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Hospital/Medical/Infectious Waste Incinerators: Background Information for Promulgated Standards and Guidelines -

Regulatory Impact Analysis for New and Existing Facilities

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Hospital/Medical/Infectious Waste Incinerators: Background Information for Promulgated Standards and Guidelines – Regulatory Impact Analysis for New and Existing Facilities

U.S. EPA
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I EXECUTIVE SUMMARY

1.1 Introduction and Background

On February 27, 1995, the United States Environmental Protection Agency (EPA) published the proposed Emission Guidelines (EG) for existing hospital/medical/infectious waste incinerator(s) (HMIWI) and new source performance standards (NSPS or standards) for new hospital/medical/infectious waste incinerators. The proposal was the result of several years of effort reviewing available information to fulfill the Clean Air Act requirements. Following proposal, a large number of comment letters were received, some including new information and some indicating that commenters were in the process of gathering information for the EPA to consider. The large amount of new information that was ultimately submitted addressed every aspect of the proposed standards and guidelines, including: the existing population of HMIWI; the performance capabilities of air pollution control systems; monitoring and testing; operator training; alternative medical waste treatment technologies; and the definition of medical waste. In almost every case, the new information has led to different conclusions. One change made to the final rule as a result of comments regarding the definition of medical waste has been a change in the title of the rulemaking. For reasons discussed in other documents, the official title of the rulemaking is "Hospital/Medical/Infectious Waste Incinerators" or "HMIWI." However, for purposes of this document, the terms "HMIWI" and "MWI" should be viewed as interchangeable.

The purpose of this revised regulatory impact analysis (RIA) is to reassess the cost and benefits of new regulatory options that have been developed for existing and new HMIWI. The assessment of the costs and benefits of four EG control options for existing HMIWI and three control options for new sources were originally evaluated in *Medical Waste Incinerators - Background Information for Proposed Standards and Guidelines: Regulatory Impact Analysis for New and Existing Sources*[1]. An addendum was subsequently prepared to estimate the potential economic impacts of a fifth control option for existing sources and a third for new sources.[2,3] The economic impacts, benefits, and comparison of cost and benefits presented in this document should be viewed as a revision to the original regulatory impact analysis document.

This report has been prepared to comply with Executive Order 12866, which requires federal agencies to assess costs and benefits of each significant rule that is proposed or promulgated. The promulgated regulation for hospital/ medical/ infectious waste incinerators meets the definition of a significant rule. The Agency has assessed the costs and benefits of the rule, as presented in this RIA.

The principle requirements of the Executive Order are that the Agency perform an analysis comparing the benefits of the regulation to the costs that the regulation imposes, that the Agency analyze alternative approaches in the development of the rule, and that the need for the regulation be identified. Wherever possible, the costs and benefits of the rule are to be expressed in monetary terms. This RIA is organized to meet the requirements of the Executive Order.

1.2 Regulatory Options and Analysis Scenarios

This RIA evaluates the benefits and economic impacts of six regulatory options for the emission guidelines and three regulatory options for the new source performance standards. The floor for small existing HMIWI requires good combustion; add-on wet scrubbing systems would not be necessary to meet the MACT floor. For medium existing HMIWI, the MACT floor requires good combustion and a moderate efficiency wet scrubber. The MACT floor for large existing HMIWI requires good combustion and a high efficiency wet scrubber.

Having identified the emission control technology most existing HMIWI would likely install to meet the MACT floor emission limits, the EPA also reviewed the performance capabilities of other emission control technologies that would reduce emissions by an amount greater than the MACT floor level of control. This process enables the EPA to identify more stringent regulatory options which could be selected as MACT. The regulatory options are a combination of the various emission guidelines the EPA believes merit consideration as MACT for existing HMIWI. These regulatory options are constructed only for the purpose of organizing and structuring an analysis of the cost, environmental, energy, and economic impacts associated with determining or selecting MACT for existing HMIWI.

The MACT "floor" defines the least stringent emission standards the EPA may adopt for new HMIWI. However, the Clean Air Act also requires EPA to examine alternative emission standards (i.e., regulatory options) more stringent than the MACT floor.

Based on the new information submitted to the EPA following proposal of the MACT emission standards for new HMIWI, new MACT floor emission levels were developed for new small, medium, and large HMIWI. Next, the EPA determined the emission control technologies new HMIWI would probably need to meet regulations based on these floor emission limits. The floor for small new HMIWI requires good combustion and moderate efficiency wet scrubbers. For medium new HMIWI, the MACT floor requires good combustion and a combined wet/dry scrubbing system without activated carbon injection. The MACT floor for large new HMIWI requires good combustion and a combined wet/dry scrubbing system with activated carbon injection.

In addition to identifying the emission control technology most new HMIWI would likely install to meet the MACT floor emission limits, the EPA also reviewed the performance capabilities of other emission control technologies that would reduce emissions by an amount greater than the MACT floor level of control. When considering the various regulatory options for the EG and NSPS, it is important to note the following.

First, the EG for existing HMIWI and the NSPS for new sources will not include requirements to use a specific emission control system or technology; the EG and NSPS will only include emission limits, which may be met by any means or by any control system or technology of the HMIWI owner's or operator's choice. Second, to the extent possible, it is an objective of the EPA to

adopt emission limits in the EG that can be met through the use of several emission control systems or technologies.

In the analysis of costs, economic impacts, and benefits discussed in this report, selection of an alternative form of medical waste treatment and disposal by a health care facility, rather than installing a new HMIWI, is referred to as "switching." Switching was incorporated into the cost analysis at proposal and was the basis for the conclusion at proposal that adoption of the proposed emission standards could lead to as many as 80 percent of health care facilities that might have installed HMIWI to choose an alternative means of medical waste treatment and disposal. However, the economic impacts presented with the proposed MACT for new sources were only evaluated using the costs under a "no switching" scenario. Although the RIA presented a qualitative discussion of the likely possibility of facilities that might have installed on-site HMIWI deciding to switch to alternative treatment and disposal methods, the economic impacts under a switching scenario were not quantified due to time constraints.

Switching has now been incorporated into the cost, economic impact, and benefit analysis. Three scenarios are evaluated: one scenario which ignores switching, and two scenarios which consider switching. Scenario A assumes that each existing and new HMIWI will comply with the appropriate regulatory option by having the appropriate emission control equipment installed. This scenario most likely overstates national costs and economic impacts and therefore should not be viewed as representative of the emission guidelines and new source emission standards. It is included only to fulfill the goal of providing a complete analysis.

Switching scenarios B and C are considered more representative of the cost and economic impacts of the MACT for existing and new HMIWI. Both scenarios assume switching occurs when the cost associated with purchasing and installing the air pollution control technology or system necessary to comply with the MACT emission standards (i.e., a regulatory option) is greater than the cost of using an alternative means of treatment and disposal. The difference between the two scenarios is the assumption of whether or not the medical waste stream is separated.

1.3 Economic Impacts

Industry-wide impacts presented in the RIA include estimates of the change in market price for the services provided by the affected industries, the change in market output or production, the change in industry revenue, and the change in affected labor markets in terms of the number of employees lost. For the EG, industries that generate medical waste (hospitals, nursing homes, etc.) are expected to experience average price increases in the range of 0 to 0.14 percent, depending on the industry, regulatory option, and scenario analyzed. These industries are expected to experience output and employment impacts in the range of 0 to -0.18 percent. In addition, revenue impacts for these industries are expected to range from an increase of 0.05 percent to a decrease of 0.04 percent. An increase in industry revenue will occur if demand for the industry's service is relatively price-inelastic, i.e., between -1 and 0. Such a price elasticity

indicates that output is not very responsive to a change in price, specifically that the percentage decrease in output will be less than the percentage increase in price. Since revenue is the product of price and output, a less than proportional change in output compared to price means that total revenue will increase.

For the NSPS the industry-wide impacts represent the combined, or cumulative, effects of both the NSPS for new sources and the EG for existing sources. Control costs from the NSPS and EG are accumulated in order to account for market adjustments that would first occur after implementation of the EG. Industries that generate medical waste (hospitals, nursing homes, etc.) are expected to experience average price increases in the range of 0 to 0.16 percent, depending on the industry, regulatory option, and scenario analyzed. These industries are expected to experience output and employment impacts in the range of 0 to -0.21 percent. In addition, revenue impacts for these industries are expected to range from an increase of 0.05 percent to a decrease of 0.05 percent.

The estimated average price increase for the commercial medical waste incineration industry is 2.6 percent for the EG, regardless of the regulatory option (control requirements for commercial HMIWI do not vary by regulatory option). When the EG and NSPS are costs are aggregated, the price increase for commercial HMIWI becomes 4.1 percent. These price increases are considered achievable because of the cost advantage (i.e., lower cost per ton of waste burned) – due to economies of scale – that commercial HMIWI have over smaller on-site HMIWI.

Impacts were also estimated at the facility level by employing the concept of the model facility (i.e., by defining key parameters to describe typical facilities in the affected industries). The vast majority of facilities impacted by the regulation are those that send their medical waste off-site to be incinerated and will have to pay more for commercial incineration. For the EG and NSPS, all impacts on these facilities are minuscule. At the most, the increased cost of commercial incineration could be recovered with a price increase of only 0.03 percent. For facilities that operate on-site HMIWI ("HMIWI operators"), impacts are also generally insignificant. Either the cost of controls or the cost of switching to an alternative medical waste treatment and disposal method could be recovered with a price increase that does not significantly exceed the market price increase.

Two types of HMIWI operators may not be able to switch to an alternative, however: commercial HMIWI operators, because their line of business is commercial incineration; and small, rural, remote HMIWI (defined as more than 50 miles away from an SMSA and burning less than 2,000 pounds of medical waste per year), which may not have access to waste hauling and/or commercial incineration services.

Under the EG, three of the 59 commercial incineration facilities operating the 79 commercial HMIWI in the HMIWI inventory were found to be significantly impacted by the regulation (under all six regulatory options). These facilities may not have to shut down, though, considering that they are completely uncontrolled in the baseline and therefore may currently enjoy a cost

advantage over their competitors (most of which are at least partially controlled in the baseline), and that the regulation will bring about – due to switching away from on-site incineration – an increase in the demand for commercial incineration services.

For the NSPS, only 10 new commercial HMIWI are projected over the next five years and could potentially be significantly impacted by the regulation. A "significant impact" does not necessarily imply closure or the need to cancel plans to open up, or expand, a facility. For example, operators of small, remote on-site HMIWI may still have switching opportunities. As the commercial incineration industry continues to grow (with additional impetus being provided by the EG and NSPS), it is possible that services will be extended to remote, isolated areas that are currently not served. On-site autoclaving is another possible treatment alternative. If a facility had planned to invest in a new HMIWI, it stands to reason that an on-site autoclave unit of comparable cost would be affordable. Additionally, a facility that had planned – by virtue of operating an on-site HMIWI – to open in a remote area without access to commercial incineration services, might be able to reconsider its location decision, and locate instead in an area with such access.

Impacts are not significant for small, rural, remote HMIWI operators under regulatory options one and two of the EG. Under regulatory options three through six of the EG, on the other hand, some of these facilities are significantly impacted and might therefore have to shut down. Few, if any, of the projected 85 new small on-site HMIWI over the next five years, are likely to be significantly impacted by the regulation (under all three regulatory options) for reasons previously stated.

The RIA examines industries that are directly impacted by the regulation, namely industries that generate or treat medical waste. Secondary impacts such as those on air pollution device vendors and HMIWI vendors were not evaluated due to data limitations. However, it can be said that air pollution device vendors are expected to experience an increase in demand for their products due to the regulation. The regulation is also expected to increase the demand for commercial HMIWI services. Due to economies of scale, however, there is likely to be a demand shift from smaller incinerators to larger incinerators. Therefore, vendors of small HMIWI may be adversely affected by the regulation.

1.4 Benefits Analysis

Implementation of the NSPS and EG for HMIWI is expected to reduce emissions of hazardous air pollutants, dioxin/furan, and criteria air pollutants. Reduction in a variety of hazardous air pollutants including cadmium (Cd), hydrochloric acid (HCl), lead (Pb), and mercury (Hg) is expected as a result of the regulation. Dioxin/furan emissions are also expected to be reduced. In addition, decreases in the following criteria air pollutants are anticipated: particulate matter (PM), sulfur dioxide (SO_2), carbon monoxide (CO), and nitrogen oxides (NO_x). Air benefits resulting from the air quality improvements associated with this regulation include a reduction in adverse health effects associated with inhalation of the above pollutants as well as improved welfare

effects such as improved visibility and crop yields.

While the Agency believes that the health and environmental benefits of this rule are quite significant, the EPA is not currently able to quantitatively evaluate all human and environmental benefits associated with the rule's air quality improvements, and is even more limited in its ability to assign monetary values to these benefit categories. Categories that are not evaluated include several health and welfare endpoints (categories), as well as entire pollutant categories. The quantitative assessment of the benefits associated with the rule is limited to the monetized value of PM emission reductions. Total monetized benefits for the combined reductions associated with the EG and NSPS for option 1 is $5.2 million under scenario B and $4.4 million under scenario C.

A qualitative discussion of the pollutants that do not have a monetary benefit value shows the significance of other benefits achieved by the rule. Emission reductions of Cd, Pb, HCl, and Hg are expected to occur as a result of the HMIWI rule. Health effects associated with exposures to Cd and Pb include probable carcinogenic effects and respiratory effects associated with exposure to Cd, HCl, and Hg. The HAPs emitted from HMIWI facilities have also been associated with effects on the central nervous system, neurological system, gastrointestinal system, mucous membranes, and kidneys.

Reduction in emissions of dioxin/furan are expected as a result of the HMIWI rule. Exposure to dioxin/furan has been linked to reproductive and developmental effects, changes in hormone levels, and chloracne. Toxic Equivalent Quantity, or TEQ, has been developed as a measure of the toxicity of dioxin/furan. TEQ measures the more chlorinated compounds of dioxin/furan and thus provides a better indicator of the part of dioxin/furan that has been linked to the toxic effects associated with dioxin/furan. Unfortunately, quantitative relationships between the toxic effects and exposure to CDD/CDF and TEQ have not been developed. Therefore, quantitative estimates of the health effects of dioxin emission reductions are not estimated.

Emission reductions are also anticipated for criteria air pollutants. The health effects associated with exposure to PM include premature mortality as well as morbidity. The morbidity effects of PM exposure have been measured in terms of increased hospital and emergency room visits, days of restricted activity or work loss, increased respiratory symptoms, and reductions in lung function. The welfare effects of PM exposure include increased soiling and visibility degradation. SO_2 has been associated with respiratory symptoms and pulmonary function changes in exercising asthmatics and may also be associated with respiratory symptoms in non-asthmatics. In addition to the effects on human health, SO_2 has also been linked to adverse welfare effects, such as materials damage, visibility degradation, and crop and forestry damage. CO affects the oxygen-carrying capacity of hemoglobin and, at current ambient concentrations, has been related to adverse health effects among persons with cardiovascular and chronic respiratory disease. Both congestive heart failure and angina pectoris have been related to CO exposure. NO_x has also been shown to have an adverse impact on both human health and welfare. The effects associated with NO_x include respiratory illness, damages to materials, crops, and forests, and visibility degradation.

A comparison of the benefits of alternative control options to the costs imposed by the options identifies the strategy that results in the highest net benefit to society. A typical net benefit analysis uses total "social" cost of the regulation in the comparison with monetized benefits, which captures costs associated with emission control equipment as well as economic costs of changes in production, prices, employment and other economic parameters. The analysis presented in this document is viewed with two considerations. First, since a welfare analysis was not conducted for the rule, annualized emission control costs are being used as a proxy for the social cost of the regulation. Secondly, the quantifiable benefits are limited to the monetization of PM reductions only. Therefore, the EPA recognizes that the monetized benefits and thus the net benefits are understated (or in this case, since annualized costs exceed the monetized benefits, net costs are overstated) for the regulation. The net cost of the final EG and NSPS for regulatory option 1 is from $62.2 million under scenario B to $104.0 million under scenario C. The net cost of all other regulatory options are greater than option 1, therefore, net costs are minimized under option 1 for both scenarios.

1.5 Small Business Impacts

In accordance with the Regulatory Flexibility Act of 1980 and its amendment in 1996 by the Small Business Regulatory Enforcement Fairness Act (SBREFA), an analysis of impacts on small "entities" – including small businesses, small nonprofit organizations, and small governmental jurisdictions – was performed. This analysis indicates that the Emission Guidelines will not have a "significant impact on a substantial number of small entities" under any regulatory option. Impacts are not significant for the vast majority of medical waste generators that send their waste off-site to be treated and disposed. Impacts are also not significant for the great majority of HMIWI operators that would have the opportunity to switch to an alternative method of medical waste treatment and disposal if control costs are prohibitive. Some significant impacts were found for commercial HMIWI operators under all six regulatory options and for small on-site HMIWI operators that are remote from an urban area under regulatory options three through six. These facilities might not have the opportunity to switch to an alternative medical waste treatment and disposal method – commercial HMIWI operators because medical waste incineration is their line of business, and small, remote HMIWI because they may not have access to commercial incineration services. However, the number of such facilities that are both significantly impacted under the regulatory option proposed for promulgation and "small" would be, at the most, only a few, and would therefore not be substantial.

II BACKGROUND

2.1 Regulatory Background

This action promulgates new source performance standards and emission guidelines to reduce air emissions from hospital/medical/infectious waste incinerator(s) by adding subpart Ec, standards of performance for new HMIWI, and subpart Ce, emission guidelines for existing HMIWI, to 40 CFR part 60. The standards and guidelines implement sections 111 and 129 of the Clean Air Act as amended in 1990 and are based on the Administrator's determination that HMIWI cause, or contribute significantly to, air pollution that may reasonably be anticipated to endanger public health or welfare. The standards and guidelines apply to units whose primary purpose is the combustion of hospital waste and/or medical/infectious waste. Sources are required to achieve emission levels reflecting the maximum degree of reduction in emissions of air pollutants that the Administrator has determined is achievable, taking into consideration the cost of achieving such emission reduction, and any non-air-quality health and environmental impacts and energy requirements. The promulgated standards and guidelines establish emission limits for hazardous air pollutants including hydrogen chloride, lead, cadmium, and mercury; criteria air pollutants including particulate matter, sulfur dioxide, oxides of nitrogen , carbon monoxide; dioxins and dibenzofurans; and fugitive ash emissions. The standards and guidelines also establish requirements for HMIWI operator training/qualification, pollution prevention plans, and testing/monitoring of pollutants and operating parameters. Additionally, the guidelines for existing HMIWI contain equipment inspection requirements and the standards for new HMIWI include siting requirements.

2.2 Definition of Hospital/Medical/Infectious Waste

Since the EG and NSPS establish emissions guidelines and standards for HMIWI, it is necessary to define hospital waste and medical/infectious waste. Hospital waste is defined as discards generated at a hospital, except unused items returned to the manufacturer. The definition of hospital waste does not include human remains.

Medical/infectious waste is any waste generated in the diagnosis, treatment, or immunization of human beings or animals, in research pertaining thereto, or in the production or testing of biologicals that is listed below:

(1) Cultures and stocks of infectious agents and associated biologicals, including: cultures from medical and pathological laboratories; cultures and stocks of infectious agents from research and industrial laboratories; wastes from the production of biologicals; discarded live and attenuated vaccines; and culture dishes and devices used to transfer, inoculate, and mix cultures.

(2) Human pathological waste, including tissues, organs, and body parts and body fluids that are removed during surgery or autopsy, or other medical procedures, and specimens of body fluids and their containers.

(3) Human blood and blood products including:

(i) Liquid waste human blood;

(ii) Products of blood;

(iii) Items saturated and/or dripping with human blood; or

(iv) Items that were saturated and/or dripping with human blood that are now caked with dried human blood; including serum, plasma, and other blood components, and their containers, which were used or intended for use in either patient care, testing and laboratory analysis or the development of pharmaceuticals. Intravenous bags are also include in this category.

(4) Sharps that have been used in animal or human patient care or treatment or in medical, research, or industrial laboratories, including hypodermic needles, syringes (with or without the attached needle), pasteur pipettes, scalpel blades, blood vials, needles with attached tubing, and culture dishes (regardless of presence of infectious agents). Also include are other types of broken or unbroken glassware that were in contact with infectious agents, such as used slides and cover slips.

(5) Animal waste including contaminated animal carcasses, body parts, and bedding of animals that were known to have been exposed to infectious agents during research (including research in veterinary hospitals), production of biologicals or testing of pharmaceuticals.

(6) Isolation wastes including biological waste and discarded materials contaminated with blood, excretions, exudates, or secretions from humans who are isolated to protect others from certain highly communicable diseases, or isolated animals known to be infected with highly communicable diseases.

(7) Unused sharps including the following unused, discarded sharps: hypodermic needles, suture needles, syringes, and scalpel blades.

A HMIWI is any device that combusts any amount of hospital waste and/or medical/ infectious waste as previously defined.

2.3 Industries Generating Hospital/Medical/Infectious Waste and/or Operating HMIWI

The emission guidelines will impact industries that generate hospital/ medical/ infectious waste and operate an existing on-site HMIWI, existing commercial HMIWI, and industries that generate medical waste but do not operate existing on-site HMIWI. The NSPS will impact industries that generate hospital/ medical/ infectious waste and plan to operate a new on-site HMIWI, new commercial HMIWI, and industries that generate medical waste but are not expected to operate an on-site HMIWI. Facilities engaging in the above activities will generally fall into one of two categories: directly affected facilities, and "off-site generators."

Facilities in industries that generate medical waste and operate existing on-site HMIWI or will operate new on-site HMIWI will be directly affected by the MACT emission guidelines and

standards because they will need to initiate some action to comply with the regulation (i.e., install emission control equipment or switch to an alternative). Costs and economic impacts associated with these facilities and industries are referred to as direct costs and economic impacts. Industries belonging to this category include hospitals, nursing homes, and research laboratories. Also included in this category of directly affected industries are commercial HMIWI. Although the commercial HMIWI industry does not generate medical waste, it will be required to comply with the emission guidelines and standards by installing emission control equipment.

The EG and NSPS will also impact facilities that generate medical waste but do not operate an existing on-site HMIWI or will not operate a new on-site HMIWI. Such facilities are termed "off-site generators" in this report. These facilities will be indirectly affected by the regulation because they must send their medical waste off-site to be treated and disposed. Commercial HMIWI or other waste treatment facilities that provide service to these types of facilities are expected to pass on to their customers at least a portion of their cost increases for pollution control. Off-site generators are therefore expected to have to pay more for waste treatment service. Industries belonging to this off-site generator category include hospitals, nursing homes, research laboratories, funeral homes, physicians' offices, dentists' offices and clinics, outpatient care facilities, freestanding blood banks, fire and rescue operations, and correctional facilities.

Estimates of the number of facilities operating in industries that generate hospital and/or medical/infectious waste and/or operate a HMIWI are listed in Table 1. Table 2 presents the total number of existing HMIWI in the inventory. As shown in Table 1, the total number of facilities that generate hospital and/or medical/ infectious waste and/or operate and HMIWI is approximately 415,000, and this number vastly exceeds the number of HMIWI in operation shown in Table 2. Thus, most generators of hospital and/or medical/infectious waste are 'off-site generators' and do not operate an incinerator.

In order to assess the impact of the NSPS, the number of new HMIWI projected to begin operation over the period 1996 through 2000 are estimated using historical trends. The number of new commercial HMIWI that would have begun operation in the absence of the emission standards is estimated by examining the annual number of new commercial incinerators that have begun operation in the past few years. This survey is possible because the HMIWI inventory contains this information. An examination of the HMIWI inventory reveals that approximately two new commercial incinerators have begun operation in each of the past few years. Using this historical information, the cost and economic impact analyses project that in the absence of these emission standards, two new commercial incinerators would begin operation in each year of the five-year analysis time frame. Therefore, this analysis uses a future baseline of ten new commercial HMIWI that would potentially be affected by these emission standards by the fifth year of the analysis time frame used to estimate economic impacts. The same forecasting methodology is applied to the projection of new HMIWI units in each of the industry categories. Table 2 presents the number of new HMIWI that are projected to be constructed in the absence of these MACT emission standards for new HMIWI.

Table 1
Number of Facilities in Industries Generating
Hospital/Medical/Infectious Waste and/or Operating HMIWI

Industry	Number of Facilities
Hospitals	6,601
Nursing homes	20,879
Laboratories: Commercial research[1] Medical / dental	 4,170 15,961
Funeral homes	22,000
Physicians' offices	192,965
Dentists' offices and clinics	108,919
Outpatient care[2]	9,238
Freestanding blood banks	218
Fire & rescue operations	29,840
Correctional facilities	4,591
Commercial incineration facilities	79
Total	**415,461**

[1] SIC 8731, Commercial Physical and Biological Research.
[2] Defined restrictively as ambulatory care centers (represented by "general medical clinics," a subset of SIC 8011) and kidney dialysis facilities

Table 2
Number of Existing and New Medical Waste Incinerators

HMIWI Size	Existing HMIWI	Projected Number of NEW HMIWI	
		Per Year	Total 1996 to 2000
Small	1,139	17	85
Medium	692	18	90
Large	463	12	60
Commercial	79	2	10
Total	**2,373**	**49**	**245**

III NEED FOR THE REGULATION

Executive Order 12866 requires that the Agency identify the need for the regulation being proposed or promulgated. The emission of air pollutants poses a threat to human health and the environment. This section discusses: (1) the reasons the marketplace does not provide for adequate pollution control absent appropriate standards or incentives; (2) the environmental factors that indicate the need for additional pollution controls for HMIWI; and (3) the legal requirements that dictate the necessity and timing of this regulation.

3.1 Market Failure

The need for emission guidelines and new source performance standards for HMIWI arises from the failure of the marketplace to provide the optimal level of pollution control desired by society. In making decisions regarding the purchase and operation of HMIWI, owners and operators only consider those costs and benefits that accrue directly to them from the marketplace or internalized benefits and costs. However, the operation of HMIWI creates the negative externality of air pollution. An externality is defined as a cost or benefit of a market transaction that is not reflected in the prices buyers and sellers use to make their decisions. When HMIWI are operated, air pollution occurs and the costs this pollution creates in terms of adverse health and environmental effects are not considered in the price of HMIWI services absent environmental regulations. The EG and NSPS for HMIWI are an attempt to internalize the negative externality of air pollution associated with the operation of HMIWI.

In addition, air quality is a public good. Public goods are defined as goods that when produced are consumed by everyone whether the individual pays for the good or not. Public goods are nonexcludable which means it is not possible to exclude others from consumption of the good when it is produced. Individuals that pay for clean air are not able to exclude others from

enjoying the benefits of a less polluted environment. For this reason in many cases, the marketplace, absent regulation, does not provide for the optimal level of clean air.

3.2 Environmental Factors

In the case of HMIWI, the marketplace fails to adequately consider the air pollution that occurs at HMIWI without regulation. Operation of HMIWI results in the emission of HAPs, dioxins and furans, and criteria air pollutants. The EG and NSPS are expected to reduce air emissions of these pollutants. The environmental and health benefits associated with this regulation are discussed more fully in Chapter VI.

3.3 Legal Requirements

The EG and NSPS are promulgated under the authority of Sections 111 and 129 of the Clean Air Act as amended in 1990

IV REGULATORY OPTIONS

4.1 Regulatory Options for Existing Sources

At proposal, the EPA examined the impacts of five control options for existing sources but concluded that all existing HMIWI would need good combustion and dry scrubbers to meet the MACT floors for CO, PM, and HCl. Consequently, the EPA was left to consider only two control options for MACT.

After proposal, the EPA received numerous comments containing substantially new information. Review of this new information led to new conclusions in a number of areas: the HMIWI inventory; HMIWI subcategories; performance of emission control technologies; MACT floors; and monitoring and testing options. As a result, the EPA examined several new regulatory options which merit consideration in selecting MACT for existing HMIWI. This section summarizes these new regulatory options and the EPA's assessment of their merits.

Based on the new information submitted to the EPA following proposal of the EG, new MACT floor emission levels were developed for small, medium, and large HMIWI. Next, the EPA determined the emission control technologies existing HMIWI would probably need to meet regulations based on these floor emission limits The floor for small existing HMIWI requires good combustion; add-on wet scrubbing systems would not be necessary to meet the MACT floor. For medium existing HMIWI, the MACT floor requires good combustion and a moderate efficiency wet scrubber. The MACT floor for large existing HMIWI requires good combustion and a high efficiency wet scrubber.

Having identified the emission control technology most existing HMIWI would likely install to

meet the MACT floor emission limits, the EPA also reviewed the performance capabilities of other emission control technologies that would reduce emissions by an amount greater than the MACT floor level of control. This process enables the EPA to identify more stringent regulatory control options which could be selected as MACT. Table 3 summarizes the emission control technology that would probably be required for small, medium, and large HMIWI to meet the emission limits specified for each of the regulatory options. The regulatory options are a combination of the various emission guidelines the EPA believes merit consideration as MACT for existing HMIWI. This table is constructed only for the purpose of organizing and structuring an analysis of the cost, environmental, energy, and economic impacts associated with determining or selecting MACT for existing HMIWI. In reviewing this table, therefore, there are a couple of important points to keep in mind.

First, the EG for existing HMIWI will not include requirements to use a specific emission control system or technology; the EG will only include emission limits, which may be met by any means or by any control system or technology of the HMIWI owner's or operator's choice. Second, to the extent possible, it is an objective of the EPA to adopt emission limits in the EG that can be met through the use of several emission control systems or technologies. Consequently, where not constrained by the Act, the actual emission limits associated with some of the regulatory options shown in Table 3 have been selected at a level designed to encourage or permit the use of either wet or dry scrubbing control systems.

4.2 Regulatory Options for New Sources

At proposal, the EPA concluded that all new HMIWI would need good combusion and dry scrubbers to meet the MACT floors for CO, PM, HCl. Consequently, the EPA was left to consider only two regulatory control options for MACT.

After proposal, the EPA received numerous comments containing substantially new information. Review of this new information led to new conclusions in a number of areas: the HMIWI inventory; HMIWI subcategories; performance of emission control technologies; MACT floors; and monitoring and testing options. As a result, the EPA examined several new regulatory options in selecting MACT for new HMIWI. This section summarizes these new regulatory options and the EPA's assessment of their merits.

The MACT "floor" defines the least stringent emission standards the EPA may adopt for new HMIWI. However, the Clean Air Act also requires EPA to examine alternative emission standards (i.e., regulatory options) more stringent than the MACT floor.

Based on the new information submitted to the EPA following proposal of the MACT emission standards for new HMIWI, new MACT floor emission levels were developed for new small, medium, and large HMIWI. Next, the EPA determined the emission control technologies new HMIWI would probably need to meet regulations based on these floor emission limits. The floor

Table 3
Regulatory Options For Existing HMIWI

HMIWI Size	Regulatory Option					
	1	2	3	4	5	6
Small ≤200 lb/hr	Good combustion	Good combustion on units meeting the rural criteria; good combustion and low efficiency wet scrubber on other units[1]	Good combustion and low efficiency wet scrubber	Good combustion and moderate efficiency wet scrubber	Good combustion and moderate efficiency wet scrubber	Good combustion and high efficiency wet scrubber
Medium >200 lb/hr and ≤500 lb/hr	Good combustion and moderate efficiency wet scrubber	Good combustion and moderate efficiency wet scrubber	Good combustion and moderate efficiency wet scrubber	Good combustion and moderate efficiency wet scrubber	Good combustion and high efficiency wet scrubber	Good combustion and high efficiency wet scrubber
Large >500 lb/hr	Good combustion and high efficiency wet scrubber	Good combustion and high efficiency wet scrubber	Good combustion and high efficiency wet scrubber	Good combustion and high efficiency wet scrubber	Good combustion and high efficiency wet scrubber	Good combustion and high efficiency wet scrubber

[1]Units "meeting the rural criteria" are more than 50 miles from an SMSA and burn less than 2,000 pounds of medical waste per week.

for small new HMIWI requires good combustion and moderate efficiency wet scrubbers. For medium new HMIWI, the MACT floor requires good combustion and a combined wet/dry scrubbing system without activated carbon injection. The MACT floor for large new HMIWI requires good combustion and a combined wet/dry scrubbing system with activated carbon injection.

Having identified the emission control technology most new HMIWI would likely install to meet the MACT floor emission limits, the EPA also reviewed the performance capabilities of other emission control technologies that would reduce emissions by an amount greater than the MACT floor level of control. This process enables the EPA to identify more stringent regulatory options which could be selected as MACT. Table 4 summarizes the emission control technology that would probably be required for new small, medium, and large HMIWI to meet the emission limits specified for each of the regulatory options. The regulatory options are a combination of the various emission standards the EPA believes merit consideration as MACT for new HMIWI. As is true for existing sources, this table is constructed only for the purpose of organizing and structuring an analysis of the cost, environmental, energy, and economic impacts associated with determining or selecting MACT for new HMIWI. These emission standards for new HMIWI will not include requirements to use a specific emission control system or technology; the standards will only include emission limits, which may be met by any means or by any control system or technology of the HMIWI owner's or operator's choice.

4.3 Analysis Scenarios

Health care facilities may choose from among a number of alternatives for treatment and disposal of their medical waste. (It should be noted that these alternatives are generally more limited for health care facilities located in rural areas than for those located in urban areas.) At the time of proposal, inventory estimates indicated that fewer than half of all hospitals operated on-site medical waste incinerators. The clear trend over the past several years has been for more and more hospitals to turn to the use of alternative on-site medical waste treatment technologies or the use of commercial off-site treatment and disposal services. Consequently, it is quite likely that even fewer hospitals now operate on-site medical waste incinerators.

Given the above data, it can be assumed that more than half of all hospitals today have chosen to use other means of treatment and disposal of their medical waste rather than operate an on-site incinerator. This indicates that alternatives to the use of on-site incinerators exist and that they are readily available in many cases. For other health care facilities, such as nursing homes, etc., only a small number of facilities currently operate on-site HMIWI. Therefore, for these types of health care facilities, the percentage of such facilities using alternative means of treatment and disposal of medical waste – particularly commercial treatment and disposal services – is much higher, probably 95 percent or more. This further confirms the availability of alternatives to on-site incineration for the treatment and disposal of medical waste.

Table 4
Regulatory Options For New HMIWI

HMIWI Size	Regulatory Option		
	1	2	3
Small ≤200 lb/hr	Good combustion and moderate efficiency wet scrubber	Good combustion and moderate efficiency wet scrubber	Good combustion and high efficiency wet scrubber
Medium >200 lb/hr and ≤500 lb/hr	Good combustion, dry injection/fabric filter system, and high efficiency wet scrubber	Good combustion, dry injection/fabric filter system with carbon, and high efficiency wet scrubber	Good combustion, dry injection/fabric filter system with carbon, and high efficiency wet scrubber
Large >500 lb/hr	Good combustion, dry injection/fabric filter system with carbon, and high efficiency wet scrubber	Good combustion, dry injection/fabric filter system with carbon, and high efficiency wet scrubber	Good combustion, dry injection/fabric filter system with carbon, and high efficiency wet scrubber

A likely reaction and outcome associated with the adoption of the standards for existing and new HMIWI, therefore, is an increase in the use of these alternatives by health care facilities for treatment and disposal of their medical waste. It is not the objective of the EPA to encourage the use of alternatives or to discourage the continued use of on-site medical waste incinerators; rather, it is the objective of the EPA to adopt the emission standards for new HMIWI that fulfill requirements of the Clean Air Act. In doing so, however, it is clear that one outcome associated with adoption of these emission standards is likely to be an increase in the use of alternatives and a decrease in the use of on-site medical waste incinerators in the future. Consequently, it is an outcome the EPA should acknowledge and incorporate into the analysis of the costs and economic impacts of the emission standards.

In the analysis of costs and economic impacts discussed in Chapter V of this report, selection of an alternative form of medical waste treatment and disposal by a health care facility, rather than installing a new HMIWI, is referred to as "switching." Switching was incorporated into the cost analysis at proposal and was the basis for the conclusion at proposal that adoption of the proposed emission standards could lead to as many as 80 percent of health care facilities that might have installed HMIWI to choose an alternative means of medical waste treatment and disposal. However, the economic impacts presented with the proposed MACT for new sources were only evaluated using the costs under a "no switching" scenario. Although the RIA presented a qualitative discussion of the likely possibility of facilities that might have installed on-site HMIWI deciding to switch to alternative treatment and disposal methods, the economic impacts under a switching scenario were not quantified due to time constraints.

Switching has now been incorporated into the cost and economic impact analysis. Three scenarios are evaluated: one scenario which ignores switching, and two scenarios which consider switching. Scenario A assumes that each existing and new HMIWI will comply with the appropriate regulatory option by having the appropriate emission control equipment installed. This scenario most likely overstates national costs and economic impacts and therefore should not be viewed as representative of the new source emission standards. It is included only to fulfill the goal of providing a complete analysis.

Switching scenarios B and C are considered more representative of the cost and economic impacts of the MACT for existing and new HMIWI. Both scenarios assume switching occurs when the cost associated with purchasing and installing the air pollution control technology or system necessary to comply with the MACT emission standards (i.e., a regulatory option) is greater than the cost of using an alternative means of treatment and disposal.[a]

The difference between the two scenarios is the assumption of whether or not the medical waste stream is separated. Some facilities currently separate their medical waste into an infectious stream and a non-infectious stream. Some commenters have stated it is a good assumption that hospitals which currently operate on-site medical waste incinerators practice little separation of medical waste into infectious and non-infectious streams; generally all the waste is incinerated.

Based on estimates in the literature that only 10 to 15 percent of medical waste is infectious and the remaining 85 to 90 percent is non-infectious, scenario B assumes that only 15 percent of the waste currently being burned at a health care facility operating an on-site incinerator is infectious medical waste; the remaining 85 percent is non-infectious medical waste. This non-infectious waste is municipal waste; it needs no special handling, treatment, transportation, or disposal, and can be sent to a municipal landfill or a municipal combustor for disposal. Thus, under scenario B, when choosing an alternative to operation of an on-site medical waste incinerator, in response to adoption of the emission standards, a health care facility need only choose an alternative form of medical waste treatment and disposal for 15 percent of the waste stream to be burned on-site and may send the remaining 85 percent to a municipal landfill. This scenario results in the lowest costs because 85 percent of the waste is disposed at the relatively inexpensive cost of municipal waste disposal.

On the other hand, it is unlikely that all health care facilities will be able to, or will decide to, segregate their waste stream. For example, a facility may decide that the cost and inconvenience of training its staff to segregate waste is not acceptable. Scenario C, therefore, assumes that all medical waste that would be burned at a health care facility with an on-site medical waste incinerator is infectious medical waste and must be treated and disposed of accordingly. As a

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[a]Under both scenarios, however, switching may not be possible for some HMIWI that burn a small amount of medical waste and are located far away from an urban area. Such HMIWI may, in some cases, have difficulty attracting the services of waste haulers and/or commercial HMIWI operators. For some small, remote HMIWI, therefore, scenarios B and C may not apply. Only scenario A, no switching, may apply.

result, scenario C leads to higher costs than scenario B.

Scenarios B and C represent the likely range of impacts associated with the MACT emission standards for new and existing HMIWI. The actual impacts of a MACT emission standard (i.e., a regulatory option) are most likely to fall somewhere within the range represented by scenarios B and C.

V ECONOMIC IMPACTS

5.1 Methodology - Existing Sources

This section briefly describes the analytical approach used to estimate industry-wide and facility-specific economic impacts and to evaluate the economic feasibility of switching. All economic impacts presented in this document were re-estimated using the methodology described in the original economic impact analysis (EA.). Therefore, for a more detailed description of the methodology used to estimate economic impacts, refer to the *Background Information for Proposed Standards and Guidelines: Analysis of Economic Impacts for Existing Sources.*[4] The base year for this analysis is 1993. Therefore, all dollar figures (e.g., costs, prices) are stated at 1993 levels.

Average industry-wide price increases are estimated by comparing annualized control costs to annual revenue for each affected industry. The ratio of annualized control costs to revenue represents the average industry-wide price increase necessary to recover control costs. Percent changes in industry-wide output are estimated in turn using high and low estimates of the price elasticity of demand. Resulting changes in industry revenue are estimated based on the price and output calculations. Employment or labor market impacts are estimated assuming they are proportional to the output impacts.

Facility-specific economic impacts are estimated using model facility information. Facility-specific price impacts are compared to average industry-wide price impacts to determine if the difference between the two is significant. A determination of significance – implying that the facility price increase may not be achievable – is made for all but commercial HMIWI operators if the facility price increase exceeds the average industry-wide, or "market," price increase by more than one percentage point. For commercial HMIWI operators, the facility price increase is considered significant if it exceeds the market price increase by more than two percentage points. More pricing latitude is given to commercial HMIWI operators for two reasons: 1) commercial incineration is not subject to the same institutional pricing constraints as the health care sector, and 2) commercial incineration fees could actually get a boost from the regulation as a result of switching from on-site incineration and an increase in the demand for commercial incineration services. Where significance is found, the impact on net income (earnings) of absorbing control costs is estimated and evaluated.

The assumption of no switching (scenario A) represents the highest cost and economic impact scenario. (The exception is commercial HMIWI, for which control costs do not vary by scenario.) Scenario B, switching with waste segregation, represents the lowest cost and economic impact scenario. As previously discussed, the EPA considers scenario A to be unlikely. Scenarios B and C should be regarded as more representative of the impacts of the EG.

5.2 Methodology - New Sources

In general, the approach used to estimate economic impacts associated with the NSPS is quite similar to the methodology used for existing sources. However, it is necessary to make some additional assumptions for the new source analysis and these additional assumptions are briefly discussed. All economic impacts presented in this document were re-estimated using the methodology described in the original EA.. Therefore, for a more detailed description of the methodology used to estimate economic impacts, refer to the *Background Information for Proposed Standards and Guidelines: Analysis of Economic Impacts for New Sources.*[5] Although this analysis attempts to forecast future events and reactions to the emission standards, the basis for the forecast is 1993 financial and economic data. Therefore, all dollar figures (e.g., costs, prices) are stated at 1993 levels.

Economic impacts for new HMIWI are calculated under a couple of assumptions. First, the costs that are used to estimate the economic impacts of these MACT emission standards include control costs from both the emission guidelines (EG) for existing HMIWI and these emission standards for new HMIWI (i.e., NSPS). This approach is used to account for market adjustments (e.g., price impacts) that would first occur after implementation of the EG. This approach allows for the establishment of a future baseline scenario. Second, due to lack of information, revenue data for each of the affected industries were not adjusted for growth during the five-year time frame.

The NSPS will affect new HMIWI. An evaluation of the economic impacts of the NSPS requires that the number of new HMIWI be forecast. In this report, a five-year time period between 1996 and 2000 is used to evaluate the impact of the NSPS on new HMIWI. This type of analysis is only possible if projections of key analysis parameters are made. The parameters required to establish a future fifth-year baseline include: the number of new HMIWI units that would have begun operation in the absence of these emission standards for new sources, the costs of control technologies to enable the new HMIWI units to meet these emission standards, the population of facilities expected to exist in each of the industries (e.g., hospitals, etc.) and all relevant financial and economic data used in this analysis to estimate the economic impacts of these emission standards.

Although these standards specify only an emission limit that must be met, rather than a specific emission control technology that must be installed, costs are estimated by identifying the emission control technology that most new HMIWI would likely install given the current available technology. Therefore, no projections are made regarding future innovations or future changes in the price of these emission control technologies.

Time-series data were not readily available to estimate changes in the population of hospitals, nursing homes, etc. over the next five years. The population of facilities in each affected industry is therefore assumed to remain constant at the 1993 level, the most recent year for which facility population data were available. This implicitly assumes that new HMIWI in the next five years ill not be due to industry growth, but rather to the replacement of existing HMIWI.
Also due to the lack of time-series data, future values are not estimated for financial and economic inputs such as revenue and employment. Rather, the available 1993 data are assumed to apply throughout the five-year period. While this does not account for possible growth within the affected industries, it is consistent with control costs, which are stated in 1993 dollars.

5.3 Industry-wide Annualized Control Costs - Existing Sources

Tables 5A, 5B, and 5C present national capital and annualized control costs for those industries that operate existing HMIWI ("direct control costs").[6] Annualized control costs are highest under scenario A (Table 5A). Total annualized costs under scenario A range from $85.2 million for regulatory option one to $205.2 million for regulatory option six. As previously explained, scenario A impacts are calculated under the unlikely assumption that all facilities currently operating an HMIWI will purchase emission control equipment. This scenario does not allow for the possibility of switching to alternative methods of waste treatment and disposal.

National costs are lowest under scenario B, which assumes that some facilities currently operating an on-site HMIWI will switch to an alternative method of waste treatment and disposal. This scenario also assumes that those facilities deciding to switch will also segregate their waste. Total annualized costs under scenario B range from $55.2 million for regulatory option one to $66.3 million for regulatory option six. The range under scenario C, which assumes switching with no waste segregation, is $82.2 million for regulatory option one to $130.7 million for regulatory option six. In comparison to scenario A, costs under scenarios B and C do not vary significantly among the regulatory options because the cost of some alternative methods (such as autoclaving) are unaffected by the EG. In addition, control requirements for commercial HMIWI (another alternative to on-site incineration) do not vary by regulatory option. The small changes in national annualized costs observed among the regulatory options reflect the different number of facilities expected to switch from on-site incineration to an alternative method of waste treatment and disposal.

Table 5A
Industry-wide Annualized and Capital Control Costs
for Industries Operating On-site Medical Waste Incinerators: Existing Sources
Scenario A: No Switching

Industry	Regulatory Option					
	One	**Two**	**Three**	**Four**	**Five**	**Six**
Hospitals: Annualized costs	$ 58,794,683	$122,328,625	$126,027,425	$131,943,171	$138,533,521	$146,776,634
Capital costs	$153,387,845	$369,093,928	$382,596,503	$406,413,438	$435,074,626	$476,105,619
Nursing homes: Annualized costs	$ 9,304,479	$ 19,358,964	$ 19,944,313	$ 20,880,502	$ 21,923,449	$ 23,227,953
Capital costs	$ 24,274,202	$ 58,410,498	$ 60,547,332	$ 64,316,451	$ 68,852,191	$ 75,345,500
Research labs: Annualized costs	$ 9,304,479	$ 19,358,964	$ 19,944,313	$ 20,880,502	$ 21,923,449	$ 23,227,953
Capital costs	$ 24,274,202	$ 58,410,498	$ 60,547,332	$ 64,316,451	$ 68,852,191	$ 75,345,500
Other: Annualized costs	$ 2,807,387	$ 5,841,067	$ 6,017,681	$ 6,300,152	$ 6,614,834	$ 7,008,434
Capital costs	$ 7,324,113	$ 17,623,858	$ 18,268,591	$ 19,405,825	$ 20,774,368	$ 22,733,556
Commercial incineration:						
Annualized costs	$ 4,948,460	$ 4,948,460	$ 4,948,460	$ 4,948,460	$ 4,971,523	$ 4,971,523
Capital costs	$ 13,209,321	$ 13,209,321	$ 13,209,321	$ 13,209,321	$ 13,314,841	$ 13,314,841
Total : Annualized costs	$ 85,159,488	$171,836,080	$176,882,192	$184,952,787	$193,966,776	$205,212,497
Capital costs	$222,469,683	$516,748,103	$535,169,079	$567,661,486	$606,868,217	$662,845,016

Table 5B
Industry-wide Annualized and Capital Control Costs for
Industries Operating On-site Medical Waste Incinerators: Existing Sources
Scenario B: Switching With Waste Segregation

Industry	Regulatory Option					
	One	**Two**	**Three**	**Four**	**Five**	**Six**
Hospitals Annualized costs	$36,838,079	$39,733,624	$43,432,425	$43,989,339	$44,157,613	$44,973,911
Capital costs	$37,095,105	$31,027,063	$44,529,639	$46,759,965	$46,248,407	$50,323,218
Nursing homes: Annualized costs	$ 5,829,764	$ 6,287,996	$ 6,873,344	$ 6,961,478	$ 6,988,108	$ 7,117,290
Capital costs	$ 5,870,440	$ 4,910,149	$ 7,046,983	$ 7,399,940	$ 7,318,984	$ 7,963,838
Research labs Annualized costs	$ 5,829,764	$ 6,287,996	$ 6,873,344	$ 6,961,478	$ 6,988,108	$ 7,117,290
Capital costs	$ 5,870,440	$ 4,910,149	$ 7,046,983	$ 7,399,940	$ 7,318,984	$ 7,963,838
Other: Annualized costs	$ 1,758,981	$ 1,897,240	$ 2,073,854	$ 2,100,446	$ 2,108,481	$ 2,147,458
Capital costs	$ 1,771,254	$ 1,481,511	$ 2,126,246	$ 2,232,741	$ 2,208,314	$ 2,402,882
Commercial incineration:						
Annualized costs	$ 4,948,460	$ 4,948,460	$ 4,948,460	$ 4,948,460	$ 4,971,523	$ 4,971,523
Capital costs	$13,209,321	$13,209,321	$13,209,321	$13,209,321	$13,314,841	$13,314,841
Total : Annualized costs	$55,205,048	$59,155,316	$64,201,427	$64,961,201	$65,213,833	$66,327,472
Capital costs	$63,816,560	$55,538,193	$73,959,172	$77,001,907	$76,409,530	$81,968,617

Table 5C
Industry-wide Annualized and Capital Control Costs for
Industries Operating On-site Medical Waste Incinerators: Existing Sources
Scenario C: Switching With No Waste Segregation

Industry	Regulatory Option					
	One	**Two**	**Three**	**Four**	**Five**	**Six**
Hospitals: Annualized costs	$ 56,613,561	$ 84,132,595	$ 87,831,396	$ 89,019,615	$ 91,125,328	$ 92,186,286
Capital costs	$139,528,745	$138,957,564	$152,460,140	$156,968,520	$158,894,540	$161,850,735
Nursing homes: Annualized costs	$ 8,959,308	$ 13,314,299	$ 13,899,648	$ 14,087,688	$ 14,420,925	$ 14,588,825
Capital costs	$ 22,080,947	$ 21,990,556	$ 24,127,389	$ 24,840,857	$ 25,145,657	$ 25,613,486
Research labs: Annualized costs	$ 8,959,308	$ 13,314,299	$ 13,899,648	$ 14,087,688	$ 14,420,925	$ 14,588,825
Capital costs	$ 22,080,947	$ 21,990,556	$ 24,127,389	$ 24,840,857	$ 25,145,657	$ 25,613,486
Other: Annualized costs	$ 2,703,240	$ 4,017,246	$ 4,193,860	$ 4,250,596	$ 4,351,142	$ 4,401,801
Capital costs	$ 6,662,355	$ 6,635,081	$ 7,279,816	$ 7,495,086	$ 7,587,051	$ 7,728,207
Commercial incineration:						
Annualized costs	$ 4,948,460	$ 4,948,460	$ 4,948,460	$ 4,948,460	$ 4,971,523	$ 4,971,523
Capital costs	$ 13,209,321	$13,209,321	$ 13,209,321	$ 13,209,321	$ 13,314,841	$ 13,314,841
Total : Annualized costs	$ 82,183,877	$119,726,899	$124,773,012	$126,394,047	$129,289,843	$130,737,260
Capital costs	$203,562,315	$202,783,078	$221,204,055	$227,354,641	$230,087,746	$234,120,755

Table 6 presents annual costs for those industries not operating HMIWI ("indirect control costs"). Annual costs for these "off-site generators," which are assumed to have their medical waste incinerated off-site, were calculated by multiplying estimated medical waste generated annually by the incremental cost for commercial incineration. The incremental cost was calculated by dividing industry-wide annualized control costs for commercial incinerators by their throughput. The incremental cost of commercial incineration is calculated to be 0.63 cents per pound under all regulatory options. Note in Tables 5A through 5C that industry-wide annualized control costs for commercial HMIWI vary insignificantly by regulatory option, increasing only slightly from regulatory option 4 and regulatory option 5. This is because control requirements do not vary by regulatory option for commercial HMIWI.

Table 6
Industry-wide Annual Costs for Industries Not Operating On-site Medical Waste Incinerators: Existing Sources

Industry	Medical Waste Generated Annually (tons per year)	Annual Control Cost[1]
Medical / dental laboratories	17,600	$222,115
Funeral homes	900	$ 11,358
Physicians' offices	35,200	$444,230
Dentists' offices & clinics	8,700	$109,795
Outpatient care	26,300	$331,910
Freestanding blood banks	4,900	$ 61,839
Fire & rescue operations	1,600	$ 20,192
Correctional facilities	3,300	$ 41,647
Total	98,500	$1,243,087

[1] Assumes that all medical waste is incinerated off-site at an incremental cost of 0.63 cents per pound, the average cost increase for commercial HMIWI

5.4 Industry-wide Annualized Control Costs - New Sources

Tables 7A, 7B, and 7C present national annualized control costs for those industries that operate HMIWI ("direct control costs").[7] Annualized control costs are highest under scenario A (Table 7A). Total annualized costs under scenario A range from $230.2 million for regulatory option one to $242.8 million for regulatory option three. As previously explained, scenario A impacts are calculated under the unlikely assumption that all facilities operating, and expected to operate, an HMIWI will purchase emission control equipment. This scenario does not allow for the possibility of switching to alternative methods of waste treatment and disposal.

Scenario B assumes that those facilities deciding to switch will also segregate their waste. Total annualized costs under scenario B range from $77.3 million for regulatory options one and two to $78.5 million for regulatory option three. The range under scenario C, which assumes switching with no waste segregation, is $155.5 million for regulatory options one and two to $157.0 million for regulatory option three. In comparison to Scenario A, costs under scenarios B and C do not vary significantly among the regulatory options because the cost of some alternative methods (such as autoclaving) are unaffected by the emission limits imposed on HMIWI. In addition, control requirements for commercial HMIWI (another alternative to on-site incineration) do not vary by regulatory option. The small changes in national annualized costs observed among the regulatory options reflect the different number of facilities expected to switch from on-site incineration to an alternative method of waste treatment and disposal.

Table 8 presents annual costs for those industries not operating HMIWI ("indirect control costs"). Annual costs for these "off-site generators," which are assumed to have their medical waste incinerated off-site, were calculated by multiplying estimated medical waste generated annually by the incremental cost for commercial incineration. The incremental cost was calculated by dividing industry-wide annualized control costs for commercial incinerators, both existing and new, by their throughput. The incremental cost of commercial incineration is calculated to be 0.99 cents per pound under all regulatory options.

5.5 Industry-Wide Economic Impacts - Existing Sources

Industry wide impacts include estimates of the change in market price for the services provided by the affected industries, the change in market output or production, the change in industry revenue, and impact on affected labor markets in terms of employment losses or workers lost. These impacts are summarized in Tables 9 and 10.

As can be seen in Table 9, industries that generate hospital waste and/or medical/infectious waste and operate onsite incinerators (i.e., hospitals, nursing homes, etc.) are expected to experience average price increases in the range of 0% to 0.14%, depending on the industry, regulatory option, and scenario analyzed. Table 10 shows that these industries are expected to experience output and employment impacts in the range of 0% to 0.18%. In addition, the revenue impacts

Table 7A
Industry-wide Annualized Control Costs for Industries Operating On-site Medical Waste Incinerators: Existing and New Sources
Scenario A: No Switching

Industry	Annualized Costs		
	Regulatory Option 1[1]	Regulatory Option 2[2]	Regulatory Option 3[3]
Hospitals			
New	$ 23,925,809	$ 24,295,241	$ 24,918,291
Existing	$138,533,521	$138,533,521	$146,776,634
Total	$162,459,330	$162,828,762	$171,694,925
Nursing homes			
New	$ 3,786,349	$ 3,844,813	$ 3,943,413
Existing	$ 21,923,449	$ 21,923,449	$ 23,227,953
Total	$ 25,709,798	$ 25,768,262	$ 27,171,366
Research labs			
New	$ 3,786,349	$ 3,844,813	$ 3,943,413
Existing	$ 21,923,449	$ 21,923,449	$ 23,227,953
Total	$ 25,709,798	$ 25,768,262	$ 27,171,366
Other			
New	$ 1,142,432	$ 1,160,072	$ 1,189,822
Existing	$ 6,614,834	$ 6,614,834	$ 7,008,434
Total	$ 7,757,266	$ 7,774,906	$ 8,198,256
Commercial incineration			
New	$ 3,581,630	$ 3,581,630	$ 3,581,630
Existing	$ 4,971,523	$ 4,971,523	$ 4,971,523
Total	$ 8,553,153	$ 8,553,153	$ 8,553,153
Total Existing and New	$230,189,345	$230,693,345	$242,789,066

[1] Assumes Regulatory Option 5 for existing HMIWI, the most stringent Emission Guidelines that would be considered in combination with regulatory option 1 of the NSPS for new sources.
[2] Assumes Regulatory Option 5 for existing HMIWI, the most stringent Emission Guidelines that would be considered in combination with regulatory option 2 of the NSPS for new sources
[3] Assumes Regulatory Option 6 for existing HMIWI, the most stringent Emission Guidelines that would be considered in combination with regulatory option 3 of the NSPS for new sources.

Table 7B
Industry-wide Annualized Control Costs for Industries Operating On-site Medical Waste Incinerators: Existing and New Sources
Scenario B: Switching With Waste Segregation

Industry	Annualized Costs		
	Regulatory Option 1[1]	Regulatory Option 2[2]	Regulatory Option 3[3]
Hospitals			
New	$ 6,267,151	$ 6,267,151	$ 6,267,151
Existing	$44,157,613	$44,157,613	$44,973,911
Total	$50,424,764	$50,424,764	$51,241,062
Nursing homes			
New	$ 991,800	$ 991,800	$ 991,800
Existing	$ 6,988,108	$ 6,988,108	$ 7,117,290
Total	$ 7,979,908	$ 7,979,908	$ 8,109,090
Research labs			
New	$ 991,800	$ 991,800	$ 991,800
Existing	$ 6,988,108	$ 6,988,108	$ 7,117,290
Total	$ 7,979,908	$ 7,979,908	$ 8,109,090
Other			
New	$ 299,251	$ 299,251	$ 299,251
Existing	$ 2,108,481	$ 2,108,481	$ 2,147,458
Total	$ 2,407,732	$ 2,407,732	$ 2,446,709
Commercial incineration			
New	$ 3,581,630	$ 3,581,630	$ 3,581,630
Existing	$ 4,971,523	$ 4,971,523	$ 4,971,523
Total	$ 8,553,153	$ 8,553,153	$ 8,553,153
Total Existing and New	$77,345,465	$77,345,465	$78,459,104

[1] Assumes Regulatory Option 5 for existing HMIWI, the most stringent Emission Guidelines that would be considered in combination with regulatory option 1 of the NSPS for new sources.
[2] Assumes Regulatory Option 5 for existing HMIWI, the most stringent Emission Guidelines that would be considered in combination with regulatory option 2 of the NSPS for new sources.
[3] Assumes Regulatory Option 6 for existing HMIWI, the most stringent Emission Guidelines that would be considered in combination with regulatory option 3 of the NSPS for new sources

Table 7C
Industry-wide Annualized Control Costs for Industries Operating On-site Medical Waste Incinerators: Existing and New Sources
Scenario C: Switching With No Waste Segregation

Industry	Annualized Costs		
	Regulatory Option 1[1]	Regulatory Option 2[2]	Regulatory Option 3[3]
Hospitals			
New	$ 16,596,792	$ 16,596,792	$ 16,596,792
Existing	$ 91,125,328	$ 91,125,328	$ 92,186,286
Total	$107,722,120	$107,722,120	$108,783,078
Nursing homes			
New	$ 2,626,504	$ 2,626,504	$ 2,626,504
Existing	$ 14,420,925	$ 14,420,925	$ 14,588,825
Total	$ 17,047,429	$ 17,047,429	$ 17,215,329
Research labs			
New	$ 2,626,504	$ 2,626,504	$ 2,626,504
Existing	$ 14,420,925	$ 14,420,925	$ 14,588,825
Total	$ 17,047,429	$ 17,047,429	$ 17,215,329
Other			
New	$ 792,480	$ 792,480	$ 792,480
Existing	$ 4,351,142	$ 4,351,142	$ 4,401,801
Total	$ 5,143,622	$ 5,143,622	$ 5,194,281
Commercial incineration			
New	$ 3,581,630	$ 3,581,630	$ 3,581,630
Existing	$ 4,971,523	$ 4,971,523	$ 4,971,523
Total	$ 8,553,153	$ 8,553,153	$ 8,553,153
Total Existing and New	$155,513,753	$155,513,753	$156,961,170

[1] Assumes Regulatory Option 5 for existing HMIWI, the most stringent Emission Guidelines that would be considered in combination with regulatory option 1 of the NSPS for new sources.
[2] Assumes Regulatory Option 5 for existing HMIWI, the most stringent Emission Guidelines that would be considered in combination with regulatory option 2 of the NSPS for new sources.
[3] Assumes Regulatory Option 6 for existing HMIWI, the most stringent Emission Guidelines that would be considered in combination with regulatory option 3 of the NSPS for new sources

Table 8
Industry-wide Annual Costs for Industries Not Operating On-site Medical Waste Incinerators: Existing and New Sources

Industry	Medical Waste Generated Annually (tons per year)	Annual Control Cost[1]
Medical / dental laboratories	17,600	$348,067
Funeral homes	900	$ 17,799
Physicians' offices	35,200	$696,134
Dentists' offices & clinics	8,700	$172,056
Outpatient care	26,300	$520,123
Freestanding blood banks	4,900	$ 96,905
Fire & rescue operations	1,600	$ 31,642
Correctional facilities	3,300	$ 65,263
Total	98,500	$1,947,989

[1] Assumes that all medical waste is incinerated off-site at an incremental cost of 0.99 cents per pound, the average annualized cost increase for commercial HMIWI (existing and new).

Table 9
Hospital/Medical/Infectious Waste Incineration
Industry-wide Price* Impacts - Existing Sources
Percent Increase (%)

Industry	Range for Regulatory Options 1-6		
	Scenario A No Switching	**Scenario B Switching with Waste Segregation**	**Scenario C Switching with No Waste Segregation**
Hospitals	0.02-0.05	0.01	0.02-0.03
Nursing homes	0.02-0.05	0.01	0.02-0.03
Laboratories. Research Medical/dental	 0.05-0 14 0	 0.03-0 04 0	 0.05-0 09 0
Funeral homes	0	0	0
Physicians offices	0	0	0
Dentists offices and clinics	0	0	0
Outpatient care	0	0	0
Freestanding blood banks	0	0	0
Fire and rescue operations	0	0	0
Correctional facilities	0	0	0
Commercial incineration	2.6	2.6	2.6

* The price increase percentages reported represent the price increase necessary to recover annualized emission control costs for each industry

Table 10
Hospital/Medical/Infectious Waste Incineration
Industry-wide Output, Employment and Revenue Impacts - Existing Sources

Industry	Range for Regulatory Options 1-6		
	Scenario A No Switching	**Scenario B Switching with Waste Segregation**	**Scenario C Switching with No Waste Segregation**
Hospitals			
Output decrease (%)	0-0.02	0-0.01	0-0.01
Employment loss (# of jobs)	0-660	0-202	0-415
Revenue increase or (decrease) (%)	0.01-0.05	0.01	0.01-0.03
Nursing homes			
Output decrease (%)	0 01-0.03	0-0.01	0.01-0 02
Employment loss (# of jobs)	97-494	61-151	94-310
Revenue increase or (decrease) (%)	0.01-0 03	0-0.01	0 01-0.02
Laboratories:			
Research			
Output decrease (%)	0.05-0.18	0.03-0.06	0.05-0.11
Employment loss (# of jobs)	87-287	54-88	83-180
Revenue increase or (decrease) (%)	(0.04)-0	(0.01)-0	(0.03)-0
Medical/dental			
Output decrease (%)	0	0	0
Employment loss (# of jobs)	2-4	2-4	2-4
Revenue increase or (decrease) (%)	0	0	0
Funeral homes			
Output decrease (%)	0	0	0
Employment loss (# of jobs)	0	0	0
Revenue increase or (decrease) (%)	0	0	0
Physicians offices			
Output decrease (%)	0	0	0
Employment loss (# of jobs)	0-1	0-1	0-1
Revenue increase or (decrease) (%)	0	0	0
Dentists offices and clinics			
Output decrease (%)	0	0	0
Employment loss (# of jobs)	1	1	1
Revenue increase or (decrease) (%)	0	0	0
Outpatient care			
Output decrease (%)	0	0	0
Employment loss (# of jobs)	0-1	0-1	0-1
Revenue increase or (decrease) (%)	0	0	0
Freestanding blood banks			
Output decrease (%)	0	0	0
Employment loss (# of jobs)	0	0	0
Revenue increase or (decrease) (%)	0	0	0
Fire and rescue operations			
Output decrease (%)	0	0	0
Employment loss (# of jobs)	0	0	0
Revenue increase or (decrease) (%)	0	0	0
Correctional facilities			
Output decrease (%)	0	0	0
Employment loss (# of jobs)	0	0	0
Revenue increase or (decrease) (%)	0	0	0

for these industries are expected to range from an increase of 0.05% to a decrease of 0.04%. An increase in industry revenue is expected to occur in cases where the price elasticity of demand for an industry's product is inelastic or between 0 and -1. Such a price elasticity indicates that output changes are not very responsive to a change in price, specifically that the percentage decrease in output will be less than the percentage increase in price. Since revenue is a product of price and output, a less than proportional change in output compared to price means that total revenue should increase.

The following example illustrates how the above price impacts could be interpreted for the hospital industry. Table 9 shows that for hospitals, 0.03% is estimated as the price increase necessary to recover annual control costs assuming regulatory option 6 (the most stringent regulatory option) and scenario C, switching with no waste segregation. This change in price can be expressed in terms of the increased cost of hospitalization due to the regulation. Total nationwide adjusted patient days at hospitals in 1993 were an estimated 304.5 million days. ("Adjusted" patient-days include both in-patient days and the in-patient equivalent of out-patient days at hospitals.) The total annualized control cost under regulatory option 6, scenario C for the hospital industry is $92.2 million, or $.30 per adjusted patient day. This means the average price increase that an individual would experience for each hospital patient-day is expected to equal 30 cents.

Table 9 also shows that the average price impact for the commercial HMIWI industry is approximately a 2.6% increase in price. Cost and economic impact estimates are the same for the commercial HMIWI industry regardless of the regulatory option analyzed because all six regulatory options specify identical regulatory requirements. Average Industry wide output, employment, and revenue impacts were not estimated for this sector because data such as price elasticity estimates and employment levels were not available.

5.6 Industry-wide Impacts -Existing and New Sources

Industry wide impacts include estimates of the change in market price for the services provided by the affected industries, the change in market output or production, the change in industry revenue, and impact on affected labor markets in terms of number of jobs lost. These impacts are summarized for existing and new sources on Tables 11 and 12.

As can be seen on Table 11, industries that generate hospital waste and/or medical/infectious waste (i.e., hospitals, nursing homes, etc.) are expected to experience average price increases in the range of 0% to 0.16%, depending on the industry, regulatory option, and scenario analyzed. Table 12 shows that these industries are expected to experience output and employment impacts in the range of 0% to 0.21%. In addition, the revenue impacts for these industries are expected to range from an increase of 0.05% to a decrease of 0.05%. An increase in industry revenue is expected to occur in cases where the price elasticity of demand for an industry's product is inelastic or between 0 and -1. Such a price elasticity indicates that output changes are not very

Table 11
Hospital/Medical/Infectious Waste Incineration
Industry-wide Price* Impacts - New and Existing Sources
Percent Increase (%)

Industry	Range for Regulatory Options 1-3		
	Scenario A No Switching	**Scenario B Switching with Waste Segregation**	**Scenario C Switching with No Waste Segregation**
Hospitals	0.05	0.02	0.03
Nursing homes	0 05	0.02	0.03
Laboratories: Research Medical/dental	 0 15-0.16 0	 0.05 0	 0.10 0
Funeral homes	0.00	0.00	0.00
Physicians offices	0.00	0.00	0.00
Dentists offices and clinics	0 00	0.00	0.00
Outpatient care	0.00	0.00	0.00
Freestanding blood banks	0.01	0.01	0.01
Fire and rescue operations	0.00	0.00	0.00
Correctional facilities	0.00	0.00	0.00
Commercial incineration	4.1	4.1	4.1

* The price increase percentages reported represent the price increase necessary to recover annualized emission control costs for each industry.

Table 12
Hospital/Medical/Infectious Waste Incineration
Industry-wide Output, Employment and Revenue Impacts - New and Existing Sources

Industry	Range for Regulatory Options 1-6		
	Scenario A No Switching	Scenario B Switching with Waste Segregation	Scenario C Switching with No Waste Segregation
Hospitals			
Output decrease (%)	0-0.02	0-0.01	0-0.01
Employment loss	0-772	0-231	0-489
Revenue increase or (decrease) (%)	0.03-0 05	0.01-0.02	0 02-0.03
Nursing homes			
Output decrease (%)	0.02-0.04	0.01	0.01-0 02
Employment loss	269-578	84-172	179-366
Revenue increase or (decrease) (%)	0.02-0 04	0 01	0 01-0.02
Laboratories:			
Research			
Output decrease (%)	0.15-0.21	0.05-0.06	0.10-0.13
Employment loss	239-336	74-100	158-213
Revenue increase or (decrease) (%)	(0.05)-0	(0.02)-0	(0.03)-0
Medical/dental			
Output decrease (%)	0	0	0
Employment loss	3-6	3-6	3-6
Revenue increase or (decrease) (%)	0	0	0
Funeral homes			
Output decrease (%)	0	0	0
Employment loss	0	0	0
Revenue increase or (decrease) (%)	0	0	0
Physicians offices			
Output decrease (%)	0	0	0
Employment loss	0-2	0-2	0-2
Revenue increase or (decrease) (%)	0	0	0
Dentists offices and clinics			
Output decrease (%)	0	0	0
Employment loss	1-2	1-2	1-2
Revenue increase or (decrease) (%)	0	0	0
Outpatient care			
Output decrease (%)	0	0	0
Employment loss	0-2	0-2	0-2
Revenue increase or (decrease) (%)	0	0	0
Freestanding blood banks			
Output decrease (%)	0	0	0
Employment loss	0	0	0
Revenue increase or (decrease) (%)	0-0.01	0-0.01	0-0.01
Fire and rescue operations			
Output decrease (%)	0	0	0
Employment loss	0	0	0
Revenue increase or (decrease) (%)	0	0	0
Correctional facilities			
Output decrease (%)	0.00	0	0
Employment loss		0	0
Revenue increase or (decrease) (%)		0	0

responsive to a change in price, specifically that the percentage decrease in output will be less than the percentage increase in price. Since revenue is a product of price and output, a less than proportional change in output compared to price means that total revenue should increase.

The following example illustrates how the above price impacts could be interpreted for the hospital industry. The estimated average industry-wide price increase for hospitals under regulatory option 3 for the NSPS coupled with regulatory option 6 for the EG (the most stringent regulatory options) and scenario C, switching with no waste segregation, is 0.03 percent as shown in Table 11. This can be expressed in terms of the increased cost of hospitalization due to the regulation. Total nationwide adjusted patient days at hospitals in 1993 were an estimated 304.5 million days. ("Adjusted" patient days include both in-patient days and the in-patient day equivalent of out-patient visits.) The total annualized control cost under regulatory option 3 (NSPS), regulatory option 6 (EG), and scenario C for the hospital industry is $108.8 million, or $0.36 per adjusted patient day. This means that the average price increase that an individual would experience for each hospital patient-day is expected to equal 36 cents.

Table 11 also shows that the average price impact for the commercial HMIWI industry is approximately a 4.1% increase in price. Cost and economic impact estimates are the same for the commercial HMIWI industry regardless of the regulatory option analyzed because all three regulatory options specify identical regulatory requirements. Average industry-wide output, employment, and revenue impacts were not estimated for this sector because data such as price elasticity estimates and employment levels were not available.

5.7 Model Facility Analysis

Facility-specific impacts were also estimated for the affected industries. These impacts were calculated by employing the concept of the model facility. This technique allows an analysis to be prepared on a more detailed level by defining key parameters to describe "typical" facilities in the affected industries. The RIA prepared for the proposed rule used cost estimates provided on a model combustor (i.e., HMIWI) basis to estimate economic impacts for model facilities. The model facility concept not only had to incorporate model HMIWI parameters, (e.g., amount of throughput to determine size, etc.), but also key financial and economic parameters (e.g., revenue, etc.). Therefore, a scheme to assign model HMIWI to model facilities had to be developed in the original RIA.

New information received after proposal made it possible for cost estimates to be developed on a model facility basis, with key model HMIWI parameters already incorporated into the model facility concept. Therefore, this document no longer needs to employ the "linking" scheme used to assign model HMIWI to model facilities in the earlier RIA. The model facilities defined in the cost analysis are presented in Table 13. Note that hospitals are defined in terms of number of beds while nursing homes and commercial research laboratories are defined in terms of number of employees. Note also that commercial incineration facilities are not included in the table. This is

Table 13
Model Facility Definitions

Facility	Definition	HMIWI Assignment
Large Hospital	400 beds	Large HMIWI
Medium Hospital	140 beds	Medium HMIWI
Small Hospital	40 beds	Small HMIWI
Nursing Home	150 employees	Small HMIWI
Commercial Research Laboratory	200 employees	Medium HMIWI
Commercial Incineration Facility	N/A	Commercial HMIWI (large)

N/A - not available

because an exception to the model facility approach is made for commercial HMIWI. Instead, facility-specific impacts are calculated for each of the 59 facilities operating the 79 commercial HMIWI in the HMIWI inventory. (Costs and impacts for commercial HMIWI will be presented in the tables that follow as ranges representing all 59 of the commercial HMIWI facilities in the inventory.)

5.7.1 Model Plant Costs - Existing Sources

Tables 14 and 15 present capital (for scenario A) and annualized (for scenarios A, B, and C) costs for model HMIWI - existing sources. Scenario A has capital costs because it assumes that all facilities currently operating an HMIWI will have emission control equipment installed rather than switch to an alternative technology. Scenarios B and C have no capital costs because switching to an alternative technology precludes the need to invest in emission control equipment for an on-site HMIWI.

For all HMIWI other than commercial HMIWI and small, rural, remote HMIWI (defined as more than 50 miles away from an SMSA and burning less than 2,000 pounds of medical waste per year), scenario A is an unlikely representation of facility-specific impacts for a couple of reasons. First, the assumption that some currently operated HMIWI will not be replaced by alternative technologies is unrealistic. The regulation will impose additional costs on HMIWI and, therefore, will make alternative technologies more attractive – from a cost perspective – in comparison. Second, the model facility analysis under scenario A examines the cost of imposing emission

Table 14
Control Costs for Model HMIWI: Existing Sources
Scenario A: No Switching

Model HMIWI	Regulatory Option					
	One	Two	Three	Four	Five	Six
Small Urban Annualized cost Capital cost	$ 20,325 $ 59,234	$ 71,202 $238,838	$ 71,202 $238,838	$ 77,802 $264,338	$ 77,802 $264,338	$ 87,802 $312,738
Small Rural, not remote or ≥ 2,000 lbs./week Annualized cost Capital cost	$ 20,325 $ 59,234	$ 71,202 $ 238,838	$ 71,202 $238,838	$ 77,802 $264,338	$ 77,802 $264,338	$ 87,802 $312,738
Small Rural, remote and < 2,000 lbs./week Annualized cost Capital cost	$ 20,325 $ 59,234	$ 20,325 $ 59,234	$ 71,202 $238,838	$ 77,802 $264,338	$ 77,802 $264,338	$ 87,802 $312,738
Medium[1] Annualized cost Capital cost	$ 87,494 $253,086	$ 87,494 $253,086	$ 87,494 $253,086	$ 87,494 $253,086	$ 98,794 $305,186	$98,794 $305,186
Large on-site Annualized cost Capital cost	$152,494 $399,886	$152,494 $399,886	$152,494 $399,886	$152,494 $399,886	$152,494 $399,886	$152,494 $399,886
Commercial Annualized cost Capital cost	$0-227,536 $0-640,574	$0-227,536 $0-640,574	$0-227,536 $0-640,574	$0-227,536 $0-640,574	$0-227,536 $0-640,574	$0-227,536 $0-640,574

[1]Under regulatory option one, assumes conservatively that the units are not downsized to small (to meet the less-stringent good combustion control requirement for small HMIWI). Rather, the moderate efficiency wet scrubber requirement for medium HMIWI is met

Table 15
Annual Costs of Switching for Model HMIWI[1]
Scenarios B and C

Model HMIWI	Scenario B - Switching With Waste Segregation	Scenario C - Switching Without Waste Segregation
Small		
Urban	$5,260	$19,200
Rural[2]	$7,400	$31,200
Medium		
Urban	$19,944	$72,800
Rural	$28,058	$118,300
Large		
Urban	$ 93,584	$341,600
Rural	$131,658	$555,100

[1] Switching costs do not vary by regulatory option

[2] Does not apply to facilities that are remote (i.e , more than 50 miles from an SMSA) and burn less than 2,000 pounds of medical waste per week Such facilities are assumed to generally not have switching opportunities.

control costs on "uncontrolled" HMIWI in the baseline. Many currently operated HMIWI already have some emission control equipment installed. The costs of meeting any of the regulatory options would not be from a baseline of "no controls" for these facilities. Therefore, scenario A represents only the extreme case of HMIWI having no emission controls in the baseline. Scenario A, on the other hand, is the only scenario that applies to commercial HMIWI and small, rural, remote HMIWI because they are assumed to not be able to switch to an alternative technology.

Incremental annual costs for off-site generators are presented in Table 16. The costs reflect two alternative estimates of the increase in the cost of off-site incineration. The low estimate is 0.63 cents per pound, the average annualized control cost for all commercial HMIWI. The high estimate derives from an uncontrolled large model commercial HMIWI estimated to have annualized control costs of $193,694 and to burn 7,711,000 pounds of medical waste annually. Dividing cost by throughput yields a cost of 2.51 cents per pound. The use of low and high cost estimates allows for the consideration of uncertainty in the actual incremental cost that off-site generators will face.

Table 16
Annual Costs for Model Facilities Not Operating On-site HMIWI: Existing Sources

Industry/Model Facility	Medical Waste Per Facility (tons)	Incremental Annual Cost Per Facility	
		Low[1]	High[2]
Hospitals			
<50 Beds	9.75	$123	$490
50-99 Beds	17.10	$216	$859
100-299 Beds	52.08	$657	$2,616
300+ Beds	167.28	$2,111	$8,404
Nursing Homes			
0-19 Employees			
Tax-paying	0.14	$2	$7
Tax-exempt	0.17	$2	$9
20-99 Employees			
Tax-paying	1.14	$14	$57
Tax-exempt	1.04	$13	$52
100+ Employees			
Tax-exempt	2.70	$34	$135
Tax-paying	3.44	$43	$173
Commercial Research Laboratories			
Tax-paying			
0-19 Employees	0.28	$4	$14
20-99 Employees	2.19	$28	$110
100+ Employees	24 50	$309	$1,231
Tax-exempt	7 28	$92	$366
Outpatient Care Clinics			
Physicians' clinics (amb. care)			
Tax-paying	2.26	$29	$113
Tax-exempt	4.19	$53	$210
Freestanding kidney dialysis facilities			
Tax-paying	1.62	$20	$81
Tax-exempt	2.31	$29	$116
Physicians' Offices	0.18	$2	$9
Dentists' Offices and Clinics			
Offices	0.08	$1	$4
Clinics			
Tax-paying	0.14	$2	$7
Tax-exempt	0.19	$2	$10
Medical & Dental Laboratories			
Medical	1.63	$21	$82
Dental	0.51	$6	$26
Freestanding Blood Banks	22.48	$284	$1,129
Funeral Homes	0.04	$1	$2
Fire & Rescue	0.05	$1	$3
Corrections			
Federal Government	1.64	$21	$82
State Government	1.70	$21	$85
Local Government	0.34	$4	$17

1 Based on $0 006 per pound, the average annualized control cost for all commercial HMIWI.
2 Based on $0 025 per pound, the annualized control cost for a large model commercial HMIWI that is uncontrolled in the baseline.

5.7.2 Model Plant Costs - New Sources

Tables 17 and 18 present capital (for scenario A) and annualized (for scenarios A, B, and C) costs for new model HMIWI. Scenario A has capital costs because it assumes that all facilities expected to operate an HMIWI will have emission control equipment installed rather than decide to use an alternative technology (i.e., switch). Scenarios B and C have no capital costs because switching to an alternative technology precludes the need to invest in emission control equipment for an on-site HMIWI.

For all HMIWI other than commercial HMIWI and small rural HMIWI that are remote from an urban area, scenario A is an unlikely representation of facility-specific impacts because the assumption that some potentially new HMIWI will not be replaced by alternative technologies is unrealistic. The regulation will impose additional costs on new HMIWI and, therefore, will make alternative technologies more attractive – from a cost perspective – in comparison. In addition, the costs in Table A are from a baseline of no controls. The table therefore overstates control costs for the no doubt many new HMIWI that, in the absence of the emission standards, would have been equipped with at least some controls. Scenario A, on the other hand, may be the only scenario that applies to commercial HMIWI and small rural HMIWI that are remote from an urban area if they are unable to switch to an alternative technology.

Incremental annual costs for off-site generators are presented in Table 19. The costs reflect two alternative estimates of the increase in the cost of off-site incineration. The low estimate is 0.99 cents per pound, the average annualized control cost for all commercial HMIWI, existing and new. The high estimate derives from a new large model commercial HMIWI estimated to have annualized control costs of $358,163 and to burn 7,711,000 pounds of medical waste annually. Dividing cost by throughput yields a cost of 4.64 cents per pound. The use of low and high cost estimates allows for the consideration of uncertainty in the actual incremental cost that off-site generators will face.

5.8 Facility Specific Impacts - Existing Sources

Facility-specific impacts were also estimated for the affected industries. The facility specific price increase is the price increase necessary for an individual facility to fully recover control costs and it is calculated as the ratio of model facility annualized control costs to annual revenue. These estimates, presented in Tables 20 and 21, were calculated for the three switching scenarios. A cost as a percent of revenue/budget ratio was calculated to provide an indication of the magnitude of the impact of the regulation on an uncontrolled facility in each industry sector. The facility-specific cost to revenue/budget ratio was compared to the Industry wide price impact to determine if the facility's impacts differ significantly from the average Industry wide impacts. This calculation was then compared to the Industry wide price impact to determine if the facility's impacts differ significantly from the average Industry wide impacts. A determination of

Table 17
Control Costs for Model HMIWI: New Sources
Scenario A: No Switching

Model HMIWI	Regulatory Option		
	One	Two	Three
Small Urban Annualized cost Capital cost	 $ 68,194 $220,386	 $ 68,194 $220,386	 $ 78,194 $268,786
Small Rural Annualized cost Capital cost	 $ 68,194 $220,386	 $ 68,194 $220,386	 $ 78,194 $268,786
Medium Annualized cost Capital cost	 $159,563 $652,194	 $165,163 $655,394	 $165,163 $655,394
Large on-site Annualized cost Capital cost	 $208,063 $652,894	 $208,063 $652,894	 $208,063 $652,894
Large commercial Annualized cost Capital cost	 $358,163 $758,494	 $358,163 $758,494	 $358,163 $758,494

Table 18
Annual Costs of Switching for Model HMIWI [1]

Model HMIWI	Scenario B - Switching With Waste Segregation	Scenario C - Switching Without Waste Segregation
Small Urban Rural[2]	 $5,260 $7,400	 $19,200 $31,200
Medium Urban Rural	 $19,944 $28,058	 $72,800 $118,300
Large Urban Rural	 $93,584 $131,658	 $341,600 $555,100

[1] Switching costs do not vary by regulatory option.

[2] May not apply to some facilities that burn a small amount of medical waste and are remote from an urban area. Such facilities may not have switching opportunities if they have difficulty attracting the services of waste haulers and/or commercial HMIWI operators.

Table 19
Annual Costs for Model Facilities Not Operating On-site HMIWI: New Sources

Industry/Model Facility	Medical Waste Per Facility (tons)	Incremental Annual Cost Per Facility	
		Low[1]	High[2]
Hospitals			
<50 Beds	9.75	$193	$906
50-99 Beds	17.10	$338	$1,589
100-299 Beds	52.08	$1,030	$4,838
300+ Beds	167.28	$3,308	$15,539
Nursing Homes			
0-19 Employees			
Tax-paying	0.14	$3	$13
Tax-exempt	0.17	$3	$16
20-99 Employees			
Tax-paying	1 14	$23	$106
Tax-exempt	1.04	$21	$97
100+ Employees			
Tax-exempt	2.70	$53	$250
Tax-paying	3.44	$68	$320
Commercial Research Labs			
Tax-paying			
0-19 Employees	0.28	$6	$26
20-99 Employees	2.19	$43	$204
100+ Employees	24.50	$485	$2,276
Tax-exempt	7.28	$144	$676
Outpatient Care			
Physicians' clinics (amb. care)			
Tax-paying	2.26	$45	$210
Tax-exempt	4.19	$83	$389
Freestanding kidney dialysis facilities			
Tax-paying	1.62	$32	$150
Tax-exempt	2.31	$46	$215
Physicians' Offices	0 18	$4	$17
Dentists' Offices and Clinics			
Offices	0.08	$2	$7
Clinics		$3	
Tax-paying	0.14	$4	$13
Tax-exempt	0.19		$18
Medical & Dental Labs			
Medical	1.63	$32	$151
Dental	0.51	$10	$48
Freestanding Blood Banks	22.48	$445	$2,088
Funeral Homes	0.04	$1	$4
Fire & Rescue	0.05	$1	$5
Corrections			
Federal Government	1.64	$32	$152
State Government	1.70	$34	$158
Local Government	0.34	$7	$31

1Based on $0.010 per pound, the average annualized control cost for all commercial HMIWI (existing and new)
2Based on $0.046 per pound, the annualized control cost for a new large model commercial HMIWI

Table 20
Hospital/Medical/Infectious Waste Incineration
Per Facility Impacts Assuming No Switching and Onsite Incineration - Existing Sources
Annualized Control Cost as a Percent of Revenue/Budget (%)

Industry	Scenario A - No Switching					
	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Hospitals - Short term, excluding psychiatric:						
Federal Government						
Small						
Urban and rural, not remote or ≤ 2000 lbs./week	0.11	0.38	0.38	0.42	0.42	0 47
Rural, remote and > 2000 lbs./week	0 11	0.11	0.38	0.42	0.42	0 47
Medium	0.20	0.20	0.20	0.20	0.23	0 23
Large	0.13	0 13	0.13	0.13	0.13	0 13
State Government						
Small						
Urban and rural, not remote or ≤ 2000 lbs./week	0.23	0.82	0.82	0.89	0.89	1 01
Rural, remote and > 2000 lbs./week	0.23	0 23	0 82	0.89	0 89	1 01
Medium	0.21	0.21	0.21	0.21	0.24	0.24
Large	0 07	0.07	0.07	0.07	0 07	0 07
Local Government						
Small						
Urban and rural, not remote or ≤ 2000 lbs /week	0 36	1.27	1.27	1 39	1.39	1 57
Rural, remote and > 2000 lbs /week	0 36	0 36	1.27	1 39	1.39	1 57
Medium	0.32	0.32	0.32	0.32	0.36	0 36
Large	0.10	0 10	0.10	.010	0.10	0 10
Not-for-profit						
Small						
Urban and rural, not remote or ≤ 2000 lbs /week	0.25	0.86	0.86	0.94	0.94	1.06
Rural, remote and < 2000 lbs./week	0.25	0 25	0.86	0.94	0.94	I 06
Medium	0.24	0 24	0.24	0 24	0.27	0.28
Large	0.11	0 11	0.11	0 11	0 11	0.11
For-profit						
Small						
Urban and rural, not remote or ≤ 2000 lbs /week	0.28	0.97	0.97	1.06	1.06	1.20
Rural	0.28	0.28	0.97	1.06	1.06	1.20
Medium	0.25	0.25	0.25	0.25	0.28	0 28
Large	0.14	0.14	0 14	0.14	0.14	0 14
Hospitals - Psychiatric, short term and long term:						
Small						
Urban and rural, not remote or ≤ 2000 lbs /week	0.38	1.34	1.34	1 46	1.46	1 65
Rural, remote and < 2000 lbs./week	0.38	0.38	1.34	1.46	1.46	1 65
Medium	0 58	0 58	0.58	0.58	0.66	0.66
Large	0 47	0.47	0 47	0.47	0.47	0 47
Nursing Homes:						
Tax-Paying						
Urban and rural, not remote or ≤ 2000 lbs./week	0.41	1 45	1.45	1.59	1.59	1.79
Rural, remote and < 2000 lbs./week	0.41	0.41	1.45	1 59	1.59	1.79
Tax-exempt						
Urban	0.42	1.49	1.49	1.62	1.62	1.83
Rural	0.42	0.42	1.49	1.62	1.62	1.83
Commercial research labs						
Tax-paying	0.41	0.41	0.41	0.47	0.47	0 47
Tax-exempt	0.41	0 41	0.41	0 47	0.47	0.47
Commercial Incineration Facilities*	0-18.36	0-18.36	0-18.36	0-18.36	0-20 69	0-20.69

*This is the range of impacts for all 59 facilities operating commercial incinerators. Only three of these facilities are anticipated to experience cost to revenue/budget ratios exceeding the significance criteria of 4.6 percent.

Table 21
Hospital/Medical/Infectious Waste Incineration
Per Facility Impacts Assuming Switching from Onsite Incineration to Commercial Disposal Alternatives - Existing Sources
Alternative Waste Disposal Cost as a Percent of Revenue/Budget (%)

Industry	Scenario B - Switching With Waste Segregation	Scenario C - Switching Without Waste Segregation
Hospitals - Short term, excluding psychiatric:		
Federal Government·		
Small - Urban	0.03	0.10
Rural	0.04	0.17
Medium - Urban	0.05	0 17
Rural	0.06	0.27
Large - Urban	0.08	0.29
Rural	0.11	0.47
State Government.		
Small - Urban	0.06	0.22
Rural	0 08	0.36
Medium - Urban	0 05	0.18
Rural	0.07	0.29
Large - Urban	0.05	0.16
Rural	0.06	0.27
Local Government.		
Small - Urban	0.09	0.34
Rural	0.13	0 56
Medium - Urban	0.07	0.27
Rural	0.08	0.44
Large - Urban	0.06	0.22
Rural	0.08	0.36
Not-for-profit		
Small - Urban	0.06	0.23
Rural	0.09	0.38
Medium - Urban	0.05	0.20
Rural	0.08	0.32
Large - Urban	0.07	0.25
Rural	0.10	0.41
For-profit		
Small - Urban	0.07	0.26
Rural	0.10	0.43
Medium - Urban	0.06	0.21
Rural	0.08	0 34
Large - Urban	0.09	0.32
Rural	0.12	0 52
Hospitals - Psychiatric, short term and long term: Small - Urban	0.10	0.36
Rural	0.14	0.59
Medium - Urban	0.13	0.48
Rural	0.19	0.78
Large - Urban	0.29	1.05
Rural	0.40	1.70
Nursing Homes: Tax-Paying - Urban	0.11	0.39
Rural	0.15	0.64
Tax-exempt- Urban	0.11	0.40
Rural	0.15	0.65
Commercial research labs: Tax-paying - Urban	0.09	0.34
Rural	0.13	0.56
Tax-exempt - Urban	0.09	0.34
Rural	0.13	0.56

significance – implying that the facility price increase may not be achievable – is made for all but commercial HMIWI operators if the facility price increase exceeds the average industry-wide, or "market" price increase by more than one percentage point. For commercial HMIWI operators, the facility price increase is considered significant if it exceeds the market price increase by more than two percentage points. More pricing latitude is given to commercial HMIWI operators for two reasons: 1) commercial incineration is not subject to the same institutional pricing constraints as the health care sector, and 2) commercial incineration fees could actually get a boost from the regulation as a result of switching from on-site incineration and an increase in the demand for commercial incineration services. Where significance is found, the impact on net income (earnings) of absorbing control costs is estimated and evaluated.

Excluding commercial incineration, Tables 20 and 21 show that facilities with onsite HMIWI that are currently uncontrolled may experience impacts ranging from 0.03% to 1.83%, depending on the industry, regulatory option, and scenario analyzed. Commercial incinerator impacts range from 0% to 20.69%. A comparison of the facility-specific economic impacts expected to occur under the three switching scenarios to market price increases indicates that the impacts for facilities that operate on-site HMIWI are generally insignificant. Either the cost of controls or the cost of switching to an alternative waste treatment and disposal method could be recovered with a price increase that does not significantly exceed the market price increase. For many firms currently operating onsite HMIWI the option of switching will be attractive because the economic impacts of switching to an alternative method of waste disposal are much lower than the economic impacts from installing emission control equipment for facilities that are currently uncontrolled.

Two types of HMIWI operators may not be able to switch to an alternative, however: commercial HMIWI operators, because their line of business is commercial incineration; and small, rural, remote HMIWI (defined as more than 50 miles away from an SMSA and burning less than 2,000 pounds of waste per week), which may not have access to waste hauling and/or commercial incineration services. For commercial HMIWI operators, three of the 59 facilities operating the 79 commercial HMIWI in the HMIWI inventory were found to be significantly impacted by the regulation (under all six regulatory options). These facilities may not have to shut down, since they are completely uncontrolled in the baseline and therefore may currently enjoy a cost advantage over their competitors (most of which are at least partially controlled in the baseline), and that the regulation will bring about – due to switching away from on-site incineration – an increase in the demand for commercial incineration services. Impacts are not significant for small, rural, remote HMIWI operators under regulatory options one and two. Under regulatory options three through six, on the other hand, some of these facilities are significantly impacted and might therefore have to shut down.

Table 22 shows the impacts that would be incurred by medical waste generators that currently use an offsite waste incineration service. These impacts range from 0% to 0.02% and are considered negligible impacts. These results indicate that the incremental costs for the vast majority of medical waste generators are expected to be small.

Table 22
Hospital/Medical/Infectious Waste Incineration
Per Facility Impacts For Firms that Utilize Offsite Waste Incineration - Existing Sources
Incremental Annual Cost as a Percent of Revenue/Budget (%)

Industry	Incremental Annual Cost as a Percent of Revenue
Hospitals	
<50 Beds	0-0.01
50-99 Beds	0-0.01
100-299 Beds	0-0.01
300+ Beds	0-0.01
Nursing Homes	
0-19 Employees	
Tax-paying	0
Tax-exempt	0
20-99 Employees	
Tax-paying	0
Tax-exempt	0
100+ Employees	
Tax-exempt	0
Tax-paying	0
Commercial Research Labs	
Tax-paying	
0-19 Employees	0
20-99 Employees	0
100+ Employees	0
Tax-exempt	0
Outpatient Care Clinics	
Physicians clinics (Amb. Care)	
Tax-paying	0
Tax-exempt	0
Freestanding kidney dialysis facilities	
Tax-paying	0
Tax-exempt	0-0.01
Physicians offices	0
Dentists offices and clinics	
Offices	0
Clinics	
Tax-paying	0
Tax-exempt	0
Medical & dental Labs	
Medical	0-0.01
Dental	0-0.01
Freestanding blood banks	0-0.02
Funeral Homes	0
Fire & Rescue	0
Corrections	
Federal Government	0
State Government	0
Local Government	0

This economic impact analysis examines industries that are directly impacted by the regulation, namely industries that generate or treat medical waste. Secondary impacts such as those on air pollution device vendors and HMIWI vendors were not evaluated due to data limitations. However, it can be said that air pollution device vendors are expected to experience an increase in demand for their products due to the regulation. The regulation is also expected to increase the demand for commercial HMIWI services. Due to economies of scale, however, there is likely to be a demand shift from smaller incinerators to larger incinerators. Therefore, vendors of small HMIWI potentially may be adversely affected by the regulation.

5.9 Facility Specific Impacts - New Sources

Facility-specific impacts were also estimated for the affected industries for new sources. These estimates, presented in Tables 23 and 24, were calculated for the three switching scenarios. A cost as a percent of revenue/budget ratio was calculated to provide an indication of the magnitude of the impact of the regulation on an uncontrolled facility in each industry sector. This calculation was then compared to the Industry wide price impact to determine if the facility's impacts differ significantly from the average Industry wide impacts. A determination of significance – implying that the facility price increase may not be achievable – is made for all but commercial HMIWI operators if the facility price increase exceeds the average industry-wide, or "market" price increase by more than one percentage point. For commercial HMIWI operators, the facility price increase is considered significant if it exceeds the market price increase by more than two percentage points. More pricing latitude is given to commercial HMIWI operators for two reasons: 1) commercial incineration is not subject to the same institutional pricing constraints as the health care sector, and 2) commercial incineration fees could actually get a boost from the regulation as a result of switching from on-site incineration and an increase in the demand for commercial incineration services. Where significance is found, the impact on net income (earnings) of absorbing control costs is estimated and evaluated.

For industries other than commercial incineration, Tables 23 and 24 show that facilities with onsite HMIWI that are currently uncontrolled may experience impacts ranging from 0.03% to 1.70%, depending on the industry, regulatory option, and scenario analyzed.

For commercial incineration the cost to revenue/budget ratio is 19.35%. A comparison of the facility-specific economic impacts expected to occur under the three switching scenarios, presented in Tables 23 and 24, to the anticipated market price increases indicates the impacts for facilities that operate on-site HMIWI are generally insignificant. For many of the uncontrolled model facilities, the economic impacts from switching to an alternative method of waste disposal are much lower than the economic impacts from installing emission control equipment. These results indicate that the option of switching to a lower cost alternative for waste disposal will be

Table 23
Hospital/Medical/Infectious Waste Incineration
Per Facility Impacts Assuming No Switching and Onsite Incineration - New Sources
Control Cost as a Percent of Revenue/Budget (%)

Industry	Option 1	Option 2	Option 3
Hospitals - Short term, excluding psychiatric:			
Federal Government			
Small			
Urban	0.37	0.37	0.42
Rural	0.37	0.37	0.42
Medium	0.37	0.38	0.38
Large	0.18	0.18	0.18
State Government			
Small			
Urban	0.78	0.78	0.90
Rural	0 78	0.78	0.90
Medium	0.39	0.40	0.40
Large	0.10	0.10	0.10
Local Government			
Small			
Urban	1.22	1.22	1.40
Rural	1.22	1.22	1 40
Medium	0.59	0.16	0.61
Large	0.13	0.13	0 13
Not-for-profit			
Small			
Urban	0 83	0.83	0.95
Rural	0.83	0.83	0.95
Medium	0.43	0.45	0 45
Large	0.15	0.15	0 15
For-profit			
Small			
Urban	0.93	0.93	1.07
Rural	0.93	0.93	1.07
Medium	0.46	0.48	0.48
Large	0.19	0.19	0.19
Hospitals - Psychiatric, short term and long term:			
Small			
Urban	1.28	1.28	1 47
Rural	1.28	1.28	1.47
Medium	1.06	1.10	1 10
Large	0 64	0 64	0 64
Nursing Homes:			
Tax-Paying			
Urban	1.39	1 39	1.59
Rural	1.39	1 39	1.59
Tax-exempt			
Urban	1.42	1 42	1.63
Rural	1.42	1.42	1.63
Commercial research labs			
Tax-paying	0.75	0.78	0.78
Tax-exempt	0.75	0.78	0.78
Commercial Incineration Facilities*	19.35	19.35	19.35

*This cost to revenue ratio reflects the cost to new HMIWI that would otherwise have been completely uncontrolled.

Table 24
Hospital/Medical/Infectious Waste Incineration
Per Facility Impacts Assuming Switching from Onsite Incineration to Commercial Disposal Alternatives - New Sources
Alternative Waste Disposal Cost as a Percent of Revenue/Budget (%)

Industry	Scenario B - Switching With Waste Segregation	Scenario C - Switching Without Waste Segregation
Hospitals - Short term, excluding psychiatric:		
Federal Government		
Small - Urban	0.03	0.10
Rural	0.03	0.17
Medium - Urban	0.05	0.17
Rural	0.05	0 27
Large - Urban	0.08	0.29
Rural	0.11	0 47
State Government:		
Small - Urban	0.06	0 22
Rural	0.08	0 36
Medium - Urban	0.05	0.18
Rural	0.07	0 29
Large - Urban	0.05	0.16
Rural	0.06	0.27
Local Government.		
Small - Urban	0.09	0 34
Rural	0.13	0.56
Medium - Urban	0.07	0.27
Rural	0.10	0.44
Large - Urban	0.06	0 22
Rural	0.08	0 36
Not-for-profit		
Small - Urban	0.06	0.23
Rural	0.09	0.38
Medium - Urban	0.05	0.20
Rural	0.08	0.32
Large - Urban	0.07	0.25
Rural	0.10	0.41
For-profit		
Small - Urban	0.07	0 26
Rural	0.10	0.43
Medium - Urban	0.06	0.21
Rural	0.08	0.34
Large - Urban	0.09	0.32
Rural	0 12	0 52
Hospitals - Psychiatric, short term and long term: Small - Urban	0.10	0.36
Rural	0 14	0.59
Medium - Urban	0 13	0 48
Rural	0 19	0 78
Large - Urban	0 29	1.05
Rural	0.40	1.70
Nursing Homes: Tax-Paying - Urban	0.11	0.39
Rural	0.15	0.64
Tax-exempt- Urban	0.11	0.40
Rural	0.15	0.65
Commercial research labs: Tax-paying - Urban	0.09	0.34
Rural	0.13	0.56
Tax-exempt - Urban	0.09	0.34
Rural	0.13	0.56

an attractive option for some facilities currently using an onsite HMIWI. The decision to switch to an alternative method of waste disposal should preclude most facilities from experiencing a significant economic impact. These results support our assertion that implementation of the regulation will likely result in either scenarios B or C and that the costs and economic impacts of scenario A are unlikely to occur.

Two types of HMIWI operators may not be able to switch to an alternative, however: commercial HMIWI operators, because their line of business is commercial incineration; and on-site HMIWI that burn a small amount of waste and are located far away from an urban area, because they may not have access to waste hauling and/or commercial incineration services. However, only a few, if any, of the projected 10 new commercial HMIWI over the next five years, and, at the most, only a few of the projected 85 new small on-site HMIWI over the next five years, are likely to be significantly impacted by the regulation (under all three regulatory options). A "significant impact" does not necessarily imply a facility closure or the need to cancel plans to open up, or expand, a facility. For example, operators of small, remote on-site HMIWI may still have switching opportunities. As the commercial incineration industry continues to grow (with additional impetus being provided by the EG and NSPS), it is possible that services will be extended to remote, isolated areas that are currently not served. On-site autoclaving is another possible treatment alternative. If a facility had planned to invest in a new HMIWI, it stands to reason that an on-site autoclave unit of comparable cost would be affordable. Additionally, a facility that had planned – by virtue of operating an on-site HMIWI – to open in a remote area without access to commercial incineration services, might be able to reconsider its location decision, and locate instead in an area with such access.

Table 25 shows the impacts that would be incurred by medical waste generators that currently use an offsite waste incineration service. These impacts range from 0% to 0.02% and are considered negligible impacts. These results indicate that the incremental costs for the vast majority of medical waste generators are expected to be small.

This economic impact section examines possible economic impacts that may occur in industries that will be directly affected by this regulation. Therefore, the analysis includes an examination of industries that generate medical waste or dispose medical waste. Secondary impacts such as subsequent impacts on air pollution device vendors and HMIWI vendors are not estimated due to data limitations. Air pollution device vendors are expected to experience an increase in demand for their products due to the regulation. This regulation is also expected to increase demand for commercial HMIWI services. However, due to economies of scale, this regulation is expected to shift demand from smaller incinerators to larger incinerators. Therefore, small HMIWI vendors potentially may be adversely affected by the regulation. Lack of data on the above effects prevent quantification of the economic impacts on these secondary sectors.

Table 25
Hospital/Medical/Infectious Waste Incineration
Per Facility Impacts For Firms that Utilize Offsite Incineration - New Sources
Incremental Annual Cost as a Percent of Revenue/Budget (%)

Industry	Incremental Annual Cost as a Percent of Revenue
Hospitals	
<50 Beds	0-0.02
50-99 Beds	0-0.01
100-299 Beds	0-0.01
300+ Beds	0-0.01
Nursing Homes	
0-19 Employees	
Tax-paying	0
Tax-exempt	0-0.1
20-99 Employees	
Tax-paying	0-0.01
Tax-exempt	0-0.01
100+ Employees	
Tax-exempt	0-0.1
Tax-paying	0-0 1
Commercial Research Labs	
Tax-paying	
0-19 Employees	0
20-99 Employees	0
100+ Employees	0-0.1
Tax-exempt	0-0.1
Outpatient Care Clinics	
Physicians' clinics (Amb. Care)	
Tax-paying	0-0.01
Tax-exempt	0-0.01
Freestanding kidney dialysis facilities	
Tax-paying	0-0.01
Tax-exempt	0-0.01
Physicians offices	0
Dentists offices and clinics	
Offices	0
Clinics	
Tax-paying	0
Tax-exempt	0
Medical & dental Labs	
Medical	0-0.01
Dental	0-0.02
Freestanding blood banks	0.01-0.03
Funeral Homes	0
Fire & Rescue	0
Corrections	
Federal Government	0
State Government	0
Local Government	0

VI BENEFITS ANALYSIS

A benefit analysis of proposed guidelines and standards for new and existing hospital/ medical/ infectious waste incinerators was contained in *Medical Waste Incinerators - Background Information for Proposed Standards and Guidelines: Regulatory Impact Analysis for New and Existing Facilities*[8] (the 1994 HMIWI RIA). Changes in the regulatory options being considered and the resulting changes in pollutant emissions from new and existing HMIWI have necessitated a revision to the 1994 benefits analysis. This section incorporates the updated estimates of the emission changes to provide a revised benefit analysis of some of the regulatory options under consideration for the final HMIWI rulemaking.

As is discussed in the 1994 HMIWI RIA and is discussed again below, the lack of data regarding the quantitative relationship between ambient exposure to HAPs and health status prevented (and still prevents) development of quantitative benefit estimates in the appropriate framework to compare with cost estimates. As a result, quantifiable benefits are not expected to exceed quantifiable costs for any of the regulatory options under consideration.

As discussed previously in developing the final HMIWI rule, six regulatory options were considered for existing sources and three regulatory options were considered for new sources. For each of these regulatory options, the costs and emission impacts were evaluated under the three "switching" scenarios (A, B, and C). It is likely that actual conditions for "switching" will lie between scenarios B and C. Qualitative benefits are discussed below for the various pollutants. Quantitative benefits of the regulatory options under scenarios B and C are then presented, along with a comparison of quantifiable benefits with costs.

6.1 Emission Changes

Each of the regulatory options under consideration are expected to reduce HMIWI emissions of the following pollutants:

Hazardous Air Pollutants

- Cadmium (Cd)
- Hydrochloric Acid (HCl)
- Lead (Pb)
- Mercury (Hg)

Dioxins

- 2,3,7,8 - chlorinated dibenzodioxins (CDD)
- 2,3,7,8 - chlorinated dibenzofurans (CDF)
- Toxic Equivalent Quantity (TEQ)

Criteria Air Pollutants

- Particulate Matter (PM)
- Sulfur Dioxide (SO_2)
- Carbon Monoxide (CO)
- Nitrogen Oxides (NO_x)

Each of these categories is discussed below.

6.2 Hazardous Air Pollutants

The 1994 HMIWI RIA summarized the health effects associated with exposure to hazardous air pollutants (HAPs). The health effects include probable carcinogenic effects associated with exposure to Cd and Pb, and respiratory effects associated with exposure to Cd, HCl, and Hg. The HAPs emitted from HMIWI facilities have also been associated with effects on the central nervous system, neurological system, gastrointestinal system, mucous membranes, and kidneys.

Although the reductions in the emissions of HAPs are expected to reduce the adverse health effects mentioned above, the lack of data regarding the quantitative relationship between ambient exposure to HAPs and health status prevented the development of quantitative benefit estimates in both the 1994 and the current benefit analyses. To provide some idea of the impact of the promulgated HMIWI standards and guidelines, Tables 26 and 27 present estimates of the baseline HAP emissions from HMIWI and the emission reductions associated with the regulatory options under consideration for existing and new sources, respectively. All of the options under consideration significantly reduce the HAP emissions from both new and existing HMIWI. Without information on the quantitative relationship between ambient exposure to these pollutants and human health, however, the magnitude of the improvement in health associated with these emission reductions cannot be ascertained.

6.3 Dioxins

The regulatory options under consideration are expected to reduce emissions of CDD, CDF, and TEQ. A detailed qualitative discussion of the health effects of CDD and CDF was contained in the 1994 HMIWI RIA. Briefly, the 1994 RIA stated that exposure to CDD/CDF has been linked to reproductive and developmental effects, changes in hormone levels, and chloracne. Since the 1994 HMIWI RIA, TEQ has been developed as a measure of the toxicity of dioxins. TEQ measures the more chlorinated compounds of dioxin and thus provides a better indicator of the part of dioxin that has been linked to the toxic effects associated with CDD/CDF. Unfortunately, quantitative relationships between the toxic effects mentioned above and exposure to CDD/ CDF and TEQ have not been developed. Therefore, quantitative estimates of the health effects of dioxin emission reductions cannot be provided for the current benefit analysis.

Table 26
HAP BASELINE AND EMISSION REDUCTION ESTIMATES FOR EXISTING SOURCES
(tons/year)

		EMISSION REDUCTIONS					
SCENARIO B	**Baseline Emissions**	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Option 5**	**Option 6**
Cd	1.33	0.90	1.12	1.13	1.13	1.13	1.13
HCl	6,300	4,981	6,156	6,215	6,215	6,215	6,215
Pb	11.9	8.4	10.4	10.5	10.5	10.5	10 5
Hg	16.0	14 6	15.2	15.2	15.2	15.2	15 2
SCENARIO C							
Cd	1 33	0.65	1.00	1 01	1 01	1 01	1.01
HCl	6,300	3,978	6,147	6,206	6,206	6,206	6,206
Pb	11 9	6 2	9 5	9.6	9 6	9.6	9 6
Hg	16 0	13 9	14 8	14.9	14.9	14 9	14 9

Table 27
HAP BASELINE AND EMISSION REDUCTION ESTIMATES FOR NEW SOURCES
(tons/year)

		EMISSION REDUCTIONS		
SCENARIO B	**Baseline Emissions**	**Option 1**	**Option 2**	**Option 3**
Cd	0.056	0 051	0 051	0.051
HCl	70.6	68.9	68.9	68.9
Pb	0.429	0.394	0.394	0.394
Hg	0.235	0.173	0.173	0.173
SCENARIO C				
Cd	0.056	0.046	0.046	0.046
HCl	70.6	67.1	67.1	67.1
Pb	0.429	0.363	0.363	0.363
Hg	0.235	0.107	0.107	0.107

Table 28 and 29 summarize the impact of the regulatory options on HMIWI CDD/CDF and TEQ emissions. All regulatory options under consideration will significantly reduce dioxin emissions from HMIWI. Although it is probable that the adverse health risks associated with exposure to CDD/CDF and TEQ will be reduced as a result of the final HMIWI regulation.

Table 28
DIOXIN BASELINE AND EMISSION REDUCTION ESTIMATES FOR EXISTING SOURCES
(g/year)

		EMISSION REDUCTIONS					
SCENARIO B	**Baseline Emissions**	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Option 5**	**Option 6**
CDD/CDF	7,219	6,831	7,007	7,015	7,015	7,017	7,017
TEQ	148	139	143	143	143	143	143
SCENARIO C							
CDD/CDF	7,219	6,625	6,910	6,917	6,917	6,917	6,917
TEQ	148	135	141	141	141	141	141

Table 29
DIOXIN BASELINE AND EMISSION REDUCTION ESTIMATES FOR NEW SOURCES
(g/year)

		EMISSION REDUCTIONS		
SCENARIO B	**Baseline Emissions**	**Option 1**	**Option 2**	**Option 3**
CDD/CDF	46 6	40.7	40.7	40.7
TEQ	1.07	1.0	1.0	1.0
SCENARIO C				
CDD/CDF	46 6	35.0	35.0	40 7
TEQ	1.07	1 0	1.0	1 0

6.4 Criteria Air Pollutants

Several criteria pollutants will be impacted by the end of regulatory options under consideration. Table 30 and 31 report the baseline HMIWI emissions of PM, SO_2, CO, and NO_x, and the expected reductions in emissions resulting from the regulatory options for existing and new sources.

The health and welfare effects of exposure to PM were qualitatively discussed in the 1994 HMIWI RIA. The health effects associated with exposure to PM include premature mortality as well as morbidity. The morbidity effects of PM exposure have been measured in terms of increased hospital and emergency room visits, days of restricted activity or work loss, increased respiratory symptoms, and reductions in lung function. The welfare effects of PM exposure include increased soiling and visibility degradation.

SO_2 has been associated with respiratory symptoms and pulmonary function changes in exercising asthmatics and may also be associated with respiratory symptoms in non-asthmatics. In addition to the effects on human health, SO_2 has also been linked to adverse welfare effects, such as materials damage, visibility degradation, and crop and forestry damage.

Table 30
CRITERIA POLLUTANT BASELINE AND EMISSION REDUCTION ESTIMATES FOR EXISTING SOURCES
(tons/year)

		EMISSION REDUCTIONS					
SCENARIO B	**Baseline Emissions**	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Option 5**	**Option 6**
PM	1,036	823	957	960	962	963	964
SO_2	271	62	81	81	81	83	83
CO	506	407	416	416	416	417	417
NO_x	1,277	292	383	383	383	390	390
SCENARIO C							
PM	1,036	697	907	911	915	922	923
SO_2	271	0	0	0	0	0	0
CO	506	378	378	378	378	378	378
NO_x	1,277	0	0	0	0	0	0

Table 31
CRITERIA POLLUTANT BASELINE AND EMISSION REDUCTION ESTIMATES FOR NEW SOURCES
(tons/year)

		EMISSION REDUCTIONS		
SCENARIO B	**Baseline Emissions**	**Option 1**	**Option 2**	**Option 3**
PM	30.4	28.1	28.1	28.1
SO_2	31.3	16	16	16
CO	14.9	8	8	8
NO_x	148	76	76	76
SCENARIO C				
PM	30.4	25.9	25.9	25.9
SO_2	31.3	0	0	0
CO	14.9	0	0	0
NO_x	148	0	0	0

CO affects the oxygen-carrying capacity of hemoglobin and, at current ambient concentrations, has been related to adverse health effects among persons with cardiovascular and chronic respiratory disease. Both congestive heart failure and angina pectoris have been related to CO exposure.

NO_x has also been shown to have an adverse impact on both human health and welfare. The effects associated with NO_x include respiratory illness, damages to materials, crops, and forests, and visibility degradation.

Concentration-response functions have been developed for the majority of the health and welfare effects mentioned above. In these functions, a quantitative relationship between a specific health or welfare end point and exposure is established. Exposure, however, is generally measured by models in terms of ambient concentration of a pollutant. To do this, facility specific information is needed to determine how changes in control technologies will impact pollutant concentrations in the ambient air. Because such data is not available, a direct application of these concentration-response functions to the present analysis is not possible.

An approximation of the magnitude of these effects can be obtained, however, using the results of existing studies that have evaluated the health and welfare effects of reductions in pollutant concentrations. The *Benefit-Cost Analysis of Selected New Source Performance Standards for*

Particulate Matter[9] (1985) is particularly useful to develop quantitative benefit estimates for the PM emission reductions.[b] Unfortunately, no studies are representative or available to approximate the benefits associated with the SO_2, CO, and NO_x emission reductions.

The *Benefit-Cost Analysis of Selected New Source Performance Standards for Particulate Matter* considered a diverse set of sources located in 721 different counties in the United States to develop estimates of the benefits per ton of PM reduced. The benefit categories considered in this analysis included mortality, morbidity, household soiling and materials damage. The national weighted average (weighted by tons reduced) of benefit per ton values estimated for 1995 was $6,075 (1993 dollars). Wide variations exist in the amount of benefits obtained across different areas. The value is dependent on the density of the exposed population, geographic and meteorological conditions, and the ambient concentrations of PM. As a result, the county specific benefits per ton ranged from $0 to over $100,000. This analysis assumes that the weighted value of $6,075 per ton is representative on average. With this value, the PM benefit estimates of the regulatory options for Scenarios B and C are displayed in Table 32.

Table 32
MONETIZED BENEFITS FOR HMIWI REGULATORY OPTIONS
(thousands of 1993 dollars)

SCENARIO B	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Existing Sources	$4,999.7	$5,813.8	$5,838.1	$5,844.2	$5,856.3	$5,856.3
New Sources	$170.6	$170.6	$170.6	-	-	-
SCENARIO C						
Existing Sources	$4,234.3	$5,510.0	$5,534.3	$5,558.6	$5,601 1	$5,607.2
New Sources	$157.3	$157 3	$157.3	-	-	-

[b] Two more recent studies, *The Benefits and Costs of the Clean Air Act, 1970 to 1990*[10] and *Regulatory Impact Analysis for Proposed Particulate Matter National Ambient Air Quality Standard*[11] are expected to update these values. Since they are both currently in draft form, they were not able to be used as of the completion of this analysis.

6.5 Qualifications

This analysis considers a subset of the total benefits that will accrue from the HMIWI rulemaking. The EPA is not currently able to quantitatively evaluate all human and environmental benefits associated the rule's air quality improvements, and is even more limited in its ability to assign monetary values to these benefit categories. Categories that are not evaluated include several health and welfare endpoints (categories) as well as entire pollutant categories. Therefore, it is likely that the monetary estimate of benefits is an underestimate of actual health and welfare improvements that will result from the implementation of the rule.

There is also some uncertainty and variance in the values chosen to monetize benefits. Therefore, the benefits reported in Table 32 should be viewed with respect to a number of qualifications. First, the benefit per ton estimates implicitly assume that there is a linear relationship between benefits and changes in emissions of pollutants from previous studies and the benefits associated with emission reductions from the HMIWI rule. If the relationship is non-linear, the resulting benefit estimates may be biased. This may be particularly important if a threshold exists below which ambient concentrations of a pollutant do not contribute to adverse human health or the environmental impacts.

Second, the use of benefit per ton estimates from existing studies assumes that the population distributions in these studies is not too dissimilar from the population distributions of the areas impacted by the HMIWI rule. Although the application of the benefit per ton estimates to any one area impacted by the regulation may be inappropriate due to differences in population distributions, the use of average benefit per ton estimates to develop *aggregate* benefit estimates may be reasonable, since variations in these distributions are likely to balance out in the aggregate.

Third, this analysis implicitly assumes that the PM emitted from HMIWI is similar in size and composition to the PM emitted from the sources upon which the underlying PM benefit per ton numbers are based. If the PM emitted from HMIWI facilities is significantly different from the PM emitted from other types of sources, the benefits reported in Tables 7 may be biased.

Finally, a 1995 baseline is used to calculate the number of facilities existing in the industry, and to estimate the number of new sources that will develop in a five year period. From this baseline, control technology is selected to facilitate the calculation of costs and emission reductions. The actual date that benefits will begin to accrue as a result of the emission reductions is uncertain, therefore, this analysis presents the PM benefits with a 1995 baseline (expressed in 1993 dollars). Full implementation of the rule is not anticipated until the year 2002 for existing sources and the year 2000 for new sources, although some sources will comply prior to these dates. The year in which annual emission reductions begin to accrue could alter the value placed on PM benefits due to changes in population densities. If reductions in exposures to PM from HMIWI facilities begins as late as 2002, then population growth from 1995 to 2002 would result in more exposures and thus a higher benefit per ton value for PM. Thus the value presented this analysis may be an underestimate.

6.6 Benefit-Cost Comparison

Benefit-cost comparison is another tool used to evaluate the reallocation of society's resources to address the pollution problem created by HMIWI. The additional costs of pollution control is compared to the improvement in society's well-being from a cleaner and healthier environment. Typically, a net benefit analysis uses total "social"cost in the comparison to monetized benefits. First, since a welfare analysis was not conducted for these rules, the social costs of the regulations are not estimated. Engineering estimates of the costs of emission controls for the different regulatory options are used as a proxy for the social costs of the regulations. Comparing benefits of alternative control options to the costs imposed by the options identifies the strategy that results in the highest net benefit to society. Secondly, the quantifiable benefits of this analysis are limited by the data available on various health and welfare categories for the affected pollutants. EPA is not able to assign monetary values to most of these benefit categories (both health and welfare endpoints, as well as entire pollutant categories). Therefore, the monetized benefits are significantly underestimated, which in this case results in quantifiable costs exceeding the quantifiable benefits. Thus, this comparison of benefits to costs can be utilized to evaluate the option that minimizes the net costs to society. Tables 33 and 34 display the monetized benefits, annualized costs, and net costs (monetized benefits minus annualized costs) of the HMIWI rule. Option 1 under both scenarios minimizes net cost for existing sources. The benefits that are quantifiable for new sources have the same level of emission reductions across each option and therefore, the same monetary value. Thus, the net cost presented in Table 34 is the same across each regulatory option. For Scenario B, net cost is $11.9 million while Scenario C produces a net cost of $26.0 million.

Table 33
NET BENEFITS (COSTS) FOR EXISTING SOURCES
(thousands of 1993 dollars)

SCENARIO B	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Monetized Benefits	$4,999.7	$5,813.8	$5,838.1	$5,844.2	$5,856.3	$5,856.3
Annualized Costs	$55,205.0	$59,155.3	$64,201.4	$64,961.2	$65,213.8	$66,327.5
Net Benefit (Cost)	($50,205.3)	($53,341.5)	($58,363.3)	($59,117.0)	($59,357.5)	($60,471.2)
SCENARIO C						
Monetized Benefits	$4,234.3	$5,510.0	$5,534.3	$5,558.6	$5,601.1	$5,607.2
Annualized Costs	$82,183.9	$119,726.9	$124,773.0	$126,394.0	$129,289.8	$130,737.2
Net Benefit (Cost)	($77,949.6)	($114,216.9)	($119,238.7)	($120,835.4)	($123,688.7)	($125,130.0)

Table 34
NET BENEFITS (COSTS) FOR NEW SOURCES
(thousands of 1993 dollars)

SCENARIO B	Option 1	Option 2	Option 3
Monetized Benefits	$170.6	$170.6	$170.6
Annualized Costs	$12,131.6	$12,131.6	$12,131.6
Net Benefit (Cost)	($11,961.0)	($11,961 0)	($11,961.0)
SCENARIO C			
Monetized Benefits	$157.3	$157.3	$157.3
Annualized Costs	$26,223.9	$26,223.9	$26,223 9
Net Benefit (Cost)	($26,066.6)	($26,066.6)	($26,066.6)

VII SMALL ENTITY IMPACTS AND UNFUNDED MANDATES

7.1 Small Entity Impacts

Section 605 of the Regulatory Flexibility Act (RFA) (5 U.S.C. 601 et seq.) requires Federal agencies to give special consideration to the impacts of regulations on small entities, which are small businesses, small organizations, and small governments. The major purpose of the RFA is to keep paperwork and regulatory requirements from getting out of proportion to the scale of the entities being regulated without compromising the objectives of, in this case, the Clean Air Act.

The President signed the Small Business Regulatory Enforcement Fairness Act (SBREFA) into law on March 29,1996. The SBREFA amended the RFA to strengthen the RFA's analytical and procedural requirements. The SBREFA also made other changes to agency regulatory practices as they affect small entities. Finally, SBREFA established a new mechanism for expedited congressional review of virtually all agency rules.[12]

The RFA as amended by SBREFA requires the Agency to make a determination as to whether a regulation will have "a significant economic impact on a substantial number of small entities " The Administrator has determined that the EG and NSPS for HMIWI will not have a significant impact on a substantial number of small entities.

The U.S. Small Business Administration (SBA) definitions pertaining to business size are either specified by number of employees or sales revenue. For analysis of the EG and NSPS regulations being promulgated for HMIWI, the EPA considers a small business or small organization to be

one with gross annual revenue less than $5 million or one with less than 500 employees.[13] The EPA considers a small government to be one that serves a population less than 50,000.[14] Three types of small "entities" are impacted by the regulation: small businesses, small nonprofit organizations, and small governmental jurisdictions. Examples of impacted businesses include for-profit hospitals and tax-paying nursing homes. Examples of impacted nonprofit organizations include not-for-profit hospitals and, in many cases, tax-exempt nursing homes. Examples of impacted governmental jurisdictions include those (e.g., municipalities, counties, States) that operate hospitals and probably some tax-exempt nursing homes.

In accordance with the RFA as amended by the SBREFA and current EPA Guidance, an analysis of impacts of the EG and NSPS on small "entities" – including small businesses, small nonprofit organizations, and small governmental jurisdictions – was performed. The economic impact analysis indicates that neither the EG nor the NSPS will have a "significant impact on a substantial number of small entities" under any regulatory option. Impacts are not significant for the vast majority of medical waste generators that send their waste off-site to be treated and disposed. Impacts are also not significant for the great majority of HMIWI operators that would have the opportunity to switch to an alternative method of medical waste treatment and disposal if control costs are prohibitive. Some significant impacts were found for commercial HMIWI operators and for small on-site HMIWI operators that are remote from an urban area. These facilities might not have the opportunity to switch to an alternative medical waste treatment and disposal method – commercial HMIWI operators because medical waste incineration is their line of business, and small, remote HMIWI because they may not have access to commercial incineration services

For the EG, only one commercial HMIWI operator that is a small business is significantly impacted with a cost to sales ratio of 11.1 percent. For reasons stated in *Hospital/ Medical/Infectious Waste Incinerators: Background Information for Promulgated Standards and Guidelines - Analysis of Economic Impacts for Existing Sources*[15], it is quite possible that the economic impacts to this firm may not be significant. Only 10 new commercial HMIWI are projected for the period 1996 through 2000 for the NSPS. The size of entities installing new commercial HMIWI is not known, but based on the size distribution of existing commercial HMIWI, the fraction of the 10 new commercial HMIWI that will be operated by a small business is likely to be a small. Significant economic impacts may occur for new commercial HMIWI that are completely uncontrolled in the baseline, but the number of small entities affected is likely to be quite small. The *Hospital/ Medical/Infectious Waste Incinerators: Background Information for Promulgated Standards and Guidelines - Analysis of Economic Impacts for New Source*[16] provides more discussion of small entity impacts for new sources.

The number of small remote HMIWI operators that are small businesses is unknown. A total of 114 small remote HMIWI exist in the current inventory of HMIWI. Based on the analysis conducted in the economic impact analysis for existing sources, it was concluded that up to 57 of the total 114 could be owned or operated by a small entity, and that these small entities could have signficant economic impacts under regulatory options 3 through 6. However, these firms will not be significantly impacted under regulatory options 1 and 2 (i.e., these firms have cost to

sales ratios less than one percent). The number of new HMIWI that will be operated by a small entity and will be located in a remote area is unknown. The projections of new HMIWI indicated that 85 small incinerators are expected to be purchased in the period 1996 through 2000. It is possible that some portion of these new small incinerators will be owned and operated by a small entity. Significant impacts are possible for these entities (i.e., cost to sales ratios more that one percent but less than three percent). However, the EPA believes that the number of new small HMIWI operated by small entities in remote locations even without consideration of the NSPS would be quite small. The EPA believes that the availability of alternative methods of waste disposal will increase in the future also and mitigate any significant impacts resulting from the regulation.

Thus, the EPA concludes that the EG and the NSPS for HMIWI will not have a significant impact on a substantial number of small entities. For further information concerning the analyses conducted to meet the RFA and SBREFA requirements for the EG and NSPS, please refer to the economic impact analyses for existing sources and new sources previously referenced.

7.2 Unfunded Mandate Issues

Under section 202 of the Unfunded Mandates Reform Act of 1995 ("Unfunded Mandates Act"), signed into law on March 22, 1995, the EPA must prepare a statement to accompany any rule where the estimated costs to State, local, or tribal governments, or to the private sector, will be $100 million or more in any 1 year. Section 203 requires the EPA to establish a plan for informing and advising any small governments that may be significantly impacted by the rule. Under section 205(a), the EPA must select the "least costly, most cost-effective or least burdensome alternative that achieves the objectives of the rule" and is consistent with statutory requirements. The EPA has complied with section 205 of the Unfunded Mandates Act, by promulgating a rule that is the most cost-effective alternative for regulation of these sources that meets the statutory requirements under the Clean Air Act. Since this rule is estimated to impose costs to the private sector and government entities in excess of $100 million per year, it is considered a significant regulatory action. Therefore, EPA must consider issues relevant to the Unfunded Mandates Act.

The unfunded mandates statement under section 202 must include among other things an assessment of the costs and benefits of the rule including the effect of the mandate on health, safety, and the environment. Chapters V and VI of this report discuss the costs and benefits of the EG and NSPS for HMIWI.

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16. ABSTRACT

The Regulatory Impact Analysis attempted to compare the costs to the benefits expected from the implementation of standards and guidelines. The cost and economic impact discussion refers to two "Ananysis of Economic Impacts" reports (EPA-453/R-97-007b and EPA-453/R-97-008b). A qualitative discussion of relevant benefit categories is presented. Due to lack of data regarding the benefits associated with reducing specific pollutants, only a few benefit categories were quantified. Therefore, a direct comparison of costs to benefits was not possible.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air Pollution Pollution Control Standards of Performance Emission Guidelines Medical Waste Incinerators Hospital/Medical/Infectious Waste Incinerators	Air Pollution Control Solid Waste Medical Waste Incineration Hospital Waste Infectious Waste	

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