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Economic Analysis of Final Effluent Limitations Guidelines and Standards for Commercial Hazardous Waste Combustors

ECONOMIC ANALYSIS OF FINAL EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS FOR COMMERCIAL HAZARDOUS WASTE COMBUSTORS

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Chapter 1

Introduction and Overview

1.1 Overview and definitions

The Federal Water Pollution Control Act Amendments of 1972 established a comprehensive program to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (Section 101(a)). To implement these amendments, the U.S. Environmental Protection Agency (EPA) issues effluent limitations guidelines and standards for categories of industrial dischargers. By regulation, EPA establishes guidelines and standards that represent the following.

- **Best Practicable Control Technology Currently Available (BPT)** BPT regulations apply to existing industrial direct dischargers, and generally cover discharge of conventional pollutants.

- **Best Available Technology Economically Achievable (BAT)** BAT regulations apply to existing industrial direct dischargers and the control of priority and non-conventional pollutant discharges.

- **Best Conventional Pollutant Control Technology (BCT)** BCT regulations are an additional level of control for direct dischargers beyond BPT for conventional pollutants.

- **Pretreatment Standards for Existing Sources (PSES)** PSES regulations apply to existing indirect dischargers (i.e., facilities which introduce their discharges into Publicly Owned Treatment Works, or POTWs). They generally cover discharge of toxic and non-conventional pollutants that pass through the POTW or interfere with its operation. They are analogous to the BAT controls.

- **New Source Performance Standards (NSPS)** NSPS regulations apply to new industrial direct dischargers and cover all pollutant categories.

- **<u>Pretreatment Standards for New Sources (PSNS)</u>** PSNS regulations apply to new indirect dischargers and generally cover discharge of toxic and non-conventional pollutants that pass through the POTW or interfere with its operation.

Table 1-1 below provides more detailed information about these six types of regulations.

This economic analysis (EA) assesses the economic impact of the effluent limitation guidelines and standards for the Commercial Hazardous Waste Combustor (CHWC) Industry. This rulemaking establishes BPT, BAT, BCT, PSES, NSPS and PSNS effluent limitations guidelines.

The final rule establishes national effluent limitations and pretreatment standards for a segment of the waste combustion industry – "commercial hazardous waste combustors." The segment of the universe of incineration units for which EPA has adopted regulations includes units that operate commercially and that use controlled flame combustion to treat or recover energy from hazardous industrial waste. For example, industrial boilers, industrial furnaces, rotary kiln incinerators and liquid-injection incinerators are all types of units included in the Commercial Hazardous Waste Combustor Subcategory. However, the rule does not include cement kilns, since EPA specifically exempts cement kilns from this final rule.

For the final rule, EPA identified only ten facilities that were discharging CHWC wastewater to a receiving stream or introducing wastewater to a POTW. Of these ten facilities, two facilities have, since 1992, either stopped accepting waste from off site for combustion or have closed their combustion operations. The economic analysis addresses the remaining eight operating facilities.

Table 1-1. Levels of Pollutant Controls

	CONTROLS ON DIRECT DISCHARGERS	CONTROLS ON INDIRECT DISCHARGERS
EXISTING SOURCES	**BPT** **Best Practicable Control Technology Currently Available** The lowest level of control, BPT targets conventional pollutants but can also control priority and nonconventional pollutants.	No controls for indirect dischargers comparable to BPT for directs, since indirect dischargers discharge wastewater into a POTW, which treats conventional pollutants.
	BCT **Best Conventional Pollutant Control Technology** Controls conventionals (i.e., conventional pollutants) only. Limits for conventionals must be equal to or more stringent than BPT.	No controls for indirect dischargers comparable to BCT for directs, since indirect dischargers discharge wastewater into a POTW, which treats conventional pollutants.
	BAT **Best Available Technology Economically Achievable** Applies to existing facilities. Usually, BAT limits only apply to priority pollutants and nonconventionals. BAT can only control conventional incidentally or as a surrogate / indicator for priority pollutants and/or nonconventionals. BAT limits can be equal to or more stringent than BPT regulations.	**PSES** **Pretreatment Standards for Existing Sources** Generally analogous to BAT regulations for direct dischargers. EPA determines which pollutants to regulate in PSES on the basis of whether or not they pass through, cause an upset in, or otherwise interfere with the operation of a POTW or its sludge practices. PSES usually begins with BAT control technology, adjusted on the basis of pass-through and interference considerations. Limits usually apply only to priority pollutants and nonconventionals. PSES can only control conventionals incidentally, as a surrogate / indicator for priority pollutants and nonconventionals, or if the industry discharges large enough loadings to cause a national problem for pass-through or interference.*
NEW SOURCES	**NSPS** **New Source Performance Standards** Applies to new sources. EPA can promulgate NSPS for conventionals on the basis of BPT limitations. NSPS limits can be equal to or more stringent than BPT regulations (e.g., require BPT technology plus additional treatment). EPA can promulgate NSPS for priority pollutants and nonconventionals on the basis of BAT limitations. NSPS limits can be equal to or more stringent than BAT regulations.	**PSNS** **Pretreatment Standards for New Sources** Applies to new sources. Generally analogous to NSPS. Generally promulgated for priority pollutants and nonconventionals

* Limits for oil and grease were set in Petroleum Refining to prevent nationwide interference problems. See 40 CFR-419.

1.2 Summary of the rule

The rule includes BPT, BAT, BCT, PSES, NSPS and PSNS limitations and standards. These are discussed below.

Best Practicable Control Technology (BPT)

EPA is promulgating BPT limitations for nine priority and non-conventional metal pollutants, TSS and pH.

Best Available Technology Economically Achievable (BAT)

EPA is promulgating BAT limitations equal to the BPT limitations for the non-conventional and priority pollutants.

Best Conventional Pollutant Control Technology (BCT)

EPA is promulgating BCT limitations equal to the BPT limitations for conventional pollutants.

New Source Performance Standards (NSPS)

EPA is promulgating NSPS limitations equal to the BPT/BCT/BAT effluent limitations for conventional, priority and non-conventional pollutants.

Pretreatment Standards for Existing Sources (PSES)

EPA is promulgating PSES limitations for nine priority and non-conventional pollutants.

Pretreatment Standards for New Sources (PSNS)

EPA is promulgating PSNS effluent limitations equal to the PSES effluent limitations.

1.3 Rationale for the limitations and standards

1.3.1 Rationale for the BPT/BAT/PSES Limitations and Standards

EPA is basing the final BPT limitations on the same treatment technologies it considered at proposal with one modification. The technology forming the basis of the limitations and standards is: two-stage chemical precipitation with and without sand filtration as a final step. See 63 FR at 6404. Based on a thorough analysis of the sampling data, EPA considered only one option for the final BPT/BAT/PSES limitations. EPA concluded that a two-stage precipitation process with or without a sand filtration polishing step provided the greatest overall pollutant removals at a cost that is economically achievable at most commercial hazardous waste combustion facilities.

The treatment system for which the EPA assessed performance is: Chromium Reduction (as necessary), Primary Precipitation, Solid-Liquid Separation, Secondary Precipitation, and Solid-Liquid Separation with (or without) Sand Filtration.

EPA is basing BPT limitations upon two stages of chemical precipitation, each followed by some form of separation and sludge dewatering. The pH levels used for chemical precipitation vary to promote optimal removal of metals because different metals are preferentially removed at different pH levels. In addition, chromium reduction precedes the first stage of chemical precipitation, when necessary. In some cases, BPT limitations would require the current treatment technologies in place to be improved by use of increased quantities of treatment chemicals and additional chemical precipitation/sludge dewatering systems. Sand filtration is employed at the end of the treatment train, if necessary.

The Agency has concluded that this treatment system represented the best practicable technology currently available and should be the basis for the BPT limitations for the following reasons. First, the demonstrated effluent reductions attainable through this control technology represent performance that may be achieved through the application of demonstrated treatment measures currently in operation in this industry. Three facilities demonstrate achievement of these removals and the technology is readily applicable to all facilities. Second, the adoption of this level of control would represent a significant reduction in pollutants discharged into the environment (approximately 94,000 pounds of TSS and metals). Third, the Agency assessed the total cost of water pollution controls likely to be incurred to meet the BPT limitations and standards in relation to the effluent reduction benefits and determined these costs were not wholly disproportionate to the effluent benefits achieved.

EPA is establishing BAT limitations based upon the same treatment technology used to establish BPT limitations. EPA did consider and reject zero discharge as a possible BAT technology for reasons discussed at length in the Notice of Final Rulemaking (published in the Federal Register) and in the "Development Document for Final Effluent Limitations Guidelines and Standards for Commercial Hazardous Waste Combustors" (EPA 821-R-99-020) (hereafter "Technical Development Document").

Based on new data received and analyzed by EPA following the proposal of the rule, EPA has decided to base PSES and BPT/BAT on the same treatment technology. This treatment technology is chromium reduction (as necessary) and two stages of chemical precipitation with (or without) sand filtration. EPA developed BPT/BAT limitations using sampling data from facilities both with and without a final sand filtration step. The data show that filtration may or may not be necessary to meet the final limitations, depending upon the level of treatment provided in the initial two stages of chemical precipitation. EPA, however, costed the PSES technology standards with sand filtration to ensure its economic achievability.

Section 307(b) of the Act requires EPA to promulgate pretreatment standards for pollutants that are not susceptible to treatment by POTWs or which would interfere with the operation of POTWs. EPA looks at a number of factors in deciding whether a pollutant was not susceptible to treatment at a POTW or would interfere with POTW operations – the predicate to establishment of pretreatment standards. First, EPA assesses the pollutant removals achieved at POTWs relative to those achieved by directly discharging systems using BAT treatment. Second, EPA estimates the quantity of pollutants likely to be discharged to receiving waters after POTW removals. Third, EPA studies whether any of the pollutants introduced to POTWs by combustors interfere with or are otherwise incompatible with POTW operations. EPA, in some cases also looks at the costs and other economic impacts of pretreatment standards and the effluent reduction benefits in light of treatment systems currently in-place at POTWs.

EPA is establishing PSES for this industry to prevent pass-through of the same pollutants controlled by BPT/BAT from POTWs to waters of the U.S. EPA has determined that all of the pollutants that "passed through" at proposal would "pass-through" and has consequently developed pretreatment standards for these pollutants.

1.3.2 Rationale for the BCT Limitations

EPA could not identify any technologies that achieve greater removals of conventional pollutants other than those associated with the BPT limitations. Because EPA did not identify any incremental conventional removal technology options that pass the BCT cost reasonable test, EPA is promulgating BCT limitations equal to the BPT limitations.

1.3.3 Rationale for New Source Performance Standards

EPA establishes NSPS limitations that are identical to those for BPT/BCT/BAT. The technologies used to control pollutants at existing facilities are fully applicable to new facilities. The Agency did consider basing NSPS on zero discharge but rejected this technology for reasons described in the Notice of Final Rulemaking (published in the Federal Register) and in the Technical Development Document.

1.3.4 Rationale for Pretreatment Standards for New Sources

EPA established PSNS limitations that are identical to those for PSES. EPA has decided to base PSNS on the same technology as it used for BPT/BAT and for PSES. The Agency considered energy requirements and other non-water quality environmental impacts and found no basis for any different standards than the established PSNS.

1.4 Structure of the economic analysis

This EA describes both the methodology employed to assess impacts of the rule and the results of the analyses. Figure 1-1 summarizes the overall structure of the impact analysis. The two main inputs to the analysis are data on industry baseline financial and operating conditions and projected costs of complying with the rule. EPA based the industry baseline financial and operating data are based principally on the CHWC survey conducted under the authority of Section 308 of the Clean Water Act.

All eight facilities EPA expects to be affected by the CHWC rule received and completed the detailed survey. The survey asked for balance sheet and income statement information, as well as quantitative and qualitative information regarding each facility's dependence on market sectors, types of customers and business activity. The survey asked facilities to characterize the competition they faced in various markets. The survey also gathered data regarding facility liquidation value, cost of capital and the facility's owning firm. EPA supplemented data obtained from the survey with secondary sources, including trade literature and public filings.

In addition to baseline facility data, the second major type of data input to the analysis is the technical estimate of costs associated with compliance with the regulatory options. EPA developed these estimates based on engineering analysis of the facilities. EPA incorporated the cost estimates into the economic analysis by adding an annualized capital cost of compliance to the estimated annual operating and maintenance costs of compliance to yield a single, total annualized compliance cost estimate.

EPA used baseline financial data and estimated annualized compliance costs to calculate baseline and post-compliance cash flows at the level of the entire facility as well as for waste treatment operations alone. EPA considers facilities that change from non-negative to negative facility-level cash flows as a result of incurring compliance costs closures associated with the regulation. EPA also calculated the ratio of compliance costs to revenue as a secondary measure of financial stress short of closure.

The economic analysis uses the results of the facility-level cash flow analysis to develop the other components of the EA (see Figure 1-1). The firm-level impact analysis evaluates the effect of facility-level compliance costs on the parent firm. The community impact analysis examines how employment losses due to projected facility closures affect not only the people employed by the facility but also the communities to which these people belong. EPA examined whether CHWC closures might influence the U.S. trade balance by decreasing export-related activity and increasing imports.

EPA also examined the guideline to determine if it would create barriers to entry. If existing firms were to gain a significant financial advantage over new firms in complying with the guideline, then the guideline might deter new entrants and reduce market competition.

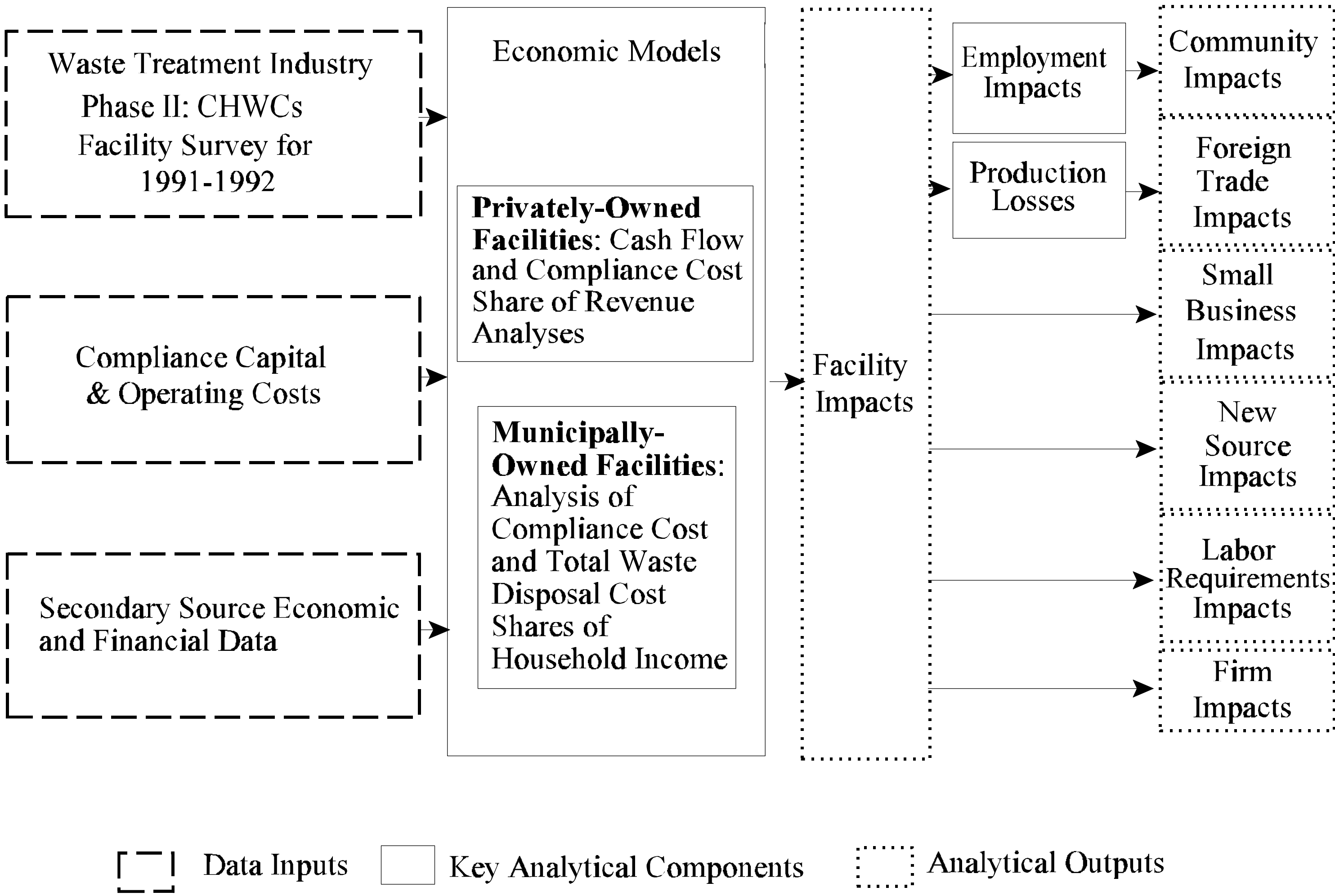
Finally, EPA assessed the regulatory impact on small businesses, in accordance with the requirements of the Regulatory Flexibility Act. The key methodological component of this analysis was the identification of small businesses. EPA used small business thresholds provided by the Small Business Administration, which defines small businesses by firm-level employment or revenues, depending on the industry.   In the

Regulatory Flexibility Analysis, EPA applied these thresholds and found no small businesses among the ten facilities.

1.5 Organization of the economic analysis report

This report presents the remaining parts of the economic analysis as follows. Chapter 2 describes the data sources consulted for this EA. Chapter 3 profiles the CHWC industry and examines the economic and financial structure and performance of its markets. Following the background material in Chapters 2 and 3, Chapter 4 details the methodology used to estimate facility impacts and presents the results. Chapters 5 through 9 connect the results of the facility impact analysis to potential collateral effects on firms, foreign trade, communities, new entrants and small businesses. Chapter 10 presents the water quality-related benefits associated with achievement of the rule. Chapter 11 details the cost reasonableness methodology and presents the results.

Figure 1-1
Economic Impact Analysis of the CHWC Industry
Effluent Limitations Guidelines: Analytic Components



Chapter 2
Data Sources

2.1 Introduction

This chapter describes the primary and secondary sources that provided economic and financial data used to assess the expected economic impact of the CHWC rule.

2.2 Primary source data

EPA, under the authority of CWA Section 308, sent out the Waste Treatment Industry Phase II: Incinerators 1992 Screener Survey (OMB Approval Number: 2040-0162) and the 1994 Waste Treatment Industry Phase II: Incinerators Questionnaire (OMB Approval Number: 2040-0167). These survey efforts covered all ten of the facilities EPA is regulating under the CHWC rule. Two of these facilities have either stopped accepting waste from off-site for combustion or have closed their combustion operations. The survey obtained 1991 and 1992 information on the technical and financial characteristics of facilities to estimate how facilities would be affected by an effluent guideline.

The technical data obtained by the survey include information on facility operating processes that use water, the quantities of water and pollutants discharged by the various processes, and the treatment systems that are currently in place for managing discharge of pollutants and other data. These data provided the basis for estimating treatment system and process change costs for complying with various rule options. The estimated technical costs for compliance in turn yielded estimates of the capital and operating costs of treatment systems and any production costs or savings that would accompany installation and operation of a treatment system. For a detailed description of the technical data obtained by the survey and the related engineering and cost analyses leading to estimates of technical compliance costs, see the Technical Development Document.

The survey also obtained a variety of financial data from the facilities. These data include the following.

- two years (1991-1992) of income statements and balance sheets at the facility and firm levels
- selected financial data for incinerator and waste treatment operations
- estimated value of facility assets and liabilities in liquidation
- borrowing costs
- employment at the level of the facility as well as by type of operation
- characterizations of market structure

Some respondents attached annual reports or equivalent supporting documents. The financial data obtained in the survey provided the basis for assessing how the effluent guidelines are likely to affect facilities and product lines.

In addition to the survey, EPA obtained facility- and firm-specific data from Form 10-K submissions to the Securities and Exchange Commission and from company press releases and profiles on the internet.

EPA received detailed financial data from all ten facilities included in the CHWC rule.

2.3 Secondary source data

EPA used secondary source data in a number of economic analyses in this document. In addition, secondary source data helped to characterize and update background economic and financial conditions in the national economy and in the CHWC industry. For example, EPA used secondary source data to track the numerous consolidations and facility closures since administering the survey. Secondary source data also contributed significantly to the firm-level analysis and to the characterization of future prospects. Secondary sources used in the analysis included the following.

- 1987 to 1992 *U.S. Industrial Outlooks*, published by the Department of Commerce, which supplied information for Chapter 3
- Small business thresholds, by 4-digit industry group from the Small Business Administration, used in the Regulatory Flexibility Analysis and in the preliminary statistical analyses
- Industry sources and trade publications (especially *EI Digest* and *The Hazardous Waste Consultant*), which contributed to the incinerators profile presented in Chapter 3 and to the facility and firm-level impact analyses

- *Regional Multipliers: A User Handbook for the Regional Input-Output Modeling System (RIMS II) 2nd Edition*, published by the Bureau of Economic Analysis, provided regional multipliers
- Financial databases, including Robert Morris Associates' *Annual Statement Studies*, Dun & Bradstreet's Million Dollar Directory and the Dun & Bradstreet company database. These sources provided diagnostic financial ratios and firm-level income statement and balance sheet values, as well as supplementary identification data
- The FY 1997 *Economic Report of the President* provided Producer Price Index series
- *County Business Patterns*, published by U.S. Bureau of Census
- *Canadian News Wire*
- Market Guide "Company Snapshots"

Chapters for each component of the economic analysis discuss in detail relevant sources.

Chapter 3
Profile of the Commercial Hazardous Waste Combustor Industry

3.1 Introduction

Though still relatively young, the Commercial Hazardous Waste Combustor[1] Industry has progressed from rapid growth in its inception to overcapacity during the early- and mid-90s to a period of increasing financial stability that appears to be emerging from recent consolidations.

This chapter presents a brief economic profile of the market segment to which the CHWC effluent guidelines will likely apply. Because the industry continues to evolve, the profile provides information on the recent years since the proposed rule and to the near-term future. The Economic Analysis and Cost-Effectiveness Analysis of Proposed Effluent Limitations Guidelines and Standards for Industrial Waste Combustors (EPA 821-B-97-010) provides an extensive economic profile of the entire commercial waste combustion industry and compares the 1991-1992 period of the survey to the period through 1997.

Since this chapter supports the economic analysis, it emphasizes economic characteristics that relate to the industry's ability to absorb or pass-through compliance costs to customers. The two most important characteristics involve market risk.

1. The capital intensiveness of the production process and the long lead-times needed for facility construction and permitting make it difficult for firms to respond quickly to exogenous market shocks, such as unforeseen technological or regulatory developments.

2. Waste combustors potentially face considerable short term volatility in market demand, because they depend closely upon client industries that respond strongly to business cycles. A significant

[1] For the purposes of this economic analysis, "waste combustors" will refer to the commercial hazardous waste incinerators, boilers and industrial furnaces subject to the rule.

portion of waste combustor client industries also have access to close substitutes – especially waste minimization.

Management strategies apparently exist that can deal effectively with the special challenges waste combustors face. While some members of the industry have suffered crippling financial setbacks in recent years, others have managed to grow. Waste combustor parent firms have reduced risk from market volatility by consolidating. Various types of waste combustor facilities have responded to the emergent regulatory and technological environment through an aggressive series of market entry and exit decisions.

In short, the industry responded in recent years to some of the risk issues inherent to the waste treatment business and to the secular decline in aggregate market size. It remains to be seen what effect these responses will have on the financial condition of facilities, but the perennially pessimistic forecasts that have become the norm for the industry no longer seem viable.

The following section defines relevant terms and explains the structure of the hazardous waste combustion industry. After the overview, the profile discusses likely economic prospects for the industry in the near future. The profile then focuses on the portion of hazardous waste combustion EPA expects will be required to comply with a CHWC rule, drawing from the incinerators survey, publicly available electronic databases and the sources previously cited.

3.2 Industry definitions

The CHWC industry includes facilities that provide a waste treatment or disposal service by burning hazardous industrial wastes. Some facilities use the heat energy generated from combustion to produce some other commodity. Facilities that burn wastes without recovering heat energy as an input to some other industrial application are *incinerators*. Facilities that use the heat of combustion as an input to some other industrial production process are *boilers and industrial furnaces*, or *BIF*s.

Another characteristic that subdivides the industry is whether a facility provides waste combustion services to other facilities or burns wastes produced by other activities at the same site. *Commercial* waste combustors offer services to off-site generators (sources) of wastes. Commercial waste combustors also include those incinerators and BIFs that accept both on-site and off-site wastes. Facilities that burn only on-site wastes are *non-commercial* incinerators or BIFs. A full discussion of the scope and applicability of the final rule, including relevant definitions is presented in the Notice of Final Rulemaking (published in the Federal Register).

The final rule establishes national effluent limitations and pretreatment standards for a segment of the waste combustion industry – “commercial hazardous waste combustors.” The segment of the universe of incineration units for which EPA has adopted regulations includes units which operate commercially and which use controlled flame combustion in the treatment or recovery of energy values from hazardous industrial waste. For example, industrial boilers, industrial furnaces, rotary kiln incinerators and liquid-injection incinerators are all types of units included in the Commercial Hazardous Waste Combustor Subcategory. However, it does not include cement kilns, since EPA specifically exempts cement kilns from this final rule.

Incinerators burn a wide range of wastes, including those that have low energy content and those that have a high hazardous content. BIFs burn a more limited range of wastes than other incinerators, depending on the production process in which they are integrated, but they can do so at a lower cost. BIF's costs are lower than costs for other incinerators because the value of their produced energy offsets purchased energy costs. Furthermore, some costs of BIF combustion equipment is required for the associated production process. Thus, incinerators are generally more versatile, while BIFs are generally less costly.

The decision to send wastes to an off-site, commercial waste combustor as opposed to an on-site facility depends largely upon the quantity of wastes generated. A manufacturer that produces a large quantity of wastes can save transportation costs, reduce combustion cost variability, address liability concerns and/or utilize existing equipment by combusting waste on-site, in a non-commercial incinerator or BIF. On the other hand, a manufacturer that produces lesser quantities of wastes may not be able to recover the capital and operating costs of an on-site incinerator or BIF, and might thus turn to a commercial waste combustor.

3.3 Recent changes in the CHWC market

The CHWC industry is a small and contracting industry that is becoming increasingly integrated, both vertically and horizontally. After several decades of growth, the industry found itself mired in overcapacity by the beginning of the 1990s, when the regulatory environment that had launched waste combustion as a growth industry began to yield more complex, and sometimes adverse, effects on the size and profitability of the market.

In 1984, EPA promulgated restrictions on how hazardous waste generators could dispose of their wastes. Where generators had previously sent untreated waste to landfills, they now had to find alternative methods of treating and disposing wastes. Combustion proved attractive because it often met the Best Demonstrated Available Technology requirement of EPA's disposal restrictions and because combustion effectively destroyed some organic wastes that other treatment methods could not manage as well.
Over time regulation of waste disposal encouraged generators to reduce their output of wastes in the first place. Not only can waste minimization often cost less than alternative management methods, but some waste minimization and pollution prevention techniques improve the technical and economic efficiency of the production process. Generators found numerous ways to increase profits by reducing wastes.

Related regulatory actions since proposal

Recently, under the joint authority of the Clean Air Act (CAA) and the Resource Conservation Recovery Act (RCRA), EPA promulgated the Hazardous Waste Combustion (HWC) MACT (64 FR 52828, September 30, 1999). These final regulations apply to the following types of combustors:

- RCRA Incinerators (as defined in 40 CFR 260.10)

- RCRA Cement Kilns and RCRA Lightweight Aggregate Kilns (as defined in 40 CFR 260.10 under the Industrial Furnace definition)

These regulations do not apply to:

- RCRA Boilers and Industrial Furnaces (other than Cement Kilns and Lightweight Aggregate Kilns, as defined in 40 CFR 260.10)

The HWC regulations establish stack emission limits for several hazardous air pollutants (HAPs). Under the Clean Air Act (CAA), these limits must require the maximum achievable degree of emission reductions of HAPs, taking into account the cost of achieving such reductions and non-air quality health and environmental impacts and energy requirements -- so-called Maximum Achievable Control Technologies

(MACT) standards. The HWC regulation does not set limits on the water effluents from the air pollution control systems (APCS) (like wet scrubbers, quench systems). As a result of promulgation of these standards, it is likely that some facilities using dry air pollution control, not presently generating wastewater, may switch to using wet APCS.

Changes since proposal and future prospects

Despite the inherent difficulty of forecasting the commercial hazardous waste combustion market, the data show several unequivocal trends.

The industry will clearly be more heavily concentrated, as major players continue to buy former competitors. Consolidation makes strategic sense, from a theoretical perspective, because of the high entry and exit costs. Uncertainty in market demand exposes individual facilities to a high risk of being unable to finance their substantial sunk costs. However, large firms that control a number of different stages in the waste treatment, storage and disposal process, employing a range of technologies, can better hedge against shifts in preferred waste management methods in response to unexpected regulatory developments or unforeseeable technological changes in client industries.

Consolidation is also the theoretically expected response to the fierce price competition that characterized the 1990s. In fact, the reduction in capacity during the period before proposal (often due to acquisitions) greatly lessened one of the most important reasons cited by industry participants for depressed prices: overcapacity. In 1999, *EI Digest* reported that commercial incinerator utilization rates remained high, at 70 percent of practical capacity in 1998, and consolidations, conversions and closures have continued strongly.[2] In 1998, utilization of total capacity declined slightly to 67 percent because total capacity grew slightly faster than combustion volume.

The future path of capacity and utilization is unclear in the face of proposed expansion as well as anticipated exits. Finalization of the Hazardous Waste Combustion MACT standards also introduces uncertainty.

[2] Cited in the HWCR EIA, page 2-14.

Significant obstacles clearly remain. Waste minimization continues to threaten the total size of the market. However, even in the face of steady or declining aggregate volumes of hazardous waste, commercially incinerated quantities could nevertheless rise. Public opposition to new permits continues, but this is less of an issue since the industry is more interested in consolidating ownership and closing excess capacity than applying for new permits.

While no one forecasts a financial boom, the elements appear to be in place to reverse some of the severe stresses to date. High entry and exit barriers plus horizontal and vertical integration make a recipe for economic empowerment. Major players expect market demand to stabilize or grow slightly. Finally, a growing number of states have adopted differential fees for disposing of wastes – fees that favor combustion over land disposal.

3.4 Potentially Affected Facilities

In 1994, EPA received detailed data from all ten CHWCs relevant to the rule. This section of the profile examines the survey data as well as other, secondary source data for these facilities. The survey requested data for the 1991 and 1992 fiscal years.

Market structure and size

While the choice of combustion over alternative methods of managing wastes may respond sensitively to economic and regulatory events, the financial health of facilities does not share the volatility characteristic of combustion quantities. In addition to the fact that a few large firms dominate a market of relatively atomistic customers, commercial hazardous waste combustion tends to be a relatively small part of all the activities at the facilities and the firms that own them.

Since 1992, the industry has consolidated under fewer parent firms, and many of the facilities have ceased hazardous waste combustion. In the survey, two respondents identified themselves as “independently owned.” However, as of the beginning of 1997, all of the respondents belonged to a multi-site firm.[3]

[3] While it is probable that some of this difference may arise from the ambiguous interpretation of the question's term “independently owned,” EPA has identified the pattern of consolidation on a facility-by-facility basis from secondary sources.

This section presents most of the discussion of current conditions in the industry at the firm level, because of the recent consolidations. The ability of facilities to finance compliance costs should be seen in the context of parent corporation financial health and market strategies. Information regarding firms come from two trade journals – *EI Digest* and *Hazardous Waste Consultant* – in addition to the following sources: Form 10-Ks, attachments to survey responses, facility and parent firm press releases, *Canadian News Wire* and the "Market Guide Company Snapshot."

Consolidation among suppliers in the commercial hazardous waste combustion market appears to have augmented the market power of suppliers asymmetrically, compared to customers. The expectation of industry observers that prices will recover from their recent declines supports the implications of the structural developments in the market.

Survey responses identify other incinerators and BIFs as the primary source of competition. Only one respondent identified a landfill as a major competitor in the respondent's market.

Financial condition

The financial performance of facilities varies widely between facilities as well as over time. This instability applies to both the survey and current periods, making generalizations and comparisons difficult. Revenues are currently increasing for the firms for which financial data were available from public sources. Corporate Form 10-Ks indicate less financial stress in recent years than they did in the survey period. Because directly comparable data are scarce, this section will present some summary facility data from 1991 and 1992, selecting highlights from available financial news regarding the recent performance of firms that own facilities.

Return on assets is a more stable measure of profitability than return on equity, which can be and frequently is manipulated through debt-equity management. Return on assets averaged 11.57 percent in 1991 and 18.37 percent the following year. Both of these are healthy values, but they exclude two facilities that changed ownership during the period and were not able to provide complete data.

Management strategies

Hazardous waste combustors responded to the financial stress of the 1980's and 1990's by integrating both horizontally and vertically, resulting in the industry structure described earlier in this chapter. These firms continue to pursue a strategy of reducing market risk by mixing asset types and closing facilities particularly vulnerable to market volatility.

One firm that exemplifies the current strategies describes itself as a "one source service provider" with over a dozen facilities in 1996. Through acquisitions, the firm sought to integrate vertically rather than horizontally, closing some duplicative capacity while maintaining facilities that diversified its capabilities.

However, the firm has not completely eliminated its access to the capacity it has closed. Recognizing the variability in market demand, this firm created a "ready" status where "incineration can begin quickly when market demand warrants."[4] This kind of flexible capacity strategy has helped a number of industries retain market share during periods of peak demand without incurring high costs of idle capacity during periods of lower demand.

The same illustrative firm also developed an interesting strategy of accumulating wastes for periodic rather than continuous incineration. Therefore, facilities can operate at economically and technically efficient flow rates even if the total quantity of wastes varies widely from one month or year to the next.

3.5 Representativeness of the survey period

When EPA developed the survey, the Agency selected 1991 and 1992 as the years for which respondents would report economic and financial data. These were the years with the most recent complete data available at the time, and no other years were more representative of the industry than the selected years.

The reason for this is two-fold. First, the CHWC industry has undergone a continuous progression of changes from the 1980's to the present. The most recent data resemble the current state of the industry more than any prior year of data. This is not true of all industry surveys; industries that exhibit a cyclical

[4] From a Form 10-K filing with the Securities and Exchange Commission.

pattern of performance may be better represented by selecting a specific segment of the business cycle rather than the most recent year.

Another consequence of the monotonic pattern of the industry's development is that a brief period is more accurate than a broad period of analysis. Unlike a cyclical industry, where gathering data over several years can allow averaging over a business cycle, an industry undergoing continuous change in one direction over a long period of time is not expected to return to conditions present at any point in the past. Therefore averaging over a greater period of time includes increasingly irrelevant data. EPA's choice of two years rather than more provides a snapshot that is less "contaminated" by conditions in an earlier period that the industry had left behind. Choosing two years rather than one allows some accommodation of random shocks not associated with time and also allows EPA to recognize and analytically accommodate facilities that began or ceased operations immediately before or after a particular year.

The period selected captures characteristics of the industry that followed some significant consolidations, though significant further acquisitions have continued in intervening years. However, even current data are not likely to reflect the impact of other management strategies described above relating to capacity control. Any trends in profitability due to increasing integration since the survey years probably would not be statistically distinguishable from the profitability data gathered, because of the extremely high variability of observed data. The standard deviation of observed return on assets across the relevant facilities, for instance, is over 1.05 (105 percent) – far overwhelming any change in observed return on assets ratios one could reasonably expect between the survey years and the present.[5]

While the industry has undergone some important changes since the survey, the survey period probably represents the current economic and financial condition of the industry better than any other period that EPA could have selected at the time. Current quantitative measures of financial performance are likely to be statistically indistinguishable from measures calculated on survey data. Integration has continued, with Canadian-ownership increasing its presence in the hazardous waste market. The industry has introduced some management strategies aimed at reducing the risk of demand fluctuations.

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[5] This 1.05 value is not the same as the observational standard deviation from which a confidence interval can be directly calculated. However, combined with the small number of observations, the variation in profitability presented does indicate the difficulty of determining statistically significant changes.

Chapter 4
Facility Impact Analysis

4.1 Introduction

The facility-level economic impact analysis assesses how the CHWC rule would affect individual facilities, as opposed to the firms that own them. While facilities are geographically contiguous entities, a firm might own more than one facility, at various locations. While Chapter 5 assesses firm-level impacts, this chapter provides the basis for estimating the extent of facility closures and associated production and employment losses that may result from the rule.

This analysis draws largely from facility data obtained from EPA's 1994 Waste Treatment Industry Phase II: Incinerators Questionnaire. EPA used engineering analysis of technical survey and other data to generate estimates of facility costs of complying with each regulatory option. In this chapter, EPA uses economic and financial responses from the survey to evaluate the impact of compliance costs on the financial condition of facilities.

Based on this analysis, EPA finds that the incinerator rule is economically achievable and will not subject affected facilities to unmanageable or unreasonable financial or economic burdens.

The major sections of this chapter explain the methodology behind each component of the facility impact analysis and present the results. EPA applied two kinds of financial tests:

- **After-Tax Cash Flow Test**. This test examines whether a facility loses money on a cash basis. If a facility's cash flow is negative when averaged over the period of analysis, then EPA finds that the facility's management and ownership will experience unmanageable or unreasonable financial or economic burdens.

- **Compliance Cost Share of Revenue**. This test examines whether a facility's estimated compliance costs amount to more than 5 percent of revenue, in which case EPA finds that the facility will experience unmanageable or unreasonable financial or economic burdens.

EPA applied the cash flow test to all eleven facilities that returned detailed surveys. Two additional facilities that EPA expects will incur costs under the CHWC rule did not submit the detailed financial data necessary for the cash flow test, so EPA conducted only the compliance cost share of revenue test for these two facilities.

4.2 Compliance costs

EPA technical analysis yielded estimates of how much each facility would need to spend to comply with each regulatory option.[6] There are two components to estimated expenditures: *operating and maintenance costs* component, which recurs annually, and a one-time *capital cost of compliance* component. In order to perform the economic impact tests, EPA combined the two cost components into a single *annualized* cost. Based on properly calculated annualized cost is properly calculated, the facility should be indifferent between: a) incurring the annualized cost every year, and b) incurring a capital cost plus operating and maintenance cost the first year and then only operating and maintenance costs each subsequent year.

EPA conducted the facility impact analysis on an after-tax basis because after-tax cash flow is the portion of cash flow that the facility can use to meet regulatory compliance costs. After-tax cash flow commonly indicates the ongoing viability of business enterprises. In this analysis, EPA calculated after-tax annualized costs (ATC_{Ann}) as follows:

$$\mathbf{ATC_{Ann} = ATC_{OM} + ATC_{C,Ann}}$$

where

ATC_{Ann}	=	After-tax annualized cost of compliance
ATC_{OM}	=	After-tax operating and maintenance cost of compliance

[6] See Development Document for Final Effluent Limitations Guidelines and Standards for Commercial Hazardous Waste Combustors, EPA-821-R-99-020.

$ATC_{C,Ann}$	=	After-tax annualized capital cost of compliance

The only adjustment needed to calculate ATC_{OM} from technical estimates of operating and maintenance costs is to subtract the offsetting benefit the facility would experience from reduced taxes. EPA used a marginal corporate tax rate of 34 percent, which implies that for every dollar of operating and maintenance compliance costs, before taxes, the facility would lose 66 cents in after-tax profit. Therefore,

$$ATC_{OM} = (1 - \tau) \times C_{OM}$$

where

ATC_{OM}	=	After-tax operating and maintenance cost of compliance
C_{OM}	=	Operating and maintenance cost of compliance (pre-tax)
τ	=	Marginal corporate tax rate (34% in this analysis)

After adjusting for taxes, EPA annualized the technical estimates of capital costs of compliance. EPA annualized capital costs by amortizing them over 15 years, using a discount rate of 7 percent. The 15 year time period conforms with EPA practice and reflects a technical estimate of the useful life of the relevant kinds of capital. The 7 percent discount rate – also OMB's measure of the social opportunity cost of capital (see Executive Order #12866) – represents a reasonable estimate of the real, after-tax cost of capital for a typical facility using both equity and debt financing.[7] EPA showed, in developing the CHWC rule impact methodology, that annualized compliance costs are only modestly sensitive to large variations in the discount rate.

To calculate offsetting tax benefits, EPA used straight-line depreciation over 15 years – the estimated useful lifetime of the relevant capital goods. Therefore, the facility applies 1/15th of the capital cost of compliance to each year's income calculations for tax purposes. Tax codes in effect at the time of this

[7] EPA performed a sensitivity test in the Metal Products and Machinery Phase 1 proposed effluent guidelines economic analysis to show that annualized costs are quite insensitive to discount rates over a reasonable range. In a review of prior economic impact analyses, the Office of Water similarly found that the use of OMB's 7 percent rate may be preferable to collecting facility-specific measures of costs of capital because of the burdensome data requirements and the practically insignificant analytical benefits associated with alternatives. (See “Review of Data Gathering and Methodology Issues for Effluent Guideline Economic Impact Analyses (Draft),” August 1996.)

analysis allow businesses to use straight-line depreciation or a Modified Accelerated Cost Recovery (MACRS) depreciation schedule.[8] EPA chose the straight-line method for this analysis because it is the simpler and more conservative method.

The following equation calculates the annualized, after-tax capital cost of compliance.

$$ATC_{C,Ann} = \frac{r}{1-(1+r)^{-t}} \times C_C - \frac{C_C}{t} \times \tau$$

where

$ATC_{C,Ann}$	=	After-tax annualized capital cost of compliance
C_C	=	Capital cost of compliance
r	=	Discount rate (7 percent in this analysis)
t	=	Amortization period (15 years)
τ	=	Corporate tax rate (34 percent)

In the above formula, the first expression on the right-hand side is the annualized equivalent of the lump sum capital cost, C_C. The second expression is the offsetting benefit in the form of reduced taxes associated with depreciation. Each year, the taxable income is reduced by 1/15 the total capital cost of compliance. The tax associated with that depreciation is τ times the depreciation.

Substituting numeric values into the above formulas, the calculation of annualized, after-tax compliance costs becomes:

$$ATC_{Ann} = 0.66 \times C_{OM} + (0.1098 \times C_C - \frac{C_C}{15} \times 0.34)$$

where

[8] The "15-year" class of depreciable property includes "municipal wastewater treatment plants" and other property with a class life of 20 to 25 years. *1992 U.S. Master Tax Guide*, Commerce Clearing House, Inc., 1991.

ATC_{Ann}	=	After-tax annualized cost of compliance
C_C	=	Capital cost of compliance
C_{OM}	=	Operating and maintenance cost of compliance

ATC_{Ann} is the compliance cost subtracted from baseline cash flow in the after-tax cash flow test, and it is also the value compared to total revenue in the compliance cost share of revenue test.

Offsetting revenue increases

While some facilities might offset a portion of compliance costs by passing them through to customers in the form of higher prices, EPA used the conservative assumption in this analysis of zero cost pass-through. Since EPA finds that no facilities would bear unmanageable impacts in the zero cost pass-through case, it follows that none would bear unmanageable impacts under any other cost pass-through assumption.

Some facilities might also substitute non-hazardous for hazardous waste or change from combustion activities to alternative waste treatment techniques. The current facility impact analysis excludes these dynamic, long-run responses that can mitigate the financial impact of effluent guidelines.

Table 4-1 shows the aggregate compliance costs for the selected options.

Table 4-1. Total Costs of Regulatory Options

	Sites	Capital Costs (Million 1998$)	O&M Costs (Million 1998$)	Pre-Tax Annualized Costs (Million 1998$)	After-Tax Annualized Costs (Million 1998$)
All CHWCs	8	8.19	1.97	2.87	2.01

4.3 After-tax cash flow test (severe impacts)

EPA conducted the after-tax cash flow test both in the baseline case and post-compliance case as an indicator of severe impacts. If a facility's baseline cash flow is not negative, but, after incurring estimated compliance costs, the facility's cash flow becomes negative, then EPA determines that facility will experience unmanageable or unreasonable financial or economic burdens *as a result of the rule* and the facility will likely close. If, on the other hand, a facility exhibits negative cash flow before the adoption of a CHWC rule, then the negative cash flow must be attributed to some prior cause.

EPA conducted the after-tax cash flow test once using facility-wide income statement values and again using revenues, costs and expenses specifically associated with waste treatment operations. The former analysis measures the impact of alternative regulatory options on the financial health of the affected business entity. The second analysis yields additional insight into how management may perceive the impact the CHWC rule has on the mix of operations within a facility.

Methodology

The after-tax cash flow test involves calculating, for each sample facility, the average after-tax cash flow (ATCF) over the years for which income statement data were obtained in the survey. The calculations are as follows:

1. <u>Express all income statement values for a sample facility as a two-year average, in 1992 constant dollars, based on the Producer Price Index for finished goods (PPI)</u>. The PPI is the appropriate deflator because waste combustion services are purchased primarily by commodity producers late in the production process. The survey requested financial data for 1991 and 1992, and most facilities reported values for each of these years. However, a few facilities were not in operation in one or more of these years, or accounting procedures changed during the period in a way that precluded responding for one of the years. For these facilities, the average is the properly deflated value for the year for which the respondent reported data.

2. <u>Compute facility-level after-tax cash flow in 1992 dollars for each year of data.</u> The following equation computes the *After-Tax Cash Flow* (ATCF).

$$\mathbf{ATCF = (1-\tau)(R-C_T+D)}$$

where

ATCF	=	After-tax cash flow
R	=	Total revenue (1991-1992 average)

C	=	Total costs and expenses (1991-1992 average)
D	=	Depreciation expense (1991-1992 average)
τ	=	Average tax rate, calculated by dividing average reported income taxes by average earnings before taxes

3. Repeat using revenue and costs specific to waste treatment operations.[9] In this iteration, the relevant revenue is the revenue from waste treatment, as reported in the survey responses. Facilities reported costs specifically for the waste treatment portion of facility activities. EPA allocated overhead expenses – including sales, general and administrative, and depreciation expenses – were allocated to waste treatment in proportion to costs. The calculation of after-tax cash flow becomes:

$$ATCF_{wt} = (1-\tau)[R_{wt} - (C_{wt} + \omega \times C_{OH}) + \omega \times D]$$

where

$ATCF_{wt}$	=	After-tax cash flow, waste treatment operations alone
R_{wt}	=	Waste treatment revenue (1991-1992 average)
C_{wt}	=	Waste treatment costs (1991-1992 average)
C_{OH}	=	Facility overhead expenses (1991-1992 average), including sales, G&A, interest and depreciation
D	=	Depreciation expense (1991-1992 average)
ω	=	Share of facility costs attributable to waste treatment, recycling/recovery, and/or disposal operations, calculated by dividing total waste treatment costs by the sum of waste treatment costs, costs of goods sold for products manufactured, and cost of other goods and services sold
τ	=	Average tax rate, calculated by dividing average reported income taxes by average earnings before taxes

[9] To target combustion operations alone, EPA performed the cash flow test using the same methodology described here, but substituted combustion response values for waste treatment response values. EPA performed this alternative analysis and found no difference in results.

4. Calculate post-compliance cash flows. The above calculations yielded baseline after-tax cash flows, based on survey responses. EPA estimated post-compliance cash flows by subtracting After-tax annualized compliance costs from baseline cash flows. Thus,

$$ATCF_{pc} = ATCF - ATC_{Ann}$$
$$ATCF_{wt,pc} = ATCF_{wt} - ATC_{Ann}$$

where

ATC_{Ann}	=	After-tax annualized cost of compliance
ATCF	=	Baseline after-tax cash flow, facility
$ATCF_{wt}$	=	Baseline after-tax cash flow, waste treatment only
$ATCF_{pc}$	=	Post-compliance after-tax cash flow
$ATCF_{wt,pc}$	=	Post-compliance after-tax cash flow, waste treatment operations alone

Results

At the level of the facility, EPA found that none of the CHWCs in the analysis will experience negative cash flows as a result of the rule.

EPA conducted the analysis at the waste treatment level for six facilities that submitted detailed facility data. Of the six facilities, one experiences negative cash flow post-compliance. Therefore, EPA determines one facility to be a regulatory closure. Table 4-2 presents a summary of these results. EPA concludes the cost of installation of the selected control technology is economically achievable, with only one facility experiencing a line closure as a result of the CHWC final rule. Because the BPT/BAT/PSES technology is economically achievable for 7 of the 8 CHWC facilities identified, EPA concludes that it is an appropriate technology upon which to base BPT/BAT/ PSES.

Table 4-2. Summary of After-Tax Cash Flow Test Results

	Waste Treatment Operations		**All Facility Operations**	
# of Facilities	**Baseline**	**Post-Compliance**	**Baseline**	**Post-Compliance**
Total	6	6	8	8
Cash flow < 0	0	1	0	0

4.4 Compliance cost share of revenue test (moderate impacts)

In addition to the after-tax cash flow test, EPA also conducted a compliance cost share of revenue analysis that offers perspectives on economic impacts that cash flow analysis cannot offer. In this test, annualized compliance costs (C_{Ann}) calculated in the usual way are expressed as a ratio to revenues. EPA judged compliance costs that amount to less than 5 percent of revenues to cause moderate adverse impacts short of closure, though ratios greater than 5 percent do not necessarily indicate unachievable. EPA has frequently used this standard in the past to measure the financial impact of compliance costs.

EPA performed the compliance cost share of revenue test once using facility-wide revenues and again using revenues specifically associated with waste treatment operations. As in the cash flow test, the facility-level analysis provides the best assessment of economic achievability for the regulated business entity.

EPA included all eight regulated facilities in the share of revenue test, but one facility submitted only sufficient data to conduct the test at the facility level. Compliance costs amounted to less than 2.3 percent of facility revenues in every case analyzed. EPA did not conduct the compliance cost share of revenue test on the waste treatment operations previously identified to experience serious impacts in the after-tax cash flow test. Table 4-3 summarizes the results. EPA concludes the results support the determination of technology option as economically achievable.

Table 4-3. Summary of Compliance Cost Share of Revenue Test Results

Number of Facilities	Waste Treatment Operations*	All Facility Operations*
Facilities in test	6	8
Share > 5%	0	0

* One facility submitted insufficient data for this test.

Chapter 5
Firm-Level Impact Analysis

The firm level analysis evaluates the effects of regulatory compliance on firms owning one or more affected CHWC facilities. It also serves to identify impacts not captured in the facility level analysis. For example, some companies might be too weak financially to undertake the investment in the required effluent treatment, even though the investment might seem financially feasible at the facility level. Such circumstances can exist at companies owning more than one facility subject to regulation.

The firm-level analysis uses ratio analysis to assess the impacts of compliance costs at all facilities owned by the firm. Ratio analysis employs two indicators of financial viability: the rate of return on assets (ROA) and the interest coverage ratio (ICR). ROA is a measure of the profitability of a company's capital assets. ROA is computed as the earnings before interest and taxes minus taxes divided by total assets. ICR is a measure of the financial leverage of a company, computed as the earnings before interest and taxes divided by interest expense.

The first step is to calculate the baseline ROA and ICR for each company absent the rule. The post-compliance analysis then calculates the ratios after the projected investment in wastewater treatment equipment and the associated compliance costs. ROA decline by less than 1 percent of assets in each case and remained above 19 percent, which is very healthy. Similarly, ICR declined by no more than 1.5 percent of interest expenses and remained above 9 percent, which again shows robust financial performance even post-compliance. EPA finds the firm-level analysis supports the conclusion of economic achievability obtained in the facility-level analysis.

Chapter 6

Foreign Trade Impacts

To the extent that effluent guidelines change the total production costs of domestic businesses without similarly affecting production costs for foreign competitors, regulation may affect the national balance of trade. Furthermore, if compliance costs cause facility closures, domestic and foreign facilities would compete to replace, in whole or in part, the sales associated with the closing facility.

However, based on survey responses and the profile analysis, EPA finds foreign trade in the CHWC industry to be practically non-existent, due to legal and economic restrictions on the transport of wastes across national borders. Therefore, even though international firms have purchased some U.S. hazardous waste incinerators recently, and some U.S. facilities receive some wastes from Canadian sources, these transactions will have no appreciable effect on the trade balance. EPA finds that the rule will not have a significant adverse impact of foreign trade.

Chapter 7
Community Impacts

The community impact analysis builds from the facility impact analysis to determine if facility closures might adversely affect the general public welfare. EPA assesses community impacts by estimating the expected change in employment in communities with CHWCs that are affected by the rule. Possible community employment effects include the employment losses in the facilities expected to close because of the regulation and the related employment losses in other businesses in the affected community. In communities where plants continue to operate, employment may increase as a result of facilities' operation of treatment systems for regulatory compliance. Job gains will mitigate community employment losses only if they occur in the same communities in which facility closures occur.

EPA estimated that the rule will result in the post-compliance closure of the waste burning operations of one facility. The post-compliance closure results in the direct loss of 27 Full-Time Equivalent (FTE) positions. EPA based its estimates of secondary employment impacts on multipliers that relate the change in employment in a directly affected industry to aggregate employment effects in linked industries. These multipliers also account for employment changes in consumer businesses whose employment is affected by changes in the earnings and expenditures of the employees in the directly and indirectly affected industries. The Bureau of Economic Analysis calculates appropriate multipliers using its Regional Input-Output Modeling System (RIMS).[10] Multiplying the RIMS national multiplier of 4.049 to the 27 direct FTE losses leads to an estimated community impact of 110 total FTE losses as the result of the rule. The county in which EPA projects the closure to occur has a current employment of 170,000 FTEs dispersed among 9,900 establishments.[11] The direct and secondary job losses represent 0.06 percent of current employment in the affected county.

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[10] The "direct-effect multiplier" measures the "total change in number of jobs in all row industries for each additional job in the industry corresponding to the entry." Source: *Regional Multipliers: A User Handbook for the Regional Input-Output Modeling System (RIMS II) 2nd Edition*, Bureau of Economic Analysis, May 1992.

[11] U.S. Bureau of the Census, *County Business Patterns 1994*, U.S. Government Printing Office, Washington, DC, 1996.

Estimated national job gains of 10 FTEs associated with the operation of control equipment mitigates the FTEs losses. EPA estimated the secondary and indirect effects at the national level by using the average multiplier of 4.049, resulting in an estimate of 40 total FTE gains associated with expenditures on pollution control equipment.

Chapter 8

Impacts on New Sources

The rule includes limitations that will apply to new discharging sources within the CHWC industry. EPA examined the impact of these regulations on new dischargers to determine if they would impose an undue economic and financial burden on new sources seeking to enter the industry.

In general, EPA finds that, when new and existing sources face the same discharge limitations, new sources will be able to comply with those limitations at the same or lower costs than those incurred by existing sources. Engineering analysis indicates that the cost of installing pollution control systems during new construction is generally less than the cost of retrofitting existing facilities. Thus, a finding that discharge limitations are economically achievable by existing facilities also means that those same discharge limitations will be economically achievable to new facilities.

Chapter 9

Regulatory Flexibility Analysis

Since none of the facilities in the analysis are owned by small businesses under the Small Business Administration (SBA) definition, EPA has concluded that the rule will not have a significant economic impact on a substantial number of small entities.

In evaluating the small business status of each facility, EPA used SBA standards for testing the small business status of the parent of each facility. These standards specify a revenue or employment threshold for each SIC code, below which the firm is considered a small business.

EPA obtained SIC codes for parent firms from SEC filings of the firms themselves. When the SEC filing did not cite an SIC code, EPA used an SIC code 4953 for known refuse companies. EPA searched its Facility Index System (FINDS) to determine the SIC codes of the remaining firms. Within the database, EPA gave precedence to Dun & Bradstreet SIC code assignments. In their absence, the analysis used the RCRA SIC code assignment.

EPA could not assign some firms to a single SIC code. In these cases, the threshold is a two-part value comprised of both the highest employment threshold and revenue threshold over all the SIC codes that apply to the firm. If firm-level revenues *or* employment failed to exceed the relevant threshold, the facility would be categorized as a small business.

One firm is a very large conglomerate. Instead of examining all the SIC codes that actually apply to the parent firm, EPA applies the highest employment and revenue thresholds among all industries to the firm.

Chapter 10
Summary Environmental Assessment

10.1 Introduction

This environmental assessment quantifies the water quality-related benefits associated with achieving the Best Available Technology (BAT) limitations and Pretreatment Standards for Existing Sources (PSES) EPA promulgated to regulate commercial hazardous waste combustors (CHWCs). Using site-specific analyses of current conditions and changes in discharges associated with the regulation, the U.S. Environmental Protection Agency (EPA) estimated instream pollutant concentrations for 15 priority and nonconventional pollutants from direct and indirect discharges using stream dilution modeling.

EPA assessed the potential impacts and benefits to aquatic life by comparing the modeled instream pollutant concentrations to published EPA aquatic life criteria guidance or to toxic effect levels. EPA projected potential adverse human health effects and benefits by:

- comparing estimated instream concentrations to health-based water quality toxic effect levels or criteria, and

- estimating the potential reduction of carcinogenic risk and noncarcinogenic hazard (systemic) from consuming contaminated fish or drinking water.

The assessment estimated upper-bound individual cancer risks, population risks, and systemic hazards using modeled instream pollutant concentrations and standard EPA assumptions. The assessment evaluated modeled pollutant concentrations in fish and drinking water to estimate cancer risk and systemic hazards among the general population, sport anglers and their families, and subsistence anglers and their families. EPA used the findings from the analyses of reduced occurrence of instream pollutant concentrations in excess of both aquatic life and human health criteria or toxic effect levels to assess improvements in recreational fishing habitats that are impacted by CHWC wastewater discharges (ecological benefits). EPA expects these improvements in aquatic habitats will improve the quality and value of recreational fishing opportunities and nonuse (intrinsic) values of the receiving streams.

This assessment also evaluated potential inhibition of operations at publicly owned treatment works (POTWs) and sewage sludge contamination (here defined as a sludge concentration in excess of that permitting land application or surface disposal of sewage sludge) at current and final pretreatment levels. The assessment estimated inhibition of POTW operations by comparing modeled POTW influent concentrations to available inhibition levels. The assessment estimated contamination of sewage sludge by comparing projected pollutant concentrations in sewage sludge to available EPA regulatory standards for land application and surface disposal of sewage sludge. EPA estimated economic productivity benefits on the basis of the incremental quantity of sludge that, as a result of reduced pollutant discharges to POTWs, meets criteria for the generally less expensive disposal method, namely land application and surface disposal.

In addition, the report presents the potential fate and toxicity of pollutants of concern associated with CHWC wastewater on the basis of known characteristics of each chemical. The report includes reviews of recent literature and studies, as well as information obtained from State environmental agencies, as evidence of documented environmental impacts on aquatic life, human health, POTW operations, and on the quality of receiving water.

Performed analyses included discharges from the 8 commercial hazardous waste combustors identified as within the scope of the CHWC guidelines. This report provides the results of these analyses.

10.2 Comparison of instream concentrations with ambient water quality criteria (AWQC)/Impacts at POTWs

The water quality modeling results for 8 CHWC facilities discharging 15 pollutants (metals) to 8 receiving streams indicate that at current discharge levels, instream concentrations of 3 pollutants will likely exceed acute aquatic life criteria or toxic effect levels in 1 of the 8 receiving streams (12 percent). Instream concentrations of 5 pollutants will likely exceed chronic aquatic life criteria or toxic effect levels in 38 percent (3 of the total 8) of the receiving streams. The CHWC guidelines will reduce acute aquatic life excursions from 3 pollutants to 1 pollutant in the 1 receiving stream. The guidelines will also reduce the chronic aquatic life excursions from 5 pollutants to 4 pollutants in the 3 receiving streams. Additionally, the assessment projects that at current discharge levels, instream concentrations of 2 pollutants (using a target risk of 10^{-6} (1E-6) for carcinogens) will exceed human health criteria or toxic effect levels (developed for consumption of water and organisms) in 62 percent (5 of the total 8) receiving streams. It also projects the instream concentrations of 1 pollutant (using a target risk of 10^{-6} (1E-6) for carcinogens) will exceed the human health criteria or toxic effect levels (developed for organisms consumption only) in 38 percent (3 of the total 8) of the receiving streams. The CHWC guidelines will eliminate excursions of human health criteria and toxic effect levels (developed both for consumption of water and organisms and for consumption of organisms only) in 1 receiving stream. The CHWC guidelines also will reduce pollutant loadings by 88 percent.

In addition, the analysis projects POTW sludge contamination problems at current discharge levels. Sludge contamination will likely occur at 1 POTW due to the discharge of 1 pollutant. The CHWC guidelines will eliminate sludge contamination problems. The analysis projects that no inhibition problems will occur at any of the POTWs.

10.3 Human health risks and benefits

The CHWC guidelines will reduce total excess annual cancer cases from the ingestion of contaminated fish by 7.1E-3 cancer cases. The monetary value of benefits to society from these avoided cancer cases is $17,700-$92,800 (1998 dollars). The analysis projects no total excess annual cancer cases will result from the consumption of contaminated drinking water. In addition, using the estimated hazard calculated for each receiving stream, the analysis projects no systemic toxicant effects from exposure to contaminated fish or drinking water.

10.4 Ecological benefits

The analysis projects the following potential ecological benefits resulting from improvements in recreational fishing habitats. According to the projections, the final regulation will completely eliminate instream concentrations in excess of aquatic life and human health ambient water quality criteria (AWQC) in 1 stream receiving wastewater discharges from a CHWC facility. The analysis estimates the monetary value of improved recreational fishing opportunities by first calculating the baseline value of the receiving stream using a value per person/day of recreational fishing, and the number of person-days fished on the receiving stream. It then calculates the value of improving water quality in this fishery, based on the increase in value to anglers of achieving contaminant-free fishing. The resulting estimate of the increase in value of recreational fishing to anglers on the improved receiving stream is $93,300 to $333,700 (1998 dollars). In addition, the estimate of the nonuse (intrinsic) benefits to the general public, as a result of the same improvements in water quality, ranges from at least $46,700 to $166,900 (1992 dollars). These nonuse benefits are estimated as one-half of the recreational benefits and may be significantly underestimated.

The estimated benefit of improved recreational fishery opportunities is only a limited measure of the value to society of the improvements in aquatic habitats expected to result from the regulation. Additional benefits, which cannot be quantified in this assessment, include increased assimilation capacity of the receiving stream, protection of terrestrial wildlife and birds that consume aquatic organisms, maintenance of an aesthetically pleasing environment, and improvements to other recreational activities such as swimming, water skiing, boating, and wildlife observation. Such activities contribute to the support of local and State economies.

10.5 Economic productivity benefits

The analysis projects no potential economic productivity benefits from reduced sewage sludge contamination and sewage sludge disposal costs at the POTWs receiving CHWC discharges. One POTW is expected to accrue a modest benefit through reduced record-keeping requirements and exemption from certain sewage sludge management practices. EPA cannot currently estimate a monetary value for these modest benefits.

10.6 Pollutant fate and toxicity

EPA identified 16 pollutants of concern (10 priority pollutants, 1 conventional pollutant, and 5 nonconventional pollutants) in wastestreams from CHWC facilities. EPA evaluated 15 of these pollutants (all metals) to assess their potential fate and toxicity based on known characteristics of each chemical.

All of the 15 pollutants have at least one known toxic effect. Using available physical-chemical properties and aquatic life and human health toxicity data for these pollutants, the analysis determined that 10 exhibit moderate to high toxicity to aquatic life; 3 are classified as known or probable human carcinogens, 14 are human systemic toxicants, 12 have drinking water values, and 10 are designated by EPA as priority pollutants. In terms of projected partitioning, 4 have a moderate to high potential to bioaccumulate in aquatic biota, potentially accumulating in the food chain and causing increased risk to higher trophic level organisms and to exposed human populations via consumption of fish and shellfish. All of the modeled pollutants are metals, which in general are not applicable to evaluation based on volatility and adsorption to solids. The analysis assumes that all of the metals have a high potential to sorb to solids.

Evaluations do not include the impacts of the 1 conventional pollutant when modeling the effect of the final regulation on receiving stream water quality and POTW operations or when evaluating the potential fate and toxicity of discharged pollutants. This pollutant is total suspended solids (TSS). The discharge of TSS may have adverse effects on human health and the environment. For example, habitat degradation may result from increased suspended particulate matter that reduces light penetration, and thus primary productivity, or from accumulation of sludge particles that alter benthic spawning grounds and feeding habitats.

10.7 Documented environmental impacts

This assessment also summarizes documented environmental impacts on aquatic life, human health, POTW operations, and receiving stream water quality. The summaries are based on a review of published literature abstracts, State 304(l) Short Lists, State Fishing Advisories, and contact with State environmental agencies. States identified 1 direct discharging CHWC facility and 1 POTW receiving the discharge from 1 CHWC facility as being point sources causing water quality problems, these are included on their 304(l) Short List. State contacts indicate that the 1 direct facility is currently in compliance with its permit limits and is no longer a source of impairment. The POTW listed is also currently in compliance for the listed pollutants. In addition, 2 CHWC facilities are located on waterbodies with State-issued fish consumption advisories. However, the advisories are based on dioxin levels, which are not pollutants of concern for the CHWC industry.

Chapter 11
Cost-Reasonableness Test

11.1 Introduction

CWA Section 304(b)(1)(B) requires a cost-reasonableness assessment for BPT limitations. In determining BPT limitations, EPA must consider the total cost of treatment technologies in relation to the effluent reduction benefits achieved by such technology. This inquiry does not limit EPA's broad discretion to adopt BPT limitations that are achievable with available technology unless the required additional reductions are wholly out of proportion to the costs of achieving such marginal level of reduction.

The C-R ratio is the average cost per raw pound of conventional pollutants removed by a BPT regulatory option.

This chapter presents the C-R ratio for the CHWC final rule and a brief discussion of methodology. An earlier document, “Economic and Cost-Effectiveness Analysis of Proposed Effluent Limitations Guidelines and Standards for Industrial Waste Combustors” (EPA 821-B-97-010) presents a more detailed discussion of the C-R methodology. To protect confidential business information, EPA presents detailed results from the cost-reasonableness analysis in a memo, “Results of the Cost-Reasonableness Analysis,” (November 29, 1999) which appears in the administrative record.

The cost-reasonableness analysis uses the estimated annual costs of complying with the CHWC rule. The annual costs include annual expenses for operating and maintaining compliance equipment and for meeting monitoring requirements, and an annual allowance for the capital outlays for pollution prevention and treatment systems needed for compliance. EPA calculated compliance costs on a pre-tax basis, without any adjustment for tax treatment of capital outlays and operating expenses. In these calculations, EPA used a discount rate of 7 percent.

11.2 Summary of methodology

EPA calculated the reduction in *at-stream* pollutant loadings to the receiving water body for the final rule and estimated associated costs of achieving these reductions. The Technical Development Document and the economic analysis of the proposed rule present full details of the methods used to estimate loadings and the costs of complying with the regulatory options. A brief summary of the compliance cost analysis follows.

The C-R analysis include two categories of compliance costs: (1) capital costs, including costs for equipment, retrofitting and upgrading control technology, permit modification, and land; and (2) operating, maintenance, and monitoring costs. While operating, maintenance, and monitoring costs occur annually, capital costs are a one-time "lump sum" cost. To express the capital costs on an annual basis, EPA annualized capital costs over the expected useful life of the capital equipment – 15 years – at a discount rate of 7 percent. Total annualized costs are the sum of annualized capital costs and the annual operating, maintenance and monitoring costs. The cost-effectiveness analysis presented in the main body of this report uses pre-tax costs as the basis for its calculations.

The engineering analysis yielded compliance cost estimates in 1992 dollars, the base year of the landfill industry regulatory analysis. EPA converted these compliance costs to 1998 dollars using the *Engineering News Record*'s Construction Cost Index (CCI). This adjustment factor is:

$$Adjustment\ factor = \frac{1998\ CCI}{1992\ CCI} = \frac{5920}{4985} = 1.18756$$

11.3 Results

The CHWC rule is associated with a C-R ratio of $27 per pound of pollutants removed, in 1998 dollars. EPA considers the cost-reasonableness value of the rule to be acceptable and that the rule is cost-reasonable. Detailed results appear in the confidential record.