management Industry.	Per pound costs were not available for less than truckload quantities. Full load averages were approximately 1.3 times higher than common carrier costs; multiplied the common carrier cost by a factor of 1.3.
Transport Distance	Cost Analysis of Hypothetical Pesticide Recall Actions U.S. EPA, Office of Pesticide Programs, July 19, 1991.	Assumed transportation to consolidation point was 300 miles.
Consolidation Costs		
Bonded warehouse (Consolidation Point)	Cost Analysis of Hypothetical Pesticide Recall Actions U.S. EPA, Office of Pesticide Programs, July 19, 1991.	Assumed to be single story structures with concrete floors, temperature control, sprinkler systems, security, and secondary containment. $1,629,071 per storage facility.
RCRA Facility Storage	Cost Analysis of Hypothetical Pesticide Recall Actions U.S. EPA, Office of Pesticide Programs, July 19, 1991.	Assumed to be single story structures with RCRA permits, insurance, concrete floors, temperature control, sprinkler systems, security, secondary containment, and ground water monitoring. $26,291,758 per storage facility.

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